Oracle8™ ConText® Cartridge

Application Developer's Guide

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Oracle8 ConText Cartridge Application Developer’s Guide, Release 2.4

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Preface

This manual explains the SQL*Plus and PL/SQL tools you use to issue text and theme queries with Oracle8 ConText Cartridge and how to enable users to view queried documents. It also explains how to generate document summaries using the linguistic capabilities of Oracle8 ConText Cartridge.

Audience

This document is intended for an application designer, application programmer, or systems analyst responsible for designing and developing text query applications using the facilities provided by ConText.

It is also applicable to the user responsible for managing text in a ConText application. Such users could also include DBAs or system administrators.

Prerequisites

This document assumes that you have experience with the Oracle relational database management system, SQL, SQL*Plus, and PL/SQL. See the documentation provided with your hardware and software for additional information.

If you are unfamiliar with the Oracle RDBMS and related tools, read Chapter 1, "A Technical Introduction to the Oracle Server", in the *Oracle8 Concepts Manual.* The chapter is a comprehensive introduction to the concepts and terminology used throughout Oracle documentation.

Related Publications

For more information about ConText, see:

- *Oracle8 ConText Cartridge QuickStart*
- *Oracle8 ConText Cartridge Administrator's Guide.*
- *Oracle8 Error Messages.*
- *Oracle8 ConText Cartridge Workbench User's Guide.*

For more information about Oracle8, see:

- *Oracle8 Concepts.*
- *Oracle8 Administrator's Guide.*
- *Oracle8 Utilities*
- *Oracle8 Tuning*
- *Oracle8 SQL Reference.*
- *Oracle8 Application Developer's Guide.*

For more information about PL/SQL, see:

- *PL/SQL User's Guide and Reference.*

How To Use This Manual

This manual is designed to be used by application developers to produce text retrieval applications for end users.

Specific tasks in the application design process depend on the type and complexity of the application being developed, but in general, the development process consists of six tasks:

- Analyzing user requirements
- Designing the application
- Developing a ConText application
- Estimating data storage requirements for the application
- Creating the ConText system environment with the database administrator
- Tuning the application's performance

This book only deals with developing a ConText application and tuning the application's performance. All the information necessary to develop and maintain ConText applications is covered in the following chapters.

The *Oracle8 ConText Cartridge Administrator's Guide* contains information about creating and maintaining the system environment to support ConText applications. The administrator's guide and the application developer's guide are designed to be used together.

How This Manual Is Organized

Chapter 1: Building a Query Application

This chapter describes a typical ConText query application and the ConText features you can use to build the application.

Chapter 2: Query Methods

This chapter describes and compares the different query methods.

Chapter 3: Understanding Query Expressions

This chapter describes the various operators you can use to build query expressions.

Chapter 4: Theme Queries

This chapter describes how to issue theme queries.

Chapter 5: Query Expression Feedback

This chapter describes query expression feedback.

Chapter 6: Document Presentation: Highlighting

This chapter describes how to create highlighted output from a text or theme query and how to present highlighted documents to users.

Chapter 7: ConText Linguistics

This chapter describes ConText's theme extraction system.

Chapter 8: Using CTX_LING

This chapter describes how to create linguistic output, including managing the service queue and combining theme/text queries with linguistic output.

Chapter 9: SQL Functions

This reference chapter describes the SQL functions you can use with ConText.

Chapter 10: PL/SQL Packages

This reference chapter describes the procedures and functions included in the PL/SQL packages shipped with ConText.

Appendix A, "Result Tables"

This appendix describes the schema for the result tables used for issuing text and theme queries, highlighting text, and creating linguistic output.

Appendix B, "Scoring Algorithm"

This appendix describes ConText's scoring algorithm for text queries.

Appendix C, "SQL*Plus Sample Code"

This appendix contains explanations of the demonstration applications distributed with ConText.

Appendix D, "Stopword Transformations"

This appendix lists all ConText stopword transformations.

Appendix E, "Knowledge Catalog - Category Hierarchy"

This appendix provides a list of the concepts in the knowledge catalog that serve as grouping categories.

Type Conventions

This book adheres to the following type conventions:

Type	Meaning
UPPERCASE	Uppercase letters indicate Oracle commands, standard database objects and constants, and standard Oracle PL/SQL procedures.
lowercase italics	Italics indicate variable names, PL/SQL parameter names, table names, view names and the names of example PL/SQL procedures.
`monospace`	Monospace type indicate example SQL*Plus commands and example PL/SQL code. Type in the command or code exactly as it appears.

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1

Building a Query Application

This chapter introduces the ConText features you can use to build a query application. It describes a typical query application then discusses the options ConText provides at each step:

Overview

Figure 1–1

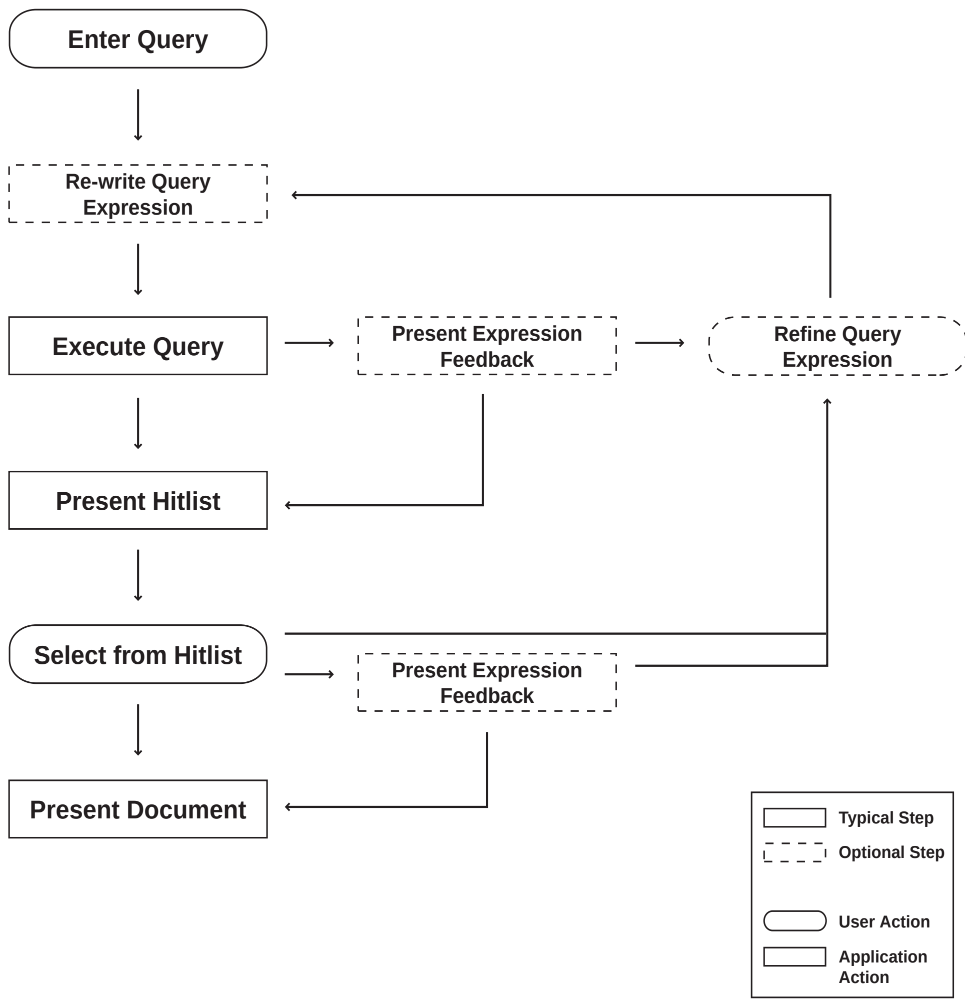


Figure 1–1 illustrates a basic design of a ConText query application. It shows the different modules required to let the user enter the query and hence view the

results. Each module represents a step in the querying process, where rectangular boxes indicate application tasks and round boxes indicate user-tasks.

As shown, the process of issuing a query can be modeled according to the following steps:

- user enters query
- application re-writes query (optional)
- application presents expression feedback (optional)
- user refines query expression (optional)
- application executes query
- application presents hitlist
- user selects from hitlist
- application presents document

Prerequisites

Generally, query applications assume the following tasks have been performed:

- text is loaded in the database
- text is indexed

Loading Text

Documents must be loaded in a text column before you can index the document set and issue queries. You can store documents directly in the text column or you can store a pointer to an external file or URL.

> **See Also:** For more information about loading and storing text, see *Oracle8 Context Cartridge Administrator's Guide.*

Creating an Index

How you index your document set affects how the user of an application can issue queries. With ConText, you can create the following basic types of indexes for documents stored in a text column:

- text index
- theme index

Having a text index allows you to issue text queries against the document set, which is a search on words or phrases.

Having a theme index allows you to issue theme queries against a document set, which is a search on the main ideas in a document.

You can create either type of index by specifying either a text or theme lexer when you create the index preference.

> **See Also:** For more information about creating preferences and text and theme indexes, see *Oracle8 Context Cartridge Administrator's Guide.*

Text Indexing Options

The options you can give the user for issuing *text* queries are determined by how you create the text index. Table 1–1 describes the more frequently used options and which index preference to set to enable each option. The *Reference* column in

Table 1–1 gives the name of the section in this book that describes the query feature in detail.

Once an index is created with these options, the options cannot be changed unless a new index is created.

Table 1–1

Text Query Option	Description	Index Preference	Reference
Stemming	Enables searches for words with same root as specified term.	Wordlist	"Stem Expansions" in Chapter 3.
Soundex	Enables searches for words that sound like specified term.	Wordlist	"Soundex Expansions" in Chapter 3
Fuzzy Matching	Enables searches for words that have similar spelling to specified term.	Wordlist	"Fuzzy Expansions" in Chapter 3
Section Searching	Enables searches for terms within pre-defined document sections.	Wordlist	"WITHIN Operator" in Chapter 3
Base-letter Matching	Queries match words with or without diacritical marks such as tildes, accents, and umlauts. For example in Spanish with a base-letter index, a query of *mañana* matches *manana* and *mañana* in the index.	Lexer	"Base-Letter Queries" in Chapter 3
Case Sensitivity	Enables case-sensitive searches.	Lexer	"Case-Sensitive Queries" in Chapter 3
Composite word query (German and Dutch only)	Enables searching on words that contain specified term as sub-composite.	Lexer	"Composite Word Queries (German and Dutch only)" in Chapter 3

See Also: For more information about creating index preferences, see *Oracle8 Context Cartridge Administrator's Guide.*

Theme Indexing Options

The options discussed in the previous section entitled "Text Indexing Options" are not supported for theme indexes. ConText has no options for creating theme indexes.

Entering the Query

This section provides an overview of the options you can build into your application for user queries.

Text Queries

In ConText, a text query is a search for a word or phrase in an indexed text column. ConText returns the documents (or rows) that satisfy the query along with a score that says how relevant the document is to the entered query.

For example, a text query on the term *unify* returns all documents that contain the word *unify*.

The simplest text query is one in which the application user enters a single word or phrase and ConText returns all documents that contain the word or phrase. More sophisticated queries can include operators to do logical searches, section searches, and wildcard searches. All of ConText's operators are available with text queries.

You can use the standard query methods to perform text queries, namely one-step, two-step, and in-memory.

Theme Queries

In addition to querying English-language documents by words (text query), you can query these documents by theme, or by their main concepts.

Theme queries work similarly to text querying in that you must create an index (theme) for the documents before you can query. Theme queries differ from text queries in that you need not provide exact wording for searches. ConText interprets your query conceptually according to its view of the world and returns an appropriate document hitlist based on theme, along with a measure of how relevant each document is to the query.

For example, a theme query on *unify* returns documents about the concept of *unification* or *unifying*.

You can use the standard query methods to perform theme queries, namely one-step, two-step, and in-memory. In a theme query, you can use some of the operators you use in regular text queries.

> **See Also:** For more information about theme queries, see Chapter 4, "Theme Queries".

Using Operators

Operators in ConText enable you to issue a wide variety of queries including logical AND/OR searches, NOT searches, near searches, document section searches, term weighted searches, and expanded term searches.

You can embed these operators within your application or pass them on to the user. When you embed them within the application, you allow users to enter only query terms. The application can then intelligently process entered terms by combining operators to get different results.

You can also pass on the functionality of operators to users. You can do this by allowing users to enter ConText operators directly or with an interface of pull-down menus and radio buttons. Allowing users to enter operators gives users the ability to tailor their queries.

See Also: Some operators can only work if the index is enabled for them. For a complete list of these operators, see the previous section entitled "Text Indexing Options".

For more information about ConText operators, Chapter 3, "Understanding Query Expressions".

Case-Sensitive Searching

ConText supports case-sensitivity in both text and theme queries.S

Text Queries

By default, ConText creates text indexes without being sensitive to the case of tokens in the documents. Because of this, text queries are case-insensitive. That is, a query on *United* returns documents that contain *United* and *UNITED* and *united*.

However, you can make text queries case-sensitive by using a case-sensitive lexer when you or your ConText administrator indexes the document set. When you create a case-sensitive index, a query on *United* is different from *united*, which is different from *UNITED*.

See Also: For more information about issuing case-sensitive text queries, see "Case-Sensitive Queries" in Chapter 3, "Understanding Query Expressions".

For more information about creating case-sensitive text indexes for columns, see *Oracle8 ConText Cartridge Administrator's Guide*.

Theme Queries

Theme queries are case-sensitive. This means that a query on *Turkey* returns hits on *Turkey* the country and not *turkey* the bird.

Even though ConText theme queries are case-sensitive, ConText tolerates poorly formatted input for known themes.

For example, entering *microsoft* or *microSoft* returns documents that include the theme of *Microsoft*, a known company. Likewise, entering *Currency Rates* returns documents that include a theme of *currency rates*, a standard classification in business and economics.

Note: For poorly formatted input, ConText always attempts to match the entered theme with themes in the index. For example if you enter *microsoft*, ConText looks up *microsoft* and *Microsoft* in the index. Likewise, if you enter *Currency Rates* as your theme, ConText looks up *Currency Rates* and *currency rates* in the index.

Document Section Searching

Section searching enables users to narrow text queries down to sections within documents. Sections can be of the following:

- sentence or paragraphs
- user-defined sections

Sentence or paragraph searching enables users to search for combination of words within sentences or paragraphs.

Searching within user-defined sections enables users to search for a term within sections they have defined prior to creating a text index. To do this type of section searching, you or your ConText administrator must define sections by specifying what tags delimit the section.

User-defined section searching is useful when your documents have internal structure, such as HTML documents.

Note: Section searching is supported for text queries only.

See Also: For more information about section searching, see the "WITHIN Operator" section in Chapter 3.

Structured Field Searching

For both text and theme queries, your application interface can give the user the options of querying on structured fields such as date, document author etc.

You can issue structured searches with one-step, two-step and in-memory queries and subsequently present the structured information related to each document in the hitlist.

> **See Also:** For more information about issuing structured queries, see "Using Two-Step Queries" and "Using In-Memory Queries" in Chapter 2.

Rewriting the Query Expression

You can design your query interface to allow users to enter ConText operators, either by allowing the user to enter operators directly or by using a more sophisticated interface in which the user can choose operators from a pull-down menu or radio button. In either case, your application can refine the query expression further by adding operators or adding or removing special words or symbols to achieve different results.

> **See Also:** For more information about ConText operators, Chapter 3, "Understanding Query Expressions".

Presenting Expression Feedback

After the user enters the query, you can either present expression feedback or execute the query. See Figure 1–1.

Expression feedback allows the user to view how ConText executes the query. Feedback is useful for understanding how ConText expands theme queries as well as how it expands stem, fuzzy, thesaurus, soundex, or wildcard text queries. By providing this additional information, query expression feedback helps users refine queries that might return an unwanted result set.

If the user requires feedback, the application presents the expression feedback, and gives the user the option of re-entering a refined query. See Figure 1–1

Your application can also present expression feedback after executing the query when you present the hitlist. See Figure 1–1

See Also: For more information about query expression feedback, see Chapter 5, "Query Expression Feedback".

Executing the Query

In a PL/SQL application, you can issue a two-step query or an in-memory query, depending on your requirements. You can also count the number of hits in a query.

A third type of query, the one-step query, is discussed in this section for completeness, even though one-step queries cannot be used in PL/SQL applications.

Two-step Queries

Two-step queries use the PL/SQL CONTAINS procedure in the first step to store the results in a specified result table. The second step uses a SELECT statement to select the results from the result table. In the SELECT statement, you can join the result table with the original text table to return more detailed document information.

Because two-step queries use tables to store the hits, they are best suited for applications that require all the results to a query.

> **See Also:** For more information about using two-step queries, see "Using Two-Step Queries" in Chapter 2.

In-memory Queries

In-memory queries use a cursor to return query results, rather than the result tables used in two-step and one-step queries.

In an in-memory query, you open a cursor and issue the query. ConText writes the results of the query to the cursor. You fetch the results one row at a time, then close the cursor. Results can be returned unordered or sorted by score.

Because in-memory queries store results in memory, they generally return hits faster than two-step queries for large hitlists, since you need not retrieve all hits at a time. As such, in-memory queries are best suited for applications that might return large hitlist but where only a small portion of hits are required at a time.

> **See Also:** For more information about using in-memory queries, see "Using In-Memory Queries" in Chapter 2.

One-step Queries

In a one-step query, you create a single SQL SELECT statement with a WHERE... CONTAINS clause to search for relevant documents. ConText returns the rows and columns of the text table that satisfy the query.

Because PL/SQL does not recognize the CONTAINS function in the SELECT statement, one-step queries are limited to interactive or ad-hoc queries in SQL*Plus.

> **See Also:** For more information about using one-step queries, see "Using One-Step Queries" in Chapter 2.

Counting Query Hits

In addition to fully executing two-step, one-step, and in-memory queries, you can count the number of hits in a two-step or in-memory query before or after you issue the query. Counting query hits helps to analyze queries to ensure large and unmanageable hitlists are not returned.

> **See Also:** For more information about counting query hits, see "Counting Query Hits" in Chapter 2.

Presenting the Hitlist

Your application presents a hitlist in one or more of the following ways:

- show structured fields related to document, such as title or author
- show documents ordered by score
- show document hit count
- show query expression feedback
- show document Gist (English only)

Presenting Structured Fields

Structured columns related to the text column can help identify documents. When you present the hitlist, you can show related columns such as document titles or author or any other combination of fields that identify the document.

In a two-step query, you can obtain the structured fields by joining the result table with the base table.

In an in-memory query, you must specify what structured column or columns to fetch into the cursor along with the textkey.

In a one-step query, you specify the name of structured column or columns in the SELECT statement.

Presenting Score

When you issue either a text query or theme query, ConText returns the hitlist of documents that satisfy the query with a relevance score for each document returned. You can present these scores when you return the hitlist to the user.

The score for each document is between one and one hundred and indicates how relevant the document is to the query entered; the higher the score, the more relevant the document. You can use scores to order the hitlist to show the most relevant documents first.

In two-step queries, ConText calculates the score when you call the CTX_QUERY.CONTAINS procedure. This procedure stores the score in the result table.

In in-memory queries, ConText returns the score for a hit as an out parameter with the CTX_QUERY.FETCH_HIT function.

In one-step queries, ConText calculates scores when you use the CONTAINS function. You obtain scores using the SCORE function.

See Also: For more information about manipulating a result set, see "Result-Set Operators" in Chapter 3.

For more information about how ConText scores text queries, Appendix B, "Scoring Algorithm".

For more information about scoring for theme queries, see "Theme Querying" in Chapter 4.

Presenting Document Hit Count

You present the number of hits the query returned alongside the hitlist, using CTX_QUERY.COUNT_LAST, which returns the number of hits in the last two-step or in-memory query.

However, when the number is all that is required, you can use CTX_QUERY.COUNT_HITS, which is more efficient than executing the two-step or in-memory query and then counting the hits.

Presenting Expression Feedback in Hitlist

You can accompany a query hitlist with expression feedback. Using feedback in this way gives the user an opportunity to see the expanded query alongside the results of the query.

When you present your hitlist with expression feedback, you can give the user the option of selecting a document, or of refining and then re-entering another query if the user is not satisfied with the results in the hitlist.

See Also: For more information about query expression feedback, see Chapter 5, "Query Expression Feedback".

Presenting Gists (English only)

If presenting a hitlist is not enough information, you can present a Gist for every document in the hitlist. A Gist is essentially a document summary. However, the generation of a Gist requires an extra processing step and is available for English only.

See Also: For more information about generating Gists and other CTX_LING output, see Chapter 8, "Using CTX_LING".

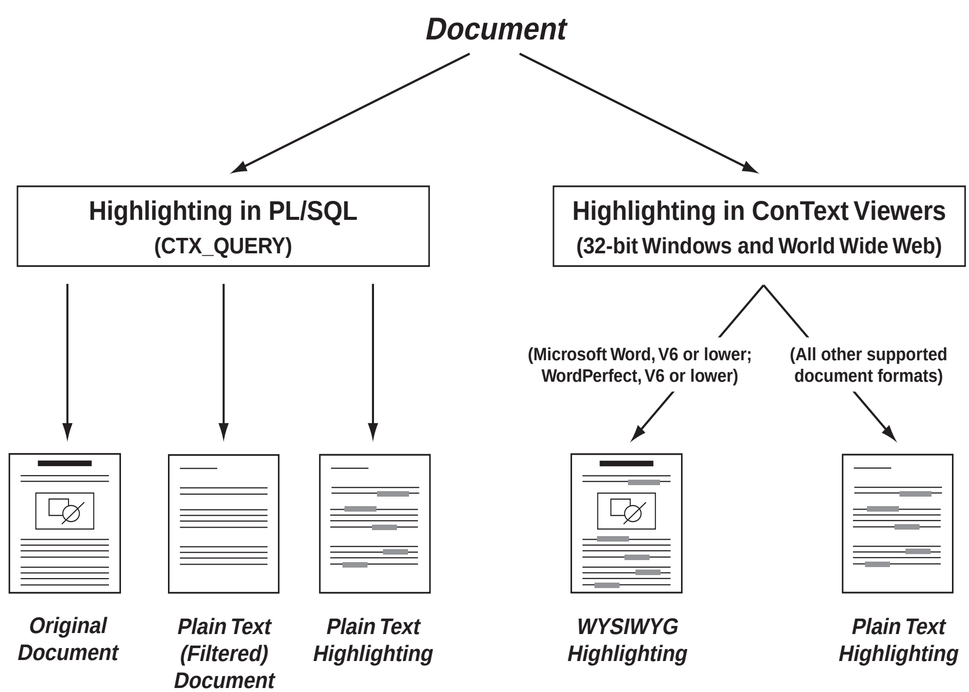
Presenting the Document

When your application obtains the results of a query, it can let the user select a document from the hitlist and then present one or more of the following ConText document services:

- document with or without query terms highlighted (text and theme queries)
- document Gist, theme summary, or list of themes (English only)

Presenting Highlighted Documents

Figure 1–2



ConText enables you to present documents to the user with query terms highlighted for text queries, or with the relevant paragraphs highlighted for theme queries. You can do highlighting in PL/SQL as well as with the ConText viewers for Windows 32-bit and world wide web applications.

HIghlighting in PL/SQL

With PL/SQL, you create the viewable output by calling the highlighting procedure, CTX_QUERY.HIGHLIGHT, usually after you issue the query. You can use this procedure to highlight documents stored as plain text or documents stored in formats such as Microsoft Word.

With the highlighting procedure, you can obtain the document plain-text, document plain-text with highlights, or the document in its native format without highlights. This procedure outputs to result tables, which you use to present the document.The highlighting procedure works for text and theme queries (See Figure 1–2).

> **See Also:** For more information about presenting highlighted documents, see Chapter 6, "Document Presentation: Highlighting".

Highlighting in ConText Viewers

Context provides a custom control that you can embed programmatically in 32-bit Windows client-side applications. This custom control allows users to query documents and then view them in their native formats (WYSIWYG), such as Microsoft Word, with query terms or paragraphs highlighted. See Figure 1–2

You can use the ConText custom control to view documents in the following server-side supported formats:

- Microsoft Word for Windows 2, 6.x
- WordPerfect for Windows 5.x, 6.x
- WordPerfect for DOS 5.0, 5.1, 6.0

For world wide web applications that use the Oracle Web Application server, you can present documents in a Windows 32-bit environment using one of the following:

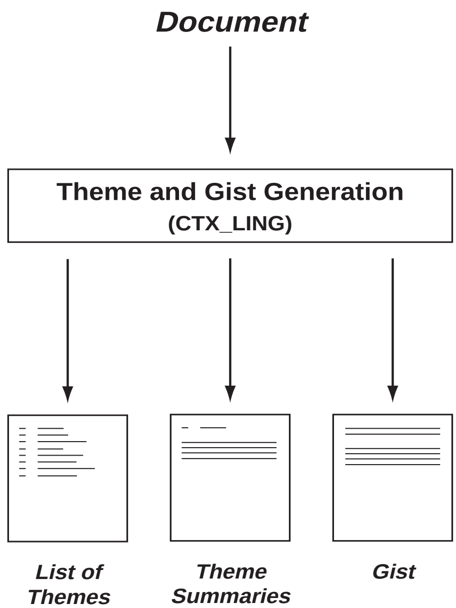
- ConText viewer plug-in with the Netscape browser
- ConText custom control with the Microsoft Internet Explorer.

Both these configurations require that the ConText viewer cartridge be installed on the Oracle Web Application Server.

> **See Also:** For more information about highlighting with ConText viewers, see the *Oracle8 ConText Cartridge Workbench User's Guide*.

Presenting CTX_LING Output (English Only)

Figure 1–3



For English-language documents, the CTX_LING PL/SQL package enables you to create different document summaries and list of themes, which you create on a per-document basis. These summaries and lists of themes are shorter than the documents themselves and can help application users quickly view the essential content of documents.

ConText can generate the following forms of CTX_LING output on a per document basis:

Output Type	Description
List of Themes	A list of the main concepts of a document.
Gist	Paragraph or paragraphs in a document that best represent what the document is about as a whole. You can also generate Gists at the sentence level.

Output Type	Description
Theme Summary	Paragraph or paragraphs in a document that best represent a given theme in the document. You can also generate theme summaries at the sentence-level.

You obtain linguistic output by submitting a linguistic request using the CTX_LING PL/SQL package.

> **See Also:** For more information about generating CTX_LING output, see Chapter 8, "Using CTX_LING".

2

Query Methods

This chapter describes the different query methods you can use in your ConText application. You can use these methods with text queries and theme queries. The following topics are covered:

- Selecting a Query Method
- Using Two-Step Queries
- Using One-Step Queries
- Using In-Memory Queries
- Counting Query Hits

Selecting a Query Method

Each of the query methods (two-step, one-step, and in-memory) provide advantages and disadvantages that you must consider when developing an application. The following table briefly describes each method and illustrates the various advantages and disadvantages to using each:

Query Method	Use	Advantage	Disadvantage
One-step	Used in SQL*Plus. Best suited for interactive queries.	■ No pre-allocation of result tables ■ Uses standard SQL statements ■ Uses table and column names ■ Query results returned in a single step ■ Can retrieve all hits at once	■ Generally slower than two-step or in-memory queries ■ No access to result tables ■ Cannot use in PL/SQL applications
Two-step	Two-step queries are best suited for PL/SQL-based applications that require all the results to a query.	■ Result tables can be manipulated ■ Generally faster than one-step queries, especially for mixed queries ■ Can retrieve all hits at once ■ Query can include a structured condition	■ Requires pre-allocation of result tables ■ Uses policy names ■ Requires two steps to complete ■ Requires join to base text table to return document details
In-memory	In-memory queries are best suited for PL/SQL-based applications that might generate large hitlists, but where only a small portion of the hits are required at a time, such as World Wide Web applications.	■ No result tables ■ Faster response time than two-step, since you need not retrieve all hits in the hitlist. ■ Large hitlists generally faster than one-step and two-step queries ■ Can specify the number of hits returned ■ Query can include a structured condition	■ Uses policy names ■ Cannot retrieve all hits at once ■ With small hitlists, performance improvement over two-step is negligible ■ Requires three steps, including a loop, to complete ■ Max and first/next operators are not supported

Using Two-Step Queries

To perform a two-step query, do the following:

1. Execute CTX_QUERY.CONTAINS. The procedure selects all documents that match the specified search criteria (query expression) and generates a score for each document.

   The document textkeys and scores are stored in the specified result table.

   Note: You must create the result table *before* you execute the CONTAINS procedure.

   ---

2. Use a SELECT statement on the result table (and the base text table, if desired) to return the specified columns as a hitlist for the rows (documents) that satisfy the query expression.

Two-Step Query Example

The following example shows a simple two-step query. The query uses a policy named ARTICLES_POL to search the text column in a table named TEXTTAB for any articles that contain the word *petroleum*. The CONTAINS procedure populates the CTX_TEMP results table with the document primary keys that satisfy the query.

The select statement then joins the results in CTX_TEMP with TEXTAB to create a list of document titles ordered by score.

Note that before the two-step query example is executed, the result table, CTX_TEMP, is created:

```
create table CTX_TEMP(
    textkey varchar2(64),
    score number,
    conid number);

execute ctx_query.contains('ARTICLE_POLICY','petroleum','CTX_TEMP')

SELECT SCORE, title
FROM CTX_TEMP, TEXTTAB
WHERE texttab.PK=ctx_temp.textkey
ORDER BY SCORE DESC;
```

In this example, the articles with the highest scores appear first in the hitlist because the results are sorted by score in descending order.

Scoring

In a two-step query, the score results generated by the CONTAINS procedure are physically stored in a result table that has been allocated (either by the application developer or dynamically within the application).

If you want to include scores in the hitlist returned by a two-step query, select the from the result table in the second step of the query.

Note: The way in which ConText calculates a relevance score for text queries is different than the way it calculates scores for theme queries.

To learn more about how ConText calculates relevance score for text queries, see Appendix B, "Scoring Algorithm".

To learn more about how ConText calculates relevance scores for theme queries, see "Understanding Theme Queries" in Chapter 4, "Theme Queries".

Hitlist Result Tables

In two-step queries, ConText uses result tables called hitlist tables to store intermediate results. Intermediate results can be merged into the standard SQL query through a join operation or a sub-query operation. The result tables must be created before the query is performed. A hitlist table can be created manually or allocated through the CTX_QUERY.GETTAB procedure.

Hitlist tables can be named anything; however, they must have the following structure:

Column Name	Column Datatype	Purpose
TEXTKEY	VARCHAR2(64)	Stores textkeys of the rows satisfying the query
SCORE	NUMBER	Stores the score for each row (document)
CONID	NUMBER	Stores the CONTAINS ID when multiple CONTAINS procedures utilize the same result table

See Also: For more information about the structure of the hitlist result tables, see "Hitlist Table Structure" in Appendix A, "Result Tables".

Sharing a Hitlist Result Table

For applications that support multiple concurrent users, ConText allows for sharing a single result table among all the users rather than allocating a separate table for each user.

You control sharing of result tables with the *sharelevel* and the *query_id* parameters of the CTX_QUERY.CONTAINS procedure. If the result table is shared, the CONTAINS procedure must specify that *sharelevel* is equal to one and include a unique *query_id* so that each result can be distinguished from others in the result table.

When *sharelevel* is equal to 0:

- the hitlist result table is intended for exclusive use
- ConText truncates the hitlist result table at the start of each query
- after the query is completed, CONID values are NULL

When *sharelevel* is equal to 1 then:

- the hitlist result table is intended for shared use
- specify a unique number for *query_id* in the CONTAINS procedure to identify which entries belong to you in the hitlist result table. This number will be assigned to the CONID for each row in the result table generated by the query.
- before the query is run, you must delete existing rows in the result table with the same *query_id* as that specified in the CONTAINS procedure
- after the query is complete, the CONID column for all rows returned by the query contains the *query_id* specified in the CONTAINS procedure
- select your rows by specifying the appropriate CONID in the WHERE clause of the SELECT statement

---

Attention: ConText does not verify that these rules are observed. You must control multiple concurrent usage by passing a different *query_id* to the requestor if the result table is shared.

Composite Textkey Result Tables

When you execute a two-step query on a table with a composite textkey, the number of textkey columns in the result table must match the composite keys count in the document table. For example, if you want to execute a query on a document table that has a two-column textkey, create a result table with the following schema: TEXTKEY, TEXTKEY2, SCORE, CONID.

The following SQL*Plus examples show two different ways in which to create a result table with a two-column composite textkey:

```
/* create composite textkey result table manually */
create table ctx_temp(
       textkey varchar2(64),
       textkey2 varchar2(64),
       score number,
       conid number);

/* allocate composite textkey result table with CTX_QUERY.GETTAB() */
exec ctx_query.gettab(CTX_QUERY.HITTAB, :hit_tab, 2)
```

> **See Also:** For more information on the structure of composite textkey result tables, see "Composite Textkey Hitlist Tables" in Appendix A, "Result Tables".

SELECT from a Pre-defined View

There is an alternative to the second step of a two-step query. Rather than joining the result table and text table in a SELECT statement, you can create a view to perform the join. Then use a SELECT statement to select the appropriate rows from that view. Use this approach when the development tool does not allow tables to be joined in a SELECT statement (e.g. Oracle Forms).

For example:

```
CREATE VIEW SURVEY AS SELECT * FROM TEXTTAB, CTX_TEMP
WHERE PK = TEXTKEY;

SELECT SCORE, AUTHOR FROM SURVEY
ORDER BY SCORE DESC;
```

In this example:

- The CREATE VIEW statement joins the table of articles (TEXTTAB) and the result table (CTX_TEMP). The PK column holds the primary key of the documents.
- The SELECT statement retrieves the scores from the view.

Composite Textkey Queries

To execute a two-step query on a table with a composite textkey, you first specify the multiple textkey columns when you create the policy for the text column.

> **See Also:** For more information about creating policies for composite textkey tables, see *Oracle8 ConText Cartridge Administrator's Guide*.

In addition, before the two-step query, create a result table in which the number of TEXTKEY columns match the number of columns in the composite textkey in the document table. You can create the result table manually or using the CTX_QUERY.GETTAB procedure.

> **See Also:** For more information on the structure of composite textkey result tables, see "Composite Textkey Hitlist Tables" in Appendix A, "Result Tables".

For example, to create a result table manually with a composite textkey consisting of two columns, issue the following SQL statement:

```
create table CTX_TEMP2(
     textkey varchar2(64),
     textkey2 varchar2(64),
     score number,
     conid number);
```

In the two-step query, use the AND operator in the WHERE condition when you join the result and text tables. For example:

```
exec ctx_query.contains('ARTICLE2_POLICY','petroleum','CTX_TEMP2')
SELECT SCORE, title
FROM CTX_TEMP2, TEXTTAB2
WHERE texttab2.PK=ctx_temp2.textkey AND
      texttab2.PK2=ctx_temp2.textkey2
ORDER BY SCORE DESC;
```

Structured Queries

A structured query is a query based on a text column and a structured data column. The structured data column is usually in the same table as the text column. For example, you might use a structured query to retrieve documents on a certain subject that were written after a certain date, where the document content is in a text column and date information is in a structured data column.

The CTX_QUERY.CONTAINS procedure provides an additional parameter, *struct_query,* for specifying the WHERE condition in a structured query. For example, to select all news articles that contain the word *Oracle* that were written on or after October 1st, 1996, you might use:

```
exec ctx_query.contains('news_text','Oracle','res_tab',
struct_query => 'issue_date >= (''1-OCT-1996'')')
```

Note: Because the *struct_query* parameter expects a WHERE condition, you can specify a subquery. This is useful when the structured data column is in another table.

Executing a structured query with the *struct_query* parameter improves performance over processing a query on a text column and then refining the hitlist by applying a where condition against a structured column. This is especially so when the selectivity of the WHERE condition is high, because when you use the structured query parameter, the ConText server executes the entire query without first writing out a potentially large hitlist to be refined later by the Oracle server.

Note: If the user who includes a structured query in a two-step query is not the owner of the table containing the structured and text columns, the user must have SELECT privilege with GRANT OPTION on the table. In addition, if the object being queried is a view, the user must have SELECT privilege with GRANT OPTION on the base table for the view. SELECT privilege with GRANT OPTION can be granted to a user using the GRANT command in SQL.

For more information, see *Oracle8 SQL Reference.*

Querying Columns in Remote Databases

If a database link has been created for a remote database, two-step queries support querying text columns in the remote database.

Note: Database links are created using the CREATE DATABASE LINK command in SQL.

For more information about creating database links, see *Oracle8 SQL Reference*.

To perform a two-step query for a text column in a remote database, specify the database link for the remote database in the CONTAINS procedure as part of the policy for the column in the remote database.

In addition, the result table specified in CONTAINS must exist in the remote database, and you, the user performing the query, must have the appropriate privileges on the result table.

For example:

```
exec ctx_query.contains('MY_POL@DB1', 'petroleum','CTX_TEMP')
```

In this example, MY_POL exists in a remote database identified by the database link DB1. The CTX_TEMP result table exists in the same remote database.

See Also: For more information about remote queries and distributed databases, see *Oracle8 Concepts*.

Two-Step Queries in Parallel

The CONTAINS procedure provides an argument for processing two-step queries in parallel. Processing queries in parallel helps balance the load between ConText servers and might improve query performance.

When the CONTAINS procedure is called in a two-step query, the PARALLEL argument can be used to specify the number of ConText servers, up to the total number of ConText servers running with the Query personality, that are used to process two-step queries and write the results to the result table.

For example:

```
exec ctx_query.contains('ARTICLE_POLICY','petroleum', 'CTX_TEMP', parallel=>2)
```

In this example, the text column in the ARTICLE_POLICY policy is queried for documents that contain the term *petroleum*. The query is processed in parallel by any two available ConText servers with the Query personality and the results are written to CTX_TEMP.

Using One-Step Queries

The one-step query uses the CONTAINS and SCORE functions in a SQL statement to execute a user's request for documents. Rows and columns containing the text and structured data for relevant documents are returned to the application program as a record set like any other query in SQL.

Note: Before one-step queries can be executed, the database in which the text resides must be text enabled by setting the ConText initialization parameter TEXT_ENABLE = TRUE. This can be done by either setting it in the init*sid*.ora system initialization file, or by using the ALTER SESSION command.

For more information about initialization parameters and the init*sid*.ora file, see *Oracle8 Administrator's Guide.*

For more information about using the ALTER SESSION command, see *Oracle8 SQL Reference.*

One-Step Query Processing

After a user has submitted a one-step query, ConText performs the following tasks to return the results to the user:

1. The query is placed on the text queue (query pipe). The Oracle server intercepts the query and passes the text portion (CONTAINS) to ConText.
2. A ConText server with the Query personality picks up the text portion of the query, processes the CONTAINS function(s) and stores the results in an internal table created automatically for the user who submitted the query. This table (and the corresponding intermediate results) are not available to the application.
3. The ConText server rewrites the query as a standard SQL statement and passes it back to Oracle.
4. The rewritten query is executed by an Oracle server and the results are returned to the user.
5. The internal result table is truncated.

One-Step Query Example

The following SELECT statement shows a simple one-step query. This query searches a text table called TEXTTAB for any articles that contain the word *petroleum*.

```
SELECT *
FROM texttab
WHERE CONTAINS (text, 'petroleum') > 0;
```

Because ConText functions execute within normal SQL statements, all of the capabilities for selecting and querying normal structured data fields, as well as text, are available. For instance, in the example, if the text table had a column listing the date the article was published, the user could select articles based on that date as well as the content of the text column.

Note: The asterisk wildcard character (*) in specifies that the record set returned by the query includes all the columns of the text table for the selected documents, as well as the scores generated for each document. If a query has more than one CONTAINS function, the asterisk wildcard does not return scores for the multiple CONTAINS and the SCORE function must be called explicitly. See "Scoring" in this chapter for an example.

