

Oracle® Role Manager

Developer's Guide

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Preface

The *Oracle Role Manager Developer's Guide* describes the Oracle Role Manager data model and information for customizing the application data model and user interface.

Audience

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Related Documents

For more information, refer to the following documents:

- *Oracle Role Manager Release Notes*
- *Oracle Role Manager User's Guide*
- *Oracle Role Manager Installation Guide*
- *Oracle Role Manager Integration Guide*
- *Oracle Role Manager Administrator's Guide*
- *Oracle Role Manager Java API Reference*

Conventions

The following text conventions are used in this document:

| Convention | Meaning |
|-------------------|--|
| boldface | Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary. |
| <i>italic</i> | Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values. |
| monospace | Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter. |

Oracle Role Manager Data Model

This chapter describes data model for Oracle Role Manager. This document contains information on the primordial and standard data models and includes the following aspects:

- [General Concepts](#)
- [Roles](#)
- [Users](#)
- [Organizations](#)
- [Hierarchies](#)
- [Internal Security and Access Control](#)
- [External Privileges](#)
- [System Infrastructure](#)

1.1 General Concepts

The general concepts described in this section reflect the important information about the Oracle Role Manager data model and how the application is built with that model.

- [Data Model Layering](#)
- [Domains and Attributes](#)
- [Permissions and Privileges](#)

1.1.1 Data Model Layering

The Oracle Role Manager data model follows a multitier approach as follows:

- The base data model objects that are required for Oracle Role Manager to function as designed are defined in the *primordial model*. The primordial model is loaded as part of the initial deployment of Oracle Role Manager.
- The *standard model* provides extensions to the primordial layer, building on base objects. The objects in the standard model are required for the Web application to function as designed. This should be considered when customizing the model-related aspects of the user interface. For example, one customization approach could be satisfied by simply extending the standard model where another approach could require the standard model to be altered or even not deployed at all.

The standard model is defined in a file named `standard.xml`. To view the content of this file, refer to [Section 2.2](#).

- Optional extensions, such as the *oim_integration* model that supports the Oracle Role Manager Integration Library with Oracle Identity Manager, contain extensions to the standard model.

The Oracle Role Manager *application data model* (extensions to the primordial model) is configurable and supports incremental model additions and customizations. For example, the model containing the extensions required to use the Oracle Role Manager Integration Library with Oracle Identity Manager can be deployed after Oracle Role Manager is already installed and in production. Incremental data model deployments can be performed while the application and database are running without disrupting the environment.

One effect of this layered approach is that things defined on a lower layer have very specific ways that they can be extended. For example:

- A domain definition (attribute definition) in one configuration cannot be changed or removed in another. For example, if there is a domain defined in `standard.xml`, you cannot deploy another data model definition at the same time that alters or removes that domain. (Refer to [Section 1.1.2](#) for more information about domains.)
- An object type defined in one configuration cannot be changed or removed in another.
- Hierarchies can only be defined once and not extended in another configuration.

1.1.2 Domains and Attributes

The Oracle Role Manager model uses the concept of *domains*. Domains are attributes (values on objects) within the data model and are defined individually before they are associated with object types.

A domain defines the data type and some inherent aspects of that domain such as various aspects (maximum length, size, precision). Supported data types are String (CLOB), integer, decimal, datetime, Boolean, binary (BLOB), and reference (Long).

The domain can then be associated to object types to define attributes. When associated to those object types, further constraints can be added, such as string pattern constraints, enumerated value lists and value ranges.

Note: Constraints already defined in the domain definition, not the associated object type, cannot be altered. The same is true for domain constraints defined in the primordial model.

1.1.3 Permissions and Privileges

The internal permissions and privileges in Oracle Role Manager are key to the system's internal security and access model and give users the access to types of events in Oracle Role Manager. These permissions and privileges should not be confused with the IT privileges that are used to represent external security models.

Permissions represent general actions that a user may want to do with objects in Oracle Role Manager. These are defined globally and associated with object types in the *standard_permissions* model. The standard permissions model is defined in the `standard_permissions.xml` file. To view the content of this file, refer to [Section 2.2](#).

Note: Permissions are not inherited. For example, person does not inherit the permissions defined for abstractIdentity.

Privileges are the association of a permission and an object type, such as "audit person" or "manage organization." Privileges also support inheritance, for example, a permission on abstractOrg is a general case of the same permission bound to the organization sub-type. Using this example, if a person has the manage permission on abstractOrg but not on organization, that person would implicitly have the manage permission on organization because organization extends abstractOrg.

In addition to defining permissions and privileges, the data model is also the place where particular security policy enforcement is defined. Security policy enforcement is done through access policies on an object type that specify which privilege is necessary to manage (modify) an object of that type and also which privilege is necessary to read the audit details of objects of that type.

The standard permissions model extends the person object type to include the audit, delegate, grant, and manage permissions on person objects. The permissions in the Oracle Role Manager system are defined in both the primordial model and the standard model as shown in [Table 1-1](#).

Table 1-1 System Permissions

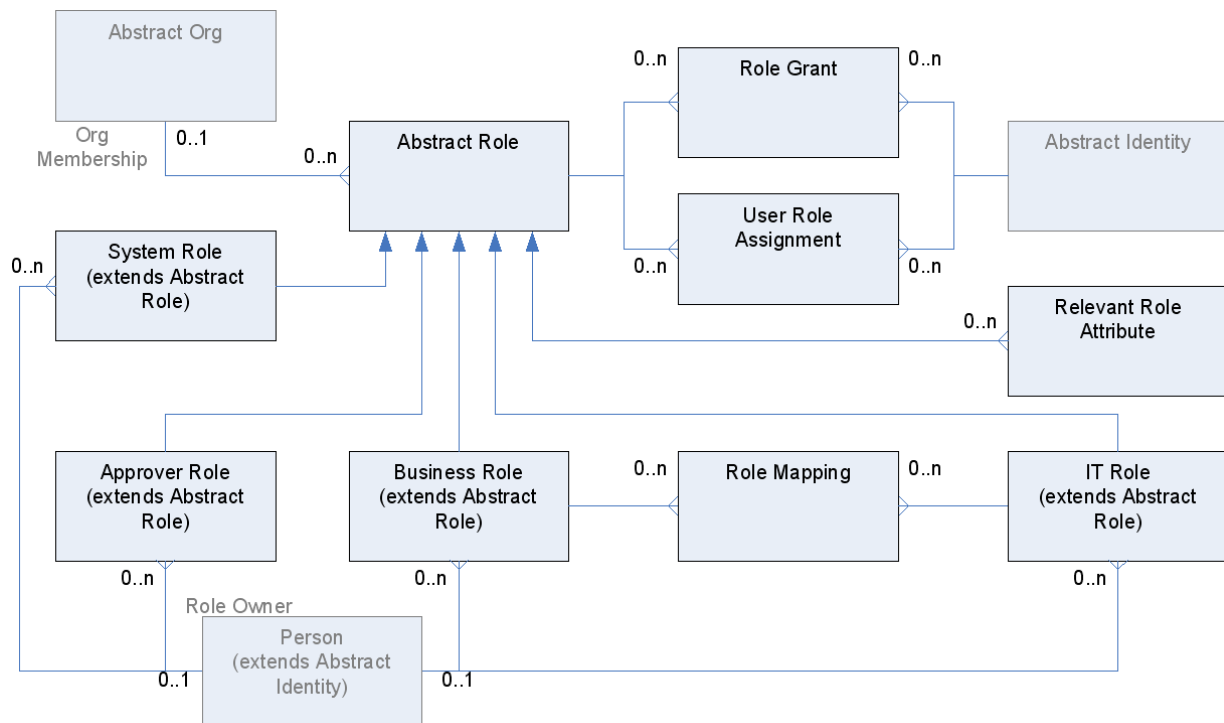
| Permission ID | Defined in | Default Title | Description |
|---------------|----------------------|---------------|--|
| any | primordial | All | Have all permissions for an object. |
| audit | standard_permissions | Audit | Have audit permission for an object (Access through the Web application's user interface to transaction history.) |
| delegate | standard_permissions | Delegate | Have delegate permission for an object. (Used for role delegation.) |
| grant | standard_permissions | Grant | Have grant permission for an object. (Used for role objects for user-role assignments.) |
| manage | standard_permissions | Manage | Have management permission for an object (Includes create, update, and delete.) |

1.2 Roles

This section describes all of the role objects and role-related relationships in the data model, illustrated in [Figure 1–1](#). The following objects are described in this section:

- `abstractRole`
- `approverRole`
- `businessRole`
- `itRole`
- `systemRole`
- `roleGrant`
- `roleMapping`
- `relevantRoleAttribute`
- `userRoleAssignment`

Figure 1–1 Role Object Relationship Diagram



1.2.1 abstractRole

The `abstractRole` object type is the abstract base type from which all roles are extended. The use of an abstract base type is necessary to permit the generalization patterns of role grants, user role assignments and general role functionality.

An instance of `abstractRole` is never explicitly created, but rather, is created as part of creating instances of its subtypes. `abstractRole` is related to `abstractOrg` to represent its membership in the reporting hierarchy for administrative purposes.

The base definition of `abstractRole` is in the primordial model and it is extended in the standard model. `abstractRole` has no permissions as they are defined on its subtypes. The external title for `abstractRole` instances is "all role," which is used in tokenized privileges names, for example, "Audit all role objects" and "Manage all role objects."

1.2.1.1 Attributes for abstractRole

The attributes for abstract role, shown in [Table 1-2](#) are defined in both the primordial model and the standard model.

Table 1-2 *abstractRole Attributes*

| Attribute ID | Defined in | Type | Default Title | Constraints |
|-----------------|------------|---------|---------------------------|---|
| description | primordial | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |
| displayName | primordial | String | Display name | Must not be null whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| eligibilityRule | primordial | CLOB | Eligibility rule | max-length=100000000 |
| membershipRule | primordial | CLOB | Membership rule | max-length=100000000 |
| roleType | primordial | String | Role type | Must not be null. Allowable values are <code>static</code> or <code>dynamic</code> . max-length=32 |
| simpleDynamic | primordial | Boolean | Simple Dynamic | |
| status | primordial | String | Status | Must not be null. Allowable values are <code>inactive</code> or <code>active</code> . Default is <code>inactive</code> . max-length=32 |
| uniqueName | primordial | String | Uniquely Identifying Name | Must be unique (case-sensitive=false). whitespace (cannot have leading or trailing spaces) max-length=256 |

1.2.1.2 Relationship Paths for abstractRole (primordial)

The relationship paths shown in Table 1–3, are defined in the primordial model.

Table 1–3 *abstractRole Relationship Paths (primordial)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|-----------------------|-------------------|--------------|--------------------|
| socHierarchy | socHierarchyRoles | many-to-one | hierarchy |
| role_grants | role | one-to-many | roleGrant |
| grantees | granted_roles | many-to-many | abstractIdentity |
| user_role_assignments | role | one-to-many | userRoleAssignment |
| assignees | assigned_roles | many-to-many | abstractIdentity |

1.2.1.3 Relationship Paths for abstractRole (standard)

The relationship paths shown in Table 1–4 are defined in the standard model.

Table 1–4 *abstractRole Relationship Paths (standard)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|---------------------------------|-------------------------|-------------|--------------|
| parent_reporting_organization | child_reporting_roles | many-to-one | abstractOrg |
| parent_cost_center_organization | child_cost_center_roles | many-to-one | abstractOrg |
| parent_location_organization | child_location_roles | many-to-one | abstractOrg |

1.2.1.4 Related audit objects for abstractRole

The related audit object for abstractRole, shown in Table 1–5, is defined in the standard model.

Table 1–5 *abstractRole Related Audit Objects*

| Related Object Type | Incoming Relationship Path |
|---------------------|----------------------------|
| roleGrant | role |

1.2.2 approverRole

The approverRole subtype of abstractRole is specifically for representing approver roles. It supports only being a dynamic role to fit the recommended model of dynamically managed role memberships. The special aspect of approver roles is that the membership rule resolves in a relative as opposed to a simple fashion, meaning that the set of members of the role can be determined by the approval context object provided when membership is resolved. When defining rules for approver roles, any object type can be provided as an approval context object to resolve the set of people who qualify as approvers.

The base definition of approverRole is in the primordial model and it is extended in the standard model. approverRole has the manage, and audit permissions. The external title for approverRole is "Approver Role," which is used in tokenized privilege names, for example "Audit Approver Role objects."

For more general information about Approver Roles and examples of eligibility rules, refer to the *Oracle Role Manager User's Guide*.

1.2.2.1 Attributes for approverRole

The attributes for `approverRole`, shown in [Table 1–6](#) are defined in the primordial model. All attributes are inherited from the `abstractRole` object type from which `approverRole` is extended.

Table 1–6 *approverRole Attributes*

| Inherited Attribute ID | Defined in | Type | Default Title | Constraints |
|------------------------------|------------|---------|---------------------------|---|
| <code>description</code> | primordial | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |
| <code>displayName</code> | primordial | String | Display name | Must not be null whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| <code>eligibilityRule</code> | primordial | CLOB | Eligibility rule | max-length=100000000 |
| <code>membershipRule</code> | primordial | CLOB | Membership rule | max-length=100000000 |
| <code>roleType</code> | primordial | String | Role type | Must not be null. Allowable values are <code>static</code> or <code>dynamic</code> . max-length=32 |
| <code>simpleDynamic</code> | primordial | Boolean | Simple Dynamic | |
| <code>status</code> | primordial | String | Status | Must not be null. Allowable values are <code>inactive</code> or <code>active</code> . Default is <code>inactive</code> . max-length=32 |
| <code>uniqueName</code> | primordial | String | Uniquely Identifying Name | Must be unique (case-sensitive=false). whitespace (cannot have leading or trailing spaces) max-length=256 |

1.2.2.2 Relationship Paths for approverRole (standard)

The relationship path shown in [Table 1–7](#), is defined in the standard model.

Table 1–7 *approverRole Relationship Paths (standard)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|------------------------|---------------------------------|-------------|--------------|
| <code>roleOwner</code> | <code>ownedApproverRoles</code> | many-to-one | person |

1.2.3 businessRole

The `businessRole` subtype of `abstractRole` is specifically for representing business roles. It supports being either a static or a dynamic role. Static grants of business roles

support sphere of control within the Oracle Role Manager system. (Refer to [Section 1.5](#) for information about sphere of control.)

The base definition of `businessRole` is in the primordial model and it is extended in the standard model. `businessRole` has the `manage`, `audit`, `grant`, and `delegate` permissions. The external title for `businessRole` is "Business Role," which is used in tokenized privilege names, for example "Grant Business Role objects."

For more general information about Business Roles and examples of membership rules, refer to the *Oracle Role Manager User's Guide*.

1.2.3.1 Attributes for `businessRole`

The attributes for `businessRole`, shown in [Table 1-8](#) are defined in the primordial model and extended in the standard model. Many attributes are inherited from the `abstractRole` object type from which `businessRole` is extended.

Table 1-8 *businessRole* attributes

| Attribute ID | Inherited Attribute ID | Defined in | Type | Default Title | Constraints |
|-----------------------------|------------------------------|------------|---------|---------------------------|---|
| <code>isDelegatable</code> | | primordial | Boolean | Can Be Delegated | Default is <code>false</code> . |
| <code>responsibility</code> | | standard | String | Responsibilities | <code>max-length=4000</code> |
| | <code>description</code> | primordial | String | Description | whitespace (cannot have leading or trailing spaces) <code>max-length=4000</code> |
| | <code>displayName</code> | primordial | String | Display name | Must not be null whitespace (cannot have leading or trailing spaces) <code>searchable=true</code> <code>max-length=256</code> |
| | <code>eligibilityRule</code> | primordial | CLOB | Eligibility rule | <code>max-length=100000000</code> |
| | <code>membershipRule</code> | primordial | CLOB | Membership rule | <code>max-length=100000000</code> |
| | <code>roleType</code> | primordial | String | Role type | Must not be null. Allowable values are <code>static</code> or <code>dynamic</code> . <code>max-length=32</code> |
| | <code>simpleDynamic</code> | primordial | Boolean | Simple Dynamic | |
| | <code>status</code> | primordial | String | Status | Must not be null. Allowable values are <code>inactive</code> or <code>active</code> . Default is <code>inactive</code> . <code>max-length=32</code> |
| | <code>uniqueName</code> | primordial | String | Uniquely Identifying Name | Must be unique (<code>case-sensitive=false</code>). whitespace (cannot have leading or trailing spaces) <code>max-length=256</code> |

1.2.3.2 Relationship Paths for businessRole (primordial)

The relationship paths shown in [Table 1–9](#), are defined in the primordial model.

Table 1–9 businessRole Relationship Paths (primordial)

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|------------------------------|----------------|--------------|--------------|
| business_to_it_role_mappings | business_role | one-to-many | roleMapping |
| it_roles | business_roles | many-to-many | itRole |

Refer to [Table 1–3](#) for additional relationship paths of `abstractRole`, which `businessRole` extends.

1.2.3.3 Relationship Paths for businessRole (standard)

The relationship path shown in [Table 1–10](#), is defined in the standard model.

Table 1–10 businessRole Relationship Paths (standard)

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|-------------|--------------------|-------------|--------------|
| roleOwner | ownedBusinessRoles | many-to-one | person |

1.2.3.4 Related audit objects for businessRole

The related audit object for `businessRole`, shown in [Table 1–11](#), is defined in the standard model.

Table 1–11 businessRole Related Audit Objects

| Related Object Type | Incoming Relationship Path |
|---------------------|----------------------------|
| roleMapping | business_role |

1.2.4 itRole

The `itRole` subtype of `abstractRole` is specifically for representing IT roles. It is constrained to only be a static role, but does support mapping to zero or more business roles, representing membership inheritance (in other words, all people who have the business roles mapped to this IT role are considered members of the IT role). Static grants of IT roles do not support sphere of control.

The base definition of `itRole` is in the primordial model and it is extended in the standard model. `itRole` has the `manage`, `audit`, `grant`, and `delegate` permissions. The external title for `itRole` instances is "IT Role," which is used in tokenized privilege names, for example "Grant IT Role objects."

For more general information about IT Roles and examples of membership rules, refer to the *Oracle Role Manager User's Guide*.

1.2.4.1 Attributes for itRole

The attributes for `itRole`, shown in [Table 1–12](#) are defined in both the primordial model and the standard model. Many attributes are inherited from the `abstractRole` object type from which `itRole` is extended.

