IBM Industry Customer Intelligence Solutions
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# Behavior Based Customer Insight for Communication Service Providers Solution Guide

IBM

## Product Information

This document applies to IBM Industry Customer Intelligence Solutions Version 1.0.0 and may also apply to subsequent releases.

# Contents

# Introduction

The IBM Behavior Based Customer Insight for Communication Service Providers solution gives you the information and insight that you need to provide proactive service to your customers.

## Audience

This guide is intended for administrators and users of the Behavior Based Customer Insight for Communication Service Providers solution. It provides information on installation, configuration, and use of the Behavior Based Customer Insight for Communication Service Providers solution.

## Finding information

To find product documentation on the web, including all translated documentation, access IBM® Knowledge Center (http://www.ibm.com/support/knowledgecenter).

## Accessibility features

Accessibility features help users who have a physical disability, such as restricted mobility or limited vision, to use information technology products. Some of the components included in the Behavior Based Customer Insight for Communication Service Providers have accessibility features. For more information, see Appendix A, "Accessibility features," on page 33.

Behavior Based Customer Insight for Communication Service Providers HTML documentation has accessibility features. PDF documents are supplemental and, as such, include no added accessibility features.

## Forward-looking statements

This documentation describes the current functionality of the product. References to items that are not currently available may be included. No implication of any future availability should be inferred. Any such references are not a commitment, promise, or legal obligation to deliver any material, code, or functionality. The development, release, and timing of features or functionality remain at the sole discretion of IBM.

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# Chapter 1. Overview

The IBM Behavior Based Customer Insight for Communication Service Providers is a prepackaged solution that works with IBM Predictive Customer Intelligence.

**Important:** Before you install the application, IBM Predictive Customer Intelligence must be installed on your system.

IBM Behavior Based Customer Insight for Communication Service Providers is a solution that drives improved marketing through advanced and predictive analytics of customer activity across locations, devices, applications, and interests. It highlights behavior-based information about customers using deep analysis of large volumes of raw and aggregate mobile usage data, including internet usage and voice, and SMS activity.

The solution also provides a churn management application, utilizing standard churn modelling factors, as well as voice, SMS, and mobile data records, to analyze trends in subscriber voice, SMS, and mobile data usage and to interpret the churn model.

## What need does the solution address?

Customer experience teams have many unanswered questions due to limited data and analytics. Some of these questions include:

- Why are my customers not satisfied or happy?
- Why are our NPS® (or T-NPS) so low?
- What segment of customers has the most negative or positive influence on NPS?
- What changes are required in order to improve NPS?
- What can be done to improve customers' satisfaction and happiness?
- What are the factors impacting subscriber churn?
- Who is most likely to churn in the next few months and why?
- Who are my most valuable customers?

To help address these questions, IBM Behavior Based Customer Insight for Communication Service Providers is composed of three separate components:

- an NPS correlation model, predictive algorithm, and reporting suite
- a churn segmentation, scoring, and prediction model
- a customer behavior and profile dataset

## What does the NPS correlation application provide?

The solution helps customer experience team members in the telecommunications industry to determine customer insights by drilling down into Net Promoter Score (NPS) data and providing filters on key factors based on out-of-the-box correlations with network data. The NPS predictive index measures the likeliness of customers to recommend a company's offerings. It is used to gauge a customer's overall satisfaction and brand loyalty.

IBM Behavior Based Customer Insight for Communication Service Providers analyzes subscribers' relative satisfaction or happiness with their service based on

NPS. The solution allows users to drill down into the data to determine specific issues that correlate with negative NPS . The solution's metrics can be used to:

- proactively address key issues impacting churn and other issues
- measure and correlate NPS with subscriber network experience
- improve customer experience and reduce attrition by improving their NPS

The NPS correlation application includes an IBM Cognos user interface, which is described in the workflow procedure:

- a dashboard of prioritized factors impacting transactional-NPS (T-NPS)
- the ability to quickly view the top factors that negatively affect T-NPS scores within appropriately grouped categories, such as customer, data activity, device, and location
- access to various data sources to build the profiles of a typical promoter and detractor, which can be used to infer the profiles' impact across the customer base, gauging NPS for all customers based on similar experience
- combining of data sets such as 2G, 3G, 4G LTE data, NPS survey results, cell, CRM, and device provisioning to create a single Subscriber Analytics Record for each subscriber
- predictive models, which correlate subscriber analytics records to identify and address possible causes for poor NPS

The solution is delivered with predefined industry data models, use case specific metrics, and interactive dashboards.

## What does the churn management application provide?

The churn management application provides an analysis of subscriber data suggesting how and when a customer is likely to churn. The application includes an IBM Cognos user interface, which is described in the workflow procedure:

- a churn overview providing a relative segmentation of subscribers, based on their churn likelihood
- the ability to filter subscribers based on key factors, including churn propensity, customer value (a "keep score"), predicted churn date, churn factors, and contract type

The churn management application helps customer experience team members to understand subscriber experience trends across different "experience" categories, such as mobile data activity (including connectivity and retransmissions), voice, SMS, web browsing, and video. These inputs provide important insights into a subscriber's experience and are valuable when attempting to predict churn. Furthermore, not all subscribers are equally valuable to Communication Service Providers. Therefore, this solution provides a "keep score" for each subscriber, using a scale of 1-100, with 100 being the most valuable.

## What does the customer behavior dataset provide?

The customer behavior dataset is a set of tables customers can access, along with an accompanying data dictionary. The dataset contains subscribers' usage data, including their interests, preferences, and profile. The application analyzes the amount of time subscribers spend browsing, searching, reading, and streaming information on their devices. Each period of activity is categorized, where possible, into one of hundreds of interest categories, enabling communication service providers to categorize their subscribers into hundreds of different micro-segments based upon these interests.

# Chapter 2. Installation and configuration

The IBM Behavior Based Customer Insight for Communication Service Providers solution is for use with IBM Predictive Customer Intelligence.

Behavior Based Customer Insight for Communication Service Providers consists of the following nodes:

- An Analytics Platform node.
- A Mediation node.
- A Business Intelligence node.
- A Predictive Analytics node.
- A data node.

**Note:** The IBM Predictive Customer Intelligence topology includes an Integration Bus node, which is not used in the Behavior Based Customer Insight for Communication Service Providers solution.

## Contents of the solution package

The IBM Behavior Based Customer Insight for Communication Service Providers solution package contains several parts.

The following parts are included in the solution package:

- Solution Installer. This puts the installation packages on the nodes required for a particular deployment architecture.
- IBM SPSS® Collaboration and Deployment Services. This package is used for managing SPSS models used in the solution.
- IBM Cognos® Business Intelligence (BI) reports and IBM Cognos Framework Manager models
- The Analytics Platform contains the software for data management and ETL (extract, transfer, and load) and will be installed on the Analytics Platform and Streams nodes.

## Overview of the installation and configuration process

This is an overview of the general tasks that you must perform to install and configure the Behavior Based Customer Insight for Communication Service Providers solution.

The following diagram provides a high-level overview of the installation and configuration process. If you are viewing this diagram from the IBM Knowledge Center, you can click on a task to go to the procedure for that task.

**1** Download the package to the installation server and ensure network connectivity between all server nodes in the deployment

Configure firewall

**Solution installer**

**2** Install the Solution Installer, and configure it to identify the computers where the parts of the solution will reside. The Solution Installer then copies the files to the computers that you specified.

**IBM Predictive Customer Intelligence**

Analytics Platform Data Node | Analytics Platform Mgmt Node | PCI Business Intelligence Node | PCI Analytics Node | PCI DB2 Node | Streams Node

There can be multiple Analytics Platform Data nodes and a minimum of one Analytics Platform Mgmt node per three Analytics Platform Data nodes

There can be multiple Streams nodes

**Final steps**

**3** Configure the various nodes.

Install Analytics Platform package and configure | Deploy Cognos content | Install and configure SPSS | Install and configure database | Install Streams Mediation package and configure

Perform the following tasks:

1. Install prerequisite software.
2. Download the solution from IBM Passport Advantage®.
3. Plan where you want the various parts of the solution to reside. For example, you must decide which computers to use for the Analytics Platform node and Streams node.
4. Run the Solution Installer to deploy the installation files to the relevant nodes.
5. Install the TELCO database.
6. Set up the IBM Cognos Framework Manager model.
7. Install IBM Cognos reports.
8. Install and configure the Analytics Platform node.
9. Install and configure the Mediation node.
10. Configure the Behavior Based Customer Insight for Communication Service Providers database.

## Prerequisites

Before you install the Behavior Based Customer Insight for Communication Service Providers solution, there are prerequisites that must be met.

Ensure the following conditions are met before you install the solution:

- IBM Predictive Customer Intelligence version 1.1.0 is installed and configured and you have applied all known fix packs to it.
- IBM InfoSphere® BigInsights® 4.1.0 is installed and configured on the Analytics Platform node.

- IBM InfoSphere Streams 4.0.1 is installed and configured on the Streams nodes. For more information, see the installation instructions for IBM InfoSphere Streams 4.0.1 on IBM Knowledge Center.
- You have a Red Hat Enterprise Linux operating system that you can install to. The Solution Installer works only on that version of Linux.
- You understand your deployment environment. There are a combination of nodes that you must install to, so you need to determine where you want the various components of the solution to reside.
- You have administration rights and the ability to copy files between computers.

In the context of the Behavior Based Customer Insight for Communication Service Providers solution, the BigInsights master node is one of the Analytics Platform nodes.

## Installing IBM Predictive Customer Intelligence version 1.1.0

To install PCI version 1.1.0, refer to the IBM Predictive Customer Intelligence *Installation Guide* 1.1.0 on IBM Knowledge Center.

Ensure that you adhere to the following sections in this guide:
- Prerequisites and installation preparation
- Solution architecture
- Supported operating systems and hardware requirements
- Prerequisites for using the solution installer
- Install IBM Predictive Customer Intelligence by using the solution installer
- Manually install IBM Predictive Customer Intelligence
- Troubleshooting (if necessary)

Install PCI on the designated PCI nodes in your deployment.

## Installing IBM InfoSphere BigInsights 4.1.0

Before installing IBM InfoSphere BigInsights 4.1.0, you must first install IBM Open Platform (IOP) with Apache Hadoop. This is an IBM open-source download that provides the components and services to start your Hadoop project, including development tools, a management dashboard, and cluster management tools. This download is available form the IBM Open Platform with Apache Hadoop 4.1 web page.