Multiple CONTAINS

One-step queries support calling more than one CONTAINS functions in the WHERE clause of a SELECT statement. Multiple CONTAINS can be used in a one-step query to perform queries on multiple text columns located either in the same table or in separate tables.

If multiple ConText servers with the Query personality are running and a one-step query with multiple CONTAINS is executed, the query is processed in parallel. Each CONTAINS function is evaluated by one of the available ConText servers and the results from the servers are combined before they are returned to the user.

Suggestion: If your application makes use of multiple CONTAINS in one-step queries, ensure that multiple ConText servers with the Query personality are running to optimize query performance. The number of ConText servers should be at least equal to the number of CONTAINS you support in one-step queries for the application.

Scoring

In a one-step query, the document scores are generated by the CONTAINS function and returned by the SCORE function.

Each CONTAINS function in a query produces a separate score. When there are multiple CONTAINS functions, each CONTAINS function must have a label (a number) so the SCORE value can be identified in other clauses of the SELECT statement.

The SCORE function can be used in the SELECT statement to order a hitlist as follows:

```
SELECT SCORE (10), title FROM DOCUMENTS
WHERE CONTAINS (TEXT, 'dog', 10) > 0
ORDER BY SCORE(10) DESC;
```

Note: The way in which ConText calculates a relevance score for text queries is different than the way it calculates scores for theme queries.

To learn more about how ConText calculates relevance score for text queries, see Appendix B, "Scoring Algorithm".

To learn more about how ConText calculates relevance scores for theme queries, see "Understanding Theme Queries" in Chapter 4.

Restrictions

The CONTAINS function can only appear in the WHERE clause of a SELECT statement.

You cannot issue the CONTAINS function in the WHERE clause of an UPDATE, INSERT or DELETE statement.

Multiple Policies

For a text column that has more than one policy associated with it, you must specify which policy to use in the CONTAINS clause using the *pol_hint* parameter.

You might create two policies for a column when you want to perform both theme and text queries on the column, or in any application where you build two separate indexes for a text column.

> **See Also:** For more information on issuing one-step queries with multiple policies see "Theme Query Examples" in Chapter 4.
>
> To learn more about using the *pol_hint* parameter, see the specification for the SELECT Statement in Chapter 9.

Composite Textkey Queries

You can perform one-step queries on text tables with composite textkeys. The syntax for the query is the same as the syntax for a query on a table with a single-column textkey.

Querying Columns in Remote Databases

If a database link has been created for a remote database, one-step queries support querying text columns in the remote database.

To perform a one-step query for a text column in a remote database, the database link for the remote database is specified as part of the table name in the SELECT clause.

For example:

```
SELECT *
FROM texttab@db1
WHERE CONTAINS (text, 'petroleum') > 0;
```

In this example, *texttab* exists in a remote database identified by the database link DB1

Note: One-step queries do not support querying LONG and LONG RAW columns in remote database tables.

For more information about creating database links, see *Oracle8 SQL Reference.*

For more information about remote queries and distributed databases, see *Oracle8 Concepts.*

Using In-Memory Queries

In-memory queries use a buffer and a cursor to return query results. Returning query results to a buffer in memory improves performance over writing and reading query results to and from database result tables, which is typical of one- and two-step queries.

To perform an in-memory query, do the following:

1. Call the CTX_QUERY.OPEN_CON function. OPEN_CON performs the following operations:

   - opens a cursor to the query buffer
   - queries a text column using the specified policy and query expression
   - stores in the query buffer the document textkeys and scores for all the documents that meet the search criteria. Hits are stored in order that they are returned or ranked by score, depending on the argument specified for OPEN_CON

   In addition, you can specify that OPEN_CON return additional columns (up to five) for the selected documents from the text table.

2. Call the CTX_QUERY.FETCH_HIT function for each textkey in the buffer to fetch the desired query results, one hit at a time, until the desired number of hits has been returned or no hits remain in the buffer.

3. Call the CTX_QUERY.CLOSE_CON procedure to release the cursor opened by OPEN_CON.

In-Memory Query Example

The following example shows a simple in-memory query. This query uses a policy named ARTICLES_POL to search the text column in a table named TEXTTAB for any articles that contain the word *petroleum*.

```
declare
  score  char(5);
  pk     char(5);
  curid  number;
  title  char(256);

begin
  dbms_output.enable(100000);
  curid := ctx_query.open_con(
                      policy_name  =>  'ARTICLES_POL',
                      text_query   =>  'petroleum',
                      score_sorted =>  true,
                      other_cols   =>  'title');
  while (ctx_query.fetch_hit(curid, pk, score, title)>0)
   loop
    dbms_output.put_line(score||pk||substr(title,1,50));
   end loop;
  ctx_query.close_con(curid);
end;
```

In this example, the TITLE column from the table is also returned by OPEN_CON, so a variable must be declared for TITLE.

DBMS_OUTPUT.ENABLE sets the buffer size to the maximum of 100000 bytes (1 Mb) to ensure that the buffer is large enough to hold the results of the query.

The SCORE_SORTED argument in OPEN_CON is set to *true* which causes OPEN_CON to store the hits in the query buffer in descending order by score.

FETCH_HIT is called in a loop to fetch SCORE, PK, and TITLE for each hit until a value less than zero is returned, indicating that the buffer is empty.

DBMS_OUTPUT.PUT_LINE prints the results to the standard output.

> **See Also:** For more information about the DBMS_OUTPUT PL/SQL package, see *Oracle8 Application Developer's Guide*.

In-Memory Queries and Composite Textkeys

You can perform in-memory queries on text tables that have multiple column textkeys. When you use CTX_QUERY.FETCH_HIT to retrieve each hit from the buffer, the PK argument is returned as an encoded string. To access an individual textkey, you must use CTX_QUERY.PKDECODE.

In-Memory Query Limitations

In-memory queries have the following limitation:

Max and First/Next Operators

You *cannot* use the max and first/next operators with in-memory queries.

Querying Columns in Remote Databases

If a database link has been created for a remote database, in-memory queries support querying text columns in the remote database.

Note: Database links are created using the CREATE DATABASE LINK command in SQL.

For more information about creating database links, see *Oracle8 SQL Reference*.

To perform an in-memory query for a text column in a remote database, the database link for the remote database is specified in the CTX_QUERY.OPEN_CON procedure as part of the policy for the column in the remote database.

In addition, the result table specified in CTX_QUERY.CONTAINS must exist in the remote database and the user performing the query must have the appropriate privileges on the result table.

See Also: For more information about remote queries and distributed databases, see *Oracle8 Concepts*.

Counting Query Hits

In addition to two-step, one-step, and in-memory queries, you can count the number of hits in a two-step or in-memory query. Counting query hits helps to audit queries to ensure large and unmanageable hitlists are not returned.

You can count the number of hits before or after you issue the query using one of the following functions:

- CTX_QUERY.COUNT_HITS
- CTX_QUERY.COUNT_LAST

Using COUNT_HITS Before the Query

Before you issue a two-step or in-memory query, you can use the CTX_QUERY.COUNT_HITS function to return the number of hits for the query without generating scores for the hits or returning the textkeys for the documents.

COUNT_HITS can be called in two modes, estimate and exact. The results in estimate mode may be inaccurate; however, the results are generally returned faster than in exact mode.

See Also: CTX_QUERY.COUNT_HITS in Chapter 10.

Using COUNT_LAST After the Query

You can use the CTX.QUERY.COUNT_LAST function to obtain the number of hits in a two-step query and in-memory query *after* issuing CONTAINS or OPEN_CON.

COUNT_LAST returns the number of hits obtained from the last call to CTX_QUERY.CONTAINS or CTX_QUERY.OPEN_CON.

For two-step queries, the time it takes to issue the query with CONTAINS and then to call COUNT_LAST is not as fast as calling COUNT_HITS before the query. However, in the case where you need to process all hits in a two-step query, issuing the query with CONTAINS and then calling COUNT_LAST is more efficient than calling COUNT_HITS and then calling CONTAINS.

With in-memory queries, issuing OPEN_CON and then calling COUNT_LAST is always a more efficient way to obtain an estimate of the query hits over calling COUNT_HITS and then calling OPEN_CON, since COUNT_LAST returns a number faster than COUNT_HITS.

See Also: CTX.QUERY.COUNT_LAST in Chapter 10.

3 Understanding Query Expressions

This chapter explains how to use ConText to create query expressions to find relevant text in documents. The topics covered in this chapter are:

- About Query Expressions
- Logical Operators
- WITHIN Operator
- Score-Changing Operators
- Result-Set Operators
- NEAR Operator
- Expansion Operators
- Thesaurus Operators
- Wildcard Characters
- Grouping Characters
- Stored Query Expressions
- PL/SQL in Query Expressions
- Operator Precedence
- Escaping Reserved Words and Characters
- Querying with Stopwords
- Querying with Special Characters

About Query Expressions

A query expression defines the search criteria for retrieving documents using ConText. A query expression consists of query terms (words and phrases) and other components such as operators and special characters which allow users to specify exactly which documents are retrieved by ConText.

A query expression can also call stored query expressions (SQEs) to return stored query results or call PL/SQL functions to return values used in the query.

When a query is executed using any of the methods supported by ConText, one of the arguments included in the query is a query expression. ConText then returns a list of all the documents that satisfy the search criteria, as well as scores that measure the relevance of the document to the search criteria

Query Terms

Query terms can consist of words and phrases. Query terms can also contain stopwords.

Words and Phrases

The words in a query expression are the individual tokens on which the query expression operators perform an action. If multiple words are contained in a query expression, separated only by blank spaces (no operators), the string of words is considered a phrase and the entire string is searched for during a query.

Stopwords

Stopwords are common words, such as *and*, *the*, *of*, and *to*, that are not considered significant query terms by themselves because they occur so often in text. However, stopwords can provide useful search information when combined with more significant terms.

For example, a query for documents containing the phrase *peanut butter and jelly* returns different results than a query for documents containing the terms *peanut butter* and *jelly*.

When you define a policy for a column, ConText lets you identify a list of stopwords. When stopwords are encountered in the documents in the column, they are not included as indexed terms in the text index; however, they are recorded.

As a result, stopwords cannot be searched for explicitly in text queries, but can be included as part of a phrase in a query expression.

See Also: For more information about querying with stopwords, see "Querying with Stopwords" in this chapter.

Stoplists can be created in any language supported by ConText. ConText provides a default stoplist in English.

Note: Stopwords do not have an affect on the theme indexes generated by ConText for your English-language documents.

Query Expression Components

In addition to query terms, a query expression may contain any or all of the following components:

Component	Purpose
Operators	Define the relationships between the terms in a query expression and specify the output returned by the query. The different types of operators are: logical, ranking, result set, proximity, expansion, and thesaurus.
Wildcard Characters	Expand query terms using pattern matching
Grouping Characters	Group terms and operators in a query expression
Stored Query Expressions (SQEs)	Return the results of a query that has been executed and the results stored in an SQE table
PL/SQL Functions	Execute a function and use the results in a query expression

Case-Sensitive Queries

ConText supports case-insensitivity for text queries and case-sensitivity for both text and theme queries.

Text Queries

With text queries, you can issue case-sensitive and case-insensitive queries. The ability to query in a case-sensitive way depends on the lexer preference used to index the document set.

By default, ConText uses a lexer preference that is not case-sensitive when indexing documents. Therefore, with a policy containing the default lexer preference, queries are not case-sensitive. When queries are not case-sensitive, a query on *United* returns the same hits as a query on *united*.

To issue case-sensitive text queries, you or your ConText administrator must first index your document set using a policy with a case-sensitive lexer preference. Using the same policy, you can issue case-sensitive queries. With case-sensitive queries, a query on *United* is different from a query on *united*.

Case-sensitive querying helps to identify words that have different meaning when capitalized. For example, to query on the proper noun *Church* (as someone's name) without getting the hits for the common noun *church*, you issue *Church* as your query. ConText returns all appearances of *Church*.

Note: Because a case-sensitive query on a term such as *Church* returns all appearances of *Church*, the hitlist includes occurrences of *Church* at the beginning of a sentence, whether it is the common or proper noun.

Stopwords and Case-Sensitivity When you have case-sensitivity enabled, searches on stopwords are also case-sensitive. Thus when you issue a case-sensitive query on a phrase containing stopwords and non-stopwords, ConText searches for the phrase containing the stopwords with the specified case.

For example, assuming the word *on* is a stopword and case-sensitivity is enabled, a search on the phrase *on the waterfront* does not return hits for documents containing the phrase *On the waterfront*.

Theme Queries

Theme queries are case-sensitive. For example, a query on *Turkey* produces hits on *Turkey* the country and not *Turkey* the bird.

See Also: For more information about case-sensitive theme queries, see Chapter 4, "Theme Queries".

Composite Word Queries (German and Dutch only)

German and Dutch language text contains composite words. With ConText, you can create a composite index and subsequently issue queries to search for composite words using a subcomposite word as your query term.

To query against a composite index, you specify the policy associated with the composite index with two-step or in-memory queries. For one-step queries, you must specify the policy if the text column has more than one index attached to it.

> **See Also:** For more information about creating a composite index for German, see *Oracle8 Context Cartridge Administrator's Guide.*

German Example

When using a German composite index, a query on the term *Bahnhof* (train station) returns documents that contain *Bahnhof* or any word containing *Bahnhof* as a sub-composite, such as *Hauptbahnhof*, *Nordbahnhof*, or *Ostbahnhof*.

However, a query on *Bahnhof* does not return documents that contain the single words *Bahn* or *Hof*.

Dutch Example

When using a Dutch composite index, a query on the term *kapitien* returns documents that contain *kapitien* or any word containing *kapitien* as a sub-composite, such a *scheepskapitien*.

Highlighting Composite Terms

You can use text highlighting with composite word queries. When you do so, ConText highlights the entire composite word, not just the sub-composite you entered as your query.

For example, when you issue *Bahnhof* as your query, context highlights the words *Hauptbahnhof*, *Nordbahnhof*, and *Ostbahnhof* entirely.

> **See Also:** For more information on highlighting text queries, see Chapter 6, "Document Presentation: Highlighting".

Base-Letter Queries

For languages that use an 8-bit character set, such as French and Spanish, Context gives you the option of converting characters to their base-letter representation before text indexing. This means that words with tildes, accents, umlauts, and so on are converted to their base-letter representation before their tokens are placed in the text index.

When you specify a text index that has used base-letter conversion in a query, ConText converts the term in the query expression to match the base-letter representation before the query is processed.

The result is that with base-letter conversion *on* for Spanish text index, a query on *manaña* returns documents that contain *manaña* and *manana*.

However, with base letter conversion *off* for a Spanish text index, a query on *manaña* returns documents that contain only *manaña*.

In addition, all expansion and stopword checking for the query is performed on the base-letter terms.

> **See Also:** For more information about creating an index that supports base-letter conversion, see *Oracle8 Context Cartridge Administrator's Guide.*

Thesaural Queries

The terms in a thesaural query are *not* converted to base-letter representation before look-up in the thesaurus. The base-letter conversion takes place after the thesaurus look-up and is performed on all the terms returned by the thesaurus.

Query Expression Examples

The following example of a one-step query returns all articles that contain the word *wine* in the TEXTTAB.TEXT_COLUMN column. The query expression consists only of the query term *wine*, surrounded by single quotes.

```
SELECT articles FROM texttab
WHERE CONTAINS(textcol, 'wine') > 0;
```

The following example of a one-step query returns all articles that contain the phrase *wine and roses* in the TEXTTAB.TEXT_COLUMN column. The query expression consists of the query phrase *wine and roses*, surrounded by single quotes.

```
SELECT articles FROM texttab
WHERE CONTAINS(textcol, '{wine and roses}') > 0;
```

See Also: For more information about the CONTAINS function used in one-step queries, see CONTAINS in Chapter 9.

Logical Operators

Logical operators combine the terms in a query expression. All single words and phrases may be combined with logical operators. When query terms are combined, the number of spaces around the logical operator is not significant.

Logical operators link query terms together to produce scores that are based on the relationship of the terms to each other. The logical operators combine the scores of their operands up to a maximum value of 100. Operands can be any query terms, as well as other operators.

Operator	Syntax	Description
AND	term1&term2 term1 and term2	Returns documents that contain *term1* and *term2*. Returns the minimum score of its operands. All query terms must occur; lower score taken.
OR	term1 | term2 term1 or term2	Returns documents that contain *term1* or *term2*. Returns the maximum score of its operands. At least one term must exist; higher score taken.
NOT	term1~term2 term1 not term2	Returns documents that contain *term1* and not *term2*.
EQUIVALENCE	term1=term2 term1 equiv term2	Specifies that *term2* is an acceptable substitution for *term1*.

AND Operator

Use the AND operator to search for documents that contain at least one occurrence of *each* of the query terms. For example, to obtain all the documents that contain the terms *batman* and *robin* and *penguin*, issue the following query:

```
'batman & robin & penguin'
```

In an AND query, the score returned is the score of the lowest query term. In the example above, if the three individual scores for the terms *batman*, *robin*, and *penguin* is 10, 20 and 30 within a document, the document scores 10.

OR Operator

Use the OR operator to search for documents that contain at least one occurrence of *any* of the query terms. For example, to obtain the documents that contain the term *cats* or the term *dogs*, use one of the following:

```
'cats | dogs'
'cats OR dogs'
```

In an OR query, the score returned is the score for the highest query term. In the example above, if the scores for *cats* and *dogs* is 30 and 40 within a document, the document scores 40.

NOT Operator

Use the NOT operator to search for documents that contain one query term and not another.

For example, to obtain the documents that contain the term *animals* but not *dogs*, use the following expression:

```
'animals ~ dogs'
```

Similarly, to obtain the documents that contain the term *transportation* but not *automobiles* or *trains*, use the following expression:

```
'transportation not (automobiles or trains)'
```

Note: The NOT operator does not affect the scoring produced by the other logical operators.

Equivalence Operator

Use the equivalence operator to specify an acceptable substitution for a word in a search. For example, if you want all the documents that contain the phrase *alsatians are big dogs* or *labradors are big dogs*, you can write:

```
'labradors=alsatians are big dogs'
```

ConText processes the above query faster and more efficiently than the same query written with the accumulate operator. For example, you could write the above query less efficiently and less concisely as follows:

```
'labradors are big dogs, alsatians are big dogs'
```

The savings you gain in using the equivalence operator over the accumulate operator is most significant when you have more than one equivalence operator in the query expression. For example, the following query

```
'labradors=alsatians are big canines=dogs'
```

is a more efficient, more concise form of:

```
'labradors are big dogs,
alsatians are big dogs,
alsatians are big canines,
labradors are big canines'
```

Precedence of Equivalence Operator

The equivalence operator has higher precedence that all other operators except the unary operators (fuzzy, soundex, stem, and PL/SQL function calls).

WITHIN Operator

You can use the WITHIN operator to narrow a query down into document sections. Document sections can be one of the following:

- sentence or paragraphs
- pre-defined sections

WITHIN Syntax

The syntax for the WITHIN operator is as follows:

Syntax	Description
expression WITHIN SENTENCE	Searches for documents that contain *expression* within a sentence. Specify an AND or NOT query for *expression*.
expression WITHIN PARAGRAPH	Searches for documents that contain *expression* within a paragraph. Specify an AND or NOT query for *expression*.
term WITHIN *section*	Searches for *term* within the pre-defined *section*. The WITHIN operator has no effect on score.

Querying Within Sentence or Paragraphs

Querying within sentence or paragraph boundaries is useful to find combinations of words that occur in the same sentence or paragraph.

Examples

To find documents that contain *dog* and *cat* within the same sentence:

```
'(dog and cat) WITHIN SENTENCE'
```

To find documents that contain *dog* and *cat* within the same paragraph:

```
'(dog and cat) WITHIN PARAGRAPH'
```

To find documents that contain sentences with the word *dog* but not *cat*:

```
'(dog not cat) WITHIN SENTENCE'
```

Querying Within User-defined Sections

Use the WITHIN operator to narrow down a query into user-defined document sections.

For example in an HTML document set, you or your ConText administrator can define a section for all headings delimited with <*HEAD*> and <\ *HEAD*> and subsequently issue a query for a term in a heading across all documents.

Note: The WITHIN operator requires you to know the name of the section you wish to search. A list of defined sections can be obtained using the CTX_ALL_SECTIONS or CTX_USER_SECTIONS views.

See Also: For more information about defining sections, see the *Oracle8 Context Cartridge Administrator's Guide.*

Examples

To find all the documents that contain the term *San Francisco* within the user-defined section *Headings,* write your query as follows:

```
'San Francisco WITHIN Headings'
```

To find all the documents that contain the term *sailing* and contain the term *San Francisco* within the user-defined section *Headings*, write your query in one of two ways:

```
'(San Francisco WITHIN Headings) and sailing'
```

```
'sailing and San Francisco WITHIN Headings'
```

To find all documents that contain the terms *dog* and *cat* within the same user-defined section *Headings,* write your query as follows:

```
'(dog and cat) WITHIN Headings'
```

Note that the above query is logically different from:

```
'dog WITHIN Headings and cat WITHIN Headings'
```

which finds all documents that contain *dog* and *cat* where the terms *dog* and *cat* are in *Headings* sections, regardless of whether they occur in the same *Headings* section or different sections.

To find all documents in which *dog* is near *cat* within the section *Headings*, write your query as follows:

```
'dog near cat WITHIN Headings'
```

Limitations

The WITHIN operator has the following limitations:

- The theme lexer does not support the WITHIN operator
- You cannot embed the WITHIN clause in a phrase. For example, you cannot write: *term1 WITHIN section term2*
- You cannot combine WITHIN with expansion operators
- Subqueries passed to WITHIN cannot use the Max or First/Next operators.
- You cannot nest the WITHIN operator For example, you cannot write: *dog WITHIN body WITHIN heading.*
- Since WITHIN is a reserved word, you must escape the word with braces to search on it.

Score-Changing Operators

Score changing operators behave like logical operators in that they return documents given the terms you specify. However, these operators affect document scores differently and, as such, can be used to change a document's rank in a hitlist with respect to a query term. The following table describes these operators:

Operator	Syntax	Description
ACCUMULATE	term1,term2 term1 accum term2	Returns documents that contain *term1* or *term2*. Calculates score by adding the score of each operand. Similar to OR, except that the returned score is the *sum* of all scores.
MINUS	term1-term2 term1 minus term2	Returns documents that contain *term1*. Calculates score by subtracting occurrences of *term2* from occurrences of *term1*.
WEIGHT	term*n	Returns documents that contain *term*. Calculates score by multiplying the raw score of *term* by *n*, where n is a number from 0.1 to 10.

Accumulate Operator

Use the accumulate operator to search for documents that contain at least one occurrence of *any* of the query terms, where the documents that contain the most frequent occurrences of the query terms are given the highest score.

For example, to search for documents that contain either term *Brazil* or *soccer* and to have the highest scores attached to the documents that contain the most occurrences of these words, you can issue:

```
'soccer,Brazil'
```

Accumulate is similar to OR, in the sense that a document satisfies the query expression if any of the terms occur in the document; however, the scoring is different. OR returns a score based *only* on the query term that occurs most frequently in a document. Accumulate combines the scores for all the query terms that occur in a document, topping out at 100 when the sum exceeds 100. Thus documents that contain the most query terms are ranked the highest.

MINUS Operator

Use the MINUS operator to search for documents that contain a query term, and when you want the presence of a second query term to cause the document to be ranked lower.

The minus operator is useful for lowering the score of documents that contain "noise". For example, suppose a query on the term *cars* always returned high scoring documents about *Ford cars*. You can lower the scoring of the Ford documents by using the expression:

```
'cars - Ford'
```

In essence, this expression returns the documents that contain the term *cars*. However, the score returned for a document is the number of occurrences of *cars* minus the number of occurrences of *Ford*. When a returned document does not contain *Ford*, the occurrence of the term *Ford* is counted as zero.

Weight Operator

The *weight* operator multiplies the score by the given factor, topping out at 100 when the product exceeds 100. For example, the query *cat, dog*2'* sums the score of *cat* with twice the score of *dog*, topping out at 100 when the score is greater than 100.

In expressions that contain more than one query term, use the weight operator to adjust the relative scoring of the query terms. You can reduce the score of a query term by using the weight operator with a number less than 1; you can increase the score of a query term by using the weight operator with a number greater than 1 and less than 10.

The weight operator is useful in accumulate, OR, or AND queries when the expression has more than one query term. With no weighting on individual terms, the score cannot tell you which of the query terms occurs the most. If you are interested in documents that contain a particular query term more than another term, the overall ranking tells you nothing about which documents pertain to the term that you are most interested in.

Example

You have a collection of sports articles. You are interested in the articles about soccer, in particular Brazilian soccer. It turns out that a regular query on *soccer, Brazil* returns many high ranking articles on US soccer. To raise the ranking of the articles on Brazilian soccer, you can issue the following query:

```
'soccer, Brazil*3'
```

Table 3–1 illustrates how the weight operator can change the ranking of three hypothetical documents A, B, and C, which all contain information about soccer. The columns in the table show the total score of four different query expressions on the three documents.

Table 3–1

	soccer	Brazil	soccer,Brazil	soccer,Brazil*3
A	20	10	30	50
B	10	30	40	100
C	50	10	60	80

The score in the third column containing the query *soccer, Brazil* is the sum of the scores in the first two columns. The score in the fourth column containing the query *soccer,Brazil*3* is the sum of the score of the first column *soccer* plus three times the score of the second, *Brazil*.

With the initial query of *soccer,Brazil*, the documents are ranked in the order C B A. With the query of *soccer,Brazil*3*, the documents are ranked B C A, which is the preferred ranking.

NEAR Operator

Use the near operator to have Context return a score based on the proximity of two or more query terms. ConText returns higher scores for terms closer together and lower scores for terms farther apart in a document.

> **Note:** The NEAR operator works with only text queries. You cannot use NEAR with theme queries.

The syntax for the near operator is as follows:

OPERATOR	SYNTAX
NEAR	NEAR((word1, word2,..., word*n*) [, MAX_SPAN [, ORDER]])

word*n*

Specify the terms in the query separated by commas. The query terms can be single words or phrases.

MAX_SPAN

Optionally specify the size of the biggest clump. The default is 100. ConText returns an error if you specify a number greater than 100.

A clump is the smallest group of words in which all query terms occur. All clumps begin and end with a query term.

For *near* queries with two terms, *max_span* is the maximum distance allowed between the two terms. For example, to query on *dog* and *cat* where *dog* is within 6 words of *cat*, issue the following query:

```
'near((dog, cat), 6)'
```

ORDER

Specify TRUE for ConText to search for terms in the order you specify. The default is FALSE.

For example, to search for the words *monday*, *tuesday*, and *wednesday* in that order with a maximum clump size of 20, issue the following query:

```
'near((monday, tuesday, wednesday), 20, TRUE)
```

Note: To specify ORDER , you must always specify a number for the MAX_SPAN parameter.

ConText might return different scores for the same document when you use identical query expressions that have the ORDER flag set differently. For example, ConText might return different scores for the same document when you issue the following queries:

```
'near((dog, cat), 50, FALSE)'
'near((dog, cat), 50, TRUE)'
```

Near Scoring

The scoring for the near operator combines frequency of the terms with proximity of terms. For each document that satisfies the query, ConText returns a score between 1 and 100 that is proportional to the number of clumps in the document and inversely proportional to the average size of the clumps. This means many small clumps in a document result in higher scores, since small clumps imply closeness of terms.

The number of terms in a query also affects score. Queries with many terms, such as seven, generally need fewer clumps in a document to score 100 than do queries with few terms, such as two.

A clump is the smallest group of words in which all query terms occur. All clumps begin and end with a query term. You can define clump size with the *max_span* parameter as described in this section.

Near with Other Operators

You can use the near operator with other operators such as AND and OR. Scores are calculated in the regular way.

For example, to find all documents that contain the terms tiger, lion, and cheetah where the terms *lion* and *tiger* are within 10 words of each other, issue the following query.

```
'near((lion, tiger), 10) AND cheetah'
```

The score returned for each document is the lower score of the near operator and the term *cheetah*.

You can also use the equivalence operator to substitute a single term in a near query:

```
'near((stock crash, Japan=Korea), 20)'
```

This query ask for all documents that contain the phrase *stock crash* within twenty words of *Japan* or *Korea*.

Backward Compatibility Near Syntax

You can write near queries using the syntax of ConText release 2.3.6 and before. For example, to find all documents where *lion* occurs near *tiger*, you can write:

```
'lion near tiger'
```

or with the semi-colon as follows:

```
'lion;tiger'
```

This query is equivalent to the following query:

```
'near((lion, tiger), 100, FALSE)'
```

Note: Only the syntax of the near operator is backward compatible. In the example above, the score returned is calculated using the clump method as described in this section.

Highlighting with the Near Operator

When you use highlighting and your query contains the near operator, all occurrences of all terms in the query that satisfy the proximity requirements are highlighted. Highlighted terms can be single words or phrases.

For example, assume a document contains the following text:

```
Chocolate and vanilla are my favorite ice cream flavors.  I like chocolate
served in a waffle cone, and vanilla served in a cup with carmel syrup.
```

If the query is *near((chocolate, vanilla)), 100, FALSE)*, the following is highlighted:

```
<<Chocolate>> and <<vanilla>> are my favorite ice cream flavors.  I like
<<chocolate>> served in a waffle cone, and <<vanilla>> served served in a cup
with carmel syrup.
```

However, if the query is *near((chocolate, vanilla)), 4, FALSE)*, only the following is highlighted:

```
<<Chocolate>> and <<vanilla>> are my favorite ice cream flavors.  I like
chocolate served in a waffle cone, and vanilla served in a cup with carmel
syrup.
```

See Also: For more information about highlighting, see Chapter 6, "Document Presentation: Highlighting".

Section Searching and Near

You can use the NEAR operator with the WITHIN operator for section searching as follows:

```
'near((dog, cat), 10) WITHIN Headings'
```

When evaluating expressions such as these, Context looks for clumps that lie entirely within the given section.

In the example above, only those clumps that contain *dog* and *cat* that lie entirely within the section *Headings* are counted. That is, if the term *dog* lies within *Headings* and the term *cat* lies five words from *dog*, but outside of *Headings*, this pair of words does not satisfy the expression and is not counted.

Result-Set Operators

Use the result-set operators to control what documents are returned from a query result set. The operands for these operators are expressions, which can be an individual query term or a logical combination of query terms that use other operators.

Note: Because these operators manipulate a result set, they cannot be embedded within each other; they must be placed at the outermost level of the query expression.

These operators also have no effect on highlighting with CTX_ QUERY.HIGHLIGHT.

Result set operators are typically used to exclude noise from the hitlist (irrelevant documents) and to retrieve documents out of a hitlist more efficiently. There are three result set operators:

Operator	Syntax	Description
THRESHOLD	*expression*>n	Returns only those documents in the result set that score above the threshold *n*.
	term>n	Within an expression, selects documents that contain the query term with score of at least *n*.
MAX	*expression*:n	Returns the first *n* highest scoring documents. For example,*:20* means to return the top 20 documents in the hitlist. The value *n* must be an integer between 1 and 65535.
FIRST / NEXT	*expression*#m-n	Returns the specified number of documents as ordered in the hitlist range *m* to *n*.

Threshold Operator

You can use the threshold operator in two ways:

- at the expression level
- at the query term level

Expression level

Use the expression level threshold operator to eliminate documents in the result set that score below a threshold number. For example, to search for documents that contain *relational databases* and to return only documents that score greater than 75, use the following expression:

```
'relational databases > 75'
```

Query Term Level

Use the query term threshold operator in a query expression to select a document based on how a term scores in the document. For example, to select documents that have at least a score of 30 for *lion* and contain *tiger*, use:

```
'(lion > 30) and tiger'
```

Max Operator

Use the max operator to retrieve a given number of the highest scoring documents. For example, to obtain the twenty highest scoring documents that contain the word *dance*, you can write:

'dance:20'

The max operator is particularly useful to prevent writing a large number of records to the hitlist table, which could result in performance degradation.

Note: The max operator cannot be used with the CTX_QUERY.COUNT_HITS function or with in-memory queries.

First/Next Operator

Use the first/next operator to return a specified range of documents from the hitlist.

Note: In a first/next query, the order of the returned documents is *not* based on score or textkey. ConText returns the documents based on the order in which it encounters the documents in the queried text column

---

For example, to return the first 10 documents encountered by ConText that contain the term *dog*, use the following expression:

```
'dog#1-10'
```

You could then return the next 10 documents using the following expression:

```
'dog#11-20'
```

The first/next operator can be used to create an application interface in which query results (rows in the hitlist) are returned incrementally. Because the query results are returned incrementally, query response is generally faster. The application can display the hitlists in a more manageable size, and control can be returned to the user faster.

Note: The first/next operator cannot be used with the CTX_QUERY.COUNT_HITS function or with in-memory queries.

Combined First/Next and Max Queries

You can use the first/next operator extract chunks of a sorted hitlist returned by the max operator. For example, if you use the max operator to return only the highest scoring 50 documents that contain the term *cat*, you can extract the first 10 documents from the 50 as follows:

```
'cat:50#1-10'
```

Note: Placing the max operator inside the first/next operator as such is the only instance in which you can embed the max operator in a query expression.

Expansion Operators

The expansion operators expand a query expression to include variants of the query term supplied by the user. There are three kinds of expansion operators:

Operator	Syntax	Description
STEM	$term	Expands a query to include all terms having the same stem or root word as the specified term.
SOUNDEX	!term	Expands a query to include all terms that sound the same as the specified term (English-language text only).
FUZZY	?term	Expands a query to include all terms with similar spellings as the specified term (English-language text only).

The expansion operators are unary operators. They may be used in combination with each other and with any other operators described in this chapter. In addition, searches can be broadened by performing an expansion on an expansion.

The methods used by the expansion operators to perform stemming, fuzzy matching, and soundex matching for a text column are determined by the Wordlist preference in the policy for the column.

See Also: For more information about setting up preferences and policies, see *Oracle8 Context Cartridge Administrator's Guide.*

Stem Expansions

Use the STEM ($) operator to search for terms that have the same linguistic root as the query term. For example:

Input	Expands To
$scream	scream screaming screamed
$distinguish	distinguish distinguished distinguishes
$guitars	guitars guitar
$commit	commit committed
$cat	cat cats
$sing	sang sung sing

The ConText stemmer, licensed from Xerox Corporation's XSoft Division, supports the following languages: English, French, Spanish, Italian, German, and Dutch.

Note: If STEM returns a stopword, the stopword is not included in the query or highlighted by CTX_QUERY.HIGHLIGHT.

Soundex Expansions

The soundex (!) operator enables searches on words that have similar sounds; that is, words that sound like other words. This function allows comparison of words that are spelled differently, but sound alike in English.

Soundex in ConText uses the same logic as the soundex function in SQL to search for words that have a similar sound. It returns all words in a text column that have the same soundex value.

The following example illustrates the results that could be returned for a one-step query that uses SOUNDEX:

```
SELECT ID, COMMENT FROM EMP_RESUME
WHERE CONTAINS (COMMENT, '!SMYTHE') > 0

ID COMMENT
-- ------------
23 Smith is a hard worker who..
```

Note: SOUNDEX works best for languages that use a 7-bit character set, such as English. It can be used, with lesser effectiveness, for languages that use an 8-bit character set, such as many Western European languages.

For more information about the SOUNDEX function in SQL, see *Oracle8 SQL Reference*.

Fuzzy Expansions

Fuzzy (?) expansions generate words that are spelled similarly. This type of expansion is helpful for finding more accurate results when there are frequent misspellings in the documents in the database.

Unlike the stem expansion, the number of words generated by a fuzzy search depends on what is in the text index; results can vary significantly according to the contents of the database index.

For example:

Input	Expands To
?cat	cat cats calc case
?feline	feline defined filtering
?apply	apply apple applied April
?read	lead real

Note: Fuzzy works best for languages that use a 7-bit character set, such as English. It can be used, with lesser effectiveness, for languages that use an 8-bit character set, such as many Western European languages. Also, the Japanese lexer provides limited fuzzy matching.

In addition, if fuzzy returns a stopword, the stopword is not included in the query or highlighted by CTX_QUERY.HIGHLIGHT.

Penetration in Expansion Operators

Penetration allows complex query expansions to be expressed in short concise notation. Penetration is a system of notation for query expressions and does not affect the meaning of the expansion operators or the order in which operations are performed; it is a tool to help you generate non-ambiguous queries using the expansion operators.

Penetration applies the expansion operators to each term within an explicit expression (i.e., an expression delimited by parentheses or braces). Any expansion operators outside an expression delimited by parentheses ( ) or braces { } is applied to each word or phrase inside the expression.

For example:

Query Before Penetration	Query After Penetration
?(dog, cat, mouse)	?dog, ?cat, ?mouse
?(dog,!(cat & mouse))	?dog, (!?cat & !?mouse)
?((cat=feline) meows)	(?cat =?feline)?meows

In the first example, a fuzzy expansion is performed on each term.

In the second example, a fuzzy expansion is performed on each term and a soundex expansion is performed only on the terms cat and mouse because *cat* and *mouse* are enclosed in a separate set of parentheses

In the third example, a fuzzy expansion is performed on each term, including both equivalence terms.

Note: Expansion operators do not penetrate expressions delimited by brackets [ ].

Examining Query Expansions

You can use query expression feedback to examine how ConText expands query expressions containing fuzzy, stem and soundex operators.

See Also: Chapter 5, "Query Expression Feedback".

Base-letter Support

If you have base-letter conversion specified for a text column and the query expression contains a SOUNDEX or FUZZY operator, ConText operates on the base-letter form of the query.

The STEM operator does not support base-letter conversion.

Thesaurus Operators

The thesaurus operators expand a query for a single term (word or phrase) using a thesaurus that defines relationships between the user-specified term and other semantically related terms.

There are ten kinds of thesaurus operators, corresponding to the ten types of relationships that can be defined in an ISO2788 standard thesaurus.

Operator	Syntax	Description
SYNONYM	SYN(term[,thes])	Expands a query to include all the terms defined in the thesaurus as synonyms for *term*.
PREFERRED	PT(term[,thes])	Replaces the specified word in a query with the preferred term for *term*.
RELATED	RT(term[,thes])	Expands a query to include all the terms defined in the thesaurus as a related term for *term*.
TOP	TT(term[,thes])	Replaces the specified word in a query with the top term in the standard hierarchy (BT, NT) for *term*.
NARROWER	NT(term[,level[,thes]])	Expands a query to include all the lower level terms defined in the thesaurus as narrower terms for *term*.
NARROWER GENERIC	NTG(term[,level[,thes]])	Expands a query to include all the lower level terms defined in the thesaurus as narrower generic terms for *term*.
NARROWER PARTITIVE	NTP(term[,level[,thes]])	Expands a query to include all the lower level terms defined in the thesaurus as narrower partitive term for *term*.
NARROWER INSTANCE	NTI(term[,level[,thes]])	Expands a query to include all the lower level terms defined in the thesaurus as narrower instance term for *term*.
BROADER	BT(term[,level[,thes]])	Expands a query to include the term defined in the thesaurus as a broader term for *term*.
BROADER GENERIC	BTG(term[,level[,thes]])	Expands a query to include all terms defined in the thesaurus as a broader generic terms for *term*.

Operator	Syntax	Description
BROADER PARTITIVE	BTP(term[,level[,thes]])	Expands a query to include all the terms defined in the thesaurus as broader partitive terms for *term*.
BROADER INSTANCE	BTI(term[,level[,thes]])	Expands a query to include all the terms defined in the thesaurus as broader instance terms for *term*.

