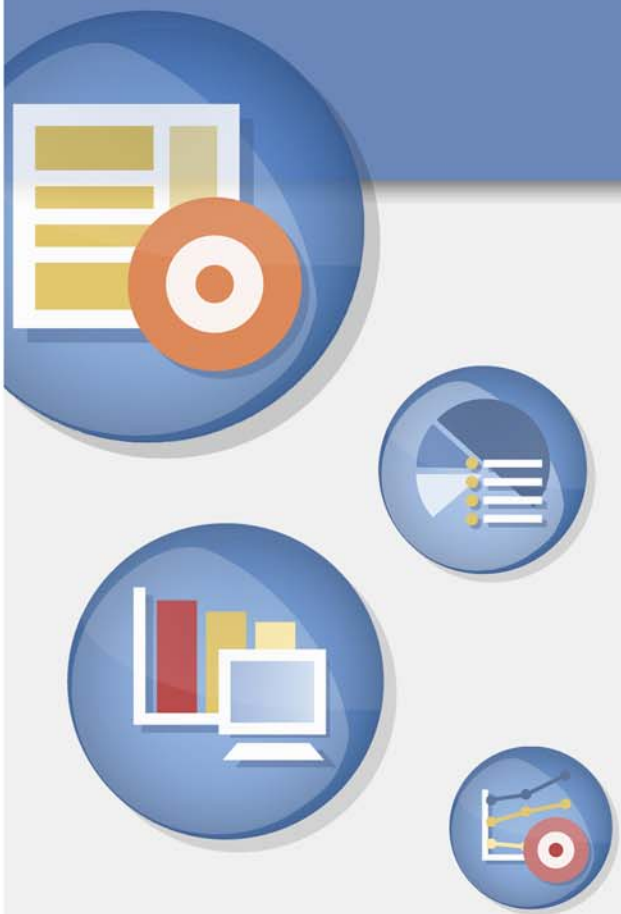
FatWire | Analytics 2.5



Developer's Tutorial

Document Revision Date: Jun. 26, 2009

FatWire
SOFTWARE

FatWire Analytics Developer’s Tutorial
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Introduction

This chapter contains the following sections:

- About This Tutorial
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About This Tutorial

The goal of this tutorial is to provide you with an understanding of how to create and configure reports in FatWire Analytics. To achieve this, you will complete the following exercises:

1. "Adding a New Parameter." This exercise walks you through adding a new parameter to Analytics for data capture.
2. "Developing a New Analytics Job" This exercise walks you through developing an Analytics job for a new parameter. The Analytics job you create will process the new parameter (created in step 1), for display in a report ("NewBrowsers" report in this tutorial).
3. "Creating and Configuring a Report." This exercise walks you through configuring a custom Analytics report. The report will draw existing statistical data from the Analytics database and contain the following features:
   - A table
   - A time period selector
   - A chart
   - A data filter

The "Quick Reference" section on page 8 outlines the steps you will complete in each exercise.

> **Note**
>
> Throughout this tutorial, we assume you are working exclusively with the FirstSite II sample site. Select this site whenever prompted in the Analytics or Content Server interfaces.

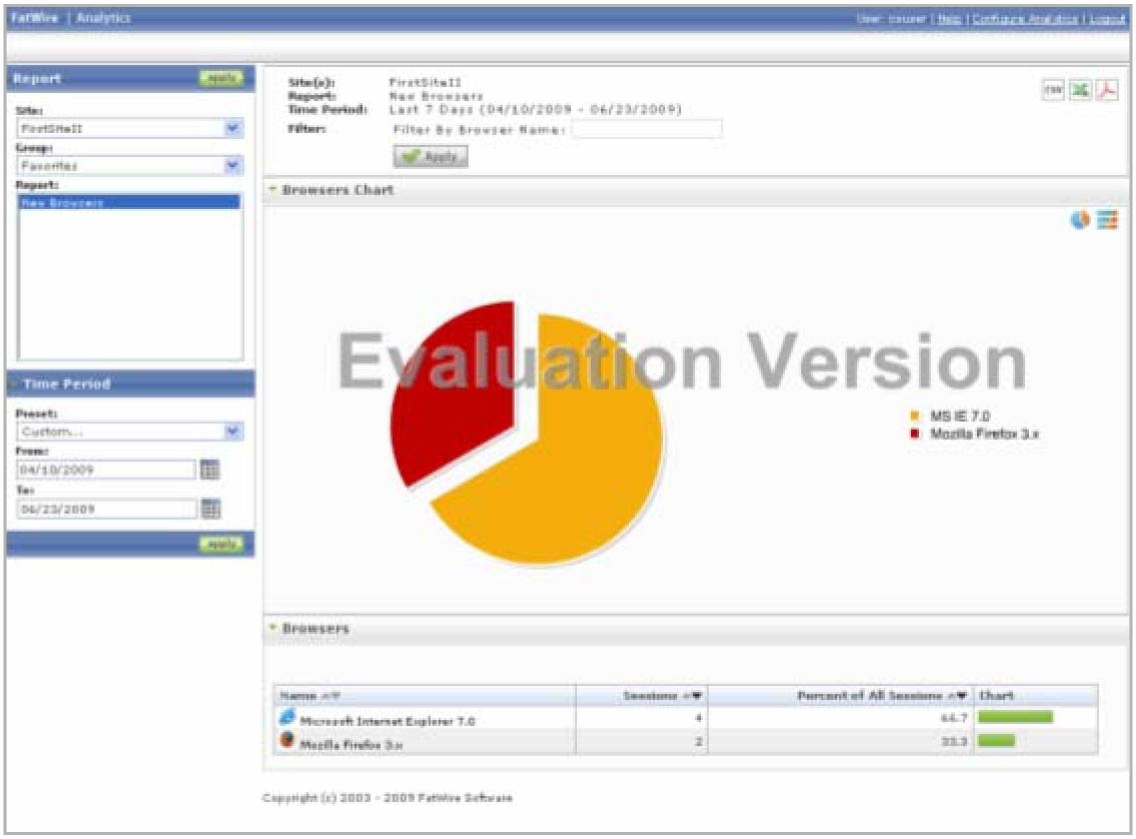
The 'NewBrowsers' Report

In this tutorial you will learn how to add a parameter to a report, develop a new Analytics job to process that parameter, and how to create and configure a new report for your Analytics installation. The report you will be creating in this tutorial is the "NewBrowsers" report.

> **Note**
>
> The "NewBrowsers" report you will be creating and configuring in this tutorial, is a duplicate of the default "Browsers" report in your Analytics installation. For the purposes of this tutorial, the xml file and report name of the "Browsers" report you will be configuring, along with the bean and mapper class names, have been renamed to avoid overwriting the default "Browsers" report.

The first exercise in this tutorial walks you through how to add a new parameter to Analytics for data capture. The second exercise in this tutorial demonstrates how to process the new parameter for display in a report. The third exercise in this tutorial walks you through how to configure a custom report ("NewBrowsers" report in this tutorial). For a quick reference of the steps you need to complete in order to successfully add a parameter and create a report, see the section "Quick Reference," on page 8.

Once you have completed the exercises in this tutorial, your report should be displayed as shown below:



Prerequisites

Before proceeding through the rest of this document, you should:

- Be familiar with configuring and using FatWire Analytics to capture data and generate reports.
- Have working knowledge of the following aspects of Content Server:
  - Element code (JSPs). You will be adding a new parameter to the Analytics image tag call in an element asset, as well as the Analytics image tag JSP.
  - Flex and basic asset models. You should be familiar with how your assets are structured in order to know which asset attributes to pass to Analytics for tracking.
- Know SQL. You will write and modify SQL code that retrieves data in your reports.

> **Note**
>
> When writing SQL code, have the *FatWire Analytics Database Schema Reference* handy. It describes how Analytics stores data in its database.

- Know XML. Analytics reports are built with XML tags that define report features.

> **Note**
>
> When writing report code, have the *FatWire Analytics Tag Reference* handy. It contains descriptions of the XML tags you will use when coding your reports, as well as the parameters they take.

- Have the following documentation handy in case you need to refer to it when completing the exercises:
  - *Installing and Configuring Analytics*
  - *FatWire Analytics User's Guide*
- Be familiar with the basics of the Hadoop Distributed File System and how to create Hadoop Map/Reduce jobs.

> **Note**
>
> For more information about Hadoop Distributed File Systems and how to create Map/Reduce jobs, refer to the following website:
>
> `http://hadoop.apache.org/core/docs/current/mapred_tutorial.html`

Quick Reference

For your reference, the steps you will follow in each exercise are outlined below.

Exercise 1: Adding a New Parameter

In Exercise 1, "Adding a New Parameter," you will add a new parameter to Analytics so Analytics can start capturing data on that parameter. The steps are:

1. Modify the Analytics image tag and its JSP to trigger data capture for the new parameter, as explained in "Adding the New Parameter to the Image Tag and Its JSP," on page 12.
2. The next step in this tutorial is to develop a new Analytics job. Before you start the next exercise, click around in your FSII site to create data for the new Analytics job (you will be developing) to process. Make sure that your Analytics sensor, Hadoop, and HDFS Agent are running before you proceed to Exercise 2: Developing a New Analytics Job.

Exercise 2: Developing a New Analytics Job

In Exercise 2, "Developing a New Analytics Job, you will be developing an analytics job to process the raw data that the new parameter captures. The steps are:

1. Develop a new Analytics job. In this example we use the "NewBrowsers" report (which you will create in Exercise 3: Creating and Configuring a Report). The new job enables Analytics to process raw data captured from the given site. The processed data will then be inserted into the database. For instructions, see "Developing an Analytics Job for the 'NewBrowsers' Report," on page 21. The steps are outlined below:
   a. Select the location that will be used as the input data for the report. For instructions, see "1. Select the Input Location," on page 21.
   b. Add a new `L3` table to store the processed data. For instructions, see "2. Extend the Schema," on page 21.
   c. Create a new bean class which will store the output data. For instructions, see "3. Create the Beans," on page 21.
   d. Create a new mapper class which will encapsulate the business logic to process the input data for the report. For instructions, see "4. Create the Mapper Classes," on page 25.
   e. Configure the processor to integrate the bean and mapper classes. For instructions, see "5. Adding Beans and Mappers to the Processor Definitions," on page 26.
2. Create and configure the "NewBrowsers" report, which will include the new parameter you create in this exercise. For instructions, see Exercise 3, "Creating and Configuring a Report".

Exercise 3: Creating and Configuring a Report

In Exercise 3, "Creating and Configuring a Report," you will create, from scratch, a "NewBrowsers" report, by completing the following steps:

Note

The "NewBrowsers" report you will be creating in this tutorial, is a duplicate of the default "Browsers" report in your Analytics installation. For the purposes of this tutorial, the xml file and report name of the "Browsers" report you will be configuring, along with the bean and mapper class names, have been renamed to avoid overwriting the default report.

1. Create a new report file and register it with Analytics as explained in "Creating and Registering the Report File," on page 40" and outlined below:
   a. Create the XML file that will contain the report code. For instructions, see "A. Create the XML File," on page 41.
   b. Place the file in the Analytics reports directory so that Analytics can access the file. For instructions, see "B. Place the XML File in the Analytics Reports Directory," on page 41.
   c. Label the report components, such as module captions, column heads, and so on by defining them in a property file and registering the file with Analytics, as explained in "C. Label the Report Components," on page 41.

d. Make the report available to Analytics users, as explained in "D. Make the Report Available to Analytics Users," on page 42.

e. Test the report, as explained in "E. Test the New Report," on page 44 to make sure it has been coded correctly.

2. Add a table, as explained in "Adding a Table," on page 45. A table is the primary method of presenting statistical data in an Analytics report.

3. Add a time period selector, as explained in "Adding a Time Period Selector," on page 50. The selector allows users to restrict the statistical data displayed in the report to a specific time period.

4. Add a data filter, as explained in "Adding a Filter," on page 53.
Filters allow users to restrict the statistical data displayed in the report to specific parameter values. A separate filter is required for each parameter against which you want to filter data.

5. Add a chart, as explained in "Adding a Chart," on page 57. Charts allow you to visually present statistical data in a report.

6. Test your completed "Visitor Detail" report. At this point, you should have a complete, functional report, as shown in "Testing the Completed 'NewBrowsers' Report," on page 61.

Exercise 1

Adding a New Parameter

This exercise shows you how to add a new parameter to Analytics for data capture.

This exercise contains the following sections:

- Overview
- Adding the New Parameter to the Image Tag and Its JSP
- Next Steps

Overview

In this exercise, based on the FirstSite II sample site, you will configure Analytics to start capturing data on a new parameter, `agent`. Once you add the new `agent` parameter to Analytics, proceed to the next exercise ("Developing a New Analytics Job") in order to process the new parameter for display in a report ("NewBrowsers" report in this tutorial). The processed `agent` parameter will be displayed as a table column in the "NewBrowsers" report.

