Rifidi Edge Server User's Guide

Version 3.2 (Rifidi Edge Server version 3.2)
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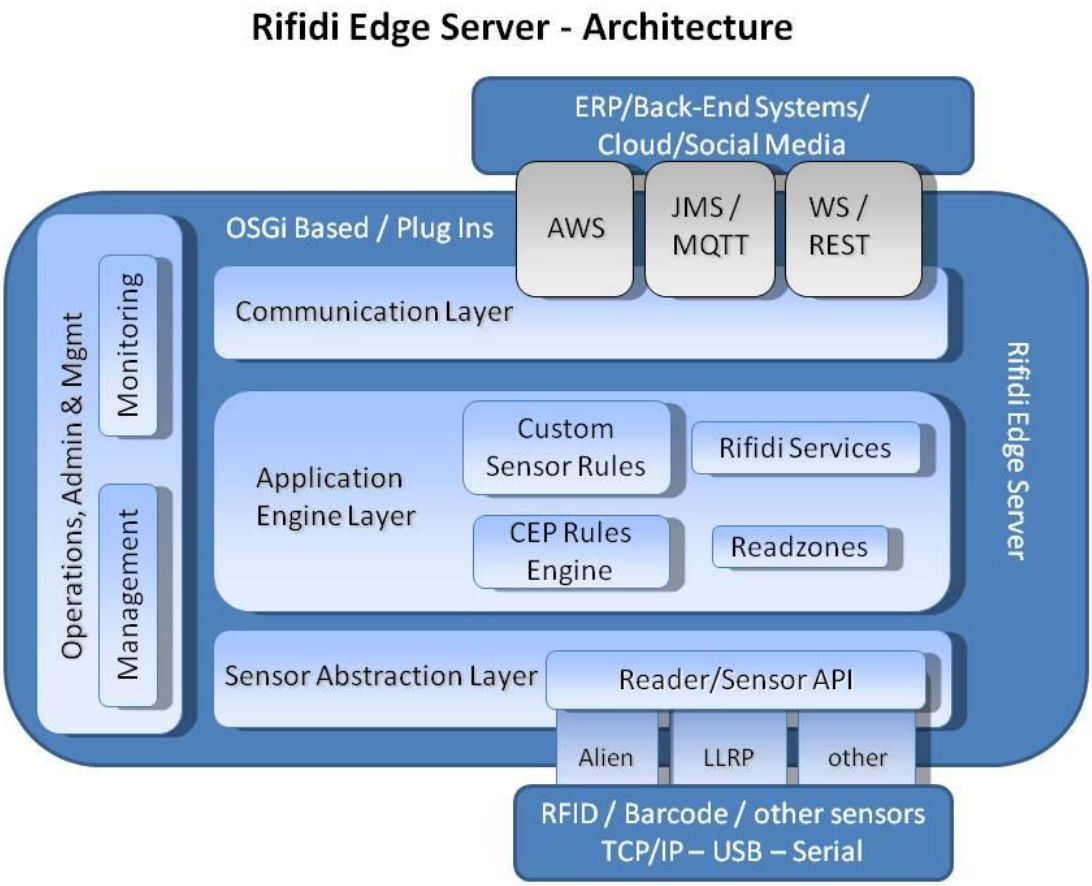
Documentation

There are several places to look for specific documentation needs

- The User Documentation (this document) is a PDF that explains how to run and control the Rifidi Edge Server
- The Developer Documentation explains how to develop reader adapters and plugins for our Edge Server
- The Javadoc for the Rifidi API can be found online at http://www.transcends.co/www/javadoc/edge3.2.0/
- The wiki has some helpful pages to answer some common questions that users and developers have. It can be found at http://wiki.rifidi.net
  The wiki has also a quick start guide for getting a reader setup with a basic configuration: http://www.transcends.co/www/docs/Rifidi_Edge_Server_Quick_Start_Guide_2.1.pdf
  The forums provide a way for users and developers to ask questions. It can be found online at http://forums.rifidi.net

Rifidi® Edge Server Architecture

This chapter explains the architecture of the Rifidi® Edge Server at a high level. The Edge Server is broken up into three conceptual layers. The Sensor Abstraction Layer provides a common API to integrate with sensors to collect various kinds of data from them. The Application Engine Layer performs custom business processing rules on the data. The Communication layer (sometimes referred to as the integration layer) provides a means to integrate the business events collected in the Application layer with other systems (such as databases or ERP systems). In addition, starting with version 3.1, Rifidi® Edge Server offers an Operations, Administration & Management layer that exposes many internal functions via a restful services interface.