To prepare your environment and servers, refer to the documentation Preparing to install IBM Open Platform with Apache Hadoop on IBM Knowledge Center.

To install IOP with Apache Hadoop, refer to the documentation Installing the IBM Open Platform with Apache Hadoop software on IBM Knowledge Center.

This documentation will guide you through the key set up and installation steps, including
- reference architecture
- minimum system requirements
- preparing your environment
- default ports

To ensure reliability, you may wish to use a mirror site rather than IBM's hosted repository. If you require a repository, refer to Creating a mirror repository for the IBM Open Platform with Apache Hadoop software. The repository can be installed on the same computer as IOP with Apache Hadoop.

Regarding the information provided in the topic Installing the IBM BigInsights value-added services on IBM Open Platform with Apache Hadoop, ensure the following added value services are installed. These services should be deployed on your designated Analytics Platform nodes:

- BigInsights Home
- BigInsights -- Big SQL Service
- BigInsights -- Data Server Manager Service

### Installing IBM IBM InfoSphere Streams 4.0.1

IBM InfoSphere Streams enables you to capture, analyze, and act on business data from a broad range of sources. Using real-time analytic processing (RTAP) technology, InfoSphere Streams can continuously analyze massive volumes of streaming data in real time, with extremely fast response times.

InfoSphere Streams must be installed before you install the IBM Streams mediation package, which is part of the IBM Customer Experience Analytics for Communication Service Providers solution.

To install InfoSphere Streams 4.0.1, refer to Installing IBM InfoSphere Streams on IBM Knowledge Center. Follow the instructions for installing the product on the designated Streams mediation nodes in your deployment. Please note the following:

- InfoSphere Streams provides a dependency checker script that you run on your system before installing the product. This script verifies that your system meets the software requirements for InfoSphere Streams. To run the dependency checker script, enter the **./dependency_checker.sh** command from/opt/tnf/streams/StreamsInstallFiles.
- If required, correct any dependencies and run the dependency checker again. The following message will be displayed once all dependencies are in place:

  ```
  === Summary of Errors and Warnings ===
  CDISI0003I The dependency checker evaluated the system and did not find errors or warnings.
  ```
- If the dependency checker display the following warning, the **ulimit** settings need to be updated and the device rebooted. Please refer to Guidelines for configuring Linux ulimit settings for InfoSphere Streams.

  ```
  Warning: CDISI3044W The system soft limit for the maximum number of processes is low: 1024
  ```
- Install InfoSphere Streams in console mode using the following command:
  **./InfoSphereStreamsSetup.bin -i console**

## Modifying the sudoers file for the Linux user who runs the installation

To run the Behavior Based Customer Insight for Communication Service Providers installation in a Linux environment, you must be either root user or have sudo permission on each node computer, and you must disable requiretty during the installation.

To install with sudo user permissions, you must add the user to the sudoers file.

**Procedure**

1. Log in as root user.
2. Enter the following command to open the `sudoers` file for editing:

   `visudo -f /etc/sudoers`
3. Locate the following line:

   `Defaults requiretty`
4. Press the I key to insert text.
5. Type a number sign (#) in front of `Defaults requiretty` to comment out the line. For example, the line will appears as `#Defaults requiretty`
6. If you run the installer as a user with sudo user permissions, go to the end of the file, and add the following line for your user:

   *username* `ALL=(ALL) NOPASSWD: ALL`
7. Press the Esc key, and enter `:wq` to save and close the file.
8. Repeat these steps on each computer on which you install a Behavior Based Customer Insight for Communication Service Providers node.

## Computer firewall settings required for the installation on Linux

The solution installer requires bidirectional communication with each node when you install a server component or server artifact component, and your firewall can interfere with this communication.

To ensure bidirectional communication, you must configure your firewall settings for the installation. Alternatively, you can temporarily disable your firewall during the installation.

A script is provided to open all necessary ports on the installation node. You can either use the `firewall.sh` script, open the ports manually, or disable the firewall settings.

In addition to opening ports on the installation node computer, you must open some ports on each computer to which content from the solution will be copied.

### Disabling firewall settings during installation (optional)

If you choose to temporarily disable your computer's firewall during the installation of the IBM Behavior Based Customer Insight for Communication Service Providers solution, ensure that you enable the firewall on each node after the installation is complete.

#### About this task

**Important:** If you disable your computer's firewall during the installation, you must still ensure that the required ports are opened on each node computer when you restart your firewall.

#### Procedure

1. Log on to the computer as the root user or as a user with sudo permissions.
2. Type the following command:

   `/etc/init.d/iptables stop`

   `/etc/init.d/iptables save`
3. Repeat these steps on each computer on which you install a node and on the server from which you are running the installation.

**What to do next**

After the installation is complete, on each node, type `/etc/init.d/iptables start` to restart your firewall.

## Manually configuring firewall settings on the installation node

If you prefer not to disable your firewall settings or use the firewall.sh script, you can manually configure your firewall settings on the installation node.

### Procedure

1. As the root user or as a user with sudo permissions, log on to the computer that contains the solution installer node .
2. Back up your existing firewall settings by typing the following command: . `/etc/init.d/iptables save`
3. On the computer that contains the solution installer node, add rules for the ports that are required by the installer by typing the following commands:

   ```
   iptables -I INPUT -p tcp --dport 8080 -j ACCEPT
   iptables -I OUTPUT -p tcp --sport 8080 -m state --state
   RELATED,ESTABLISHED -j ACCEPT

   iptables -I INPUT -p tcp --dport 443 -j ACCEPT
   iptables -I OUTPUT -p tcp --sport 443 -m state --state
   RELATED,ESTABLISHED -j ACCEPT

   iptables -I INPUT -p tcp --dport 9683 -j ACCEPT
   iptables -I OUTPUT -p tcp --sport 9683 -m state --state
   RELATED,ESTABLISHED -j ACCEPT

   iptables -I OUTPUT -p tcp --dport 22 -j ACCEPT
   iptables -I INPUT -p tcp --sport 22 -m state --state
   RELATED,ESTABLISHED -j ACCEPT
   ```

## Configuring your firewall settings on the installation node computer by using the firewall script

You can run the firewall.sh script to open the ports on a Linux installation node.

### About this task

The firewall.sh script opens the following ports on the solution installer node:
- 8080 incoming
- 443 incoming
- 9683 incoming
- 22 outgoing

### Procedure

1. As the root user or as a user with sudo permissions, log on to the computer that contains the solution installer node.
2. Back up your existing firewall settings by typing the following command: `/etc/init.d/iptables save`.
3. Run the firewall.sh script.

## Configuring firewall settings on other computers that will contain content from the solution

On all node computers to which content from the solution will be copied, the ports 443, 9683, and 8080 must be opened for the installation process.

**Procedure**

1. On each of the computers to which content for the solution will be copied, add rules for the ports that are required by the installer by typing the following commands:

```
iptables -I OUTPUT -p tcp --dport 443 -j ACCEPT
iptables -I INPUT -p tcp --sport 443 -m state --state RELATED,ESTABLISHED -j ACCEPT

iptables -I OUTPUT -p tcp --dport 9683 -j ACCEPT
iptables -I INPUT -p tcp --sport 9683 -m state --state RELATED,ESTABLISHED -j ACCEPT

iptables -I OUTPUT -p tcp --dport 8080 -j ACCEPT
iptables -I INPUT -p tcp --sport 8080 -m state --state RELATED,ESTABLISHED -j ACCEPT
```

2. Type the following command to save your firewall settings:

```
 /etc/init.d/iptables save
```

3. Type the following command to restart your firewall:

```
/etc/init.d/iptables restart
```

4. Verify that your changes are applied by using the following command:

```
iptables -L
```

   The added port appears in the list.

5. Repeat these steps on each computer on which you will install an IBM Behavior Based Customer Insight for Communication Service Providers node.

# Installing the solution installer

Before using the Solution Installer to configure and deploy the nodes in a Linux environment, you must install the Solution Installer.

## About this task

Here's a short video that shows you how to install the Solution Installer:

http://youtu.be/9u6ZOk8iyt4

The steps that are shown in the video are described in the following procedure.

## Procedure

1. Log on to the computer where you downloaded the solution package.
2. Decompress the solution package.
3. Go to the solution installer directory in the following location:
   `opt/IBM/IS_CSP_Customerinsight_1.0.1/SolutionInstaller`.
4. If you haven't already opened the ports required by the solution installer, you can open them by running the following command:

   ```
   ./firewall.sh
   ```

5. Enter the following command:

   ```
   ./setup.sh username first name last name email
   ```

   Username is the name that can be used to log on to the Chef server. It must be all lowercase characters. First and last names are for display purposes only. Email is used for notifications from Chef server. The password for the user that is created in chef is optional. If it is not included, it will be prompted for at login.

   The web server is started and the URL for the Solution Installer displays in the command line window.

6. A browser window might open automatically. If it doesn't, copy and paste the URL into a web browser and bookmark it.

### What to do next

Use the Solution Installer to deploy the installation files to the nodes in your solution.

# Deploying the installation files on the nodes

You use the Solution Installer to deploy the installation files to the appropriate nodes in your solution.

### Before you begin

Ensure that you know the URL for accessing the Solution Installer.

Ensure that you know the following information for each of the nodes in your solution:
- Host name or IP address
- A user ID and password that has write permissions to the /opt/ directory.

Each node must also meet the following requirements:
- Has a valid DNS name that is resolvable.
- Does not have Chef server or client software installed on it.

### About this task

In this task, you create an installation configuration of your solution by dragging objects onto a canvas, adding components to the objects, and defining properties for the components.

**Important:** The Industry Solution Installer runs on the latest versions of Chrome and Firefox. It does not run on Internet Explorer and it is untested on Safari.

### Procedure
1. In a web browser, go to the Solution Installer.
2. Read the license agreement and click **Accept**.
3. Click **New Configuration** and then click **OK**.
4. From the Mandatory Content List pane, select **Node**.

   A visual representation of an empty node is displayed on the canvas.
5. In the Property Editor, type a name for the node, and in the **Host Name** box, specify the server on which the node will be placed.

   For example, you might create a node that is named BI Node.
6. Enter a username and password for a user that has sudo access.

   If you click **Validate** before all the mandatory content is added, a message indicates that the node is not valid. For example, if you validate the BI Node before adding Cognos BI Content, then a message indicates that the node is not yet valid.

7. From the **Optional Content** list, drag any content that you want to add into the appropriate node. The reason that this content is optional is because you might already have some of the necessary components installed in your environment.