The new `agent` parameter is used for capturing raw data about the browsers used by visitors of your site. This raw data is then processed, and the processed data is then displayed in the "NewBrowsers" report (which you will be creating in Exercise 3, "Creating and Configuring a Report").

> **Note**
>
> Throughout this exercise, we assume you are working exclusively with the FirstSite II sample site. Select this site whenever prompted in the Analytics or Content Server interfaces.

Adding the New Parameter to the Image Tag and Its JSP

The first step is to make Analytics aware of the new parameter so that it starts capturing data on that parameter. In our example, you will do so by adding the parameter to the Analytics image tag inside the `FSIIWrapper` element and to `AddAnalyticsImgTag` JSP. When you complete the steps below, the sensor servlet will start capturing the parameter values and storing them as raw data.

1. Add the new parameter to the Analytics image tag call in the `FSIIWrapper` element:
   a. Log in to the Advanced interface on your Content Server system as an administrator or another user who has the permissions to edit "CSElement" assets.
   b. When prompted, select the FirstSite II sample site.
   c. In the button bar, click **Search**.
   d. In the list of asset types, click **Find CSElement**.
   e. In the "Search" form, enter **FSIIWrapper** into the search field and click **Search**.
   f. In the list of results, click the **Edit** (pencil) icon next to the **FSIIWrapper** asset.

      Content Server displays the "FSIIWrapper" asset in the "Edit" form.
   g. In the section selector at the top of the form, click **Element**.

      Content Server displays the "Element" section of the "Edit" form.
   h. To make editing the element code easier, select all of the text in the **Element Logic** field, then copy and paste it into a text editor of your choice. Save the code to a temporary file.

1) In the element code, locate the call to the Analytics image tag, shown below:

```
<render:callelement elementname="Analytics/AddAnalyticsImgTag">
    <render:argument name="c" value='<%=ics.GetVar("c")%>'/>
    <render:argument name="cid" value='<%=ics.GetVar("cid")%>'/>
    <render:argument name="site" value='<%=ics.GetVar("site")%>'/>
    <render:argument name="pagename" value='<%=ics.GetVar("childpagename")%>'/>
    <render:argument name="recid" value='<%=ics.GetVar("recid")%>'/>
</render:callelement>
```

2) Insert the following statement at the end of the Analytics image tag call, but before the closing `</render:callelement>` tag:

```
<render:argument name="agent" value='<%= request.getHeader("User-Agent")%>'/>
```

> **Note**
>
> The `agent` variable must be set before the Analytics image tag is called.

The modified Analytics image tag call should look as follows:

```
 <render:callelement elementname="Analytics/AddAnalyticsImgTag">
    <render:argument name="c" value='<%=ics.GetVar("c")%>'/>
    <render:argument name="cid" value='<%=ics.GetVar("cid")%>'/>
    <render:argument name="site" value='<%=ics.GetVar("site")%>'/>
    <render:argument name="pagename" value='<%=ics.GetVar("childpagename")%>'/>
    <render:argument name="recid" value='<%=ics.GetVar("recid")%>'/>
<render:argument name="agent" value='<%= request.getHeader( "User-Agent" )
    %>'/>
 </render:callelement>
```

3) Save and close the file.

2. Add the new parameter to the Analytics image tag JSP.

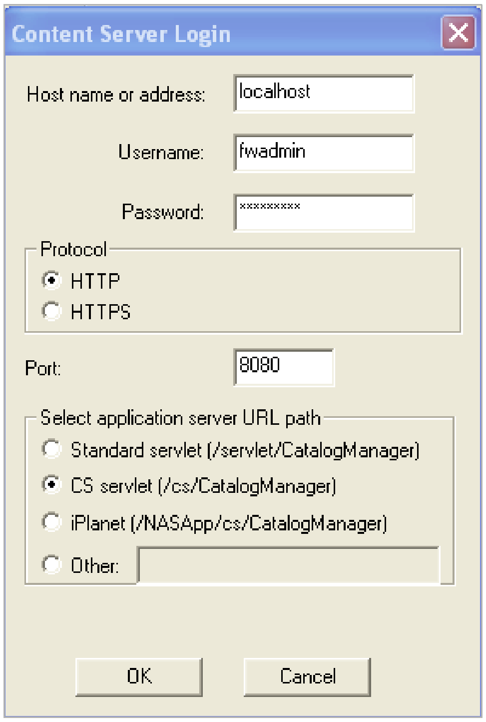
   a. Start Content Server Explorer.

   b. In the Content Server Explorer screen, select **File > Open Content Server** to display the “Content Server Login” dialog box.

   c. Enter the following values:

      - **Host name or address** – The host name or IP address. You must not leave this blank.
      - **Username** – Your Content Server user name.
      - **Password** – Your Content Server password.
      - **Port** – The port number (the default is 8080).
      - **Protocol** – Typically, this is HTTP. (You may select HTTPS if the web server is running SSL).
      - **Application server URL path** – Select the `CS servlet (/cs/CatalogManager)` option.

Your completed log in form should be similar to the one displayed below:



d. Click **OK** to log in. The Content Server Explorer window appears.

e. In the `localhost` tree, expand the following: `Tables` > `ElementCatalog` > `Analytics`.

f. In the `Analytics` table, open the `AddAnalyticsImgTag` JSP.

g. Copy and paste the `AddAnalyticsImgTag.jsp` code in a text editor and locate the following lines:

```
String recid = ics.GetVar("recid");
String siteName = ics.GetVar("site");
```

h. Add the following line after the two lines listed in step g (directly above:)

```
String agent = ics.GetVar("agent");
```

The modified section will look as follows:

```
String recid = ics.GetVar("recid");
String siteName = ics.GetVar("site");
String agent = ics.GetVar("agent");
```

i. Locate the following piece of code and insert the bold-type code in the exact locations shown:

```
<script type="text/javascript">
    <!--
        var jsParam = '';
        if(self.StatPixelParamFromPage) {jsParam=StatPixelParamFromPage;};
        var color = 'n/a'; var size = 'n/a'; var puri = '';
        var java = navigator.javaEnabled();
        var nav = navigator.appName;
        var agent = navigator.userAgent;
        var objValue = '';
        var write = (navigator.appName=='Netscape' &&
            (navigator.appVersion.charAt(0)=='2' ||
            navigator.appVersion.charAt(0)=='3')) ? false:true;
        if (write==true) {
        size = screen.width + "x" + screen.height;
        color = (nav!='Netscape') ? screen.colorDepth:screen.pixelDepth;
        objValue= encodeURIComponent('<%= ics.GetVar("assetname") %>');
           puri = '?siteName=<%= siteName %>&objType=<%= UobjType %>&objID=<%=
             id
              %>&objName=' +objValue+'&sessionID=<%= TsessionID %>
              &agent=<%= agent %>&Referer=<%= referer
              %>&nav='+nav+'&size='+size+'&color='+color+'&java=
              '+java+'&js=true'+jsParam;
        puri += '<%= recparameter%>';
        puri += '<%= urlEncparameter%>';
        //alert(puri);
        document.write('<img style="display:none;" height="1" width="1"
            border="0" src="<%= statisticSensorPath%>'+puri+'" alt="pixel" /
            >');
        }
    //-->
</script>
<noscript>
    <img style="display:none;" height="1" width="1" src="<%=
       statisticSensorPath%>?siteName=<%= siteName%>&objType=<%=
       UobjType%>&objID=<%= id%>&objName=<%=
       ics.GetVar("assetname")%>&URLENC=<%= ics.GetVar("objUrl")
       %>&sessionID=<%= TsessionID%>
       &agent=<%= agent %>&Referer=<%= referer%>&js=false"
       alt="pixel" />
</noscript>
```

3. When you have made your modifications, select all of the code in your text editor, then copy and paste it back into the Content Server Explorer field.
4. **Save** and close the file.
5. Restart the application server for your changes to take effect.

Next Steps

In Exercise 2, “Developing a New Analytics Job", you will create a new analytics job to process the raw data that is captured by the new `agent` parameter you added in this exercise. The new analytics job will process the `agent` parameter for display in a report (“NewBrowsers” report in this tutorial). The processed agent parameter will be displayed as a table column in the “NewBrowsers” report.

Before you develop a new Analytics job, keep in mind that:

In order for the new parameter to start capturing data for Analytics, the following components must be installed and running:

- Analytics Sensor
- Hadoop
- HDFS Agent

Note

Before developing a new Analytics job, click around in your FSII site. This ensures that there will be data for the new Analytics job (you will be developing in the next exercise) to process.

Exercise 2

Developing a New Analytics Job

In order for Analytics to process raw data for a custom report, you must develop a new Analytics job to process that data. The processed data will be inserted into the database.

> **Note**
>
> This exercise walks you through how to develop a new Analytics job, for the parameter you added (in Exercise 1) to your Analytics installation. The Analytics job you will be developing is a duplicate of the default Analytics job in your Analytics installation. For the purposes of this tutorial, all bean and mapper class names, used to develop the Analytics job in this exercise have been renamed to avoid overwriting the default Analytics job.

This exercise contains the following sections:

Overview for Creating an Analytics Job

The following is a brief description of the steps that are required for developing an Analytics job.

1. Select the most appropriate location as the input:

Select a location from the folders within the `analytics` directory, which must be used by the analytics job as input data for the report. The criteria for choosing a particular location as an input depends primarily on the data required for a particular report. In most instances, the following locations are sufficient for satisfying the data requirements for your report.

- `Sesdata`: This location stores the data for all sessions, along with the details of the visitor, object impressions, and other relevant information associated with a session.

Note

When creating a custom report, do not use the `injected` folders (such as `oiinjected`, `sesinjected`, or `visinjected)` as your input location(s), because the data stored within these locations is used by the database injection processor to store into the database.

For more information about locations and processors, and which type of data is stored in each location, see the *Locations & Processors* section of the *Installing and Configuring Analytics* guide.

2. Extend the schema:

To store the processed data, you will add a new `L3` table to the Analytics database.

3. Create a new bean class:

The main purpose of the bean class is to store the output data. The framework will use the bean class to store the final output of the job. The database injection processors will take the data stored within each bean class and insert the data into the `L3` table (created in the previous step).

The new bean class extends the pre-defined classes provided by the framework. Implementation details are explained on the following pages: page 20 ("Example for Developing a New Analytics Job") and page 21 ("Developing an Analytics Job for the 'NewBrowsers' Report")

4. Create a new `Mapper` class:

The `Mapper` class will encapsulate the business logic to process the input data. For every input bean, the Mapper class will create a new instance of the bean class (created in step 3), and then store the processed data in the newly created instance. The output of the Mapper class will be collected by the Analytics framework and further processed before it is finally written to the designated output location.

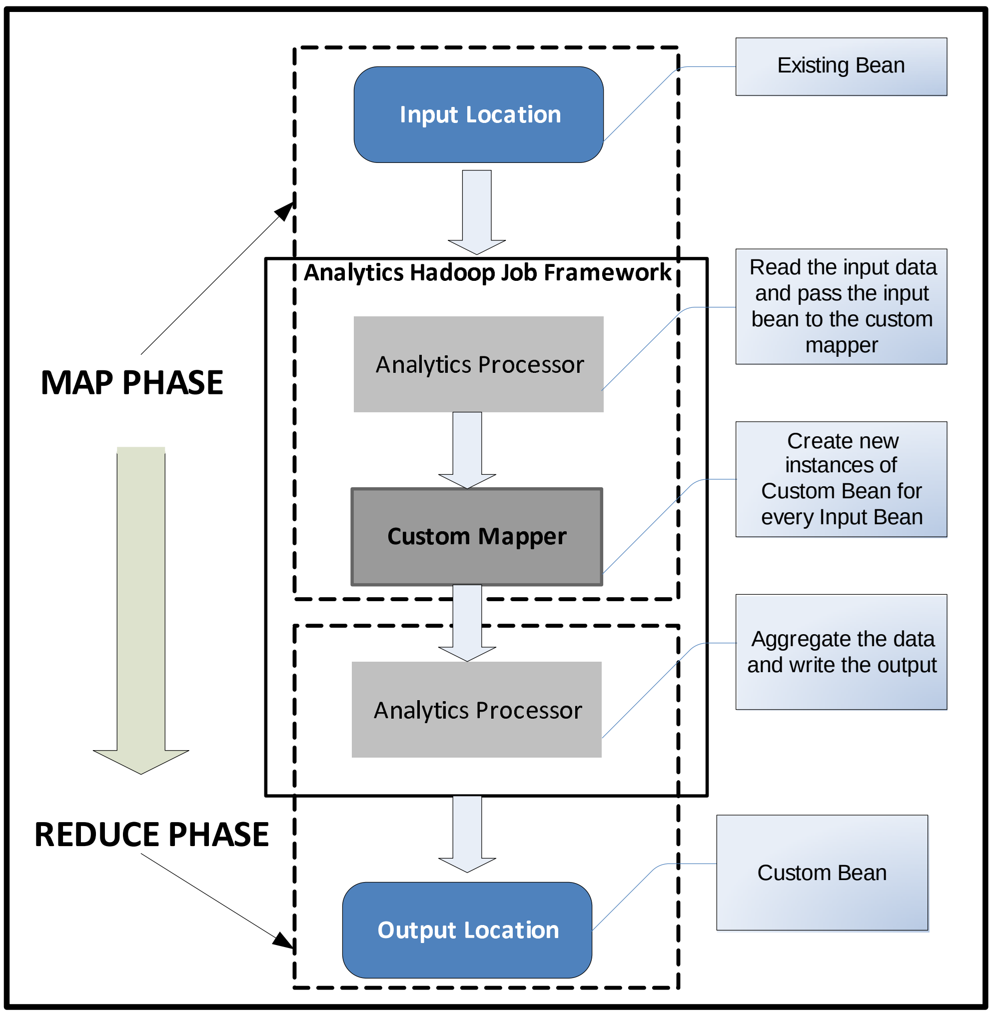
The new Mapper class will extend the pre-defined classes provided by the framework. The implementation details will be explained in the next section.