Table 1–12 *itRole* attributes

| Attribute ID | Inherited Attribute ID | Defined in | Type | Default Title | Constraints |
|---------------------|-------------------------------|-------------------|-------------|---|--|
| isDelegatable | | primordial | Boolean | Can Be Delegated | Default is false. |
| isFinanceRelated | | standard | Boolean | Finance related | Default is false. |
| isHighRisk | | standard | Boolean | High Risk | Default is false. |
| isNpiRelated | | standard | Boolean | Non-Public Personal Information Related | Default is false. |
| isSoxRelated | | standard | Boolean | Sarbanes-Oxley Related | Default is false. |
| | description | primordial | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |
| | displayName | primordial | String | Display name | Must not be null whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| | eligibilityRule | primordial | CLOB | Eligibility rule | max-length=100000000 |
| | membershipRule | primordial | CLOB | Membership rule | max-length=100000000 |
| | roleType | primordial | String | Role type | Must not be null. Allowable values are static or dynamic. max-length=32 |
| | simpleDynamic | primordial | Boolean | Simple Dynamic | |
| | status | primordial | String | Status | Must not be null. Allowable values are inactive or active. Default is inactive. max-length=32 |
| | uniqueName | primordial | String | Uniquely Identifying Name | Must be unique (case-sensitive=false) whitespace (cannot have leading or trailing spaces) max-length=256 |

1.2.4.2 Relationship Paths for itRole (primordial)

The relationship paths shown in [Table 1–13](#), are defined in the primordial model.

Table 1–13 *itRole Relationship Paths (primordial)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|------------------------------|-------------|--------------|------------------------|
| business_to_it_role_mappings | it_role | one-to-many | roleMapping |
| business_roles | it_roles | many-to-many | businessRole |
| it_role_privilege_mappings | it_role | one-to-many | itRolePrivilegeMapping |
| it_privileges | it_roles | many-to-many | itPrivilege |

Refer to [Table 1–3](#) for additional relationship paths of `abstractRole`, which `itRole` extends.

1.2.4.3 Relationship Paths for itRole (standard)

The relationship path shown in [Table 1–14](#), is defined in the standard model.

Table 1–14 *itRole Relationship Paths (standard)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|-------------|--------------|-------------|--------------|
| roleOwner | ownedITRoles | many-to-one | person |

1.2.4.4 Related audit objects for itRole

The related audit objects for `itRole`, shown in [Table 1–15](#), are defined in the standard model.

Table 1–15 *itRole Related Audit Objects*

| Related Object Type | Incoming Relationship Path |
|------------------------|----------------------------|
| roleMapping | it_role |
| itRolePrivilegeMapping | it_role |

1.2.5 systemRole

The `systemRole` subtype of `abstractRole` is specifically for representing system roles. It only supports being a static role. Static grants of system roles support sphere of control by defining the objects on which the grantee has the associated privileges to act upon. For more information about privileges, refer to [Section 1.7](#) For more information about sphere of control, refer to [Section 1.5](#).

The base definition of `systemRole` is in the primordial model and it is extended in the standard model. `systemRole` has the `manage`, `audit`, and `grant` permissions. The external title for `systemRole` is "System Role," which is used in tokenized privilege names, for example "Grant System Role objects."

1.2.5.1 Attributes for systemRole

The attributes for `systemRole`, shown in [Table 1–16](#) are defined in both the primordial model and the standard model. Many attributes are inherited from the `abstractRole` object type from which `systemRole` is extended.

Table 1–16 *systemRole Attributes*

| Attribute ID | Inherited Attribute ID | Defined in | Type | Default Title | Constraints |
|---------------|------------------------|------------|---------|---------------------------|---|
| isDelegatable | | primordial | Boolean | Can Be Delegated | Default is false. |
| | description | primordial | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |
| | displayName | primordial | String | Display name | Must not be null whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| | eligibilityRule | primordial | CLOB | Eligibility rule | max-length=100000000 |
| | membershipRule | primordial | CLOB | Membership rule | max-length=100000000 |
| | roleType | primordial | String | Role type | Must not be null. Allowable values are static or dynamic. max-length=32 |
| | simpleDynamic | primordial | Boolean | Simple Dynamic | |
| | status | primordial | String | Status | Must not be null. Allowable values are inactive or active. Default is inactive. max-length=32 |
| | uniqueName | primordial | String | Uniquely Identifying Name | Must be unique (case-sensitive=false). whitespace (cannot have leading or trailing spaces) max-length=256 |

1.2.5.2 Relationship Paths for systemRole (primordial)

The relationship paths shown in [Table 1–17](#), are defined in the primordial model.

Table 1–17 *systemRole Relationship Paths (primordial)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|-----------------------------|--------------|--------------|-------------------------|
| sys_role_privilege_mappings | system_role | one-to-many | sysRolePrivilegeMapping |
| system_privileges | system_roles | many-to-many | systemPrivilege |

Refer to [Table 1–3](#) for additional relationship paths of `abstractRole`, which `systemRole` extends.

1.2.5.3 Relationship Paths for systemRole (standard)

The relationship path shown in [Table 1–18](#), is defined in the standard model.

Table 1–18 *systemRole Relationship Paths (standard)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|-------------|------------------|-------------|--------------|
| roleOwner | ownedSystemRoles | many-to-one | person |

1.2.5.4 Related audit objects for systemRole

The related audit object for `systemRole`, shown in [Table 1–19](#), is defined in the standard model.

Table 1–19 *systemRole Related Audit Objects*

| Related Object Type | Incoming Relationship Path |
|-------------------------|----------------------------|
| sysRolePrivilegeMapping | system_role |

1.2.6 roleGrant

The `roleGrant` relationship object type represents an explicit membership of an abstract identity to a role. Due to its relationship nature, there can only be one grant per abstract identity per role. Multiple grants that differentiate themselves by sphere of control are represented by zero or more relationships between this object and the sphere of control (represented by hierarchy index mix-ins).

To represent delegated grants, the grantee from which the delegated grant originates is stored in the `originalGrantee_id` reference attribute. If the grant was due to delegation, this attribute is null. Refer to [Section 1.5](#) for more information about sphere of control on role grants.

The base definition of `roleGrant` is in the primordial model and it is extended in the standard model. The external title for `roleGrant` is "Role Grant," which is used in system messages that display in the log files and application server console.

1.2.6.1 Relationship Paths for roleGrant (primordial)

The relationship paths shown in [Table 1–20](#), are defined in the primordial model.

Table 1–20 *roleGrant Relationship Paths (primordial)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|-----------------|---------------------|-------------|------------------|
| originalGrantee | delegatedRoleGrants | many-to-one | abstractIdentity |
| grantee | role_grants | many-to-one | abstractIdentity |
| role | role_grants | many-to-one | abstractRole |

1.2.7 roleMapping

The `roleMapping` relationship object type represents the mapping between a business role and an IT role. The business ramifications of this are that the effective membership of the IT role is the union of its direct members and those of all of its mapped business roles. This also implies that all members of the mapped business roles have any IT privileges that are mapped to the IT role, but the emphasis is normally on the attainment of IT role membership by the people who are members of the business role. Refer to [Section 1.7](#) for information about the mapped IT privileges.

The base definition of `roleMapping` is in the primordial model and it is extended in the standard model. The external title for `roleMapping` is "Business Role to IT Role Mapping," which is used in system messages that display in the log files and application server console.

1.2.7.1 Relationship Paths for roleMapping (primordial)

The relationship paths shown in [Table 1-21](#), are defined in the primordial model.

Table 1-21 *roleMapping Relationship Paths (primordial)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|---------------|------------------------------|-------------|--------------|
| business_role | business_to_it_role_mappings | many-to-one | businessRole |
| it_role | business_to_it_role_mappings | many-to-one | itRole |

1.2.8 relevantRoleAttribute

The `relevantRoleAttribute` structural type object stores attributes that are relevant to the type of role and is used to enable a fast search for "which simple dynamic roles would be affected by a particular set of attribute values changing." For example, to resolve to all person objects whose first name is John, the `relevantRoleAttribute` table will contain the `givenName` attribute.

This type enables fast synchronization of user role assignments when a system identity's attributes are modified. The external title for `relevantRoleAttribute` is "Relevant Role Attribute," which is used in system messages that display in the log files and application server console.

1.2.8.1 Attributes for relevantRoleAttribute

The attribute for `relevantRoleAttribute`, shown in [Table 1-22](#) is defined in the primordial model.

Table 1-22 *relevantRoleAttribute Attributes (primordial)*

| Attribute ID | Defined in | Type | Default Title | Constraints |
|---------------|------------|--------|----------------|------------------------------------|
| attributeName | primordial | String | Attribute Name | Must not be null. max-length=64 |

1.2.8.2 Relationship Paths for relevantRoleAttribute (primordial)

The relationship path shown in [Table 1-23](#), is defined in the primordial model.

Table 1-23 *relevantRoleAttribute Relationship Paths (primordial)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|-------------|--------------------------|-------------|--------------|
| role | relevant_role_attributes | many-to-one | abstractRole |

1.2.9 userRoleAssignment

The `userRoleAssignment` relationship object type represents a derived (implicit) membership of an abstract identity to a role (subtype of `abstractRole`). These objects are created and deleted by the framework based on the results of a role's membership rule, thus representing the derived version of a role grant. Due to its relationship nature, there can only be one assignment per abstract identity per role. Unlike `roleGrant` objects, `userRoleAssignment` objects do not support concepts of sphere of control or delegation.

The definition of `userRoleAssignment` is in the primordial model. The external title for `userRoleAssignment` is "User Role Assignment," which is used in system messages that display in the log files and application server console.

1.2.9.1 Relationship Paths for userRoleAssignment (primordial)

The relationship path shown in [Table 1-24](#), is defined in the primordial model.

Table 1-24 *userRoleAssignment Relationship Paths (primordial)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|-------------|-----------------------|-------------|------------------|
| assignee | user_role_assignments | many-to-one | abstractIdentity |
| role | user_role_assignments | many-to-one | abstractRole |

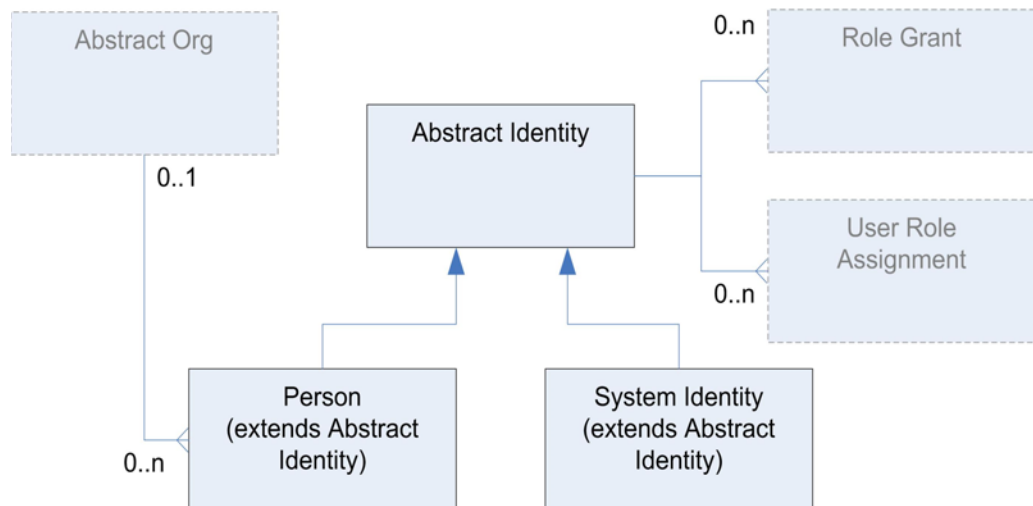
1.3 Users

The objects in this section represent things that can interact with Oracle Role Manager, such as application users, system users, or integrated users, as illustrated in [Figure 1-2](#). Whether a particular object can be used to interact with the system depends on the ability for it to authenticate.

The following objects are described in this section:

- [abstractIdentity](#)
- [person](#)
- [systemIdentity](#)

Figure 1-2 *Users Entity Relationship Diagram*



The object types shown in the diagram with solid borders are described in the following sections.

1.3.1 abstractIdentity

The `abstractIdentity` object type is the abstract root type for all users. This object type is necessary to allow general, user-oriented operations like role grants, user role assignments and authorization. With this base object type, there is shared business logic for identities and people and the ability to define its subtypes independently.

An instance of `abstractIdentity` is never explicitly created, but rather, is created as part of creating instances of its subtypes.

The base definition of `abstractIdentity` is in the primordial model and it is extended in the standard model. `abstractIdentity` has no permissions as they are defined on its subtypes. The external title for `abstractIdentity` instances is "User," which is used in system messages that display in the log files and application server console.

1.3.1.1 Attributes for abstractIdentity

The attributes for `abstractIdentity`, shown in [Table 1–25](#) are defined in both the primordial model and the standard model.

Table 1–25 *abstractRole Attributes*

| Attribute ID | Defined in | Type | Default Title | Constraints |
|--------------|------------|--------|---------------------------|---|
| displayName | primordial | String | Display Name | Must not be null whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| locale | primordial | String | Locale | max-length=128 |
| status | primordial | String | Status | Must not be null. Allowable values are <code>inactive</code> or <code>active</code> . Default is <code>inactive</code> . max-length=32 |
| uniqueName | primordial | String | Uniquely Identifying Name | Must be unique (case-sensitive=false). whitespace (cannot have leading or trailing spaces) max-length=256 |
| userPassword | primordial | String | Hashed Password | max-length=64 |

1.3.1.2 Relationship Paths for abstractIdentity (primordial)

The relationship paths shown in [Table 1–26](#), are defined in the primordial model.

Table 1–26 abstractRole Relationship Paths (primordial)

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|-----------------|-----------------------|-------------|--------------------|
| originalGrantee | delegatedRoleGrants | one-to-many | roleGrant |
| grantee | role_grants | one-to-many | roleGrant |
| assignee | user_role_assignments | one-to-many | userRoleAssignment |

1.3.1.3 Related audit objects for abstractIdentity

The related audit objects for `abstractIdentity`, shown in [Table 1–27](#), are defined in the standard model.

Table 1–27 abstractIdentity Related Audit Objects

| Related Object Type | Incoming Relationship Path |
|---------------------|----------------------------|
| roleGrant | grantee |
| roleGrant | originalGrantee |

1.3.2 person

The `person` object type extends `abstractIdentity` and represents users of Oracle Role Manager that are associated with a real person. Because of this association, they are often synchronized with external systems such as identity management, directory, or single-sign-on products. `person` objects are distinct from `systemIdentity` objects because they are typically synchronized with external systems and configured with custom attributes that would not be applicable for system identities.

The base definition of `person` is in the primordial model and it is extended in the standard model. `person` has the `manage`, `audit`, `grant`, and `delegate` permissions. The external title for `person` is "Person," which is used in tokenized privilege names, for example "Audit Person objects."

1.3.2.1 person Attributes

The `person` object inherits attributes from `abstractIdentity`, defined in the primordial model, and also has direct attributes, defined in the standard model. All `person` attributes are shown in [Table 1–28](#).

Table 1–28 person Attributes

| Inherited Attribute ID | Attribute ID | Defined in | Type | Default Title | Constraints |
|------------------------|--------------|------------|--------|---------------|--|
| | displayName | primordial | String | Display Name | Must not be null whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| | locale | primordial | String | Locale | max-length=128 |
| | status | primordial | String | Status | Must not be null. Allowable values are inactive or active. Default is inactive. max-length=32 |

Table 1–28 (Continued) person Attributes

| Inherited Attribute ID | Attribute ID | Defined in | Type | Default Title | Constraints |
|-------------------------------|----------------------|-------------------|-------------|---------------------------|---|
| uniqueName | | primordial | String | Uniquely Identifying Name | Must be unique (case-sensitive=false). whitespace (cannot have leading or trailing spaces) max-length=256 |
| userPassword | | primordial | String | Hashed Password | max-length=64 |
| | audio | standard | binary | Audio file | |
| | businessCategory | standard | String | Business Category | max-length=64 |
| | carLicense | standard | String | Car License | max-length=16 |
| | departmentNumber | standard | String | Department Number | max-length=64 |
| | description | standard | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |
| | destinationIndicator | standard | String | Destination Indicator | max-length=256 |
| | employeeNumber | standard | String | Employee Number | whitespace (cannot have leading or trailing spaces) max-length=32 |
| | employeeType | standard | String | Employee Type | max-length=64 |
| | fax | standard | String | Fax number | max-length=32 |
| | givenName | standard | String | First Name | whitespace (cannot have leading or trailing spaces) max-length=128 |
| | homePhone | standard | String | Home phone number | max-length=32 |
| | homePostalAddress | standard | String | Home Postal Address | max-length=256 |
| | initials | standard | String | Initials | max-length=16 |
| | jobTitle | standard | String | Job Title | whitespace (cannot have leading or trailing spaces) max-length=256 |
| | jpegPhoto | standard | binary | JPEG Photo | |
| | l | standard | String | Locale | max-length=256 |
| | mail | primordial | String | Email | Pattern must be in the form <i>aa@bb.cc</i> . max-length=128 |

Table 1–28 (Continued) person Attributes

| Inherited Attribute ID | Attribute ID | Defined in | Type | Default Title | Constraints |
|-------------------------------|----------------------------|-------------------|-------------|---------------------------|---|
| | mobile | standard | String | Mobile phone number | max-length=20 |
| | pager | standard | String | Pager number | max-length=20 |
| | photo | standard | binary | Photo | |
| | physicalDeliveryOfficeName | standard | String | Physical delivery office | max-length=256 |
| | postalAddress | standard | String | Postal Address | max-length=256 |
| | postalCode | standard | String | Postal Code | max-length=256 |
| | postOfficeBox | standard | String | P.O. Box | max-length=256 |
| | preferredDeliveryMethod | standard | String | Preferred Delivery Method | max-length=256 |
| | preferredLanguage | standard | String | Preferred Language | max-length=256 |
| | registeredAddress | standard | String | Registered Address | max-length=256 |
| | roomNumber | standard | String | Room Number | max-length=256 |
| | seeAlso | standard | String | See Also | max-length=256 |
| | sn | standard | String | Last Name | Must not be null. whitespace (cannot have leading or trailing spaces) max-length=256 |
| | st | standard | String | State | max-length=256 |
| | street | standard | String | Street | max-length=256 |
| | telephoneNumber | standard | String | Telephone Number | max-length=20 |
| | telexNumber | standard | String | Telex Number | max-length=20 |
| | userCertificate | standard | binary | User Certificate | |
| | userID | primordial | string | User ID | Must be unique (case-sensitive=false). whitespace (cannot have leading or trailing spaces) min-length=4 max-length=256 |
| | userSMIMECertificate | standard | binary | User SMIME Certificate | |
| | x121Address | standard | String | x121 Address | max-length=16 |

1.3.2.2 Relationship Paths for person

The relationship paths shown in [Table 1–29](#) are defined in the standard model.