8. For every node that you want to add content to, define the node and then drag content objects onto it.

9. If you want to save the configuration to use or refer to in the future, click **Save Configuration**.

10. Click **Validate**. The progress of the validation is displayed. If the validation fails, look at the log file to troubleshoot the problem.

11. After all nodes are defined, the contents are specified, and each node is validated, click **Run**. The scripts and files that are used to install and configure the solution are copied to the target nodes.

### What to do next

Complete the installation of the solution on each of the nodes.

## Installing the TELCO database

To install the TELCO database on the data node, you run a script that creates the TELCO database, tables, constraints, and indexes.

### Procedure

1. Log on to the data node with a user ID that has access to the IBM DB2® database. For example, **db2inst1**.

2. Enter the following command to run the script:

   `db2 -tvf TELCO_Db2.sql`

3. Verify that the database tables exist. Type the following commands:

   a. `db2 connect to TELCO db2 list tables for schema NPS`

   Information similar to the following message is displayed:

   ```
   FACTOR_IMPORTANCE              NPS         T      2015-06-07-22.46.41.072519
   FACT_SCORE                     NPS         T      2015-06-07-22.46.41.815746
   MASTER_CUSTOMER                NPS         T      2015-06-07-22.46.41.833610
   MASTER_DATA_ACTIVITY_LOCATION  NPS         T      2015-06-07-22.46.41.848970
   MASTER_DEVICE                  NPS         T      2015-06-07-22.46.41.864207
   ```

   b. `db2 list tables for schema BBCI`

   Information similar to the following message is displayed:

   ```
   CGR_DEVICE                     BBCI        T      2015-09-09-02.12.13.907406
   CHURN_DATA                     BBCI        T      2015-08-20-15.56.39.964202
   CHURN_MANAGEMENT               BBCI        T      2015-08-19-01.33.27.083252
   CHURN_MANAGEMENT_HISTORY       BBCI        T      2015-09-11-16.47.45.466452
   SUBSCRIBER_BILLING             BBCI        T      2015-09-11-16.03.21.410002
   SUBSCRIBER_CARE                BBCI        T      2015-09-11-16.04.12.393064
   SUBSCRIBER_CRM                 BBCI        T      2015-09-11-16.05.00.176739
   SUBSCRIBER_LEVEL_CX_SCORE_WEEKLY BBCI      T      2015-08-20-16.02.13.77829
   ```

## Deploying content on the Business Intelligence node

You must deploy the content files (report images and Framework Manager model) for the Behavior Based Customer Insight for Communication Service Providers solution.

## Procedure

1. Log on to the BI node as the **root** user or as a user with **sudo** permissions.
2. Decompress the following files:
   - CSP_CustomerInsight_FMProject.zip
   - CSP_CustomerInsight_Images.zip
3. Extract the `CSP_CustomerInsight_BIContent.zip` folder and copy it to the `Cognos_Install_location`/`Deployment` folder on the BI node computer.
4. Copy the `CSP_CustomerInsight_Images` folder to the `Cognos_Install_location`/`webcontent/samples` folder on the BI node computer. If a folder of this name already exists at the destination location, merge the two folders.
5. Catalog the TELCO database on the computer where you installed Framework Manager. The following steps are optional but are a best practice:
   a. Open a command prompt by selecting **Windows Start** > **Run**.
   b. Type the following command:

      `db2cmd`

   c. Enter the following commands to catalog the database node command line editor:

      `catalog tcpip node node_name remote dbserver_ip server port_number`

      where *node_name* is the name of the computer where you installed Framework Manager and *dbserver_ip* is the IP address of the database server. The default *port_number* is 50000.

      `catalog database database_name at node node_name authentication server`

      For example,

      `catalog tcpip node TELCO remote 9.124.113.116 server 50000`
      `catalog db TELCO at node TELCO authentication server`

## Creating a data source connection to the TELCO database

You must create a data source connection from the Business Intelligence node to the IBM DB2 database that is on the data node.

### Procedure

1. Open a web browser on the BI node.
2. Go to the IBM Cognos BI portal URL. For example, go to `http:<hostname>/ibmcognos/`.
3. On the **Welcome** page, click **Administer IBM Cognos Content**.
4. Click the **Configuration** tab, and then click **Data Source Connections**.
5. Click **New Data Source**.
6. In the **Name** field, type `TELCO`, and then click **Next**.
7. From the **Type** list, select `IBM DB2`. Ensure that **Configure JDBC connection** is selected and click **Next**.
8. Based on the connection information that is provided by your database administrator, enter the appropriate information. If applicable, select the authentication mode to be used. Configure the signon credentials if applicable, and click **Next**.
9. On the **Specify the DB2 (JDBC) connection string** page, enter the server name, port number, and database name.
10. Click **Test the connection**, then click **Test**. On the **View the results** page, the status of the connection tests for the dynamic query mode is **Succeeded**.

11. Click **Close**, click **Close** again, and then click **Finish**.

# Setting up the Cognos Framework Manager model

Open the project file in IBM Cognos Framework Manager and save it.

## Before you begin

The user ID that you log in with when you open Framework Manager must belong to the **db2admins** group.

## Procedure

1. On the Business Intelligence node, open Cognos Framework Manager.
2. Click **Open a project**.
3. Select the *File_saved_location*/CSP_CustomerInsight_FMModel/ CSP_CustomerInsight_FMModel.cpf file.
4. Click **OK**. The model opens and you can view the data model, sources, and package.
5. Publish the package.

# Deploying the IBM Cognos BI reports

You use IBM Cognos Administration to deploy the reports.

## Before you begin

Ensure that CSP_CustomerInsight_BIContent.zip is in the *Cognos_install_location*/Deployment folder on the Business Intelligence node.

## Procedure

1. Open a web browser on the Business Intelligence node.
2. Go to the IBM Cognos BI portal URL. For example, go to http://cognos node/ibmcognos/.
3. On the **Welcome** page, click **Administer IBM Cognos Content**.
4. Click the **Configuration** tab, and then click **Content Administration**.
5. On the toolbar, click **New Import**.
6. In the **Deployment Archive** pane, select deployment archive (CSP_CustomerInsight_BIContent.zip), and click **Next**.
7. In the **Specify a name and description** pane, accept the default or enter a new name, and click **Next**.
8. In the **Select the public folders and directory content** pane, select all of the packages in the table, leave the **Options** as default, ensure that the **Disable after import** option is unselected, and click **Next**.
9. In the **Specify the general options** pane, accept the defaults, and click **Next**.
10. On the **Review the summary** page, click **Next**.
11. On the **Select an action** page, select **Save and run once**, and click **Finish**.
12. On the **Run with options** page, accept the defaults, and click **Run**, and then click **OK**.
13. Select **View the details of this import after closing this window** and click **OK**.

14. In IBM Cognos Administration, click **Home**. The content is available in **Public Folders** > **CSP_CustomerInsight_BIContent_Model** > **CSP_CustomerInsight** > **CSP_CustomerInsight_Analysis_Report**.

# Deploying IBM SPSS content

You must create a data source connection, and then import the content files into IBM SPSS Deployment Manager for Collaboration and Deployment Services.

## Before you begin

Ensure that the following things are in place:

- IBM SPSS Collaboration and Deployment Services Deployment Manager is installed on the client computer.
- The `CSP_CustomerInsight_CDS.pes` file is on the local client computer from which the deployment is performed. The default installation folder for this file is `/opt/IBM/IS_CustomerInsight_1.0/Analytics/`.
- You know the admin credentials for the Predictive Analytics node, IBM DB2, and IBM SPSS Collaboration and Deployment Services.

## Procedure

1. Launch the IBM Analytic Server at http://host:port/analyticserver/admin/ibm.
2. Log in using your Analytic Server Credentials.
3. Click **Datasources**.
4. Import each of the zip files located in the `/opt/IBM/IS_CSP_CustomerInsight_1.0.3/rapidanalytics/analyticserver_datasources/` directory.
5. Select **Actions > Import > Browse** and select a data source.
6. Start **Deployment Manager**.
7. Click **File** > **New** > **Content Server Connection**.
8. In the **Connection Name** field, enter a name that identifies the Predictive Analytics node.
9. In the **Server URL** field, enter `http://analytics_node_IP:9080` and click **Finish**.
10. Right-click **Content Repository** and click **Import**.
11. Browse to and select the `CSP_CustomerInsights_CDS.pes` file.
12. Click **Open**.
13. Accept the default options in the **Import** window, and click **OK**. The **CSP_CustomerInsights_NPS** folder, a job in the **Jobs** folder, and streams in the **Modeler Streams** folder are created.
14. Repeat steps 6-8 for the `CSP_CustomerInsights_Profile.pes` file.
15. Update the credential information for the **Admin**, **Db2inst1**, and **root** users so that the job and streams run successfully.
    a. In the **Content Explorer** tab, under **Resource Definitions**, open the **Credentials** folder.
    b. Update the **Admin** user with the credentials for the SPSS Collaboration and Deployment Services user that has access to the content repository and runs the job.
    c. Update the **Db2inst1** user with the credentials for the user that has access to the IBM DB2 database.

> d. Update the **root** user with the credentials for the user that has access to the Modeler Server.
>
> e. Update the **bigsql** user with the credentials for the user that has access to the BigSQL instance.

16. Open the job in the **Jobs** folder and ensure that the user credentials match the credentials of the IBM DB2 instance on the **ODBC** tab.

17. Verify the server connections are correct for your environment. In the Content Explorer, open the Servers folder and verify the cads and modeler connections.

18. Create an ODBC connection with the name `IBMPCI` that points to the `TELCO` database on the data node.

    For information about how to create an ODBC connection, see "Configuring ODBC for IBM SPSS Modeler Server on Linux operating systems." In the `odbc.ini` file, specify the driver path as `/opt/IBM/SDAP711/lib/XEdb227.so`.

## Configuring ODBC for IBM SPSS Modeler Server on Linux operating systems

To use an ODBC data source with IBM SPSS Modeler Server on a Linux operating system, you must configure the environment.

### Procedure

1. Stop the IBM SPSS Modeler Server.

2. Go to the `/root/SDAP711` directory.

   The driver files are installed as part of the IBM Predictive Customer Intelligence Server deployment.