5. Configuring the processor

To integrate your newly coded beans and Mapper classes with the Analytics framework, you need to add them to the existing processor configuration file (`.xml` file).

Figure 1 depicts the job execution flow with the custom mapper integrated into the Analytics-Hadoop job framework.

Figure 1: Execution flow chart with custom mapper integrated with the analytics hadoop job framework



In the **Map Phase**, the processor will read the data from the input location. This data will be passed to the custom mapper. The custom mapper will transform every input bean to custom bean.

In the **Reduce Phase**, the data collected from the Custom Mapper will be further processed before it is written to the output location. The content of the output location will contain the Custom Bean. This aggregated data will be stored into the database by the database injection processor.

Example for Developing a New Analytics Job

- Designing the 'NewBrowsers' Report
- Developing an Analytics Job for the 'NewBrowsers' Report
- Configuring Database Injection
- Integrating the New Analytics Job with the Existing Hadoop-Jobs Component

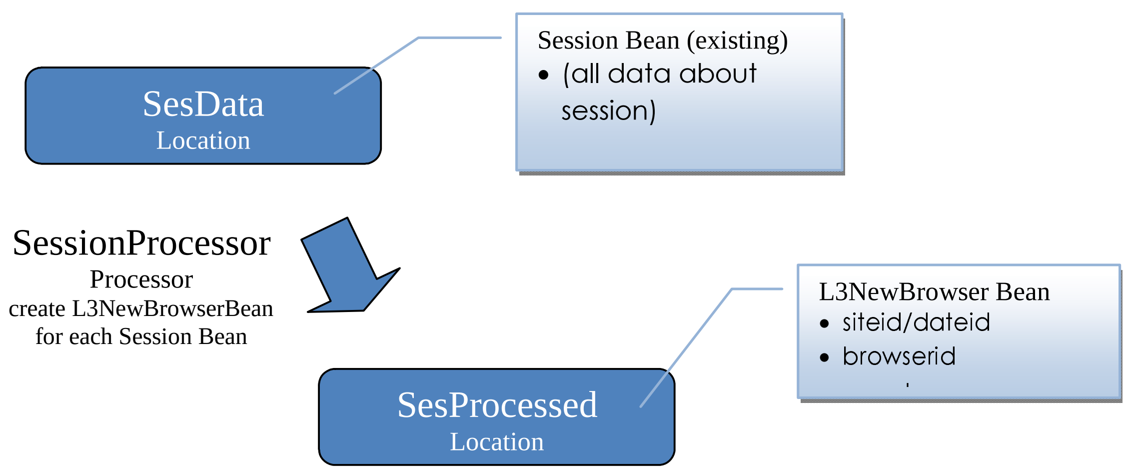
Designing the 'NewBrowsers' Report

The "NewBrowsers" report identifies the browsers that visitors used to access a given site's page view within the reported time period.

Counting browsers is simply counting the sessions for each browser. We simply sum up the aggregated values on sessions. Aggregating sums for all possible time ranges that users can select results in too many aggregated values, so we concentrate on daily sums.

Data aggregation is done in a single Map-Reduce phase. (1) The starting point is the session data (`SesData` location). You will use this data to generate intermediate/uncompressed raw data stored as `L3NewBrowserBean` objects in the `SesProcessed` location. (2) The `SessionBean` objects are then used by the `SessionProcessor` processor to create `L3NewBrowserBean` objects, which store aggregated data that can be inserted into the database. The implementation is illustrated in Figure 2.

Figure 2: "New Browsers" Report Implementation



- The `SesData` location has all data on all sessions. You will use this data as the starting point for generating your report data. There is no need to add to or modify that data; you can use the existing `SessionBean` objects.
- Extend the `SessionProcessor` processor to create a new `L3NewBrowserBean` object for each combination of `siteid`, `dateid`, `browserid`, `siteid/dateid/browserid` combination. This object will be stored by the `SessionProcessor` processor in the `Sesinjected` location.
- The `SessionInjection` processor inserts the data into the database. A new bean is not required, but for proper insertion into the database, make sure that you have

properly annotated the fields of the L3 Bean (created in the SessionProcessor) with the Aggregator.

Note

The Aggregator is a java annotation used to tag fields of a bean that can be aggregated. If you wish to use an Aggregator other than SumAggregator, then you can use any of the following Aggregators listed:

- AvgAggregator
- CountAggregator
- DistinctCountAggregator
- MaxAggregator
- NullAggregator
- MinAggregator

Developing an Analytics Job for the 'NewBrowsers' Report

Follow the general steps, as described in the above section, for developing an Analytics Job.

1. Select the Input Location
2. Extend the Schema
3. Create the Beans
4. Create the Mapper Classes
5. Adding Beans and Mappers to the Processor Definitions

1. Select the Input Location

In the "NewBrowsers" report you are aggregating data on a session, so the input location should be the sesdata location.

2. Extend the Schema

To store the data, you will need to add a new table to store the pre-aggregated L3 data. Execute the following SQL statement as the analytics user:

```
CREATE TABLE L3_DATEXSITEXNEWBROWSERXCOUNT ( DATEID NUMBER NOT
 NULL , SITEID NUMBER(6) , BROWSERID NUMBER , COUNT NUMBER);
 commit;
```

3. Create the Beans

For this report, one bean is required:

L3NewBrowserBean - This class is mapped to the L3 table in the database. The L3NewBrowserBean is used to store the aggregated count of browser visits. The content of this bean will be injected into the L3_DATEXSITEXNEWBROWSERXCOUNT table.

Create the L3NewBrowserBean bean class. For sample code, see Table 1, "L3NewBrowserBean.java".

Table 1: L3NewBrowserBean.java

```java
/*
 * Copyright (c) 2008 FatWire Corporation. All Rights Reserved. Title, ownership
 * rights, and intellectual property rights in and to this software remain with
 * FatWire Corporation. This software is protected by international copyright
 * laws and treaties, and may be protected by other law. Violation of copyright
 * laws may result in civil liability and criminal penalties.
 */
package com.fatwire.analytics.domain.l3;
import javax.persistence.AttributeOverride;
import javax.persistence.Column;
import javax.persistence.Entity;
import javax.persistence.Id;
import javax.persistence.Transient;
import com.fatwire.analytics.domain.AbstractL3Bean;
import com.fatwire.analytics.domain.annotation.Aggregate;
import com.fatwire.analytics.domain.annotation.SumAggregator;
import com.fatwire.analytics.domain.key.DateSiteEntityKey;
/**
 * this class represents entries in the L3_dateXsiteXnewbrowserXcount table
 *
 */
@Entity(name="L3_dateXsiteXnewbrowserXcount")
@AttributeOverride(name = "key.firstEntity", column = @Column(name =
  "BROWSERID", nullable = false, insertable = false, updatable = false))
public class L3NewBrowserBean extends AbstractL3Bean<DateSiteEntityKey> {
private static final long serialVersionUID = 1L;
/** the primary key definition of the object/table */
@Id
private DateSiteEntityKey key = new DateSiteEntityKey();
/** the count value for the entity */
@Aggregate(aggregatorClass = SumAggregator.class)
private Long count;
/**
 * overwrite constructor to set the hadoop keys
 */
public L3NewBrowserBean() {
       keys = new String[]{"dateid", "siteid", "browserid", "type"};
}
public Long getBrowserid() {
       return key.getFirstEntity();
}
public void setBrowserid(Long browserid) {
       key.setFirstEntity(browserid);
}
@Transient
public DateSiteEntityKey getKey() {
       return key;
}
public void setKey(DateSiteEntityKey key) {
       this.key = key;
}
public Long getSiteid() {
       return key.getSiteid();
}
```

```
33  public void setSiteid(Long siteid) {
34          key.setSiteid(siteid);
    }
35  public Long getDateid() {
36          return key.getDateid();
    }
37  public void setDateid(Long dateid) {
38          key.setDateid(dateid);
    }
39  public Long getCount() {
40          return count;
    }
41  public void setCount(Long count) {
42          this.count = count;
    }
}
```

Analyzing the L3NewBrowserBean code

- Lines 2-10:
  Import all the required packages
- Line 13:
  Extend the `com.fatwire.analytics.domain.AbstractL3Bean` class.
- Lines 16-18

  Declare private member variables where:

  - `key`: primary key
  - `count`: number of sessions
- `@Entity` annotation designates this class as persistent entity thereby making it eligible for use by the JPA services (Line 11). The value of the name attribute is the name of the database table to which the entity should be mapped.
- With the `@Attribute` annotation (Line 12), the `L3_DATEXSITEXNEWBROWSERXCOUNT` table would have the `key.firstEntity` attribute of the persistent entity mapped to the `BROWSERID` column.
- Use the `DateSiteEntity` key (Line 16) which is an implementation of an `L3` multi-column primary key.

> **Note**
>
> If you do not wish to use the `DateSiteEntity` implementation, then you can use any of the following multi-column primary key implementations:
>
> - `DateSite`**`Entity`**`Entitykey`
> - `DateSite`**`Entity`**`Stringkey`
> - `DateSiteStringkey`
>
> where **Entity** represents a numeric entity.
>
> The choice of implementation will depend solely on the primary key of the table used for storing the contents of the `L3` bean.

- Use the `@Id` annotation (Line 15) to designate `DateSiteEntity` key member variable as the entity's primary key.
- Use the aggregate annotation to annotate the count field with `SumAggregator`. The `SumAggregator` annotation is used to sum the session count for each browser. (Line 17)
- In the constructor specify the key on the basis of which multiple instances of the bean class will be aggregated (Lines 20-21). The `type` signifies the name of the bean class.
- Implement getter/starter methods to expose the private member fields (Lines 22-42).

4. Create the Mapper Classes

For this report, one Mapper class is required:

- `L3NewBrowserMapper` (`L3NewBrowserMapper.java`)

Table 2: L3NewBrowserMapper.java

```
/*
 * Copyright (c) 2008 FatWire Corporation. All Rights Reserved. Title, ownership
 * rights, and intellectual property rights in and to this software remain with
 * FatWire Corporation. This software is protected by international copyright
 * laws and treaties, and may be protected by other law. Violation of copyright
 * laws may result in civil liability and criminal penalties.
 */

package com.fatwire.analytics.report.mapper;

import java.io.IOException;
import org.apache.log4j.Logger;
import com.fatwire.analytics.domain.SessionBean;
import com.fatwire.analytics.domain.l3.L3NewBrowserBean;
import com.fatwire.analytics.mapreduce.AbstractAnalyticsMapper;
import com.fatwire.analytics.mapreduce.AnalyticsOutputCollector;

/**
 * L3 mapper on New Browser
 *
*/
public class L3NewBrowserMapper extends AbstractAnalyticsMapper<SessionBean,
L3NewBrowserBean> {

/** initialize logging */
private static final Logger logger =
   Logger.getLogger(L3NewBrowserMapper.class);

@Override
public void map(SessionBean input,
   AnalyticsOutputCollector<L3NewBrowserBean> outputCollector) throws
   IOException {
      if(logger.isTraceEnabled()) {
           logger.trace("mapping input bean '"+ input +"' to
              L3NewBrowserBean");
      }

      L3NewBrowserBean output = new L3NewBrowserBean();
      output.setDateid(input.getDateid());
      output.setSiteid(input.getSiteid());
      output.setBrowserid(input.getBrowserid());
      output.setCount(1L);

     // collect the output bean
          outputCollector.collect(output);
    }
}
```

Analyzing the `L3NewBrowserMapper` class code

- The `L3NewBrowserMapper` class will extend the `AbstractAnalyticsMapper` class (Line 8) and override the map method (Lines 10-11).
- In the map method, every input `SessionBean` is transformed into `L3NewBrowserBean` by setting the value of `L3NewBrowserBean` from the `SessionBean` (Lines 13-17).
- The count property of the `L3NewBrowserBean` is set to `1L` for every input bean (Line 18).
- Every `L3NewBrowserBean` created will be collected by the output collector (`AnalyticsOutputCollector`) (Line 19).
- Add debugging statements (Line 13).