Table 1–29 *person Relationship Paths*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|---------------------------------|--------------------------|-------------|--------------|
| headedOrg | orgHead | one-to-many | abstractOrg |
| secretary | secretarialCients | many-to-one | person |
| parent_reporting_organization | child_reporting_people | many-to-one | abstractOrg |
| parent_cost_center_organization | child_cost_center_people | many-to-one | abstractOrg |
| parent_location_organization | child_location_people | many-to-one | abstractOrg |
| manager | managedPeople | many-to-one | person |
| ownedITRoles | roleOwner | one-to-many | itRole |
| ownedSystemRoles | roleOwner | one-to-many | systemRole |
| ownedBusinessRoles | roleOwner | one-to-many | businessRole |
| ownedApproverRoles | roleOwner | one-to-many | approverRole |

1.3.3 systemIdentity

The `systemIdentity` object type extends `abstractIdentity` and represents users of Oracle Role Manager that do not have a person representation. Examples of these are:

- **System**

This is the identity used by Oracle Role Manager to represent the user for automated tasks. This identity cannot be used externally as it has no password to authenticate with. This user is created through the bootstrap process and cannot be modified.
- **System Administrator**

This is the identity used to administer the system, for example, for running deployment tools at the command line or through the Oracle Universal Installer. This user is created through the bootstrap process and can be modified and deleted as needed.
- **oimSystem**

This is an identity used by an external system, Oracle Identity Manager, when it interacts with Oracle Role Manager for purposes such as system synchronization. The user is created as part of the deployment process of the Oracle Role Manager Integration Library. Refer to the *Oracle Role Manager Integration Guide* for information about deploying the Oracle Role Manager Integration Library and the `oimSystem` user. Refer to the *Oracle Role Manager Administrator's Guide* for information about creating system identities.

The definition of `systemIdentity` is in the primordial model. `systemIdentity` has the `manage`, `audit`, `grant`, and `delegate` permissions. The external title for `systemIdentity` is "System Identity," which is used in tokenized privilege names, for example "Audit System Identity objects." }

1.3.3.1 Attributes for systemIdentity

The attributes for `systemIdentity`, shown in [Table 1–30](#) are defined in the primordial model. All attributes are inherited from the `abstractIdentity` object type from which `systemIdentity` is extended.

When an external system is the system of record for people or any other particular object type, the Oracle Role Manager administrator would typically configure the system roles/grants so that only the system identity that represents the system of record for person would have permission to create, modify or delete person records. An example of this is the `oimSystem` system identity for Oracle Identity Manager.

Table 1–30 *systemIdentity Attributes*

| Inherited Attribute ID | Attribute ID | Defined in | Type | Default Title | Constraints |
|------------------------|--------------|------------|--------|---------------------------|---|
| displayName | | primordial | String | Display Name | Must not be null whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| locale | | primordial | String | Locale | max-length=128 |
| status | | primordial | String | Status | Must not be null. Allowable values are inactive or active. The default is inactive. max-length=32 |
| uniqueName | | primordial | String | Uniquely Identifying Name | Must be unique (case-sensitive=false). whitespace (cannot have leading or trailing spaces) max-length=256 |
| userPassword | | primordial | String | Hashed Password | max-length=64 |
| | description | primordial | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |
| | mail | primordial | String | Email | Pattern must be in the form <i>aa@bb.cc.dd</i> . max-length=128 |
| | userID | primordial | String | User ID | Must be unique (case-sensitive=false). whitespace (cannot have leading or trailing spaces) min-length=4 max-length=256 |

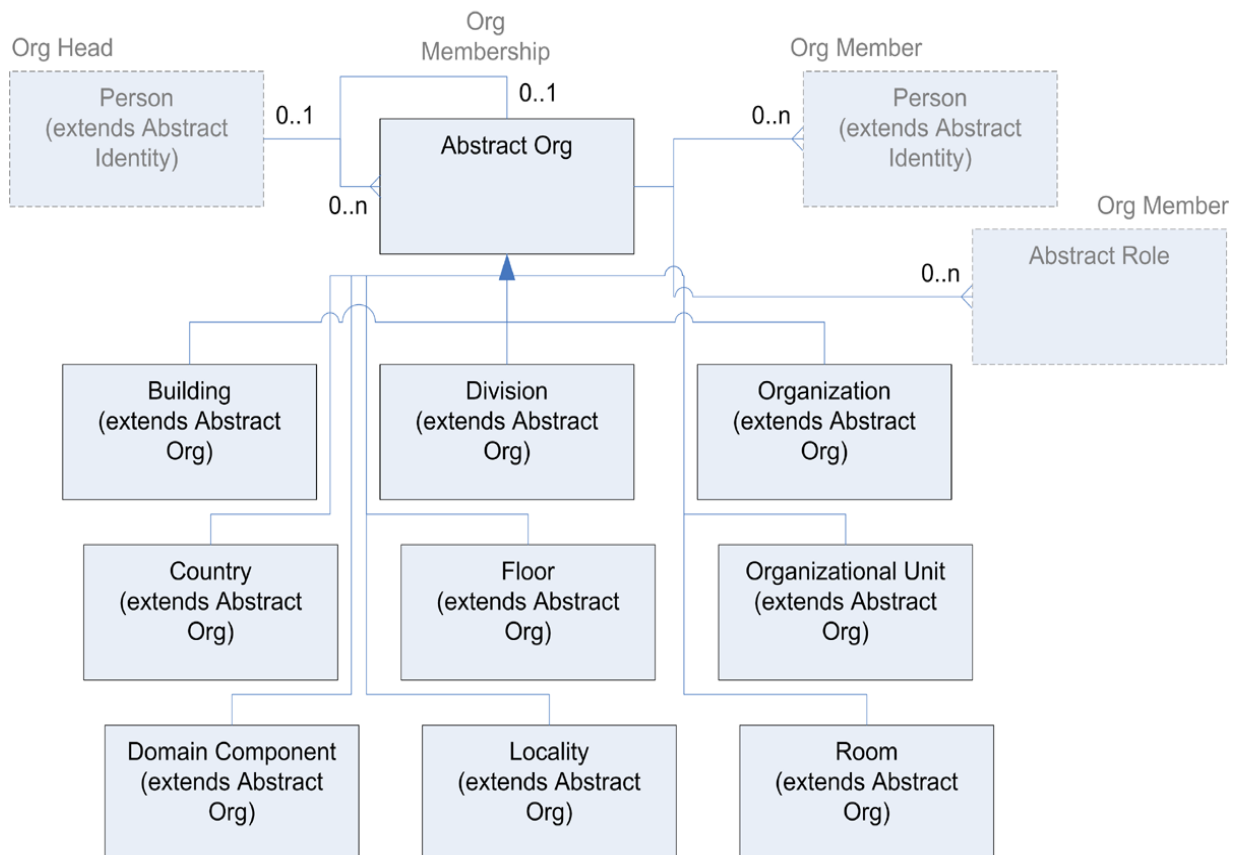
1.4 Organizations

The objects described in this section and illustrated in [Figure 1–3](#) represent various containers that are used to model different types of organization structures such as reporting hierarchies, locations and cost centers. These objects are defined in the standard model and not required for the Oracle Role Manager system to function. However, the Oracle Role Manager Web application requires that these object types exist.

The following objects are described in this section:

- [abstractOrg](#)
- [building](#)
- [country](#)
- [dcObject](#)
- [division](#)
- [floor](#)
- [locality](#)
- [organization](#)
- [ou](#)
- [room](#)

Figure 1–3 Organization Model Entity Relationship Diagram



1.4.1 abstractOrg

The `abstractOrg` object type represents the base type for all organizational constructs. This is necessary to allow generalization for things like hierarchy construction. Most interorganizational relationships are defined in `abstractOrg` so other objects generally refer to this base type for membership information.

An instance of `abstractOrg` is never explicitly created, but rather, is created as part of creating instances of its subtypes.

The definition of `abstractOrg` is in the standard model and has the `manage` and `audit` permissions. The external title for `abstractOrg` instances is "all organization," which is used in tokenized privileges names, for example, "Audit all organization objects" and "Manage all organization objects."

1.4.1.1 Attributes for abstractOrg

The attributes for `abstractOrg`, shown in [Table 1-31](#) are defined in the standard model.

Table 1-31 *abstractOrg Attributes*

| Attribute ID | Defined in | Type | Default Title | Constraints |
|--------------------------|------------|--------|---------------------------|---|
| <code>description</code> | standard | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |
| <code>displayName</code> | standard | String | Display Name | Must not be null. whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| <code>uniqueName</code> | primordial | String | Uniquely Identifying Name | Must be unique (case-sensitive=false). whitespace (cannot have leading or trailing spaces) max-length=256 |

1.4.1.2 Relationship Paths for abstractOrg (standard)

The relationship path shown in [Table 1-32](#), is defined in the standard model.

Of these relationship paths, all of the `parent_*_organization` paths have an incoming, restricted parent action, so that the `abstractOrg` cannot be deleted if there is an active relationship. An active relationship would be if an organization contains another organization, person, or role.

Note: This approach to generic organizational membership, allows the data model great flexibility but also could represent some nonintuitive patterns, such as `building` being contained in `floor`, and so forth.

Table 1–32 abstractOrg Relationship Paths (standard)

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|---------------------------------|---------------------------------|-------------|---------------------|
| orgHead | headedOrgs | many-to-one | person |
| parent_reporting_organization | child_reporting_organizations | many-to-one | abstractOrg |
| parent_location_organization | child_location_organizations | many-to-one | abstractOrg |
| parent_cost_center_organization | child_cost_center_organizations | many-to-one | abstractOrg |
| reporting_hierarchy_root | reporting_hierarchy_anchors | many-to-one | reportingHierarchy |
| location_hierarchy_root | location_hierarchy_anchors | many-to-one | locationHierarchy |
| cost_center_hierarchy_root | cost_center_hierarch_anchors | many-to-one | costCenterHierarchy |
| child_reporting_roles | parent_reporting_organization | one-to-many | abstractRole |
| child_location_roles | parent_location_organization | one-to-many | abstractRole |
| child_cost_center_roles | parent_cost_center_organization | one-to-many | abstractRole |
| child_reporting_people | parent_reporting_organization | one-to-many | person |
| child_location_people | parent_location_organization | one-to-many | person |
| child_cost_center_people | parent_cost_center_organization | one-to-many | person |

1.4.2 building

The `building` subtype of `abstractOrg` is specifically for representing physical buildings. The definition of `building` is in the standard model and has the `manage` and `audit` permissions. The external title for `building` instances is "Building," which is used in tokenized privilege names, for example "Manage Building objects."

The attributes for `building`, shown in [Table 1–33](#) are defined in the standard model. Many attributes are inherited from the `abstractOrg` object type from which `building` is extended.

Table 1–33 building attributes

| Attribute ID | Inherited Attribute ID | Defined in | Type | Default Title | Constraints |
|-----------------|------------------------|------------|--------|------------------|---|
| buildingName | | standard | String | Building name | Must not be null. whitespace (cannot have leading or trailing spaces) max-length=64 |
| postalAddress | | standard | String | Postal Address | max-length=256 |
| telephoneNumber | | standard | String | Telephone number | max-length=20 |

Table 1–33 (Continued) building attributes

| Attribute ID | Inherited Attribute ID | Defined in | Type | Default Title | Constraints |
|--------------|------------------------|------------|--------|---------------------------|--|
| | description | standard | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |
| | displayName | standard | String | Display Name | Must not be null. whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| | uniqueName | standard | String | Uniquely Identifying Name | Must be unique (case-sensitive=false) whitespace (cannot have leading or trailing spaces) max-length=256 |

1.4.3 country

The `country` subtype of `abstractOrg` is specifically for representing countries. The definition of `country` is in the standard model and has the `manage` and `audit` permissions. The external title for `country` instances is "Country," which is used in tokenized privilege names, for example "Manage Country objects."

The attributes for `country`, shown in [Table 1–34](#) are defined in the standard model. Many attributes are inherited from the `abstractOrg` object type from which `country` is extended.

Table 1–34 country attributes

| Attribute ID | Inherited Attribute ID | Defined in | Type | Default Title | Constraints |
|--------------|------------------------|------------|--------|---------------------------|--|
| c | | standard | String | Country code | Must be unique (case-sensitive=false) whitespace (cannot have leading or trailing spaces) max-length=2 |
| | description | standard | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |
| | displayName | standard | String | Display Name | Must not be null. whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| | uniqueName | standard | String | Uniquely Identifying Name | Must be unique (case-sensitive=false) whitespace (cannot have leading or trailing spaces) max-length=256 |

1.4.4 dcObject

The `dcObject` subtype of `abstractOrg` is specifically for representing domain components. The definition of `dcObject` is in the standard model and has the `manage` and `audit` permissions. The external title for `dcObject` instances is "Domain Component," which is used in tokenized privilege names, for example "Manage Domain Component objects."

The attributes for `dcObject`, shown in [Table 1–35](#) are defined in the standard model. All attributes are inherited from the `abstractOrg` object type from which `dcObject` is extended.

Table 1–35 *dcObject attributes*

| Inherited Attribute ID | Defined in | Type | Default Title | Constraints |
|--------------------------|------------|--------|---------------------------|--|
| <code>description</code> | standard | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |
| <code>displayName</code> | standard | String | Display Name | Must not be null. whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| <code>uniqueName</code> | standard | String | Uniquely Identifying Name | Must be unique (case-sensitive=false) whitespace (cannot have leading or trailing spaces) max-length=256 |

1.4.5 division

The `division` subtype of `abstractOrg` is specifically for representing divisions. The definition of `division` is in the standard model and has the `manage` and `audit` permissions. The external title for `division` instances is "Division," which is used in tokenized privilege names, for example "Manage Division objects."

The attributes for `division`, shown in [Table 1–36](#) are defined in the standard model. All attributes are inherited from the `abstractOrg` object type from which `division` is extended.

Table 1–36 *division attributes*

| Inherited Attribute ID | Defined in | Type | Default Title | Constraints |
|--------------------------|------------|--------|---------------|---|
| <code>description</code> | standard | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |
| <code>displayName</code> | standard | String | Display Name | Must not be null. whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |

Table 1–36 (Continued) division attributes

| Inherited Attribute ID | Defined in | Type | Default Title | Constraints |
|------------------------|------------|--------|---------------------------|--|
| uniqueName | standard | String | Uniquely Identifying Name | Must be unique (case-sensitive=false) whitespace (cannot have leading or trailing spaces) max-length=256 |

1.4.6 floor

The `floor` subtype of `abstractOrg` is specifically for representing floors. The definition of `floor` is in the standard model and has the `manage` and `audit` permissions. The external title for `floor` instances is "Floor," which is used in tokenized privilege names, for example "Manage Floor objects."

The attributes for `floor`, shown in [Table 1–37](#) are defined in the standard model. Most attributes are inherited from the `abstractOrg` object type from which `floor` is extended.

Table 1–37 floor attributes

| Attribute ID | Inherited Attribute ID | Defined in | Type | Default Title | Constraints |
|-----------------|------------------------|------------|--------|---------------------------|---|
| floorIdentifier | | standard | String | Floor identifier | Must not be null. whitespace (cannot have leading or trailing spaces) max-length=64 |
| | description | standard | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |
| | displayName | standard | | Display Name | whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| | uniqueName | standard | String | Uniquely Identifying Name | Must be unique (case-sensitive=false). whitespace (cannot have leading or trailing spaces) max-length=256 |

1.4.7 locality

The `locality` subtype of `abstractOrg` is specifically for representing groupings of locales. The definition of `locality` is in the standard model and has the `manage` and `audit` permissions. The external title for `locality` instances is "Locality," which is used in tokenized privilege names, for example "Manage Locality objects."

The attributes for `locality`, shown in [Table 1–38](#) are defined in the standard model. Many attributes are inherited from the `abstractOrg` object type from which `locality` is extended.

Table 1–38 *locality attributes*

| Attribute ID | Inherited Attribute ID | Defined in | Type | Default Title | Constraints |
|--------------|------------------------|------------|--------|---------------------------|---|
| l | | standard | String | Locale | Must not be null. whitespace (cannot have leading or trailing spaces) max-length=256 |
| seeAlso | | standard | String | See Also | max-length=256 |
| st | | standard | String | State | max-length=256 |
| street | | standard | String | Street | max-length=256 |
| | description | standard | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |
| | displayName | standard | String | Display Name | Must not be null. whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| | uniqueName | standard | String | Uniquely Identifying Name | Must be unique (case-sensitive=false). whitespace (cannot have leading or trailing spaces) max-length=256 |

1.4.8 organization

The `organization` subtype of `abstractOrg` is specifically for representing organizations. The definition of `organization` is in the standard model and has the `manage` and `audit` permissions. The external title for `organization` instances is "Organization," which is used in tokenized privilege names, for example "Manage Organization objects."

The attributes for `organization`, shown in [Table 1–39](#) are defined in the standard model. Some attributes are inherited from the `abstractOrg` object type from which `organization` is extended.

Table 1–39 organization attributes

| Attribute ID | Inherited Attribute ID | Defined in | Type | Default Title | Constraints |
|----------------------------|------------------------|------------|--------|---------------------------|--|
| businessCategory | | standard | String | Business category | max-length=64 |
| destinationIndicator | | standard | String | Destination Indicator | max-length=256 |
| fax | | standard | String | Fax number | max-length=32 |
| internationalISDNNumber | | standard | String | International ISDN Number | max-length=32 |
| l | | standard | String | Locale | max-length=256 |
| physicalDeliveryOfficeName | | standard | String | Physical delivery office | max-length=256 |
| postalAddress | | standard | String | Postal Address | max-length=256 |
| postalCode | | standard | String | Postal Code | max-length=256 |
| postOfficeBox | | standard | String | post Office Box | max-length=256 |
| preferredDeliveryMethod | | standard | String | Preferred Delivery method | max-length=256 |
| registeredAddress | | standard | String | Registered Address | max-length=256 |
| seeAlso | | standard | String | See Also | max-length=256 |
| st | | standard | String | State | max-length=256 |
| street | | standard | String | Street | max-length=256 |
| telephoneNumber | | standard | String | Telephone number | max-length=20 |
| telexNumber | | standard | String | Telex Number | max-length=20 |
| x121Address | | standard | String | x121Address | max-length=16 |
| | description | standard | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |
| | displayName | standard | String | Display Name | Must not be null. whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| | uniqueName | standard | String | Uniquely Identifying Name | Must be unique (case-sensitive=false) whitespace (cannot have leading or trailing spaces) max-length=256 |

1.4.9 ou

The ou subtype of abstractOrg is specifically for representing organizational units. The definition of ou is in the standard model and has the manage and audit

permissions. The external title for ou instances is "Organizational Unit," which is used in tokenized privilege names, for example "Manage Organizational Unit objects."