Sensor Abstraction Layer

The purpose of the edge server is to connect to any kind of sensors (e.g. RFID readers, Barcode readers, Mobile Devices) and collect information from them. In many scenarios, this consists of connecting to a Gen2 fixed reader (such as Alien 9800, Motorola LLRP, etc), and collecting EPC information. However, the edge server is designed in a way so that so that it can collect many kinds of data (active, passive, etc) from many kinds of devices. This layer allows users to connect to devices in a sensor-agnostic way to collect the kind of data required for the application.

Application Engine Layer

For most applications it is not desirable to save every event that the sensors produce. Many sensors can send 1,000 of events a second, a large number of which might be duplicates. Most applications are interested in events that are one-level higher than the raw events produced by sensors. For examples, an ERP system is probably interested in the event of a box arriving in area 1, and it is not desirable for the ERP system to do the work of filtering and processing all of duplicate reads the sensor produces.

Complex Event Processing (CEP) is a paradigm of viewing data as ephemeral events (i.e. a stream consisting of non-persisted events) and identifying meaningful (i.e. business) events from the stream using rules. Rifidi® Edge Server uses a Complex Event Processor called Esper. It allows you to write queries using an SQL-like syntax. An example query to get tags from a particular reader might look something like this:

```
select * from ReadCycle where ReaderID='gate_1'
```

The application layer lets developers write custom business logic that uses Esper to filter, aggregate and process events produced by the Sensor. The applications in this layer can perform custom business logic based on the tags that are seen. For example, one application might alert a warehouse manager via an email if a tag that matches a certain pattern is seen in a particular area. Another application might correlate barcode reads with RFID tags and write the association to a database.

Communication Layer

After data has been processed, it probably needs to be handed up to some kind of application-dependent system. For example, some users might want the data to be stored in a database, others might want it to be pushed into an ERP system like SAP or handed to a Rich User Interface of some sort. The edge server has several built in connectors to use, namely JMS and Web Services (via Spring's remoting framework). However, as this is application dependent, it is possible to write your own connector (such as a TCP/IP socket connection) if the application needs it.

Operations, Administration & Management Layer

The purpose of the OA&M layer is to expose Rifidi® internal functions to the developer dynamically at runtime. Many of those functions have been available in prior versions already via RMI, but are now offered via REST Services calls.

Sensor Layer

The sensor layer allows the edge server to connect to various kinds of sensors and collect data from them. The kinds of sensors can be wide ranging, from network-enabled Gen2 RFID readers to barcode scanners to JMS queues of events. In addition, the events can be of various types. The most common events are Gen2 RFID, but other event types can be collected as well, such as barcodes and GPIO events.

In addition to collecting events, the sensor layer allows some level of sensor configuration. The level of configuration depends on the capabilities of the sensor and how much works has been put into the adapter. For the most part, however, sensor configuration is normally handled by a

technician when first setting up the sensor. The sensor is either then configured to send events back to the edge server or the edge server will poll the sensor for events. For the vast majority of the cases, once a sensor had been configured, it will not change much. Thus, it is easiest in most cases to configure the sensor using a tool provided by the sensor's manufacturer.
This section describes the main components of a sensor adapter for the Rifidi® Edge Server. It does not give a step-by-step walkthrough on how to build an adapter, since the easiest way to learn this is by looking at the source code for adapters that ship with the Edge Server. In addition the sensor API's source code is well documented, so it is recommended to look into that. This chapter serves as a guide on how the various pieces of the sensor API work together.

Overview of Rifidi® Edge Server Directory Structure

This section explains the directory structure of the Rifidi Edge Server. It points out the important files and folders that users should be aware of, and explains how to modify them in order to meet particular configuration needs.