5. Adding Beans and Mappers to the Processor Definitions

To enable your newly coded beans and mapper classes, add them to the existing processor definitions. Adding a mapper is done by adding the mapper to the `spring-mapper.xml` files in the corresponding processor folder.

In this exercise you will be configuring:

- `L3NewBrowserMapper`
- `L3NewBrowserBean`

To add beans and mappers to the processor definitions

1. Configure `L3NewBrowserMapper`:
    a. Open the **`processors/sesprocessor/spring-mapper.xml`** file in a text editor.

b. Add the **`bean class`** line (shown in bold type, below) to the `spring-mapper.xml` file:

```
<bean id="AnalyticsMapperConfigBean" class="java.util.ArrayList">
    <constructor-arg>
      <list>
       <bean id="clickstreamMapper"
class="com.fatwire.analytics.report.mapper.L3ClickstreamMapper"/>
       <bean id="newBrowserMapper"
class="com.fatwire.analytics.report.mapper.L3NewBrowserMapper"/>
       <bean id="osMapper"
class="com.fatwire.analytics.report.mapper.L3OperatingsystemMapper"/>

       <bean id="sessionEntryidMapper"
class="com.fatwire.analytics.report.mapper.L3SessionEntryMapper"/>
       <bean id="sessionExitidMapper"
class="com.fatwire.analytics.report.mapper.L3SessionExitMapper"/>
       <bean id="ipMapper"
class="com.fatwire.analytics.report.mapper.L3IpMapper"/>
       <bean id="hostnameMapper"
class="com.fatwire.analytics.report.mapper.L3HostnameMapper"/>
       <bean id="jsMapper"
class="com.fatwire.analytics.report.mapper.L3JsMapper"/>
       <bean id="searchengineMapper"
class="com.fatwire.analytics.report.mapper.L3SearchengineMapper"/>
       <bean id="refererMapper"
class="com.fatwire.analytics.report.mapper.L3RefererMapper"/>
       <bean id="screenresMapper"
class="com.fatwire.analytics.report.mapper.L3ScreenresMapper"/>

       <bean id="sessionQuantilMapper"
class="com.fatwire.analytics.report.mapper.L3SessionQuantilMapper"/>

       <bean id="objectDurationMapper"
class="com.fatwire.analytics.report.mapper.L3ObjectDurationMapper"/>

       <bean id="engageMapper"
class="com.fatwire.analytics.report.mapper.L3EngageMapper"/>
      </list>
    </constructor-arg>
   </bean>
```

2. Configure `L3NewBrowserBean`:

   a. Open the **`processor/sesprocessor/spring-combiner_reducer.xml`** file in a text editor.

   b. Add the **`entry key`** line (shown in bold type, below) to the `spring-combiner_reducer.xml` file:

```
<util:map id="AnalyticsCombinerReducerConfigBean" map-
class="java.util.HashMap">
       <entry key="com.fatwire.analytics.domain.l3.L3ClickstreamBean"
value-ref="analyticsBeanReducer"/>
       <entry key="com.fatwire.analytics.domain.l3.L3OperatingsystemBean"
value-ref="analyticsBeanReducer"/>
       <entry key="com.fatwire.analytics.domain.l3.L3NewBrowserBean"
value-ref="analyticsBeanReducer"/>

       <entry key="com.fatwire.analytics.domain.l3.L3SessionEntryBean" value-
ref="analyticsBeanReducer"/>
       <entry key="com.fatwire.analytics.domain.l3.L3SessionExitBean" value-
ref="analyticsBeanReducer"/>
       <entry key="com.fatwire.analytics.domain.l3.L3IpBean" value-
ref="analyticsBeanReducer"/>
       <entry key="com.fatwire.analytics.domain.l3.L3HostnameBean" value-
ref="analyticsBeanReducer"/>
       <entry key="com.fatwire.analytics.domain.l3.L3JsBean" value-
ref="analyticsBeanReducer"/>
       <entry key="com.fatwire.analytics.domain.l3.L3SearchengineBean" value-
ref="analyticsBeanReducer"/>
       <entry key="com.fatwire.analytics.domain.l3.L3RefererBean" value-
ref="analyticsBeanReducer"/>
       <entry key="com.fatwire.analytics.domain.l3.L3ScreenresBean" value-
ref="analyticsBeanReducer"/>

       <entry key="com.fatwire.analytics.domain.l3.L3SessionQuantilBean" value-
ref="analyticsBeanReducer"/>

       <entry key="com.fatwire.analytics.domain.l3.L3ObjectDurationBean" value-
ref="analyticsBeanReducer"/>

       <entry key="com.fatwire.analytics.domain.l3.L3EngageRecBean" value-
ref="analyticsBeanReducer"/>
       <entry key="com.fatwire.analytics.domain.l3.L3EngageRecSegBean" value-
ref="analyticsBeanReducer"/>
       <entry key="com.fatwire.analytics.domain.l3.L3EngageRecSegObjBean" value-
ref="analyticsBeanReducer"/>
    </util:map>
```

Configuring Database Injection

1. Open the **`processors/sesinjection/spring-combiner.xml`** file in a text editor.
2. Add the **`entry key`** line (shown in bold type, below) to the `spring-combiner.xml` snippet:

```
<util:map id="AnalyticsCombinerConfigBean" map-class="java.util.HashMap">
    <entry key="com.fatwire.analytics.domain.l3.L3ClickstreamBean" value-
ref="analyticsBeanReducer"/>
    <entry key="com.fatwire.analytics.domain.l3.L3NewBrowserBean" value-
ref="analyticsBeanReducer"/>
    <entry key="com.fatwire.analytics.domain.l3.L3OperatingsystemBean" value-
ref="analyticsBeanReducer"/>
    <entry key="com.fatwire.analytics.domain.l3.L3SearchengineBean" value-
ref="analyticsBeanReducer"/>

<entry key="com.fatwire.analytics.domain.l3.L3SessionEntryBean" value-
ref="analyticsBeanReducer"/>
<entry key="com.fatwire.analytics.domain.l3.L3SessionExitBean" value-
ref="analyticsBeanReducer"/>
<entry key="com.fatwire.analytics.domain.l3.L3IpBean" value-
ref="analyticsBeanReducer"/>
<entry key="com.fatwire.analytics.domain.l3.L3HostnameBean" value-
ref="analyticsBeanReducer"/>
<entry key="com.fatwire.analytics.domain.l3.L3JsBean" value-
ref="analyticsBeanReducer"/>
<entry key="com.fatwire.analytics.domain.l3.L3SearchengineBean" value-
ref="analyticsBeanReducer"/>
<entry key="com.fatwire.analytics.domain.l3.L3RefererBean" value-
ref="analyticsBeanReducer"/>
    <entry key="com.fatwire.analytics.domain.l3.L3ScreenresBean" value-
ref="analyticsBeanReducer"/>

    <entry key="com.fatwire.analytics.domain.l3.L3SessionQuantilBean" value-
ref="analyticsBeanReducer"/>

    <entry key="com.fatwire.analytics.domain.l3.L3ObjectDurationBean" value-
ref="analyticsBeanReducer"/>

    <entry key="com.fatwire.analytics.domain.l3.L3EngageRecBean" value-
ref="analyticsBeanReducer"/>
<entry key="com.fatwire.analytics.domain.l3.L3EngageRecSegBean" value-
ref="analyticsBeanReducer"/>
<entry key="com.fatwire.analytics.domain.l3.L3EngageRecSegObjBean" value-
ref="analyticsBeanReducer"/>
</util:map>
```

3. Open the **`processors/sesinjection/spring-reducer.xml`** files in a text editor.

4. Add the **`entry key`** line (shown in bold type, below) to the `spring-reducer.xml` snippet:

```
<util:map id="AnalyticsReducerConfigBean" map-class="java.util.HashMap">
    <entry key="com.fatwire.analytics.domain.l3.L3ClickstreamBean" value-
ref="databaseInjection"/>
    <entry key="com.fatwire.analytics.domain.l3.L3NewBrowserBean" value-
ref="databaseInjection"/>
    <entry key="com.fatwire.analytics.domain.l3.L3OperatingsystemBean" value-
ref="databaseInjection"/>
    <entry key="com.fatwire.analytics.domain.l3.L3SearchengineBean" value-
ref="databaseInjection"/>

     <entry key="com.fatwire.analytics.domain.l3.L3SessionEntryBean" value-
ref="databaseInjection"/>
     <entry key="com.fatwire.analytics.domain.l3.L3SessionExitBean" value-
ref="databaseInjection"/>
     <entry key="com.fatwire.analytics.domain.l3.L3IpBean" value-
ref="databaseInjection"/>
     <entry key="com.fatwire.analytics.domain.l3.L3HostnameBean" value-
ref="databaseInjection"/>
     <entry key="com.fatwire.analytics.domain.l3.L3JsBean" value-
ref="databaseInjection"/>
     <entry key="com.fatwire.analytics.domain.l3.L3SearchengineBean" value-
ref="databaseInjection"/>
     <entry key="com.fatwire.analytics.domain.l3.L3RefererBean" value-
ref="databaseInjection"/>
  <entry key="com.fatwire.analytics.domain.l3.L3ScreenresBean" value-
ref="databaseInjection"/>

  <entry key="com.fatwire.analytics.domain.l3.L3SessionQuantilBean" value-
ref="databaseInjection"/>

  <entry key="com.fatwire.analytics.domain.l3.L3ObjectDurationBean" value-
ref="databaseInjection"/>

  <entry key="com.fatwire.analytics.domain.l3.L3EngageRecBean" value-
ref="databaseInjection"/>
     <entry key="com.fatwire.analytics.domain.l3.L3EngageRecSegBean" value-
ref="databaseInjection"/>
     <entry key="com.fatwire.analytics.domain.l3.L3EngageRecSegObjBean" value-
ref="databaseInjection"/>
   </util:map>
```

Integrating the New Analytics Job with the Existing Hadoop-Jobs Component

Once you have developed the new Analytics job, integrate the new job you developed with the existing hadoop-jobs component by recreating a jar file (`hadoop-jobs.jar`). Copy the new hadoop-jobs.jar file to the hadoop-jobs directory. Recreating the jar file enables the hadoop-jobs component to process the data captured by the new Analytics job you developed in this exercise.

To integrate the new Analytics job with the existing hadoop-jobs component:

1. Create the `hadoop-jobs.jar` file.
2. Replace the existing `hadoop-jobs.jar` file, located in the hadoop-jobs installation directory, with the jar file you created in step 1.
3. Run the hadoop-jobs component in order to process the data captured by the parameter (added in Exercise 1).

Next Steps

Exercise 3 of this tutorial walks you through how to create a new report in the reporting interface. As an example, you will create the “NewBrowsers” report, which displays the number of visitors for each browser.

Note

The “NewBrowsers” report you will be creating in this tutorial, is a duplicate of the default “Browsers” report in your Analytics installation. For the purposes of this tutorial, the xml file and report name of the “Browsers” report you will be configuring, along with the bean and mapper class names, have been renamed to avoid overwriting the default “Browsers” report.

Exercise 3

Creating and Configuring a Report

Your goal in this exercise is to learn how to configure a complete, usable Analytics report.

To accomplish that, you will configure a custom report called “NewBrowsers” that will display the browsers that visitors used to gain access to the given site’s page view within the reported time period.

Note

The “NewBrowser” report you will be creating in this tutorial, is a duplicate of the default “Browsers” report in your Analytics installation. For the purposes of this tutorial, the xml file and report name of the “Browsers” report you will be configuring, along with the bean and mapper class names, have been renamed to avoid overwriting the default “Browsers” report

The report will display data that has already been captured on the FirstSite II sample site and stored in the Analytics database.

When building the report, you will first create a simple report with a test module that displays a “Hello World” greeting. You will remove this test module when you begin adding features to your report.