Internally, ConText processes the expansion by bracketing each individual term returned by the expansion, then the terms are accumulated together using the ACCUMULATE operator.

For example, if *bird*, *birdy*, and *avian* are all synonyms:

SYN(bird) is expanded to *{bird},{avian},{birdy}*.

If a term in a thesaural query does not have corresponding entries in the specified thesaurus, no expansion is produced and the term itself is used in the query.

> **See Also:** For more information about viewing thesaural expansions, see Chapter 5, "Query Expression Feedback".
>
> For more information about thesaural relationships and creating thesauri, see *Oracle8 Context Cartridge Administrator's Guide*.

Limitations

The thesaurus operators can be used in conjunction with all the other query expression operators and special characters supported by ConText, with the *exception* of the near operator.

The maximum length of the expanded query is 32000 characters.

Thesaural operations cannot be nested. For example, the following query is *not* allowed.

```
'SYN(BT(bird))'
```

Thesaurus Arguments

The thesaurus operators are implemented in ConText as PL/SQL functions, and, as such, have arguments that must be specified with the operator. All of the notational conventions and usage rules for PL/SQL apply to the thesaurus operators.

The thesaurus operators have the following arguments:

term

Specify the operand for the thesaurus operator. You *must* specify a term when using the NT operator. For preferred term (PT) and top term (TT) queries, *term* is replaced by the preferred term/top term defined for the term in the specified thesaurus; however, if no PT or TT entries are defined for the term, the term is not replaced and is used in the query.

For all other thesaural queries, *term* is expanded to include the synonymous, related, broader, or narrower terms defined for the term in the specified thesaurus.

level

Specify the number of levels traversed in the thesaurus hierarchy to return the broader (BT, BTG, BTP) or narrower (NT, NTG, NTP) term for the specified term. For example, a level of 1 in a BT query returns only the broader term, if one exists, for the specified term. A level of 2 returns the broader term for the specified term, as well as the broader term, if one exists, for the broader term.

The level argument is optional and has a default value of one (1). Zero or negative values for the level argument return only the original query term.

thes

Specify the name of the thesaurus used to return the expansions for the specified term. The *thes* argument is optional and has a default value of DEFAULT. As a result, a thesaurus named DEFAULT *must* exist in the thesaurus tables before using any of the thesaurus operators.

Synonym Operator

Use the synonym operator (SYN) to expand a query to include all the terms that have been defined in a thesaurus as synonyms for a specified term.

The following query returns all documents that contain the term *tutorial* or any of the synonyms defined for *tutorial* in the DEFAULT thesaurus:

```
'SYN(tutorial)'
```

Compound Phrases in Synonym Operator

Expansion of compound phrases for a term in a synonym query are returned as AND conjunctives.

For example, the compound phrase *temperature + measurement + instruments* is defined in a thesaurus as a synonym for the term *thermometer*. In a synonym query for *thermometer*, the query is expanded to:

```
{thermometer},({temperature}&{measurement}&{instruments})
```

Note: In a thesaurus, compound phrases can only be defined in synonym relationships for a term.

Preferred Term Operator

Use the preferred term operator (PT) to replace a term in a query with the preferred term that has been defined in a thesaurus for the term.

For example, the term *building* has a preferred term of *construction* in a thesaurus. A PT query for *building* returns all documents that contain the word *construction*. Documents that contain the word *building* are not returned.

Related Term Operator

Use the related term operator (RT) to expand a query to include all terms with the related term that has been defined in a thesaurus for the term.

For example, the term *dinosaur* has a related term of *paleontology*. A RT query for *dinosaur* returns all documents that contain the word *paleontology*. Documents that contain the word *dinosaur* are not returned.

Narrower Term Operators

Use the narrower term operators (NT, NTG, NTP, NTI) to expand a query to include all the terms that have been defined in a thesaurus as the narrower or lower level terms for a specified term. They can also expand the query to include all of the narrower terms for each narrower term, and so on down through the thesaurus hierarchy.

Note: The hierarchy can contain four separate branches, represented by the four narrower term operators. During a narrower term query, the specified operator only searches down the designated branch of the hierarchy.

The following query returns all documents that contain either the term *tutorial* or any of the NT terms defined for *tutorial* in the DEFAULT thesaurus:

```
'NT(tutorial)'
```

The following query returns all documents that contain either *fairy tale* or any of the narrower instance terms for *fairy tale* as defined in the DEFAULT thesaurus:

```
'NTI(fairy tale)'
```

That is, if the terms *cinderella* and *snow white* are defined as narrower term instances for *fairy tale*, ConText returns documents that contain *fairy tale*, *cinderella*, or *snow white*.

Broader Term Operators

Use the broader term operators (BT, BTG, BTP, BTI) to expand a query to include the term that has been defined in a thesaurus as the broader or higher level term for a specified term. They can also expand the query to include the broader term for the broader term and the broader term for that broader term, and so on up through the thesaurus hierarchy.

Note: The hierarchy can contain four separate branches, represented by the four broader term operators. In a broader term query, the specified operator only searches up the designated branch of the hierarchy.

The following query returns all documents that contain the term *tutorial* or the BT term defined for *tutorial* in the DEFAULT thesaurus:

```
'BT(tutorial)'
```

Broader and Narrower Term Operator on Homographs

If a homograph (a word or phrase with multiple meanings, but the same spelling) appears in two or more nodes in the same hierarchy branch of a thesaurus, a qualifier is required for each occurrence of the term in the branch.

If the qualifier is not specified for a homograph in a broader or narrower term query, the query expands to include all of the broader/narrower terms for the homograph.

For example, if *machine* is a broader term for *crane (building equipment)* and *bird* is a broader term for *crane (waterfoul)*:

BT(crane) expands to *{crane},{machine},{bird}*

If the qualifier for a homograph is specified in a broader or narrower term query, only the broader / narrower terms for the qualified homograph are returned.

Using the previous example:

BT(crane{(waterfoul)}) expands to *{crane},{bird}*

Note: When specifying a qualifier in a broader or narrower term query, the qualifier and its notation (parentheses) must be escaped, as is shown in this example.

Top Term Operator

Use the TOP TERM operator (TT) to replace a term in a query with the top term that has been defined for the term in the standard hierarchy (BT, NT) in a thesaurus. Top terms in the generic (BTG, NTG), partitive (BTP, NTP), and instance (BTI, NTI) hierarchies are not returned.

For example, the term *tutorial* has a top term of *learning systems* in the standard hierarchy of a thesaurus. A TT query for *tutorial* returns all documents that contain the phrase *learning systems*. Documents that contain the word *tutorial* are not returned.

Thesaural Expansions and Case-Sensitivity

Thesaural expansions in text queries can differentiate between terms based on case.

For example, a case-sensitive thesaurus named *thes1* is created and *Mercury* is defined as a narrower term for *planets*, while *mercury* is defined as a narrower term for *metals*.

During a query, the following expansions occur:

BT(mercury,1,thes1) expands to *{MERCURY}, {METALS}*

BT(Mercury,1,thes1) expands to *{MERCURY}, {PLANETS}*

Note: There is no way to enable or disable case-sensitivity. ConText preserves the case of all entries entered in a thesaurus based on whether the thesaurus was specified during creation to be case-sensitive. Similarly, text queries use the cases of terms to perform the thesaural look-up based on the thesaurus specified for the term(s).

Limitations

Case-sensitive thesauri only affect the expansion of a term and not the terms actually used in the query. The case of the expanded terms depends on whether the text index being queried is case-sensitive or case-insensitive.

For example, when the case-sensitive thesaurus, *thes1*, is used with a case-insensitive index, the following expansion is returned:

BT(Mercury,1,thes1) expands to {MERCURY}, {PLANETS}

The query then returns all documents in which the two terms occur, regardless of case. In other words, documents that contain *mercury*, *Mercury*, *planets*, *Planets*, or any other combinations of case for the two terms are all returned by the query.

With a case-sensitive text index, the same query expands to:

BT(Mercury,1,thes1) expands to {Mercury}, {planets}

The query returns only those documents in which *Mercury* and *planets* occur.

Base-letter Support for Thesaural Queries

When ConText processes a query on a base-letter index and the expression contains a thesaurus operator, ConText looks up the query term in the thesaurus without converting the query to base-letter. The expansions obtained from the thesaurus are converted to base-letter and looked up subsequently within the index according to query rules.

This sequence of look-up enables base-letter queries to work independent of whether the thesaurus is in base-letter form. However, if the keys in the thesaurus are in base letter form, these keys will not match the corresponding non-base letter form query terms. When you have a base-letter thesaurus, you must specify the base-letter form in the query.

Wildcard Characters

Wildcard characters can be used in query expressions to expand word searches into pattern searches. The wildcard characters are:

Wildcard Character	Description
%	The percent wildcard specifies that any characters can appear in multiple positions represented by the wildcard.
_	The underscore wildcard specifies a single position in which any character can occur.

For example, the following abbreviated one-step query finds all terms beginning with the pattern *scal* in a column named *text*:

```
...contains(TEXT, 'scal%') > 0
```

Note: To expand the wildcard query, ConText uses the word list for the text column and rewrites the query with these terms. When your wildcard query expands to a number of terms greater than the maximum allowed in a query, ConText returns an error.

In addition, if a wildcard expression translates to a stopword, the stopword is not included in the query or highlighted by CTX_QUERY.HIGHLIGHT.

Grouping Characters

The grouping characters control operator precedence by grouping query terms and operators in a query expression. The grouping characters are:

- parentheses ( )
- brackets [ ]

The beginning of a group of terms and operators is indicated by an open character from one of the sets of grouping characters. The ending of a group is indicated by the occurrence of the appropriate close character for the open character that started the group. Between the two characters, other groups may occur.

For example, the open parenthesis indicates the beginning of a group. The first close parenthesis encountered is the end of the group. Any open parentheses encountered before the close parenthesis indicate nested groups.

Brackets perform the same function as the parentheses, but prevent penetration for the expansion operators.

Stored Query Expressions

You can store the results of a query expression and then call the SQE later in a query expression to return the stored results. To call a stored query expression, use the SQE operator.

Operator	Syntax	Description
Stored Query Expression	SQE(SQE_name)	Returns the stored result of *SQE_name*.

The advantage of calling an SQE in a query expression, rather than specifying query terms, is that the results are typically returned faster, since ConText does not have to query the text table directly.

In addition, SQEs can be used to perform iterative queries, in which an initial query is refined using one or more additional queries.

Using Stored Query Expressions

The process for using stored query expressions is:

1. Call CTX_QUERY.STORE_SQE to store the results for the text column or policy. With STORE_SQE, you specify a name for the SQE, a policy (which identifies the text column for the SQE), a query expression, and whether the SQE is a session or system SQE
2. Call the stored query expression in the query expression of a text (or theme) query. ConText returns the results of the SQE in the same way it returns the results of a regular query. If the results of the SQE are out-of-date, ConText automatically re-evaluates the SQE before returning the results.

Note: Because ConText must first determine if the results are out-of-date with respect to the document index, many changes to the index though inserting, deleting, and updating documents will slow down the retrieval of the stored query expression results.

Administration of stored query expressions can be performed using the REFRESH_SQE, REMOVE_SQE, and PURGE_SQE procedures in the CTX_QUERY PL/SQL package.

Example

To create a session SQE named PROG_LANG, use CTX_QUERY.STORE_SQE as follows:

```
exec ctx_query.store_sqe('emp_resumes', 'prog_lang', 'cobol', 'session');
```

This SQE queries the text column for the EMP_RESUMES policy (in this case, EMP.RESUMES) and returns all documents that contain the term *cobol*. It stores the results in the SQE table for the policy.

PROG_LANG can then be called within a query expression as follows:

```
select score, docid from emp
where contains(resume, 'sqe(prog_lang)')>0
order by score;
```

Session and System SQEs

When you initially create an SQE using CTX_QUERY.STORE_SQE, you can specify whether the SQE is for the current session or for all sessions (system SQE).

You can use session SQEs only in the current session. These SQEs are stored only for the duration of the session. When a session is terminated, all session SQEs created during the session are deleted from the SQE tables. If you want to use a session SQE in another session, you must recreate the SQE.

System SQEs can be used in all sessions, including concurrent sessions. When a session is terminated, system SQEs created during the session are *not* deleted from the SQE tables and can be used in future sessions.

Re-evaluation of Stored Query Expressions

If the text column referenced by an stored query expression has been modified since the stored query expression was created, the stored query expression results may be out-of-date. Before returning the results of an stored query expression in a query expression, ConText verifies that the results are current. If they are not current, ConText automatically evaluates the differences and updates the results.

ConText also verifies that any stored query expressions nested within an stored query expression have up-to-date results

---

Note: ConText does not verify whether PL/SQL functions in stored query expressions have been updated. If a PL/SQL function in an stored query expression has been updated, the stored query expression must be manually re-evaluated.

Result lists in stored query expression tables may get fragmented by consecutive re-evaluations. You can resolve fragmentation by calling CTX_QUERY.REFRESH_SQE.

Iterative Queries

Iterative queries are queries built on other queries to refine or add to the result set of the original query. Once you define a stored query expression, you can add additional search criteria in two ways:

- extending the expression in the CONTAINS procedure
- nesting SQEs

Extending the Expression in the CONTAINS Procedure

Sometimes you might want to add a condition to a stored query expression to re-define your search criteria. You can do so by extending the query with additional operators when you call CTX_QUERY.CONTAINS. When you extend stored queries in this way, the response time is usually faster than an equivalent query without the SQE operator.

For example, you find that wildcard queries take a long time to process. You therefore define a wildcard query as a stored query expression, Q1, to return all documents indexed under policy *pol* that have words beginning with the letter *z*:

```
ctx_query.store_sqe('pol', 'Q1', 'z%', 'session');
```

You then extend the query by adding an OR condition: You ask for all documents indexed under policy *pol* that contain words beginning with the letter z or contains the word *cat*:

```
ctx_query.contains('pol', 'SQE(Q1) | cat', 'ctx_temp');
```

Internally, ConText must still use the text index to find those documents that might have the word *cat* but not *z%*; however, the response time is generally much faster than the following equivalent query:

```
ctx_query.contains('pol', 'z% | cats', 'ctx_temp');
```

Nesting Stored Query Expressions

You can use stored query expressions to define other stored query expressions. This is useful when you want to refine the result set returned from a stored query expression.

For example, you define the stored query expression, Q1 as follows:

```
ctx_query.store_sqe('pol', 'Q1', 'lions | tigers', 'session');
```

You then want to reduce this hitlist by adding another condition, so you define Q2 as follows:

```
ctx_query.store_sqe('pol', 'Q2', 'SQE(Q1) and zoos', 'session');
```

You then execute Q2 as follows:

```
ctx_query.contains('pol', 'SQE(Q2)', 'ctx_temp');
```

This query searches for all documents that contain the terms *lions* or *tigers* and *zoos*. It is generally faster that the following equivalent query:

```
ctx_query.contains('pol', 'lions | tigers and zoos', 'ctx_temp');
```

SQE Tables

Each stored query expression is stored in two tables: a central or system table owned by CTXSYS and an text index table attached to the policy for which the stored query expression was created.

The table owned by CTXSYS is an internal table which stores the stored query expression definitions for all the stored query expressions that have been created for all existing policies. It cannot be accessed directly, but can be viewed through two views, CTX_SQES (users with CTXADMIN role) and CTX_USER_SQES (users with CTXAPP and CTXADMIN roles).

The table used to store the results of an stored query expression for a text column is one of the tables created automatically when the column is indexed; however, the SQR table is only populated when an stored query expression is created and updated when an stored query expression is re-evaluated.

The tablespace, storage clause, and other parameters used to create the SQR table are specified by the Engine preference in the policy for the text column of the stored query expression.

Note: Similar to the other ConText index tables, the SQR table is an internal table that is accessed only by ConText when an stored query expression is processed in a query.

For more information about policies, preferences, text indexing, and the structure of the stored query expression tables and views, see *Oracle8 Context Cartridge Administrator's Guide.*

Using Operators in Stored Query Expressions

You can use all query expression operators in stored query expressions, with the following exceptions:

- Max
- First/Next

Stored query expressions also support all of the special characters and other components that can be used in a query expression, including PL/SQL functions and other stored query expressions.

PL/SQL in Query Expressions

In a query expression, you can call a PL/SQL function that returns a value. The syntax for the PL/SQL operator is as follows:

Syntax	Description
@owner_name.fname(arg1, arg2,...,argn) execute owner_name.fname() exec owner_name.fname()	Executes *fname()* where *fname()* returns a value. Return values that are not of type VARCHAR2 are cast into strings when possible. If *fname()* does not return a value, an exception is raised.

Example

Calling a PL/SQL function within a query is useful for converting words to alternate forms. For example, you can call a function that takes acronyms and returns the expanded string.

Suppose you, as user *ctxuser*, create a function named CONVERT that takes an acronym as input and returns the fully-expanded version of the acronym. Then, to obtain all documents that contain either *IBM* or *International Business Machine,* you issue the following query:

```
'execute ctxuser.convert(IBM), IBM'
```

Likewise, you can call a PL/SQL function that translates words. For example, you can call a function *french* that converts an English word to its French equivalent. You can then search on the French word for *cat* by issuing the following query:

```
'@ctxuser.french(cat)'
```

Operator Precedence

Operator precedence is the order in which the components of a query expression are evaluated. ConText query operators can be divided into two sets of operators that have their own order of evaluation. These two groups are described below as Group 1 and Group 2.

In all cases, query expressions are evaluated in order from left to right according to the precedence of their operators. Operators with higher precedence are applied first. Operators of equal precedence are applied in order of their appearance in the expression from left to right.

Group 1

Within query expressions, the Group 1 operators have the following order of evaluation from highest precedence to lowest:

Operator	Equivalent
EQUIV	=
NEAR	;
Weight, Threshold	* >
MINUS	-
NOT	~
WITHIN	
AND	&
OR	|
ACCUM	,
Max	:
First / Next	#

Group 2

Within query expression, the Group 2 operators have the following order of evaluation from highest to lowest:

Operator	Equivalent
Wildcard	% _
Stem	$
Fuzzy	?
Soundex	!

Procedural Operators

Other operators not listed under Group 1 or Group 2 are procedural. These operators have no sense of precedence attached to them. They include the SQE, PL/SQL, and thesaurus operators.

Precedence Examples

Query Expression	Order of Evaluation
w1 | w2 & w3	(w1) | (w2 & w3)
w1 & w2 | w3	(w1 & w2) | w3
?w1, w2 | w3 & w4	(?w1), (w2 | (w3 & w4))
abc = def ghi & jkl = mno	((abc = def) ghi) & (jkl=mno)
dog and cat WITHIN body	dog and (cat WITHIN body)

In the first example, because AND has a higher precedence than OR, the query returns all documents that contain *w1* and all documents that contain both *w2* and *w3*.

In the second example, the query returns all documents that contain both *w1* and *w2* and all documents that contain *w3*.

In the third example, the fuzzy operator is first applied to *w1*, then the AND operator is applied to arguments *w3* and *w4*, then the OR operator is applied to term *w2* and the results of the AND operation, and finally, the score from the fuzzy operation on *w1* is added to the score from the OR operation.

The fourth example shows that the equivalence operator has higher precedence than the AND operator.

The fifth example shows that the AND operator has lower precedence than the WITHIN operator.

Altering Precedence

Precedence is altered by grouping characters as follows:

- expansion or execution of operations within parentheses is resolved before other expansions regardless of operator precedence

  Precedence of operators is maintained during evaluation of expressions inside of the parentheses.

- expansion operators are not applied to expressions within brackets unless the operators are also within the brackets

Escaping Reserved Words and Characters

To query on words or symbols that have special meaning to query expressions such as *and & or | accum, execute*, you must escape them. There are two ways to escape characters in a query expression:

Escape Symbol	Meaning
{}	Use braces to escape a string of characters or symbols. Everything within a set of braces in considered part of the escape sequence.
\	Use the backslash character to escape an individual character or symbol. Only the character immediately following the backslash is escaped.

Example

In the following examples, an escape sequence is necessary because each expression contains a ConText operator or reserved symbol:

```
'AT\&T'
'{AT&T}'

'high\-voltage'
'{high-voltage}'
```

Note: If you use braces to escape an individual character within a word, the character is escaped, but the word is broken into three tokens.

For example, a query written as *high{-}voltage* searches for *high - voltage*, with the space on either side of the hyphen.

Reserved Words

The following is a list of ConText reserved words and characters that must be escaped to be searched on:

<table>
<tr><th>Operator</th><th>Reserved Word</th><th>Reserved Character</th></tr>
<tr><td>And</td><td>AND</td><td>&</td></tr>
<tr><td>Or</td><td>OR</td><td>|</td></tr>
<tr><td>Accumulate</td><td>ACCUM</td><td>,</td></tr>
<tr><td>Minus</td><td>MINUS</td><td>-</td></tr>
<tr><td>Not</td><td>NOT</td><td>~</td></tr>
<tr><td>Near</td><td>(none)</td><td>;</td></tr>
<tr><td>Stem</td><td>(none)</td><td>$</td></tr>
<tr><td>Soundex</td><td>(none)</td><td>!</td></tr>
<tr><td>Fuzzy</td><td>(none)</td><td>?</td></tr>
<tr><td>Threshold</td><td>(none)</td><td>></td></tr>
<tr><td>Weight</td><td>(none)</td><td>*</td></tr>
<tr><td>First/Next</td><td>(none)</td><td>#</td></tr>
<tr><td>Max</td><td>(none)</td><td>:</td></tr>
<tr><td>Wildcard (multiple)</td><td>(none)</td><td>%</td></tr>
<tr><td>Wildcard (single)</td><td>(none)</td><td>_</td></tr>
<tr><td>Within</td><td>WITHIN</td><td>(none)</td></tr>
<tr><td>Grouping (parentheses)</td><td>(none)</td><td>( )</td></tr>
<tr><td>Grouping (brackets)</td><td>(none)</td><td>[ ]</td></tr>
<tr><td>Escape (multiple characters)</td><td>(none)</td><td>{ }</td></tr>
<tr><td>Escape (single character)</td><td>(none)</td><td>\</td></tr>
<tr><td>Paragraph Searching</td><td>PARAGRAPH (used with WITHIN)</td><td>(none)</td></tr>
<tr><td>PL/SQL call</td><td>EXECUTE</td><td>@</td></tr>
<tr><td></td><td>EXEC</td><td>@</td></tr>
<tr><td>Sentence Searching</td><td>SENTENCE (used with WITHIN)</td><td>(none)</td></tr>
</table>

Operator	Reserved Word	Reserved Character
Stored Query Expression	SQE	(none)
Synonym	SYN	(none)
Preferred	PT	(none)
Related	RT	(none)
Top	TT	(none)
Broader	BT	(none)
Narrower	NT	(none)
Broader Generic	BTG	(none)
Narrower Generic	NTG	(none)
Broader Partitive	BTP	(none)
Narrower Partitive	NTP	(none)

Querying Escape Characters

The open brace { signals the beginning of the escape sequence, and the closed brace} indicates the end. Everything between the opening brace and the closing brace is part of the query expression (including any open brace characters). To include the close brace character in a query expression, use}}.

To escape the backslash escape character, use \\.

Querying with Stopwords

Stopwords are words for which ConText does not create an index entry. They are usually common words that are unlikely to be searched on by themselves.

ConText is shipped with a default list of stopwords in English containing common words such as *this* and *that*. However, you or ConText administrator can define stopwords.

> **See Also:** For more information about defining stopwords, see *Oracle8 Context Cartridge Administrator's Guide.*

Stopwords by Themselves

You cannot query on a stopword by itself or a phrase of only stopwords; whenever you attempt to query on a stopword by itself or a stopword-only phrase, the result is always no hits.

For example, you cannot issue a query to retrieve all documents that contain *this* if *this* is defined as a stopword, nor can you issue a query on a phrase of stopwords such as *the who*, if the words *the* and *who* are defined as stopwords.

Stopwords with Non-stopwords

You can query on phrases that contain stopwords as well as non-stopwords, such as *this boy talks to that girl*, where *this* and *that* are the only stopwords. This is possible because Context records the position of stopwords even though it does not create an index entry for them.

Case-Sensitivity

If you have case-sensitivity enabled for text queries and you issue a query on a phrase containing stopwords and non-stopwords, you must specify the correct case for the stopwords. For example, a query on *this boy talks to that girl* does not return documents that containing the phrase *This boy talks to that girl*, assuming *this* is a stopword.

> **See Also:** For more information about issuing case-sensitive text queries, see "Case-Sensitive Queries" in this chapter.

Stopwords with Operators

When you use a stopword or a stopword-only phrase as an operand of a query operator, ConText rewrites the expression to eliminate the stopword or stopword-only phrase and then executes the query.

The following table describes *some* common stopword transformations. The *Stopword Expression* column describes the query expression or component of a query expression you enter, while the right-hand column describes the way ConText rewrites the query.

In these examples, a value of *no_token* for the rewritten expression means no hits are returned for the query.

Stopword Expression	Rewritten Expression
non_stopword AND *stopword*	non_stopword
stopword AND *non_stopword*	non_stopword
stopword AND *stopword*	no_token
non_stopword NOT *stopword*	non_stopword
stopword NOT *non_stopword*	no_token
stopword NOT *stopword*	no_token

For example, assuming that the word *this* is a stopword and that the word *dog* is a non-stopword, the query *dog and that* is rewritten to *dog*, applying the first transformation is the list.

See Also: For a complete list of stopword transformations, see Appendix D, "Stopword Transformations".

To learn about how to examine stopword transformations, see Chapter 5, "Query Expression Feedback".

Querying with Special Characters

Context indexes text by identifying tokens (words). For English and most European languages it assumes that blank spaces delimit tokens. At index time, ConText must also know how to interpret punctuation characters and characters that occur within words and numbers. Such special characters must be defined in the BASIC LEXER preference. They are described as follows:

Type of Character	Description
Punctuations	Characters that delimit the end of sentences such as the period '.' and question mark '?' and those that occur next to words and numbers, such as the comma ',' and the dollar sign '$'. These characters are not indexed.
Continuation	Characters that indicate a word continues on the next line. An example is the hyphen '-'. These characters are not indexed.
Printjoins	Characters that join words together such as hyphen '-'. These characters are indexed.
Skipjoins	Characters that join words together such as hyphen '-'. These characters are not indexed.
Numjoin	Characters that occur in numbers such as the decimal point '.'. These characters are indexed.
Numgroup	Characters that group digits within a number such as the comma ','. These characters are indexed.
Startjoin	Non-alphanumeric characters that occur at the beginning of a token. For example, you can define < as a startjoin character for HTML tagged text. These characters are indexed.
Enjoin	Non-alphanumeric characters that occur at the end of a token. For example, you can define > as and endjoin character for HTML tagged text. These characters are indexed.

In the BASIC LEXER preference, ConText defines a default set of characters for each group.

The way you query on tokens that contain these characters depends on how ConText indexes the tokens containing these characters. This is because ConText tokenizes words at query time the same way it tokenizes words at index time. To query on words or numbers that contain special characters, you must know how these words are represented in the index.

See Also: For more information about defining special characters for the BASIC LEXER preference, see *Oracle8 Context Cartridge Administrator's Guide.*

Querying with Punctuation and Continuation Characters

Punctuation and continuation characters are not indexed with the words they occur next to or with, and thus are ignored by ConText at query time. The following table shows how ConText strips punctuation characters at query time:

Query	Equivalent Query
'John swims fast. Sharks eat.'	'John swims fast sharks eat'
'John swims. Fast sharks eat.'	'John swims fast sharks eat'
'{John swims, fast sharks eat}'	'John swims fast sharks eat'
'{SHAZAM!}'	'SHAZAM'
'{$250}'	'250'
'{#101}'	'101'
'{phone#}'	'phone'

Suggestion: Because ConText strips punctuation characters at query time, leaving them out of the query expression and using the equivalent query might be a better approach, especially when the characters are reserved as in the last five examples.

Querying with Printjoins and Skipjoins

Printjoins and skipjoins are characters such as hyphens that join words together.

When you define a character as a printjoin, such as a hyphen, you specify that the words on either side of the hyphen are to be indexed with the hyphen. For example, *sister-in-law* is indexed as the token *sister-in-law.*

When you define a character as a skipjoin, such as a hyphen, you specify that the two words on either side of the hyphen are to be indexed as one token without the hyphen. For example, *sister-in-law* is indexed as *sisterinlaw.*

To query on words that contain a join character, you must know if the character is defined as a skipjoin or printjoin in the BASIC LEXER preference.

Printjoin Example

If the hyphen character is defined as a printjoin, you must write your query with the hyphen, since the indexed token contains the hyphen. Thus, to query on all the documents that contain the term *sister-in-law*, you must write your query as follows with the hyphen:

```
'{sister-in-law}'
```

Note: The '-' character must be escaped, or else ConText interprets it as the MINUS operator.

Skipjoin Example

When a character is defined a as skipjoin, it is not indexed with the word, therefore you can write queries with or without the skipjoin character.

If the hyphen character is defined as a skipjoin, you can write your query with or without the hyphen. Thus, to query on all documents that contain *sister-in-law*, you can write your query as one of the following expressions:

```
'sisterinlaw'
'{sister-in-law}'
```

You can write your query in two ways, because both queries are lexed to *sisterinlaw* before index look-up. This also means that the documents retrieved can contain either *sisterinlaw* or *sister-in-law*.

Querying with Numjoins and Numgroups

Numjoin and numgroup characters are characters that can appear in numbers, such as the decimal point and the comma.

Numjoin

A numjoin is a character that occurs once in a string of digits, such as a decimal point, and gets indexed with the number. (ConText defines the decimal as a default numjoin character for the BASIC LEXER preference.) For example, the number *3.14* is indexed as *3.14*. Thus to query on *3.14* with the decimal point defined as a numjoin character, you write:

```
'3.14'
```

When you define the numjoin character to be NULL, Context indexes 3.14 as the two separate numbers 3 and 14.

Note: When a period follows a number such as at the end of a sentence, ConText knows to index the number without the decimal point. For example, the number fourteen in the following sentence gets indexed as *14* without the period:

The score was San Francisco 21, Dallas 14.

Numgroup

A numgroup is a character such as a comma that groups digits together in a number. Numgroup characters get indexed with the number. (ConText defines the comma as a default numgroup character for the BASIC LEXER preference.) For example, the number *6,344,555* gets indexed as *6,344,555*.

To query on a number that contains numgroup characters, you must write the query with the numgroup character. For example, to query on *6,344,555*, you write:

```
'{6,344,555}'
```

Note that the comma must be escaped.

Note: When you have the comma defined as a numgroup character, you must query on numbers using the comma. That is, a query on *{1,000}* does not return documents that contain *1000* without the comma. A better query is with the equivalence operator:

'{1,000}=1000'

When you define the numgroup character as NULL, numbers such as 1,000 get indexed as *1* and *000*.

Querying with Startjoin and Endjoin Characters

Startjoin and endjoin characters are non-alphanumeric characters that start and end tokens. These characters are indexed with the token they occur with.

You or your ConText administrator typically define startjoin and endjoin characters when you index tagged text such as HTML. This makes it easy to define sections for section searching as well as to query on the tags themselves.

For example, to query on the tag <HEAD> with < defined as a startjoin and > defined as an endjoin, write your query as follows:

'{<HEAD>}'

In the query above, an escape sequence is necessary, since > is an operator.

> **See Also:** For more information about section searching, see "WITHIN Operator" in this chapter.

4

Theme Queries

This chapter describes how to perform theme queries. The following topics are covered:

- Understanding Theme Queries
- Constructing Theme Queries
- Refining Theme Queries
- Theme Query Examples

Understanding Theme Queries

Theme queries enable you to search for documents by their major concepts. The following sections describe the theme indexing and querying processes and how they use the knowledge base:

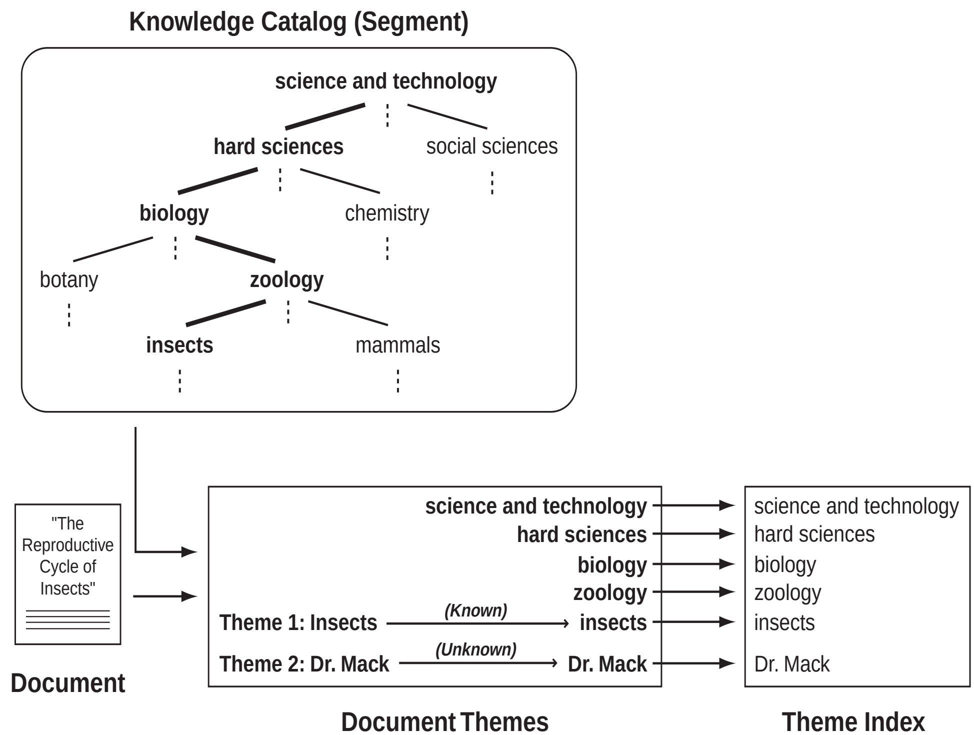
- Theme Indexing Concepts
- Theme Querying

See Also: For more information about the knowledge base, see "Knowledge Base" in Chapter 7, "ConText Linguistics".

For more information about how to create a theme index, see *Oracle8 Context Cartridge Administrator's Guide.*

Theme Indexing Concepts

Figure 4–1



Before you can issue a theme query, your set of documents must be indexed by theme. During theme indexing, ConText extracts up to fifty main concepts or themes of a document and stores these themes in the theme index. A weight is also associated with every theme that is indexed. A theme can be a concrete concept, such as *insects*, or an abstract concept, such as *success*, sufficiently developed in the document.

Figure 4–1 illustrates how ConText uses the knowledge base to extract document themes from an example document "The Reproductive Cycle of Insects" that contains information about insects. This example shows that ConText recognizes the following types of themes:

- known themes
- unknown themes

Known Themes

Known themes are document themes that can attach to a branch of the knowledge base.

In the example in Figure 4–1, the document A entitled "The Reproductive Cycle of Insects" contains information about *insects*. The known document theme *insects* has four parent themes corresponding to the branch of the knowledge base: *science and technology, hard sciences, biology, zoology,* and *insects*. Each theme in the branch is entered as a searchable row in the theme index along with a weight.

When themes are indexed as such, a theme query on *insects* or any of its parents returns the document A.

Unknown Themes

Unknown themes are document themes that cannot be found in the knowledge base, because they are either unknown to the knowledge base or inherently ambiguous.

Figure 4–1 shows how an unknown theme of *Dr. Mack* is extracted without having a representation in the knowledge base. Unknown themes such as this are indexed as a single row.

Ambiguous document themes such as the term *cricket* or the term *table* also have no attachments to the knowledge base and hence are indexed as a single row. To query on ambiguous document themes, you would rely on other supporting themes such as *sports* or *insects* being indexed with an ambiguous theme like *cricket*.

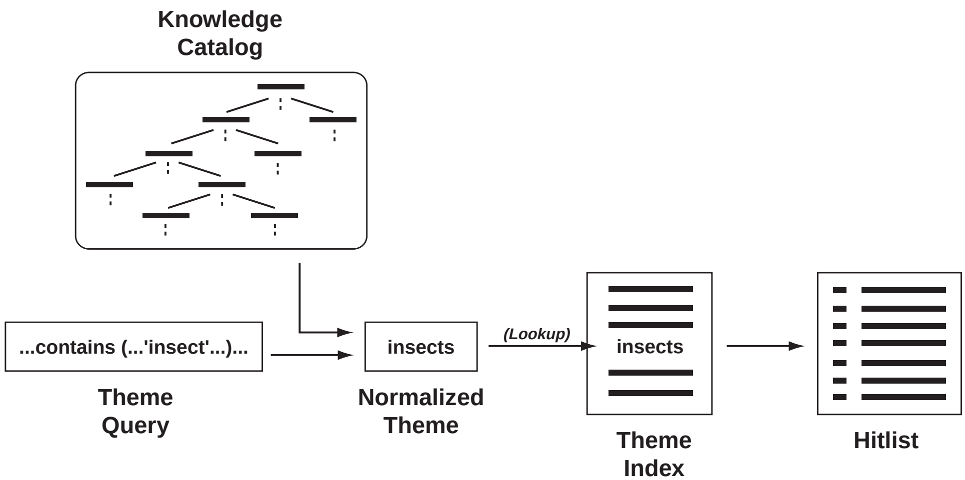
> **See Also:** For more information about querying ambiguous themes, see "Refining Theme Queries" in this chapter.

Theme Weight

The theme weight is a measure of the strength of a theme relative to the other themes in a document. Weights are indexed with every theme and the related parent themes extracted from a document. ConText uses theme weights to help score theme queries.

Theme Querying

Figure 4–2



To execute a theme query, you specify a query string, which can be a sentence or a phrase with or without operators. ConText uses the knowledge base to normalize the word or phrase you enter into a standard form. It then looks up the normalized theme in the index and returns the documents that were indexed with the given theme. See Figure 4–2. Scores for theme queries are calculated based on the weights associated with each theme in the index.

For example, a theme query on *insect* retrieves the document indexed in Figure 4–1 entitled, "The Reproductive Cycle of Insects". Likewise, a theme query on any of the indexed parents, such as *science and technology, hard sciences, biology,* or *zoology* also retrieves the same document.

Note: When you issue a theme query, you are asking ConText to return to you all the documents that ConText indexed with that theme. For ConText to attach a theme to a document, the idea or concept must be developed sufficiently in the document. If a concept is not developed sufficiently in a document, ConText does not index it as a document theme, and consequently the document is not returned in a query for that theme.

Scoring

ConText returns a relevance score for each document it returns in a theme query; the higher the score, the more relevant the returned document. This relevance score is out of 100 and is based on the weight of the indexed theme.

Generally, specifying broader themes or concepts in a theme query will return higher scoring documents.

When using operators in theme queries, the scoring behavior is the same as for regular text queries. For example, the OR operator returns the higher score of its operand, and the AND operator returns the lower score of its operands.

Case-Sensitivity

Theme queries are case-sensitive. For example, doing a query on the common noun *turkey* produces a hit on turkey the bird. Such a query does not produce a hit on the proper noun *Turkey*, which describes a country. To query on the proper noun, you must enter the query as *Turkey*.

Recognition of Known Themes Even though ConText theme queries are case-sensitive, ConText tolerates poorly formatted input for known themes.

For example, entering *microsoft* or *microSoft* returns documents that include the theme of *Microsoft*, a known company. Likewise, entering *Currency Rates* returns documents that include a theme of *currency rates*, a standard classification in business and economics.

Note: ConText always attempts to match the entered theme with themes in the index. For example if you enter *microsoft*, ConText looks up *microsoft* and *Microsoft* in the index. Likewise, if you enter *Currency Rates* as your theme, ConText looks up *Currency Rates* and *currency rates* in the index.

