

Call Resolver User Guide

Revised: 4/18/06

Table of Contents

Call Resolver User Guide.....	1
Introduction.....	1
Call Detail Records (CDRs).....	1
Call Direction.....	2
Call State Events.....	2
Automatically Running the Call Resolver.....	2
Manually Running the Call Resolver.....	3
Creating CDRs.....	3
Daily Processing.....	3
Exporting Data.....	3
Configuration.....	3
Call State Event Logging.....	3
Call Resolver.....	4
Troubleshooting.....	5
System Requirements.....	5
Installation.....	6
Red Hat Enterprise Linux 4 (RHEL4).....	6
Other Linux Distributions.....	6

Introduction

The Call Resolver is a sipX component that generates Call Detail Records (CDRs) based on Call State Events (CSEs) logged by a sipX PBX. See the Call Resolver design spec for business/functional requirements and design details. This memo explains how to use the Call Resolver and the outputs that it produces. We also describe how to configure the proxies to log CSEs.

Call Detail Records (CDRs)

Call Resolver output is a set of CDRs stored as records in a PostgreSQL database instance, named "SIPXCDR" by default. It's up to the user to decide how they want to access the data; there are many products out there for database access and data export. For basic database maintenance and inspection, we recommend the "psql" command-line tool included with PostgreSQL, and the graphical tool "pgAdmin III". pgAdmin III is an open source product available from <http://www.pgadmin.org/>.

As detailed in the design spec, cdrs are stored in two tables, parties and cdrs. parties holds the SIP address of record (AOR) and contact address for callers and callees. An AOR looks like this: "sip:502@example.com", and a contact looks like this: "sip:502@10.1.1.1". "502" is the SIP username, which is typically a phone number or extension, but can also be a name like "alice". Contacts are usually resolved to IP addresses like "10.1.1.1" in this example, but not always.

We provide a view, view_cdrs, that presents a simple, unified view of the commonly used CDR data. **Using view_cdrs is recommended to insulate you from future database schema changes, as well as simplifying data access.** Here is a simple psql query to print out all the CDRs:

```
psql -d SIPXCDR -U postgres -c "select * from view_cdrs;"
```

Here is an example query on test data, selecting a limited set of columns to fit on the page:

```
psql -d SIPXCDR -U postgres -c "select caller_aor, callee_aor, start_time from view_cdrs;"
```

prints out:

caller_aor	callee_aor	start_time
sip:alice@example.com	sip:bob@example.com	1990-05-17 19:30:00
sip:mick@example.com	sip:keith@example.com	2001-01-01 00:00:00
sip:cathy@example.com	sip:heathcliff@example.com	1999-08-13 06:00:00
sip:mick@example.com	sip:keith@example.com	2000-01-01 00:00:00
sip:alice@example.com	sip:bob@example.com	1990-05-17 19:30:00

(5 rows)

Call Direction

“Call direction” is an application-level plugin feature where calls are identified as:

- Incoming (I): the call is coming from a PSTN gateway
- Outgoing (O): the call is going to a PSTN gateway
- Intranetwork (A): neither the caller nor callee is a PSTN gateway

The Call Resolver looks at the From and To contact headers and compares these addresses with the addresses of all gateways configured in sipXconfig, the configuration server. It resolves domain names to IP addresses to get addresses in a standard form where they can be easily compared.

Call direction is stored in the `call_direction` column of the `cdrs` table. There is a view, `view_cdrs_with_call_direction`, that is just like `view_cdrs` but has `call_direction` as an additional column. **Again, accessing the view rather the raw tables protects you from schema changes.** Call direction is not computed by default since most PBXs won't use this feature. See the Configuration section for instructions on how to turn it on.

Call State Events

Call Resolver processes call state events (CSEs) logged by the sipX proxies. CSEs are stored in the same database instance as CDRs. CSE logging must be turned on so that CSEs will be recorded for Call Resolver to operate on. See the section “Configuration” below for details.

Automatically Running the Call Resolver

Users do not typically invoke Call Resolver directly, rather it runs automatically every day at 4 AM local time, if daily runs are enabled. Each run creates CDRs for the preceding 24-hour period and also purges old data, if purging is enabled. Daily runs are disabled by default since many customers don't use CDRs. Purging is enabled by default and happens independently of whether daily runs are enabled. Purging discards all CSEs and CDRs older than 35 days, to keep the disk space consumption under control. The age threshold is configurable.

See “Configuration” below for instructions on turning on daily runs and configuring purging.

Manually Running the Call Resolver

Creating CDRs

Open a terminal window and type:

```
sipxcallresolver.sh --start "2005-12-1T02:47" --end "2005-12-2T02:47"
```

This example runs the Call Resolver on CSEs collected between 2:47 AM on December 1, 2005 and 2:47 AM on December 2, 2005, recording CDRs. `--start` provides the time at which analysis begins and `--end` the time at which analysis ends. `--end` is optional and defaults to 24 hours after the start time. The time format is [ISO 8601](#), the same format used by sipX log files.