Note

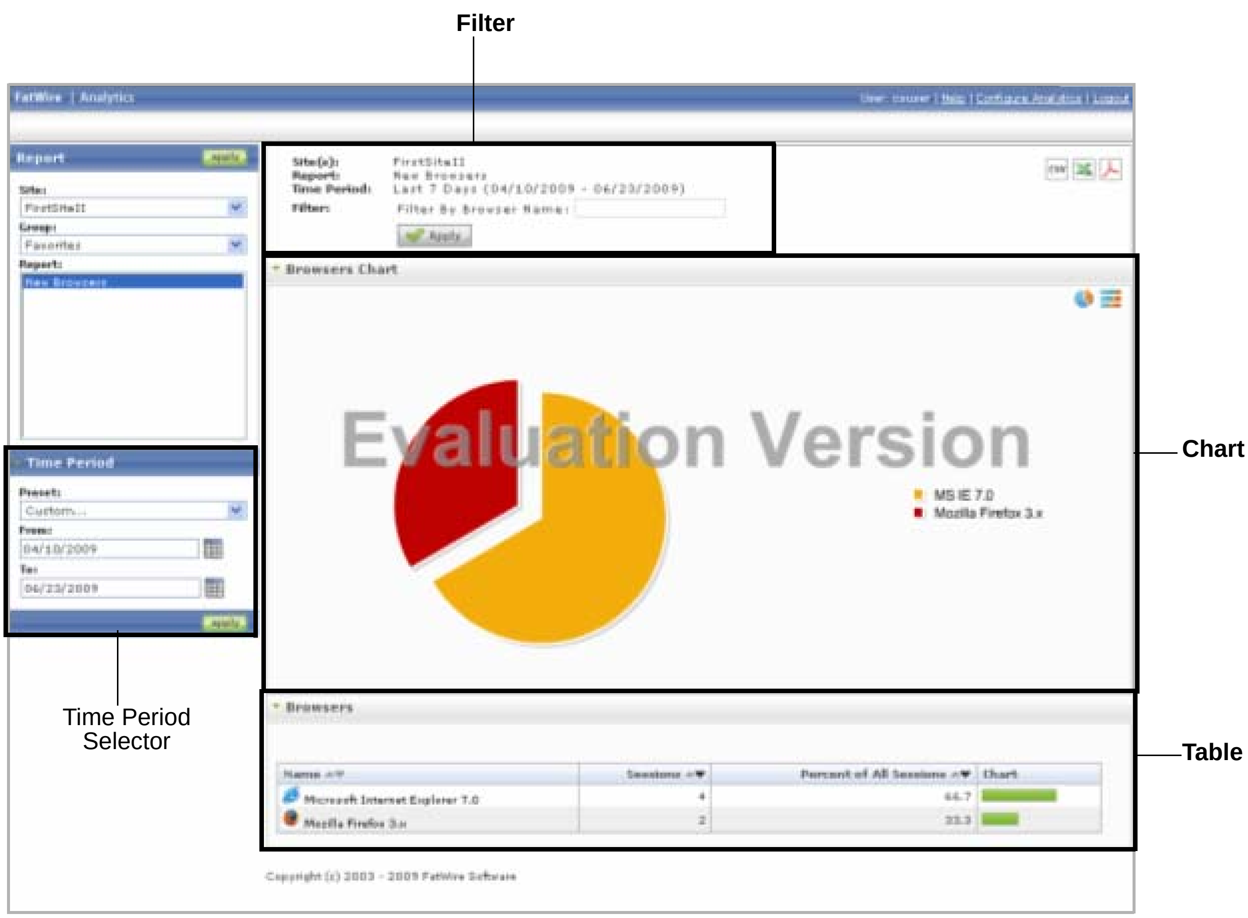
Throughout this exercise, we assume that you are working exclusively with the FirstSite II sample site. Select this site whenever prompted in the Analytics or Content Server interfaces.

This exercise consists of the following sections:

- Report Design
- Creating the ‘NewBrowsers’ Report

Report Design

An Analytics report is composed of modules. A module is a piece of code that implements a specific feature in the report, such as a table, a chart, or a filter. For example, the “NewBrowsers” report you will build in this exercise contains the following features:



Each of these features, except for the time period selector, is implemented as a separate and, in most cases, self-contained module. (Some features, such as filters, require you to modify the code of other modules in order to function.) Let’s look at the structure of the table module. It has a module declaration, a data retrieval section, and a display section:

```
<module type="stdtable" name="tableexample">
    <sql>
      <!-- This is the data retrieval section. It contains the queries that
        retrieve data from the Analytics database for display in your
        table. -->
    </sql>
    <display>
       <!-- This is the display section. It contains the code that defines
        the layout and contents of your table. -->
    </display>
</module>
```

The pair of <module> tags defines the module, its type, and object handle.

The code inside the <module> tags defines the report’s features.

Modules that query the database to display data contain the `<sql>` and `<display>` tags, as shown in the sample code on page 34. Modules that do not display data, such as filter modules, contain the following structure:

```
<filter name="filter-browsername" required="false" type="text" captions="name"
        key="filter-browsername" />
```

The chart module has the same structure.

The tables, charts, and other features of your report contain areas (such as headings, field names and column heads) that must be filled in manually by having their values defined in a property file accessible within your application server's classpath. For example, the following statement defines the heading for the "Browser Name" column in your table:

```
report_newbrowser_module_browser_column_broname=Name
```

Now that you know how reports are built, let's go ahead and create the "NewBrowsers" report. Continue on to "Creating the 'NewBrowsers' Report," on page 40.

Note

For your reference, the code for the "NewBrowsers" report, annotated module by module, is included in "'NewBrowsers' Report Code," on page 36."

‘NewBrowsers’ Report Code

Below is the code that powers the “NewBrowsers” report. The code is annotated for your reference.

```
<?xml version="1.0" encoding="UTF-8"?>
<!--  <!DOCTYPE report SYSTEM "report.dtd">  -->

<report type="std" visible="true" name="newbrowser" >

<!-- Global parameters (such as sitenames), are defined here-->

<globalparam name="sitenames" />

<!-- After declaring global parameters, start declaring several request
parameters like rgrpid, timepreset, sdate, edate etc. sdate, edate enable the
time range selector in the report-->
<param type="request" name="rgrpid" key="rgrpid" required="false" />
<param type="request" name="timepreset" key="timepreset" required="false">
    <restriction type="listvalue">
       <restrictionvalue value="yesterday" />
             <restrictionvalue value="lastweek" />
             <restrictionvalue value="lastmonth" />
             <restrictionvalue value="last7days" />
             <restrictionvalue value="last4weeks" />
             <restrictionvalue value="last12months" />
       </restriction>
</param>
<param type="request" name="siteid" key="siteid" required="true" />
<param type="request" name="sdate" key="sdate" required="true">
    <restriction type="isDate" value="dd.MM.yyyy" />
</param>
<param type="request" name="edate" key="edate" required="true">
    <restriction type="isDate" value="dd.MM.yyyy" />
</param>

<!—a filter is getting configured here, that will filter the report data by
browser name. -->
<filter name="filter-browsername"
        required="false"
        type="text"
        captions="name"
        key="filter-browsername"
/>

<!—the following parameter will generate the sum of all sessions that have come
from different browsers-->
<param type="sql" name="browsertotal" >
    <query>
       select
          nvl(sum(count), 0) as count
       from
          help_dates dates
          join l3_datexsitexnewbrowserxcount l3 on (dates.id = l3.dateid)
```

```
        where<![CDATA[
            siteid = #siteid# and
            dates.dat >= to_date('#sdate#', 'DD-MM-YYYY') and
            dates.dat  < to_date('#edate#', 'DD-MM-YYYY')+1 ]]>
    </query>
</param>
<!-- The chart module defines your pie chart. -->
<module type="stdchart" name="chartbrowser">
    <param type="request" name="charttype" key="chartbrowser_charttype"
        default="pie_labeled">
        <restriction type="listvalue">
              <restrictionvalue value="pie_labeled" />
              <restrictionvalue value="bar_labeled" />
        </restriction>
    </param>

    <param type="string" name="chart_max_display" value="10"/>
    <param type="string" name="chart_display_rest" value="true"/>
    <sql>
    <query>
        select
            bro.id as broid,
            bro.name as broname,
            nvl(count, 0) as count,
            <equals name="browsertotal" value="0">
                0 as percent
            </equals>
            <notEquals name="browsertotal" value="0">
                (nvl(count, 0)/#browsertotal#)*100 as percent
            </notEquals>
        from
            l2_browser bro
            join (
            select
                bro2.id as broid,
                bro2.name as broname,
                sum(count) as count
            from
                help_dates dates
                join l3_datexsitexnewbrowserxcount l3 on
                        (dates.id = l3.dateid)
                        join l2_browser bro2 on (l3.browserid = bro2.id)
            where<![CDATA[
                siteid = #siteid# and
                dates.dat >= to_date('#sdate#', 'DD-MM-YYYY') and
                dates.dat  < to_date('#edate#', 'DD-MM-YYYY')+1 ]]>
            group by
                bro2.id, bro2.name

            ) on (bro.id = broid)
            <dynamicOrderBy default="count-desc" />
    </query>
    </sql>
```

```
    <display type="html">
       <value name="xaxis" type="string">
           <valueparam name="format" parse="false"/>
           <valueparam name="value" value="#broname#" />
       </value>

       <value name="yaxis" type="number">
              <valueparam name="format" parse="false" value="#####0" />
              <valueparam name="value" value="#count#" />
       </value>
    </display>

    </module>
<!-- This module defines the table that will show statistics for each browser to
the target page.-->
<module type="stdtable" name="browser" >
    <sql>
       <query>
           select
              bro.id as broid,
              bro.name as broname,
              bro.iconpath as broiconpath,
              nvl(count, 0) as count,
              <equals name="browsertotal" value="0">
                 0 as percent
              </equals>
              <notEquals name="browsertotal" value="0">
                 (nvl(count, 0)/#browsertotal#)*100 as percent
              </notEquals>
           from
              l2_browser bro
              join (
              select
                 bro2.id as broid,
                 bro2.name as broname,
                 sum(count) as count
              from
                 help_dates dates
                 join l3_datexsitexnewbrowserxcount l3 on (dates.id = l3.dateid)
                 join l2_browser bro2 on (l3.browserid = bro2.id)
              where<![CDATA[
<!-- The CDATA statement allows the time period selector to limit the data
displayed in the table to a specific time period. -->
                 siteid = #siteid# and
                 dates.dat >= to_date('#sdate#', 'DD-MM-YYYY') and
                 dates.dat < to_date('#edate#', 'DD-MM-YYYY')+1 ]]>

<!-- The <notNull> tag ensures that its contents are added to the main query only
if they are not null. -->


                 <notNull name="filter-browsername">
```

```
                  and lower(bro2.name) like lower(replace('#filter-
                  browsername#','*','%'))
               </notNull>
         group by
            bro2.id, bro2.name

         ) on (bro.id = broid)
         <dynamicOrderBy default="count-desc" />
      </query>
      <count type="simple" />
    </sql>

    <display type="html">
    <!-- Table columns are defined here.
    Each <column> statement defines one column.-->

    <column name="broname" columntype="text" sortrscolumn="broname">
         <value type="image">
            <valueparam name="src" value="#imgpath#/browser/#broiconpath#" />
            <valueparam name="alt" value="#broname#" />
            <valueparam name="text" value="#broname#" />
            <valueparam name="width" value="16" />
            <valueparam name="height" value="16" />
         </value>
         <value type="string">
            <valueparam name="value" value=" #broname#" />
         </value>
         </column>
         <column name="count" columntype="number" sortrscolumn="count">
            <value type="number">
               <valueparam name="format" parse="false" value="#####0" />
               <valueparam name="value" value="#count#" />
            </value>
         </column>
         <column name="percent" columntype="number" sortrscolumn="count">
            <value type="number">
                <valueparam name="format" parse="false" value="#####0.0" />
                <valueparam name="value" value="#percent#" />
            </value>
         </column>
         <column name="chart" columntype="string">
            <value type="chart">
                <valueparam name="format" parse="false" value="#####0" />
                <valueparam name="value" value="#percent#" />
                <valueparam name="maxvalue" value="100" />
                <valueparam name="width" value="100" />
                <valueparam name="image"
                 value="#imgpathstyle_branding#graph_blue.gif" />
            </value>
         </column>
    </display>
</module>
</report>
```

Creating the 'NewBrowsers' Report

You will now create the "NewBrowsers" report (shown on page 34).

Note

In this exercise, you will add features to your report in the order shown below. Once you are familiar with report code, you can build your report in the order that's most convenient for you. Be aware, however, that certain features, such as filters, require you to modify the code in other modules.

1. Creating and Registering the Report File. The first task is to create the XML file that will hold the report code and register it with Analytics.
2. Adding a Table. The table displays a set of statistics for each browser (Browser Name; Sessions; Percent of all sessions; and the chart that shows the percent graphically).
3. Adding a Time Period Selector. This selector allows you to limit the data displayed in the report to a specific time period. (This feature does not require a module.)
4. Adding a Filter. Using filters, you can restrict the data displayed in the report to specific browsers and session counts.
5. Adding a Chart. The "NewBrowsers" chart shows how often a given browser was used to access the site's page view during the reported time period.
6. Testing the Completed 'NewBrowsers' Report. Test your report to make sure it looks and behaves as intended.

Creating and Registering the Report File

Your first task is to create the foundation for the report – the XML file that will hold the report code. In this section you will create a report file containing the "Hello World" test module that will display only text, and you will register the report with Analytics.