Constructing Theme Queries

The following section describes how to construct theme queries:

- Using Operators
- Phrasing Theme Queries

Using Operators

With theme queries, the following operators have the same semantics as with regular text queries:

Operator	Symbol
Accumulate	,
Or	|
And	&
Minus	-
Not	~
Weight	*
Threshold	>
Max	:

Examples

Some valid theme query strings using operators are as follows:

```
contains(text, 'cricket ~ insects') > 0;
contains(text, 'cricket & sports') > 0;
contains(text, 'music, reggae*5') > 0;
contains(text, 'chemistry > 30') > 0;
contains(text, 'soccer | basketball') > 0;
contains(text, 'computer software - Microsoft') > 0;
contains(text, 'music:20') > 0;
```

See Also: For more information about how to use operators in theme queries, see "Refining Theme Queries" in this chapter.

For more information about the semantics of query operators, see Chapter 3, "Understanding Query Expressions".

Thesaurus Operators

In a theme query, the thesaurus operators (synonym, broader term, narrower term etc.) work the same way as in a regular text query, provided a thesaurus has been created / loaded.

> **See Also:** For more information about thesaurus operators, see "Thesaurus Operators" in Chapter 3.

Grouping Characters

In theme query expressions, the grouping characters ( ) [ ] have the same semantics as with a regular text query.

> **See Also:** For more information about grouping characters, see "Grouping Characters" in Chapter 3.

Wildcard Characters

In theme query expressions, the wildcard characters% _ work the same way as in regular text queries.

> **Note:** There is a risk of ambiguity when using the wildcard character. For example, doing a theme query on *%court%* might return documents that have a theme of *court of law* or *tennis court*.

> **See Also:** For more information about grouping characters, see "Wildcard Characters" in Chapter 3.

Unsupported Operators

ConText does not support the following query expression operators with theme queries:

Operator	Symbol
Near	;
Fuzzy	?
Soundex	!
Stem	$

Phrasing Theme Queries

The following issues affect the phrasing of theme queries.

Use Noun Forms

When you enter your theme query, ConText normalizes the word or phrase representing your theme into a form that it can use to compare with document themes in the index. This normal form is nouns and noun phrases, such as *chemistry* or *personal computer*. It is therefore better to use nouns and noun phrases when constructing theme queries. Avoid using sentences or long phrases.

For example, to search for documents about *computer programming*, use the noun form *computer programming* not *programming my computer*.

Avoid Splitting Phrases

Avoid splitting phrases that describe your idea as a whole. For example, use the phrase *physical chemistry*, not *physical and chemistry*.

Understand Case-Sensitivity

Theme queries are case-sensitive. For example, doing a query on the common noun *turkey*, which describes a type of bird, will not produce a hit on the proper noun *Turkey*, which describes a country.

See Also: For more information about case-sensitivity and theme queries, see the "Theme Querying" section in this chapter.

Refining Theme Queries

Depending on how you write your theme query, ConText usually returns documents that are relevant to your query as well as documents that might be irrelevant to your query. Before you issue the query, you do not know what combination of document themes your query will return.

For example, a query on *cricket* might return documents on *sports* and *insects* depending on your document set. The best way to know the possible outcome is to run the query and examine the set of returned documents. Then you run the query again, using logical operators to eliminate unwanted documents.

You can approach the trial and error method in one of two ways:

- Restrict query. You select a broad category/concept, examine results, and then issue the query again using the AND or NOT operator to further restrict the query hitlist.
- Expand query. You select a specific category, examine the results, then expand query to include more documents in the hitlist.

Restricting a Query

Starting with broad theme queries might generate noise or unwanted documents. This is because of the following:

- the word or phrase in your query can represent more than one concept
- a document can have more than one theme attached to it

You can use the AND or NOT operator to eliminate unwanted documents. However, use these operators with caution, because in both cases you run the risk of eliminating documents that you might be interested in. For this reason, it is always better to have some noise than none at all.

Using AND

You can use the AND operator with a qualifying theme to restrict your theme query and hence eliminate noise.

For example, if a theme query on cricket always returned documents about the sport *cricket* and the insect *cricket*, and you were interested only in those documents about *cricket* the sport, you can restrict your query by qualifying *cricket* with the more general category *sports* as follows:

```
'cricket and sports'
```

The disadvantage of using AND with a restricting theme is that a successful query depends on both themes being developed sufficiently in the document for ConText to index them as such. For example, a hypothetical news article about the personal affairs of cricket player might not have the theme of *sports* developed substantially for ConText to index *sports* as a theme, and therefore such a document would not be returned in the above query.

Suggestion: When choosing the restricting condition to use with the AND operator, we recommend choosing a broad category; choosing a very specific category as the restricting condition might inadvertently eliminate relevant documents.

Using NOT

You can use the NOT operator to exclude unwanted themes. For example, suppose you have a collection of news articles. You find that a theme query on cricket returns documents about *cricket* the sport as well as *cricket* the insect.

In such a scenario, you can use the NOT operator to exclude the unwanted theme. Thus if you are interested in those documents only about the sport cricket, you exclude documents about insects as follows:

```
'cricket not insects'
```

One disadvantage of using the NOT operator is that you run the risk of excluding documents that are coincidentally about the desired theme and the unwanted theme. For example, the above query does not return a hypothetical document about a cricket game that was swarmed by locusts, assuming that the theme of *insects* is developed sufficiently for ConText to index *insects* as a document theme.

Another disadvantage of using NOT is that you usually have a better idea of the themes you want, not of the themes you don't want. Predicting unwanted themes depends on knowing your document corpus. For this reason, using NOT is best suited for eliminating irrelevant high-ranking documents you specifically know about.

Expanding a Query

Sometimes it is better to start with specific categories and then expand these queries into more general ones, especially when your query covers a topic that is categorized specifically in the world. For example, if you are searching for documents that are about *bees*, you issue a query on *bees*, which is a specific category of insects. If you find that the result set is not returning the documents you need, you can expand the query by issuing a theme of *insects*, which is slightly broader.

After expanding a query, you can use the NOT or AND operators to scale back the query.

Theme Query Examples

To execute a theme query, you specify a query string, which can be a sentence or a phrase with or without operators. ConText interprets your query, creating a normalized form of your query that it can use to match against document themes in the index. Context returns a list of documents that satisfy the query, based on certain rules, along with a score of how relevant each document is to the query.

You can issue themes queries using either the two-step or one-step method. The way in which ConText matches themes and scores hits is the same for both methods.

Note: To issue theme queries, you must have a theme index.

For more information about how to create a theme index on a text column, see *Oracle8 Context Cartridge Administrator's Guide*.

Two-Step Query

To execute a theme query with the CTX_QUERY.CONTAINS procedure against a theme index, you must specify a policy that has a theme lexer associated with it.

For example, you specify a theme query on *computer software* as follows:

```
execute ctx_query.contains('THEME_POL', 'computer software', 'CTX_TEMP');
```

In the above example, ConText normalizes *computer software*, and then attempts to match the normal form with document themes in the index.

When a match is found, ConText uses the weight of the matched theme to compute a score that reflects how relevant the match is to the query; the higher the score, the more relevant the hit. ConText returns the matched document as part of the hitlist.

One-Step Query

You can execute theme queries in SQL*Plus using the one-step method. To do so, the text column must be indexed by theme. The way in which ConText matches themes and scores hits is the same as in a two-step query.

For example, to execute a theme query on *computer software*:

```
SELECT * FROM TEXTAB
WHERE CONTAINS (text, 'computer software') > 0;
```

Multiple Policies

For a text column that has more than one policy associated with it, you must specify which policy to use in the CONTAINS clause using the *pol_hint* parameter. You might create two policies for a column when you want to perform both theme and text queries on the column.

For example, if the column *text* had a regular text policy and a theme policy THEME_POL associated with it, you issue a theme query as follows:

```
SELECT ID, SCORE(0) FROM TEXTAB
WHERE CONTAINS (text, 'computer software', 0, 'THEME_POL') > 0;
```

When you specify *pol_hint*, you must also specify a placeholder (in this example 0) for the LABEL parameter.

> **See Also:** For more information about using the *pol_hint* parameter in the CONTAINS function, see the specification for CONTAINS in Chapter 9.

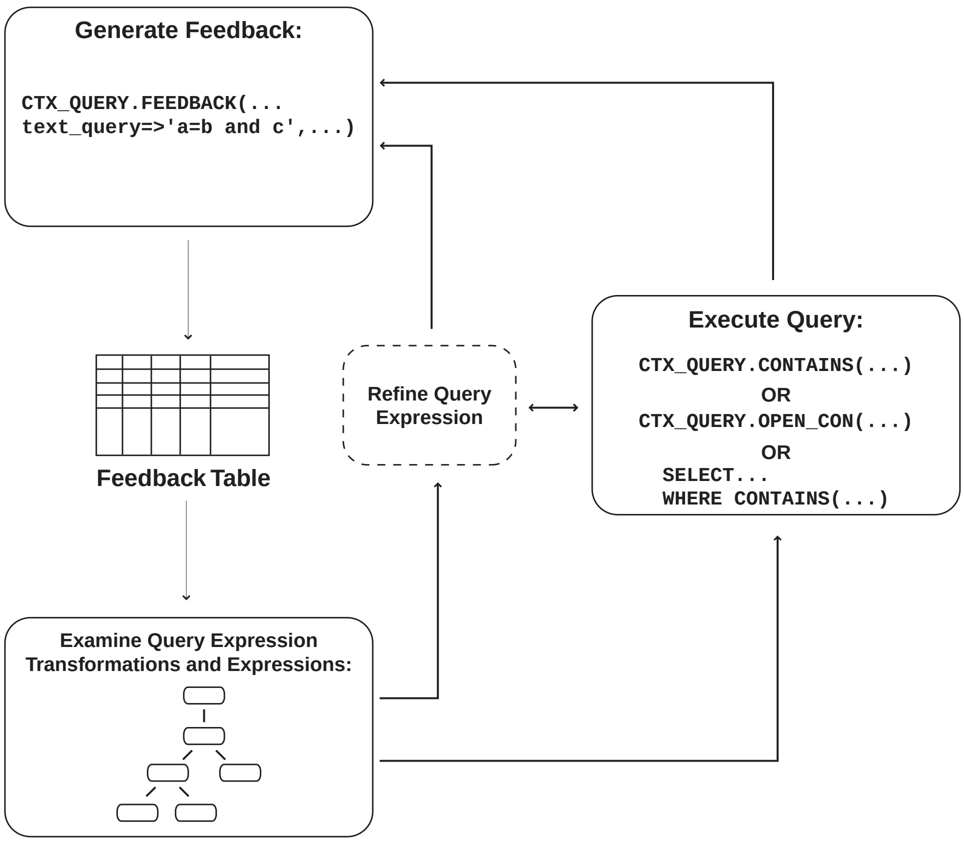
5

Query Expression Feedback

This chapter describes query expression feedback. The following topics are covered:

The Feedback Process

Figure 5–1



Query expression feedback is a feature that enables you to know how ConText parses a text or theme query expression *before* you execute the query. Knowing how ConText evaluates a text or theme query expression is useful for refining and debugging queries. You can also design your application so that it uses the feedback information to help users write better queries.

The diagram above shows how you use query expression feedback. You execute the PL/SQL procedure CTX_QUERY.FEEDBACK, which generates and stores feedback information to a table. From the data in this feedback table, you can visualize the ConText parse tree to examine how the expression was expanded and parsed. You can then refine the query and re-execute FEEDBACK, or you can execute the real query with CONTAINS for two-step queries, OPEN_CON for in-memory queries, or SELECT for one-step queries.

In text queries, query expression feedback is especially useful for knowing how context expands expressions that contain stem, wildcard, thesaurus, fuzzy, soundex, PL/SQL, or SQE operators before you execute the query. This is because such queries can potentially expand into many tokens or result in very large hitlists.

In theme queries, query expression feedback is useful for knowing how ConText uses the knowledge catalog to normalize query expressions.

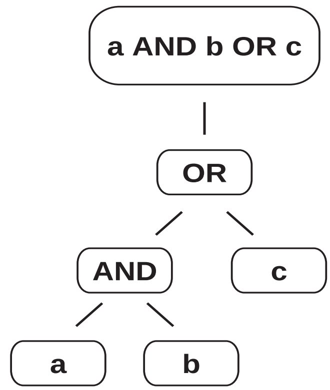
Understanding ConText Parse Trees

Before ConText executes a query, it parses the expression. The resulting expression can be represented as a parse tree. A ConText parse tree can show:

- order of execution (precedence of operators)
- stem, fuzzy, thesaurus, soundex, PL/SQL, SQE, and wildcard expansions
- theme query normalization
- query optimization
- stop-word transformations
- breakdown of composite-word tokens (German)

The output table of the FEEDBACK procedure is graphical representation of a ConText parse tree.

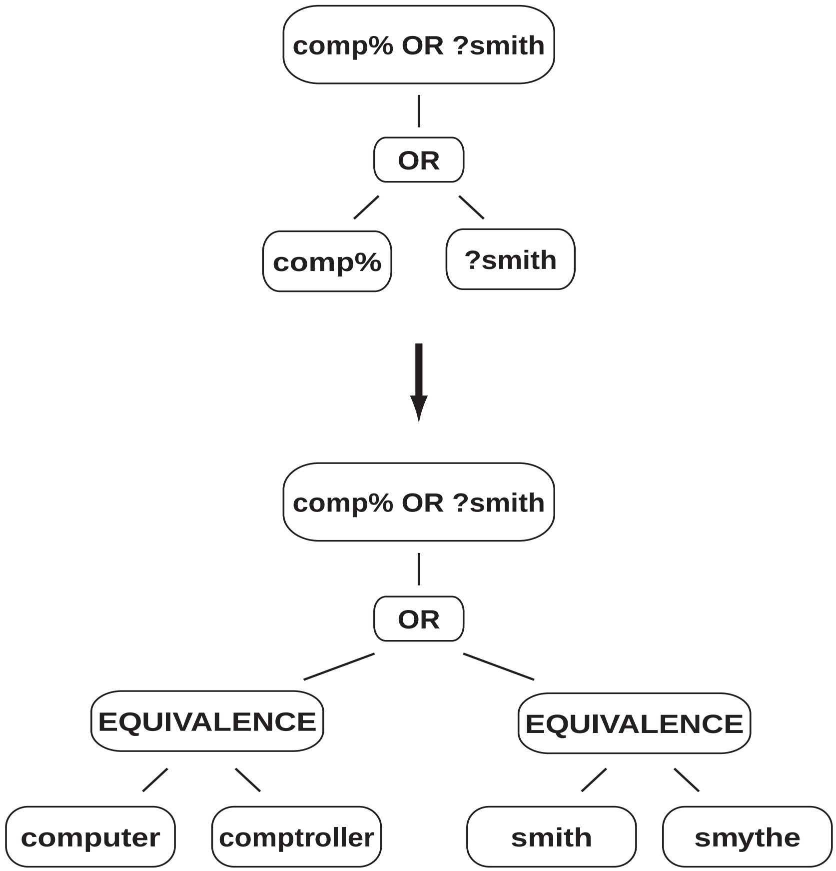
Operator Precedence



Parse trees are read in a depth-first manner and from left to right. This means the first operation is always furthest to the left and at the bottom of the branch. In this way, parse trees illustrate operator precedence.

The example above shows the parse tree for the evaluation of *a AND b OR c*, where *a*, *b* and *c* stand for three arbitrary words. Since the *and* operation *a AND b* is the leftmost operation and at the bottom of the tree, it is executed first. In this way, the parse tree above indicates correctly that the *and* operator has higher precedence over the *or* operator. The resulting query is hence *(a AND b) OR c* rather than *a AND (b OR c)*.

Query Expansions

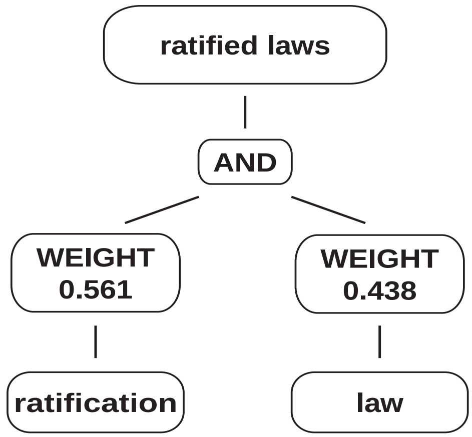


The above example shows how ConText expands the query *comp% OR ?smith*. The parse tree shows that before ConText executes the query, the token *comp%* is expanded to *computer* and *comptroller*, while *?smith* is expanded to *smith* and *smythe*.

ConText parse trees show similar expansions with thesaurus, wildcard, soundex, stem, SQE, and PL/SQL operators. In the case of the wildcard, soundex, and fuzzy operators, ConText obtains the correct word expansions from the index.

Note: When you include the SQE operator in the feedback expression, the feedback (expansion of the stored query expression) is based on the current state of the index and will take into account any inserts, updates, or deletes made to the base table; however, unlike a call to CONTAINS, the stored query expression is *not* updated or refreshed as a result of the call to FEEDBACK.

Theme Query Normalization



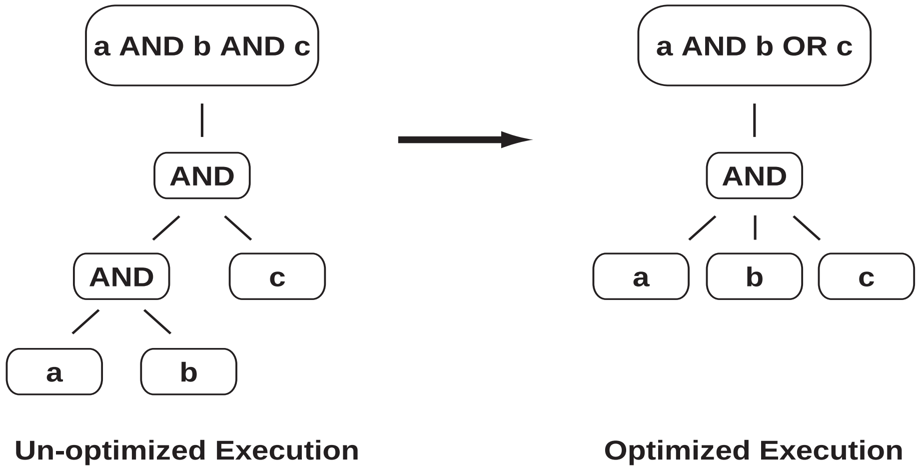
You can use query expression feedback to know how ConText interprets theme queries. The feedback information provides the normalized version of the query as obtained from the knowledge catalog.

The example above shows how ConText normalizes the theme query *ratified laws* to the themes *ratification* and *law*. The resulting expression is an AND operation with weights attached to the normal forms: *ratification*0.561 AND law*0.438*.

Note: Because numbers are rounded off when displayed, weights might not always add up to 1.000 exactly.

See Also: For more information about theme queries, see Chapter 4, "Theme Queries".

Query Optimization

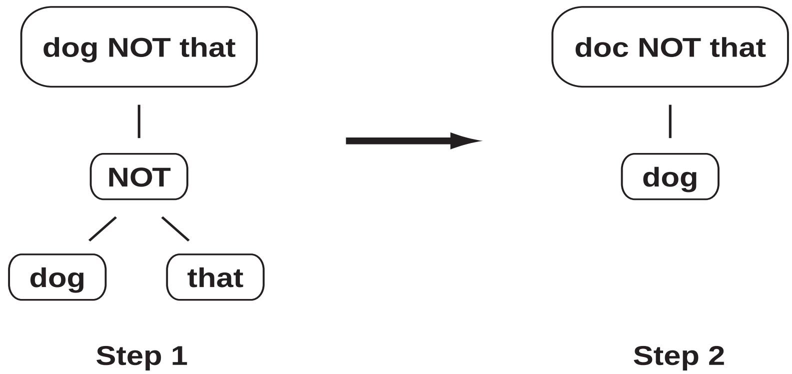


The example above shows how ConText optimizes the expression *a AND b AND c*, where *a* and *b* and *c* stand for three different words.

In the first step of the parse, ConText evaluates *a AND b*, then ANDs the result with *c*. With such a parse tree, ConText must search for all documents that contain *a* and *b*, then search for all documents that contain *c*, and then intersect the two result sets.

The ConText optimizer realizes this query is more efficiently executed by simultaneously searching for all the documents that contain *a* and *b* and *c*, which is illustrated in the second step of the optimizing process.

Stopword Rewrite



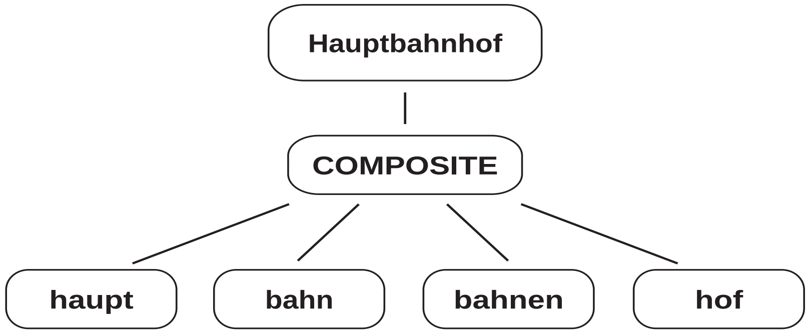
The example above shows the parse sequence for the stopword transformation:

non_stopword NOT stopword => non_stopword

Assuming *that* is a stopword, ConText reduces the query *dog NOT that* to *dog*.

> **See Also:** To learn more about querying with stopwords, see "Querying with Stopwords" in Chapter 3.
>
> For a list of all possible stopword transformations, see Appendix D, "Stopword Transformations".

Decompounding of Composite Word Tokens



When using a composite index with German or Dutch text, you can use query feedback to examine how ConText breaks down a composite word query into its subcomposites. Even though ConText does not return documents that contain only subcomposite words in a query, composite word query feedback is useful for verifying where ConText places word boundaries.

The above example shows that ConText breaks down the German composite word *Hauptbahnhof* into *haupt*, *bahn*, *bahnen*, and *hof*.

Note: To obtain composite word query feedback, the policy's lexer must have the COMPOSITE attribute of the lexer set to 1.

For more information about defining policies, see the *Oracle8 Context Cartridge Administrator's Guide.*

Understanding the Feedback Table

Before you issue a query, you can obtain the parse tree information for the query expression. The procedure CTX_QUERY.FEEDBACK creates a graphical representation of the parse tree and stores this information in a feedback table, which you create before executing CTX_QUERY.FEEDBACK. To reconstruct ConText parse trees, you must understand the structure of this table.

Table Structure

The feedback table has the following structure:

Table 5–1

Column Name	Datatype	Description
FEEDBACK_ID	VARCHAR2(30)	The value of the *feedback_id* argument specified in the FEEDBACK call.
ID	NUMBER	A number assigned to each node in the query execution tree. The root operation node has ID =1. The nodes are numbered in a top-down, left-first manner as they appear in the parse tree.
PARENT_ID	NUMBER	The ID of the execution step that operates on the output of the ID step. Graphically, this is the parent node in the query execution tree. The root operation node (ID =1) has PARENT_ID = 0.
OPERATION	VARCHAR2(30)	Name of the internal operation performed. Refer to Table 5–2 for possible values.
OPTIONS	VARCHAR2(30)	Characters that describe a variation on the operation described in the OPERATION column. When an OPERATION has more than one OPTIONS associated with it, OPTIONS values are concatenated in the order of processing. See Table 5–3 for possible values.
OBJECT_NAME	VARCHAR2(64)	Section name, or wildcard term, or term to lookup in the index.
POSITION	NUMBER	The order of processing for nodes that all have the same PARENT_ID.The positions are numbered in ascending order starting at 1.
CARDINALITY	NUMBER	Reserved for future use. You should create this column for forward compatibility.

OPERATION Column

Table 5–2 lists the possible values for the OPERATION column in the feedback table:

Table 5–2

Operation Value	Query Operator	Equivalent Symbol
ACCUMULATE	ACCUM	,
AND	AND	&
COMPOSITE	(none)	(none)
EQUIVALENCE	EQUIV	=
FIRST_NEXT_DOC	#	#
MAX_DOC	:	:
MINUS	MINUS	-
NEAR	NEAR	;
NOT	NOT	~
NO_HITS	(no hits will result from this query)	
OR	OR	|
PHRASE	(a phrase term)	
SECTION	(section)	
THRESHOLD	>	>
WEIGHT	*	*
WITHIN	within	(none)
WORD	(a single term)	

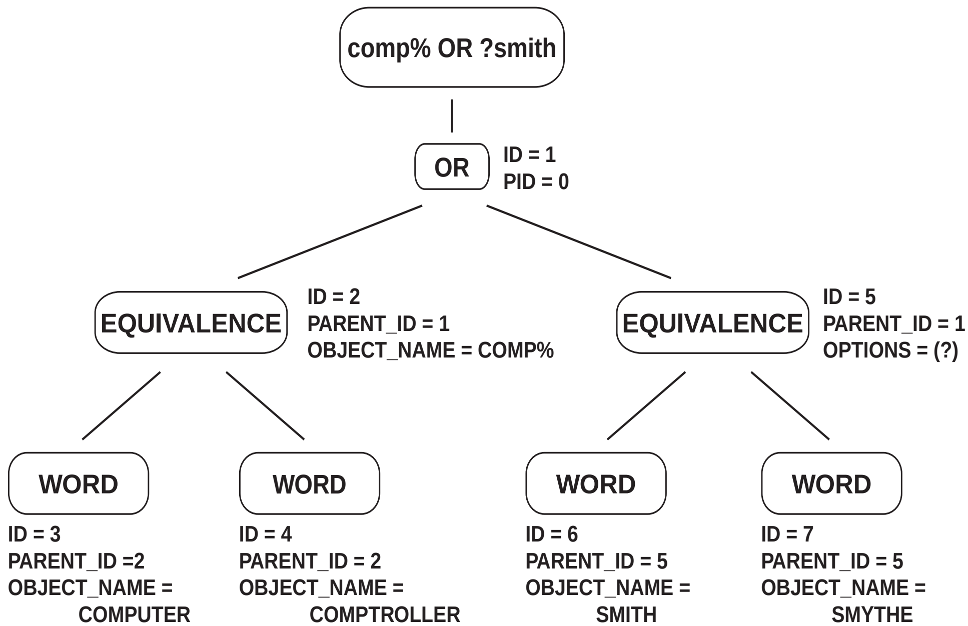
OPTIONS Column

Table 5–3 shows the values for the OPTIONS column in the feedback table. When an OPERATION has more than one OPTIONS associated with it, the OPTIONS values are concatenated in the order of processing.

Table 5–3

Options Value	Description
($)	Stem
(?)	Fuzzy
(!)	Soundex
(T)	Order for ordered Near.
(F)	Order for unordered Near.
(n)	A number associated with Threshold, Weight, Max, or the max_span parameter for the Near operator.
(m-n)	First next range (m and n are integers)

Example



The figure above shows how ConText encodes the parse tree for the query *comp% OR $smith*, which is asking for all documents that contain words beginning with *comp* or contain words that are spelled like *smith.*

Each node is labeled with a value that corresponds to the OPERATION column in the feedback table. The tree above contains one OR node, two EQUIVALENCE nodes, and four WORD nodes.

The ID and PARENT_ID values are listed beside each node. For example, the OR node has an ID of 1 and PARENT_ID of 0, since it is the root node.

The EQUIVALENCE node with ID = 2, PARENT_ID = 1, has an OBJECT_NAME value of *COMP%*, because this equivalence operation is a result of wildcard term *comp%*.

The WORD node with *id* = 3 has an OBJECT_NAME value of *computer*, because in this instance, *computer* is one of the words that satisfy *comp%*.

Obtaining Query Expression Feedback

To obtain query expression feedback information, you must do the following:

1. Create the feedback table.
2. Execute CTX_QUERY.FEEDBACK.
3. Retrieve data from feedback table.
4. Optionally, construct expansion tree from table information.

Creating the Feedback Table

To create a feedback table called *test_feedback* for example, use the following SQL statement:

```
create table test_feedback(
         feedback_id varchar2(30)
         id number,
         parent_id number,
         operation varchar2(30),
         options varchar2(30),
         object_name varchar2(64),
         position number,
         cardinality number);
```

Executing CTX_QUERY.FEEDBACK

To obtain the expansion of a query expression such as *comp% OR ?smith*, use CTX_QUERY.FEEDBACK as follows:

```
ctx_query.feedback(
         policy_name => 'scott.test_policy',
         text_query => 'comp% OR ?smith',
         feedback_table => 'test_feedback',
         sharelevel => 0,
         feedback_id => 'Test');
```

Retrieving Data from Feedback Table

To read the feedback table, you can select the columns as follows:

```
select feedback_id, id, parent_id, operation, options, object_name, position
from test_feedback
order by id;
```

The output is ordered by ID to simulate a hierarchical query:

```
FEEDBACK_ID   ID PARENT_ID OPERATION    OPTIONS OBJECT_NAME POSITION
----------- ---- --------- ------------ ------- ----------- --------
Test           1         0 OR           NULL    NULL          1
Test           2         1 EQUIVALENCE  NULL    COMP%         1
Test           3         2 WORD         NULL    COMPTROLLER   1
Test           4         2 WORD         NULL    COMPUTER      2
Test           5         1 EQUIVALENCE  (?)     SMITH         2
Test           6         5 WORD         NULL    SMITH         1
Test           7         5 WORD         NULL    SMYTHE        2
```

Constructing the Parse Tree

You can optionally construct an approximate graphical representation of the parse tree using a hierarchical query. This type of query outputs rows in a hierarchical manner, where children nodes are indented under parent nodes.

The following statement selects from a populated feedback table, indenting the output according to level:

```
select lpad(' ',2*(level-1)) || operation operation, options, object_name,
position
from test_feedback
start with id = 1
connect by prior id = parent_id;
```

This statement produces hierarchical output for the query *comp% OR ?smith* as follows:

```
OPERATION            OPTIONS    OBJECT_NAME          POSITION
-------------------- ---------- -------------------- -------
OR                   NULL       NULL                       1
  EQUIVALENCE        NULL       COMP%                      1
    WORD             NULL       COMPTROLLER                1
    WORD             NULL       COMPUTER                   2
  EQUIVALENCE        (?)        SMITH                      2
    WORD             NULL       SMITH                      1
    WORD             NULL       SMYTHE                     2
```

6

Document Presentation: Highlighting

This chapter describes how ConText query applications can present documents with highlighted information.

The following topics are covered in this chapter:

- Overview of Document Presentation
- Using CTX_QUERY.HIGHLIGHT
- Creating Highlighted Text

Overview of Document Presentation

In a typical query application, users can issue text or theme queries. The application executes the query and returns to the user a hitlist, allowing the user to select one or more documents.

When the user chooses a document, ConText enables you to present the selected document with the query terms highlighted for text queries, or with the relevant paragraphs highlighted for theme queries.

Your application can also present linguistic summaries of the selected documents.

> **See Also:** For more information about linguistic output, see Chapter 7, "ConText Linguistics".

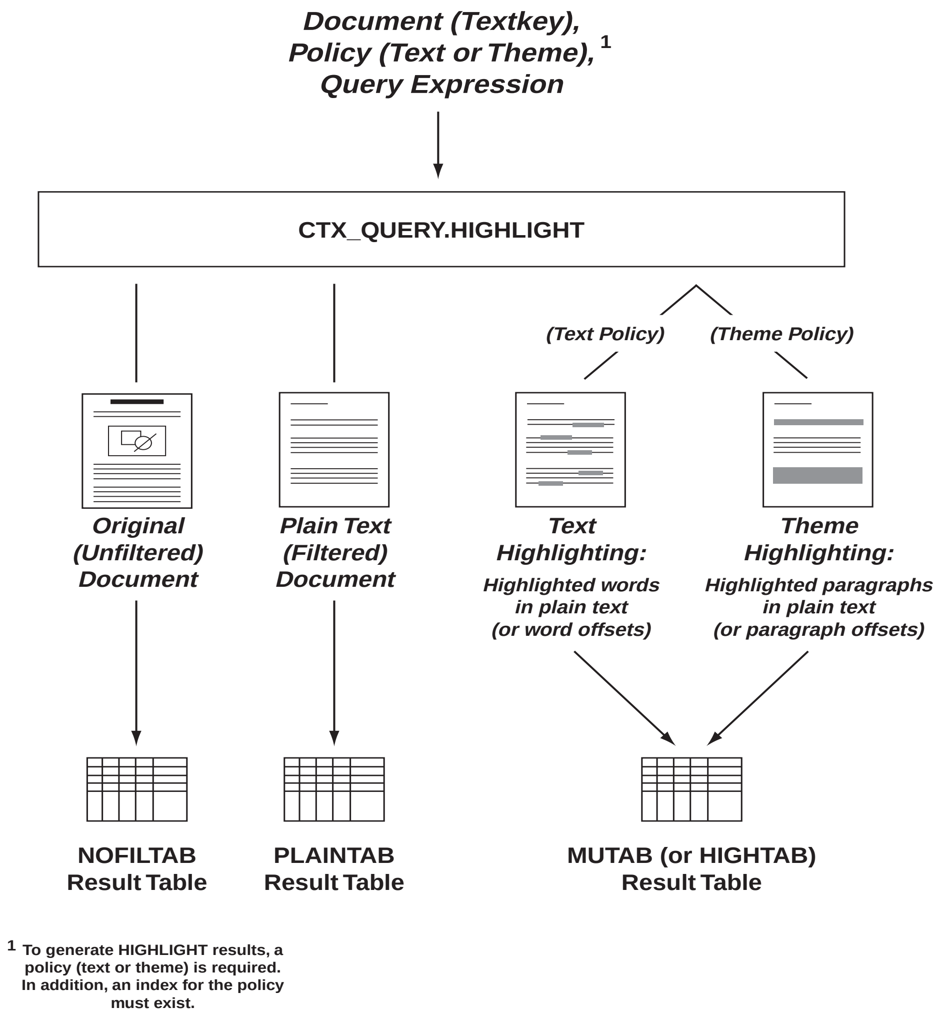
When developing applications in PL/SQL, you use the CTX_QUERY.HIGHLIGHT procedure to create various forms of highlighted documents that can be presented to users. The source documents can be stored as plain text or in any of the formats ConText supports for text indexing.

For world wide web applications, you can use the ConText viewers to present highlighted documents.

> **See Also:** For more information about highlighting with ConText viewers, see the *Oracle8 ConText Cartridge Workbench User's Guide*.

Using CTX_QUERY.HIGHLIGHT

Figure 6–1



CTX_QUERY.HIGHLIGHT generates highlighting information for text or theme queries. You typically call CTX_QUERY.HIGHLIGHT after executing a text or theme query. With text queries, HIGHLIGHT marks the relevant words or phrases in the document. With theme queries, HIGHLIGHT marks the relevant paragraphs in the document.

Note: ConText does not do sentence-level theme highlighting.

Output

As illustrated in Figure 6–1, CTX_QUERY.HIGHLIGHT can be used to generate the following output for a document:

Output	Description	Table
Original Document	Document in native format without highlights.	NOFILTAB
Plain Text Document	Plain text of document without highlights.	PLAINTAB
Highlighted Document	Plain text document with occurrences of the specified word (text query) or paragraph (theme query) highlighted.	MUTAB
Offset Information	Highlight information that identifies the position and length of the query terms or paragraphs found in the source document. The positions and lengths of the query terms are specified as offsets from the beginning of the plain text version of the document.	HIGHTAB

Note: The filter ConText uses to create the plain text in the PLAINTAB and MUTAB tables is the same filter ConText uses to index the document.

For more information about supported formats, see *Oracle8 ConText Cartridge Administrator's Guide.*

Note: If the document is an HTML document filtered through the internal HTML filter, the marked-up ASCII text version generated by HIGHLIGHT and stored in a MUTAB table retains the original HTML tags from the document.

See Also: For more information about the structure of the highlight output tables, see "Highlight Table Structures" in Appendix A, "Result Tables".

Highlighting Mark-up

When you call CTX_QUERY.HIGHLIGHT, you can specify the markup used to indicate the start and end of a highlighted word or phrase for text queries, or the start and end of a highlighted paragraph for theme queries.

When you specify no markup, HIGHLIGHT uses default markup. The default highlighting mark-up produced by HIGHLIGHT differs depending on the format of the source document.

If the source document is an ASCII document or a formatted document, the default highlighting markup is three angle brackets immediately to the left (<<<) and right (>>>) of each term.

If the source document is an HTML document filtered through an external filter, the default highlighting markup is the same as the highlighting markup for plain text or formatted documents (<<< and >>>).

If the source document is an HTML document filtered through the internal HTML filter, the default highlighting markup is the HTML tags used to indicate the start and end of a font change:

- <FONT =...> to the immediate left of the term
- </FONT> to the immediate right of the term

See Also: For more information about internal and external filters, see *Oracle8 ConText Cartridge Administrator's Guide.*

Creating Highlighted Text

To present highlighted documents in an application, do the following:

1. Allocate one or more highlight result tables to store the results.
2. Issue a query to obtain a list of documents.
3. Call the CTX_QUERY.HIGHLIGHT procedure for a document from the hitlist.
4. Display (or otherwise use) the output generated by HIGHLIGHT.
5. Release the result table(s).

Allocating Result Tables

The result tables required by the HIGHLIGHT procedure can be allocated manually using the CREATE TABLE command in SQL or using the CTX_QUERY.GETTAB procedure.

For example, to create a MUTAB table to store highlighted ascii mark-up, issue the following statement:

```
create table mu_ascii
(
id number,
document long
);
```

To create a HIGHTAB table to store highlight offset information, issue the following statement:

```
create table highlight_ascii
(
id number,
offset number,
length number,
strength number
);
```

> **See Also:** For more information about the structure of the highlight output tables, see "Highlight Table Structures" in Appendix A, "Result Tables".

Issuing a Query

Issue a one-step, two-step, or in-memory query to return a hitlist of documents. You can issue either a text or theme query. For text queries, you call CONTAINS with a text policy; for theme queries, you call CONTAINS with a theme policy. The hitlist provides the textkeys that are used to generate highlight and display output for specified documents in the hitlist.

Calling CTX_QUERY.HIGHLIGHT

Call CTX_QUERY.HIGHLIGHT with a pointer to a document (generally the textkey obtained from the hitlist) and a text or theme query expression.

CTX_QUERY. HIGHLIGHT returns various forms of the specified document that can be further processed or displayed by the application.

ConText uses the query expression specified in the HIGHLIGHT procedure to generate the highlight offset information and marked-up ASCII text. In addition, the offset information is based on the ASCII text version of the document.

Note: While the query expression is usually the same as the expression used to return documents in the text query, it is not required that the query expressions match. For example, you might allow a user to search for all articles by a particular author and then allow the user to view highlighted references to a specified subject in the returned documents.

If the query expression contains a result set operator (first / next, max, threshold), the result set operator is ignored. ConText returns highlight information for the entire result set.

See Also: For more information about the query expression in HIGHLIGHT, see the CTX_QUERY.HIGHLIGHT specification in Chapter 10.

Text Query Highlighting

To create highlight mark-up for text queries, you must specify a *text* policy, which is usually the policy you specify with the CONTAINS procedure for the same query. With text queries, the HIGHLIGHT procedure highlights the terms you specify in the *query* parameter.

For example, to highlight all the occurrences of the term *dog* with a document identified by textkey *14*, issue the following statement:

```
ctx_query.highlight
   (
cspec=> 'text_policy',
textkey => '14',
query => 'dog',
id=> 14,
hightab => 'highlight_ascii',
mutab   => 'mu_ascii'
   );
```

Theme Query Highlighting

To create highlight mark-up for a theme query, you must specify a *theme* policy, which is usually the policy you specify with the CONTAINS procedure for the same query. With theme queries, the HIGHLIGHT procedure highlights the relevant paragraphs in the document.