If you run the Call Resolver on a time window that has already been partially or completely analyzed, then only incomplete CDRs are updated. Complete CDRs are not updated. An incomplete CDR is one marked as “call requested” or “call in progress”, indicating that an incomplete set of CSEs was found. This can happen for calls that start before the time window being analyzed, or finish afterwards.

Daily Processing

Automatically scheduled runs of the Call Resolver fire it up like so:

```
sipxcallresolver.sh --daily
```

where `--daily` tells it to perform daily processing:

- Create CDRs for the previous 24 hour period, if daily runs are enabled
- Purge CSEs and CDRs older than the age threshold, if purging is enabled

Exporting Data

You can use the `psql` command line tool to export data. For example:

```
psql -At -F "," SIPXCDR -U postgres -c "select * from view cdrs" > cdrs.csv
```

dumps the important CDR data into a CSV file that can then be imported directly into Excel or another spreadsheet program. See <http://www.varlena.com/GeneralBits/40.php> for more discussion. Use `view cdrs_with_call_direction` instead of `view cdrs` with the above command line if you want to include call direction in the exported data.

A quick Google search on “postgresql data export” leads to the product “EMS Data Export for PostgreSQL”: see <http://sqlmanager.net/en/products/postgresql/dataexport> . Caveat emptor: we haven't tested this product and are not endorsing it.

Configuration

Call State Event Logging

Call state event (CSE) logging to the database must be turned on for the authorization proxy and forking proxy in order to provide the raw data from which CDRs are created:

- In `authproxy-config.in`, set logging parameters as follows:
`SIP_AUTHPROXY_CALL_STATE :`

```
SIP_AUTHPROXY_CALL_STATE_LOG :  
SIP_AUTHPROXY_CALL_STATE_DB : ENABLE
```

- The first two parameters control logging to XML files and should be left blank. Setting `SIP_AUTHPROXY_CALL_STATE_DB` to `ENABLE` turns on call state event logging to the database.
- Similarly, in `proxy-config.in`, set logging parameters as follows:

```
SIP_PROXY_CALL_STATE :  
SIP_PROXY_CALL_STATE_LOG :  
SIP_PROXY_CALL_STATE_DB : ENABLE
```

Call Resolver

All Call Resolver configuration parameters are set in `callresolver-config.in`, located in `/etc/sipxpbx` with the other sipX configuration files.

- **Daily run:** By default, the Call Resolver does not run automatically. To run the Call Resolver every day at 4 AM local time, add this line to the config file:

```
SIP_CALLRESOLVER_DAILY_RUN : ENABLE
```

Call Resolver analyzes the time window from 4 AM the previous day up to 4 AM on the current day, that is, up to the time that the resolver starts running.

- **Call direction:** To configure the Call Resolver to compute call direction, add this line to the config file:

```
SIP_CALLRESOLVER_CALL_DIRECTION : ENABLE
```

- **Data purging:** Purging is enabled by default. To turn it off:

```
SIP_CALLRESOLVER_PURGE : DISABLE
```

- The purge interval defaults to 35 days. Data older than that is deleted as part of the daily run, if purging is enabled. To change it to (for example) 10 days:

```
SIP_CALLRESOLVER_PURGE_AGE : 10
```

- **Logging:** for troubleshooting purposes.
 - By default, Call Resolver logs to a file `sipcallresolver.log` in the directory `/var/log/sipxpbx/`. The default log level is `NOTICE`, with very few log messages. Call Resolver doesn't follow the standard sipX log format because Call Resolver is not real-time and event-driven, like the proxies, so it has different requirements.
 - **Log level:** control the log level via the config parameter `SIP_CALLRESOLVER_LOG_LEVEL`. For example, set the log level to `DEBUG` if you are having problems and want the maximum amount of information on what's happening.
 - **Log directory:** set `SIP_CALLRESOLVER_LOG_DIR` if you want the log file to go in a directory other than the default.
 - **Log to the console:** set `SIP_CALLRESOLVER_LOG_CONSOLE` to `ENABLE` to cause logging to go to the console. Unlike other sipX components, logging can go to a file or to the console, but not both.

Troubleshooting

- Do you have all the right software installed? See “System Requirements”.
- Is call state event logging turned on? See “Configuration”. Look at the table `call_state_events` in the SIPXCDR database and see if there's any data there.
- Try running the Call Resolver script and see if it complains, in this example everything is fine:

```
$ /usr/bin/sipxcallresolver.sh --setup
Database SIPXCDR exists
```

- Call Resolver is installed with unit tests that you can run as a sanity check:

```
$ cd /usr/bin/sipxcallresolver/test/functional/
$ ruby call_resolver_test.rb
```

```
Loaded suite call_resolver_test
Started
.....
Finished in 0.727583 seconds.
```

```
18 tests, 93 assertions, 0 failures, 0 errors
```

The important thing here is “0 failures, 0 errors” as highlighted above. If the test reports errors, then that information can be useful in diagnosing the problem.