The steps for creating and registering a report file are:

A. Create the XML File

B. Place the XML File in the Analytics Reports Directory

C. Label the Report Components

D. Make the Report Available to Analytics Users

E. Test the New Report

A. Create the XML File

1. In a text editor, create a new file named `report_newbrowser.xml`.
2. Paste the following code into the file:

```
<report type="std" name="newbrowser">

<param type="request" name="rgrpid" key="rgrpid" required="false" />
<param type="request" name="siteid" key="siteid" required="true" />

<module type="simpletext" name="helloworld" >
   <display type="html">
       <text>
           <![CDATA[
              <div>
                 Hello World! FatWire is greeting you!
              </div>
           ]]>
       </text>
   </display>
</module>
</report>
```

3. Save and close the file.

B. Place the XML File in the Analytics Reports Directory

Copy the report file to the directory defined by the `report_instdir` parameter in the `global.xml` configuration file, so that Analytics can access the report file.
For information on the `global.xml` file and its location, see the guide *Installing and Configuring Analytics*.

C. Label the Report Components

You must now define the labels for areas such as the report name, module headings, and so on. The labels you define will be displayed in the reporting interface when the report is generated.

Note

Component labeling in Analytics is implemented using the `ResourceBundle` Java class. For more information on this class, see the following URL:

`http://java.sun.com/developers/technicalArticles/Intl/ResourceBundles/`

1. In a text editor, create a new file named `NewBrowsersLocalization.properties`.
2. Save the file in a directory that is within your application server's classpath. In this exercise, place it in the `WEB-INF/classes` directory inside the `analytics` web application directory on your application server.

3. In the property file, add a statement for each parameter string that you want to label in the reporting interface. For now, you will give the report a name, and give the “Hello World” module a heading. Add the following statements to the property file:

```
report_newbrowser=New Browsers
report_newbrowser_module_helloworld=My first report in Analytics!
```

Note

You must use the following syntax when adding statements to the property file:

- Report name: `report_`*`reportName`*
- Module names: `report_`*`reportName`*`_module_`*`moduleName`*
- Column heads in a table: `report _`*`reportName`*`_module_column_`*`columnName`*

4. When you have added the two statements, save and close the file.
5. Register the property file with Analytics by adding its name to the `global.xml` file as follows:
   a. Open the `global.xml` file (usually located in the `WEB-INF/classes` directory inside the `analytics` web application directory on your application server) in a text editor.
   b. Locate the `<locales></locales>` section and insert the following statement inside it:

      ```
      <locale name="NewBrowserLocalization" />
      ```
   c. Save and close the file.
6. Restart the application server for your changes to take effect.

D. Make the Report Available to Analytics Users

In order to make the new report available to your Analytics users, you must register the report with Analytics, add it to a report group, and grant users access to the report.

1. Log in to the Analytics administration interface as `csuser/csuser` via the following URL:

   ```
   http://<hostname>:<port>/analyticsadmin/Admin?advmode=true
   ```

Note

The `advmode=true` parameter gives you access to advanced configuration options normally unavailable in the administration interface.

2. Register the new report with Analytics:
   a. In the “Report” section of the left-hand pane, click **Register**.

      Analytics displays the “Add/Edit Report” form.

b. In the **Name** field, enter `newbrowser`.

   This is the object handle for your report. The value you enter here will be used to refer to the report in code (you used this name when you labeled the components of your report in “C. Label the Report Components,” on page 41). This name will **not** be displayed in the reporting interface.

c. In the **Config-file path** field, enter `report_newbrowser.xml`.

d. Click **Save**.

3. Add the new report to the “Favorites” report group:

   a. In the “Report to Reportgroup” section of the left-hand pane, click **Assign**.

      Analytics displays the “Report Group” form.

   b. In the “Report Group” drop-down list, select **user**.

   c. In the list of reports, select the check box next to **newbrowser**.

   d. In the “Report Group” drop-down list, select **favorite**.

   e. In the list of reports, select the check box next to **newbrowser**.

   f. Click **Save**.

4. Grant users access to the report:

   a. In the “Access Rights” section of the left-hand pane, click **Grant rights**.

   b. Analytics displays the “User Groups” form.

   c. In the form, select the check box next to **newbrowser**.

   d. Click **Save**.

E. Test the New Report

Generate the report to check that it is behaving as intended.

1. Log in to the Analytics reporting interface as `csuser/csuser` via the following URL:

   `http://<hostname>:<port>/analytics/Reports.do`

2. In the “Group” drop-down list in the left-hand pane, select **Favorites**.
3. In the “Report” list, double-click **New Browsers**.

   Analytics displays your report. The report should look as follows:

4. If your report does not appear as in the above figure, or if an error is displayed, retrace your steps and check your code for errors.

Once you have verified your report is behaving as intended, continue on to the next section, “Adding a Table,” on page 45.

Adding a Table

A table is the primary way of presenting data in an Analytics report. In this section, you will add a table to your “NewBrowsers” report that will display several categories of information on different browsers.

How Do I Add a Table?

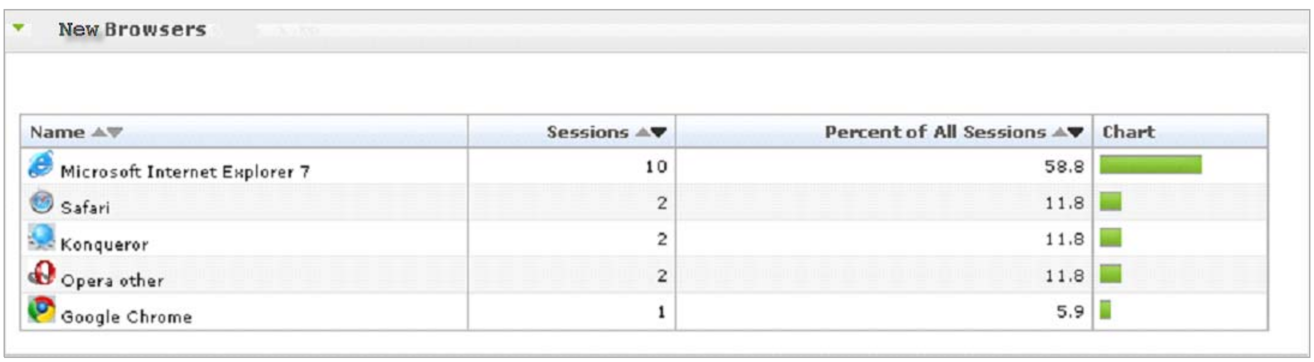
You add a table to your report by inserting a table module into your report’s code. A table module has two sections (as shown in the example on page 34):

- **Data retrieval section** (enclosed within the `<sql>` tag, lines 1–21 below).
  This section contains the SQL code that retrieves the data you want to display in your table from the Analytics database.
- **Display section** (enclosed within the `<display>` tag, lines 22–46 below).
  This section contains the code that formats and displays the data retrieved from the Analytics database by the code in the data retrieval section. The code in the display section defines the layout of the table and the formatting applied to each column.

In this section, you will add the “NewBrowsers” table to your report. The table will display the following columns:

- Name
- Sessions
- Percent of All Sessions
- Chart

The table will look as follows:


New Browsers

Name	Sessions	Percent of All Sessions	Chart
Microsoft Internet Explorer 7	10	58.8	
Safari	2	11.8	
Konqueror	2	11.8	
Opera other	2	11.8	
Google Chrome	1	5.9	

To add a table to your report

1. Open your `report_newbrowser.xml` file and replace the “Hello World” test module with the following code:

```
<module type="stdtable" name="browser" >
 <sql>
   <query>
    select
     bro.id as broid,
     bro.name as broname,
     bro.iconpath as broiconpath,
     nvl(count, 0) as count,
     <equals name="browsertotal" value="0">
       0 as percent
      </equals>
      <notEquals name="browsertotal" value="0">
       (nvl(count, 0)/#browsertotal#)*100 as percent
      </notEquals>
     from
      l2_browser bro
      join (
     select
      bro2.id as broid,
      bro2.name as broname,
      sum(count) as count
     from
      help_dates dates
      join l3_datexsitexnewbrowserxcount l3 on (dates.id = l3.dateid)
      join l2_browser bro2 on (l3.browserid = bro2.id)
     where<![CDATA[
      siteid = #siteid# and
      dates.dat >= to_date('#sdate#', 'DD-MM-YYYY') and
      dates.dat  < to_date('#edate#', 'DD-MM-YYYY')+1 ]]>
      <notNull name="filter-browsername">
       and lower(bro2.name) like lower(replace('#filter-
       browsername#','*','%'))
      </notNull>
     group by
      bro2.id, bro2.name

     ) on (bro.id = broid)
     <dynamicOrderBy default="count-desc" />
   </query>
   <count type="simple" />
  </sql>

  <display type="html">
   <column name="broname" columntype="text" sortrscolumn="broname">
    <value type="image">
     <valueparam name="src" value="#imgpath#/browser/#broiconpath#" />
     <valueparam name="alt" value="#broname#" />
     <valueparam name="text" value="#broname#" />
     <valueparam name="width" value="16" />
     <valueparam name="height" value="16" />
    </value>
```

```
52     <value type="string">
53      <valueparam name="value" value=" #broname#" />
54     </value>
55    </column>
56    <column name="count" columntype="number" sortrscolumn="count">
57     <value type="number">
58      <valueparam name="format" parse="false" value="#####0" />
59      <valueparam name="value" value="#count#" />
60     </value>
61    </column>
62    <column name="percent" columntype="number" sortrscolumn="count">
63     <value type="number">
64      <valueparam name="format" parse="false" value="#####0.0" />
65      <valueparam name="value" value="#percent#" />
66     </value>
67    </column>
68    <column name="chart" columntype="string">
69     <value type="chart">
70      <valueparam name="format" parse="false" value="#####0" />
71      <valueparam name="value" value="#percent#" />
72      <valueparam name="maxvalue" value="100" />
73      <valueparam name="width" value="100" />
74     <valueparam name="image" value="#imgpathstyle_branding#graph_blue.gif" />
75     </value>
76    </column>
77   </display>
78  </module>
```

Analyzing the code

- In the data retrieval section, a select query retrieves the required rows (`broid`, `broname`, `broiconpath`, `count`, `percent`) from the `L3_DATEXSITEXNEWBROWSERXCOUNT` and `L2_BROWSER` tables (lines 4-37). You access these values from the display section by calling them enclosed within hash (#) signs, (for example, `value="#broname#"` in line 53).
- The `<dynamicOrderBy>` tag in line 38 defines how the rows should be ordered. In our example, the value `"count-desc"` indicates the rows are ordered by the number of sessions, in descending order.
- In the display section, the `<column>` statements define columns that constitute your table (lines 44-55, 56-61, 62-67, and 68-76). Each column definition is responsible for one column in the table and takes the following parameters:
  - `name` (required) – specifies the object handle for the column. You use this handle to specify a label for the column in the `NewBrowserLocalization.properties` file.
  - `columntype` (required) – specifies the type of the column. Your table uses number, text, and string columns.

- `sortrscolumn` (required) – specifies whether the column should be sortable, and if so, how the data should be sorted.

> **Note**
>
> A sortable column displays a small arrow in its heading that indicates the direction in which its values are being sorted. Clicking the arrow reverses the sort order.

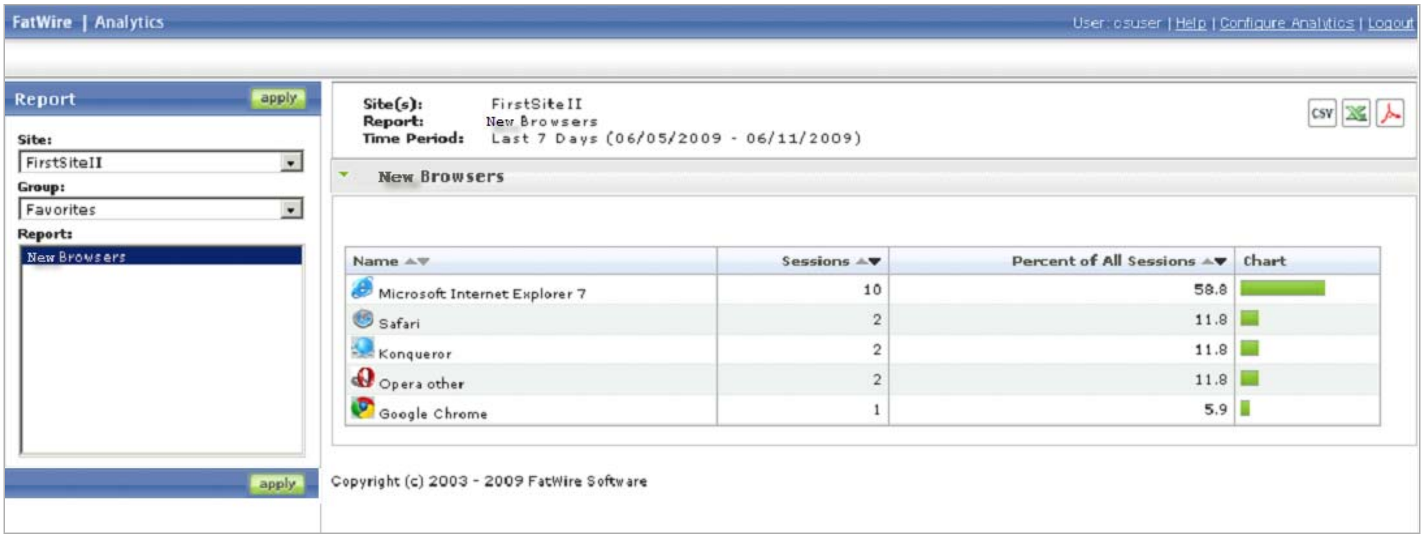
- The following columns are defined in our example:
  - The `broname` column of type text (lines 23-28) displays the name of the browser along with the corresponding icon. Columns of type text may have a value parameter (lines 24-27) of type image, number, string, date etc. (parameter type is defined in the value tag). Here the `broname` column is composed of two different types of values namely image and string. The value of type image can have several value-parameters, including, but not limited to: `src` (`source path`), `alt` (`alternative text`), `width`, and `height`, which collectively define the rendition of the image on the report.
  - The `count` column (lines 29-33) of type number displays the number of sessions that have come from the browser. Columns of type `number` must have a `value` parameter (lines 24-27) of type `number` (parameter type is defined in the `value` tag) which specifies:
    - What data should be displayed (value parameter, line 26)
    - How the data should be formatted (format parameter, line 25)
  - The percent column (lines 34-39) of type number displays the percent of sessions with respect to all sessions that have come from all different browsers.
  - The chart column (lines 40-45) of type chart is the graphic representation of the percent column.