The attributes for ou, shown in Table 1–40 are defined in the standard model. Many attributes are inherited from the abstractOrg object type from which ou is extended.

Table 1–40 ou attributes

| Attribute ID | Inherited Attribute ID | Defined in | Type | Default Title | Constraints |
|----------------------------|------------------------|------------|--------|---------------------------|---|
| businessCategory | | standard | String | Business category | max-length=64 |
| destinationIndicator | | standard | String | Destination Indicator | max-length=64 |
| fax | | standard | String | Fax number | max-length=32 |
| internationalISDNNumber | | standard | String | International ISDN Number | max-length=32 |
| l | | standard | String | Locale | max-length=256 |
| physicalDeliveryOfficeName | | standard | String | Physical delivery office | max-length=256 |
| postalAddress | | standard | String | Postal Address | max-length=256 |
| postalCode | | standard | String | Postal Code | max-length=256 |
| postOfficeBox | | standard | String | post Office Box | max-length=256 |
| preferredDeliveryMethod | | standard | String | Preferred Delivery method | max-length=256 |
| registeredAddress | | standard | String | Registered Address | max-length=256 |
| seeAlso | | standard | String | See Also | max-length=256 |
| st | | standard | String | State | max-length=256 |
| street | | standard | String | Street | max-length=256 |
| telephoneNumber | | standard | String | Telephone number | max-length=20 |
| telexNumber | | standard | String | Telex Number | max-length=20 |
| x121Address | | standard | String | x121Address | max-length=16 |
| | description | standard | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |
| | displayName | standard | String | Display Name | Must not be null. whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| | uniqueName | standard | String | Uniquely Identifying Name | Must be unique (case-sensitive=false). whitespace (cannot have leading or trailing spaces) max-length=256 |

1.4.10 room

The `room` subtype of `abstractOrg` is specifically for representing physical rooms. The definition of `room` is in the standard model and has the `manage` and `audit` permissions. The external title for `room` instances is "Room," which is used in tokenized privilege names, for example "Manage Room objects."

The attributes for `room`, shown in [Table 1–41](#) are defined in the standard model. Some attributes are inherited from the `abstractOrg` object type from which `room` is extended.

Table 1–41 *room attributes*

| Attribute ID | Inherited Attribute ID | Defined in | Type | Default Title | Constraints |
|-----------------|------------------------|------------|--------|---------------------------|--|
| roomNumber | | standard | String | Room number | Must not be null. whitespace (cannot have leading or trailing spaces) max-length=256 |
| seeAlso | | standard | String | See Also | max-length=256 |
| telephoneNumber | | standard | String | Telephone number | max-length=20 |
| | description | standard | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |
| | displayName | standard | String | Display Name | Must not be null. whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| | uniqueName | standard | String | Uniquely Identifying Name | Must be unique (case-sensitive=false) whitespace (cannot have leading or trailing spaces) max-length=256 |

1.5 Hierarchies

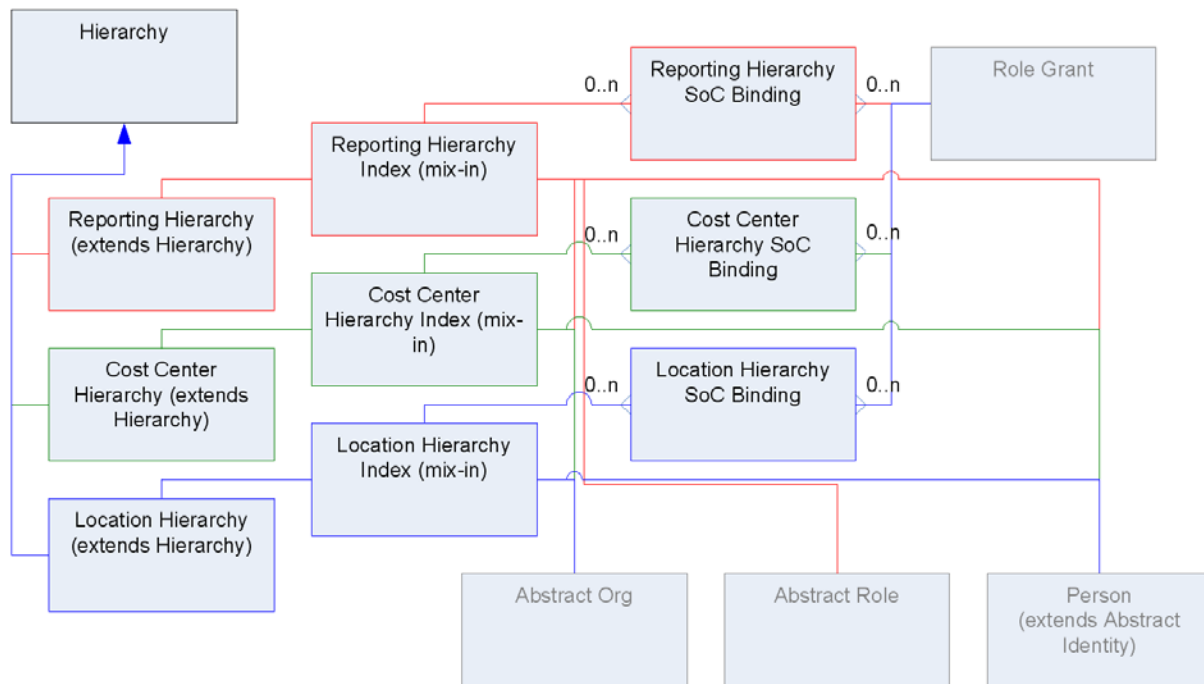
Hierarchies are a specialized combination between a type and a mechanism. Each defined hierarchy creates a hierarchy root type that extends from the `hierarchy` structural object type, a type to represent the hierarchy's index, and a *sphere of control* binding relationship that links role grants to the hierarchy index. The index type also acts as an attachment point for sphere of control. Sphere of control is a relationship between a grant and a node within a hierarchy such as reporting organization, cost center, and location. The sphere of control specifies the scope within which a grant is valid, which provides a means of limiting the validity of a role grant within a hierarchy.

The hierarchy model is illustrated in [Figure 1-4](#).

The following objects are described in this section:

- [hierarchy](#)
- [reportingHierarchy](#)
- [costCenterHierarchy](#)
- [locationHierarchy](#)

Figure 1-4 Hierarchy Model Entity Relationship Diagram



1.5.1 hierarchy

The `hierarchy` object is the abstract base type from which all hierarchy roots extend. It is defined in the primordial data model. It is necessary to support some of the generalizations, for example, the ability to specify hierarchical sphere of control for role grants.

The Oracle Role Manager deploy tool creates, edits and deletes `hierarchy` objects indirectly during the instance management of the hierarchy subtypes.

The definition of `hierarchy` is in the primordial model. The external title for `hierarchy` instances is "Hierarchy," which is used in system messages that display in the log files and application server console.

1.5.1.1 Attributes for hierarchy

The attributes for `hierarchy`, shown in [Table 1-42](#) are defined in the primordial model.

Table 1-42 *abstractOrg Attributes*

| Attribute ID | Defined in | Type | Default Title | Constraints |
|--------------------------------|------------|--------|---------------|---|
| <code>displayName</code> | standard | String | Display Name | Must not be null. whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| <code>hierarchyRootType</code> | standard | String | Root Type | Must not be null. Allowable values are ROOT, NEGATIVE or POSITIVE. max-length=16 |

1.5.1.2 Relationship Paths for hierarchy (primordial)

The relationship path shown in [Table 1-43](#), is defined in the primordial model.

Table 1-43 *hierarchy Relationship Paths (primordial)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|--------------------------------|---------------------------|-------------|---------------------------|
| <code>socHierarchyRoles</code> | <code>socHierarchy</code> | one-to-many | <code>abstractRole</code> |

1.5.2 reportingHierarchy

The `reportingHierarchy` hierarchy object type represents the reporting structure of an organization. All object types use the reporting hierarchy to structure information.

A reporting hierarchy represents the managerial and authoritative relationships that reporting organizations have to one another. For example, the sales organization in China reports to the sales organization that spans all of Asia Pacific.

Because it is the default administrative hierarchy for the Oracle Role Manager application, the system places any unassigned person or role objects that don't have explicit parent organizations into a node in this hierarchy named Unassigned that is created at deploy time. (For more information about the Unassigned node, refer to the *Oracle Role Manager User's Guide*.)

The definition of `reportingHierarchy` is in the standard model and has the `manage` permission. The external title for `reportingHierarchy` instances is "Reporting Hierarchy Root," which is used in tokenized privilege names, for example "Manage Reporting Hierarchy Root objects."

1.5.2.1 Node Relationships for `reportingHierarchy`

The node relationship paths shown in [Table 1–44](#), are defined in the standard model.

Table 1–44 *reportingHierarchy Node Relationship Paths (standard)*

| Parent ID | Child ID | Relationship Path |
|---------------------------------|---------------------------|--|
| <code>reportingHierarchy</code> | <code>abstractOrg</code> | <code>reporting_hierarchy_root</code> |
| <code>abstractOrg</code> | <code>abstractOrg</code> | <code>parent_reporting_organization</code> |
| <code>abstractOrg</code> | <code>abstractRole</code> | <code>parent_reporting_organization</code> |
| <code>abstractOrg</code> | <code>person</code> | <code>parent_reporting_organization</code> |

1.5.3 `costCenterHierarchy`

The `costCenterHierarchy` hierarchy object type represents the cost center structure of the organization.

A cost center hierarchy represents the monetary relationships organizations have to one another. For example, the North American accounting organization pays the expenses for all organizations in North America.

The definition of `costCenterHierarchy` is in the standard model and has the `manage` permission. The external title for `reportingHierarchy` instances is "Cost Center Hierarchy Root," which is used in tokenized privilege names, for example "Manage Cost Center Hierarchy Root objects."

1.5.3.1 Node Relationships for `costCenterHierarchy`

The node relationship paths shown in [Table 1–45](#), are defined in the standard model.

Table 1–45 *reportingHierarchy Node Relationship Paths (standard)*

| Parent ID | Child ID | Relationship Path |
|----------------------------------|--------------------------|---|
| <code>costCenterHierarchy</code> | <code>abstractOrg</code> | <code>cost_center_hierarchy_root</code> |
| <code>abstractOrg</code> | <code>abstractOrg</code> | <code>cost_center_reporting_organization</code> |
| <code>abstractOrg</code> | <code>person</code> | <code>cost_center_reporting_organization</code> |

1.5.4 `locationHierarchy`

The `locationHierarchy` hierarchy object type represents the location structure of the organization.

The location hierarchy represents the physical relationship that different locations have to one another. For example, individual bank branches in San Francisco are organized under the California location.

The definition of `locationHierarchy` is in the standard model and has the `manage` permission. The external title for `locationHierarchy` instances is "Location Hierarchy Root," which is used in tokenized privilege names, for example "Manage Location Hierarchy Root objects."

1.5.4.1 Node Relationships for locationHierarchy

The node relationship paths shown in Table 1–46, are defined in the standard model.

Table 1–46 *locationHierarchy Node Relationship Paths (standard)*

| Parent ID | Child ID | Relationship Path |
|-------------------|-------------|------------------------------|
| locationHierarchy | abstractOrg | location_hierarchy_root |
| abstractOrg | abstractOrg | parent_location_organization |
| abstractOrg | person | parent_location_organization |

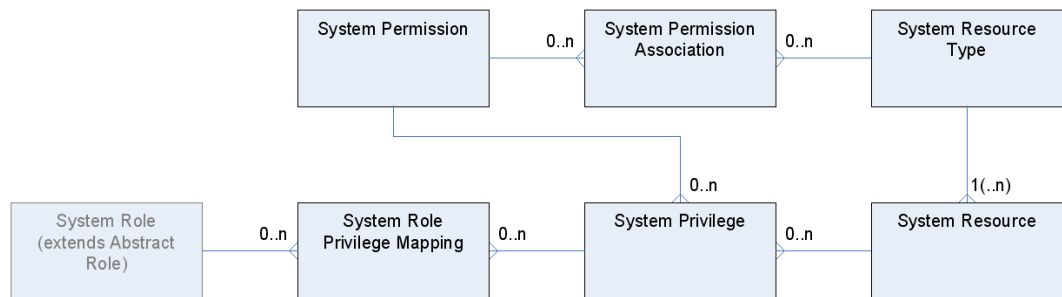
1.6 Internal Security and Access Control

The objects in this section are the underlying infrastructure used for the internal security model. (Refer to Section 1.2.5 for details on the `systemRole` object type.)

The following objects are described in this section:

- `systemPermission`
- `systemPrivilege`
- `systemResource`
- `systemResourceType`
- `sysPermissionAssociation`
- `sysRolePrivilegeMapping`

Figure 1–5 *Internal Security Entity Relationship Diagram*



1.6.1 systemPermission

The `systemPermission` object type represents the permissions that are available to associate with system resource types to use for privileges. They are explicitly defined in the data model configuration. The any permission is defined in the primordial model and implicitly inherits all of the capabilities of any other defined permission. At model deployment time, the deployment framework creates `systemPermission` objects based on the permissions defined in the data model configurations.

The definition of `systemPermission` is in the primordial model. The external title for `systemPermission` is "System Permission," which is used in which is used in system messages that display in the log files.

1.6.1.1 Attributes for systemPermission

The attributes for `systemPermission`, shown in [Table 1–54](#) are defined in the primordial model.

Table 1–47 *systemPermission Attributes*

| Attribute ID | Defined in | Type | Default Title | Constraints |
|--------------|------------|--------|---------------|--|
| name | primordial | String | Name | Must not be null. Must be unique (case-sensitive=false). whitespace (cannot have leading or trailing spaces) max-length=256 |
| displayName | primordial | String | Display Name | Must not be null whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| description | primordial | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |

1.6.1.2 Relationship Paths for systemPermission (primordial)

The relationship paths shown in [Table 1–48](#), are defined in the primordial model.

Table 1–48 *systemPermission Relationship Paths (primordial)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|----------------------------|--------------------|--------------|--------------------------|
| sys_applicable_permissions | system_permission | one-to-many | sysPermissionAssociation |
| n/a | system_permissions | many-to-many | systemResourceType |
| system_privileges | system_permission | one-to-many | systemPrivilege |

1.6.2 systemPrivilege

The `systemPrivilege` object type represents the association between system permissions and system resources. `systemPrivilege` objects are mapped to system roles to represent that the members of that system role have the system permission with respect to the system resource (and due to the `all` pattern, to objects associated with that type). At model deployment time, the deployment framework creates one `systemPrivilege` for each `systemResource` for each applicable `systemPermission` (applicable system permissions are those mapped to the `systemResourceType` associated with the `systemResource`).

The base definition of `systemPrivilege` is in the primordial model and extended in the standard model. The external title for `systemPrivilege` is "System Privilege," which is used in which is used in system messages that display in the log files and application server console.

1.6.2.1 Attributes for systemPrivilege

The attributes for `systemPrivilege`, shown in [Table 1–49](#) are defined in the primordial model.

Table 1–49 *systemPrivilege Attributes*

| Attribute ID | Defined in | Type | Default Title | Constraints |
|--------------|------------|--------|---------------|--|
| name | primordial | String | Name | Must not be null. whitespace (cannot have leading or trailing spaces) max-length=256 |
| displayName | primordial | String | Display Name | Must not be null whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| description | primordial | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |

1.6.2.2 Relationship Paths for systemPrivilege (primordial)

The relationship paths shown in [Table 1–50](#), are defined in the primordial model.

Table 1–50 *systemPrivilege Relationship Paths (primordial)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|-----------------------------|-------------------|-------------|-------------------------|
| system_resource | system_privileges | many-to-one | systemResource |
| system_permission | system_privileges | many-to-one | systemPermission |
| sys_role_privilege_mappings | system_privilege | one-to-many | sysRolePrivilegeMapping |

1.6.2.3 Related Audit Objects for systemPrivilege (primordial)

The related audit object, shown in [Table 1–51](#), is defined in the primordial model.

Table 1–51 *systemPrivilege Related Audit Objects (primordial)*

| Related Object | Incoming Relationship Path |
|-------------------------|----------------------------|
| sysRolePrivilegeMapping | system_privilege |

1.6.3 systemResource

The `systemResource` object type represents a particular instance or group of system resources. Each is associated with a `systemResourceType` and adds a qualifier. The qualifier is intended as a mechanism allowing system resources to represent some subset of all resources of that type. When the Oracle Role Manager model is first deployed, the deployment framework creates one `systemResource` instance with the `all` qualifier for each `systemResourceType` object. `systemResource` objects are created and updated by deployment framework and cannot be modified by users.

The definition of `systemResource` is in the primordial model. The external title for `systemResource` is "System Resource," which is used in system messages that display in the log files and application server console.

1.6.3.1 Attributes for systemResource

The attributes for `systemResource`, shown in [Table 1–52](#) are defined in the primordial model.

Table 1–52 *systemResource Attributes*

| Attribute ID | Defined in | Type | Default Title | Constraints |
|--------------|------------|--------|---------------|--|
| name | primordial | String | Name | Must not be null. Must be unique (case-sensitive=false). whitespace (cannot have leading or trailing spaces) max-length=256 |
| displayName | primordial | String | Display Name | Must not be null whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| qualifier | primordial | String | Qualifier | Must not be null. whitespace (cannot have leading or trailing spaces) max-length=256 |

1.6.3.2 Relationship Paths for systemResource (primordial)

The relationship paths shown in [Table 1–53](#), are defined in the primordial model.