For example, to highlight all the paragraphs that are relevant to the theme query *computers* for document with textkey *12*, issue the following query:

```
ctx_query.highlight
   (
cspec=> 'theme_policy',
textkey => '12',
query => 'computers',
id=> 12,
hightab => 'highlight_ascii',
mutab   => 'mu_ascii'
   );
```

Presenting HIGHLIGHT Output

You can use the MUTAB table to view highlighted ascii text. For example in SQL*Plus, you can issue the following statement to view a MUTAB table called *mu_ascii*:

```
select * from mu_ascii order by id;
```

You can also use the offset information in the HIGHTAB table to highlight the document in ways that suit your application.

Text Query Highlight Output

With text queries, the word or phrase is highlighted. For example, a text query on *dog* might produce the following type of highlighted ascii output for a document:

```
...
The quick brown <<dog>> jumped over the fox.
...
```

Theme Query Highlight Output

With theme queries, the relevant paragraphs in the document are highlighted. For example, a theme query of *computers* produces the following type of highlighted ascii output for a document:

```
<<< LAS VEGAS -- International Business Machines Corp. is using the huge
computer trade show here this week to try to prove a much disputed marketing
claim ofthe past year and a half: that its PS/2 line of personal computers
really does offer unique benefits.>>>
   In the battle for the hearts and minds of the 100,000 dealers, corporate
customers and other spectators gathered here, IBM has set up a series of
demonstrations of the Micro Channel, which is the PS/2's internal data pathway.
The demonstrations seek to show that this pathway has extra flexibility
that can translate into more speed. One demonstration uses an add-in circuit
board that IBM claims allows data to be sent over a network about 60% faster.
Another illustrates a quicker way to store the huge amounts of data handled by a
so-called file server, the machine that controls a network of personal
computers.
  <<< While most personal computers contain just one "master" processor -- the
chip that tells the various parts of the computer what to do -- the Micro
Channel allows for more than one. That means that in Micro Channel machines, the
workhorse central processor can dump lots of work onto another processor,
freeing itself to go about other tasks.>>>

...
```

In this three paragraph excerpt of a news article that satisfies the theme query *computers*, ConText highlights (with angle brackets) only the paragraphs that are about computers.

Release Highlight Result Tables

After documents have been processed by the HIGHLIGHT procedure and displayed to the user, drop the highlight result tables.

If the tables were allocated using CTX_QUERY.GETTAB, you use CTX_QUERY.RELTAB to release the tables.

If the tables were created manually, drop the tables using the SQL command DROP TABLE.

7

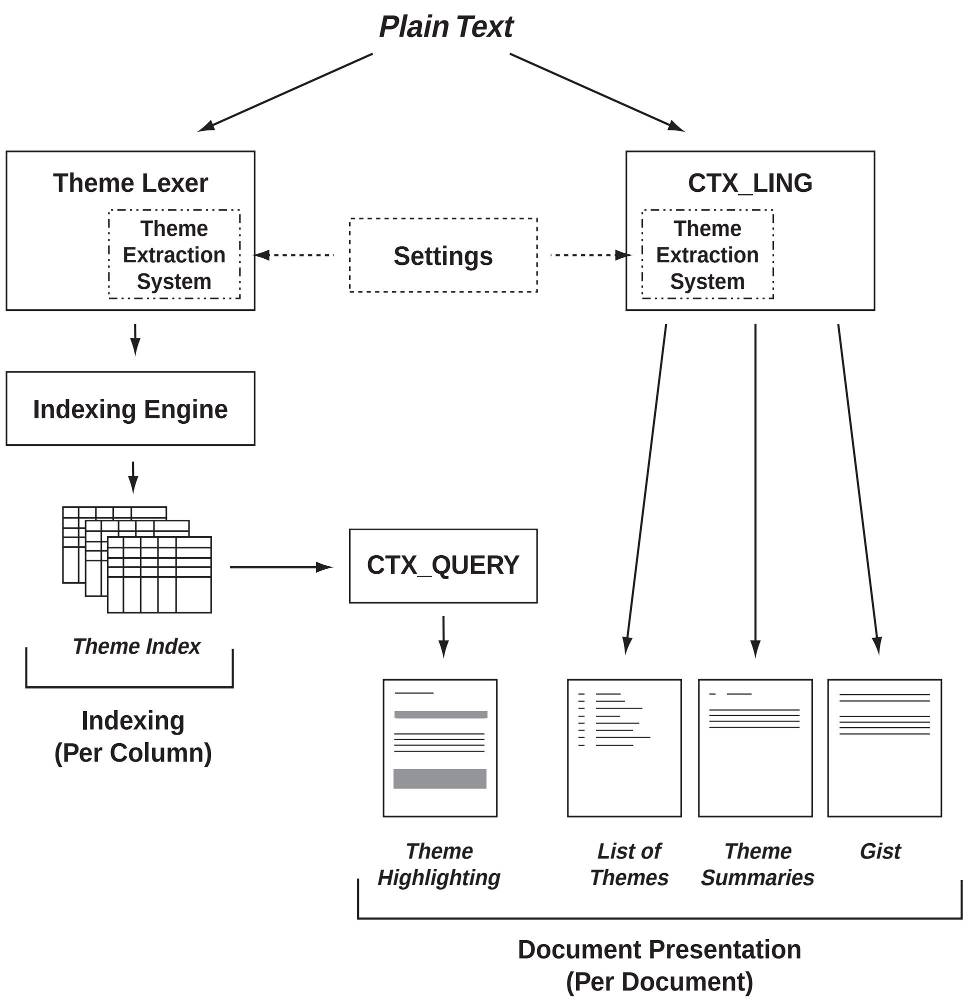
ConText Linguistics

This chapter describes the approach used by ConText to provide thematic analysis of English-language text.

The following topics are covered in this chapter:

Overview of ConText Linguistics

Figure 7–1



ConText linguistics is a system that extracts the main ideas from English-language text and uses the main ideas to produce different forms of output. These main ideas are referred to as themes.

As shown in Figure 7–1, ConText's theme extraction system extracts themes from documents to produce CTX_LING output, theme highlighting, and theme indexes.

CTX_LING output is created on a per-document basis and gives you different views of documents for presentation. Theme highlighting is also available on a per-document basis. CTX_LING output and theme highlighting are known as ConText document services.

Theme indexes are created from a document set, against which you issue theme queries.

You can optionally use linguistic settings to control case conversion of text before it is processed as well as to control the size of Gists and theme summaries.

The theme extraction system illustrated in Figure 7–1 is comprised of a parsing engine and knowledge base which work to extract themes from text. You can obtain thematic output in different forms, depending on how you invoke the system. The following table describes how to obtain each type of output:

Output	Text Input	Invocation
Theme Summaries List of Themes Gists	Single Document	Use the CTX_LING package with a ConText 'L' server.
Theme Highlighting	Single Document	Use CTX_QUERY.HIGHLIGHT with a ConText 'Q' server. A theme index is required.
Theme Index	Document Set	Use theme lexer in policy with CTX_ DDL.CREATE_INDEX to index documents.

See Also: For more information about how the theme extraction system works, refer to the "Theme Extraction System" section in this chapter.

For more information about theme summaries, list of themes, and Gists, see Chapter 8, "Using CTX_LING".

For more information about theme highlighting, see Chapter 6, "Document Presentation: Highlighting".

For information about creating theme indexes, see the *Oracle8 ConText Cartridge Administrator's Guide*.

For more information about issuing theme queries, see "Understanding Theme Queries" in Chapter 4.

What is a Theme?

Themes are the main ideas in a document. Themes can be concrete concepts such as *Oracle Corporation, jazz music, football, England,* or *Nelson Mandela;* themes can be abstract concepts such as *success, happiness, motivation*, or *unification*. Themes can also be groupings commonly defined in the world, such as *chemistry, botany*, or *fruit*.

When processing text to extract themes, Context extracts up to fifty themes per document.

To derive document themes, ConText uses the information stored in the knowledge catalog. Most themes are concepts in the knowledge catalog. However, ConText can still infer themes that are not known concepts in the knowledge catalog.

> **See Also:** For more information about the knowledge catalog and how ConText extracts themes, see "Theme Extraction System" in this chapter.

Theme Weight

ConText assigns a weight to every theme it extracts from a document. Theme weight is a measure of how well that idea is developed in the document with respect to other themes in the document.

ConText returns a theme weight with each theme returned in a list of themes. During theme indexing, Context also indexes document theme weights with themes and uses the weights to score theme queries issued against the index.

Text Input

Text input to the theme extraction system in Figure 7–1 can be one of the following:

- single documents to create CTX_LING output
- single documents to create theme highlighting
- a set of documents stored in a text column to create theme indexes.
- a theme query expression which ConText normalizes for index look-up

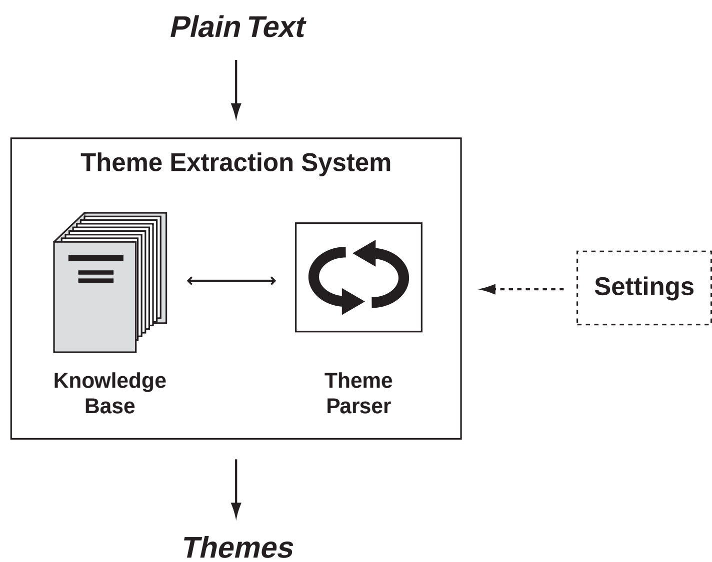
The best results are obtained when the text input to the theme extraction system is in mixed case. However, if your text is all-uppercase or all-lower text, you can convert it to mixed case by changing linguistic settings.

> **See Also:** For more information about linguistic settings, see"Linguistic Settings" in this chapter.

In addition, having good paragraph and sentence structure improves results for generating CTX_LING output, theme highlighting, and theme indexes.

Theme Extraction System

Figure 7–2



The theme extraction system extracts themes from English-language text. It is made up of the following components:

- knowledge base
- parsing engine

Knowledge Base

The knowledge base is a collective term referring to the lexicon and the knowledge catalog. The parsing engine uses the knowledge base to help extract themes from text.

Lexicon

The lexicon is a static information store that provides word and phrase information for the parsing engine. The lexicon recognizes over five hundred thousand English words and phrases and defines hundreds of lexical characteristics for each word.

Note: The lexicon is specific to the English language, handling both American and British usage and spelling.

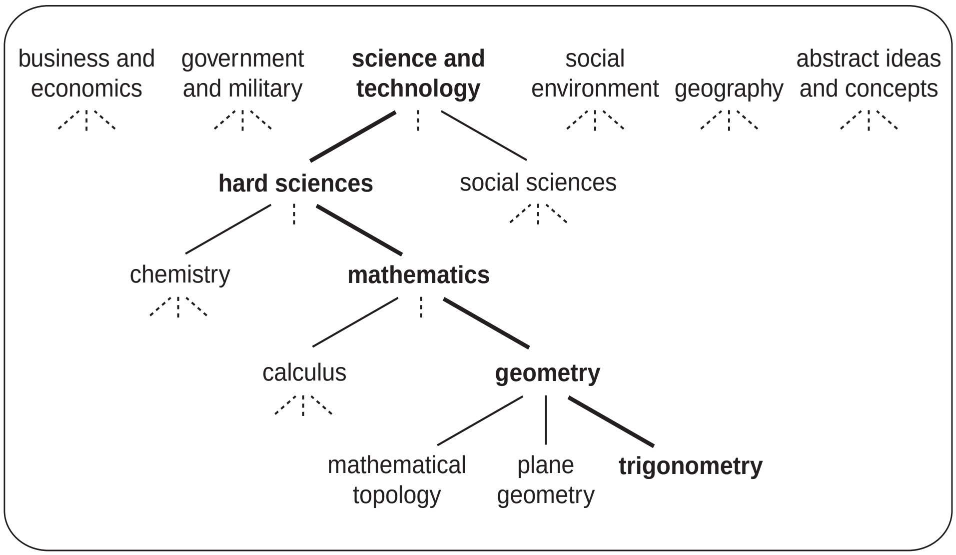
Linguistic information about words in the lexicon is divided into the following types:

Information Type	Description
Syntax	Syntax flags indicate the part-of-speech of a word or phrase.
Theme	Theme flags identify the thematic qualities of a word (e.g. weak noun/needs support, strong verb). The parser uses these flags to determine how a word contributes to the thematic construction of the document as a whole.

In the theme extraction process, ConText uses the information in the lexicon to identify potential themes, and to help rank themes in a document.

Knowledge Catalog

Figure 7–3



The knowledge catalog is a tree-like structure whose branches break down various realms of discourse. The knowledge catalog is divided into the following six main categories as shown in Figure 7–3:

- Business and Economics
- Government and Military
- Science and Technology
- Social Environment
- Geography
- Abstract Ideas and Concepts

> **See Also:** For a complete breakdown of the *categories* in the knowledge catalog, see Appendix E, "Knowledge Catalog - Category Hierarchy".

Categories Categories are groupings of related nouns and ideas that can be sub-divided into further categories and concepts.

Children categories are related to parent categories by an "is-associated-with" relationship, loosely defined as such to cover other standard child-parent type relationships such as "is-a-part-of", "belongs-to", or "is-a".

Figure 7–3 illustrates the basic structure of the knowledge catalog, showing a break down of an example branch within the top-level category of *science and technology*. In the example branch (outlined in boldface), the category of *trigonometry* belongs to the category of *geometry*, which is a part of the more general category of *mathematics*, which is part of the even more general category of *hard sciences*.

In the theme extraction process, ConText uses this structure of categories and concepts to interpret document themes, to help relate themes to each other, and to rank themes.

> **See Also:** For a complete listing of the *categories* in the knowledge catalog, see Appendix E, "Knowledge Catalog - Category Hierarchy".

Concepts Concepts are leaf nodes in the knowledge catalog and can be associated with any level in the category tree. Concepts are related to parent categories by an "is-associated-with" relationship that covers specific relationships such as "is-a".

The category of *trigonometry*, whose branch appears in Figure 7–3, contains over 30 associated concepts including *sines*, *cosines*, *radians* and *polar axes*.

The category of *success*, located in the *abstract ideas and concepts* branch, contains over 30 associated concepts including *award winners*, *conquerors*, *prosperity*, and *winning streaks*.

Concepts can be associated with any level in the category tree. Using the example in Figure 7–3, the category of *mathematics*, which is in the middle of the branch, has over 130 associated concepts. Some of these concepts include *Isaac Newton*, *Fibonacci sequences*, *arithmetic progressions*, and *complex integers*.

Other categories such as *flowering plants* contain over 1000 associated concepts.

The average number of concepts associated with a category in the knowledge catalog is approximately 94.

In the theme extraction process, all concepts in the knowledge catalog are potential document themes.

Note: All categories are also concepts. This means that categories can also be potential document themes in the theme extraction process. For example, the categories of *trigonometry* and *success* can appear as document themes.

Unknown and Ambiguous Concepts ConText's knowledge catalog is not an exhaustive repository of all possible themes (concepts) that can be extracted from a document. Some concepts that ConText might extract from a document are not known to the knowledge catalog.

In addition, concepts such as *bank*, *cricket*, or *tangent* can have more than one meaning in English and hence are ambiguous. Because they are ambiguous, these concepts cannot be placed in the knowledge catalog and are treated as if they are unknown.

See Also: For more information about how ConText handles unknown and ambiguous themes in the theme extraction process, see the following sections:

"Parsing Engine" in this chapter

"Theme Indexing Concepts" in Chapter 4

Normal Forms In the theme extraction process, ConText must convert words and phrases in text to their normal forms so they can attach into the knowledge hierarchy. To make this conversion, the knowledge catalog keeps the following lists:

Type of List	Description
Standard Noun Forms	A list of mappings from inflected variations of words to their standard noun forms as stored in the knowledge catalog's hierarchy of concepts. For example, the words *notify* and *notifies* are mapped to the normal form *notification*; likewise, the words *summarize* and *summarizes* are mapped to the normal form *summaries*.
Alternate Forms	A list of mappings from acronyms, abbreviations, and alternate spellings to their standard forms. For example, *IBM* is an acronym for the standard form *IBM - International Business Machines Corporation*

Parsing Engine

ConText uses the parsing engine to produce all types of thematic output, including CTX_LING output and theme indexes.

The parsing engine syntactically analyzes text, identifying phrase, sentence and paragraph boundaries. It then interprets meaning, selecting the high-information content to produce themes. The lexicon and knowledge catalog provide the reference information necessary to do this processing.

If case-conversion is enabled, the parsing engine converts all the text to lowercase and processes the text through the case-sensitivity routines to determine capitalization.

Note: Case conversion does not affect the original text of the documents being processed; only the output of the parsing engine is stored in mixed-case.

The following sections describe how the parsing engine analyzes text to extract themes.

Token Recognition

ConText breaks up text into paragraphs and then breaks paragraphs into tokens. Tokens can consist of either single words or phrases. Words are groups of characters separated by blank space or punctuation marks; phrases are sequences of two or more words.

Information about English words and phrases is derived from ConText's knowledge base. Sequences of words that match known phrases are collapsed and treated as single tokens for further processing. For example, the phrases *stock market* and *relational database* are treated as tokens.

Token Normalization

ConText converts each token to a normal form using information stored in the knowledge base. Normal forms are the preferred forms of all alternative forms of the token. When ConText is able to find the token in the knowledge base it is a *known* token.

Specifically, token normalization includes the following transformations of alternative forms to preferred forms: Verbs are converted to their noun forms; most nouns are converted to their plural forms; and acronyms and abbreviations are converted to their full forms. For example, the acronyms *IBM* and *I.B.M* are converted to *IBM - International Business Machines*.

Words that mean the same thing for the purposes of text indexing and retrieval are also converted to normal forms. For example, the words *loving* and *amorousness* are normalized to *love*.

When a token cannot be found in the knowledge base, ConText guesses its part-of-speech and then normalizes it according to one of the standard transformations. However, since the token cannot be placed in the knowledge base, it is *unknown*, and is treated as its own normal form isolated from the knowledge base.

Theme Ranking

In this step, ConText scores the normalized tokens, known and unknown, then sorts the tokens, which are potential document themes, into a ranked list. The scoring and ranking of tokens is based on the information associated with each token in the knowledge base, such as what words and parts-of-speech are good candidates for themes. The highest ranking tokens are called themes.

Theme Accumulation

ConText combines duplicated and closely related themes into single themes. This is done by generalizing related themes to common parents using the hierarchical structure of the knowledge catalog. The goal of this process is to find the top-ranking themes, up to fifty, for a document.

Theme Proving

In the final step, ConText looks back at the known themes it generated and evaluates the evidence for each theme in the surrounding text.

Because words can be ambiguous or can be used with new meaning, ConText attempts to find support for the parent concept of each theme. Parent concepts are derived from the knowledge catalog.

If no support exists for the parent concept, ConText indexes the theme as a single row without the parent concept (theme).

Themes that are indexed as single rows have no parents in the hierarchical list-of-themes you obtain with CTX_LING.REQUEST_THEMES.

> **See Also:** For more information about how ConText indexes themes, see "Theme Indexing Concepts" in Chapter 4.

Linguistic Settings

Linguistic setting are settings you can enable to control how ConText processes text to extract themes.

There are two types of linguistic settings that affect output to the theme extraction system:

- case-conversion settings
- Gist and theme summary settings

Case-Conversion Settings

ConText provides two pre-defined linguistic setting labels for case-conversion. These settings affect the processing of all text input to the theme extraction system:

Setting	Description
GENERIC	Default configuration. Parses mixed-case English text. Produces theme output.
SA (Case Sensitive)	Same as GENERIC except that ConText converts text that is all-uppercase or all lower-case to mixed-case text before performing theme analysis.

You can set linguistic settings labels with the CTX_LING.SET_SETTINGS_LABEL procedure.

Gist and Theme Summary Settings

You can use the administration tool to create settings labels to control the following options:

- size of Gist
- size of theme summary
- Gist generation method

When you use the administration tool to create your own settings, you must use one of the ConText predefined settings as a starting point, depending on whether your text is mixed-case, or all upper-case, or all lower-case.

See Also: For more information about using the administration tool to create your own labels, see the help file for the administration tool.

For more information about Gists and theme summaries, see Chapter 7, "ConText Linguistics".

Enabling Linguistic Settings

To switch to a case-sensitive setting (SA) or to enable settings labels you create with the administration tool, you must use the CTX_LING.SET_SETTINGS_LABEL procedure.

Note: When you enable a setting other than the default, it affects the way ConText processes text for only that session. To obtain the same type of processing in a new session, you must re-enable the settings with CTX_LING.SET_SETTINGS_LABEL.

See Also: For more information on how to specify linguistic settings, see "Enabling Linguistic Settings" in Chapter 8, "Using CTX_LING".

8

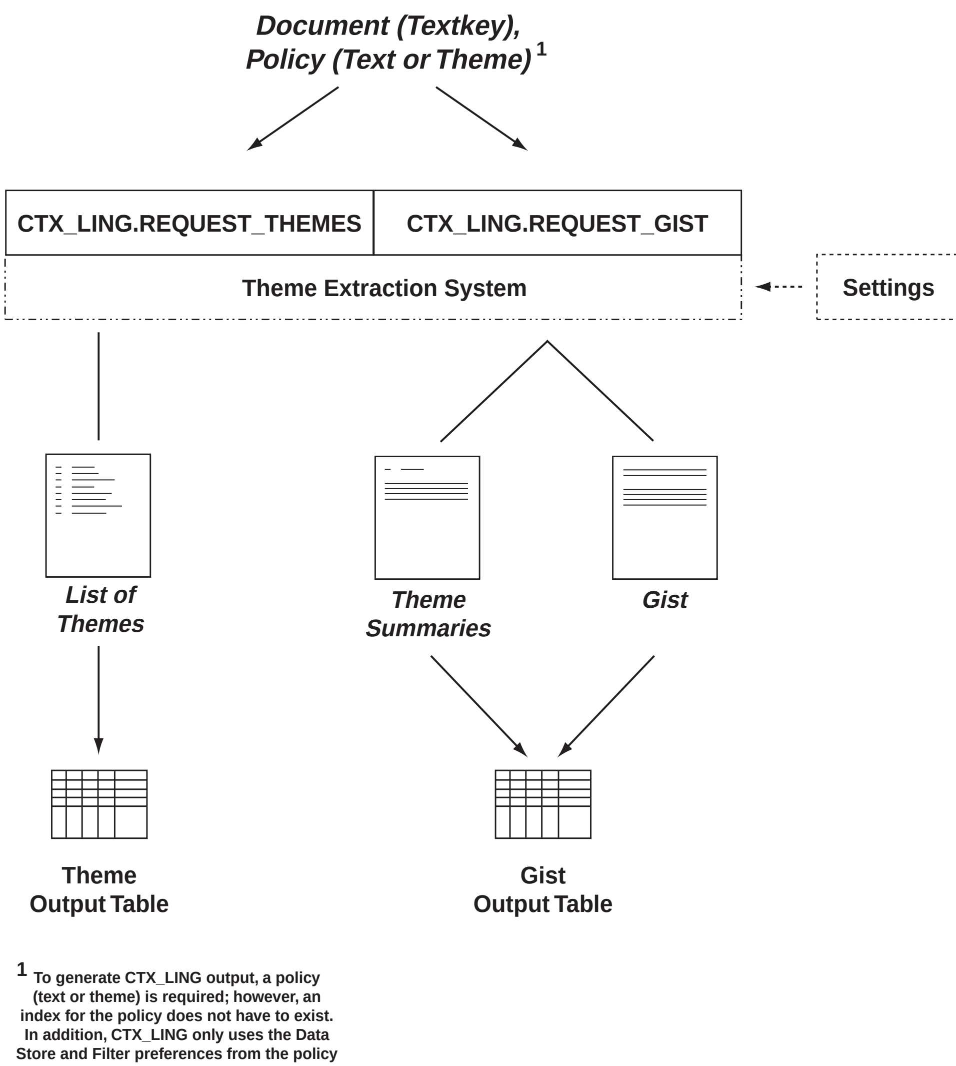
Using CTX_LING

This chapter explains how to use the CTX_LING PL/SQL package in ConText to generate the different types of theme output for English text. It also provides some tips and suggestions for using the output to enhance query applications.

The topics covered in this chapter are:

Overview

Figure 8–1



As shown in Figure 8–1, CTX_LING output consists of lists of themes, theme summaries, and Gists. ConText stores the output in either the theme or Gist table. The following table describes the different output as well as how to generate each type:

Table 8–1

Output Type	Description	How to Generate
List of Themes	The main concepts of a document. You can generate list of themes where each theme is a single word or phrase or where each theme is a hierarchical list of parent themes.	Call CTX_LING.REQUEST_THEMES with document textkey and a policy. Use CTX_LING.SET_FULL_THEMES to enable hierarchical list of themes.
Gist	Text in a document that best represents what the document is about as a whole. You can generate either paragraph or sentence level Gists.	Call CTX_LING.REQUEST_GIST with document textkey and a policy. Specify GENERIC for the *pov* parameter and specify either PARAGRAPH or SENTENCE for the *glevel* parameter.
Theme Summary	Text in a document that best represent a given theme in the document. You can generate either paragraph or sentence level theme summaries.	Call CTX_LING.REQUEST_GIST with document textkey and a policy. Specify the required document theme with the *pov* parameter and specify either PARAGRAPH *or* SENTENCE for the *glevel* parameter

In a query application, you can use CTX_LING output as an alternative to presenting the entire text of a document. For example, you can present some form of CTX_LING output next to each title when you present the hitlist to the user.

Likewise, after the user selects a document from the hitlist, you can also give the user the option of viewing the Gist of a document in addition to or as an alternative to viewing the entire text of a document.

You can use linguistic settings to enable case-conversion for all-uppercase or all-lowercase text, or to change the default size of Gists and theme summaries.

> **See Also:** For more information about linguistic settings, see "Enabling Linguistic Settings" in this chapter.

You obtain CTX_LING output (list-of-themes, theme summaries, and gists) by submitting a request using procedures in the CTX_LING PL/SQL package. Table 8–1 describes which procedures to use.

To generate CTX_LING output, the documents must be stored in a column (either directly or indirectly through a pathname to files), and a policy must be attached to the column.

Note: The setup requirements of having text in a column and having a policy for the column apply to ConText indexes (text/theme) as well as ConText linguistics. The procedures for storing text and creating policies are not discussed in this manual.

For more information about storing text in columns and creating policies for the columns, see *Oracle8 ConText Cartridge Administrator's Guide.*

Linguistic Personality

Requests for CTX_LING output can only be processed by ConText servers running with the Linguistic personality. A ConText server with the Linguistic personality can also have other personalities in its personality mask. Starting up ConText servers is the task of the ConText administrator, through the CTXSYS Oracle user.

See Also: For more information about the Linguistic personality and starting ConText servers, see *Oracle8 ConText Cartridge Administrator's Guide.*

Services Queue

The Services Queue is used for managing requests for CTX_LING output. Such a request is cached in memory until the requestor uses the CTX_LING.SUBMIT procedure to add the request to the Services Queue. If more than one request for a single document is cached in memory when the user submits the requests, ConText stores all of the requests as a single batch request in the queue.

ConText servers with the Linguistic personality monitor the Service Queue for requests and process the next request in the queue.

See Also: For more information about the Services Queue, see *Oracle8 ConText Cartridge Administrator's Guide.*

List of Themes

A list of themes is a list of the main ideas of a document. With each theme, ConText returns a weight that measures the strength of the theme relative to the other themes in the document.

You can use a list of themes in a query application as an alternative to presenting the entire text of a document after a query. When used with theme queries, a presentation of a list of themes for a returned document can also help the user select other documents with the same theme.

You generate a list of themes on a per document basis. To generate a list of themes, use CTX_LING.REQUEST_THEMES. You can generate a list of themes in two ways:

- single themes
- theme hierarchies

Single Themes

You can generate up to fifty themes for each document, using the CTX_LING.REQUEST_THEMES procedure. This procedure writes a single word or phrase that represents the theme to a row in the theme table. The words or phrases that represent the themes are normalized themes derived from the knowledge catalog.

Theme Hierarchies

You can also generate each document theme (up to 50) accompanied by the hierarchical list of parent themes as defined in the knowledge catalog. A theme is related to its parent theme usually by an "is-associated-with" or "is-a-part-of" relationship. For example, a theme of *insects* belongs to the hierarchical list of parent themes defined as *zoology, biology, hard sciences* and *science and technology.*

To enable hierarchical list of themes output, you must use CTX_LING.SET_FULL_THEMES before you call CTX_LING.REQUEST_THEMES.

Generating theme hierarchical information in the theme table helps to match themes with theme summaries generated with CTX_LING.REQUEST_GIST.

> **See Also:** For more information about generating themes, see "Generating Lists of Themes, Theme Summaries, and Gists" in this chapter.

Theme Summaries

A theme summary for a document provides a short summary of the document from a specific point-of-view. You can use theme summaries to present the relevant text (paragraph or sentence) of documents selected by a theme query.

Because a theme summary provides a concise, focused summary for a particular theme in a document, users of a query application can use a theme summary to compare documents with similar themes.

You can generate two types of theme summaries:

- paragraph-level
- sentence-level

A paragraph-level theme summary consists of the paragraph or paragraphs that best represent a single document theme. A sentence-level theme summary consists of the sentence or sentences that best match a single document theme.

To create either paragraph-level or sentence-level theme summaries, use CTX_LING.REQUEST_GIST.

You can control the size of theme summaries with linguistic settings.

Note: The size settings for theme summaries can only be modified by creating custom setting labels in the administration tool.

See Also: For more information about how to generate theme summaries, see "Generating Lists of Themes, Theme Summaries, and Gists" in this chapter.

For more information on specifying linguistic settings, see "Enabling Linguistic Settings" in this chapter.

Gists

A Gist for a document provides a summary that reflects all of the themes in the document. In a query application, you can use a Gist to give the user a overall summary of a document returned in a hitlist.

You can generate two types of Gists:

- paragraph-level
- sentence-level

A paragraph-level Gist consists of the document paragraphs that best represent the themes in a document as a whole. A sentence-level Gist is the sentence or sentences that best represent the themes in a document as a whole.

To generate either a paragraph-level or sentence-level Gist, use CTX_LING.REQUEST_GIST.

Note: The settings for Gist can only be modified by creating custom setting configurations in the GUI administration tool.

See Also: For more information about how to generate Gists, see "Generating Lists of Themes, Theme Summaries, and Gists" in this chapter.

For more information on specifying linguistic settings, see "Enabling Linguistic Settings" in this chapter.

Generating CTX_LING Output

You can present CTX_LING output (lists of themes, theme summaries, and Gists) as an alternative to presenting entire documents to users after a query. To generate theme and Gist information, follow these steps:

- create CTX_LING output tables for the theme and Gist output.
- call either REQUEST_GIST or REQUEST_THEMES in the CTX_LING package to generate the output.
- call CTX_LING.SUBMIT to submit the request to the services queue.

> **Note:** For ConText to generate CTX_LING output, at least one server must be running with the Linguistic (L) personality. For more information about ConText Servers, see *Oracle8 ConText Cartridge Administrator's Guide.*

Creating Output Tables

To create a theme table called CTX_THEMES to store the list of themes from REQUEST_THEMES, issue the following SQL statement:

```
create table ctx_themes (
    cid        number,
    pk         varchar2(64),
    theme      varchar2(2000),
    weight     number);
```

To create a Gist table called CTX_GIST to store the Gist or theme summaries from REQUEST_GIST, issue the following SQL statement:

```
create table ctx_gist (
    cid        number,
    pk         varchar2(64),
    pov        varchar2(80),
    gist       long);
```

Note: Because the combination of the CID (column ID) and PK (primary key) columns in the output tables uniquely identify each document in a text column, you can use the output tables to store theme and Gist information for multiple text columns. You can also choose to create multiple output tables to store the theme and Gist information separately for each text column.

See Also: For more information about the structure of CTX_LING output tables, see "CTX_LING Output Table Structures" in Appendix A, "Result Tables".

Creating Composite Textkey Output Tables

To create a theme table whose textkey has two columns, issue the following SQL statement:

```
create table ctx_themes
    cid         number,
    pk1         varchar2(64),
    pk2         varchar2(64),
    theme       varchar2(2000),
    weight      number);
```

To create a Gist table whose textkey has two columns, issue the following SQL statement:

```
create table ctx_gist (
    cid         number,
    pk1         varchar2(64),
    pk2         varchar2(64),
    pov         varchar2(80),
    gist        long);
```

See Also: For more information about the structure of CTX_LING output tables, see "CTX_LING Output Table Structures" in Appendix A, "Result Tables".

Generating Lists of Themes, Theme Summaries, and Gists

Table 8–2 describes the different types of CTX_LING output and how to generate each type.

Table 8–2

Output Type	Description	How to Generate
List of Themes	The main concepts of a document. You can generate list of themes where each theme is a single word or phrase or where each theme is a hierarchical list of parent themes.	Call CTX_LING.REQUEST_THEMES with document id. Use CTX_LING.SET_FULL_THEMES to enable hierarchical list of themes.
Gist	Text in a document that best represents what the document is about as a whole. You can generate either paragraph or sentence level Gists.	Call CTX_LING.REQUEST_GIST. Specify *GENERIC* for the pov parameter and specify either *paragraph* or *sentence* for the glevel parameter.
Theme Summary	Text in a document that best represent a given theme in the document. You can generate either paragraph or sentence level theme summaries.	Call CTX_LING.REQUEST_GIST. Specify the required document theme with the pov parameter and specify either *paragraph or sentence* for the glevel parameter.

To generate CTX_LING output for a document in a text column, you first call CTX_LING.REQUEST_GISTor CTX_LING.REQUEST_THEMES as described in Table 8–2, then call CTX_LING.SUBMIT to enter these requests in the services queue as a single transaction for that particular document.

> **Note:** A policy must be defined for a column before you can generate CTX_LING output for the documents in the column.

The following example shows how to generate a list of themes and a paragraph-level theme summary. It assumes the tables *ctx_themes* and *ctx_gist* have already been created:

```
declare handle number;
begin
ctx_ling.request_themes('CTXSYS.DOC_POLICY','7039','CTXSYS.CTX_THEMES');
ctx_ling.request_gist('CTXSYS.DOC_POLICY','7039','CTXSYS.CTX_GIST',
                      'PARAGRAPH', 'Oracle Corporation');

handle := ctx_ling.submit;
end;
```

The first call requests a list of themes from document 7039, stored in a column identified by the DOC_POLICY policy. The second call requests a paragraph-level theme summary for *Oracle Corporation* from the same document. The list of themes and theme summary that ConText generates is stored in the CTX_LING output tables (*ctx_themes* and *ctx_gists*), which were created beforehand.

The call to CTX_LING.SUBMIT submits the requests as one batch request to the services queue and returns a handle which can be used to monitor the status of the request. Because the two requests are submitted as one batch request, ConText generates the theme and Gist output in only one linguistic processing cycle.

> **See Also:** For more examples on generating Gists and theme summaries, refer to CTX_LING.REQUEST_GIST in Chapter 10.
>
> For more examples on generating lists of themes, refer to CTX_LING.REQUEST_THEMES in Chapter 10.

Generating Theme Hierarchical Information

By default, ConText generates single themes when you request a list of themes with CTX_LING.REQUEST_THEMES. To generate the hierarchical theme information, you must set the full themes flag to TRUE with CTX_LING.SET_FULL_THEMES. A hierarchical list-of-themes contains single themes accompanied by its parent themes as defined in the knowledge catalog. A theme is related to its parent theme usually by an "is-a-part-of" relationship.

Generating theme hierarchical information helps to match themes with the theme summaries generated with CTX_LING.REQUEST_GIST.

The following examples illustrates the difference between single theme output and hierarchical theme output.

Examples

The following SQL statements generate and output single theme information for a document identified by *pk*:

```
SQL> exec ctx_ling.request_themes('ctx_thidx', pk, 'ctx_themes')
SQL> exec ctx_ling.submit(200)
SQL> select theme from ctx_themes;

THEME
------------------------------------------------------------------------------
NASDAQ - National Association of Securities Dealers Automated Quotation System
stocks
indexes
weakness
composites
prices
franchises
shares
cellularity
declining issues
measures
analysts
OTC
purchases
Wall Street
lows

16 rows selected.
```

However, when you set the full themes flag to TRUE, ConText generates theme hierarchical information:

```
SQL> exec ctx_ling.set_full_themes(TRUE)
SQL> exec ctx_ling.request_themes('ctx_thidx', pk, 'ctx_themes')
SQL> exec ctx_ling.submit(200)
SQL> select theme from ctx_themes

THEME
------------------------------------------------------------------------------
:stock market:NASDAQ - National Association of Securities Dealers Automated
Quotation System:
:stock market:stocks:
:catalogs, itemization:indexes:
:weakness, fatigue:weakness:
:combination, mixture:composites:
:retail trade industry:prices:
:business fundamentals:franchises:
:possession, ownership:shares:
:cellularity:
:stock market:declining issues:
:analysis, evaluation:measures:
:analysis, evaluation:analysts:
:OTC:
:general commerce:purchases:
:general investment:Wall Street:
:bottoms, undersides:lows:
```

Combining Queries with CTX_LING Output

Generating a list of themes is a good way of extending theme or text queries. For a document in a query hitlist, the user can learn more about the document by reading a list-of themes or Gist.

For example, suppose a theme query on *music* returns a hitlist containing 20 documents. If these documents are lengthy, the user might not want to read every single document to find out what each is about. Rather than return to the user the document text, you can return a list of themes or a Gist for each document for the user to skim.

Implementation

Generally, you can generate CTX_LING output for a document set at two different times:

- text/theme indexing time
- query time

Generating CTX_LING output at Indexing Time

You can generate CTX_LING output at indexing time; that is, generate output before queries are issued against the document set. When you do so, the CTX_LING output is returned to the user immediately, since the output was already created.

However, while the retrieval time for the CTX_LING output is good, the drawback to this method is that you have to maintain a permanent theme or Gist output table, using your own triggers to keep it updated. A permanent output table for an entire document set also takes up system disk space.

Generating CTX_LING output at Query-Time

You could also generate CTX_LING output after executing a query. The advantage of generating themes as needed is that the output table lasts only for the user session; you need not maintain a permanent CTX_LING output table for all your documents.

However, generating CTX_LING output takes time depending on the number of documents, the length of the documents, and how your linguistic servers are configured. A user might not want to wait a few minutes for a ConText query application to process a large number of documents.

The example below shows how to generate CTX_LING output after a theme query.

Example

The following PL/SQL code illustrates how to generate a list of themes for every document in a hitlist table returned from a theme query on *birds*. (You can use the same method to loop through any text table, once the text column table has a policy attached to it.)

```
create or replace procedure get_theme IS
handle number;

cursor ctx_cur is
   select textkey from ctx_temp;

BEGIN

ctx_query.contains('DOWTHEME', 'birds', 'ctx_temp');

for ctx_cur_rec in ctx_cur loop
    ctx_ling.request_themes('DOWPOLICY', ctx_cur_rec.textkey, \
           'ctx_themes');
   handle:= ctx_ling.submit;
end loop;

END;
/
```

This routine first declares a cursor that selects the rows from the *ctx_temp* result table, to be populated with a theme query on *birds*.