Important Folders within the Edge Server Directory

- Applications Folder
  The applications folder is the folder in which custom Rifidi Edge Server applications should be deployed. By default, the applications will not be started when the edge server starts. If this behavior is desired, use the default.ini file.
- Config directory
  This folder contains all the Rifidi Edge configuration files, such as the rifid.xml file, the rifid-amq-external.xml, and logging.properties file.
- Logs Folder
  The logs folder contains all log files generated by the Rifidi Edge Server, which is useful for debugging and troubleshooting problems
- Licenses Folder
  The licenses folder contains all license information for the Rifidi Edge Server and all its dependencies.
- Plugins & Configuration Folders
  These two folders contain the jar files and configuration information for the Rifidi Edge Server. Users should not normally ever need to edit any files in these folders.

Important Files within the Edge Server Directory

- rifidiedgeserver executable (linux)
  This is the executable to start the server. While it is possible to execute this file right from the shell, it's better to use the start up script located in /etc/init. You can edit this file to change any system properties for linux.
- config/logging.properties
  This file is a log4j properties file that lets the user have fine-grained control over the logging. For more information, see http://logging.apache.org/log4j/1.2/index.html
- config/rifidi.xml
  This is the persistence file for all reader configurations. When the server stops and

restarts, these configurations will be automatically loaded, and they will return to their saved state.

- config/rifidi-amq-external.xml
  The ActiveMQ configuration file
- rifidiserver.ini (windows)
  This file contains java system properties. They are loaded when the server starts up and affect things like which network interfaces and ports certain processes (such as JMS, RMI, and web services) are started at. In addition, custom rifidi applications may supply their own system properties using this file.
- applications/default.ini
  The applications folder contains a file called 'default.ini' which is a list of applications that should be started up when the Rifidi Edge Server starts. The name of the application is simply the name of the folder that contains the application. Each application should be located on a separate line in the default.ini file. If this file doesn't exist, you can create it.

Starting the Edge Server

To start the edge server run the appropriate executable. In linux:

```
> sudo chmod +x rifidi-server
> ./rifidi-server
```

In windows, just double click on the rifidiserver.exe file.

Using the Console to Determine the Rifidi® Edge Server State

The Rifidi® Edge Server console allows users to find out useful, detailed information about the current state of the edge server. Once you are connected, issue the 'help' commands to list out all available commands.

```
osgi> help
```

The commands at the top are all commands provided by the OSGi framework itself to display information and control the bundles. The commands at the bottom (under the Rifidi Edge Server section) are all commands provided by the Rifidi® Edge Server. One useful command is the 'readers' command, which lists all available reader configurations and their state:

```
osgi> readers

ID: Awid2010_1
    session (1): IPSession: 192.168.1.91:4000 (CREATED),
                [GPIO Session IPSession: 192.168.1.91:4001 (CREATED)]
                      Recurring Command(0): Awid2010_Push_Start_1

ID: Alien_1
    session (1): IPSession: 192.168.1.120:23 (PROCESSING),
                 [Autonomous Session IPServerSession: 54321 (PROCESSING)],
                 [GPIO Session IPServerSession: 54322 (PROCESSING)]
```

In this case, there are two reader configurations. The first is called Awid2010_1. It has two interactive sessions that are both tied to session ID 1. One is for reading tags (at 192.168.1.91:4000), and the other for interacting with GPI/O events (at 192.168.1.91:4001). Neither session is connected, since they both say they are in the CREATED state. In addition there is a recurring command scheduled to execute once the session connects.

The second configuration has an ID of Alien_1. It has three sessions, all tied to session ID 1. The interactive session (at 192.168.1.120:23) is used for issuing commands to the reader. The autonomous session (at port 54321) simply listens for tags that the Alien reader pushes to it. The GPIO session (at port 54322) is another passive session that listens for the Alien reader to push GPI/O events to it. There are no commands scheduled on the session, and the session is currently active sine the states of the sessions are PROCESSING.