Table 1–53 *systemResource Relationship Paths (primordial)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|----------------------|------------------|-------------|--------------------|
| system_resource_type | system_resources | many-to-one | systemResourceType |
| system_privileges | system_resource | one-to-many | systemPrivilege |

1.6.4 systemResourceType

The `systemResourceType` object represents types of system resources (for example, `person`, `abstractRole`, `itRole`, or `organization`). When the Oracle Role Manager model is first deployed, the deployment framework creates one `systemResourceType` instance for each object type defined in the data model. `systemResourceType` objects cannot be modified by users and are normally not queried by them.

The definition of `systemResourceType` is in the primordial model. The external title for `systemResourceType` is "System Resource Type," which is used in system messages that display in the log files and application server console.

1.6.4.1 Attributes for systemResourceType

The attributes for `systemResourceType`, shown in [Table 1–54](#) are defined in the primordial model.

Table 1–54 *systemResourceType Attributes*

| Attribute ID | Defined in | Type | Default Title | Constraints |
|--------------|------------|--------|---------------|--|
| name | primordial | String | Name | Must not be null. Must be unique (case-sensitive=false). whitespace (cannot have leading or trailing spaces) max-length=256 |
| displayName | primordial | String | Display Name | Must not be null whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| description | primordial | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |

1.6.4.2 Relationship Paths for systemResourceType (primordial)

The relationship paths shown in [Table 1–55](#), are defined in the primordial model.

Table 1–55 *systemResourceType Relationship Paths (primordial)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|---------------------------|----------------------|--------------|--------------------------|
| system_resources | system_resource_type | one-to-many | systemResource |
| sys_applicable_permission | system_resource_type | one-to-many | sysPermissionAssociation |
| system_permissions | n/a | many-to-many | systemPermission |

1.6.5 sysPermissionAssociation

The `sysPermissionAssociation` relationship object type represents the association between system permissions and a system resource types. If a system permission is associated to a system resource type, this signifies that the associated system permission is applicable for resources of that system resource type. These associations are defined at the object-type level in the data model configurations. There is an implicit association between all system resource types and the any primordial-defined system permission.

At model deployment time, the deployment framework creates these objects based upon the data model configuration.

The definition of `sysPermissionAssociation` is in the primordial model. The external title for `sysPermissionAssociation` is "System Resource Type to Permission Mapping," which is used in system messages that display in the log files and application server console.

1.6.5.1 Relationship Paths for relevantRoleAttribute (primordial)

The relationship path shown in [Table 1–56](#), is defined in the primordial model.

Table 1–56 *sysPermissionAssociation Relationship Paths (primordial)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|----------------------|----------------------------|-------------|--------------------|
| system_resource_type | sys_applicable_permissions | many-to-one | systemResourceType |
| system_permission | sys_applicable_permissions | many-to-one | systemPermission |

1.6.6 sysRolePrivilegeMapping

The `sysRolePrivilegeMapping` relationship object types are, along with `systemRole` objects, the only user-modifiable parts of the internal security model.

`sysRolePrivilegeMapping` objects describe which system privileges the members of a system role have. These mappings can be created or deleted through business logic to support whatever system role to system privilege combinations are required. At deployment time, the bootstrap deployment manager creates several of these to represent which privileges the system administrator role has by default.

The definition of `sysRolePrivilegeMapping` is in the primordial model. The external title for `sysRolePrivilegeMapping` is "System Role to System Privilege Mapping," which is used in system messages that display in the log files and application server console.

1.6.6.1 Relationship Paths for sysRolePrivilegeMapping (primordial)

The relationship path shown in [Table 1–57](#), is defined in the primordial model.

Table 1–57 *sysRolePrivilegeMapping Relationship Paths (primordial)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|------------------|-----------------------------|-------------|-----------------|
| system_role | sys_role_privilege_mappings | many-to-one | systemRole |
| system_privilege | sys_role_privilege_mappings | many-to-one | systemPrivilege |

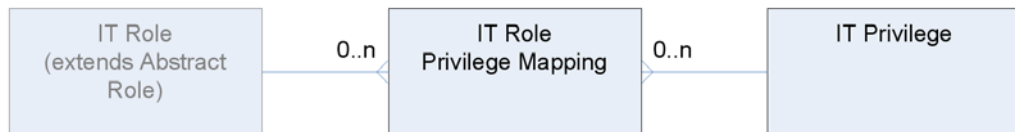
1.7 External Privileges

The objects described in this section represent external privilege information that may be consumed by external identity management and provisioning systems. These objects, illustrated in [Figure 1–6](#), have no impact on the internal security model.

The following objects are described in this section:

- [itPrivilege](#)
- [itRolePrivilegeMapping](#)

Figure 1–6 *External Privilege Model Entity Relationship Diagram*



1.7.1 itPrivilege

The `itPrivilege` object type represents an external privilege. What that means to the external system is represented in the Oracle Role Manager system only in the `itPrivilegeDetails` CLOB attribute where information can be stored that is interpreted by the provisioning system or the actual system where the privilege is applied. It is up to the external system, such as an access provisioning system, to interpret this data.

The base definition of `itPrivilege` is in the primordial model and extended in the standard model. `itPrivilege` has the `manage` and `audit` permissions. The external title for `itPrivilege` is "IT Privilege," which is used in tokenized privilege names, for example "Manage IT Privilege objects."

1.7.1.1 Attributes for itPrivilege

The attributes for `itPrivilege`, shown in [Table 1-58](#), are defined in both the primordial model and the standard model.

Table 1-58 *itPrivilege Attributes*

| Attribute ID | Defined in | Type | Default Title | Constraints |
|---------------------------------|------------|--------|---------------------------|---|
| <code>description</code> | standard | String | Description | whitespace (cannot have leading or trailing spaces) max-length=4000 |
| <code>displayName</code> | primordial | String | Display Name | Must not be null whitespace (cannot have leading or trailing spaces) searchable=true max-length=256 |
| <code>itPrivilegeDetails</code> | primordial | CLOB | Privilege Details | max-length=100000000 |
| <code>uniqueName</code> | standard | String | Uniquely Identifying name | Must be unique (case-sensitive=false). whitespace (cannot have leading or trailing spaces) max-length=256 |

1.7.1.2 Relationship Paths for itPrivilege (primordial)

The relationship path shown in [Table 1-59](#), is defined in the primordial model.

Table 1-59 *itPrivilege Relationship Paths (primordial)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|-----------------|--------------------------------|-------------|-----------------------------|
| <code>it</code> | <code>system_privileges</code> | many-to-one | <code>systemResource</code> |

1.7.1.3 Related Audit Objects for itPrivilege (standard)

The related audit object, shown in [Table 1-60](#), is defined in the standard model.

Table 1-60 *itPrivilege Related Audit Objects (standard)*

| Related Object | Incoming Relationship Path |
|-------------------------------------|----------------------------|
| <code>itRolePrivilegeMapping</code> | <code>it_privilege</code> |

1.7.2 itRolePrivilegeMapping

The `itRolePrivilegeMapping` relationship object type represents the link between IT roles and IT privileges. When a link between an IT role and a privilege exists, this indicates that any member of the role (directly or through an IT to business role mapping) should be given the mapped privilege.

The definition of `itPrivilege` is in the primordial model. The external title for `itRolePrivilegeMapping` is "IT Role to IT Privilege Mapping," which is used in system messages that display in the log files and application server console.

1.7.2.1 Relationship Paths for itPrivilege (primordial)

The relationship path shown in [Table 1–59](#), is defined in the primordial model.

Table 1–61 *itPrivilege Relationship Paths (primordial)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|---------------------------|---|-------------|--------------------------|
| <code>it_role</code> | <code>it_role_privilege_mappings</code> | many-to-one | <code>itRole</code> |
| <code>it_privilege</code> | <code>it_role_privilege_mappings</code> | many-to-one | <code>itPrivilege</code> |

1.7.2.2 Related Audit Objects for itPrivilege (standard)

The related audit object, shown in [Table 1–60](#), is defined in the standard model.

Table 1–62 *itPrivilege Related Audit Objects (standard)*

| Related Object | Incoming Relationship Path |
|-------------------------------------|----------------------------|
| <code>itRolePrivilegeMapping</code> | <code>it_privilege</code> |

1.8 System Infrastructure

The objects in this section have little in common other than they are used by the system for (typically) non-business-related operations. Most of them are used for back-end infrastructure and have no obvious presence in any normal user interface. All of the objects described in this section are defined in the primordial model.

The following objects are described in this section:

- [auditEvent](#)
- [auditEventDetail](#)
- [baseBundle](#)
- [configuration](#)
- [localizedBundle](#)
- [pluginPack](#)

1.8.1 auditEvent

The `auditEvent` object type represents the audit events that are caused during the lifetime of business transactions. It is used by the business logic layer to search for audit events, but has special access patterns. The `auditEvent` objects that would be returned by a search are limited to those events where the current user has the appropriate audit privilege over the event's related object. `auditEvent` objects are updated by the Oracle Role Manager framework during business transactions.

The definition of `auditEvent` is in the primordial model. The external title for `auditEvent` is "Audit Event," which is used in which is used in system messages that display in the log files and application server console.

1.8.1.1 Attributes for `auditEvent`

The attributes for `auditEvent`, shown in [Table 1-63](#), are defined in the primordial model.

Table 1-63 *itPrivilege Attributes (primordial)*

| Attribute ID | Defined in | Type | Default Title | Constraints |
|------------------|------------|----------|--------------------|---|
| actorID | primordial | integer | Actor ID | Must not be null. scale=20 |
| actorDisplayName | primordial | String | Actor Display Name | Must not be null. max-length=256 |
| operationID | primordial | String | Operation ID | Must not be null. whitespace (cannot have leading or trailing spaces) max-length=64 |
| definitionID | primordial | String | Definition ID | Must not be null. whitespace (cannot have leading or trailing spaces) max-length=64 |
| operationTitle | primordial | String | Operation Title | Must not be null. whitespace (cannot have leading or trailing spaces) max-length=128 |
| reason | primordial | String | Reason | max-length=4000 |
| eventTime | primordial | datetime | Event Time | Must not be null. |
| transactionID | primordial | integer | Transaction ID | Must not be null. scale=10 |
| auditStatus | primordial | String | Audit Status | Must not be null. Allowable values are <code>finalized</code> , <code>pending</code> or <code>anceled</code> . max-length=32 |

1.8.1.2 Relationship Paths for `auditEvent` (primordial)

The relationship path shown in [Table 1-64](#) is defined in the primordial model.

Table 1-64 *Relationship Paths for `auditEvent`*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|-------------|-------------|-------------|------------------|
| auditEvent | details | one-to-many | auditEventDetail |

1.8.2 auditEventDetail

The `auditEventDetail` object type represents the audit event details that are created during the lifetime of business transactions. The `auditEventDetail` objects that would be returned by a search are limited to those events where the current user has the appropriate audit privilege over the event's related object. `auditEventDetail` objects are updated by the Oracle Role Manager framework during business transactions.

The definition of `auditEventDetail` is in the primordial model. The external title for `auditEventDetail` is "Audit Event Detail," which is used in which is used in system messages that display in the log files and application server console.

1.8.2.1 Attributes for auditEventDetail

The attributes for `auditEventDetail`, shown in [Table 1–65](#), are defined in the primordial model.

Table 1–65 *auditEventDetail Attributes (primordial)*

| Attribute ID | Defined in | Type | Default Title | Constraints |
|-----------------|------------|----------|------------------------|--|
| subjectKeyID | primordial | integer | subject Key ID | Must not be null. searchable=true scale=20 |
| subjectKeyType | primordial | String | Subject Key Type | Must not be null. searchable=true whitespace (cannot have leading or trailing spaces) max-length=64 |
| changeTime | primordial | datetime | Change Time | Must not be null. |
| changeInfo | primordial | CLOB | Change Information XML | max-length=100000000 |
| oldSubjectState | primordial | String | Old Subject State | Allowable values are effective or non-effective. max-length=64 {} |
| newSubjectState | primordial | String | New Subject State | Allowable values are effective or non-effective. max-length=64 {} |

1.8.2.2 Relationship Paths for auditEventDetail (primordial)

The relationship path shown in [Table 1–66](#) is defined in the primordial model.

Table 1–66 *Relationship Paths for auditEventDetail (primordial)*

| Outgoing ID | Incoming ID | Cardinality | Foreign Type |
|-------------|-------------|-------------|--------------|
| details | auditEvent | many-to-one | auditEvent |

1.8.3 baseBundle

The `baseBundle` object type is where the default localization data is stored in XML form. It is used by the Oracle Role Manager deployment tools and not accessed for business purposes. The API base bundles are not in the database, but are instead in the class path.

1.8.4 configuration

The `configuration` object type is where the business configuration is stored in XML form. It is used by the Oracle Role Manager deployment tools and not accessed for business purposes.

1.8.5 localizedBundle

The `localizedBundle` object type is where the localizations are stored in property file form. It is used by the Oracle Role Manager deployment tools and read by way of the Oracle Role Manager administrative console; it is not accessed for business purposes. Both the `baseBundle` and the `localizedBundle` have a `categoryID` attribute indicating a relationship, but because some of the base bundles are deployed in the class path as opposed to the database, there cannot be relational integrity and hence no supporting relationship paths. This object is not accessed by business logic.

1.8.6 pluginPack

The `pluginPack` object type is where the pluggable custom Java business logic is stored in binary form. It is used by the Oracle Role Manager deployment tools and not accessed for business purposes.



Configuring the Data Model

This chapter describes the steps to modify the data model configuration of the Oracle Role Manager data model in a managed fashion.

Note: This chapter assumes that an instance of Oracle Role Manager is already installed following the instructions in the *Oracle Role Manager Installation Guide*.

This chapter includes the following sections:

- [Best Practices](#)
- [Viewing the Standard Model Configuration](#)
- [Adding and Modifying Attributes](#)
- [Adding and Modifying Reference Attributes](#)
- [Adding Structural Type Objects](#)
- [Extending the Standard Configuration](#)
- [Modifying the Standard Configuration](#)
- [Deploying Data Model Customizations](#)

2.1 Best Practices

Caution: Data model changes cannot be reverted. Before making any modifications to the Oracle Role Manager data model, be sure to back up both of the Oracle Role Manager schemas (owner and application user schema) so that you can revert to the original state.

There are several approaches to customizing the Oracle Role Manager data model, depending on the type of customization that you want.

The data model is configurable through XML files. Oracle Role Manager provides a standard data model, which creates and configures the entities required by the Oracle Role Manager application. The first thing to determine is whether your customizations require modifications to the standard model or additions to the standard model.

If the standard model has already been deployed and you need to make changes, it is recommended that you copy the standard configuration, edit it, then deploy your changes to the database. In this case, it is recommended that the deployment of the

modified standard model is deployed on an empty schema because some definitions, such as constraints on attributes, cannot be additive. If you are certain that your changes are only additive and do not affect constraints, you can deploy your customizations over an existing deployment of the standard model.

Note: If you are using the Oracle Role Manager application's user interface, you should take care not to modify any entities or attributes in a way that would make the application unusable. Examples of this are removing the `organization` or `location` hierarchy entities.

If you are adding attributes on entities that are already in the standard model or new entities with new definitions, you can create a new XML file and deploy just those additions.

2.2 Viewing the Standard Model Configuration

The standard model depends on the *primordial* model, which defines the core entities required for Oracle Role Manager to function.

Both the standard and primordial models are described in detail in [Chapter 1](#). Although all the object types and constraints are described in that chapter, it is helpful to be aware of how those object types are defined in the XML file while determining the customization approach you want to take.

Note: The primordial model is not customizable.

To view the standard configuration, you will need to extract files from the `standard.car` configuration archive.

To view the standard model configuration:

1. On the Oracle Role Manager host, navigate to the `ORM_HOME/config` directory:
2. Using a utility like WinZip or `jar`, extract the entire contents of `standard.car` into a temporary location, such as `ORM_HOME/config_temp`.

Once expanded, notice that in your temporary location, there is the `config` directory, and in that, the subdirectories for the standard configuration. The subdirectory and files the pertain to the standard data model can be found in the following layout:

```
config/  
  oracle.iam.rm.temporal/  
    standard.xml  
    standard_permissions.xml
```

The `standard.xml` file contains configuration for all objects necessary for the Oracle Role Manager application to function properly.

2.3 Adding and Modifying Attributes

Attributes in the Oracle Role Manager model are first defined as *domains*. A domain is an abstract logical data type that when associated with an object type as part of the attribute definitions of an entity, it is then considered an *attribute*.

Adding attributes in Oracle Role Manager means the domain must be defined before it can be added to an attribute definition. In other words, the domain definition must already exist, either in a configuration that your configuration depends on (such as standard), or earlier in the XML file in which it is being defined as an attribute.

Refer to the "Object Type Definition" and "Model Definition" sections of [Appendix A](#) for the schema definition defining which data types and constraints are available for use in attribute definitions.

Example 2–1 Creating an Attribute

This example adds a new attribute to the `person` structural type with a pattern restriction for specified characters. (Refer to [Section 2.5](#) for more information about structural object types. (Refer to API documentation of the `java.util.regex.Pattern` class for information about controlling allowed characters in attribute values.)

This change is purely additive, so it can be deployed at any time after the standard model has been deployed.

In a new XML file, the new domain is first defined. For example:

```
<domain-definitions>
  <domain-definition name="favoriteColor">
    <t:string>
      <t:length id="length" max-length="32">
        <t:violation-message>The favorite color can be no longer than 32
          characters</t:violation-message>
      </t:length>
    </t:string>
  </domain-definition>
</domain-definitions>
```

Later in the same file, the `person` structural type is extended to have the new domain as an attribute along with a special pattern to restrict specified characters. For example:

```
<type-definitions>
  <extension-type-definition extending-type-id="person">
    <attribute-definitions>
      <attribute domain="favoriteColor">
        <title>Favorite Color</title>
        <t:pattern id="pattern">
          <t:violation-message>The favorite color cannot contain the following
            characters: # ^ + ! @ = </t:violation-message>
          <t:pattern>[^\#\^\+\!\@\=]+</t:pattern>
        </t:pattern>
      </attribute>
    </attribute-definitions>
  </extension-type-definition>
</type-definitions>
```

The model addition is then deployed as described in [Section 2.6, "Extending the Standard Configuration."](#)

Example 2-2 Modifying an Attribute

This example changes the `employeeNumber` attribute so that it is required for all person objects in the system. In addition, this example adds constraints so it is both required and unique (no duplicates may be created).

Important Note: Because this changes a domain definition that is already in standard model, it cannot be additive and requires that it the modified standard model is deployed on a schema where no standard model has been deployed previously.