System Requirements

- Red Hat Enterprise Linux 4 or Fedora Core 4.
 - Other Linux distributions should work but have not been tested.
 - The Call Resolver is 100% portable Ruby code that should run just about anywhere, including Windows and MacOS. But we haven't tested that, and the proxies that generate call state events run only on Linux.
- PostgreSQL 7.4 or greater
- Ruby Libs 1.8.4
- Ruby 1.8.4
- Ruby Devel 1.8.4
- Irb 1.8.4
- RubyGems 0.8.11
- Rails 1.0.0 and its dependencies
- Postgres-pr 0.4

To check the Ruby installation, on Fedora Core 4:

```
$ yum list installed | grep ruby
ruby.i386                1.8.4-1.fc4            installed
ruby-devel.i386          1.8.4-1.fc4            installed
ruby-libs.i386           1.8.4-1.fc4            installed
$ yum list installed | grep irb
irb.i386                  1.8.4-1.fc4            installed
```

Try running Ruby:

```
$ ruby --version
ruby 1.8.4 (2005-12-24) [i386-linux]
```

Use RubyGems to show which “gems” are installed. Most of these gems are Rails and its dependencies:

```
$ gem list

*** LOCAL GEMS ***
actionmailer (1.1.5)
  Service layer for easy email delivery and testing.
actionpack (1.11.2)
  Web-flow and rendering framework putting the VC in MVC.
actionwebservice (1.0.0)
  Web service support for Action Pack.
activerecord (1.13.2)
  Implements the ActiveRecord pattern for ORM.
activesupport (1.2.5)
  Support and utility classes used by the Rails framework.
postgres-pr (0.4.0)
  A pure Ruby interface to the PostgreSQL (>= 7.4) database
rails (1.0.0)
  Web-application framework with template engine, control-flow layer,
  and ORM.
rake (0.7.0)
  Ruby based make-like utility.
sources (0.0.1)
  This package provides download sources for remote gem installation
```

Installation

The Call Resolver must be installed on the same machine as the proxies (forking proxy and auth proxy) and the configuration server. HA configurations with multiple proxies are not yet supported. Future releases will support HA and offer greater flexibility.

Red Hat Enterprise Linux 4 (RHEL4)

Pingtel's commercial SIPxchange™ product bundles all dependencies. There are no special installation instructions. Notes:

- The initial SIPxchange™ 3.3 release featuring the Call Resolver does not support upgrading from earlier versions: it must be installed on a clean system.
- Applications on RHEL typically rely on packages installed via RHEL's up2date mechanism. However, the Call Resolver needs a more recent version of the Ruby language interpreter. RHEL provides Ruby 1.8.1; SIPxchange™ upgrades that to Ruby 1.8.4.

Other Linux Distributions

Detailed instructions to be provided later. Here is a start:

- Install **PostgreSQL 7.4** or greater. This requirement is shared with the configuration server, sipXconfig, which cohabits with Call Resolver.
- Install **RubyLibs 1.8.4** or greater. For example, as root on Fedora Core 4: `yum install ruby-libs`.
- Install **Ruby 1.8.4** or greater: `yum install ruby`.
- Install **Ruby Devel 1.8.4** or greater: `yum install ruby-devel`.
- Install **Irb 1.8.4** or greater: `yum install irb`.

- Install **RubyGems 0.8.11** or later, from <http://rubyforge.org/projects/rubygems/>. RubyGems is not generally available in RPM form, although we may make a RubyGems RPM available on sipfoundry for Fedora Core 4.
- RubyGems is a platform-independent packaging mechanism like `yum`. As root, use RubyGems to install remaining dependencies via the Internet:
 - `gem install rails`
 - `gem install postgres-pr`
- The minimum required versions are **rails 1.0.0** and **postgres-pr 0.4**.
 - Rails is a web application framework. We are primarily using just the ActiveRecord part of Rails, for database access. But when “gem install rails” asks you about installing dependencies, say yes to all dependencies. It's hard to tease out which pieces are needed and which aren't, and not worth the effort given that these packages are small.
 - Postgres-pr is the Ruby database driver for PostgreSQL.
- See the section “System Requirements” for a summary and for info on checking that the right dependencies are installed.
- You don't need to install any of this stuff to get basic PBX functionality.
- **Run sipxcallresolver.sh to set up the SIPXCDR database:**

```
cd /usr/bin
./sipxcallresolver.sh --setup
```

This is handled automatically on RHEL4 when using the install script. Running it again does no harm and can be a useful diagnostic.