Creating Readers Configurations

It is possible to use the OSGi console to create and control reader configurations. To list the available reader adapters use the 'readertypes' command:

```
osgi> readertypes
ThingMagic
LLRP
Alien
Awid3014
Awid2010
Alien-Autonomous
```

To create a configuration to connect to an Alien reader, use the 'createreader' command.

```
osgi> createreader Alien IpAddress 192.168.1.8 Port 23
Reader Created with ID Alien_1
```

Each reader adapter has its own set of properties (e.g. IpAddress, Port) that allow users to specify connection information. For details see the wiki.

Next, create a session:

```
osgi>createsession Alien_1
Session created: Alien_1:1
```

For this particular reader, we will schedule a recurring command that polls the reader to ask for tags. To list the available command types, use the 'commandtypes' command:

```
osgi> commandtypes
ID: Awid-Read-Block-Data
ID: Awid-Mask-Push-Start
ID: Awid3014-Push-Stop
ID: LLRP-Configure
ID: Awid3014-Push-Start
ID: LLRP-Push-Stop
ID: LLRP-Poll
ID: Awid2010-Push-Stop
ID: ThingMagic-Poll
ID: Awid2010-Push-Start
ID: Alien-Push-Stop
ID: Alien-Push-Start
ID: Alien-Poll
```

We need to create a new Alien-Poll command and submit it to the session:

```
osgi>createcommand Alien-Poll
Command Configuration Created with ID Alien_Poll_1

osgi>executecommand Alien_1 1 Alien_Poll_1 1000
```

```
Command submitted
```

Finally, start the session and save the configuration so that it will automatically start if the edge server is stopped and restartred.

```
osgi> startsession Alien_1 1
Session Alien_1:1 started

osgi> save
Configuration Saved!
```

Reader Adapter Guides

This section is a guide to all of the various reader guides offered out-of-the-box. It explains how to use each of the reader adapters to connect to the specific kind of reader and collect tags back from that reader.

Alien Reader Guide

This section represents an updated user's guide for communicating with an Alien reader through Rifidi Edge. The instructions should work with any Alien reader as the all share the same protocol but it has been tested on the 8800, 9800 and 9900 series of readers.
The general outline to create a session can be found in the 'Rifidi Getting Started Guide'. The only differences are the properties set which are outlined below.

Properties

These are the properties of the Alien reader which can be adjusted (except for read-only properties) by a "setproperties" command.

Connection properties:

- MaxNumConnectionAttempts: The number of connections that the Edge Server will try to connect to the reader before giving up. -1 is equivalent to infinite.
- Username: The username used to connect to the reader.
- Password: The password used to connect to a reader.
- IpAddress: The IP of the physical reader.
- Port: The port that the physical reader uses to connect with the Edge Server.
- ReconnectionInterval: The amount of time in milliseconds that the Edge Server will wait after failing to connect before attempting to reconnect to a reader.

General properties:

- Uptime: The time in milliseconds that the reader has been turned on. (Read only)
- MACAddress: The MAC address of the reader. (Read only)
- ReaderType: The type of reader you are connected to (9800, 9900, etc). (Read only)
- PersistTime: The amount of time a tag will be persisted in memory once it is read. If this value is set to -1 the tags will be persisted indefinetly until they are returned through a command.
- ExternalOutput : The bit mask representation of the current output of the reader. (Read only)

- DisplayName: The name that will be displayed for this reader.
- IOStreamPort: The port to open up to listen to IOEvents from the reader
- MaxAntennas: The maximum number of antennas this reader can support. (Read only)
- ReaderVersion: The firmware version that this reader has. (Read only)
- NotifyPort: The port that the Edge Server will use to receive Autonomous connections.
- InvertExternalOutput: Flip the values of the external output.
- ExternalInput: The bit mask representation of the current input of the reader. (Read only)
- InvertExternalInput: Flip the values of the external input.

Commands

This is a list of the commands that can be used when communicating with the Alien reader.

Alien-Poll:

This command will poll the alien reader with "get taglist" commands for a given duration, returning any tags seen by the reader. It has one property:

- TagType: The type of tag that will be searched for. "0" will search for only Gen1 tags. "1" will search for only Gen2 tags. "2" will search for all kinds of tags. Some readers, such as the 9900, can only read Gen2 tags. Make sure this value is set to "1" with such readers.