3. Run the `setodbcpath.sh` script to update the ODBC path in the scripts.

4. Edit the `odbc.sh` script to add the definition for ODBCINI to the bottom of the script. For example:

   ```
   ODBCINI=/root/SDAP711/odbc.ini; export ODBCINI
   ```

   ODBCINI must point to the full file path of the `odbc.ini` file for IBM SPSS Modeler. The `odbc.ini` file lists the ODBC data sources that you want to connect to. A default `odbc.ini` file is installed with the drivers.

5. In the `odbc.ini` file, add the data source and specify the driver in the `[ODBC Data Sources]` section of the file.

   **Note:** You must create both `BigSQL` and `TELCO` data source connections.

   For example, add the `BigSQL` data source as:

   ```
   [ODBC Data Sources]
   BigSQL=IBM DB2 ODBC Driver
   ```

   Or add the `TELCO` data source as:

   ```
   [ODBC Data Sources]
   TELCO=IBM DB2 ODBC Driver
   ```

6. In the `odbc.ini` file, create an ODBC `bigsql` or `TELCO` data source connection.

   For example, include the following content for `bigsql`. For `TELCO`, replace a few code strings as shown below (the text following the word "OR").

   ```
   [BigSQL] OR [TELCO]
   Driver=/opt/ibm/db2/V10.5/lib64/libdb2o.so
   DriverUnicodeType=1
   Description=IBM DB2 ODBC Driver
   ApplicationUsingThreads=1
   AuthenticationMethod=0
   ```

```
BulkBinaryThreshold=32
BulkCharacterThreshold=-1
BulkLoadBatchSize=1024
CharsetFor65535=0
#Database applies to DB2 UDB only
Database=bigsql OR TELCO
DefaultIsolationLevel=1
DynamicSections=200
EnableBulkLoad=0
EncryptionMethod=0
FailoverGranularity=0
FailoverMode=0
FailoverPreconnect=0
GrantAuthid=PUBLIC
GrantExecute=1
GSSClient=native
HostNameInCertificate=
IpAddress=IP_Address_of_DB_server
KeyPassword=
KeyStore=
KeyStorePassword=
LoadBalanceTimeout=0
LoadBalancing=0
LogonID=bigsql OR TELCO
MaxPoolSize=100
MinPoolSize=0
Password=password
PackageCollection=NULLID
PackageNamePrefix=DD
PackageOwner=
Pooling=0
ProgramID=
QueryTimeout=0
ReportCodePageConversionErrors=0
TcpPort=51000 OR 50000
TrustStore=
TrustStorePassword=
UseCurrentSchema=0
ValidateServerCertificate=1
WithHold=1
XMLDescribeType=-10
```

**Note:** You must use the driver library libdb2o.so with IBM SPSS Modeler.

Ensure that you set DriverUnicodeType=1 to avoid buffer overflow errors when you connect to the database.

7. If you are using the 64-bit version of IBM SPSS Modeler Server, define and export LD_LIBRARY_PATH_64 in the odbc.sh script:

```
if [ "$LD_LIBRARY_PATH_64" = "" ]; then
LD_LIBRARY_PATH_64=<library_path>
else
LD_LIBRARY_PATH_64=<library_path>:$LD_LIBRARY_PATH_64
fi
export LD_LIBRARY_PATH_64
```

Where <library_path> is the same as for the LD_LIBRARY_PATH definition in the script that was initialized with the installation path. For example, /opt/spss/odbc/lib.

**Tip:** You can copy the if and export statements for LD_LIBRARY_PATH in the odbc.sh file, append them to the end of the file. Then, replace the LD_LIBRARY_PATH strings in the newly appended if and export statements with LD_LIBRARY_PATH_64. Here is an example of the odbc.sh file for a 64-bit IBM SPSS Modeler Server installation:

```
if [ "$LD_LIBRARY_PATH" = "" ]; then
  LD_LIBRARY_PATH=/opt/spss/odbc/lib
else
  LD_LIBRARY_PATH=/opt/spss/odbc/lib:$LD_LIBRARY_PATH
fi
export LD_LIBRARY_PATH
if [ "$LD_LIBRARY_PATH_64" = "" ]; then
  LD_LIBRARY_PATH_64=/opt/spss/odbc/lib
else
  LD_LIBRARY_PATH_64=/opt/spss/odbc/lib:$LD_LIBRARY_PATH_64
fi
export LD_LIBRARY_PATH_64
ODBCINI=/opt/spss/odbc/odbc.ini; export ODBCINI
```

Ensure that you export `LD_LIBRARY_PATH_64`, and define it with the `if` loop.

8. Configure IBM SPSS Modeler Server to use the driver. Edit `modelersrv.sh` and add the following line immediately below the line that defines SCLEMDNAME:

    `. <odbc.sh_path>`

    Where `odbc.sh_path` is the full path to the `odbc.sh` file.

    For example: `. /opt/spss/odbc/odbc.sh`

    Ensure that you leave a space between the first period and the file path.

9. Save `modelersrv.sh`.

10. Configure the IBM SPSS Modeler Server to use the ODBC wrapper named `libspssodbc_datadirect.so`.

    a. Go to the `/opt/IBM/SPSS/ModelerServer/17.0/bin` directory.

    b. Remove the existing `libspssodbc.so` soft link by using the following command:

        `rm –fr libspssodbc.so`

    c. Link the new wrapper to `libspssodbc.so` by using the following command:

        `ln –s libspssodbc_datadirect_utf16.so libspssodbc.so`

11. Configure the `db2cli.ini` file in `<db2 instance home>/sqllib/cfg/db2cli.ini` to add the sections for each database.

    For `BigSQL` :

    ```
    [BigSQL]
    Database=bigsql
    DBAlias=bigsql
    Protocol=TCPIP
    DriverUnicodeType=1
    Port=51000
    Hostname=IP_Address_of_DB_server
    UID=bigsql
    PWD=password
    ```

    For `TELCO` :

    ```
    [TELCO]
    Database=TELCO
    Protocol=TCPIP
    DriverUnicodeType=1
    Port=50000
    Hostname=IP_Address_of_DB_server
    UID=username
    PWD=password
    ```

12. Save `odbc.ini`.

13. Repeat the steps above for the TELCO database.

**What to do next**

To test the connection, do the following steps:

1. Restart IBM SPSS Modeler Server.
2. Connect to IBM SPSS Modeler Server from a client.
3. Add a database source node to the canvas.
4. Open the node and verify that you can see the data source names that you defined in the `odbc.ini` file.

For additional information and troubleshooting tips for connecting to data sources, see the SPSS Modeler documentation (www.ibm.com/support/knowledgecenter/ SS3RA7_16.0.0)

# SPSS job sequencing and triggering

Specific processing jobs define execution sequences and triggering events for individual files stored in the IBM SPSS Collaboration and Deployment Services Repository.

For churn prediction, the jobs which perform the training of the model and the scoring of the model have been separated. The data for training needs to be prepared and loaded in the Behavior Based Customer Insight for Communication Service Providers churn tables. Once this is performed, the job `\CSP_CustomerInsight_NPS\Jobs\Training Churn Prediction Model` present in IBM SPSS Collaboration and Deployment Services needs to be run from the SPSS CADS Deployment Manager. This will create the predictive model nuggets which will be used subsequently in the job used to score the active customers. Failure to run this job before running the `\CSP_CustomerInsight_NPS\Jobs\Scoring Churn Prediction Model` will result in error.

The job `\CSP_CustomerInsight_NPS\Jobs\Scoring Churn Prediction Model` will be triggered each time the sqoop job for transferring the churn dataset from the Analytics Platform node to the DB2 data node is complete.

The job `\CSP_CustomerInsight_NPS\Jobs\Load Report Tables` will be triggered each time the sqoop job for transferring the NPS dataset from the Analytics Platform node to the DB2 data node is complete.

# Changing churn factor labels

You can change the churn factor labels to suit your business needs.

Each time the SPSS training job is run, it creates a decision list model. The decision list model nugget is then exported to a `.csv` file so that it can be provided as an additional input apart from the churn propensity and displayed in the Churn Management Report. The idea is to provide actionable insights for the churn along with providing the churn propensity and the expected churn date.

The decision list usually has a list of a few variables expressed as an if/else condition. A business analyst or user can interpret these segments and provide labels which can be used in the churn management report. This will help the users of the churn management report understand the reason for the churn. Providing of labels is optional. In the event that the label is not provided, the base ruleset that appeared in the decision list will appear in the churn factors column.

To provide the **Churn_Factors** with easy to understand labels, the following steps need to be performed.

1. Copy the file `Decision List Formatted.csv` located in the folder `/opt/IBM/SPSS/ModelerServer/17.0/data` in the SPSS/Analytics node.

2. Open the comma separated file in a spreadsheet. You will see these columns: **ID**, **NBCORRECT**, **RECORD_COUNT SCORE**, **CHURN_RULES**, and **CHURN_FACTORS**.

3. Input values in the **Churn_Factors** column can be changed to something more meaningful. For instance, a churn rule from the decision list which states **OVERALL_EXP_SCORE_5 greaterThan 0.500000** and **OVERALL_EXP_SCORE_5 lessOrEqual 3** can be labeled as **Low Overall Experience Score** and entered in the **Churn_Factors** column.

4. In the example in step 3, the scoring stream will identify **Low Overall Experience Score** as the churn factor and display the same based on the `Rule Id`.

# Improving the SPSS model performance

You can fine-tune the SPSS model performance.

The Model Training stream `Churn Prediction Model Training.str` is used to train the two predictive models that are used for scoring. The first predictive model is a decision list, which provides the rules to identify segments that have a higher propensity to churn, along with the propensity to churn. The second predictive model is a COX regression model, which uses the attributes of the customer to identify when they are likely to churn.

In the decision list, changing the following options can alter the performance characteristics, such as time needed to build the model and overall accuracy of the mode:

• Decreasing the minimum segment size will create smaller segments. When decreasing the minimum segment size, the maximum number of segments need to be increased correspondingly, so that you can adequately cover the population. For instance, with a minimum segment size of 0.5% and a maximum number of groups of 100, we are likely to cover upwards of 50% of the total population based on their propensity to churn. The rest of the population can be considered as likely to be active. However, increasing the maximum number of segments is likely to increase the model development time proportionately.

• Increasing the confidence interval for new conditions will decrease the number of segments formed. However, they will be more reliable segments.

The analysis weight is currently set as 3 for churned customers and 1 for active customers. This is set in the supernode **Data Cleansing** in the node **Analysis Weight**. This results in oversampling of churned customers. This will help provide importance to identifying churned customers. If the number of active customers is very high and there is a need to decrease model development time, the analysis weight can be changed to 1 for churned customers and 0.34 for active customers. This will result in undersampling of active customers and provide improvements in the model development time.