2. Save and close the file.
3. Label the table and column headings as follows:
   a. Open the `NewBrowserLocalization.properties` file (in this exercise, located in the `WEB-INF/classes` directory in the `analytics` application directory on your application server) in a text editor.
   b. Add the following statements at the end of the file:

```
# Report New Browser
report_newbrowser=Browsers
report_newbrowser_module_browser_column_broname=Name
report_newbrowser_module_browser_column_count=Sessions
report_newbrowser_module_browser_column_percent=Percent of All Sessions
report_newbrowser_module_browser_column_chart=Chart
report_newbrowser_module_browser=Browsers
```

   c. Save and close the file.
   d. Restart your application server for your changes to take effect.

4. Test your report. At this point, it should look as follows:



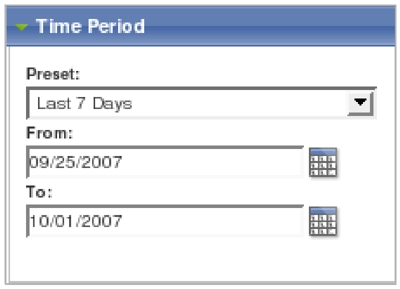
5. If your report does not appear as in the above figure, or if an error is displayed, retrace your steps and check your code for errors.

6. Continue on to the next section, “Adding a Time Period Selector,” on page 50.

Adding a Time Period Selector

Now that your “NewBrowsers” report displays data, you will add a time period selector. This selector is a very useful feature, as it allows you to limit the amount of data displayed in the report to a specific time period. For example, you might want to view visitor activity that happened during a specific day or even hour, instead of all activity captured to date.

The time period selector will appear in the navigation pane in the reporting interface when you access the report:



To enable time period selection in your report

1. Open the `report_newbrowser.xml` file (located in the Analytics reports directory described in “B. Place the XML File in the Analytics Reports Directory,” on page 41) in a text editor.
2. Locate the global parameter section and add the boxed parameters:

```
<param type="request" name="rgrpid" key="rgrpid" required="false" />
<param type="request" name="timepreset" key="timepreset" required="false">
   <restriction type="listvalue">
       <restrictionvalue value="yesterday" />
       <restrictionvalue value="lastweek" />
       <restrictionvalue value="lastmonth" />
       <restrictionvalue value="last7days" />
       <restrictionvalue value="last4weeks" />
       <restrictionvalue value="last12months" />
   </restriction>
</param>
<param type="request" name="siteid" key="siteid" required="true" />

<param type="request" name="sdate" key="sdate" required="true">
   <restriction type="isDate" value="dd.MM.yyyy" />
</param>
<param type="request" name="edate" key="edate" required="true">
   <restriction type="isDate" value="dd.MM.yyyy" />
</param>
```

The new parameters cause the “Time Period” panel to appear in the left-hand navigation pane when the report is accessed.

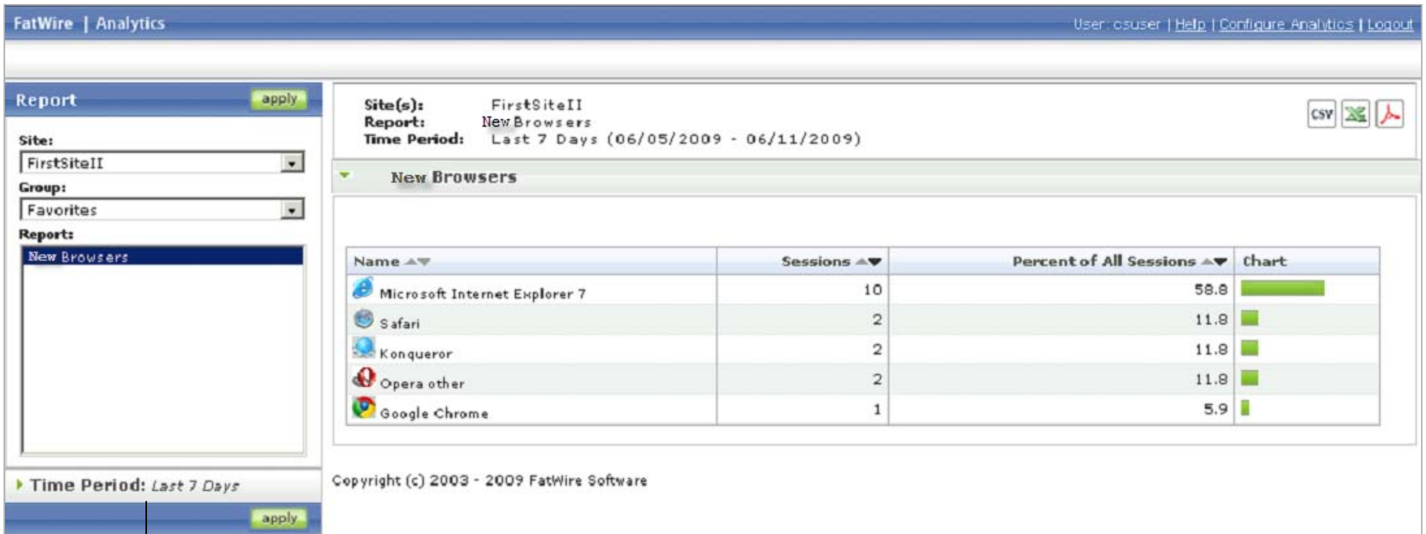
3. Insert the boxed code into the data retrieval section of the table module at the exact locations shown:

```
select
    bro.id as broid,
    bro.name as broname,
    bro.iconpath as broiconpath,
    nvl(count, 0) as count,
    <equals name="browsertotal" value="0">
       0 as percent
    </equals>
    <notEquals name="browsertotal" value="0">
       (nvl(count, 0)/#browsertotal#)*100 as percent
    </notEquals>
from
    l2_browser bro
    join (
    select
       bro2.id as broid,
       bro2.name as broname,
       sum(count) as count
    from
       help_dates dates
       join l3_datexsitexnewbrowserxcount l3 on (dates.id = l3.dateid)
       join l2_browser bro2 on (l3.browserid = bro2.id)
    where<![CDATA[
       siteid = #siteid# and
       dates.dat >= to_date('#sdate#', 'DD-MM-YYYY') and
       dates.dat  < to_date('#edate#', 'DD-MM-YYYY')+1 ]]>
    group by
       bro2.id, bro2.name

    ) on (bro.id = broid)
```

4. Save and close the file.

5. Test your report. The report should now look as follows:



Click the **Time Period** bar to expand the time period selector panel.

6. Test the time period selector.
   a. Click the **Time Period** bar to expand the time period selector panel.
   b. Select the desired start date and end date.
   c. Click **Apply**.

   The data displayed in the table should change depending on the selected time period. If it does not, or if an error is displayed, retrace your steps and check your code for errors.

7. Continue on to the next section, “Adding a Filter,” on page 53.

Adding a Filter

In the previous section you added a time period selector to your report to enable restriction of the displayed data to a specific time period. However, what if you want to restrict the displayed data by a parameter other than time? Your solution is to add a data filter.

What Does a Filter Do?

A filter module adds the “Filter by” field in the summary section of the report, and allows the users to:

- Search for a specific data point or value (for example, a specific browser).
- Restrict the displayed data to a specific range of a particular parameter (such as the number of recorded sessions)

You will add the following filter to your “NewBrowsers” report:

- **A “Browser Name”** filter, which will allow you to search for specific browsers or to restrict the displayed data to a specific range of browser names.

How Do I Add a Filter?

To implement a filter, you must:

- Add the filter module that defines your filter(s) to the report code.
- Modify the data retrieval sections of your display modules (such as table or chart modules) to support query filtering.

To add filters to your report

1. Open the `report_newbrowser.xml` file (located in the Analytics reports directory described in “B. Place the XML File in the Analytics Reports Directory,” on page 41) in a text editor.
2. Add the following module code after the table module but before the closing `</report>` element:

```
<filter name="filter-browsername" required="false" type="text" captions="name"
       key="filter-browsername" />
```

Analyzing the Code

> **Note**
>
> For detailed information on the tags shown in this example, and the parameters they take, see the *FatWire Analytics Tag Reference*.

You define the filter by using a `filter` tag, which takes the following parameters:

- `name` (required) – specifies an object handle for the filter. The following conditions apply to this parameter:
  - The value of this parameter must begin with `filter-` so that Analytics treats this definition as a filter definition.

  - The value must be identical to the value of the `key` parameter (explained below).

> **Note**
>
> If either of these conditions is not met, the filter will not function.

- `required` (required) – specifies whether the `key` parameter (explained below) must be assigned a value for the report to function. In our example, `required` is set to `false`.
- `type` (required) – specifies the type of the filter and, simultaneously, the filter's input method (for example, how the filter will be presented in the reporting interface).

  In this example, you are using a filter of type `text`, which manifests the filter as a text field into which the user can enter one or more filtering criteria. Other available types include `yesno`, `radio`, `dbselect`, `date`, and others.
- `key` (optional, see `required` above) – specifies the name used for the parameter in the URL of the report page to pass the value of the filter entered by the user when the user clicks **Apply**. The following conditions apply to this parameter:
  - The value of this parameter must begin with `filter-` so that Analytics treats this definition as a filter definition.
  - The value must be identical to the value of the `name` parameter (explained above).

> **Note**
>
> If either of these two conditions is not met, the filter will not function.

3. Insert the boxed code into the data retrieval section at the exact locations shown:

```
select
    bro.id as broid,
    bro.name as broname,
    bro.iconpath as broiconpath,
    nvl(count, 0) as count,
    <equals name="browsertotal" value="0">
       0 as percent
    </equals>
    <notEquals name="browsertotal" value="0">
       (nvl(count, 0)/#browsertotal#)*100 as percent
    </notEquals>
from
    l2_browser bro
    join (
    select
       bro2.id as broid,
       bro2.name as broname,
       sum(count) as count
    from
       help_dates dates
       join l3_datexsitexnewbrowserxcount l3 on (dates.id = l3.dateid)
       join l2_browser bro2 on (l3.browserid = bro2.id)
    where<![CDATA[
       siteid = #siteid# and
       dates.dat >= to_date('#sdate#', 'DD-MM-YYYY') and
       dates.dat  < to_date('#edate#', 'DD-MM-YYYY')+1 ]]>

     <notNull name="filter-browsername">
       and lower(bro2.name) like lower(replace('#filter-browsername#','*','%'))
     </notNull>

    group by
       bro2.id, bro2.name

    ) on (bro.id = broid)
```