Alien-Push-Start:

This command will start the Alien reader pushing tag reads back to a given IP and port within a given time.

- AutoStopTimer: The amount of time between reports returning, in milliseconds.
- NotifyAddressPort: Set this to the same value as the "NotifyPort" in the reader properties.
- NotifyAddressHost: The IP of the machine the Edge Server is running on.

Set the NotifyAddress to the IP that Edge is running on, and set NotifyPort to the port that is set in the properties of the reader. The execute interval is set to -1 because we only want the command to run once (all the command does is turn on the AutoMode and NotifyMode properties of the reader). After running these commands, assuming the properties are set correctly, you should have tags coming back to the reader.
After this the final piece is to set up the Reader to go into Autonomous mode and send messages to the port that Rifidi Edge is listening on. This is best done through the web interface or admin tool of the reader.

Alien-Push-Stop:

This command will turn off the Autonomous and Notify modes for the reader. It has no properties.

Common Usage Scenario:

For a Push:

```
//Create an Alien Push command
```

```
> createcommand Alien-Push-Start

//Create the autonomous command
> setproperties Alien_Push_Start_1 NotifyAddressPort 54321
NotifyAddressHost 192.168.1.201

//Executes the stop command
> executecommand Alien_1 1 Alien_Push_Start_1 -1

//Create the stop command
createcommand Alien-Push-Stop

//Execute the stop command once
> executecommand Alien_1 1 Alien_Push_Stop_1 -1
```

For a Poll:

```
//Create the Alien Poll command
> createcommand Alien-Poll

//Starts polling the reader every 1000 milliseconds
> executecommand Alien_1 1 Alien_Poll_1 1000

//Stops and deletes the command
> deletecommand Alien_Poll_1
```

LLRP Reader Guide

This section will give an overview of the commands and properties associated with the LLRP module in Rifidi Edge.

LLRP is an EPCGlobal specification for communication in a common language with LLRP Compliant readers. The Rifidi Edge Server supports all LLRP commands as outlined by the specification. However, many readers also provide custom extensions so you should be sure to test your reader prior to use.

If you want more help using an LLRP reader, try LLRP Commander:
http://www.fosstrak.org/llrp/index.html

LLRP Commander can help you visualize LLRP messages very easily, and it can also help you build XML messages to use with the "LLRP-ADD_ROSPEC-File" command.

We have tested our LLRP Adapter with the following Readers:

Note: In our experience the LLRP Adapter should work with any LLRP compliant reader

- Impinj
- Motorola (XR Series) – any LLRP compliant readers
- Sirit
- Thingmagic

Note on the Motorola: A setting is enabled by default which caused the reader to not send back any tags. With version 2.2 we have fixed the default configuration in such a way that all Motorolas should now behave correctly.

Properties

Connection properties:

These properties are used when connecting to the reader.

- ReconnectionInterval: The amount of time in milliseconds that the plugin will wait when a connection attempt fails before attempting to reconnect.
- Port: The port that will be used to connect to the physical reader.
- IpAddress: The IP that will be used to connect to the physical reader.
- MaxNumConnectionAttempts: The maximum number of attempts to connect that the plugin will make before giving up.

General properties:

- DisplayName: The name of the reader that will be displayed.
- ReaderConfigPath: The path of an optional .llrp file which can be used to configure the reader when the session starts. Simply create a "SET_READER_CONFIG" command in LLRP Commander (URL), and export the resulting XML into the desired file.

Commands

LLRP-Configure

This command will configure a reader to send tags back to Rifidi Edge. It has 4 properties:

- ROSpecID: The ID of the ROSpec you want to create.
- AntennaID: The IDs of the antennas that you want to look for tags on (0 means all antennas).
- Duration: (For PUSH trigger only) How often the ROSpec will push tag lists back to the reader (in milliseconds).
- TriggerType: (PUSH or POLL) Which kind of trigger will be used to generate ROReports. PUSH means that the reader will push ROReports back to the reader asynchronously. POLL means that a LLRP-Poll command must be created that will synchronously poll the LLRP reader and send tags back. If you aren't sure which kind you want to use, use PUSH and set the duration to the value you want.