The **Analysis Weight** proportion should reflect the business priorities of how important it is to identify customers likely to churn over the ones that remain active. In an environment where there is a customer churn of 25% a year, an

analysis weight of 3:1 might be good to make the importance equal in proportion. In an environment where customer churn is already 50%, an analysis weight proportion of 1:1 might be sufficient.

Balancing can be used effectively to reduce the number of records instead of analysis weight, which could reduce the time needed to train for both the Decision List & Cox Regression Model Development.

The time required for **Model Scoring** `Churn Prediction Model Scoring.str` can be improved by having intermediate tables from which the data can be loaded. Subsequent sections of the stream can read the data for scoring. This can be used to have SQL pushback features increase the speed of the stream overall by distributing a significant portion of the workload to the database.

Splitting the data for scoring purposes into multiple divisions and running the streams in parallel can help improve the performance.

# Installing the Analytics Platform

The Analytics Platform is software that is installed on your Analytics Platform nodes. It manages the creation of your data sets in the Apache Hadoop ecosystem. Analytics Platform allows deployment of data sets and management of those data sets, which makes up the basis of your solution.

To install and configure the Analytics Platform, refer to the Analytics Platform *Installation and Configuration Guide for CSP Solutions* available from the following location: http://www-01.ibm.com/support/docview.wss?uid=swg27046047

This document describes the installation and configuration of Analytics Platform software and data sets for Communication Service Provider (CSP) solutions. It includes operations that are required to be performed on your Analytics Platform nodes in your deployment.

In the context of the Behavior Based Customer Insight for Communication Service Providers solution, the BigInsights master node is one of the Analytics Platform nodes.

# Installing the SLM tagging functionality

You can deploy the slm tagging functionality on the Analytics Platform node.

### About this task

A RPM Package Manager (RPM) is contained in the `rapidanalytics/build/slm/ci-slm-deployment-1.0.0.rpm` folder. To install this RPM, follow these steps:

### Procedure
1. Install the SLM via the RPM installer by typing the following command:

   `rpm -i bis-main-2*.rpm`

   The files will be copied to `/opt/tnf/apps/slm`.
2. Running SLM tagging:
   - A Cron job needs to be created that runs the SLM tagging command daily, just after midnight:

```
java -cp /opt/tnf/apps/slm/lib/log4j-1.2.16.jar:/opt/tnf/apps/slm/
lib/* com.tnf.slm.SlmMain
```
- The SLM tagging process appends to a log file in the directory, with the
  extension .slmtag: /opt/tnf/apps/slm/log/<log file>.slmtag

This log file is used by IBM to ensure that the product is being used according
to its license.

# Installation and configuration of the Mediation node

Mediation software is deployed on the mediation nodes in your deployment,
manages the loading and aggregation of your telecommunication (telco) data into
the Apache Hadoop ecosystem, and works in conjunction with the Analytics
Platform. The mediation software works with the Infosphere Streams software
installed on your mediation nodes. It manages the loading and key performance
indicator (kpi) calculation of your telco data and prepares the data for analysis by
the end user. The volume of data to be analyzed will determine how many
mediation nodes are required in your platform.

To install and configure the Mediation node, you will need to reference
information on Analytics Platform 2.0.

This information includes the following:
- installation prerequisites
- RPM installation
- Vedia Supercollector installation
- streams domain and instance configuration
- customization
- administration

To perform these operations, refer to the Analytics Platform Mediation *Installation
and Configuration Guide for CSP Solutions* available from the Industry Solutions
Customer Intelligence Solutions version 1.0 documentation web page.

This document provides information regarding installation, deployment,
configuration, and maintenance of the mediation layer of Analytics Platform 2.0.
This platform is similar to Analytics Platform 1.0, except that 2.0 is Streams-based
and 1.0 is Vedia-based.

The mediation solutions include the following components:
- Supercollector (Vedia-based)
- Lookup Manager (Streams-based)
- ITE Application to produce 5 minute aggregations (Streams-based)
- Raw TDR processing Application (Streams-based)
- DB Loader Application (Streams-based)

Please note that the Analytics Platform Mediation *Installation and Configuration
Guide for CSP Solutions* will not cover the installation of the Streams platform,
which is a prerequisite for the application deployment. Also, the Hadoop
installation and Hadoop-based aggregation are not covered in the document.

# Loading data and starting the predictive analytics job

After the Analytics Platform is installed, you must configure and run the data load process and start the predictive analytics job.

## Before you begin

Ensure that the following conditions are met:
- The Analytics Platform is installed.
- You have a user ID that has access to the IBM InfoSphere BigInsights database that is on the Analytics Platform node.
- IBM InfoSphere BigInsights is running.
- The IBM DB2 database exists on the data node.

## About this task

The `runDBExport.sh` script extracts data from the IBM InfoSphere BigInsights database on the Analytics Platform node and loads it into the IBM DB2 database on the data node. The script takes a parameter that runs the following variations of the script:

**runDBExport.sh nps**
> Extracts and loads the nps data.

**runDBExport.sh churn**
> Extracts and loads the churn data.

The following table lists the parameters in the `config.properties` file that you must configure:

*Table 1. Parameters in the config.properties file*

| Parameter | Description | Default value |
| --- | --- | --- |
| HiveHost | Change the hive host and port number | localhost:10000/default |
| HiveUser | Hive user name | hive |
| HivePasswd | Hive user password | No default value. |
| DB2Host | DB2 Host and DB2 port number | localhost:50000 |
| DB2User | DB2 user name | db2inst1 |
| DB2Passwd | DB2 user password | No default value. |
| SqoopHost | Change the Sqoop host address and sqoop port number | localhost:12000/sqoop |
| HiveDataDirectory | Location of the Hive warehouse directory on the Analytics Platform node | /biginsights/hive/warehouse/tnf.db |
| SPSSEndPoint | URL of the IBM Predictive Customer Intelligence job. Update the host address. | `http://localhost:9080/process/services/ProcessManagement` |
| SPSSID | Job ID of SPSS. The OBJECT URI of the job to be started. You can find this value by right-clicking the job in Deployment Manager and selecting properties. | No default value. |

*Table 1. Parameters in the config.properties file  (continued)*

| Parameter | Description | Default value |
|---|---|---|
| SPSSUser | SPSS CADS User ID. Used to log in to the Deployment Manager. | admin |
| SPSSPasswd | SPSS CADS Password. | No default value. |

## Procedure

1. Log on to the Analytics Platform node.
2. Change directory to `/opt/IBM/IS_CSP_CustomerInsight_1.0.3`.
3. Decompress the `CSP_CustomerInsight_DB` folder.
4. Copy the following files to the *SqoopHomeDir*/lib and *HiveHomeDir*/lib folders:
   - `db2jcc.jar`
   - `db2jcc_licence_cu.jar`
5. Open the `config.properties` file and change the parameters to refer to IBM InfoSphere BigInsights and the IBM DB2 database. Refer to the table in *About this task* for information about the parameters to change.

   **Note:** There are two configuration files in `/opt/IBM/IS_CSP_CustomerInsight_1.0.3/CSP_CustomerInsight_DB/conf`: `churn_config.properties` and `nps_config.properties`.
6. Enter the following commands:
   ```
   chmod 755 runDBExport.sh
   chmod 755 script/sqoop.sh
   ```

# Chapter 3. Using Behavior Based Customer Insight for Communication Service Providers

This section describes a typical user case that shows how to use the Behavior Based Customer Insight for Communication Service Providers solution to understand customer experience trends.

IBM Behavior Based Customer Insights for Communication Service Providers is composed of three separate components:

- a net promoter score (NPS) correlation application
- a churn management application
- a customer behavior dataset

The NPS correlation and churn management applications include an IBM Cognos user interface, which are described in the workflow procedures.

The churn management application provides an analysis of subscriber data suggesting how likely and when a customer is likely to churn, as well predicting the factors that influence churn.

The customer behavior dataset provides the following:

- a set of tables customers can access
- an accompanying data dictionary

The dataset contains subscribers' usage data, including their interests and preferences. The application analyzes the amount of time subscribers spend browsing, searching, reading, and streaming information on their devices. Each period of activity is categorized, where possible, into one of hundreds of interest categories, enabling communication service providers to categorize their subscribers into hundreds of different micro-segments based upon these interests.

## Workflow and user roles

This workflow shows how the NPS correlation application provides a dashboard and key metrics to a communication service provider. For this example, a customer experience team member investigates the NPS score for mobile data. A typical process workflow is described.

The workflow also provides a set of key metrics demonstrating the churn management application. For this example, the likelihood of a subscriber's churn propensity is associated with their churn propensity score. This functionality gives communication service providers (CSPs) the ability to identify customers who are likely to churn and also those of greatest value to the CSP. It also provides the ability to predict the factors influencing churn using the top rulesets and subscriber trend data. A typical process workflow is described.

## Using the NPS correlation application

The Behavior Based Customer Insight for Communication Service Providers solution provides in-depth analytics to help communication service providers evaluate key subscriber metrics.

## About this task

This task describes how a typical customer experience team member would use the reports to investigate net promoter score (NPS) and transactional-NPS. The data is linked to the actual activity of subscribers. Subscriber data such as services, devices, or location are linked to their NPS, providing an enhanced view of the network and services.

The screen shots shown are for example purposes and will vary depending on your particular implementation.

## Procedure

1. Open the **Behavior Based Customer Insight Top Factors** dashboard.
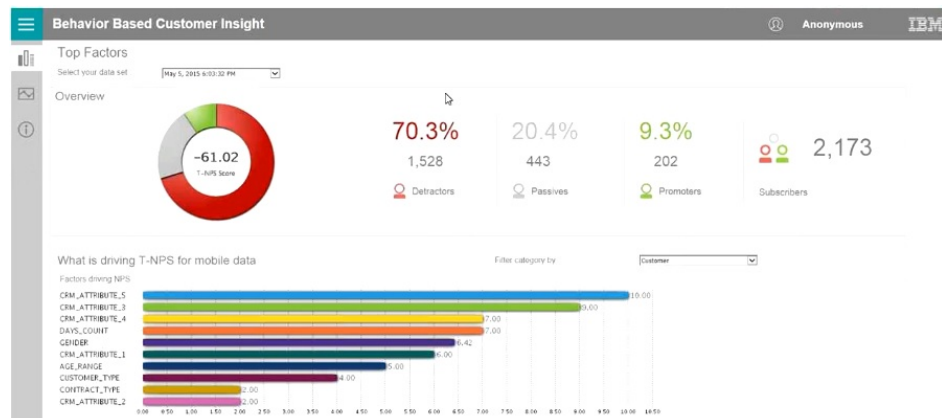


   The T-NPS score of -61.02 indicates a high number of unhappy subscribers. This number reflects promoters (approximately 9%) minus detractors (approximately 70%). Factors driving the NPS data are summarized in the bar chart and legend.