In the copy of the `standard.xml` file, in the section that extends the person object type, `<extension-type-definition extending-type-id="person">`, the `employeeNumber` attribute is edited as follows (the modifications are shown in bold type):

```
<attribute domain="employeeNumber">
  <title>Employee Number</title>
  <t:string-ext>
    <t:non-null-constraint id="non-null">
      <t:violation-message>The employee number must be
        specified.</t:violation-message>
    </t:non-null-constraint>
    <t:unique-constraint id="unique" case-sensitive="false"
      type="varying-temporal">
      <t:violation-message>The employee number must be
        unique.</t:violation-message>
    </t:unique-constraint>
    <t:whitespace id="whitespace">
      <t:violation-message>The employee number cannot have leading or trailing
        spaces.</t:violation-message>
    </t:whitespace>
  </t:string-ext>
</attribute>
```

The model addition is then deployed as described in [Section 2.7, "Modifying the Standard Configuration."](#)

2.4 Adding and Modifying Reference Attributes

Relationships in Oracle Role Manager are defined by *reference attributes* in the object definition. Reference attributes are many-to-one relationships and refer to another object type rather than a primitive type.

Each reference attribute has an ID, the foreign object of the relationship and the IDs and user-friendly titles representing incoming and outgoing relationship paths.

For example, the person object definition contains this reference attribute for the relationship between person and `costCenter` as shown here:

```
<reference-attribute id="costCenterOrg_id" foreign-type="abstractOrg"
  parent-action="restrict"
  outgoing-relationship-path="parent_cost_center_organization"
  incoming-relationship-path="child_cost_center_people">
  <title>Cost Center Organization</title>
  <outgoing-relationship-path-title>Parent Cost Center
    Organization</outgoing-relationship-path-title>
  <incoming-relationship-path-title>Child Cost Center
    People</incoming-relationship-path-title>
</reference-attribute>
```

The following table describes the elements of this reference attribute. Refer to the [Appendix A.1, "Object Type Definition"](#) for the schema definition defining these elements.

Table 2–1 Reference Attribute Components

| Attribute | Description |
|----------------------------|--|
| id | This is the ID of the reference attribute that backs this relationship path. The convention is that the ID be the object type followed by <code>_id</code> . |
| foreign-type | The foreign type is the type of object this relationship points to. It can be the same object as the one used as the ID, or it can be its parent object. In the case of the relationship shown previously, the ID is <code>costCenterOrg_id</code> and the foreign type is <code>abstractOrg</code> . By defining the relationship using the parent type as the foreign type, this allows a broader relationship, for example, if the foreign type is <code>abstractOrg</code> , the parent can be any subtype of <code>abstractOrg</code> . |
| parent-action | <p>This optional attribute is used for governing the sphere of control around relationships. The available values are:</p> <ul style="list-style-type: none"> ▪ <code>restrict</code> The child must be deleted or the value changed before the parent can be deleted. ▪ <code>cascade</code> The child is deleted when the parent is deleted. ▪ <code>set-null</code> The child's field value in the relationship is set to null when the parent is deleted. <p>Note: If no parent action attribute is set, the default parent action is <code>set null</code>.</p> |
| outgoing-relationship-path | The outgoing relationship path represents the path from the object type where the reference attribute is being defined to the object type used as the ID. |
| incoming-relationship-path | The incoming relationship path represents the path from the object type used as the ID to the object type where the reference attribute is defined. |

Example 2–3 Creating a Relationship

This example adds a new reference attribute for the one-to-many, person to person relationship between a Review Manager and the people managed by that manager. This change is purely additive, therefore it can be deployed at any time after the standard model has been deployed.

In a new XML file, the person structural type is extended to have the new relationship. For example:

```
<type-definitions>
  <extension-type-definition extending-type-id="person">
    <attribute-definitions>
      <reference-attribute id="reviewManager_id" foreign-type="person"
        outgoing-relationship-path="reviewer_manager_person"
        incoming-relationship-path="reviewees_managed_people">
        <title>Review Manager</title>
        <outgoing-relationship-path-title>
          Review Manager
        </outgoing-relationship-path-title>
        <incoming-relationship-path-title>
          Review-Managed People
        </incoming-relationship-path-title>
      </reference-attribute>
    </attribute-definitions>
  </extension-type-definition>
</type-definitions>
```

The model addition is then deployed as described in [Section 2.6, "Extending the Standard Configuration."](#)

2.5 Adding Structural Type Objects

Structural type objects in the Oracle Role Manager model represent first-class business objects, such as organizations, people, and roles. They have no identifying foreign keys and store attributes and permissions.

Structural type objects can extend other structural type objects, for example like organization does from abstractOrg, or not, depending on the needs of the model.

When adding structural type objects, you can use existing domains in attribute definitions as well as any new domains that you need. Make sure that the domains are defined in the domain definitions before you associate them with the new object type.

Example 2-4 Creating a Structural Type

This example adds a new object type to represent a physical resource and its attributes. It also creates relationships (such the person responsible for the resource and the building that contains the resource) and permissions (manage and audit).

This change is purely additive, so it can be deployed at any time after the standard model has been deployed.

In a new XML file, all the new domains to associate with the new object are first defined. For example:

```
<domain-definitions>
  <domain-definition name="isInWorkingOrder">
    <t:boolean/>
  </domain-definition>
  <domain-definition name="isReservable">
    <t:boolean/>
  </domain-definition>
</domain-definitions>
```

Later in the same file, the `physicalResource` structural type is defined and the previously defined attributes and relationships are associated. For example:

```
<type-definitions>
  <structural-type-definition id="physicalResource">
    <title>Physical Resource</title>
    <attribute-definitions>
      <attribute domain="displayName">
        <title>Physical Resource</title>
        <t:string-ext>
          <t:non-null-constraint id="non-null">
            <t:violation-message>The resource name is
              required.</t:violation-message>
          </t:non-null-constraint>
        </t:string-ext>
      </attribute>
      <attribute domain="description">
        <title>Description</title>
      </attribute>
      <attribute domain="isInWorkingOrder">
        <title>In Working Order</title>
        <t:boolean-ext>
          <t:default-value>>true</t:default-value>
        </t:boolean-ext>
      </attribute>
      <reference-attribute id="resourceOwner_id" foreign-type="person"
        outgoing-relationship-path="resourceOwner"
        incoming-relationship-path="ownedResources">
        <title>Resource Owner</title>
        <outgoing-relationship-path-title>Resource
          Owner</outgoing-relationship-path-title>
        <incoming-relationship-path-title>Owned
          Resources</incoming-relationship-path-title>
      </reference-attribute>
      <reference-attribute id="building_id" foreign-type="abstractOrg"
        outgoing-relationship-path="parent_building"
        incoming-relationship-path="child_resources">
        <title>Building</title>
        <outgoing-relationship-path-title>Parent Resource
          Building</outgoing-relationship-path-title>
        <incoming-relationship-path-title>Child Building
          Resources</incoming-relationship-path-title>
      </reference-attribute>
    </attribute-definitions>
    <permissions>
      <permission id="audit"/>
      <permission id="manage"/>
    </permissions>
    <access-policy read-audit-details-permission="audit"/>
  </structural-type-definition>
</type-definitions>
```

The model addition is then deployed as described in [Section 2.6](#).

2.6 Extending the Standard Configuration

To extend the standard model, you will need to create a new XML file containing your customizations and create a new .car file containing that XML file in the expected directory layout. This file will depend on the standard model also being deployed.

To extend the standard model configuration:

1. On the Oracle Role Manager host, create a directory for your customization. For example, `C:\ORM_HOME\model_custom`.
2. In the new directory, create a subdirectory named `config`.
3. In the `config` directory, create a subdirectory named `oracle.iam.rm.temporal`.
4. In the `temporal` directory, create an XML file that contains the following expected elements at the beginning:

```
<?xml version="1.0" encoding="UTF-8"?>
<temporal xmlns="http://xmlns.oracle.com/iam/rm/temporal/config/1_0"
  xmlns:t="http://xmlns.oracle.com/iam/rm/type/def/1_0"
  id="datamodel_custom" version="1.0.0">

  <dependencies>
    <dependency id="standard" version="3.0.0"/>
  </dependencies>
```

where `datamodel_custom` is the name of the XML file without the file extension and `1.0.0` is the version to assign to this customization.

5. Add the configuration you want in the body of the XML, after the dependencies element, in the following order:

- New domain definitions
- New permission definitions
- New or extensions to object type definitions

6. Make sure the content in this file ends with:

```
</temporal>
```

7. Using a utility like WinZip or jar, repackage everything in the within the directory created in step 1, and create a archive file appended with the .car file extension, for example, `datamodel_custom.car`.

8. Open the .car file and ensure that it contains the XML file with the path `config/oracle.iam.rm.temporal`.

Note: If it instead is `datamodel_custom/config/oracle.iam.rm.temporal`, then your changes will not be deployed to the database.

9. Deploy your model additions by include this file in the collection of .car files following the steps in [Section 2.8, "Deploying Data Model Customizations."](#)

2.7 Modifying the Standard Configuration

To modify the standard model, you will need to edit and repackage the standard configuration before deploying your customizations to the database.

Note: Care should be taken when modifying object types in the standard model. If you are using the Oracle Role Manager application, changes you make to existing object types in this file could result in errors or unexpected behavior in the application.

To modify the standard model configuration:

1. From the temporary location where `standard.car` was extracted (refer to [Section 2.2](#)), navigate to `config/oracle.iam.rm.temporal`.
2. Add or edit the definitions in the `standard.xml` file as needed.

Note: If you are deploying a model that has been deployed previously, you must increment the version number.

3. Using a utility like WinZip or jar, repackage everything in the temporary directory and create a new file appended with the `.car` file extension, for example, `datamodel_custom.car`.
4. Include this file in the collection of `.car` files as part of the deploy command described in [Section 2.8](#).

2.8 Deploying Data Model Customizations

This procedure assumes that Oracle Role Manager has been successfully installed and the Oracle Role Manager database instance is running.

To deploy data model customizations:

1. On the Oracle Role Manager installation host, navigate to `ORM_HOME/config`.
2. Make sure the `db.properties` file in `ORM_HOME/config` contains the correct information for your database environment. If it does not, modify it so it contains the following two lines:

```
db.driverClass=oracle.jdbc.driver.OracleDriver
db.connection_string=jdbc:oracle:thin:@//$HOST$: $PORT$/ $SERVICE$
```

where `$HOST$` is the database host name, `$PORT$` is the database listener port, and `$SERVICE$` is the database instance on which the Oracle Role Manager users/schemas were created.

3. Stop the Oracle Role Manager application server if it is running.
4. In a command window, navigate to `ORM_HOME/bin`.

-
5. Run the following command to deploy the configuration

```
deploy "collection_of_cars" orm-owner ormapp-user admin-user
```

where:

collection_of_cars contains the relative paths and file names of the .car files to deploy. This collection must be within quotes with delimiters appropriate to the platform (a semicolon (;) for Windows, otherwise a colon (:)). For example, if you have customized the standard model and a separate customization that extends the standard model, the .car collection might be:

```
"../model_custom/datamodel_custom.car;../model_custom/standard_custom.car;"
```

orm-owner is the user name of the Oracle Role Manager database owner user/schema

ormapp-user is the user name of the Oracle Role Manager application user/schema

admin-user is the user name of the Oracle Role Manager System Administrator.

6. At the prompts, type the passwords of the database owner, application user, and administrator.

After you have deployed your data model customizations, you can verify the data model changes using a database utility such as Oracl SQL Developer or DB Visualizer.

Configuring the User Interface

This chapter describes the steps to modify the application user interface of Oracle Role Manager in a managed fashion.

This chapter includes the following sections:

- [Best Practices](#)
- [Extracting Files from the Web Application Archive](#)
- [Modifying Appearance and Style](#)
- [Modifying the Search Component](#)
- [Deploying UI Customizations](#)

3.1 Best Practices

Changes to the Oracle Role Manager user interface are made by modifying files contained in the Web application archive file that is deployed on the application server. To support future upgrades and to simplify reverting to the original state of the application, the recommendation is as follows:

- Archive a copy of the original Web application archive file provided with the release.

Keeping a copy allows the opportunity to make comparisons and redeploy the application as its original state at any time.

- Extract the entire contents of the Web application archive file, retaining all directory path information, and store them in a version control repository system.

Using a version control system enables you to carefully manage updates and additions to those files, but more importantly, helps you retain your customizations when upgrading to later versions of Oracle Role Manager.

Note: All user interface customizations require modifying the content of the Web application archive file, rebundling it, and redeploying it on the application server. For most deployments, the application server must then be restarted for changes to be in effect.

For the purpose of clarity in this document, the location where you extracted the contents of the Web application archive file is referred to as *ORMUI_HOME*.

3.2 Extracting Files from the Web Application Archive

To extract files from Web application archive:

1. On the Oracle Role Manager host, navigate to the *ORM_HOME/webui* directory.
2. Go to the subdirectory named for the application server where Oracle Role Manager intended to be deployed (for example, *weblogic/9.2*).
3. In the source control location that you will store your customization, create a directory named *webui*.
4. Using a utility like WinZip or *jar*, extract the entire contents of the *webui.war* file (or for WebSphere, the *webui.ear* file) into the newly created *webui* directory.

Note: This location is the one referred to in this document as *ORMUI_HOME*.

Once expanded, the subdirectories and files you should see in that location are:

```
images/  
META-INF/  
nlstree/  
pages/  
scripts/  
styles/  
WEB-INF/  
signin.jsf  
signin.xhtml  
signout.xhtml
```

5. Navigate to *WEB-INF/lib* and create a directory named *webui*.
6. Using a utility like WinZip or *jar*, extract the entire contents of the *webui.jar* file into the newly created *webui* directory within *WEB-INF/lib*.

These files include the *Resource.properties* file that is used for setting properties and labels in the user interface.

7. Using the source control system, check in all these files so you can store the baseline of the application before any changes are made

3.3 Modifying Appearance and Style

The appearance and style of the Oracle Role Manager user interface is governed by style sheets and image files. The style sheet for the general areas of the application is the *style.css* file. This is where you can modify the "look and feel" of the application.

Before you decide on your modifications you might want to see the settings in this style sheet.

To view the style sheet:

- Navigate to the *ORMUI_HOME/styles* directory.

You should see the *style.css* file, which is where customizations can be made.

Once you decide on your modifications, you can edit this file and then deploy your changes as described in [Section 3.5](#).

The following sections include examples of some of the style modifications you can do.

3.3.1 Changing the Header Logo

If desired, you can replace the Oracle Role Manager logo with one of your own.

Note: The logo you use should be within the range of 234 pixels in width and 40 pixels in height.

Example 3-1 Changing the Logo

This example replaces the standard logo with a custom logo.

1. Navigate to `ORMUI_HOME/images`.
2. Rename `logo.gif` to `RoleManagerLogo.gif`.
3. Copy the logo you want to use as the banner logo into `ORMUI_HOME/images`.
4. Rename your logo to `logo.gif`.

Depending on your logo, you may want to modify the header background and link colors as described in the subsequent section.

3.3.2 Changing the Header Background and Link Colors

If desired, you can modify the header background and link colors in the header to match your logo.

Example 3-2 Changing the Background and Link Colors

This example changes the background of the header area to white. It also changes the color of the link text so they display over the white background.

1. Navigate to `ORMUI_HOME/styles`.
2. Open the `style.css` file for editing.
3. Change the `globalheader` element to remove the header background graphic and change the background color as follows:

```
.globalheader {
    background-color: #ffffff;
    padding-top: 10px;
    padding-bottom: 10px;
    width: 100%;
}
```

4. Change the `globalhelp` element to change the help links in the header to blue so they are visible on the white background as follows:

```
.globalhelp {
    font-size: 11px;
    font-family: Tahoma, Arial, sans-serif;
    color: #0033cc;
    vertical-align: top;
    text-align: right;
    padding-top: 5px;
    padding-right: 12px;
}
```

-
5. Change the following elements to change the color to black to make the Sign Out link visible:

```
..globalhelp a{
  color: #000000;
  text-decoration: none;
  text-align: right;
  padding-left: 5px;
}

.globalhelp a:visited{
  color: #000000;
  text-decoration: none;
  text-align: right;
}

.globalhelp a:hover {
  color: #000000;
  text-decoration: underline;
  text-align: right;
}
```

6. Save and close the `style.css` file.

3.4 Modifying the Search Component

The number of search results per page in can be configured by modifying the value for the `page.table.rowcount` property.

Example 3-3 *Changing the Number of Rows in the Search Results*

This example changes the number of rows in the search results area from the default of 15 rows to 20 rows.

1. Navigate to `ORMUI_HOME/WEB-INF/lib/webui`.
2. Open the `Resource.properties` file for editing.
3. Search for the property named `page.table.rowcount` and replace the value with 20 for twenty rows in the search results.
4. Save and close the `Resource.properties` file.
5. Using a utility such as WinZip or jar, rebundle the entire contents of `WEB-INF/lib/webui` and name the file `webui.jar` to replace the previous `webui.jar` file in `WEB-INF/lib`.
6. Remove the `webui` directory created in `ORMUI_HOME/WEB-INF/lib`.
7. Deploy your changes as described in [Section 3.5](#).

3.5 Deploying UI Customizations

This procedure assumes that Oracle Role Manager has been deployed previously following the instructions in the *Oracle Role Manager Installation Guide*.

To deploy UI customizations:

1. Navigate to the `ORMUI_HOME` directory chosen in [Section 3.2](#).
2. Using a utility such as WinZip or jar, archive the entire content of the `ORMUI_HOME` and save it with the following name:
 - For WebLogic: `webui.war`
 - For JBoss: `webui.war`
 - For WebSphere: `webui.ear`
3. For WebLogic, deploy and test the modified Web application as follows:
 - a. In a Web browser, log in to the WebLogic Server Console. For example:
`http://appserverhost:7001/console`
 - b. In the left pane, click **Deployments**, then click **Install**.
 - c. Navigate to the location of the new Web application archive file, select `webui.war`, then click **Next**.
 - d. Select **Install this deployment as an application**, then click **Next**.
 - e. In the Target field, select the Oracle Role Manager server, then click **Next**.
 - f. In the Name field, type `Oracle Role Manager Application`.
 - g. In the Security list, select **Custom Roles and Policies: Use only roles and policies that are defined in the Administration Console**, then click **Next**.
 - h. Click **Finish**.
 - i. In a Web browser, navigate to the Oracle Role Manager Web application address. For example:
`http://appserverhost:7001/webui`
 - j. Log in as the Oracle Role Manager Administrator.
You should be able to see your customizations to the UI.
4. For JBoss, deploy and test the modified Web application as follows:
 - a. Copy the new `webui.war` file to the JBoss server where Oracle Role Manager server is deployed. For example:
`JBOSS_HOME/server/default/deploy`
 - b. Start the JBoss server.
 - c. In a Web browser, navigate to the Oracle Role Manager Web UI. For example:
`http://appserverhost:8080/webui`
 - d. Log in as the Oracle Role Manager Administrator.
You should be able to see your customizations to the UI.