The cursor FOR loop opens the cursor, executing the select statement that copies all textkeys in the *ctx_temp* table to the cursor. The loop index *ctx_cur_rec* is implicitly defined as a cursor record of type%ROWTYPE.

Every iteration of the loop calls the CTX_LING.REQUEST_THEMES procedure with the document textkey derived from *ctx_cur_rec*. Each request is submitted to the services queue with CTX_LING.SUBMIT, which returns a handle.

The theme output is written to the *ctx_themes* table.

Enabling Linguistic Settings

The default linguistic setting of GENERIC is active whenever you initialize linguistics to create theme indexes, theme highlighting or to generate CTX_LING output.

You can enable a linguistic setting other than the default (GENERIC) when you want to process all lower-case or all upper-case text, or when you want to change the sizes of Gists and theme summaries. When you enable a linguistic setting for a session, the setting applies only to that session.

The settings for case-conversion (GENERIC or SA) are pre-defined. However, to change the size of Gists and theme summaries, you must create a custom setting with the administration tool.

To enable either a case-conversion setting or a custom setting created with the administration tool, use the CTX_LING.SET_SETTINGS_LABEL procedure with a setting label. For example, to process all-uppercase or all-lowercase text for your current session:

```
execute ctx_ling.set_settings_label('SA')
```

The specified setting configuration is active for your session until SET_SETTINGS_LABEL is called with a new setting configuration label.

You can use the CTX_LING.GET_SETTINGS_LABEL function to return the label for the active setting configuration for the current session.

> **See Also:** For more information about creating custom settings, refer to the online help system for the administration tool.

Monitoring the Services Queue

When you submit a request to the services queue with CTX_LING.SUBMIT, a handle is returned. With this handle, you can use procedures in the CTX_SVC package to perform the following tasks:

- monitor the status of requests in the queue
- remove pending requests (requests that have not yet been picked up by a ConText server)
- clear requests with errors

Monitoring the Status of Requests

To monitor the status of requests in the Services Queue, use the CTX_SVC.REQUEST_STATUS function. This function returns one of the following statuses:

Status	Meaning
PENDING	The request has not yet been picked up by a ConText server.
RUNNING	The request is being processed by a ConText server.
ERROR	The request errored.
SUCCESS	The request completed successfully.

For example, the following PL/SQL procedure submits a request to generate themes and gist for a document with an id of 49. It then checks the status of the request.

```
 CREATE OR REPLACE PROCEDURE GENERATE_THEMES AS

   v_Handle number;
   v_Status varchar2(10);
   v_Time   date;
   v_Errors varchar2(60);

BEGIN
  DBMS_OUTPUT.PUT_LINE('Begin generate_themes procedure' );

  ctx_ling.request_themes('CTXDEMO.DEMO_POLICY', '49', 'CTXDEMO.ctx_themes' );
  ctx_ling.request_gist('CTXDEMO.DEMO_POLICY', '49', 'CTXDEMO.ctx_gist' );
  v_Handle := ctx_ling.submit;

  DBMS_OUTPUT.PUT_LINE( v_Handle );

  v_Status := ctx_svc.request_status( v_Handle, v_Time, v_ErrorS );
  DBMS_OUTPUT.PUT_LINE( v_Status );
  DBMS_OUTPUT.PUT_LINE( v_Time );
  DBMS_OUTPUT.PUT_LINE( substr( v_Errors, 1, 20 ) );

  EXCEPTION
    WHEN OTHERS THEN
       DBMS_OUTPUT.PUT_LINE(' Exception handling' );

END GENERATE_THEMES;
/
```

This procedure binds the return value of REQUEST_STATUS to *v_Status* for the linguistic request identified by *v_Handle*. The value for *v_Handle* is returned by the call to CTX_LING.SUBMIT which placed the requests for the themes and gists in the Services Queue.

Removing Pending Requests

To remove requests with a status of PENDING from the Services Queue, use the CTX_SVC.CANCEL procedure.

For example:

```
execute ctx_svc.cancel(3321)
```

In this example, a pending request with handle 3321 is removed from the Services Queue.

If a request has a status of RUNNING, ERROR, or SUCCESS, it cannot be removed from the Services Queue.

Clearing Requests with Errors

To remove requests with a status of ERROR from the Services Queue, use the CTX_SVC.CLEAR_ERROR procedure.

For example:

```
execute ctx_svc.clear_error(3321)
```

In this example, a request with handle 3321 is removed from the Services Queue.

If a value of 0 (zero) is specified for the handle, all requests with a status of ERROR are removed from the queue. If a request has a status of PENDING, RUNNING, or SUCCESS, it cannot be removed from the queue using CLEAR_ERROR.

Specifying Completion and Error Procedures

To specify a procedure to be called when a linguistic request completes or errors, use the SET_COMPLETION_CALLBACK and SET_ERROR_CALLBACK procedures in CTX_LING. ConText invokes the procedure defined by SET_COMPLETION_CALLBACK after it processes a linguistic request; ConText invokes the procedure defined by SET_ERROR_CALLBACK when it encounters an error.

The following is an example of how to define and use a completion callback procedure. This example is taken from genling.sql in the *ctxling* demonstration provided with the ConText installation.

For every linguistic request processed, *ling_comp_callback* keeps track of the number articles processed by decrementing *num_docs*, previously defined as the number of articles in the table. The procedure also keeps track of any errors by incrementing *num_errors*.

```
create or replace procedure LING_COMP_CALLBACK
     p_handle in number,
     p_status in varchar2,
     p_errors in varchar2
   ) IS
     l_total number;
     l_pk    varchar2(64);
BEGIN

 -- decrement the count in the tracking table

 update ling_tracking set num_docs = num_docs - 1;

 -- if the request errored, mark the errors in the pending table

 IF (p_status = 'ERROR') then
     update ling_tracking set num_errros = num_errors + 1;
 end IF;
 commit;

END;
/
```

The following code is an anonymous PL/SQL block that sets the linguistic completion callback procedure to *ling_comp_callback* and then generates CTX_LING output for every document in the *articles* table:

```
declare
  cursor c1 is select article_id
                    from articles;
  l_handle number;

begin

-- set the completion callback procdure to keep the pending table
-- in sync with the number of documents processed (completed requests)
-- and the number of errored requests.

   ctx_ling.set_completion_callback('LING_COMP_CALLBACK');
end;

-- loop through all articles in the article table, requesting themes
-- and gists
--

for crec in c1 loop

ctx_ling.request_themes('DEMO_POLICY', crec.article_id, 'ARTICLE_THEMES');
ctx_ling.request_gist('DEMO_POLICY', crec.article_id, 'ARTICLE_GISTS');
l_handle := ctx_ling.submit;

end loop;

end;
```

Logging Parse Information

At start-up of a ConText server, the logging of linguistic parse information is disabled by default.

To enable logging of the parse information generated by ConText linguistics during a session, use the CTX_LING.SET_LOG_PARSE procedure.

For example:

```
execute ctx_ling.set_log_parse('TRUE')
```

Once you enable parse logging for a session, it is active until you explicitly disable it during the session. You can use the CTX_LING.GET_LOG_PARSE function to know whether parse logging is enabled or disabled for the session.

Attention: Parse logging is a useful feature if you are having difficulty generating CTX_LING output and you want to monitor how ConText is parsing your documents; however, parse logging may affect performance *considerably*. As such, you should *only* enable parse logging if you encounter problems with generating CTX_LING output.

9

SQL Functions

This chapter contains details for using the ConText SQL functions in SELECT statements to perform one-step queries.

The following topics are covered in this chapter:

- Query Functions
- SELECT Statement

Query Functions

In addition to the functions in the PL/SQL packages, ConText provides the following functions for performing one-step queries in SQL*Plus:

Name	Description
CONTAINS	Specifies the query expression and SCORE label for a one-step query.
SCORE	Returns the score generated by CONTAINS.

Prerequisites

Before one-step queries can be executed, the database in which the text resides must be text enabled by setting the ConText initialization parameter TEXT_ENABLE = TRUE. This can be done in two ways:

- setting it in the init*sid*.ora system initialization file
- using the ALTER SESSION command

See Also: For more information about initialization parameters and the initsid.ora file, see *Oracle8 Administrator's Guide.*

For more information about using the ALTER SESSION command, see *Oracle8 SQL Reference.*

CONTAINS

Use the CONTAINS function in the WHERE clause of a SELECT statement to specify the query expression for a one-step query. You can also define a numeric label for the scores generated by the function so that the SCORE function can be used in other clauses of the SELECT statement.

Syntax

```
CONTAINS(
        column_id       NUMBER,
        text_query      VARCHAR2,
        label           NUMBER,
        pol_hint        VARCHAR2)
```

column_id
Specify the text column to be searched in the table.

text_query
Specify the query expression for the text or theme to search for in *column_id*.

> **See Also:** For more information about how to write query expressions, see Chapter 3, "Understanding Query Expressions".

label
Specify the label that identifies the score generated by the CONTAINS function (required only if CONTAINS called more than once in a query).

pol_hint
Specify which policy to use for text columns that have multiple policies.

Example

See the SELECT statement syntax in this chapter.

Notes

Each CONTAINS function in a query produces a separate set of score values. When there are multiple CONTAINS functions, each CONTAINS function must have a *label* specified.

If only one CONTAINS function is used in a SELECT statement, the *label* parameter is not required in the CONTAINS function; however, a SCORE label value of zero (0) is automatically generated. When the SCORE function is call (e.g. in a SELECT clause), the function must reference the label value.

The CONTAINS function may only be used in the WHERE clause of a SELECT statement; it may not be issued in the WHERE clause of an UPDATE, INSERT or DELETE statement.

In order to specify *pol_hint*, you must specify *label* as a place holder. *pol_hint* must name a policy that is indexed either by text or theme. Do not specify *user.policy_name* notation for *pol_hint*; specify only policy name, otherwise ConText will raise an error. You cannot specify bind variables for *pol_hint*.

When you do not specify *pol_hint* and *column_id* has more than one indexed policy attached to it, ConText uses the policy whose name is lexicographically first. For example, if a text column had policies named POL1 and POL2 associated with it and you did not specify *pol_hint*, ConText uses POL1.

Suggestion: Oracle Corporation does not recommend relying on ConText to select a policy when you perform queries on columns with multiple policies. In this situation, always specify a policy name in *pol_hint*.

SCORE

The SCORE function returns the score values produced by the CONTAINS function in a one-step query.

Syntax

```
SCORE(label NUMBER)
```

label
Identifies the scores produced by a query.

Notes

The SCORE function may be used in any of these clauses: SELECT, ORDER BY, or GROUP BY.

The value specified for LABEL is the same value defined by the LABEL argument in the CONTAINS function that generated the scores and is referenced by the SCORE function in all other clauses.

If only one CONTAINS function is used in a SELECT statement, the LABEL parameter is not required in the CONTAINS clause, but a SCORE label value of zero (0) will be generated. All other clauses must then refer to SCORE(0) or SCORE(*).

Example

```
SELECT SCORE(10), title FROM documents
WHERE CONTAINS(text, 'dog', 10) > 0
ORDER BY SCORE(10);
```

This example returns the score and title of all articles (documents) in the DOCUMENTS.TEXT column that contain the word dog, sorted by score.

SELECT Statement

You perform one-step queries in SQL*Plus using the SELECT statement. The following syntax illustrates how the CONTAINS and SCORE query functions can be used in a SELECT statement.

Syntax

```
SELECT SCORE(label1), SCORE(label2), ...SCORE(labeln),
column1, column2, ... columnn
FROM table[@dblink]
WHERE CONTAINS (column_id, 'text_query', label1, polhint1) > 0
CONTAINS (column_id, 'text_query', label2, polhint2) > 0
CONTAINS (column_id, 'text_query', labeln, polhintn) > 0
ORDER BY SCORE(labeln)
```

label$_x$

Specify the numeric label that identifies the specific CONTAINS function that generated the score (required only when CONTAINS is called more than once in a query).

column$_n$

Specify the columns to be returned by the query. Each CONTAINS clause produces a virtual SCORE column that can be referenced by its numeric label (*label$_x$*) and included in the query output.

table

Specify the name of the table that contains the text column to be searched.

Note: If a database link has been created for a remote database, the table specified in a one-step query can reside in the remote database. The table name must include the database link (*@dblink*) to access the remote table.

For more information about database links and remote queries, see *Oracle8 Concepts*.

---

column_id

Specify the name of the text column.

text_query

Specify the query expression to be used to return the relevant text.

pol_hint$_x$

Specify the policy to be used when *column_id* has multiple policies.

Notes

The CONTAINS function must always be followed by the > 0 syntax which specifies that the score value calculated by the CONTAINS function must be greater than zero for the row to be selected.

> **Note:** Other comparison operators and other numeric values can be used to satisfy this requirement and select rows with specific SCORE values; however, this method of refining the selection criteria is significantly less efficient than using the threshold and weight query expression operators.

The following example returns the names of all employees who have listed trumpet in their resume or who have been in an orchestra, sorted by the value of the score for the first CONTAINS (trumpet) and the second CONTAINS (orchestra).

```
SELECT employee_name, SCORE(10), SCORE(20)
FROM employee_database
WHERE CONTAINS (emp.resume, 'trumpet', 10) > 0 OR
CONTAINS (emp.history, 'orchestra', 20) > 0
ORDER BY NVL(SCORE(10),0), NVL(SCORE(20),0);
```

10

PL/SQL Packages

This chapter describes the ConText Option PL/SQL packages you use to develop applications. The following topics are described in this chapter are:

Developing with ConText PL/SQL Packages

Before you can develop your own PL/SQL stored procedures and triggers that call the procedures in the ConText packages described in this chapter, your ConText administrator must explicitly grant EXECUTE privileges to you for each ConText PL/SQL package you use.

> **See Also:** For more information about granting execute privileges, see *Oracle8 ConText Cartridge Administrator's Guide*.
>
> For more information about creating and invoking PL/SQL packages, see *Oracle8 Application Developer's Guide*.

CTX_QUERY: Query and Highlighting

The CTX_QUERY package contains stored procedures and functions that enable processing of two-step queries and highlighting for documents returned by queries.

The package includes the following procedures and functions:

Name	Description
CLOSE_CON	Closes the in-memory query cursor.
CONTAINS	Selects documents in the text column for a policy and writes the results to a specified result table.
COUNT_HITS	Performs a query and returns the number of hits without returning a hitlist.
COUNT_LAST	Returns the number of hits retrieved in the last call to CONTAINS or OPEN_CON.
FEEDBACK	Generates query expression feedback information.
FETCH_HIT	Retrieves hits stored in query buffer by OPEN_CON.
GETTAB	Gets tables from the result table pool.
HIGHLIGHT	Provides filtering and/or highlighting for documents returned by a query.
OPEN_CON	Opens a cursor and executes an in-memory query.
PKDECODE	Decodes a composite textkey string (value).
PKENCODE	Encodes a composite textkey string (value).
PURGE_SQE	Deletes all SQEs from SQE tables.
REFRESH_SQE	Re-executes an SQE and updates the results stored in the SQE tables.
RELTAB	Releases tables allocated by GETTAB.
REMOVE_SQE	Removes a specified SQE from the SQL tables.
STORE_SQE	Executes a query and stores the results in stored query expression tables.

CLOSE_CON

The CTX_QUERY.CLOSE_CON procedure closes a cursor opened by CTX_QUERY.OPEN_CON. The CLOSE_CON procedure is used in in-memory queries and called after CTX_QUERY.FETCH_HIT, which retrieves the desired number of hits.

Syntax

```
CTX_QUERY.CLOSE_CON(curid NUMBER);
```

curid
Specify the cursor to be closed.

Examples

See CTX_QUERY.FETCH_HIT.

CONTAINS

The CTX_QUERY.CONTAINS procedure selects documents from a text column that match the specified search criteria, generates scores for each document, and writes the results to a specified hitlist result table.

Syntax

```
CTX_QUERY.CONTAINS(
         policy_name[@dblink]  IN VARCHAR2,
         text_query            IN VARCHAR2,
         restab                IN VARCHAR2,
         sharelevel            IN NUMBER   DEFAULT 0,
         query_id              IN NUMBER,
         cursor_id             IN NUMBER,
         parallel              IN NUMBER,
         struct_query          IN VARCHAR2);
```

policy_name

Specify the policy that identifies the text column to be searched.

If a database link to a remote database has been created, the database link can be specified as part of the policy name (using the syntax shown) to reference a policy in the remote database.

text_query

Specify the query expression to be used as criteria for selecting rows.

> **See Also:** For more information about how to write query expressions, see Chapter 3, "Understanding Query Expressions".

restab

Specify the name of the hitlist table that stores intermediate results returned by CONTAINS.

sharelevel

Specify whether the results table is shared by multiple CONTAINS. Specify 0 for exclusive use and 1 for shared use. This parameter defaults to 0 (single-use).

When you specify 0, the system automatically truncates the result table before the query. In this case, *conid* is set to NULL and *query_id* is ignored.

When you specify 1 for multiple use, you must give a *query_id* to distinguish the results in the shared result table. Because the system does not truncate shared result tables, you must get rid of results from a previous CONTAINS by deleting from the result table where *conid* = *query_id* before you issue the query.

query_id
Specify the ID used to identify query results returned by a CONTAINS procedure when more than one CONTAINS uses the same result table (*sharelevel* = 1).

cursor_id
Not currently used.

parallel
Specify the number of ConText servers (with the Query personality) which execute a query and write the results to *restab*.

struct_query
Specify the structured WHERE condition related to *text_query*. This WHERE condition can include a subquery that selects rows from a structured data column in another table.

Examples

```
exec ctx_query.contains('my_pol', 'cat|dog','CTX_TEMP', 1, 10)

exec ctx_query.contains('my_pol@db1', 'oracle','CTX_DB1_TEMP')
```

In the first example, the results of the query for the term *cat* or *dog* are stored in the *ctx_temp* result table. The result table is shared because *sharelevel* is specified as 1. The results in *ctx_temp* are identified by *query_id* of 10.

In the second example, *my_pol* exists in a remote database that has a database link named DB1. The result table, *ctx_db1_temp* exists in the same remote database.

Notes

The *parallel* parameter does *not* support the max (:) and first/next (#) query expression operators. When you specify either operator in the query expression, the query is processed by a single ConText server, regardless of the specified *parallel* level.

sharelevel determines whether the hitlist result table is shared by multiple CONTAINS procedures.

If the result table (*restab*) is used to hold the results of multiple CONTAINS, a *sharelevel* must be specified by each CONTAINS so that the results of previous CONTAINS are not truncated.

If a query is performed on a policy in a remote database, the result table specified by *restab* must exist in the remote database.

In *struct_query*, you can use any predicate, value expression or subquery except USERENV function, CONTAINS function, SCORE function, DISPLAY function and the ROWNUM pseudo column.

If the user who includes a structured query in a two-step query is not the owner of the table containing the structured and text columns, the user must have SELECT privilege with GRANT OPTION on the table. In addition, if the object being queried is a view, the user must have SELECT privilege with GRANT OPTION on the base table for the view.

> **See Also:** For more information about SELECT privilege with GRANT OPTION, see *Oracle8 SQL Reference.*

COUNT_HITS

The CTX_QUERY.COUNT_HITS function executes a query for a policy and returns the number of hits for the query. It does *not* populate a result table with query results.

COUNT_HITS can be called in two modes, estimate and exact. The results in estimate mode may be inaccurate; however, the results are generally returned faster than in exact mode.

Syntax

```
CTX_QUERY.COUNT_HITS(
                policy_name[@dblink]  IN VARCHAR2,
                text_query            IN VARCHAR2,
                struct_query          IN VARCHAR2,
                exact                 IN BOOLEAN DEFAULT FALSE)
RETURN NUMBER;
```

policy_name[@dblink]
Specify the name of the policy that defines the column to be searched.

If a database link to a remote database has been created, the database link can be specified as part of the policy name (using the syntax shown) to reference a policy in the remote database.

text_query
Specify the query expression to be used as criteria for counting returned hits (rows)

struct_query
Specify the structured where condition related to *text_query*.

exact
Specify TRUE to obtain an exact count of the documents in the hitlist. Specify FALSE to obtain an estimate count. The result returned when you request an estimate count includes hits for documents that have been deleted or updated. The default is FALSE.

Returns

NUMBER that represents the number of hits.

Examples

```
declare count number;
begin
 count := ctx_query.count_hits(my_pol, 'dog|cat', TRUE);
 dbms_output.put_line('No. of Docs with dog or cat:');
 dbms_output.put_line(count);
end;
```

Notes

Counting query hits can be performed in two modes: estimate and exact. The modes are based on the method ConText uses to record deleted documents in a text index.

In exact mode, hits are returned *only* for those documents that satisfy the conditions of the query expression and are currently in the text column of the table.

In estimate mode, hits may be included for documents that satisfy the query condition, but have been deleted from the text column or have been updated so that they no longer satisfy the query expression. This can occur when the text index for the column has not been optimized and the internal document IDs are still present in the index.

In general, the inaccuracy of the results returned by COUNT_HITS in estimate mode is proportional to the amount of DML that has been performed on a text column.

Note: If the index being queried has been optimized and no further DML has been performed on the text column, estimate mode will return accurate results.

See Also: For more information about text indexing, DML, and optimization, see *Oracle8 ConText Cartridge Administrator's Guide.*

COUNT_LAST

Use the CTX_QUERY.COUNT_LAST function to obtain the number of hits after executing CONTAINS in a two-step query or OPEN_CON in an in-memory query. The alternative method of obtaining the number of hits is to run the query once to get the row count using CTX_QUERY.COUNT_HITS and then run the query again to get the query results.

Syntax

```
CTX_QUERY.COUNT_LAST        RETURN NUMBER;
```

Returns

The number of hits obtained from the last call to CTX_QUERY.CONTAINS or CTX_QUERY.OPEN_CON.

Examples

In-memory Query

```
declare
    curid number;
    count number;
begin
    curid := ctx_query.open_con('mypol', 'me', score_sorted=>true);
    count := ctx_query.count_last ;
end
```

Two-step Query

```
declare
    count number;
begin
    ctx_query.contains('mypol', 'dog', 'ctx_temp');
    count := ctx_query.count_last ;
end
```

Notes

With two-step queries, COUNT_LAST always returns an exact count.

With in-memory queries, COUNT_LAST returns an exact count except when you include a structured condition, in which case it returns an estimate. This is because COUNT_LAST ignores the structured condition, specified in the *struct_query* parameter of OPEN_CON, when computing number of hits in an in-memory query.

For two-step queries, the COUNT_LAST function is not meant to replace calling COUNT_HITS, which is always faster than running the query. However, in the case where you want to process all hits in a two-step query, issuing the query with CONTAINS and then calling COUNT_LAST is more efficient than calling COUNT_HITS and then calling CONTAINS.

With in-memory queries, issuing OPEN_CON and then calling COUNT_LAST is always a more efficient way to obtain an estimate of the query hits over calling COUNT_HITS and then calling OPEN_CON, since COUNT_LAST returns a number faster than COUNT_HITS.

FEEDBACK

Use CTX_QUERY.FEEDBACK to generate feedback information for query expressions. This procedure creates a graphical representation of the ConText parse tree and stores the information in a feedback table.

Syntax

```
CTX_QUERY.FEEEDBACK(
          policy_name     IN VARCHAR2,
          text_query      IN VARCHAR2,
          feedback_table  IN VARCHAR2,
          sharelevel      IN NUMBER DEFAULT 0,
          feedback_id     IN VARCHAR2 DEFAULT NULL);
```

policy_name

Specify the policy that identifies the text column to be queried.

text_query

Specify the query expression to be used as criteria for selecting rows.

feedback_table

Specify the name of the feedback table to store representation of the ConText parse tree for *text_query*.

sharelevel

Specify whether *feedback_table* is shared by multiple FEEDBACK calls. Specify 0 for exclusive use and 1 for shared use. This parameter defaults to 0 (single-use).

When you specify 0, the system automatically truncates the feedback table before the next call to FEEDBACK.

When you specify 1 for shared use, Context does not truncate the feedback table. Only results with the same *feedback_id* are updated. When no results with the same *feedback_id* exist, then new results are added to the feedback table.

feedback_id

Specify a name that identifies the feedback results returned by a FEEDBACK procedure when more than one FEEDBACK call uses the same shared feedback table. This parameter defaults to NULL.

Notes

The user must have at least INSERT and DELETE privileges on the feedback table. You must have at least CTXUSER role to call FEEDBACK.

When you include a wildcard, fuzzy, or soundex operator in *text_query*, ConText looks at the index tables to determine the expansion.

When you include the SQE operator in *text_query*, the expression feedback (expansion of the SQE expression) is based on the current state of the index and will take into account any inserts, updates, or deletes made to the base table; however, unlike a call to CONTAINS, the SQE is *not* updated or refreshed as a result of the call to FEEDBACK.

Wildcard, fuzzy (?), and soundex (!) expression feedback does not account for lazy deletes.

You cannot use FEEDBACK with remote queries.

To use the FEEDBACK procedure, you must have at least one Q server running.

> **See Also:** For more information on using the FEEDBACK procedure, see Chapter 5, "Query Expression Feedback".

FETCH_HIT

The CTX_QUERY.FETCH_HIT function returns a hit stored in the query buffer created by CTX_QUERY.OPEN_CON. You must call FETCH_HIT once for each hit in the buffer until the desired number of hits is returned or the buffer is empty.

Syntax

```
CTX_QUERY.FETCH_HIT(
          curid     IN  NUMBER,
          pk        OUT VARCHAR2,
          score     OUT NUMBER,
          col1      OUT VARCHAR2,
          col2      OUT VARCHAR2,
          col3      OUT VARCHAR2,
          col4      OUT VARCHAR2,
          col5      OUT VARCAHR2);
```

curid
Specify the cursor opened by CTX_QUERY.OPEN_CON.

pk
Returns the primary key of the document. When the primary key is a composite textkey, PK is returned as encoded string. In this situation, use CTX_QUERY.PKDECODE to access an individual textkey column.

score
Returns the score of the document.

col1-5
Returns additional columns for the document.

Returns

NUMBER that indicates whether hit was retrieved: 0 if no hits fetched, 1 if hit was fetched.

Example

```
declare
  score  char(5);
  pk     char(5);
  curid  number;
  title  char(256);
begin
  dbms_output.enable(100000);
     curid := ctx_query.open_con(
                       policy_name  =>  'MY_POL',
                       text_query   =>  'dog',
                       score_sorted =>  true,
                       other_cols   =>  'title');
  while (ctx_query.fetch_hit(curid, pk, score, title)>0)
  loop
      dbms_output.put_line(score||pk||substr(title,1,50));
    end loop;
  ctx_query.close_con(curid);

end;
```

Notes

If the primary key PK is a composite textkey, use CTX_QUERY.PKDECODE to access the individual columns of the textkey.

GETTAB

CTX_QUERY.GETTAB procedure allocates result tables from the result table pool to be used to store results from CTX_QUERY.HIGHLIGHT or CTX_QUERY.CONTAINS.

If no result table of the specified type exists, GETTAB creates a new table.

Syntax

```
CTX_QUERY.GETTAB(
          type          IN  VARCHAR2,
          tab           OUT VARCHAR2,
          tk_count      IN  NUMBER  DEFAULT 1);
```

type

Specify the type of table to be allocated for text processing. This parameter must be fully qualified with the PL/SQL package name (CTX_QUERY). The type of table you specify can be one of the following:

Table Type	Description	Stores Results For
DOCTAB	Result table which is used to store the marked-up text (MUTAB) or plain ASCII text (PLAINTAB) returned by CTX_QUERY.HIGHLIGHT	MUTAB or PLAINTAB
RDOCTAB	Result table which is used to store the non-filtered documents (NOFILTAB) or ICF output (ICFTAB) returned by CTX_QUERY.HIGHLIGHT	NOFILTAB or ICFTAB
HIGHTAB	Result table which is used to store the textkey, offsets, and lengths of query terms to be highlighted in documents (returned by CTX_QUERY.HIGHLIGHT)	HIGHTAB
HITTAB	Result table which is used to store the hitlist data returned by CTX_QUERY.CONTAINS	Hitlist Result Table.

See Also: For more information about the structure of result tables, see Appendix A, "Result Tables".

For more information about using HIGHLIGHT, see Chapter 6, "Document Presentation: Highlighting".

tab

Returns the name of the allocated table.

tk_count

Specify the number of textkeys in the allocated result table. This parameter applies only to HITTAB tables. The *tk_count* parameter defaults to 1.

Examples

```
set serveroutput on
 declare
   mytab varchar2(32) ;
begin
   ctx_query.gettab(CTX_QUERY.HITTAB, mytab, 3) ;
   dbms_output.put_line('table : '||mytab) ;
 end ;
```

This example returns a HITTAB result table that has a three-column composite textkey. The name of the table is then output.

The schema for the returned table is: TEXTKEY, TEXTKEY2, TEXTKEY3, SCORE, CONID.

Notes

The *tk_count* parameter applies only to HITTAB tables; it has no effect on other table types.

HIGHLIGHT

THE CTX_QUERY.HIGHLIGHT procedure takes a query specification and a document textkey and returns information that you can use to display the document with or without the query terms highlighted. This procedure is usually used after a query, from which you identify the document to be processed.

Syntax

```
CTX_QUERY.HIGHLIGHT(
          cspec       IN VARCHAR2,
          textkey     IN VARCHAR2,
          query       IN VARCHAR2 DEFAULT NULL,
          id          IN NUMBER   DEFAULT NULL,
          nofilttab   IN VARCHAR2 DEFAULT NULL,
          plaintab    IN VARCHAR2 DEFAULT NULL,
          hightab     IN VARCHAR2 DEFAULT NULL,
          icftab      IN VARCHAR2 DEFAULT NULL,
          mutab       IN VARCHAR2 DEFAULT NULL,
          starttag    IN VARCHAR2 DEFAULT NULL,
          endtag      IN VARCHAR2 DEFAULT NULL);
```

cspec

Specify the policy name for the column in which the document is stored.

textkey

Specify the unique identifier (usually the primary key) for the document.

The *textkey* parameter can be a single column textkey or an encoded specification for a composite (multiple column) textkey.

query

Specify the original query expression used to retrieve the document. If NULL, no highlights are generated.

If *query* includes wildcards, stemming, fuzzy matching which result in stopwords being returned, HIGHLIGHT does not highlight the stopwords.

If *query* contains a result set operator (threshold, max, or first/next), the operator is ignored. The HIGHLIGHT procedure always returns highlight information for the entire result set.

id

Specify the identifier to be used in the results tables to identify the rows that were returned by this procedure call. If NULL, the result tables are truncated.

nofilttab

Specify name of the RDOCTAB table where unfiltered document is stored. If NULL, the unfiltered version is not returned.

plaintab

Specify the name of the DOCTAB table where plain text version of document is stored. If NULL, the plain text is not returned.

hightab

Specify the name of the HIGHTAB table where highlight information for the document is stored. If NULL, the highlight information is not returned.

icftab

Used internally by the Windows 32-bit viewer to specify where the ICF output required for WYSIWYG viewing of documents is stored. If NULL, the ICF is not returned.

mutab

Specify table where marked-up, plain text version of document is stored. If NULL, marked-up version is not returned.

starttag

Specify the markup to be inserted by HIGHLIGHT for indicating the start of a highlighted term.

The default for ASCII and formatted documents is'<<<'.

The default for HTML documents filtered using an external filter is'<<<'.

The default for HTML documents filtered using the internal HTML filter is the HTML tag used to indicate the beginning of a font change (i.e. <FONT =...>).

endtag

Specify the markup to be inserted by HIGHLIGHT for indicating the end of a highlighted term.

The default for ASCII and formatted documents is'>>>'.

The default for HTML documents filtered using an external filter is'>>>'.

The default for HTML documents filtered using the internal HTML filter is the HTML tag used to indicate the end of a font change (i.e. </FONT>).

Examples

```
begin
  ctx_query.highlight(cspec => '2354',
                      textkey => '23',
                      query => 'dog|cat',
                      nofiltab => 'FORMATTED_TEXT',
                      hightab => 'HIGHLIGHTED_TEXT',
                      starttag => '<**<',
                      endtag => '>**>');
end;
```

Notes

Before CTX_QUERY.HIGHLIGHT is called, the highlight/display result tables (NOFILTAB, PLAINTAB, HIGHTAB, MUTAB, and ICFTAB) for the desired output must be created, either manually or using the PL/SQL procedure CTX_ QUERY.GETTAB.

If the *query* argument is not specified or is set to NULL, highlighting is not generated.

If *query* includes wildcards, stemming, fuzzy matching which result in stopwords being returned, HIGHLIGHT does not highlight the stopwords.

If the query expression *query* contains a result set operator (threshold, max, or first/next), the operator is ignored. Highlight always returns highlight information for the entire result set.

When *textkey* is a composite textkey, you must encode the composite textkey string using the CTX_QUERY.PKENCODE procedure.

If any of the table name parameters are omitted or set to NULL, the respective table is not populated.

If the *id* argument is not specified or if *id* is set to NULL, each specified table has all its rows deleted and the session-id is used as the ID for all inserted rows. If an *id* is specified, all rows with the same *id* are deleted from the respective tables before new rows are generated with that *id* by the HIGHLIGHT procedure.

For HTML documents filtered through the internal HTML filter, the plain text output generated for MUTAB retains the HTML tags from the original document.

For HTML documents filtered through an external filter, HIGHLIGHT removes all the HTML tags and stores only the plain (ASCII) marked-up text for the document in MUTAB.

> **See Also:** For more information about internal and external filters, see *Oracle8 ConText Cartridge Administrator's Guide.*
>
> For more information about the structure of result tables, see Appendix A, "Result Tables".

OPEN_CON

The CTX_QUERY.OPEN_CON function opens a cursor to a query buffer and executes a query using the specified query expression. The results of the query are stored in the buffer and retrieved using CTX_QUERY.FETCH_HIT.

Syntax

```
CTX_QUERY.OPEN_CON(
               policy_name[@dblink]    IN VARCHAR2,
               text_query              IN VARCHAR2,
               score_sorted            IN BOOLEAN DEFAULT FALSE,
               other_cols              IN VARCHAR2,
               struct_query            IN VARCHAR2)
RETURN NUMBER;
```

policy_name[@dblink]
Specify the name of the policy that defines the column to be searched.

If a database link to a remote database has been created, the database link can be specified as part of the policy name (using the syntax shown) to reference a policy in the remote database.

text_query
Specify the query expression to be used as criteria for selecting rows.

score_sorted
Specify whether the results are sorted by score.

The default is FALSE.

other_cols
Specify a comma separated list of the table columns (up to 5) to be displayed, in addition to document ID and score, in the hitlist.

struct_query
Specify the structured WHERE condition related to *text_query*. This WHERE condition can include a subquery that selects rows from a structured data column in another table.

Returns

Cursor ID.

Examples

```
declare
    cid number;
begin
    cid := ctx_query.open_con('MYPOL', 'dog', score_sorted =>true, struct_query
    => 'id < 900');
end;
```

In this example, the structured condition specifies that ConText must return the documents that contain *dog* and where the document id is greater than 900.

See Also: CTX_QUERY.FETCH_HIT.

PKDECODE

The CTX_QUERY.PKDECODE function extracts and returns a composite textkey element from a composite textkey string.

This function is useful for in-memory queries when querying against a composite textkey table. Use PKDECODE to extract textkey columns from the primary key returned by CTX_QUERY.FETCH_HIT.

Syntax

```
CTX_QUERY.PKDECODE(
                 encoded_tk  IN VARCHAR2,
                 which       IN NUMBER)
RETURN VARCHAR2;
```

encoded_tk
Specify the encoded composite textkey string

which
Specify the ordinal position of which primary key to extract from *encoded_tk*. When *which* is 0 or a number greater than the number of textkeys in *encoded_tk*, *encoded_tk* is returned.

Returns

String that represents the decoded value of the composite textkey.

Examples

```
declare pkey varchar2(64);
begin
pkey := ctx_query.pkdecode('p1,p2,p3', 2)
pkey := ctx_query.pkdecode('p1,p2,p3', 0)
pkey := ctx_query.pkdecode('p1,p2,p3', 5)
end;
```

In this example, the value for the textkey is *p1,p2,p3*. The first call to PKDECODE returns the value *p2*. The second and third calls to PKDECODE specify ordinal positions that don't exist, thus these calls return the same value, which is the concatenated value *p1,p2,p3*.

PKENCODE

The CTX_QUERY.PKENCODE function converts a composite textkey list into a single string and returns the string.

The string created by PKENCODE can be used as the primary key parameter PK in other ConText procedures, such as CTX_LING.REQUEST_GIST.

Syntax

```
CTX_QUERY.PKENCODE(
         pk1    IN VARCHAR2,
         pk2    IN VARCHAR2,
         pk4    IN VARCHAR2,
         pk5    IN VARCHAR2,
         pk6    IN VARCHAR2,
         pk7    IN VARCHAR2,
         pk8    IN VARCHAR2,
         pk9    IN VARCHAR2,
         pk10   IN VARCHAR2,
         pk11   IN VARCHAR2,
         pk12   IN VARCHAR2,
         pk13   IN VARCHAR2,
         pk14   IN VARCHAR2,
         pk15   IN VARCHAR2,
         pk16   IN VARCHAR2)
RETURN VARCHAR2;
```

pk1-pk16
Each PK argument specifies a column element in the composite textkey list. You can encode at most 16 column elements.

Returns

String that represents the encoded value of the composite textkey.

Examples

```
exec ctx_ling.request_gist('my_policy',CTX_QUERY.PKENCODE('pk1-date', 'pk2-data'), 'theme table')
```

In this example, *pk1-date* and *pk2-data* constitute the composite textkey value for the document.

PURGE_SQE

The CTX_QUERY.PURGE_SQE procedure removes all session stored query expressions for the current session. Session SQEs in other sessions are not affected by PURGE_SQE.

Syntax

```
CTX_QUERY.PURGE_SQE(policy_name   IN VARCHAR2);
```

policy_name

Specify the name of the policy for which the current session SQEs are purged.

Examples

```
exec ctx_query.purge_sqe(my_pol)
```

REFRESH_SQE

The CTX_QUERY.REFRESH_SQE procedure re-executes a stored query expression and stores the results in the SQR table, overwriting existing results.

> **See Also:** For more information about the structure of the SQR table, see *Oracle8 ConText Cartridge Administrator's Guide.*

Syntax

```
CTX_QUERY.REFRESH_SQE(
                 policy_name  IN VARCHAR2,
                 query_name   IN VARCHAR2);
```

policy_name
Specify the policy for the stored query expression.

query_name
Specify the name of the stored query expression to be refreshed.

Examples

```
exec ctx_query.refresh_sqe('my_pol', 'DOG')
```

RELTAB

The CTX_QUERY.RELTAB procedure releases a table previously allocated by CTX_QUERY.GETTAB.

Syntax

```
CTX_QUERY.RELTAB(tab  IN VARCHAR2);
```

tab
Specify the name of table to be released, previously assigned by CTX_QUERY.GETTAB.

Examples

```
set serveroutput on
 declare
   mytab varchar2(32) ;
begin
   ctx_query.gettab(CTX_QUERY.HITTAB, mytab, 3) ;
   dbms_output.put_line('table : '||mytab) ;

   ....

   ctx_query.reltab(mytab);
end ;
```

This PL/SQL example allocates a HITTAB result table with GETTAB, then releases it with RELTAB.