2. Filter the data category based on **Data Activity**. The top 10 factors change to reflect the **Data Activity** category. The number of applications used on the UTRAN (3G) network is the most significant.

3. Click the Factor Analysis icon  to launch the **Factor Analysis** page for NUM_APPLICATIONS_UTRAN.
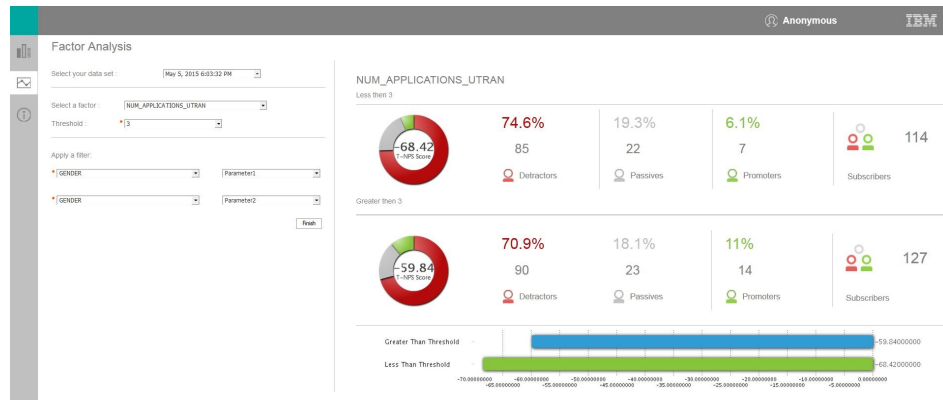


With the Factor Analysis threshold set at 3, subscribers who are running more than three applications on UTRAN (a 3G network) have much lower NPS scores than those who are using three or less. With a similar number of subscribers, this analysis is statistically significant. The customer experience team can then use this as a means of further investigation.

4. Apply further filters to the analysis, setting the data to show only female customers.
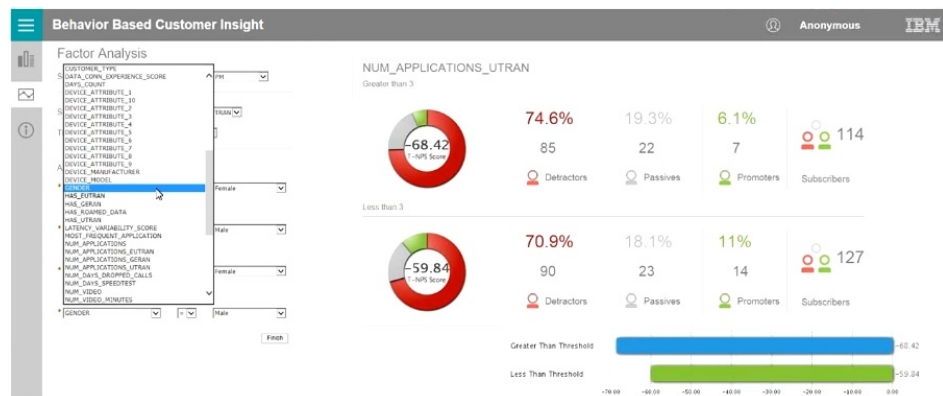


With this filter applied, the analysis shows an even greater difference between females who use more than three applications on 3G versus females who use three applications or less on 3G. A customer experience team member might then use this information for further investigation. For example, what type of applications were involved in creating this apparent negative experience for the subscribers in question?

## Using the churn management application

The churn management application utilizes standard churn management inputs, as well as voice, SMS, and mobile data records, to analyze trends in subscriber voice, SMS, and mobile data and to provide an interpretation of the churn model.

### About this task

This task describes how a typical customer experience team member would use the reports to investigate a set of subscribers and evaluate their likelihood to churn

based on their churn propensity and other factors. It also describes the ability to predict the factors influencing churn using the top rulesets and subscriber trend data

The screen shots shown are for example purposes and will vary depending on your particular implementation.

## Procedure

1. Open the **Churn Managment Overview** report.
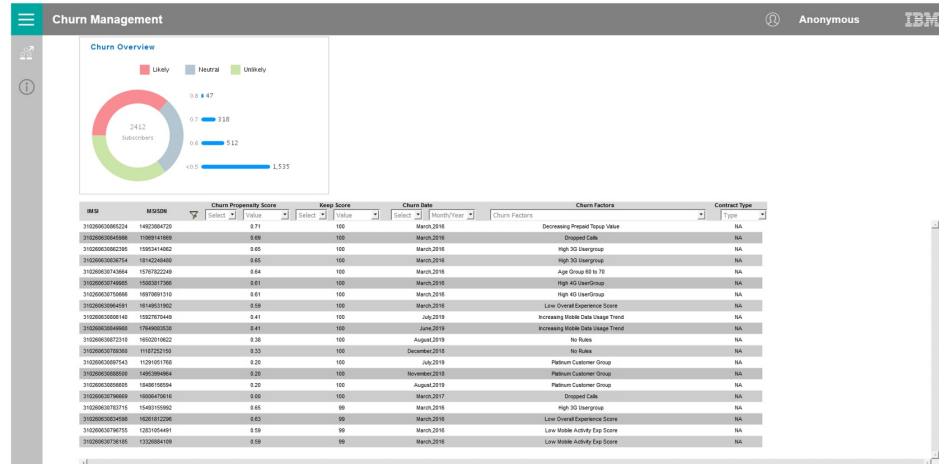


The main report page shows an overview of the entire subscriber base in the donut chart. Of the 2412 subscribers, 877 are likely to churn based on their churn propensity of >= 0.6. The default report is sorted first by **Keep Score** and then **Churn Propensity Score** (both descending). This highlights to communication service providers (CSPs) those subscribers who are the greatest value, as well as those who are most likely to churn.

2. Using the pull-down menus on the report, select the greater than sign (>) and then select a value of **0.60**.
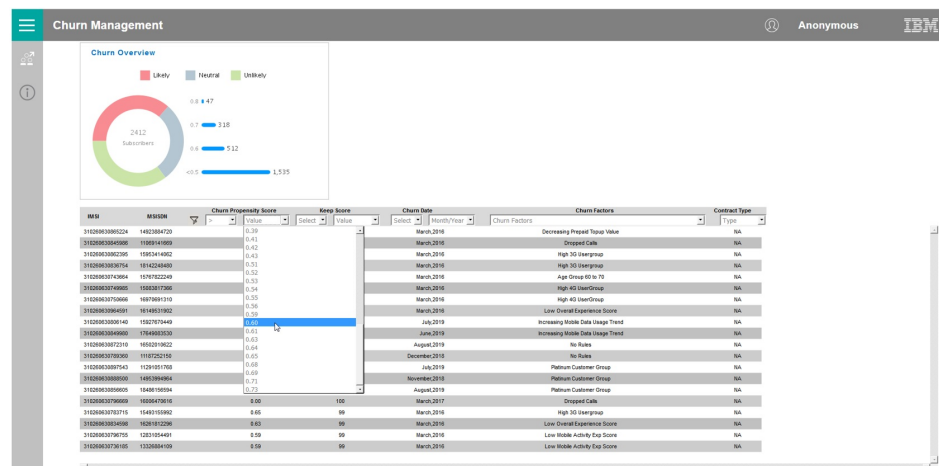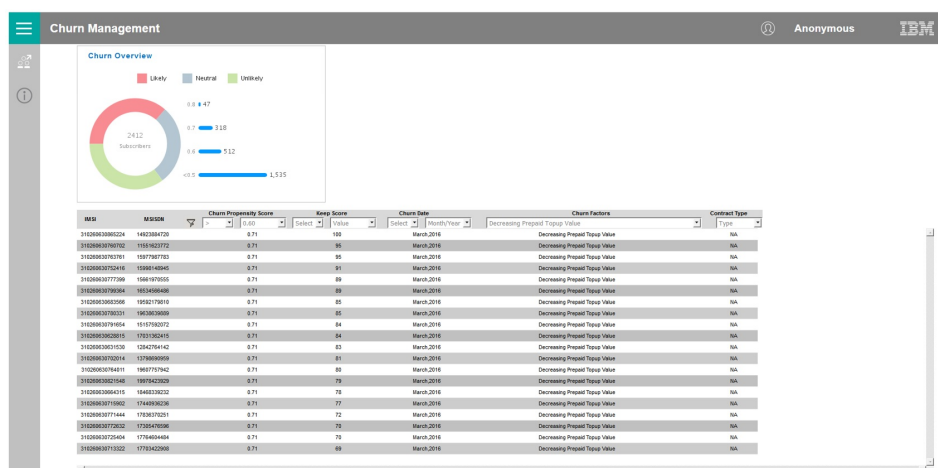
This filters the subscribers in the **Churn Propensity Score** column to include only those with a score greater than 0.60.
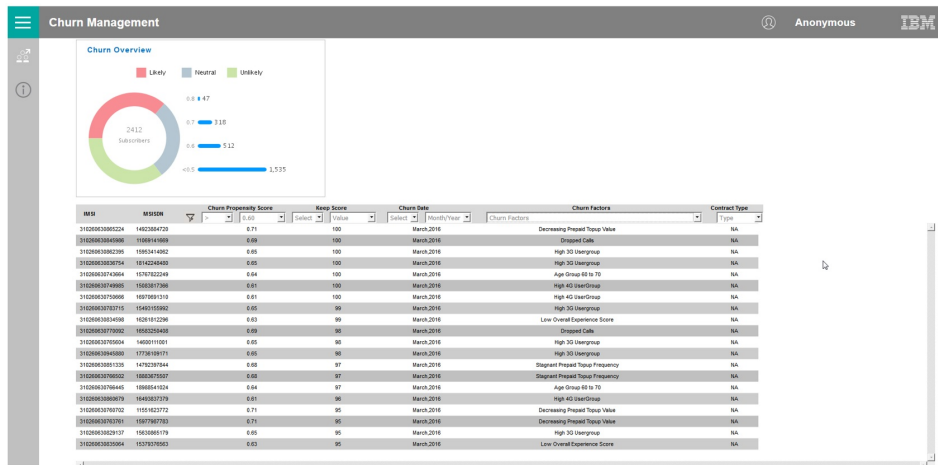


Four other factors are available for filtering:

- **Keep Score**: Filters by relative subscriber importance. For example, this factor would allow a customer experience team member to concentrate on those subscribers with a score greater than 50.