-
5. For WebSphere, deploy and test the modified Web application as follows:
 - a. In a Web browser, log in to the WebSphere administrative console. For example:
`http://appserverhost:9060/ibm/console`
 - b. From **Applications > Install New Application**, choose **Remote file system**, then click **Browse** to navigate to the location of the new Web application archive file, then select `webui.ear`.
 - c. Click **Next** on the next two pages to accept the defaults.
 - d. Click **Finish**, then save your changes.
 - e. From **Applications > Enterprise Applications > ORM Web UI**, click **Manage Modules**.
 - f. Select **webui**.
 - g. In the Class loader order list, choose **Classes loaded with application class loader first**.
 - h. Click **OK**, then save your changes.
 - i. From **Applications > Enterprise Applications**, select **ORM Web UI**, then click **Start**.

(This assumes you are administering WebSphere on the same server as the ORM Web UI is installed.)
 - j. In a Web browser, navigate to the Oracle Role Manager Web application address. For example:
`http://appserverhost:9080/webui`
 - k. Log in as the Oracle Role Manager Administrator.
You should be able to see your customizations to the UI.

XML Schema Definitions

This appendix contains the XML schema definitions for the data model. The standard data model and any customizations to the Oracle Role Manager model are validated by two schema definitions, the object type definition and the model configuration.

This appendix contains the following sections:

- [Object Type Definition](#)
- [Model Definition](#)

A.1 Object Type Definition

```
<?xml version="1.0" encoding="UTF-8"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns="http://xmlns.oracle.com/iam/rm/type/def/1_0"
  targetNamespace="http://xmlns.oracle.com/iam/rm/type/def/1_0"
  attributeFormDefault="unqualified"
  elementFormDefault="qualified" >

  <xsd:simpleType name="Version">
    <xsd:restriction base="xsd:string">
      <xsd:pattern
        value="[0-9]{1,4}\.[0-9]{1,4}\.[0-9]{1,4}(\.[0-9]{1,4}){0,2}">
        <xsd:annotation>
          <xsd:documentation>i.e. x.y.z, x.y.z.j or x.y.z.j.h. where
            x, y, z, j and h are "small" integers</xsd:documentation>
        </xsd:annotation>
      </xsd:pattern>
    </xsd:restriction>
  </xsd:simpleType>

  <xsd:complexType name="StringType">
    <xsd:complexContent>
      <xsd:extension base="PrimitiveType">
        <xsd:sequence>
          <xsd:element name="length" type="StringLengthConstraint"/>
          <xsd:element name="whitespace" type="WhitespaceConstraint"
            minOccurs="0"/>
          <xsd:element name="pattern" type="StringPatternConstraint"
            minOccurs="0"/>
          <xsd:element name="default-value" type="xsd:string"
            minOccurs="0"/>
          <xsd:element name="default-unique-value" type="xsd:string"
            minOccurs="0"/>
        </xsd:sequence>
      </xsd:extension>
    </xsd:complexContent>
  </xsd:complexType>

```

```
        </xsd:extension>
      </xsd:complexContent>
    </xsd:complexType>

    <xsd:complexType name="StringTypeExt">
      <xsd:complexContent>
        <xsd:extension base="PrimitiveTypeExt">
          <xsd:sequence>
            <xsd:element name="whitespace" type="WhitespaceConstraint"
              minOccurs="0"/>
            <xsd:element name="pattern" type="StringPatternConstraint"
              minOccurs="0"/>
            <xsd:element name="default-value" type="xsd:string"
              minOccurs="0"/>
            <xsd:element name="default-unique-value" type="xsd:string"
              minOccurs="0"/>
          </xsd:sequence>
        </xsd:extension>
      </xsd:complexContent>
    </xsd:complexType>

    <xsd:complexType abstract="true" name="NumericType">
      <xsd:complexContent>
        <xsd:extension base="PrimitiveType">
          <xsd:sequence>
            <xsd:element name="value-range" type="NumericConstraint"
              minOccurs="0"/>
          </xsd:sequence>
          <xsd:attribute name="scale" type="xsd:nonNegativeInteger"
            use="required"/>
        </xsd:extension>
      </xsd:complexContent>
    </xsd:complexType>

    <xsd:complexType abstract="true" name="NumericTypeExt">
      <xsd:complexContent>
        <xsd:extension base="PrimitiveTypeExt">
          <xsd:sequence>
            <xsd:element name="value-range" type="NumericConstraint"
              minOccurs="0"/>
          </xsd:sequence>
        </xsd:extension>
      </xsd:complexContent>
    </xsd:complexType>

    <xsd:complexType name="IntegerType">
      <xsd:complexContent>
        <xsd:extension base="NumericType">
          <xsd:sequence>
            <xsd:element name="default-value" type="xsd:long"
              minOccurs="0"/>
            <xsd:element name="default-unique-value" type="xsd:string"
              minOccurs="0"/>
          </xsd:sequence>
        </xsd:extension>
      </xsd:complexContent>
    </xsd:complexType>
```

```
<xsd:complexType name="IntegerTypeExt">
  <xsd:complexContent>
    <xsd:extension base="NumericTypeExt">
      <xsd:sequence>
        <xsd:element name="default-value" type="xsd:long"
          minOccurs="0"/>
        <xsd:element name="default-unique-value" type="xsd:string"
          minOccurs="0"/>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="DecimalType">
  <xsd:complexContent>
    <xsd:extension base="NumericType">
      <xsd:sequence>
        <xsd:element name="default-value" type="xsd:double"
          minOccurs="0"/>
        <xsd:element name="default-unique-value" type="xsd:string"
          minOccurs="0"/>
      </xsd:sequence>
      <xsd:attribute name="precision" type="xsd:nonNegativeInteger"
        use="required"/>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="DecimalTypeExt">
  <xsd:complexContent>
    <xsd:extension base="NumericTypeExt">
      <xsd:sequence>
        <xsd:element name="default-value" type="xsd:double"
          minOccurs="0"/>
        <xsd:element name="default-unique-value" type="xsd:string"
          minOccurs="0"/>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="DateTimeType">
  <xsd:complexContent>
    <xsd:extension base="PrimitiveType">
      <xsd:sequence>
        <xsd:element name="default-value" type="dateTime"
          minOccurs="0"/>
        <xsd:element name="default-unique-value" type="xsd:string"
          minOccurs="0"/>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>
```

```

<xsd:simpleType name="dateTime">
  <xsd:restriction base="xsd:string">
    <!-- yyyy-MM-dd'T'HH:mm:ss.SSS OR "transaction" -->
    <xsd:pattern
      value="(\\d{4}-(0[1-9]|1[0-2])-(0[1-9]|[12]\\d|3[01])T([01]\\d|2[
        0-3])(:[0-5]\\d){2}(\\.\\d{3})?)|transaction"/>
    </xsd:restriction>
  </xsd:simpleType>

<xsd:complexType name="DateTimeTypeExt">
  <xsd:complexContent>
    <xsd:extension base="PrimitiveTypeExt">
      <xsd:sequence>
        <xsd:element name="default-value" type="dateTime"
          minOccurs="0"/>
        <xsd:element name="default-unique-value" type="xsd:string"
          minOccurs="0"/>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="BooleanType">
  <xsd:complexContent>
    <xsd:extension base="PrimitiveType">
      <xsd:sequence>
        <xsd:element name="default-value" type="xsd:boolean"
          minOccurs="0"/>
        <xsd:element name="default-unique-value" type="xsd:string"
          minOccurs="0"/>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="BooleanTypeExt">
  <xsd:complexContent>
    <xsd:extension base="PrimitiveTypeExt">
      <xsd:sequence>
        <xsd:element name="default-value" type="xsd:boolean"
          minOccurs="0"/>
        <xsd:element name="default-unique-value" type="xsd:string"
          minOccurs="0"/>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="BinaryType">
  <xsd:complexContent>
    <xsd:extension base="AbstractType"/>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="BinaryTypeExt">
  <xsd:complexContent>
    <xsd:extension base="PrimitiveTypeExt"/>
  </xsd:complexContent>
</xsd:complexType>

```

```
<xsd:complexType abstract="true" name="PrimitiveType">
  <xsd:complexContent>
    <xsd:extension base="AbstractType" />
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType abstract="true" name="PrimitiveTypeExt">
  <xsd:complexContent>
    <xsd:extension base="AbstractTypeExt" />
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="ReferenceType">
  <xsd:complexContent>
    <xsd:extension base="AbstractType">
      <xsd:attribute name="object-type" type="xsd:string"
        use="required" />
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="ReferenceTypeExt">
  <xsd:complexContent>
    <xsd:extension base="AbstractTypeExt" />
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType abstract="true" name="AbstractType">
  <xsd:sequence>
    <xsd:element name="non-null-constraint" type="NonNullConstraint"
      minOccurs="0" />
    <xsd:element name="unique-constraint" type="UniqueConstraint"
      minOccurs="0" />
    <xsd:element name="multi-value-range-constraint"
      type="MultiValueRangeConstraint" minOccurs="0" />
    <xsd:element name="valid-value-constraint" type="ValidValueConstraint"
      minOccurs="0" />
  </xsd:sequence>
  <xsd:attribute name="multi-value" type="xsd:boolean" use="optional"
    default="false" />
</xsd:complexType>

<xsd:complexType abstract="true" name="AbstractTypeExt">
  <xsd:sequence>
    <xsd:element name="non-null-constraint" type="NonNullConstraint"
      minOccurs="0" />
    <xsd:element name="unique-constraint" type="UniqueConstraint"
      minOccurs="0" />
    <xsd:element name="multi-value-range-constraint"
      type="MultiValueRangeConstraint" minOccurs="0" />
    <xsd:element name="valid-value-constraint" type="ValidValueConstraint"
      minOccurs="0" />
  </xsd:sequence>
  <xsd:attribute name="multi-value" type="xsd:boolean" use="optional"
    default="false" />
</xsd:complexType>
```

```
<xsd:group name="TypeChoice">
  <xsd:choice>
    <xsd:element name="string" type="StringType"/>
    <xsd:element name="boolean" type="BooleanType"/>
    <xsd:element name="integer" type="IntegerType"/>
    <xsd:element name="decimal" type="DecimalType"/>
    <xsd:element name="datetime" type="DateTimeType"/>
    <xsd:element name="reference" type="ReferenceType"/>
    <xsd:element name="binary" type="BinaryType"/>
  </xsd:choice>
</xsd:group>

<xsd:group name="TypeExtChoice">
  <xsd:choice>
    <xsd:element name="string-ext" type="StringTypeExt"/>
    <xsd:element name="boolean-ext" type="BooleanTypeExt"/>
    <xsd:element name="integer-ext" type="IntegerTypeExt"/>
    <xsd:element name="decimal-ext" type="DecimalTypeExt"/>
    <xsd:element name="datetime-ext" type="DateTimeTypeExt"/>
    <xsd:element name="reference-ext" type="ReferenceTypeExt"/>
    <xsd:element name="binary-ext" type="BinaryTypeExt"/>
  </xsd:choice>
</xsd:group>

<xsd:group name="PrimitiveTypeExtChoice">
  <xsd:choice>
    <xsd:element name="string-ext" type="StringTypeExt"/>
    <xsd:element name="boolean-ext" type="BooleanTypeExt"/>
    <xsd:element name="integer-ext" type="IntegerTypeExt"/>
    <xsd:element name="decimal-ext" type="DecimalTypeExt"/>
    <xsd:element name="datetime-ext" type="DateTimeTypeExt"/>
    <xsd:element name="binary-ext" type="BinaryTypeExt"/>
  </xsd:choice>
</xsd:group>

<xsd:group name="PrimitiveTypeChoice">
  <xsd:choice>
    <xsd:element name="string" type="StringType"/>
    <xsd:element name="boolean" type="BooleanType"/>
    <xsd:element name="integer" type="IntegerType"/>
    <xsd:element name="decimal" type="DecimalType"/>
    <xsd:element name="datetime" type="DateTimeType"/>
    <xsd:element name="binary" type="BinaryType"/>
  </xsd:choice>
</xsd:group>

<xsd:complexType abstract="true" name="ValueConstraint">
  <xsd:sequence>
    <xsd:element name="violation-message" type="xsd:string"/>
  </xsd:sequence>
  <xsd:attribute name="id" type="xsd:string" use="required"/>
</xsd:complexType>
```

```
<xsd:complexType name="NumericConstraint">
  <xsd:complexContent>
    <xsd:extension base="ValueConstraint">
      <xsd:attribute name="min-value" type="xsd:double" use="optional"/>
      <xsd:attribute name="max-value" type="xsd:double" use="optional"/>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="StringLengthConstraint">
  <xsd:complexContent>
    <xsd:extension base="ValueConstraint">
      <xsd:attribute name="min-length" type="xsd:nonNegativeInteger"
        use="optional" default="0"/>
      <xsd:attribute name="max-length" type="xsd:nonNegativeInteger"
        use="required"/>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="WhitespaceConstraint">
  <xsd:complexContent>
    <xsd:extension base="ValueConstraint">
      <xsd:attribute name="allow-leading-spaces" type="xsd:boolean"
        use="optional" default="false"/>
      <xsd:attribute name="allow-trailing-spaces" type="xsd:boolean"
        use="optional" default="false"/>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="StringPatternConstraint">
  <xsd:complexContent>
    <xsd:extension base="ValueConstraint">
      <xsd:sequence>
        <xsd:element name="pattern" type="xsd:string"/>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="MultiValueRangeConstraint">
  <xsd:complexContent>
    <xsd:extension base="ValueConstraint">
      <xsd:attribute name="min-values" type="xsd:nonNegativeInteger"
        use="optional" default="0"/>
      <xsd:attribute name="max-values" type="xsd:nonNegativeInteger"
        use="optional"/>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>
```

```
<xsd:complexType name="UniqueConstraint">
  <xsd:complexContent>
    <xsd:extension base="ValueConstraint">
      <xsd:attribute name="case-sensitive" type="xsd:boolean"
        use="optional" default="true"/>
      <xsd:attribute name="type" type="xsd:string" use="optional"
        default="varying-temporal"/>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="ValidValueConstraint">
  <xsd:complexContent>
    <xsd:extension base="ValueConstraint">
      <xsd:sequence>
        <xsd:element name="values">
          <xsd:complexType>
            <xsd:sequence>
              <xsd:element name="value" minOccurs="1"
                maxOccurs="unbounded">
                <xsd:complexType>
                  <xsd:sequence>
                    <xsd:choice>
                      <xsd:element name="string-value"
                        type="xsd:string"/>
                      <xsd:element name="integer-value"
                        type="xsd:long"/>
                      <xsd:element name="decimal-value"
                        type="xsd:double"/>
                      <xsd:element name="boolean-value"
                        type="xsd:boolean"/>
                    </xsd:choice>
                    <xsd:element name="label"
                      type="xsd:string"/>
                  </xsd:sequence>
                </xsd:complexType>
              </xsd:element>
            </xsd:sequence>
          </xsd:complexType>
        </xsd:element>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="NonNullConstraint">
  <xsd:complexContent>
    <xsd:extension base="ValueConstraint"/>
  </xsd:complexContent>
</xsd:complexType>

</xsd:schema>
```


A.2 Model Definition

```

<?xml version="1.0" encoding="UTF-8"?>
<?xml version="1.0" encoding="UTF-8"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:t="http://xmlns.oracle.com/iam/rm/type/def/1_0"
  xmlns:c="http://xmlns.oracle.com/iam/rm/cache/config/1_0"
  xmlns="http://xmlns.oracle.com/iam/rm/temporal/config/1_0"
  targetNamespace="http://xmlns.oracle.com/iam/rm/temporal/config/1_0"
  attributeFormDefault="unqualified"
  elementFormDefault="qualified" >

  <xsd:import namespace="http://xmlns.oracle.com/iam/rm/type/def/1_0"/>
  <xsd:import namespace="http://xmlns.oracle.com/iam/rm/cache/config/1_0"/>

  <xsd:element name="temporal" type="TemporalType"/>

  <xsd:simpleType name="dbEntityName">
    <xsd:restriction base="xsd:string">
      <xsd:pattern value="[a-zA-Z][a-zA-Z0-9_]*"/>
    </xsd:restriction>
  </xsd:simpleType>

  <xsd:complexType name="TemporalType">
    <xsd:sequence>
      <xsd:element name="compatible-versions" type="CompatibleVersions"
        minOccurs="0"/>
      <xsd:element name="dependencies" type="Dependencies" minOccurs="0"/>
      <xsd:element name="default-cache-config" type="c:cacheConfigType"
        minOccurs="0"/>
      <xsd:element name="domain-definitions" minOccurs="0" maxOccurs="1">
        <xsd:complexType>
          <xsd:sequence>
            <xsd:element name="domain-definition"
              type="DomainDefinition" minOccurs="1"
              maxOccurs="unbounded"/>
          </xsd:sequence>
        </xsd:complexType>
      </xsd:element>
      <xsd:element name="permission-definitions" minOccurs="0"
        maxOccurs="1">
        <xsd:complexType>
          <xsd:sequence>
            <xsd:element name="permission-definition"
              type="PermissionDefinition" minOccurs="1"
              maxOccurs="unbounded"/>
          </xsd:sequence>
        </xsd:complexType>
      </xsd:element>
      <xsd:element name="system-indexes" minOccurs="0">
        <xsd:complexType>
          <xsd:sequence>
            <xsd:element name="index" type="IndexDefinition"
              minOccurs="1" maxOccurs="unbounded"/>
          </xsd:sequence>
        </xsd:complexType>
      </xsd:element>
    </xsd:sequence>
  </xsd:complexType>