REMOVE_SQE

The CTX_QUERY.REMOVE_SQE procedure removes a specified stored query expression from the system SQE table and the results of the SQE from the SQR table for the policy.

> **See Also:** For more information about the structure of the SQE and SQR tables, see *Oracle8 ConText Cartridge Administrator's Guide.*

Syntax

```
CTX_QUERY.REMOVE_SQE(
                 policy_name    IN VARCHAR2,
                 query_name     IN VARCHAR2);
```

policy_name
Specify the policy for the stored query expression.

query_name
Specify the name of the stored query expression to be removed.

Examples

```
exec ctx_query.remove_sqe('my_pol', 'DOG')
```

STORE_SQE

The CTX_QUERY.STORE_SQE procedure executes a query for a policy and stores the named SQE in the SQE table and results from the SQE in the SQR table for the policy.

> **See Also:** For more information about the structure of the SQE and SQR tables, see *Oracle8 ConText Cartridge Administrator's Guide.*

Syntax

```
CTX_QUERY.STORE_SQE(
            policy_name    IN VARCHAR2,
            query_name     IN VARCHAR2,
            text_query     IN VARCHAR2,
            scope          IN VARCHAR2);
```

policy_name
Specify the policy for the stored query expression.

query_name
Specify the name of the stored query expression to be created.

text_query
Specify the query expression.

scope
Specify whether the SQE is a *session* or *system*. When you specify *session*, the stored query expression exists only for the current session. When you specify *system*, the stored query expression can be used in all sessions including concurrent sessions. SQEs defined as *system* are not deleted when your session terminates.

Examples

```
exec ctx_query.store_sqe('my_pol', 'DOG', '$(dogs|puppy)','session')
```

Notes

SQEs support all of the ConText query expression operators, *except* for:

- max
- first/next

SQEs also support all of the special characters and other components that can be used in a query expression, including PL/SQL functions and other SQEs.

CTX_LING: Linguistics

CTX_LING is the package of PL/SQL procedures used to request linguistic output and to control how requests are submitted and processed by ConText servers with the Linguistics personality.

CTX_LING contains the following stored procedures and functions:

Name	Description
CANCEL	Cancels all cached theme and gist requests.
GET_COMPLETION_CALLBACK	Returns the completion callback procedure specified for the current session.
GET_ERROR_CALLBACK	Returns the error callback procedure specified for the current session.
GET_FULL_THEMES	Returns TRUE when theme hierarchy generation is enabled for the current session.
GET_LOG_PARSE	Returns TRUE when parse logging is enabled for current session.
GET_SETTINGS_LABEL	Returns the currently active setting configuration.
REQUEST_GIST	Requests gists for a document.
REQUEST_THEMES	Requests themes for a document.
SET_COMPLETION_CALLBACK	Specifies a procedure to be called when a request completes.
SET_ERROR_CALLBACK	Specifies a procedure to be called if an error is encountered by a request.
SET_FULL_THEMES	Enables/disables the writing of theme hierarchy information.
SET_LOG_PARSE	Enables/disables logging of parse information for the current session.
SET_SETTINGS_LABEL	Specifies a setting configuration for the current session.
SUBMIT	Submits all cached theme and gist requests to Services Queue.

CANCEL

The CTX_LING.CANCEL procedure cancels all pending linguistic requests cached in memory.

Syntax

```
CTX_LING.CANCEL ;
```

Examples

```
exec ctx_ling.cancel
```

Notes

Requests for themes and gists are cached in memory until CTX_LING.SUBMIT is called. CTX_LING.CANCEL only cancels these cached requests. After these requests have been submitted and placed in the Service Queue, CTX_LING.CANCEL has no effect.

To cancel requests that have already been submitted to the Services Queue, use CTX_SVC.CANCEL.

GET_COMPLETION_CALLBACK

The CTX_LING.GET_COMPLETION_CALLBACK function returns the name of the completion callback procedure for the current session (specified in CTX_LING.SET_COMPLETION_CALLBACK).

Syntax

```
CTX_LING.GET_COMPLETION_CALLBACK        RETURN VARCHAR2;
```

Returns

Completion callback procedure.

Examples

```
declare callback varchar2(60);
begin
  callback := get_completion_callback;
  dbms_output.put_line('Completion callback:');
  dbms_output.put_line(callback);
end;
```

Notes

To call procedures for both completed task processing as well as error processing, you must also identify the error completion processing routine with CTX_LING.SET_COMPLETION_CALLBACK.

If both completion and error callback procedures are defined, the completion callback routine is performed first, then the error callback routine.

The value assigned to VARCHAR2 in the declarative part of the PL/SQL block depends on the length of the name for the specified completion callback.

GET_ERROR_CALLBACK

The CTX_LING.GET_ERROR_CALLBACK function returns the name of the error callback procedure for the current session (specified in CTX_LING.SET_ERROR_CALLBACK).

Syntax

```
CTX_LING.GET_ERROR_CALLBACK     RETURN VARCHAR2;
```

Returns

Error callback procedure.

Examples

```
declare e_callback varchar2(60);
begin
   e_callback := ctx_ling.get_error_callback;
   dbms_output.put_line('Error callback:');
   dbms_output.put_line(e_callback);
end;
```

Notes

If both completion and error callback are set, the completion callback is performed first, then the error callback.

The value assigned to VARCHAR2 in the declarative part of the PL/SQL block depends on the length of the name for the specified completion callback.

GET_FULL_THEMES

This function returns TRUE if the generation of theme hierarchy information is enabled for the current session; otherwise it returns FALSE.

You enable the generation of theme hierarchy information with SET_FULL_THEMES. ConText writes theme hierarchy information to the THEME column of the theme table when you call REQUEST_THEMES.

Syntax

```
CTX_LING.GET_FULL_THEMES  RETURN BOOLEAN;
```

Returns

Returns TRUE if the generation of theme hierarchy information is enabled; otherwise returns FALSE.

GET_LOG_PARSE

The CTX_LING.GET_LOG_PARSE function returns a FALSE or TRUE string to indicate whether parse logging is enabled for the current database session (specified in CTX_LING.SET_LOG_PARSE).

Syntax

```
CTX_LING.GET_LOG_PARSE     RETURN BOOLEAN;
```

Returns

TRUE if parse logging is enabled, FALSE if parse logging is not enabled.

Examples

```
declare parse_logging boolean;
begin
   parse_logging := get_log_parse;
end;
```

GET_SETTINGS_LABEL

The CTX_LING.GET_SETTINGS_LABEL function returns the label for the setting configuration that is active for the current session (specified in CTX_LING.SET_SETTINGS_LABEL).

Syntax

```
CTX_LING.GET_SETTINGS_LABEL  RETURN VARCHAR2;
```

Returns

Current settings configuration label.

Examples

```
declare settings varchar2(60);
begin
   settings := get_settings_label;
   dbms_output.put_line('Current setting configuration:');
   dbms_output.put_line(settings);
end;
```

Notes

The value assigned to VARCHAR2 in the declarative part of the PL/SQL block depends on the character length of the label for the specified setting configuration. The maximum length of a setting configuration label is 80 characters.

REQUEST_GIST

Use the CTX_LING.REQUEST_GIST procedure to generate theme summaries and a Gist for a document. You can generate paragraph-level or sentence-level Gists and theme summaries.

By default, this procedure generates theme summaries for all the themes in a document (up to 50); however, you can specify a single theme for which a theme summary is to be generated.

Syntax

```
CTX_LING.REQUEST_GIST(
                policy   IN VARCHAR2,
                pk       IN VARCHAR2,
                table    IN VARCHAR2,
                glevel   IN VARCHAR2 DEFAULT 'PARAGRAPH',
                pov      IN VARCHAR2 DEFAULT NULL);
```

policy
Specify the name of the ConText policy on the column.

pk
Specify the primary key (textkey) of the document (row) to be processed. The parameter *pk* can be a single column textkey or an encoded specification for a multiple column textkey.

table
Specify the table used to store the gist output.

glevel
Specify the type of Gist/theme summary to produce. The possible values are:

- paragraph
- sentence

The default is *paragraph*.

pov

Specify the theme for which a single Gist or theme summary is generated. The type of Gist/theme summary generated (sentence-level or paragraph-level) depends on the value specified for *glevel*.

To generate a Gist for the document, specify a theme of 'GENERIC' for *pov*. To generate a theme summary for the document, specify the theme from the document for which the matching paragraphs/sentences are selected.

If you specify a NULL value for *pov*, ConText generates a Gist for the document and a theme summary for each of the document themes (up to 50).

Note: The *pov* parameter is case sensitive. To return a Gist for a document, specify 'GENERIC' in all uppercase. To return a theme summary, specify the theme *exactly* as it is generated for the document.

The themes generated by CTX_LING.REQUEST_THEMES can be used as input for *pov*.

Examples

```
exec ctx_ling.request_gist('my_pol', '34', 'ctx_gist')

begin
ctx_ling.request_gist('doc_pol',
   CTX_QUERY.PKENCODE('Jones','Naval Inst Pr','10-1-1970'),
   'CTX_GIST');
end;
```

Theme Summary Generation for a Single Theme

In the following example, a single, paragraph-level theme summary is generated for a document with a *pk* of *1442* stored in the text column for policy *my_pol*. The theme (*pov*) for which the theme summary is generated is *Oracle Corporation*:

```
exec ctx_ling.request_gist('my_pol','1442','ctx_gist',pov=>'Oracle Corporation')
```

Sentence-level Gist

In the following example, a sentence-level Gist is generated for document with a *pk* of *1442* stored in the text column for policy *my_pol*:

```
exec ctx_ling.request_gist('my_pol','1442','ctx_gist','sentence','GENERIC')
```

Notes

You must call the CTX_LING.REQUEST_GIST procedure once for each document for which you want to generate gists.

By default, ConText linguistics generates up to 50 themes for a document. If the user settings specify that gists are to be created for only the top 10 themes of the document, the REQUEST_GIST procedure creates a total of 11 gists: one gist for the specified number of themes and one generic gist for the entire document.

The REQUEST_GIST procedure only creates gists if the setting configuration for the session in which REQUEST_GIST is called supports gist generation.

The parameter *pk* can be either a single column textkey or a multiple column (composite) textkey. When *pk* is a composite textkey, you must encode the composite textkey string using the CTX_QUERY.PKENCODE procedure as in the second example above.

Requests are not automatically entered into the Services Queue; each request is cached in memory until the application calls the CTX_LING.SUBMIT procedure.

CTX_LING.SUBMIT explicitly enters all of the cached requests into the Services Queue as a single batch.

All of the linguistic settings that can be specified for Gist-generation also apply to sentence-level Gists/theme summaries when requested. The settings simply act on sentences rather than paragraphs.

For example, the *size* setting for Gists, which determines the maximum number of paragraphs in a paragraph-level Gist, determines the maximum number of sentences in a sentence-level Gist, when a sentence-level Gist is requested.

> **See Also:** For more information about the *size* setting, as well as the other settings that can be specified for Gists and theme summaries, see the help system provided with the ConText System Administration tool.

REQUEST_THEMES

The CTX_LING.REQUEST_THEMES procedure generates a list of up to fifty themes for a document.

By default, this procedure generates single theme information. To generate hierarchical theme information, you must first call CTX_LING.SET_FULL_THEMES.

Syntax

```
CTX_LING.REQUEST_THEMES(
                  policy       IN VARCHAR2,
                  pk           IN VARCHAR2,
                  table        IN VARCHAR2);
```

policy
Specify the name of the ConText policy for the column.

pk
Specify the primary key (textkey) of the document (row) to be processed. The parameter *pk* can be a single column textkey or an encoded specification for a multiple column textkey.

table
Specify the table used to store the theme output.

Examples

```
exec ctx_ling.request_themes('my_pol', 34, 'CTX_THEMES')

begin
ctx_ling.request_themes('doc_pol',
   CTX_QUERY.PKENCODE('Jones','Naval Inst Pr','10-1-1970'),
  'CTX_THEMES');
end;
```

Notes

You must call CTX_LING.REQUEST_THEMES procedure once for each document for which you want to generate themes.

The parameter *pk* can be either a single column textkey or a multiple column textkey. When *pk* is a composite key, you must encode the composite textkey string using the CTX_QUERY.PKENCODE procedure as in the second example above.

Requests for themes are not automatically entered into the Services Queue; each request is cached in memory pending submission by CTX_LING.SUBMIT.

CTX_LING.SUBMIT explicitly enters all of the cached requests into the Services Queue as a single batch.

SET_COMPLETION_CALLBACK

The CTX_LING.SET_COMPLETION_CALLBACK procedure specifies the user-defined PL/SQL processing routine (usually a procedure) to be called when a ConText server finishes processing a request in the Services Queue.

Syntax

```
CTX_LING.SET_COMPLETION_CALLBACK(callback_name IN VARCHAR2);
```

callback_name
Specify the name of the callback procedure. See below for a description of the arguments to the *callback_name* procedure.

Examples

```
exec ctx_ling.set_completion_callback('COMP_PROCEDURE')
```

Notes

A completion callback procedure must be defined before SET_COMPLETION_CALLBACK can be called. The completion callback procedure must accept the following arguments:

Argument	Type	Purpose
HANDLE	NUMBER	Specify the internal identifier for the request, as returned by SUBMIT.
STATUS	VARCHAR2	Specify the status of the request: SUCCESS or ERROR.
ERRCODE	VARCHAR2	Specify the code for the error (NULL if request processed successfully).

Control is passed to the SET_COMPLETION_CALLBACK procedure at the completion of a linguistic request. It can log errors or otherwise notify the application when a request has finished processing. This can be particularly useful for a large job that is run asynchronously in batch mode.

To call a procedure specifically for requests that terminate with errors, use CTX_LING. SET_ERROR_CALLBACK.

SET_ERROR_CALLBACK

The CTX_LING.SET_ERROR_CALLBACK procedure specifies the user-defined PL/SQL processing routine (usually a procedure) to be called when a ConText server encounters an error while processing a linguistic request.

Syntax

```
CTX_LING.SET_ERROR_CALLBACK(callback_name IN VARCHAR2);
```

callback_name
Specify the name of the callback procedure to be used when an error occurs.

Examples

```
exec ctx_ling.set_error_callback('ERROR_PROCEDURE')
```

Notes

An error callback procedure must be defined before SET_ERROR_CALLBACK can be called. The error callback procedure must accept the following arguments:

Argument	Type	Purpose
HANDLE	NUMBER	Specify the internal identifier for the request, as returned by SUBMIT
ERRCODE	VARCHAR2	Specify the code for the error.

Control is passed to the SET_ERROR_CALLBACK procedure at the completion of a linguistic request. The procedure can be used to log errors or otherwise notify the application when a request has finished processing. This can be particularly useful for a large job that is run asynchronously in batch mode.

To call a procedures for both completed task processing and error processing, use SET_COMPLETION_CALLBACK.

SET_FULL_THEMES

Use this procedure to enable the writing of theme hierarchy information to the theme table. ConText writes the theme hierarchy information when you call CTX_LING.REQUEST_THEMES. (By default, ConText writes only single theme information to the theme table when you call REQUEST_THEMES.)

Syntax

```
CTX_LING.SET_FULL_THEMES (theme_mode  IN BOOLEAN DEFAULT TRUE);
```

theme_mode
Specify TRUE for ConText to write theme hierarchy information to the THEME column of the theme table.

Specify FALSE to disable the writing of theme hierarchy information to the THEME column of the theme table.

Notes

At the start of a session, the *theme_mode* flag is FALSE.

Calling SET_FULL_THEMES without an argument is the same as calling this procedure with *theme_mode* set to TRUE.

You can check whether the writing of theme hierarchy information is turned on using GET_FULL_THEMES.

SET_LOG_PARSE

The CTX_LING.SET_LOG_PARSE procedure enables/disables logging of linguistic parsing information for a session.

Syntax

```
CTX_LING.SET_LOG_PARSE(log_mode BOOLEAN DEFAULT TRUE);
```

log_mode
Specify whether to write parse information to a log file during linguistic processing in a session. The default is TRUE.

Examples

```
exec ctx_ling.set_log_parse(TRUE)
```

Notes

At start-up of a ConText server, parse information logging is disabled.

Once logging is enabled, it stays enabled for the session until it is explicitly disabled.

When logging is enabled, the text of the document being parsed and the paragraph offset information used by ConText to separate the document into its constituent paragraphs is written to the log file specified when the ConText server is started.

The log provides information about the input text used to generate linguistic output and can be used for debugging the system. The parse information is especially useful for debugging linguistic output for formatted documents from which the text is extracted before it is processed.

However, due to the large amount of information generated by ConText and written to the log file, parse logging may affect performance considerably. For this reason, you should only enable parse logging if you encounter problems with linguistics.

SET_SETTINGS_LABEL

Use the CTX_LING.SET_SETTINGS_LABEL procedure to change the linguistic settings for a database session.

Syntax

```
CTX_LING.SET_SETTINGS_LABEL(settings_label  IN VARCHAR2);
```

settings_label

Specify the label for the setting configuration used for the session. You can use one of the following predefined settings or one that you create with the administration tool:

Label	Description
GENERIC	Use this configuration to analyze mixed-case English text to produce theme and Gist output. This configuration is the default.
SA	This configuration is identical to GENERIC, except it converts all-uppercase or all lower-case text to mixed case before processing text to produce theme or Gist output. This setting should be used only when text is all-uppercase or all-lowercase, or where you are not sure of the accuracy of the case.

Examples

```
exec ctx_ling.set_settings_label('SA')
```

Notes

At start-up of a ConText server, the GENERIC default setting configuration is active.

The setting specified by SET_SETTINGS_LABEL is active for the entire session or until you call SET_SETTINGS_LABEL with a new setting configuration. In addition, the specified setting is active only for your current session; settings specified for your session have no effect on the server setting.

You can specify any predefined ConText setting configuration or any custom setting configuration. Define custom setting configurations with the Administration Tool provided with ConText Workbench.

When your text is all upper-case or all lower-case and you use the SA setting to convert the text to mixed-case, Oracle Corporation does not recommend creating theme indexes or issuing theme queries. Creating theme indexes with the SA linguistic setting does not produce consistent results.

SUBMIT

The CTX_LING.SUBMIT procedure creates a single request (row) in the Services Queue for all linguistic requests cached in memory for a single row (identified by PK) and returns a handle for the request.

Syntax

```
CTX_LING.SUBMIT(
              wait          IN NUMBER  DEFAULT 0,
              do_commit     IN BOOLEAN DEFAULT TRUE,
              priority      IN NUMBER  DEFAULT 0)
RETURN NUMBER;
```

wait
Specify maximum time in seconds to block subsequent requests while ConText server processes request. The default is 0.

do_commit
Specify whether the job request should be committed to the database. The default is TRUE.

priority
Specify the priority for the request. Requests are processed in order of priority from lowest priority to highest priority. The default is 0.

Returns

Handle that identifies the request.

Examples

```
declare handle number;
begin
    handle := ctx_ling.submit(500);
end;
```

In this example, procedures to create one or more gists and/or themes have already been executed and the requests cached in memory. The SUBMIT procedure enters the request(s) into the Services Queue and returns a handle. It this case, it also prevents the queue from accepting other submissions from the same requestor for 500 seconds.

Notes

SUBMIT does not cache requests for multiple documents nor for documents in different columns. Only requests for a single document at a time can be submitted.

If more than one request is queued in memory, SUBMIT processes all of the requests as a single batch job. If the request is a batch job, the ConText server processes each request in the batch in order.

All of the individual requests in the batch must be processed successfully or the ConText server returns an ERROR status for the entire batch. The error message stack returned by the ConText server identifies the request that caused the batch to fail.

If SUBMIT is called from a database trigger, the DO_COMMIT argument must be set to FALSE.

CTX_SVC: Services Queue Administration

The CTX_SVC package contains PL/SQL procedures used to query requests in the Services Queue and to perform administrative tasks on the Queue.

CTX_SVC contains the following stored procedures and functions:

Name	Description
CANCEL	Removes a pending request from the Services Queue.
CANCEL_ALL	Removes all pending requests from the Services Queue.
CANCEL_USER	Removes a pending request from the Services Queue for the current user.
CLEAR_ALL_ERRORS	Removes all requests with an error status from the Services Queue.
CLEAR_ERROR	Removes a request that produced an error from the Services Queue.
CLEAR_INDEX_ERRORS	Removes errored indexing requests from the Services Queue.
CLEAR_LING_ERRORS	Removes errored linguistic requests from the Services Queue.
REQUEST_STATUS	Returns the status of a request in the Services Queue.

CANCEL

The CTX_SVC.CANCEL procedure removes a request from the Services Queue, if the request has a status of PENDING.

Syntax

```
CTX_SVC.CANCEL(request_handle NUMBER);
```

request_handle
Specify the handle, returned by CTX_LING.SUBMIT, of the service request to remove.

Examples

```
exec ctx_svc.cancel(3321)
```

Notes

To cancel requests that have not been entered in the Services Queue, use the CTX_LING.CANCEL procedure.

CANCEL_ALL

The CTX_SVC.CANCEL_ALL procedure removes all requests with a status of PENDING from the Services Queue.

Syntax

```
CTX_SVC.CANCEL_ALL ;
```

Examples

```
execute ctx_svc.cancel_all
```

CANCEL_USER

The CTX_SVC.CANCEL_USER procedure removes all requests with a status of PENDING for the current user.

Syntax

```
CTX_SVC.CANCEL_USER ;
```

Examples

```
execute ctx_svc.cancel_user
```

CLEAR_ALL_ERRORS

The CTX_SVC.CLEAR_ALL_ERRORS procedure removes all requests (text indexing, theme indexing, and linguistics) that have a status of ERROR in the Services Queue.

Syntax

```
CTX_SVC.CLEAR_ALL_ERRORS ;
```

Examples

```
execute ctx_svc.clear_all_errors
```

CLEAR_ERROR

The CTX_SVC.CLEAR_ERROR procedure removes a request with a status of ERROR from the Services Queue.

Syntax

```
CTX_SVC.CLEAR_ERROR(request_handle  IN NUMBER);
```

request_handle
Specify the handle, returned by CTX_LING.SUBMIT, of the errored service request that is to be removed.

Examples

```
exec ctx_svc.clear_error(3321)
```

Notes

When you call CTX_SVC.CLEAR_ERROR with a 0 for the REQUEST_HANDLE, ConText removes all requests in the Services Queue that have an ERROR status.

You can use CTX_SVC.REQUEST_STATUS to return the status of a request in the Services Queue.

CLEAR_INDEX_ERRORS

The CTX_SVC.CLEAR_INDEX_ERRORS procedure removes all indexing requests (text and theme) that have a status of ERROR in the Services Queue.

Syntax

```
CTX_SVC.CLEAR_INDEX_ERROR ;
```

Examples

```
execute ctx_svc.clear_index_errors
```

CLEAR_LING_ERRORS

The CTX_SVC.CLEAR_LING_ERRORS procedure removes all linguistic requests that have a status of ERROR in the Services Queue.

Syntax

```
CTX_SVC.CLEAR_LING_ERROR ;
```

Examples

```
execute ctx_svc.clear_ling_errors
```

REQUEST_STATUS

The CTX_SVC.REQUEST_STATUS function returns the status of a request in the Services Queue.

Syntax

```
CTX_SVC.REQUEST_STATUS(
                  request_handle   IN   NUMBER,
                  timestamp        OUT  DATE,
                  errors           OUT  VARCHAR2)
RETURN VARCHAR2;
```

request_handle
Specify the handle of the service request, as returned by CTX_LING.SUBMIT.

timestamp
Returns the time at which request was submitted.

errors
Returns the error message stack for the request; message stack is returned only if the status of the request is ERROR.

Returns

Status of the request, which is one of the following:

PENDING
The request has not yet been picked up by a ConText server.

RUNNING
The request is being processed by a ConText server.

ERROR
The request encountered an error (see ERRORS argument).

SUCCESS
The request completed successfully.

Examples

```
declare status varchar2(10);
declare time date;
declare errors varchar2(60)
begin
status := ctx_svc.request_status(3461,timestamp,errors);
dbms_output.put_line(status,timestamp,substr(errors,1,20));
end;
```

Notes

Specifying an invalid request handle in REQUEST_HANDLE causes CTX_SVC.REQUEST_STATUS to return a status of SUCCESS.

A

Result Tables

This appendix describes the database schema of the result tables utilized by ConText. Result tables are database tables that store results from the CTX_QUERY.CONTAINS and CTX_QUERY.HIGHLIGHT procedures as well as the output from linguistic procedures, CTX_LING.REQUEST_THEMES and CTX_LING.REQUEST_GIST.

The topics described in this chapter are:

Hitlist Table Structure

The hitlist result table stores the results returned by the CTX_QUERY.CONTAINS procedure in the first step of a two-step query. The results can be queried directly to produce a hitlist for the query or combined with the base table to produce more detailed hitlists.

A hitlist result table must be created before executing a two-step query. It can be created manually or using CTX_QUERY.GETTAB.

If the hitlist table is created manually, it can be given any name; however, the table must have the following columns (with names and datatypes as specified).

Column Name	Type	Description
TEXTKEY	VARCHAR2(64)	Unique identifier (usually the primary key for the table) for documents that satisfy the two-step query.
SCORE	NUMBER	Score generated by CONTAINS function for each document.
CONID	NUMBER	ID for results returned by CONTAINS function when multiple CONTAINS use the same hitlist result table.

Composite Textkey Hitlist Tables

When you perform a two-step query on a text table that has a composite textkey, the schema of the resulting hitlist table is the same as for when you issue a query on a table with a single column textkey, except that a composite textkey result table has additional TEXTKEY columns.

The number of TEXTKEY columns in the hitlist table match the number of columns in the textkey for the original text table. The TEXTKEY columns in the hitlist table are named *TEXTKEY*, *TEXTKEY2*, *TEXTKEY3*,..., *TEXTKEYN*, where *N* is the number of columns in the textkey in the original text table. *N* is always less than or equal to 16.

For example, if you do a query on a text table that has a four-column composite textkey, the schema of the resulting hitlist table is: TEXTKEY, TEXTKEY2, TEXTKEY3, TEXTKEY4, SCORE, CONID.

The resulting TEXTKEY columns in the hitlist table are populated in the same order as they were registered in the column policy.

Highlight Table Structures

The highlight result tables store the highlighting results returned by the CTX_QUERY.HIGHLIGHT procedure.

Highlight tables must be created before calling HIGHLIGHT to generate highlighting results. They can be created manually or using CTX_QUERY.GETTAB.

If a highlight table is created manually, it can be assigned any name; however, the table must have the columns (with names and datatypes) as specified.

HIGHTAB Highlight Table

The HIGHTAB highlight table stores query term offset and length information for query terms in documents.

If a document is formatted, the text is filtered by CTX_QUERY.HIGHLIGHT into plain text and the offset information is generated for the filtered text. The offset information can be used to highlight query terms in a document.

The table must have the following columns:

Column Name	Type	Description
ID	NUMBER	The identifier for the results generated by a particular call to CTX_QUERY.HIGHLIGHT. Only used when table is used to store results from multiple HIGHLIGHTS.
OFFSET	NUMBER	The position of the query terms in the document, relative to the rest of the terms in the documents. Measured from a base of 1.
LENGTH	NUMBER	The length of the query term.
STRENGTH	NUMBER	The strength of the highlight table.

MUTAB Highlight Table

The MUTAB display table stores documents in plain text (ASCII) format with the query terms in the documents highlighted by mark-up tags generated by CTX_QUERY.HIGHLIGHT. This mark-up can be used to provide an ASCII version of the document with query terms highlighted.

The highlighting mark-up tags can be specified when HIGHLIGHT is called or the default mark-up tags can be used.

> **Note:** For HTML documents filtered through the internal HTML filter, the MUTAB stores the document with the original HTML tags.

The table must have the following columns:

Column Name	Type	Description
ID	NUMBER	The identifier for the results generated by a particular call to CTX_QUERY.HIGHLIGHT (only used when table is used to store results from multiple HIGHLIGHTS)
DOCUMENT	LONG	Marked-up text of the document, stored in ASCII format

ICFTAB Highlight Table

The ICFTAB highlight table stores the ICF output generated by CTX_QUERY.HIGHLIGHT.

> **Note:** ICF output is used primarily by the Windows viewer control to provide WYSIWIG viewing of documents in the supported formats. As such, it is stored as binary data in a LONG RAW column and is generally inaccessible to users.

The table must have the following columns:

Column Name	Type	Description
ID	NUMBER	The identifier for the results generated by a particular call to CTX_QUERY.HIGHLIGHT (only used when table is used to store results from multiple HIGHLIGHTS)
DOCUMENT	LONG RAW	Text of the document, stored in ICF format

Display Table Structures

The display result tables store the display results returned by the CTX_QUERY.HIGHLIGHT procedure. The display results can be either the document in its original format or the document filtered to plain (ASCII) text.

Display result tables must be created before calling HIGHLIGHT to generate display output. They can be created manually or using CTX_QUERY.GETTAB.

If a display table is created manually, it can be assigned any name; however, the table must have the columns (with names and datatypes) as specified.

NOFILTAB Display Table

The NOFILTAB display table stores formatted documents in their native format (i.e. WordPerfect, Microsoft Word, HTML, ASCII). No highlighting or filtering is performed on the text of the document.

The NOFILTAB table must have the following columns:

Column Name	Type	Description
ID	NUMBER	The identifier for the results generated by a particular call to CTX_QUERY.HIGHLIGHT (only used when table is used to store results from multiple HIGHLIGHTS)
DOCUMENT	LONG RAW	Text of the document, stored in the original format

PLAINTAB Display Table

The PLAINTAB display table stores documents in plain text (ASCII) format. The documents are processed through the filter defined for the text column and the results are stored in the PLAINTAB table.

The PLAINTAB table must have the following columns:

Column Name	Type	Description
ID	NUMBER	The identifier for the results generated by a particular call to CTX_QUERY.HIGHLIGHT (only used when table is used to store results from multiple HIGHLIGHTS)
DOCUMENT	LONG	Text of the document, stored in ASCII format

CTX_LING Output Table Structures

The output tables store the results returned by the CTX_LING package. The output tables serve only as temporary holding areas. You modify, augment, or truncate the output into a form best suited for your application.

> **See Also:** For more information about generating linguistic output, see "Generating CTX_LING Output" in Chapter 8, "Using CTX_LING".

Theme Table

The theme results table stores one row for each theme generated by CTX_LING.REQUEST_THEMES. The value stored in the THEME column is either a theme phrase or a colon separated list of parent themes.

The table can be named anything, but must include the following columns with names and datatypes as specified:

Column Name	Type	Description
CID	NUMBER	Policy ID.
PK	VARCHAR2(64)	Primary key (textkey) for the text table.
THEME	VARCHAR2(2000)	Theme phrase or hierarchical list of parent themes separated by colons (:).
WEIGHT	NUMBER	Weight of theme phrase, relative to other theme phrases for the document.

Composite Textkey Theme Tables

You can use CTX_LING.REQUEST_THEMES to generate themes for a document contained in a composite textkey table. When you do so, the schema of the resulting theme table is the same as for when you request a theme on a single column textkey table, except that the composite textkey result table has additional PK columns.

The number of textkey columns in the theme table match the number of textkey columns in the original text table. The textkey columns in the theme table are named *PK1, PK2, PK3,..., PKN*, where *N* is the number of textkeys in the original text table. *N* is always less than or equal to 16.

For example, if you request a theme on a text table that has four textkeys, the schema of the output table would be (CID, PK1, PK2, PK3, PK4, THEME, WEIGHT).

The resulting textkey columns in the theme table are populated in the same order as they were registered.

Gist Table

The Gist result table stores one row for each Gist generated by CTX_LING.REQUEST_GIST.

The table can be named anything, but must include the following columns (with names and datatypes as specified):

Column Name	Type	Description
CID	NUMBER	Policy ID.
PK	VARCHAR2(64)	Primary key (textkey) for the text table.
POV	VARCHAR2(80)	Document theme.
GIST	LONG	ASCII text of Gist or theme summary.

The value in the POV column for a theme summary is a string which identifies the theme in the document.

The value in the POV column for a Gist is the term GENERIC.

Note: GENERIC is the only value that is consistently in all-uppercase. For all other themes in the POV column, the case depends on how the themes were used in the document.

Composite Textkey Gist Tables

You can use CTX_LING.REQUEST_GIST to generate Gists for a document contained in a composite textkey table. When you do so, the schema of the resulting Gist table is the same as for when you request a Gist on a single column textkey table, except that the composite textkey result table has additional PK columns.

The number of textkey columns in the Gist table match the number of textkey columns in the original text table. The textkey columns in the Gist table are named

PK1, *PK2*, *PK3*,..., *PKN*, where *N* is the number of textkeys in the original text table. *N* is always less than or equal to 16.

For example, if you request a Gist on a text table that has four textkeys, the schema of the resulting hitlist table is (CID, PK1, PK2, PK3, PK4, POV, GIST).

The resulting textkey columns in the Gist table are populated in the same order as they were registered.

B

Scoring Algorithm

This appendix describes the scoring algorithm for text queries.

Note: This appendix discusses how ConText calculates score for text queries, which is different from the way it calculates score for theme queries.

For more information about scoring for theme queries, see "Theme Querying" in Chapter 4.

Scoring Algorithm for Text Queries

To calculate a relevance score for a returned document in a text query, ConText uses an inverse frequency algorithm. Inverse frequency scoring assumes that frequently occurring terms in a document set are "noise" terms, and so these terms are scored lower. For a document to score high, the query term must occur frequently in the document but infrequently in the document set as a whole.

The following table illustrates ConText's inverse frequency scoring. The first column shows the number of documents in the document set, and the second column shows the number of terms in the document necessary to score 100.

This table assumes that only one document in the set contains the query term.

Number of Documents in Document Set	Frequency of Term in Document
1	34
5	20
10	17
50	13
100	12
500	10
1,000	9
10,000	7
100,000	5
1,000,000	4

The table illustrates that if only one document contained the query term and there were five documents in the set, the term would have to occur 20 times in the document to score 100. Whereas, if there were 1,000,000 documents in the set, the term would have to occur only 4 times in the document to score 100.

Example

You have 5000 documents dealing with chemistry in which the term *chemical* occurs at least once in every document. The term *chemical* thus occurs frequently in the document set.

You have a document that contains 5 occurrences of *chemical* and 5 occurrences of the term *hydrogen*. No other document contains the term *hydrogen*.

Because *chemical* occurs so frequently in the document set, its score for the document is lower with respect to *hydrogen*, which is infrequent is the document set as a whole. This is so even though both terms occur 5 times in the document.

Note: Even if the relatively infrequent term *hydrogen* occurred 4 times in the document, and *chemical* occurred 5 times in the document, the score for *hydrogen* might still be higher, because *chemical* occurs so frequently in the document set (at least 5000 times).

Inverse frequency scoring also means that adding documents that contain *hydrogen* lowers the score for that term in the document, and adding more documents that do not contain *hydrogen* raises the score.

DML and Scoring

Because the scoring algorithm is based on the number of documents in the document set, inserting, updating or deleting documents in the document set is likely change the score for any given term before and after the DML.

If DML is heavy, you or your ConText administrator must optimize the index. Perfect relevance ranking is obtained by executing a query right after optimizing the index.

If DML is light, ConText still gives fairly accurate relevance ranking.

In either case, you or your ConText administrator must synchronize the index with CTX_DML.SYNC whenever DML is performed on the index.

See Also: For more information about optimizing and synchronizing an index, see *Oracle8 ConText Cartridge Administrator's Guide.*

C

SQL*Plus Sample Code

This appendix describes the sample SQL*Plus scripts provided by ConText. The scripts illustrate how to use SQL*Plus to build simple queries and generate linguistic output using ConText linguistics.

The scripts are divided into two functional areas: CTXPLUS (performing ad-hoc queries) and CTXLING (generating linguistic output).

The following topics are covered in this chapter:

- Setting Up the ConText Sample Applications
- Overview of CTXPLUS
- Overview of CTXLING

Setting Up the ConText Sample Applications

Before you can use either CTXPLUS or CTXLING, as well as the Oracle Forms sample application distributed with the ConText Workbench, you must create the required demonstration objects by preforming the following setup tasks.

Note: The files required for performing the setup tasks are located in the demo directory for ConText. For example, in a UNIX environment, the files are named *demo.dmp* and *demoinst.sql* and are located in *$ORACLE_HOME/ctx/demo/install*.

For the exact location and name of the setup files, see the Oracle8 installation documentation specific to your operating system.

---

1. Import the export file into the predefined ConText user CTXDEMO's schema.

   For example:

   ```
   IMP ctxdemo/ctxdemo FILE=demo.dmp TABLES=articles
   ```

   Importing the export file creates an ARTICLES table for CTXDEMO and populates ARTICLES.TEXT with the text of the articles used in the samples.

2. Start one or more ConText Server with the DDL (D) and Linguistics (L) personalities.

3. Log in to SQL*Plus as the demo user and run the install script.

   For example:

   ```
   @demoinst
   ```

   The script creates the policies, preferences, views, and results tables used by the samples and creates a text index for the ARTICLES table. It also creates the tables required for highlighting and CTX_LING.

Note: If you want to use CTXLING, you must also run the *genling.sql* script, located in the *ctxling* subdirectory in the *demo* directory.

For more information, see "Using CTXLING" in this chapter.

Overview of CTXPLUS

The CTXPLUS sample code consists of the following SQL scripts:

Script	Description
query1.sql	Performs a one-step query using the input query expression and returns a hitlist, sorted by score, to the standard output.
query2.sql	Performs a two-step query using the input query expression and returns a hitlist, sorted by score, to the standard output.
queryc.sql	Performs an in-memory query using the input query expression and returns an *unsorted* hitlist to standard output
querys.sql	Performs an in-memory query using the input query expression and returns a hitlist, sorted by score, to the standard output.
storeqry.sql	Performs a query and stores the results as a system SQE. The results of the SQE can then be used in a query (one-step, two-step, or in-memory).
showsqe.sql	Returns a list of all the system SQEs that have been stored for a policy. Note that this script is *not* currently implemented.
view.sql	Selects a document based on the input textkey and returns the text of the document to the standard output.

See Also: For more information about the location of the scripts, see the Oracle8 installation documentation specific to you operating system.

Concepts

The ConText concepts illustrated in this sample code are:

- query expression syntax
- one-step queries
- two-step queries
- two-step queries (sorted and unsorted)
- stored query expressions

Using CTXPLUS

To use the CTXPLUS sample SQL scripts:

1. Ensure that one or more ConText servers are running with the Query (Q) personality.
2. Log in to SQL*Plus as the owner of the demonstration objects (usually CTXDEMO).
3. To initiate a query, run one of the query scripts (query1, query2, queryc, or querys). The scripts prompt you to enter a query expression.

   For example:

   ```
   @query1
   Enter value for query_terms: coffee|tea
   ```

   The script then returns a hitlist of the documents in the ARTICLES table that satisfy the query expression you enter. The hitlist consists of a score, ID, author, and title.
4. To view an article, run the view.sql script and give it an article ID. The article ID is the value displayed in the ID column in the hitlist generated by the query scripts.

   For example:

   ```
   @view 14
   ```

   The script then returns the text for the document with the article ID you specified.
5. To create a stored query expression (SQE), run the storeqry.sql script. The scripts prompt you to enter a name for the SQE and a query expression.

   For example:

   ```
   @storeqry
   Enter query name: test_sqe
   Enter value for query_terms: coffee|tea
   ```

   Note: The script does not return the results of the query to the standard output.

To view the SQEs for the demonstration user, use the CTX_USER_SQES view.

For example:

```
select pol_name, query_name, query_name
from ctx_user_sqes;
```

CTXPLUS Examples

The following examples execute the query1.sql, query2.sql, and querys.sql scripts using the query terms *California* and *politics* and various logical operators (OR, ACCUMULATE, and AND).