- **Churn Date**: Provides a projected churn date. For example, this filter would allow a customer experience team member to concentrate on those likely to churn sooner rather than later.

- **Churn Factor**: Provides a suggested churn factor. This filter would allow a customer experience team member to segment based on specific factors impacting subscriber satisfaction, including offers which might be available to likely churners (such as **Decreasing Prepaid Top Value**).

- **Contract Type**: Filters by the type of subscribers. For example, this filter would allow a customer experience team member to segment based on **Prepay** or **Postpay** subscribers, which may be assigned to different departments.

3. Click the **Churn Factors** pull-down menu, and select **Decreasing Prepaid Top Value**.



With this filter applied, subscribers are listed whose predominant reason for churn is the decreasing value of their monthly top-up, ranked in descending order by **Keep Score** and **Churn Propensity Score**. In this example, there are

several very valuable subscribers who are likely to churn by March 2016. These are the subscribers who the CSP would most likely address when attempting to stop subscribers from churning.

4. Click ⊘ to view the **Churn Management Rulesets** report.



This report contains three report panes:

- **Top 10 Churn Results -- Overall**



This pane highlights the top ten rulesets for a specific execution of churn management data. The rulesets are weighted by relevance. This highlights the primary issues contributing to predicted customer churns.

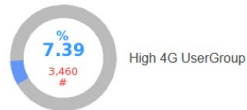- **Top 5 Churn Rulesets – Trend for Next 6 Months**
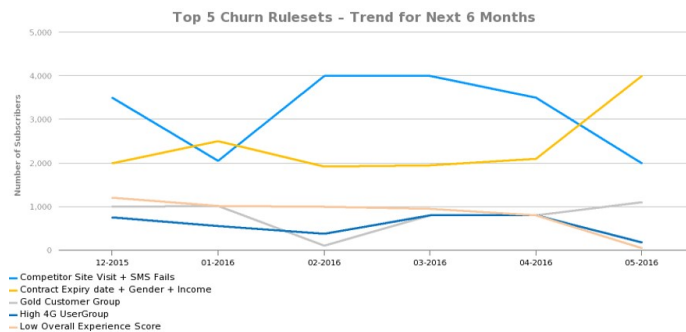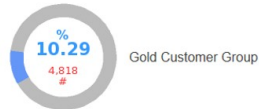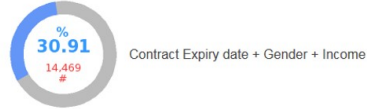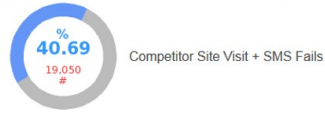


This pane highlights the top five rulesets for a specific execution of churn management data, and predicts the trend of influence for those rulesets for the next six months. This can highlight rising trends in a particular sets of circumstances (such as expiring contracts), which may impact churn rates in the near future.

- **Top 5 Churn Rulesets – Summary for Next 6 Months**

**Top 5 Churn Rulesets – Summary for Next 6 Months**

%= Percent of Overall Churn for Next 6 Months
# =Number of Expected Churning Subscribers for Next 6 Months

%
**40.69**
19.050
#       Competitor Site Visit + SMS Fails

%
**30.91**
14,469
#       Contract Expiry date + Gender + Income

%
**10.72**
5,018
#       Low Overall Experience Score

%
**10.29**
4.818
#       Gold Customer Group

%
**7.39**
3,460
#       High 4G UserGroup

This pane highlights the top five rulesets for a specific execution of churn management data, and provides an overview of how those rulesets may influence churn over the next six months. The donut charts summarize the predicted percentage of churn contribution and also the estimated number of affected subscribers.

# Appendix A. Accessibility features

Accessibility features help users who have a physical disability, such as restricted mobility or limited vision, to use information technology products.

For information about the commitment that IBM has to accessibility, see the IBM Accessibility Center (www.ibm.com/able).

IBM Cognos HTML documentation has accessibility features. PDF documents are supplemental and, as such, include no added accessibility features.

## Report output

In IBM Cognos Administration, you can enable system-wide settings to create accessible report output. For more information, see the *IBM Cognos Business Intelligence Administration and Security Guide*. In IBM Cognos Report Studio, you can enable settings to create accessible output for individual reports. For more information, see the *IBM Cognos Report Studio User Guide*. You can access the previously mentioned documents at IBM Knowledge Center (http://www.ibm.com/support/knowledgecenter).

# Appendix B. The data provision tool

The data provision tool loads, deletes, and exports data from the provision tables. The provision tables contain customer relationship management data.

The data provision tool is installed in the `/opt/tnf/apps/bis-main-var/bis-provisioning-tool` folder and consists of the following parts:

**load.sh**
> Loads and updates provision tables.

**load-all.sh**
> Checks all the files in the `.csv` folder and loads them at the same time.

**delete.sh**
> Reads records from input files and deletes records from IBM InfoSphere BigInsights by using key values.

**export.sh**
> Exports records from IBM InfoSphere BigInsights to text files.

## Usage

You must specify key values for all operations. The key field names are obtained by the provision tools from the table metadata. The primary key must be defined in table DDL. In the following examples the primary key field is **tac**:

```
create table device (
tac varchar(32) primary key, model varchar(64),
vendor varchar (64)
);
```

The follow example contains two primary keys:

```
create table device (
tac varchar(32),
model varchar(64), vendor varchar (64), primary key (tac, model)
);
```

To see the parameters for load.sh type, the script name with no parameters in a command-line window:

```
Usage: load.sh [options] Options:
* --file, -f
CSV file with data * --table, -t
DB Table name
```

**`--file, -f`**
> A list of input files that are separated by the pipe (|) character.

**`--table, -t`**
> The table name. The table name can include a dot separated schema. For example, `load.sh -f device.csv -t device`.

`delete.sh` and `export.sh` take the same parameters.

The data provision tool reads table metadata and converts the input text file into an Apache Parquet or plain text formatted file and populates specified table with the data. It updates existing records and inserts new records.

## Creating dictionary tables

Run the `/opt/tnf/apps/bis-main/bis-dbconfig/install-db.sh` script with table group name parameters. The script `/opt/tnf/apps/bis-main/bis-main.sh` creates a dictionary table in the database when it starts.

You cannot modify the data in IBM InfoSphere BigInsights directly. The data provision tool updates the database tables and exports them to IBM InfoSphere BigInsights. During the export stage, the data provision tool must know the storage format. Apache Parquet and plain text formats are supported. Update the storage format in the`/opt/tnf/apps/bis-main/bis-tools/bisprovisioning-tool/cfg/hive-storage.properties` file.

## Input files

The data input format is a pipe (|) separated utf-8 encoded plain text file with headers. The header can start with a number sign (#). Header values must match the dictionary table case insensitive field names. For example,

```
TAC|MODEL|VENDOR
12345678|Zamyang|Ciaobao
```

## Configuration files

The data provision tool IBM DB2 database configuration location is `/opt/tnf/apps/bis-main-var/bis-demon/cfg/db2_connection.properties`. For example,

```
db.url=jdbc:db2://localhost:50000/tnfbis
db.user=catalog
db.password=db2
```

where `db.url` is the JDBC URL string of the database, `db.user` is the database user ID, and `db.password` is the database password.

# Appendix C. Troubleshooting

This section contains troubleshooting information for the Behavior Based Customer Insight for Communication Service Providers installation.

## Troubleshooting a problem

Troubleshooting is a systematic approach to solving a problem. The goal of troubleshooting is to determine why something does not work as expected and how to resolve the problem.

Review the following table to help you or customer support resolve a problem.

*Table 2. Troubleshooting actions and descriptions*

| Actions | Description |
|---------|-------------|
| A product fix might be available to resolve your problem. | Apply all known fix packs, or service levels, or program temporary fixes (PTF). |
| Look up error messages by selecting the product from the IBM Support Portal, and then typing the error message code into the **Search support** box (http://www.ibm.com/support/entry/portal/). | Error messages give important information to help you identify the component that is causing the problem. |
| Reproduce the problem to ensure that it is not just a simple error. | If samples are available with the product, you might try to reproduce the problem by using the sample data. |
| Ensure that the installation successfully finished. | The installation location must contain the appropriate file structure and the file permissions. For example, if the product requires write access to log files, ensure that the directory has the correct permission. |
| Review all relevant documentation, including release notes, technotes, and proven practices documentation. | Search the IBM Knowledge Center to determine whether your problem is known, has a workaround, or if it is already resolved and documented. |
| Review recent changes in your computing environment. | Sometimes installing new software might cause compatibility issues. |

If the items in the table did not guide you to a resolution, you might need to collect diagnostic data. This data is necessary for an IBM technical-support representative to effectively troubleshoot and assist you in resolving the problem.

## Troubleshooting resources

Troubleshooting resources are sources of information that can help you resolve a problem that you are having with an IBM product.

### Support Portal

The IBM Support Portal is a unified, centralized view of all technical support tools and information for all IBM systems, software, and services.

The IBM Support Portal lets you access all the IBM support resources from one place. You can tailor the pages to focus on the information and resources that you need for problem prevention and faster problem resolution. Familiarize yourself with the IBM Support Portal by viewing the demo videos (https://www.ibm.com/blogs/SPNA/entry/the_ibm_support_portal_videos).

Find the content that you need by selecting your products from the IBM Support Portal (http://www.ibm.com/support/entry/portal).

Before contacting IBM Support, you will need to collect diagnostic data (system information, symptoms, log files, traces, and so on) that is required to resolve a problem. Gathering this information will help to familiarize you with the troubleshooting process and save you time.

## Service request

Service requests are also known as Problem Management Reports (PMRs). Several methods exist to submit diagnostic information to IBM Software Technical Support.

To open a PMR or to exchange information with technical support, view the IBM Software Support Exchanging information with Technical Support page (http://www.ibm.com/software/support/exchangeinfo.html).

## Fix Central

Fix Central provides fixes and updates for your system's software, hardware, and operating system.