```

```

<xsd:element name="type-definitions" minOccurs="0" maxOccurs="1">
  <xsd:complexType>
    <xsd:choice minOccurs="1" maxOccurs="unbounded">
      <xsd:element name="structural-type-definition"
        type="StructuralTypeDefinition"/>
      <xsd:element name="mixin-type-definition"
        type="MixinTypeDefinition"/>
      <xsd:element name="relationship-type-definition"
        type="RelationshipTypeDefinition"/>
      <xsd:element name="extension-type-definition"
        type="ExtensionTypeDefinition"/>
      <xsd:element name="hierarchy-type-definition"
        type="HierarchyTypeDefinition"/>
    </xsd:choice>
  </xsd:complexType>
  </xsd:element>
  <xsd:element name="system-constraints" type="ConstraintList"
    minOccurs="0"/>
</xsd:sequence>
<xsd:attribute name="id" type="xsd:string" use="required"/>
<xsd:attribute name="version" use="required" type="t:Version"/>
<xsd:attribute name="previous-version" use="optional" type="t:Version"/>
</xsd:complexType>

<xsd:complexType name="CompatibleVersions">
  <xsd:sequence>
    <xsd:element name="compatible-version" type="CompatibleVersion"
      minOccurs="0" maxOccurs="unbounded"/>
  </xsd:sequence>
</xsd:complexType>

<xsd:complexType name="CompatibleVersion">
  <xsd:attribute name="version" type="t:Version" use="required"/>
</xsd:complexType>

<xsd:complexType name="Dependencies">
  <xsd:sequence>
    <xsd:element name="dependency" type="Dependency" minOccurs="1"
      maxOccurs="unbounded"/>
  </xsd:sequence>
</xsd:complexType>

<xsd:complexType name="Dependency">
  <xsd:attribute name="id" type="xsd:string" use="required"/>
  <xsd:attribute name="version" type="t:Version" use="required"/>
</xsd:complexType>

<xsd:complexType name="ConstraintList">
  <xsd:choice maxOccurs="unbounded">
    <xsd:element name="mutually-exclusive-set-constraint">
      <xsd:complexType>
        <xsd:sequence minOccurs="0" maxOccurs="1">
          <xsd:element name="attributes" minOccurs="0"
            maxOccurs="unbounded">
            <xsd:complexType>
              <xsd:sequence minOccurs="2" maxOccurs="unbounded">
                <xsd:element name="attribute"
                  type="dbEntityName" />
              </xsd:sequence>
            </xsd:complexType>
          </xsd:sequence>
        </xsd:complexType>
      </xsd:element>
    </xsd:choice>
  </xsd:complexType>

```

```

        </xsd:element>
    </xsd:sequence>
</xsd:complexType>
</xsd:element>
<xsd:element name="custom-constraint">
    <xsd:complexType>
        <xsd:sequence minOccurs="0" maxOccurs="1">
            <xsd:element name="body" type="xsd:string"/>
        </xsd:sequence>
        <xsd:attribute name="name" type="dbEntityName"
            use="required"/>
    </xsd:complexType>
</xsd:element>
</xsd:choice>
</xsd:complexType>

<xsd:complexType name="DomainDefinition">
    <xsd:group ref="t:PrimitiveTypeChoice"/>
    <xsd:attribute name="name" type="dbEntityName" use="required"/>
</xsd:complexType>

<xsd:complexType name="PermissionDefinition">
    <xsd:sequence>
        <xsd:element name="name" type="xsd:string"/>
        <xsd:element name="description" type="xsd:string"/>
        <xsd:element name="privilege-name" type="xsd:string"/>
        <xsd:element name="privilege-description" type="xsd:string"/>
    </xsd:sequence>
    <xsd:attribute name="id" type="xsd:string" use="required"/>
</xsd:complexType>

<xsd:complexType name="StructuralTypeDefinition">
    <xsd:complexContent>
        <xsd:extension base="EntityTypeDefinition">
            <xsd:sequence>
            </xsd:sequence>
        </xsd:extension>
    </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="RelationshipTypeDefinition">
    <xsd:complexContent>
        <xsd:extension base="TypeDefinition">
            <xsd:sequence>
                <xsd:element name="primary-key-definitions">
                    <xsd:complexType>
                        <xsd:sequence>
                            <xsd:element name="primary-key-definition"
                                type="PrimaryKeyDefinition" minOccurs="2"
                                maxOccurs="unbounded"/>
                        </xsd:sequence>
                    </xsd:complexType>
                </xsd:element>
            </xsd:sequence>
        </xsd:extension>
    </xsd:complexContent>
</xsd:complexType>

```

```

        <xsd:element name="bypassing-relationship-paths"
            minOccurs="0">
            <xsd:complexType>
                <xsd:sequence>
                    <xsd:element name="bypassing-relationship-path"
                        minOccurs="1" maxOccurs="2">
                        <xsd:complexType>
                            <xsd:sequence>
                                <xsd:element name="title"
                                    type="xsd:string"/>
                            </xsd:sequence>
                            <xsd:attribute name="id" type="xsd:string"
                                use="required"/>
                            <xsd:attribute name="local-attribute"
                                type="dbEntityName" use="required"/>
                            <xsd:attribute name="foreign-attribute"
                                type="dbEntityName" use="required"/>
                        </xsd:complexType>
                    </xsd:element>
                </xsd:sequence>
            </xsd:complexType>
        </xsd:element>
    </xsd:sequence>
</xsd:complexType>
</xsd:element>
</xsd:sequence>
</xsd:extension>
</xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="MixinTypeDefinition">
    <xsd:complexContent>
        <xsd:extension base="EntityTypeDefinition">
            <xsd:sequence>
                <xsd:element name="related-types">
                    <xsd:complexType>
                        <xsd:sequence>
                            <xsd:element name="related-type"
                                type="dbEntityName" minOccurs="1"
                                maxOccurs="unbounded" />
                        </xsd:sequence>
                    </xsd:complexType>
                </xsd:element>
            </xsd:sequence>
        </xsd:extension>
    </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="EntityTypeDefinition">
    <xsd:complexContent>
        <xsd:extension base="TypeDefinition">
            <xsd:attribute name="extends" type="dbEntityName" use="optional"/>
            <xsd:attribute name="abstract" type="xsd:boolean" use="optional"
                default="false"/>
        </xsd:extension>
    </xsd:complexContent>
</xsd:complexType>

```

```

<xsd:complexType name="TypeDefinition">
  <xsd:sequence>
    <xsd:element name="title" type="xsd:string" nillable="false"/>
    <xsd:element name="title-attribute" type="xsd:string" minOccurs="0"/>
    <xsd:element name="cache-config" type="c:cacheConfigType"
      minOccurs="0"/>
    <xsd:element name="snapshot-interface-classname" type="xsd:string"
      minOccurs="0"/>
    <xsd:element name="index-definitions" minOccurs="0">
      <xsd:complexType>
        <xsd:choice minOccurs="0" maxOccurs="unbounded">
          <xsd:element name="index" type="IndexDefinition"/>
        </xsd:choice>
      </xsd:complexType>
    </xsd:element>
    <xsd:element name="attribute-definitions" minOccurs="0">
      <xsd:complexType>
        <xsd:choice minOccurs="1" maxOccurs="unbounded">
          <xsd:element name="reference-attribute"
            type="ReferenceAttributeDefinition"/>
          <xsd:element name="attribute" type="AttributeDefinition"/>
        </xsd:choice>
      </xsd:complexType>
    </xsd:element>
    <xsd:element name="related-audit-objects" type="RelatedAuditObjects"
      minOccurs="0"/>
    <xsd:element name="permissions" type="Permissions" minOccurs="0"/>
    <xsd:element name="access-policy" type="AccessPolicy" minOccurs="0"/>
    <xsd:element name="entity-constraints" type="ConstraintList"
      minOccurs="0"/>
  </xsd:sequence>
  <xsd:attribute name="id" type="dbEntityName" use="required"/>
  <xsd:attribute name="disjointed" type="temporalConstraintType"/>
  <xsd:attribute name="overlapping" type="temporalConstraintType"/>
  <xsd:attribute name="continuous" type="temporalConstraintType"/>
  <xsd:attribute name="storage-type" type="storageType"
    default="pan-temporal" use="optional"/>
  <xsd:attribute name="definition" type="definitionType" default="internal"
    use="optional"/>
</xsd:complexType>

<xsd:simpleType name="temporalConstraintType">
  <xsd:restriction base="xsd:string">
    <xsd:enumeration value="true"/>
    <xsd:enumeration value="fill"/>
    <xsd:enumeration value="false"/>
  </xsd:restriction>
</xsd:simpleType>

<xsd:simpleType name="definitionType">
  <xsd:restriction base="xsd:string">
    <xsd:enumeration value="external"/>
    <xsd:enumeration value="internal"/>
  </xsd:restriction>
</xsd:simpleType>

```

```

<xsd:simpleType name="storageType">
  <xsd:restriction base="xsd:string">
    <xsd:enumeration value="temporal"/>
    <xsd:enumeration value="current-time"/>
    <xsd:enumeration value="pan-temporal"/>
    <xsd:enumeration value="historical"/>
  </xsd:restriction>
</xsd:simpleType>

<xsd:complexType name="HierarchyTypeDefinition">
  <xsd:sequence>
    <xsd:element name="title" type="xsd:string"/>
    <xsd:element name="node-definitions">
      <xsd:complexType>
        <xsd:sequence>
          <xsd:element name="node-definition" minOccurs="1"
            maxOccurs="unbounded">
            <xsd:complexType>
              <xsd:sequence>
                <xsd:element name="node-relationships"
                  minOccurs="0">
                  <xsd:complexType>
                    <xsd:sequence>
                      <xsd:element
                        name="node-relationship"
                        minOccurs="1"
                        maxOccurs="unbounded">
                        <xsd:complexType>
                          <xsd:attribute
                            name="foreign-type"
                            type="dbEntityName"
                            use="required"/>
                          <xsd:attribute
                            name="relationship-path"
                            type="dbEntityName"
                            use="required"/>
                        </xsd:complexType>
                      </xsd:element>
                    </xsd:sequence>
                  </xsd:complexType>
                </xsd:element>
              </xsd:sequence>
            </xsd:complexType>
          </xsd:element>
          <xsd:element name="default-parent"
            minOccurs="0">
            <xsd:complexType>
              <xsd:sequence>
                <xsd:element
                  name="identifying-attributes"
                  type="AttributeValueList"/>
              </xsd:sequence>
              <xsd:attribute name="object-type"
                type="dbEntityName" use="required"/>
              <xsd:attribute
                name="referring-attribute"
                type="dbEntityName" use="required"/>
            </xsd:complexType>
          </xsd:element>
        </xsd:sequence>
      </xsd:complexType>
    </xsd:element>
  </xsd:sequence>
</xsd:complexType>

```

```

        <xsd:attribute name="object-type"
            type="dbEntityName" use="required"/>
        <xsd:attribute name="anchor" type="xsd:boolean"
            use="optional" default="false"/>
        <xsd:attribute name="mandatory" type="xsd:boolean"
            use="optional" default="false"/>
    </xsd:complexType>
</xsd:element>
</xsd:sequence>
</xsd:complexType>
</xsd:element>
<xsd:element name="default-anchors" minOccurs="0">
    <xsd:complexType>
        <xsd:sequence>
            <xsd:element name="default-anchor" maxOccurs="unbounded">
                <xsd:complexType>
                    <xsd:sequence>
                        <xsd:element name="identifying-attributes"
                            type="AttributeValueList"/>
                        <xsd:element name="attributes"
                            type="AttributeValueList" minOccurs="0"/>
                    </xsd:sequence>
                    <xsd:attribute name="object-type"
                        type="dbEntityName" use="required"/>
                    <xsd:attribute name="hierarchy-root-attribute"
                        type="dbEntityName" use="optional"/>
                </xsd:complexType>
            </xsd:element>
        </xsd:sequence>
    </xsd:complexType>
</xsd:element>
<xsd:element name="permissions" type="Permissions" minOccurs="0"/>
</xsd:sequence>
<xsd:attribute name="id" type="dbEntityName" use="required"/>
<xsd:attribute name="single-anchor" type="xsd:boolean" use="optional"
    default="false"/>
</xsd:complexType>

<xsd:complexType name="AttributeValueList">
    <xsd:sequence>
        <xsd:element name="attribute" maxOccurs="unbounded">
            <xsd:complexType>
                <xsd:choice>
                    <xsd:element name="integer-value" type="xsd:long"/>
                    <xsd:element name="decimal-value" type="xsd:double"/>
                    <xsd:element name="datetime-value" type="t:dateTime"/>
                    <xsd:element name="string-value" type="xsd:string"/>
                    <xsd:element name="boolean-value" type="xsd:boolean"/>
                </xsd:choice>
                <xsd:attribute name="name" type="xsd:string" use="required"/>
            </xsd:complexType>
        </xsd:element>
    </xsd:sequence>
</xsd:complexType>

```

```

<xsd:complexType name="ExtensionTypeDefinition">
  <xsd:sequence>
    <xsd:element name="title-attribute" type="xsd:string" minOccurs="0"/>
    <xsd:element name="cache-config" type="c:cacheConfigType"
      minOccurs="0"/>
    <xsd:element name="attribute-definitions" minOccurs="0">
      <xsd:complexType>
        <xsd:choice minOccurs="1" maxOccurs="unbounded">
          <xsd:element name="reference-attribute"
            type="ReferenceAttributeDefinition"/>
          <xsd:element name="attribute" type="AttributeDefinition"/>
        </xsd:choice>
      </xsd:complexType>
    </xsd:element>
    <xsd:element name="related-audit-objects" type="RelatedAuditObjects"
      minOccurs="0"/>
    <xsd:element name="permissions" type="Permissions" minOccurs="0"/>
    <xsd:element name="access-policy" type="AccessPolicy" minOccurs="0"/>
  </xsd:sequence>
  <xsd:attribute name="extending-type-id" type="dbEntityName"
    use="required"/>
</xsd:complexType>

<xsd:complexType name="Permissions">
  <xsd:sequence>
    <xsd:element name="permission" minOccurs="1" maxOccurs="unbounded">
      <xsd:complexType>
        <xsd:attribute name="id" type="xsd:string" use="required"/>
        <xsd:attribute name="soc-policy" use="optional"
          default="children">
          <xsd:simpleType>
            <xsd:restriction base="xsd:string">
              <xsd:enumeration value="none"/>
              <xsd:enumeration value="children"/>
              <xsd:enumeration value="ancestors"/>
            </xsd:restriction>
          </xsd:simpleType>
        </xsd:attribute>
      </xsd:complexType>
    </xsd:element>
  </xsd:sequence>
</xsd:complexType>

<xsd:complexType name="RelatedAuditObjects">
  <xsd:sequence>
    <xsd:element name="related-audit-object" minOccurs="1"
      maxOccurs="unbounded">
      <xsd:complexType>
        <xsd:attribute name="incoming-relationship-path"
          type="dbEntityName" use="required"/>
        <xsd:attribute name="foreign-object-type" type="dbEntityName"
          use="required"/>
      </xsd:complexType>
    </xsd:element>
  </xsd:sequence>
</xsd:complexType>

```



```

<xsd:complexType name="PrimaryKeyDefinition">
  <xsd:sequence>
    <xsd:element name="title" type="xsd:string" nillable="false"/>
    <xsd:element name="outgoing-relationship-path-title" type="xsd:string"
      nillable="false"/>
    <xsd:element name="incoming-relationship-path-title" type="xsd:string"
      nillable="false"/>
    <xsd:element name="getter" type="xsd:string" minOccurs="0"/>
  </xsd:sequence>
  <xsd:attribute name="id" type="dbEntityName" use="required"/>
  <xsd:attribute name="foreign-type" type="dbEntityName" use="required"/>
  <xsd:attribute name="outgoing-relationship-path" type="xsd:string"
    use="required"/>
  <xsd:attribute name="incoming-relationship-path" type="xsd:string"
    use="required"/>
  <xsd:attribute name="parent-action" use="optional" default="restrict">
    <xsd:simpleType>
      <xsd:restriction base="xsd:string">
        <xsd:enumeration value="restrict"/>
        <xsd:enumeration value="cascade"/>
      </xsd:restriction>
    </xsd:simpleType>
  </xsd:attribute>
</xsd:complexType>

<xsd:complexType name="ReferenceAttributeDefinition">
  <xsd:sequence>
    <xsd:element name="title" type="xsd:string" nillable="false"/>
    <xsd:element name="outgoing-relationship-path-title" type="xsd:string"
      nillable="false"/>
    <xsd:element name="incoming-relationship-path-title" type="xsd:string"
      nillable="false"/>
    <xsd:element name="reference-ext" type="t:ReferenceTypeExt"
      minOccurs="0"/>
    <xsd:element name="snapshot-getter" type="xsd:string" minOccurs="0"/>
    <xsd:element name="snapshot-setter" type="xsd:string" minOccurs="0"/>
  </xsd:sequence>
  <xsd:attribute name="id" type="xsd:string" use="required"/>
  <xsd:attribute name="foreign-type" type="xsd:string" use="required"/>
  <xsd:attribute name="parent-action" use="optional" default="set null">
    <xsd:simpleType>
      <xsd:restriction base="xsd:string">
        <xsd:enumeration value="restrict"/>
        <xsd:enumeration value="cascade"/>
        <xsd:enumeration value="set null"/>
      </xsd:restriction>
    </xsd:simpleType>
  </xsd:attribute>
  <xsd:attribute name="outgoing-relationship-path" type="xsd:string"
    use="required"/>
  <xsd:attribute name="incoming-relationship-path" type="xsd:string"
    use="required"/>
  <xsd:attribute name="multi-value" type="xsd:boolean" use="optional"
    default="false"/>
</xsd:complexType>

```

```
<xsd:complexType name="AttributeDefinition">
  <xsd:sequence>
    <xsd:element name="title" type="xsd:string" nillable="false"/>
    <xsd:group ref="t:PrimitiveTypeExtChoice" minOccurs="0"/>
    <xsd:element name="snapshot-getter" type="xsd:string" minOccurs="0"/>
    <xsd:element name="snapshot-setter" type="xsd:string" minOccurs="0"/>
  </xsd:sequence>
  <xsd:attribute name="domain" type="xsd:string" use="required"/>
  <xsd:attribute name="searchable" type="xsd:boolean" use="optional" />
</xsd:complexType>

<xsd:complexType name="IndexDefinition">
  <xsd:attribute name="body" type="xsd:string"/>
</xsd:complexType>

<xsd:complexType name="AccessPolicy">
  <xsd:attribute name="read-permission" type="xsd:string" use="optional"/>
  <xsd:attribute name="read-audit-details-permission" type="xsd:string"
    use="optional"/>
</xsd:complexType>
</xsd:schema>
</xsd:schema>
```

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