These examples illustrate how one-step, two-step, and (sorted) in-memory queries produce the same results and how the operators in a query expression affect the rows and scores returned by a query:

Single Term Queries

```
@query2
Enter value for query_terms: California

SCR  ID AUTHOR          TITLE
---- -- --------------- ----------------------------
100  17 Nolo Richards   REVIEW & OUTLOOK (Editorial):
                        California Smashup
50   18 Nolo Richards   State Farm and California
30   25 David Shribman  In the Wilderness: Democrats’
                        Troubles In Winning
20   49 Nolo Richards   California High Court Is
                        Asked to Lift Block Of In
10   16 Heidi Waleson   LEISURE & ARTS: Cynthia
                        Phelps: Violist in Vogue
@query1
Enter value for query_terms: politics

SCR  ID AUTHOR          TITLE
---- -- --------------- ----------------------------
20   25 David Shribman  In the Wilderness: Democrats’
                        Troubles In Winning
10   13 Frederick C. Kl LEISURE & ARTS -- Sports:
                        Mediocrity’s the Word Ar
```

Multiple Term Query Using OR

```
@querys
Enter value for query_terms: politics|California
SCR  ID AUTHOR          TITLE
---- -- --------------- ---------------------------
100  17 Nolo Richards   REVIEW & OUTLOOK (Editorial):
                        California Smashup
50   18 Nolo Richards   State Farm and California
30   25 David Shribman  In the Wilderness: Democrats'
                        Troubles In Winning
20   49 Nolo Richards   California High Court Is Asked
                        to Lift Block Of In
10   13 Frederick C.    Kl LEISURE & ARTS -- Sports:
                        Mediocrity's the Word Ar
10   16 Heidi Waleson   LEISURE & ARTS: Cynthia
                        Phelps: Violist in Vogue
```

Multiple Term Query Using ACCUMULATE

```
@query1
Enter value for query_terms: politics,California
SCR  ID AUTHOR          TITLE
---- -- --------------- ---------------------------
100  17 Nolo Richards   REVIEW & OUTLOOK (Editorial):
                        California Smashup
50   18 Nolo Richards   State Farm and California
50   25 David Shribman  In the Wilderness: Democrats'
                        Troubles In Winning
20   49 Nolo Richards   California High Court Is Asked
                        to Lift Block Of In
10   13 Frederick C.    Kl LEISURE & ARTS -- Sports:
                        Mediocrity's the Word Ar
10   16 Heidi Waleson   LEISURE & ARTS: Cynthia
                       Phelps: Violist in Vogue
```

Multiple Term Queries Using AND

```
@query2
Enter value for query_terms: politics&California
SCR  ID AUTHOR          TITLE
---- -- --------------- ---------------------------
20   25 David Shribman  In the Wilderness: Democrats'
                        Troubles In Winning
```

Overview of CTXLING

The CTXLING demo is a set of simple, related SQL*Plus scripts. Two of the scripts automate and track linguistic extraction on the demonstration documents. The remaining scripts can be used to query this linguistic output.

The CTXLING sample code consists of the following SQL scripts:

Script	Description
genling.sql	Requests theme and Gist generation for each of the documents in the ARTICLES table.
status.sql	Shows the status of the theme and Gist generation initiated by genling.sql.
gist.sql	Displays the Gists for a document.
themes.sql	Displays the themes for a document.
similar.sql	Displays documents with similar themes for the input document

See Also: For more information about the location of the scripts, see the Oracle8 installation documentation specifc to your operating system.

Concepts

The ConText concepts illustrated in this sample code are:

- generating linguistic output using the Linguistic Services
- document theme viewing
- document Gist viewing

Using CTXLING

To use the CTXLING sample SQL scripts:

1. Ensure that one or more ConText servers with the Linguistic (L) personality are running.
2. Log in to SQL*Plus as the owner of the demonstration objects (usually CTXDEMO).

3. To generate linguistic output, run genling.sql:

```
@genling
Clearing theme table...
Clearing article table...
Initializing ling_tracking table
Creating ling. callback function LING_COMP_CALLBACK...
Submitting all articles for linguistic extraction...
All articles submitted.
```

   The script generates Gist and theme information for each document in the ARTICLES table and stores the information in the linguistic output tables created by *demoinst.sql*.

4. The linguistic generation runs in the background. While this is happening, you can use status.sql to check on the progress:

   For example:

```
@status
Linguistic Requests left: 36
Request Errors....
```

   The extraction is complete when there are 0 Linguistic Requests left.

5. To view the themes or Gists of an article, run the appropriate script and give it an article ID.

   For example:

```
@gist 40
Points of View
01 GENERIC ..
15 production
16 purchases
which point of view gist to print: 15
```

   The script then returns the themes or Gists for the document with the article ID you specified.

6. To select articles with the same themes as an article, run the similar.sql script and give it an article ID.

   For example:

```
@similar 14
```

The script then returns a list of the articles with the same themes as the article ID you specified.

CTXLING Examples

The following examples illustrate using themes.sql, gist.sql, and similar.sql to view the linguistic output generated by genling.sql.

Theme Viewing

```
@themes 40
Commodities: Coffee Futures Prices Decline on News That
U.S. Might Not Participate in New International Pact
by John Valentine

T#  THEME                                    WEIGHT
--- ---------------------------------------- ------
01  United States                            11
02  commerce and trade                       10
03  coffee                                   10
...
```

Gist Viewing

```
@gist 40

Points of View

01 GENERIC ...
15 production
16 purchases

Which point of view gist to print: 15

Commodities: Coffee Futures Prices Decline on News That
U.S. Might Not Participate in New International Pact
by John Valentine

Consuming and producing nations appear to be poles apart
in their positions. Producing countries proposed a quota
that would incorporate the sales of
...
```

Theme Comparison Viewing

```
@similar 40

Commodities: Coffee Futures Prices Decline on News That
U.S. Might Not Participate in New International Pact
by John Valentine

Article Themes

01 United States
02 commerce and trade
03 coffee
..
14 production
15 purchases

Which theme to query: 15

Other articles with this theme

ID  WT  AUTHOR          TITLE
--- --- --------------- --------------------------------
1   8   William Power   OTC Focus: Composite Index Falls
33  7   Alex Kaufmann   Your Money Matters: How to Take
5   7   George Anders   Shades of U.S. Steel: J.P.
30  6   Michael Siconol Mutual Funds: ...And Find Out if
47  6   Nolo Richards   Ponce Federal Bank Is in Talks
45  5   Nolo Richards   Farley Wins Round In His Bid to
35  2   Alix M.         Freedma Supermarkets Push Private-Label
```

D

Stopword Transformations

This appendix describes stopword transformations. The following topic is covered:

- Understanding Stopword Transformations

Understanding Stopword Transformations

When you use a stopword or stopword-only phrase as an operand for a query operator, ConText rewrites the expression to eliminate the stopword or stopword-only phrase and then executes the query.

The following section describes the stopword rewrites or transformations for each operator. In all tables, the *Stopword Expression* column describes the query expression or component of a query expression, while the right-hand column describes the way ConText rewrites the query.

The token *stopword* stands for a single stopword or a stopword-only phrase.

The token *non_stopword* stands for either a single non-stopword, a phrase of all non-stopwords, or a phrase of non-stopwords and stopwords.

The token *no_lex* stands for a single character or a string of characters that is neither a stopword nor a word that is indexed. For example, the + character by itself is an example of a *no_lex* token.

When the *Stopword Expression* column completely describes the query expression, a rewritten expression of *no_token* means that no hits are returned when you enter such a query.

When the *Stopword Expression* column describes a component of a query expression with more than one operator, a rewritten expression of *no_token* means that a *no_token* value is passed to the next step of the rewrite.

Transformations that contain a *no_token* as an operand in the *Stopword Expression* column describe intermediate transformations in which the *no_token* is a result of a previous transformation. These intermediate transformations apply when the original query expression has at least one stopword and more than one operator.

For example, consider the following compound query expression:

```
'(this NOT dog) AND cat'
```

Assuming that *this* is the only stopword in this expression, ConText applies the following transformations in the following order:

stopword NOT non-stopword => no_token

no_token AND non_stopword => non_stopword

The resulting expression is:

```
'cat'
```

See Also: To learn more about how to examine stopword transformations, see Chapter 5, "Query Expression Feedback".

For more information about defining stopwords, see *Oracle8 ConText Cartridge Administrator's Guide*.

Word Transformations

Stopword Expression	Rewritten Expression
stopword	no_token
no_lex	no_token

The first transformation mean that a stopword or stopword-only phrase by itself in a query expression results in no hits.

The second transformation says that a term that is not lexed such as + results in no hits.

AND Transformations

Stopword Expression	Rewritten Expression
non_stopword AND *stopword*	non_stopword
non_stopword AND *no_token*	non_stopword
stopword AND *non_stopword*	non_stopword
no_token AND *non_stopword*	non_stopword
stopword AND *stopword*	no_token
no_token AND *stopword*	no_token
stopword AND *no_token*	no_token
no_token AND *no_token*	no_token

OR Transformations

Stopword Expression	Rewritten Expression
non_stopword OR *stopword*	non_stopword
non_stopword OR *no_token*	non_stopword
stopword OR *non_stopword*	non_stopword
no_token OR *non_stopword*	non_stopword
stopword OR *stopword*	no_token
no_token OR *stopword*	no_token
stopword OR *no_token*	no_token
no_token OR *no_token*	no_token

Accumulate Transformations

Stopword Expression	Rewritten Expression
non_stopword ACCUM *stopword*	non_stopword
non_stopword ACCUM *no_token*	non_stopword
stopword ACCUM *non_stopword*	non_stopword
no_token ACCUM *non_stopword*	non_stopword
stopword ACCUM *stopword*	no_token
no_token ACCUM *stopword*	no_token
stopword ACCUM *no_token*	no_token
no_token ACCUM *no_token*	no_token

MINUS Transformations

Stopword Expression	Rewritten Expression
non_stopword MINUS *stopword*	non_stopword
non_stopword MINUS *no_token*	non_stopword
stopword MINUS *non_stopword*	no_token
no_token MINUS *non_stopword*	no_token
stopword MINUS *stopword*	no_token
no_token MINUS *stopword*	no_token
stopword MINUS *no_token*	no_token
no_token MINUS *no_token*	no_token

NOT Transformations

Stopword Expression	Rewritten Expression
non_stopword NOT *stopword*	non_stopword
non_stopword NOT *no_token*	non_stopword
stopword NOT *non_stopword*	no_token
no_token NOT *non_stopword*	no_token
stopword NOT *stopword*	no_token
no_token NOT *stopword*	no_token
stopword NOT *no_token*	no_token
no_token NOT *no_token*	no_token

Equivalence Transformations

Stopword Expression	Rewritten Expression
non_stopword EQUIV *stopword*	non_stopword
non_stopword EQUIV *no_token*	non_stopword
stopword EQUIV *non_stopword*	non_stopword
no_token EQUIV *non_stopword*	non_stopword
stopword EQUIV *stopword*	no_token
no_token EQUIV *stopword*	no_token
stopword EQUIV *no_token*	no_token
no_token EQUIV *no_token*	no_token

Note: When you use query expression feedback, not all of the equivalence transformations are represented in the feedback table.

NEAR Transformations

Stopword Expression	Rewritten Expression
non_stopword NEAR *stopword*	non_stopword
non_stopword NEAR *no_token*	non_stopword
stopword NEAR *non_stopword*	non_stopword
no_token NEAR *non_stopword*	non_stopword
stopword NEAR *stopword*	no_token
no_token NEAR *stopword*	no_token
stopword NEAR *no_token*	no_token
no_token NEAR *no_token*	no_token

Weight Transformations

Stopword Expression	Rewritten Expression
stopword * n	no_token
no_token * n	no_token

Threshold Transformations

Stopword Expression	Rewritten Expression
stopword > n	no_token
no_token > n	no_token

Max Transformations

Stopword Expression	Rewritten Expression
stopword: n	no_token
no_token: n	no_token

First/Next Transformations

Stopword Expression	Rewritten Expression
stopword # m-n	no_token
no_token # m-n	no_token

WITHIN Transformations

Stopword Expression	Rewritten Expression
stopword WITHIN *section*	no_token
no_token WITHIN *section*	no_token

E

Knowledge Catalog - Category Hierarchy

This appendix provides a list of all the concepts in the knowledge catalog that serve as categories.

The appendix is divided into six sections, corresponding to the six main branches of the knowledge catalog:

- Branch 1: science and technology
- Branch 2: business and economics
- Branch 3: government and military
- Branch 4: social environment
- Branch 5: geography
- Branch 6: abstract ideas and concepts

The categories are presented in an inverted-tree hierarchy and within each category, sub-categories are listed in alphabetical order.

Note: This appendix does not contain all the concepts found in the knowledge catalog. It only contains those concepts that serve as categories (meaning they are parent nodes in the hierarchy).

See Also: For more information about categories and concepts in the knowledge catalog, see "Knowledge Catalog" section in Chapter 7, "ConText Linguistics".

Branch 1: science and technology

[1] communications

- **[2] journalism**
  - [3] broadcast journalism
  - [3] photojournalism
  - [3] print journalism
    - [4] newspapers
- **[2] public speaking**
- **[2] publishing industry**
  - [3] desktop publishing
  - [3] periodicals
    - [4] business publications
  - [3] printing
- **[2] telecommunications industry**
  - [3] computer networking
    - [4] Internet technology
      - [5] Internet providers
      - [5] Web browsers
      - [5] search engines
  - [3] data transmission
  - [3] fiber optics
  - [3] telephone service

[1] formal education

- **[2] colleges and universities**
  - [3] academic degrees
  - [3] business education
- **[2] curricula and methods**
- **[2] library science**
- **[2] reference books**
- **[2] schools**
- **[2] teachers and students**

[1] hard sciences

- **[2] aerospace industry**
  - [3] satellite technology
  - [3] space exploration
    - [4] Mars exploration
    - [4] lunar exploration
    - [4] space explorers
    - [4] spacecraft and space stations
- **[2] chemical industry**
  - [3] chemical adhesives
  - [3] chemical dyes
  - [3] chemical engineering
  - [3] materials technology
    - [4] industrial ceramics
    - [4] metal industry
      - [5] aluminum industry
      - [5] metallurgy
      - [5] steel industry
    - [4] plastics
    - [4] rubber
    - [4] synthetic textiles
  - [3] paints and finishing materials
  - [3] pesticides
    - [4] fungicides
    - [4] herbicides
- **[2] chemistry**
  - [3] chemical properties
  - [3] chemical reactions
  - [3] chemicals
    - [4] chemical acids
    - [4] chemical elements
    - [4] molecular reactivity
    - [4] molecular structure
  - [3] chemistry tools
    - [4] chemical analysis
    - [4] chemistry glassware
    - [4] purification and isolation of chemicals
  - [3] organic chemistry
  - [3] theory and physics of chemistry
- **[2] civil engineering**
  - [3] building architecture
  - [3] construction industry
    - [4] building components
      - [5] exterior structures
        - [6] entryways and extensions
        - [6] landscaping
        - [6] ornamental architecture
        - [6] roofs and towers
        - [6] walls
        - [6] windows
      - [5] interior structures
        - [6] building foundations
        - [6] building systems
          - [7] electrical systems
          - [7] fireproofing and insulation
          - [7] plumbing
        - [6] rooms
    - [4] buildings and dwellings
      - [5] outbuildings
    - [4] carpentry
    - [4] construction equipment
    - [4] construction materials
      - [5] paneling and composites
      - [5] surfaces and finishing
- **[2] computer industry**
  - [3] computer hardware industry
    - [4] computer components
      - [5] computer memory
      - [5] microprocessors
    - [4] computer peripherals
      - [5] data storage devices
    - [4] hand-held computers
    - [4] laptop computers
    - [4] mainframes
    - [4] personal computers
    - [4] workstations
  - [3] computer science
    - [4] artificial intelligence
  - [3] computer security and data encryption
    - [4] computer viruses and protection
  - [3] computer software industry

[4] CAD-CAM
[4] client-server software
[4] computer programming
[5] programming development tools
[5] programming languages
[4] operating systems
[3] computer standards
[3] cyberculture
[3] human-computer interaction
[3] information technology
[4] computer multimedia
[5] computer graphics
[5] computer sound
[5] computer video
[4] databases
[4] document management
[4] natural language processing
[4] spreadsheets
[3] network computing
[3] supercomputing and parallel computing
[3] virtual reality
[2] electrical engineering
[2] electronics
[3] consumer electronics
[4] audio electronics
[4] video electronics
[3] electronic circuits and components
[4] microelectronics
[4] semiconductors and superconductors
[3] radar technology
[2] energy industry
[3] electric power industry
[3] energy sources
[4] alternative energy sources
[4] fossil fuels industry
[5] coal industry
[5] petroleum products industry
[4] nuclear power industry
[2] environment control industries
[3] heating and cooling systems
[3] pest control
[3] waste management
[2] explosives and firearms
[3] chemical explosives
[3] firearm parts and accessories
[3] recreational firearms
[2] geology
[3] geologic formations
[3] geologic substances
[4] mineralogy
[5] gemstones
[5] igneous rocks
[5] metamorphic rocks
[5] sedimentary rocks
[3] hydrology
[3] meteorology
[4] atmospheric science
[4] clouds
[4] storms
[4] weather modification
[4] weather phenomena
[4] winds
[3] mining industry
[3] natural disasters
[3] oceanography
[3] seismology
[3] speleology
[3] vulcanology
[2] inventions
[2] life sciences
[3] biology
[4] biochemistry
[5] biological compounds
[6] amino acids
[6] enzymes
[6] hormones
[7] androgens and anabolic steroids
[7] blood sugar hormones
[7] corticosteroids
[7] estrogens and progestins
[7] gonadotropins
[7] pituitary hormones
[7] thyroid hormones
[6] lipids and fatty acids
[6] nucleic acids
[6] sugars and carbohydrates
[6] toxins
[6] vitamins
[5] cell reproduction
[5] cell structure and function
[5] molecular genetics
[4] botany
[5] algae
[5] fungi
[5] plant diseases
[5] plant kingdom
[6] ferns
[6] flowering plants
[7] cacti
[7] grasses
[6] mosses
[6] trees and shrubs
[7] conifers
[7] deciduous trees
[7] palm trees
[5] plant physiology
[6] plant development
[6] plant parts
[4] lower life forms
[5] bacteria
[5] viruses
[4] paleontology
[5] dinosaurs
[4] physiology
[5] anatomy
[6] cardiovascular systems
[6] digestive systems
[6] extremities and appendages
[6] glandular systems
[6] head and neck
[7] ear anatomy
[7] eye anatomy
[7] mouth and teeth
[6] immune systems

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            [7] antigens and antibodies
        [6] lymphatic systems
        [6] muscular systems
        [6] nervous systems
        [6] reproductive systems
        [6] respiratory systems
        [6] skeletal systems
        [6] tissue systems
        [6] torso
        [6] urinary systems
    [5] reproduction and development
[4] populations and vivisystems
    [5] biological evolution
    [5] ecology
        [6] ecological conservation
        [6] environmental pollution
    [5] genetics and heredity
[4] zoology
    [5] invertebrates
        [6] aquatic sponges
        [6] arthropods
            [7] arachnids
                [8] mites and ticks
                [8] scorpions
                [8] spiders
            [7] crustaceans
            [7] insects
        [6] coral and sea anemones
        [6] jellyfish
        [6] mollusks
            [7] clams, oysters, and mussels
            [7] octopi and squids
            [7] snails and slugs
        [6] starfish and sea urchins
        [6] worms
    [5] vertebrates
        [6] amphibians
        [6] birds
            [7] birds of prey
                [8] owls
            [7] game birds
            [7] hummingbirds
            [7] jays, crows, and magpies
            [7] parrots and parakeets
            [7] penguins
            [7] pigeons and doves
            [7] warblers and sparrows
            [7] water birds
                [8] ducks, geese, and swans
                [8] gulls and terns
                [8] pelicans
            [7] woodpeckers
            [7] wrens
        [6] fish
            [7] boneless fish
                [8] rays and skates
                [8] sharks
            [7] bony fish
                [8] deep sea fish
                [8] eels
                [8] tropical fish
            [7] jawless fish
        [6] mammals
            [7] anteaters and sloths
                [8] aardvarks
            [7] carnivores
                [8] canines
                [8] felines
            [7] chiropterans
            [7] elephants
            [7] hoofed mammals
                [8] cattle
                [8] goats
                [8] horses
                [8] pigs
                [8] sheep
            [7] hyraxes
            [7] marine mammals
                [8] seals and walruses
                    [9] manatees
                [8] whales and porpoises
            [7] marsupials
            [7] monotremes
            [7] primates
                [8] lemurs
            [7] rabbits
            [7] rodents
        [6] reptiles
            [7] crocodilians
            [7] lizards
            [7] snakes
            [7] turtles
[3] biotechnology
    [4] antibody technology
        [5] immunoassays
    [4] biometrics
        [5] voice recognition technology
    [4] genetic engineering
    [4] pharmaceutical industry
        [5] anesthetics
            [6] general anesthetics
            [6] local anesthetics
        [5] antagonists and antidotes
        [5] antibiotics, antimicrobials, and
            antiparasitics
            [6] anthelmintics
            [6] antibacterials
                [7] antimalarials
                [7] antituberculars and antileprotics
            [6] antifungals
            [6] antivirals
            [6] local anti-infectives
        [5] antigout agents
        [5] autonomic nervous system drugs
            [6] neuromuscular blockers
            [6] skeletal muscle relaxants
        [5] blood drugs
        [5] cardiovascular drugs
            [6] antihypertensives
        [5] central nervous system drugs
            [6] analgesics and antipyretics
            [6] antianxiety agents
            [6] antidepressants
            [6] antipsychotics
```

[6] narcotic and opioid analgesics
[6] nonsteroidal anti-inflammatory drugs
[6] sedative-hypnotics
[5] chemotherapeutics, antineoplastic agents
[5] dermatomucosal agents
[6] topical corticosteroids
[5] digestive system drugs
[6] antacids, adsorbents, and antiflatulents
[6] antidiarrheals
[6] antiemetics
[6] antiulcer agents
[6] digestants
[6] laxatives
[5] eye, ear, nose, and throat drugs
[6] nasal agents
[6] ophthalmics
[7] ophthalmic vasoconstrictors
[6] otics, ear care drugs
[5] fluid and electrolyte balance drugs
[6] diuretics
[5] hormonal agents
[5] immune system drugs
[6] antitoxins and antivenins
[6] biological response modifiers
[6] immune serums
[6] immunosuppressants
[6] vaccines and toxoids
[5] oxytocics
[5] respiratory drugs
[6] antihistamines
[6] bronchodilators
[6] expectorants and antitussives
[5] spasmolytics
[5] topical agents
[3] health and medicine
[4] healthcare industry
[5] healthcare providers and practices
[5] medical disciplines and specialties
[6] cardiology
[6] dentistry
[6] dermatology
[6] geriatrics
[6] neurology
[6] obstetrics and gynecology
[6] oncology
[6] ophthalmology
[6] pediatrics
[5] medical equipment
[6] artificial limbs and organs
[6] dressings and supports
[5] medical equipment manufacturers
[5] medical facilities
[4] medical problems
[5] blood disorders
[5] cancers and tumors
[6] carcinogens
[5] cardiovascular disorders
[5] developmental disorders
[5] environment-related afflictions
[5] gastrointestinal disorders
[5] genetic and hereditary disorders
[5] infectious diseases
[6] communicable diseases
[7] sexually transmitted diseases
[5] injuries
[5] medical disabilities
[5] neurological disorders
[5] respiratory disorders
[5] skin conditions
[4] nutrition
[4] practice of medicine
[5] alternative medicine
[5] medical diagnosis
[6] medical imaging
[5] medical personnel
[5] medical procedures
[6] physical therapy
[6] surgical procedures
[7] cosmetic surgery
[4] veterinary medicine
[2] machinery
[3] machine components
[2] mathematics
[3] algebra
[4] linear algebra
[4] modern algebra
[3] arithmetic
[4] elementary algebra
[3] calculus
[3] geometry
[4] mathematical topology
[4] plane geometry
[4] trigonometry
[3] math tools
[3] mathematical analysis
[3] mathematical foundations
[4] number theory
[4] set theory
[4] symbolic logic
[3] statistics
[2] mechanical engineering
[2] physics
[3] acoustics
[3] cosmology
[4] astronomy
[5] celestial bodies
[6] celestial stars
[6] comets
[6] constellations
[6] galaxies
[6] moons
[6] nebulae
[6] planets
[5] celestial phenomena
[3] electricity and magnetism
[3] motion physics
[3] nuclear physics
[4] subatomic particles
[3] optical technology
[4] holography
[4] laser technology
[5] high-energy lasers
[5] low-energy lasers

[3] thermodynamics
[2] robotics
[2] textiles
[2] tools and hardware
[3] cements and glues
[3] hand and power tools
[4] chisels
[4] drills and bits
[4] gauges and calipers
[4] hammers
[4] machine tools
[4] planes and sanders
[4] pliers and clamps
[4] screwdrivers
[4] shovels
[4] trowels
[4] wrenches
[3] knots

[1] social sciences

[2] anthropology
[3] cultural identities
[4] Native Americans
[3] cultural studies
[4] ancient cultures
[3] customs and practices
[2] archeology
[3] ages and periods
[3] prehistoric humanoids
[2] history
[3] U.S. history
[4] slavery in the U.S.
[3] ancient Rome
[4] Roman emperors
[3] ancient history
[3] biographies
[3] historical eras
[2] human sexuality
[3] homosexuality
[3] pornography
[3] prostitution
[3] sexual issues
[2] linguistics
[3] descriptive linguistics
[4] grammar
[5] parts of speech
[4] phonetics and phonology
[3] historical linguistics
[3] languages
[3] linguistic theories
[3] rhetoric and figures of speech
[3] sociolinguistics
[4] dialects and accents
[3] writing and mechanics
[4] punctuation and diacritics
[4] writing systems
[2] psychology
[3] abnormal psychology
[4] anxiety disorders
[4] childhood onset disorders
[4] cognitive disorders
[4] dissociative disorders
[4] eating disorders
[4] impulse control disorders
[4] mood disorders
[4] personality disorders
[4] phobias
[4] psychosomatic disorders
[4] psychotic disorders
[4] somatoform disorders
[4] substance related disorders
[3] behaviorist psychology
[3] cognitive psychology
[3] developmental psychology
[3] experimental psychology
[3] humanistic psychology
[3] neuropsychology
[3] perceptual psychology
[3] psychiatry
[3] psychoanalytic psychology
[3] psychological states and behaviors
[3] psychological therapy
[3] psychological tools and techniques
[3] sleep psychology
[4] sleep disorders
[2] sociology
[3] demographics
[3] social identities
[4] gender studies
[4] senior citizens
[3] social movements and institutions
[3] social structures

[1] transportation

[2] aviation
[3] aircraft
[3] airlines
[3] airports
[3] avionics
[2] freight and shipping
[3] package delivery industry
[3] trucking industry
[2] ground transportation
[3] animal powered transportation
[3] automotive industry
[4] automobiles
[4] automotive engineering
[5] automotive parts
[5] internal combustion engines
[4] automotive sales
[4] automotive service and repair
[4] car rentals
[4] motorcycles
[4] trucks and buses
[3] human powered vehicles
[3] rail transportation
[4] subways
[4] trains
[3] roadways and driving
[2] marine transportation
[3] boats and ships
[3] seamanship

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    [3] waterways
```
[2] travel industry
```
    [3] hotels and lodging
    [3] tourism
        [4] cruise lines
        [4] places of interest
        [4] resorts and spas
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Branch 2: business and economics

[1] business services industry

[1] commerce and trade

[2] electronic commerce
[2] general commerce
[2] international trade and finance
[2] mail-order industry
[2] retail trade industry
  [3] convenience stores
  [3] department stores
  [3] discount stores
  [3] supermarkets
[2] wholesale trade industry

[1] corporate business

[2] business enterprise
  [3] entrepreneurship
[2] business fundamentals
[2] consulting industry
[2] corporate finance
  [3] accountancy
[2] corporate management
[2] corporate practices
[2] diversified companies
[2] human resources
  [3] employment agencies
[2] office products
[2] quality control
  [3] customer support
[2] research and development
[2] sales and marketing
  [3] advertising industry

[1] economics

[1] financial institutions

[2] banking industry
[2] insurance industry
[2] real-estate industry

[1] financial investments

[2] commodities market
  [3] money
    [4] currency market
  [3] precious metals market
[2] general investment
[2] personal finance
  [3] retirement investments
[2] securities market
  [3] bond market
  [3] mutual funds
  [3] stock market

[1] financial lending

[2] credit cards

[1] industrial business

[2] industrial engineering
  [3] production methods
[2] industrialists and financiers
[2] manufacturing
  [3] industrial goods manufacturing

[1] public sector industry

[1] taxes and tariffs

[1] work force

[2] organized labor

Branch 3: government and military

[1] government

- **[2] county government**
- **[2] forms and philosophies of government**
- **[2] government actions**
- **[2] government bodies and institutions**
  - [3] executive branch
    - [4] U.S. presidents
    - [4] executive cabinet
  - [3] judiciary branch
    - [4] Supreme Court
      - [5] chief justices
  - [3] legislative branch
    - [4] house of representatives
    - [4] senate
- **[2] government officials**
  - [3] royalty and aristocracy
  - [3] statesmanship
- **[2] government programs**
  - [3] social programs
    - [4] welfare
- **[2] international relations**
  - [3] Cold War
  - [3] diplomacy
  - [3] immigration
- **[2] law**
  - [3] business law
  - [3] courts
  - [3] crimes and offenses
    - [4] controlled substances
      - [5] substance abuse
    - [4] criminals
    - [4] organized crime
  - [3] law enforcement
  - [3] law firms
  - [3] law systems
    - [4] constitutional law
  - [3] legal bodies
  - [3] legal customs and formalities
  - [3] legal judgments
  - [3] legal proceedings
  - [3] prisons and punishments
- **[2] municipal government**
  - [3] municipal infrastructure
  - [3] urban areas
    - [4] urban phenomena
    - [4] urban structures
- **[2] politics**
  - [3] civil rights
  - [3] elections and campaigns
  - [3] political activities
  - [3] political advocacy
    - [4] animal rights
    - [4] consumer advocacy
  - [3] political parties
  - [3] political principles and philosophies
    - [4] utopias
  - [3] political scandals
  - [3] revolution and subversion
    - [4] terrorism
- **[2] postal communications**
- **[2] public facilities**
- **[2] state government**

[1] military

- **[2] air force**
- **[2] armored clothing**
- **[2] army**
- **[2] cryptography**
- **[2] military honors**
- **[2] military intelligence**
- **[2] military leaders**
- **[2] military ranks**
  - [3] army, air force, and marine ranks
  - [3] navy and coast guard ranks
- **[2] military wars**
  - [3] American Civil War
  - [3] American Revolution
  - [3] World War I
  - [3] World War II
  - [3] warfare
- **[2] military weaponry**
  - [3] bombs and mines
  - [3] chemical and biological warfare
  - [3] military aircraft
  - [3] missiles, rockets, and torpedoes
  - [3] nuclear weaponry
  - [3] space-based weapons
- **[2] navy**
  - [3] warships
- **[2] service academies**

Branch 4: social environment

[1] belief systems

[2] folklore
[2] mythology
    [3] Celtic mythology
    [3] Egyptian mythology
    [3] Greek mythology
    [3] Japanese mythology
    [3] Mesopotamian and Sumerian mythology
    [3] Norse and Germanic mythology
    [3] Roman mythology
    [3] South and Central American mythology
    [3] mythological beings
    [3] myths and legends
[2] paranormal phenomena
    [3] astrology
    [3] occult
    [3] superstitions
[2] philosophy
    [3] epistemology
    [3] ethics and aesthetics
    [3] metaphysics
    [3] philosophical logic
    [3] schools of philosophy
[2] religion
    [3] God and divinity
    [3] doctrines and practices
    [3] history of religion
    [3] religious institutions and structures
    [3] sacred texts and objects
        [4] Bible
        [4] liturgical garments
    [3] world religions
        [4] Christianity
            [5] Christian denominations
            [5] Christian heresies
            [5] Christian theology
            [5] Mormonism
            [5] Roman Catholicism
                [6] popes
                [6] religious orders
            [5] evangelism
            [5] protestant reformation
        [4] Islam
        [4] Judaism
        [4] eastern religions
            [5] Buddhism
            [5] Hinduism
                [6] Hindu deities

[1] clothing and appearance

[2] clothing
    [3] clothing accessories
        [4] belts
        [4] functional accessories
        [4] gloves
    [3] fabrics
        [4] laces
        [4] leather and fur
    [3] footwear
    [3] garment parts
        [4] garment fasteners
        [4] garment trim
    [3] headgear
        [4] hats
        [4] helmets
    [3] laundry
    [3] neckwear
    [3] outer garments
        [4] dresses
        [4] formalwear
        [4] jackets
        [4] pants
        [4] shirts
        [4] skirts
        [4] sporting wear
        [4] sweaters
    [3] sewing
    [3] undergarments
        [4] deshabille
        [4] hosiery
        [4] lingerie
        [4] men’s underwear
[2] cosmetics
    [3] facial hair
    [3] hair styling
[2] fashion industry
    [3] supermodels
[2] grooming
    [3] grooming aids
[2] jewelry

[1] emergency services

[2] emergency dispatch
[2] emergency medical services
[2] fire prevention and suppression
[2] hazardous material control
[2] heavy rescue

[1] family

[2] death and burial
    [3] funeral industry
[2] divorce
[2] infancy
[2] kinship and ancestry
[2] marriage
[2] pregnancy
    [3] contraception
[2] upbringing

[1] food and agriculture

[2] agribusiness

[2] agricultural equipment
[2] agricultural technology
    [3] soil management
        [4] fertilizers
[2] aquaculture
[2] cereals
[2] condiments
[2] crop grain
[2] dairy products
    [3] cheeses
[2] drinking and dining
    [3] alcoholic beverages
        [4] beers
        [4] liqueurs
        [4] liquors
        [4] mixed drinks
        [4] wines
            [5] wineries
    [3] cooking
    [3] meals and dishes
        [4] sandwiches
    [3] non-alcoholic beverages
        [4] coffee
        [4] soft drinks
        [4] tea
[2] farming
[2] fats and oils
    [3] butter and margarine
[2] food and drink industry
    [3] foodservice industry
    [3] meat packing industry
[2] forestry
    [3] forest products
[2] fruits and vegetables
    [3] legumes
[2] leavening agents
[2] mariculture
[2] meats
    [3] beef
    [3] pate and sausages
    [3] pork
    [3] poultry
[2] nuts and seeds
[2] pasta
[2] prepared foods
    [3] breads
    [3] candies
    [3] crackers
    [3] desserts
        [4] cakes
        [4] cookies
        [4] pies
    [3] pastries
    [3] sauces
    [3] soups and stews
[2] ranching
[2] seafood
[2] spices and flavorings
    [3] sweeteners

[1] housekeeping and butlery

[1] housewares

[2] beds
[2] candles
[2] carpets and rugs
[2] cases, cabinets, and chests
[2] chairs and sofas
[2] curtains, drapes, and screens
[2] functional wares
    [3] cleaning supplies
[2] home appliances
[2] kitchenware
    [3] cookers
    [3] fine china
    [3] glassware
    [3] kitchen appliances
    [3] kitchen utensils
        [4] cutting utensils
    [3] pots and pans
    [3] serving containers
    [3] tableware
[2] lamps
[2] linen
[2] mirrors
[2] ornamental objects
[2] stationery
[2] stools and stands
[2] tables and desks
[2] timepieces

[1] leisure and recreation

[2] arts and entertainment
    [3] broadcast media
        [4] radio
            [5] amateur radio
        [4] television
    [3] cartoons, comic books, and superheroes
    [3] cinema
        [4] movie stars
        [4] movie tools and techniques
        [4] movies
    [3] entertainments and spectacles
        [4] entertainers
    [3] humor and satire
    [3] literature
        [4] children’s literature
        [4] literary criticism
        [4] literary devices and techniques
        [4] poetry
            [5] classical poetry
        [4] prose
            [5] fiction
                [6] horror fiction
                [6] mystery fiction
        [4] styles and schools of literature
    [3] performing arts
        [4] dance
            [5] ballet

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            [5] choreography
            [5] folk dances
            [5] modern dance
        [4] drama
            [5] dramatic structure
            [5] stagecraft
        [4] music
            [5] blues music
            [5] classical music
            [5] composition types
            [5] folk music
            [5] jazz music
            [5] music industry
            [5] musical instruments
                [6] keyboard instruments
                [6] percussion instruments
                [6] string instruments
                [6] wind instruments
                    [7] brass instruments
                    [7] woodwinds
            [5] opera and vocal
            [5] popular music and dance
            [5] world music
    [3] science fiction
    [3] visual arts
        [4] art galleries and museums
        [4] artistic painting
            [5] painting tools and techniques
            [5] styles and schools of art
        [4] graphic arts
        [4] photography
            [5] cameras
            [5] photographic lenses
            [5] photographic processes
            [5] photographic techniques
            [5] photographic tools
        [4] sculpture
            [5] sculpture tools and techniques
[2] crafts
[2] games
    [3] indoor games
        [4] board games
        [4] card games
        [4] video games
    [3] outdoor games
[2] gaming industry
    [3] gambling
[2] gardening
[2] hobbies
    [3] coin collecting
    [3] stamp collecting
[2] outdoor recreation
    [3] hunting and fishing
[2] pets
[2] restaurant industry
[2] sports
    [3] Olympics
    [3] aquatic sports
        [4] canoeing, kayaking, and rafting
        [4] swimming and diving
        [4] yachting
    [3] baseball
    [3] basketball
    [3] bicycling
    [3] bowling
    [3] boxing
    [3] equestrian events
        [4] horse racing
        [4] rodeo
    [3] fantasy sports
    [3] fitness and health
        [4] fitness equipment
    [3] football
    [3] golf
    [3] gymnastics
    [3] martial arts
    [3] motor sports
        [4] Formula I racing
        [4] Indy car racing
        [4] NASCAR racing
        [4] drag racing
        [4] motorcycle racing
        [4] off-road racing
    [3] soccer
    [3] sports equipment
    [3] tennis
    [3] track and field
    [3] winter sports
        [4] hockey
        [4] ice skating
        [4] skiing
[2] tobacco industry
[2] toys
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Branch 5: geography

[1] cartography

[2] explorers

[1] physical geography

[2] bodies of water
- [3] lakes
- [3] oceans
- [3] rivers

[2] land forms
- [3] coastlands
- [3] continents
- [3] deserts
- [3] highlands
- [3] islands
- [3] lowlands
- [3] mountains
- [3] wetlands

[1] political geography

[2] Africa
- [3] Central Africa
  - [4] Angola
  - [4] Burundi
  - [4] Central African Republic
  - [4] Congo
  - [4] Gabon
  - [4] Kenya
  - [4] Malawi
  - [4] Rwanda
  - [4] Tanzania
  - [4] Uganda
  - [4] Zaire
  - [4] Zambia
- [3] North Africa
  - [4] Algeria
  - [4] Chad
  - [4] Djibouti
  - [4] Egypt
  - [4] Ethiopia
  - [4] Libya
  - [4] Morocco
  - [4] Somalia
  - [4] Sudan
  - [4] Tunisia
- [3] Southern Africa
  - [4] Botswana
  - [4] Lesotho
  - [4] Mozambique
  - [4] Namibia
  - [4] South Africa
  - [4] Swaziland
  - [4] Zimbabwe
- [3] West Africa
  - [4] Benin
  - [4] Burkina Faso
  - [4] Cameroon
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Branch 6: abstract ideas and concepts

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