Use the pull-down menu to navigate to your product fixes on Fix Central (http://www.ibm.com/systems/support/fixes/en/fixcentral/help/getstarted.html). You may also want to view Fix Central help.

## IBM developerWorks®

IBM developerWorks provides verified technical information in specific technology environments.

As a troubleshooting resource, developerWorks provides easy access to the most popular practices, in addition to videos and other information: developerWorks (http://www.ibm.com/developerworks).

## IBM Redbooks®

IBM Redbooks are developed and published by the IBM International Technical Support Organization, the ITSO.

IBM Redbooks (http://www.redbooks.ibm.com) provide in-depth guidance about such topics as installation and configuration and solution implementation.

## Software support and RSS feeds

IBM Software Support RSS feeds are a quick, easy, and lightweight format for monitoring new content added to websites.

After you download an RSS reader or browser plug-in, you can subscribe to IBM product feeds at IBM Software Support RSS feeds (https://www.ibm.com/software/support/rss).

### Log files

Log files can help you troubleshoot problems by recording the activities that take place when you work with a product.

### Error messages

The first indication of a problem is often an error message. Error messages contain information that can be helpful in determining the cause of a problem.

## Troubleshooting known data provision tool error messages

There are solutions for known data provision tool error messages that you may encounter in IBM Behavior Based Customer Insight for Communication Service Providers.

*Table 3. Solutions to known data provision tool error messages in IBM Behavior Based Customer Insight for Communication Service Providers.*

| Error message | Action |
|---|---|
| **Permission denied.**<br><br>This error is a permission denied error with one of the following two messages:<br>1. `java.io.IOException. Cannot run program "runDBExport.sh": error=13, Permission denied.`<br>2. `java.io.IOException. Cannot run program "script/sqoop.sh": error=13, Permission denied.` | Investigate the `DBExport.log` to search for the error.<br>1. Check the permission of `runDBExport.sh`. Refer to the setup documentation for the appropriate steps.<br>2. Check the permission of sqoop.sh in the script folder in which the sqoop.sh resides. Refer to the setup documentation for the appropriate steps. |
| **Sqoop job failure**<br>1. IOException<br>`[main] LoadDB2 ERROR - java.io.IOException: Can't export data, please check task tracker logs.`<br>`ERROR tool.ExportTool: Error during export: Export job failed!`<br>2. `IllegalArgumentException. [main] LoadDB2 ERROR - Caused by: java.lang.IllegalArgumentException: Timestamp format must be yyyy-mm-dd hh:mm:ss[.fffffffff]` | 1. Verify whether the hive data from the nps_score_table (if it's option 1) or the nps_score_table_latest (if it's option 2) contains the new line character (\n) at the EOF.<br>**Tip:** The location of the hive data is specified by the `HiveDataDirectory` located in the `config.properties` file.<br>2. Verify whether the hive data from the nps_score_table (if it's option 1) or the nps_score_table_latest (if it's option 2) contains valid data in the field mentioned by the value of `HiveDataDirectory` located in the `config.properties` file. |
| **SPSS job error**<br><br>ERROR - Exception !!!<br><br>`java.io.IOException: Server returned HTTP response code: 500 for URL: http://<SPSSHost>:<port>/process/ services/ProcessManagement` | Verify whether SPSS is running and the correct host name and port number have been used. |

## Troubleshooting the FTP collection of files in Analytics Platform

There are solutions for known issues in the FTP collection of files in Analytics Platform.

On Analytics Platform mediation nodes, the function in Analytics Platform that collects transaction data record (TDR) files for storage in Analytics Platform is `Vedia`.

To verify that the collection of TDRs from the CSP probe or probes is working, note that each probe's collector will be defined in mediation. Use the secure shell (SSH) to connect to the correct collector. The allocation of collectors can be found in the file `Vediamain.cfg` at `/opt/tnf/apps/vedia/cfg/Vediamain.cfg`.

To check FileLoader logs, the format is `logs/Collection_1/FileLoader092708.log`.

When the application is running, messages would appear in the following format. For this example, `Vedia` is comparing TDRs in tmp against files on the probe:

```
[CFileListJob::GetNewFilesList] [TaskTest] Getting list of /var/opt/tnf/tdrs/ *.*
[CFileListJob::GetNewFilesList] [TaskTest] Files: 196, Match: 182, Old: 178
```

The files that are being collected correctly are shown in the following example:

```
[CFileDownloadJob::Process] Task - downloading midas/netrofeed/netro_20130918200012.log.gz
[CFileDownloadJob::Process] Task - download netro_20130918200012.log.gz (9600142)
[CProbe::Store] Save: /opt/tnf/apps/vedia/tmp/Collection_1_FileLoader.dat
[CFileListJob::Save] LastListTime: 20130918200012, Files: 664
[CFileListJob::GetNewFilesList] [Task] Getting list of midas/netrofeed/ *.*
[CFileListJob::GetNewFilesList] [Task] Files: 251, Match: 223, Old: 221
[CFileDownloadJob::Process] Task - downloading midas/netrofeed/netro_20130918200015.log.gz
[CFileDownloadJob::Process] Task - download netro_20130918200015.log.gz (9013063)
```

In contrast, the following is an example of a file that can no longer connect to a probe. Typically, if FTP is not working, the ports are not open, permissions are not set up correctly on the probe, the probe is down, or connectivity between the probe and mediation has dropped.

```
FTP not working
```

### TO FIND example of ftp failing

Full queues represent full applications within the chain. The following is an example of a file that has full queues somewhere along the chain. If one application is full, then the preceding application cannot output to the queue, thus impacting the queues (creating a knock-on effect). The queues will need be examined for skipping.

```
1C8F - 19/09 11:00:55.200 - [CFileListJob::GetNewFilesList]
Skip getting of files list
1C8F - 19/09 11:01:00.242 - [CFileListJob::GetNewFilesList]
Skip getting of files list
1C91 - 19/09 11:01:00.461 - [CFileListJob::GetNewFilesList]
Skip getting of files list
1C8F - 19/09 11:01:05.402 - [CFileListJob::GetNewFilesList]
Skip getting of files list
1C8F - 19/09 11:01:10.431 - [CFileListJob::GetNewFilesList]
Skip getting of files list
1C8F - 19/09 11:01:15.482 - [CFileListJob::GetNewFilesList]
Skip getting of files list
1C8F - 19/09 11:01:20.642 - [CFileListJob::GetNewFilesList]
Skip getting of files list
```

```
1C8F - 19/09 11:01:25.838 - [CFileListJob::GetNewFilesList]
Skip getting of files list
1C91 - 19/09 11:01:30.525 - [CFileListJob::GetNewFilesList]
Skip getting of files list
1C8F - 19/09 11:01:31.063 - [CFileListJob::GetNewFilesList]
Skip getting of files list
```

If skipping is noticed in `Vedia` logs and does not stop, restart `Vedia`. Some skipping will occur on restart, but wait up to five minutes for it to clear. It typically takes one to five minutes for the skipping messages to clear from the logs.

Recommendations:
* When collecting files and **Match** is **0**, the `regex` in the FileLoader configuration is incorrect. Review and correct this in the configuration steps.
* If FileLoader understands the files from the network to be **Old**, contact the person responsible for the production of network files to correct the date and time of the files.
* Occasionally, FTP jobs will fail to collect a file, but FileLoader will retry. Investigate situations where there are many failures, causing files that fail to be collected. Check the configuration and verify that the mediation node can reach the host of the network files (probe). If there is a network problem, contact the person responsible for the network files.
* When the configuration is correct and network connectivity is confirmed, restart the `Vedia` processes and ensure there are no further reported exceptions.

Queues commonly will fill after a long outage period. `Vedia` will attempt to collect all files and process them immediately. The number of files is determined by a period of time and is set in `Collection.xml`. If the look back period is, for example, greater than 20 minutes and there are **Skip getting of files list** messages in the log, then reset the look back period. Carefully tune anything greater than 20. Do not simply increase to 300 minutes, as this can overload `Vedia`.

The following is configured in `Collection.xml`:
```
module name="FileLoader"id="FileLoader">
  <probe name="FileLoader"log-file="FileLoader"log--process="2">
  <files>
    <ftp id="Task"host="Data"
    url="ftp://{probe-ip}"port="21"
    user="{probe-user}"password="{probe-password}"
    remotedir="{probe-dir}"storagedir="tmp/data_{probe-no}"
    filename-regex="{probe-files_mask}"
    ftp-timeout="60"ftp-downloads="1"attempt-timeout="1"
    delete-processed="0"process-file-ignore-age="0"
    max-process-file-age="20"time-shift-="-3600"
    compression_="GNUZIP"
    start-format="{probe-file-date-format}"
    detection-interval="60">
    </ftp>
  </files>
  <output name="LoadedFiles"model="File"limit="50"/>
  </probe>
</module>
```

`process-file-ignore-age` directs `Vedia` to load all the old files. Always set this to **0** in a production environment.

`max-process-file-age` defines, in minutes, how old the files on the probe can be before they will be rejected as being too old.

detection-interval indicates how often to check for files, in seconds.

download-threads indicates how many threads to download with. Note that, if this is set cumulatively across all collectors to be a higher value than the probe can process, this may impact the probe and it may reject files.

max-try indicates how many times to attempt to download a file.

## Troubleshooting SPSS

If your SPSS job fails, there are some troubleshooting steps you can follow to resolve the issue.

### Procedure

1. Right-click on the **Load Report Tables** job in the **Jobs** folder of CSP_CustomerInsights_NPS.
2. Click **Show Job History**. This will display information about the job runs, their logs, and their status.
3. Select the job that has failed. The job will have three individual SPSS streams. Select the one which has failed.
4. Open the log associated with the failed stream.
5. Scroll to the end of the job to discover the reason the job failed.

### Results

Common reasons for the job to fail include the unavailability of resources such as:
- Database
- Memory
- Any of the prerequisite services such as SPSS Modeler Server and CADS

## After the solution installer is run, Chef processes are still running after the cleanup.sh script is executed

After the cleanup.sh script is run on the solution installer node, all Chef processes should be terminated. However, in some cases Chef processes are still running.

If you try to run the solution installer setup.sh file again, you might receive a message that required ports are in use, or creation of the chef user might fail.

The solution to this issue is to reboot the installation node after you run the "cleanup.sh" script.

**Note:** This information applies only to the solution installer node and not the client/target nodes.

**Attention:** The solution installer runs on the latest versions of Chrome and Firefox. It is not tested on Safari and does not run on Internet Explorer.

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