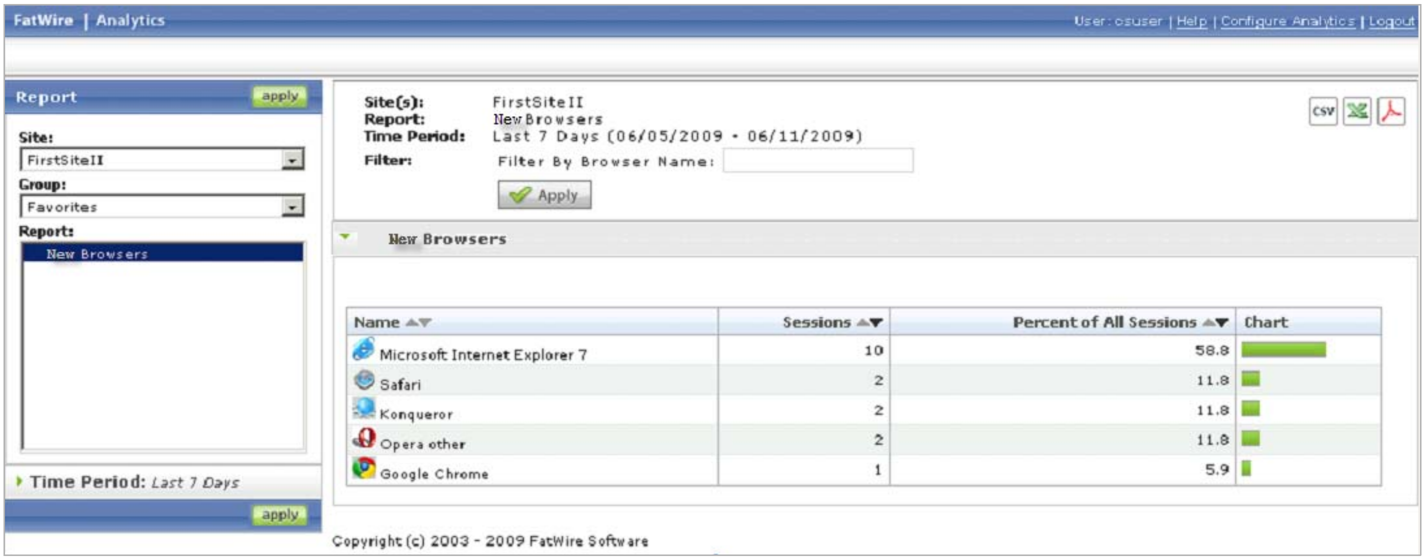
Analyzing the Code

- The inserted code limits the results returned by the SQL query based on the criteria provided to the filter (for example, the filter value).
- The code inside each `<notNull>` tag is added to the query only if the value of the parameter called by the `<notNull>` tag is not null.

4. Save and close the report file. Open the `NewBrowserLocalization.properties` file (in this exercise, located in the `WEB-INF/classes` directory in the `analytics` application directory on your application server) in a text editor. Add the following line to the end of the file:

```
report_newbrowser_filter-browsername=Filter By Browser Name
```

5. Test your report. The “Filter” field should appear in the summary section at the top of the report, as shown below:



If your report does not appear as in the above figure, or if an error is displayed, retrace your steps and check your code for errors.

6. Continue on to the next section, “Adding a Chart,” on page 57.

Adding a Chart

The final step in this exercise will be to add a chart to your “NewBrowsers” report. A chart allows you to graphically present statistical data in your report.

You add a chart to your report by inserting a chart module into your report’s code. A chart module is structured in a way similar to the table module. It has two sections:

- **Data retrieval section** (lines 10–37 on page 59).
  This section contains the SQL code that retrieves the data you want to display in your pie chart from the Analytics database.
- **Display section** (enclosed within the `<display>` tag, lines 38–48 on page 60).
  This section contains the code that formats and displays the data retrieved from the Analytics database by the code in the data retrieval section. The code in the display section defines the type of the chart and assigns data to the chart’s axes.

In our example, you will create a pie chart (XY chart, refer to step 2 on page 57) displaying session-count of all browsers in percentage format. Each section of the pie chart will display browser data, along with a legend section at the right of the chart. If you hover the mouse on the pie section, the percentage of session count will be displayed along with the browser’s name.

To add the chart to your report

1. Open the `report_newbrowser.xml` file (located in the Analytics reports directory described in “B. Place the XML File in the Analytics Reports Directory,” on page 41) in a text editor.
2. Add the following module declaration at the beginning of the report code, right after the last global parameter definition, but before the table module. This will cause the chart to appear above the table when the report is generated.

> **Note**
>
> The order in which modules appear in your code is the order in which they will appear in the reporting interface. (The exception to this is the filter module which has a fixed location in the summary section at the top of the report.)

```
1 <module type="stdchart" name=" chartbrowser">
2   <param type="request" name="charttype" key=" chartbrowser_charttype"
       default=" pie_labeled">
3      <restriction type="listvalue">
4          <restrictionvalue value="pie_labeled" />
5          <restrictionvalue value=" bar_labeled " />
6      </restriction>
7   </param>
```

Analyzing the code

- In line 1, you declare a module of type `stdchart` to indicate this will be a chart module. You also assign an object handle to the module using the `name` parameter. You will use this handle to give your chart module a heading later on in this procedure by declaring it in the report’s localization properties file.

- In line 2, you specify the desired style for your chart. The `<param>` tag declares a parameter of type `request` and name `charttype`, and specifies the chart type by assigning a value to the `key` parameter. The value of the key parameter must follow the syntax, `moduleName_chartstyle`. In our example, you are using the `chartbrowser_charttype` chart type.

> **Note**
>
> The available chart styles are defined in the Swift Chart Generator software and are referenced by Analytics. The following default Swift Chart Generator chart styles are supported: area, bar, column, line, and pie.

- In line 3, you use a `<restriction>` tag to enable validation of request parameters. Only parameter values defined by each `<restrictionvalue>` tag are allowed; an error message will be displayed for all other values.

3. Now, add the following parameters to the chart module:

```
8     <param type="string" name="chart_max_display" value="10"/>
9     <param type="string" name="chart_display_rest" value="true"/>
```

The `chart_max_display` parameter denotes that the pie chart will display ten different colored pie sections corresponding to the top 10 popular browsers. The `chart_display_rest` parameter denotes that the rest of the browser session counts will be shown as a single pie chart section. These two parameters are optional, and in the absence of these parameters the reporting engine takes the default values for chart rendering.

4. Add the data retrieval section to your chart module. Insert the following code after the chart module declaration you added in the previous step:

```
  select
         bro.id as broid,
         bro.name as broname,
         nvl(count, 0) as count,
         <equals name="browsertotal" value="0">
             0 as percent
         </equals>
         <notEquals name="browsertotal" value="0">
             (nvl(count, 0)/#browsertotal#)*100 as percent
         </notEquals>
    from
         l2_browser bro
         join (
         select
                bro2.id as broid,
                bro2.name as broname,
                sum(count) as count
         from
                help_dates dates
                join l3_datexsitexnewbrowserxcount l3 on (dates.id = l3.dateid)
                join l2_browser bro2 on (l3.browserid = bro2.id)
         where<![CDATA[
                siteid = #siteid# and
                dates.dat >= to_date(’#sdate#’, ’DD-MM-YYYY’) and
                dates.dat  < to_date(’#edate#’, ’DD-MM-YYYY’)+1 ]]>
         group by
                bro2.id, bro2.name
         ) on (bro.id = broid)
```

Analyzing the code

The SQL query retrieves the data that will be displayed on the pie chart. Note that the data retrieval query in the chart module is similar to the query of the table module. The only difference is that the data retrieval query for the chart module lacks the filter part, (for example, the data on the chart will not be filtered by the filter input, only table data will be filtered). However you can add the same filter in the query to filter the chart data.

5. Add the display section code to your chart module. Insert the following code after the data retrieval section you added in the previous step:

```
38  <display type="html">
39            <value name="xaxis" type="string">
40                   <valueparam name="format" parse="false"/>
41                   <valueparam name="value" value="#broname#" />
42            </value>
43
44            <value name="yaxis" type="number">
45                   <valueparam name="format" parse="false" value="#####0" />
46                   <valueparam name="value" value="#count#" />
47            </value>
48  </display>
```

Analyzing the code

In the display section, you define the axes for your chart and assign the appropriate data to each axis.

Analytics distinguishes between two categories of charts:

- XY charts are charts that have no axes, such as pie charts, and therefore require no legend for the data series (and thus, no Z axis declaration)
- XYZ charts are charts that have axes, (such as line, bar, area, and column charts) and therefore require that the data series legend be defined through a Z axis declaration.

In our example you are defining a pie chart, which is an XY chart so there will be no Z axis. However, we assign the different categories/data points (browser names in this exercise) to the X axis (lines 39–42) and values for each categories (here session count) to Y axis (line 44–47)

6. Save and close the file.
7. Give your chart a heading. Do the following:
   a. Open the `NewBrowserLocalization.properties` file (in our example, located in the `WEB-INF/classes` directory in the `analytics` application directory on your application server) in a text editor.
   b. Add the following statement at the end of the file:

```
# Chart Module
report_newbrowser_module_chartvisitordetail=Browsers Chart
```

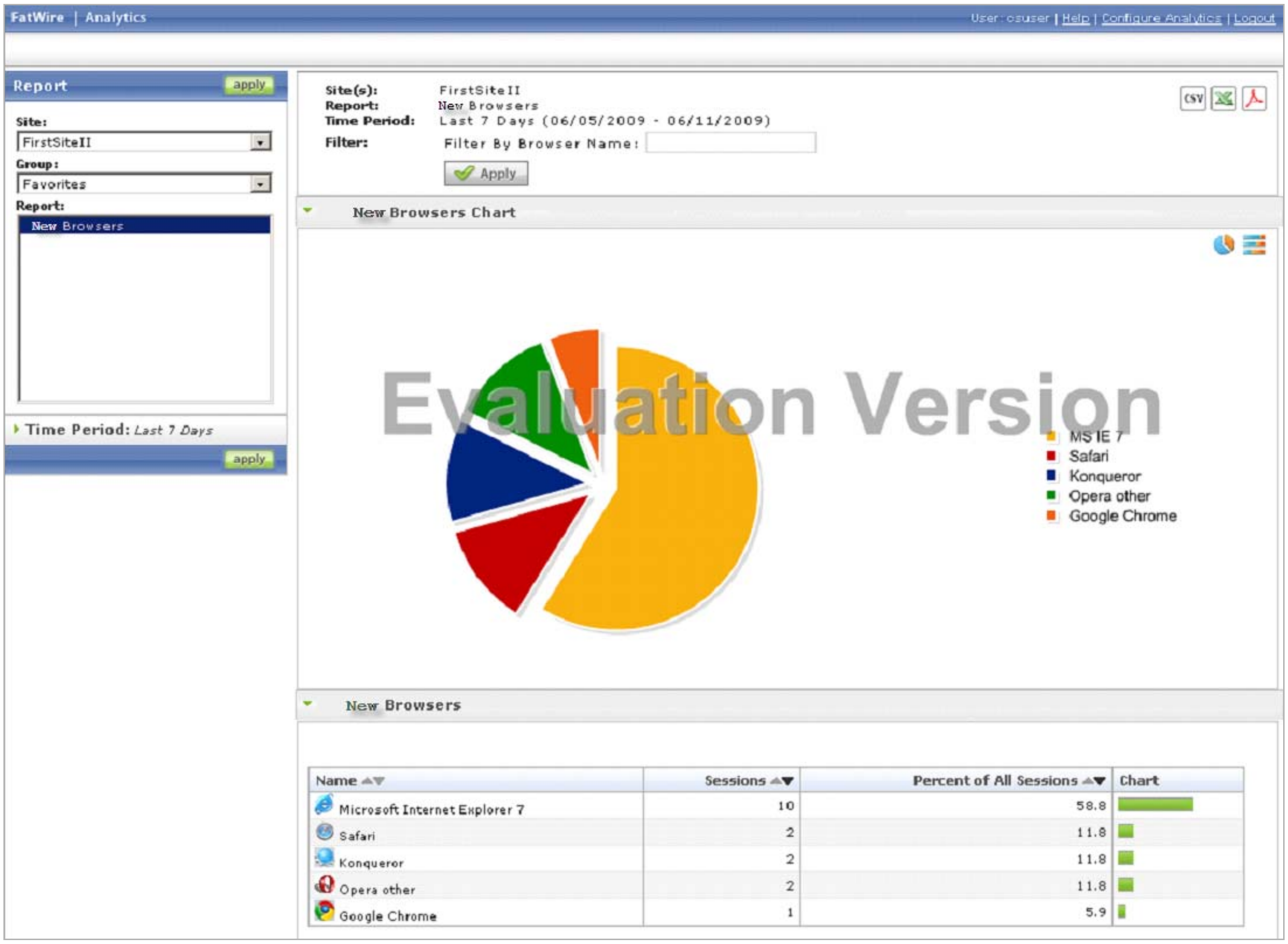
   c. Save and close the file.
   d. Restart your application server for your changes to take effect.
8. Your report is now complete! Continue on to the final step in this exercise, “Testing the Completed ‘NewBrowsers’ Report,” to test your finished report and check your code.

Testing the Completed 'NewBrowsers' Report

Congratulations! You have successfully built your first Analytics report. Test your report to make sure there are no errors in the code.

1. Log in to the Analytics reporting interface and generate the "NewBrowsers" report.

   Your report should look as follows:



2. If your report does not appear as in the above figure, or if an error is displayed, retrace your steps and check your code for errors by comparing it to the sample code in "'NewBrowsers' Report Code," on page 36.