LLRP-Push-Stop

This command will delete the ROSpec on the reader that is pushing reports back to Edge. It has 1 property:

- ROSpecID: The ID of the ROSpec that you want to delete. "0" will delete all ROSpecs.

LLRP-Poll

This command will constantly poll a ROSpec on the reader for reports. To use this command, first set up a ROSpec with the "POLL" option with the LLRP-Configure command. After that, create an execute an LLRP-Poll command on that reader with a desired interval, and the reader will constantly poll the ROSpec created for tags. It has 1 property:

- ROSpecID: The ID of the ROSpec that you wish to receive tag reports from.

LLRP-ADD_ROSPEC-File

This command allows you to add a ROSpec from a file. You can configure the file using the excellent LLRP Commander then you can export that file and submit it to the reader using this command. This command will delete all ROSpecs that are on the reader at the moment, and it will add and enable the ROSpec that you submit (it is assumed to have a start trigger that isn't NULL, if it is NULL you will have to edit the file and re-submit or manually start the ROSpec; if you aren't sure what trigger to use use an IMMEDIATE trigger). This command has 2 properties:
Filename: The name of the file that you wish to submit to the reader. It is recommended to put the file in the ./config directory.
ImpinjExtensions: If set to true, the "enable vendor extensions" command for Impinj readers will be sent to the reader before the ROSpec is sent. If your ROSpec has Impinj extensions specified, this setting will allow you to use them.

- createcommand LLRP-ADD_ROSPEC-File
- setproperties LLRP_ADD_ROSPEC_File_1 Filename config/myrospec.llrp
- executecommand LLRP_1 1 LLRP_ADD_ROSPEC_File_1 -1

This sequence of commands will look at the file "myrospec.llrp" in the ./config directory and craft a ROSpec out of it. All existing ROSpecs will be deleted, and the new ROSpec will be sent, enabled and started. The parameters of how the ROSpec is configured are completely up to you. If you need help crafting a ROSpec, try LLRP Commander.

Common Usage Scenario

For a Push:

This is a sequence of commands that will create, execute, and stop reading tags from the LLRP in a "Push" fashion.

```
//Create and execute an LLRP-Configure command
> createcommand LLRP-Configure

//This sets the ID of the ROSpec we will create to 1 and the
amount of time between reports to 1000
> setproperties LLRP_Configure_1 TriggerType PUSH ROSpecID 1
Duration 1000
> executecommand LLRP_1 1 LLRP_Configure_1 -1

//Stop the command
> createcommand LLRP-Push-Stop

//ROSpec 1 is the ROSpec that will be stopped and deleted
> setproperties LLRP_Push_Stop_1 ROSpecID 1
> executecommand LLRP_1 1 LLRP_Push_Stop_1 -1
```

For a Poll:

This is a sequence of commands that will create, execute, and stop reading tags from the LLRP in a "Poll" fashion.

```
//Create an LLRP Poll command
> createcommand LLRP-Poll
```

```
//Sets the ROSpecID to 1
> setproperties LLRP_Poll_1 ROSpecID 1

//Executes the command every 1000 milliseconds
> executecommand LLRP_1 1 LLRP_Poll_1 1000

//Stop the poll command (by deleting it)
> deletecommand LLRP_Poll_1
```

Adding Custom Extensions with LLRP:

To add custom extensions with LLRP, you would need to set property for the ROSpec file and use the ROSpec.
Example: setproperties LLRP_ADD_ROSPEC_File_1 ImpinjExtensions true
The prerequisites are:

(1) It needs to get added through the ADD_ROSPEC

(2) It does not require anything to come back through a tag report etc.

Both conditions have to be met.

Examples for usage:

ImpinjInventorySearchMode, ImpinjFixedFrequencyList, ImpinjSerializedTID, ImpinjRFPhaseAngle, ImpinjPeakRSSI

Adding Custom Extensions with LLRP:

There is a SET_READER_CONFIG.llrp file in the config folder. This file allows you to adjust overall reader properties, including some of the properties that will be sent back in LLRP tag reports.

Generic Reader Guide (for Handheld, Smartphone and any device/sensor with TCP/IP)

The Generic Reader Adapter is provided for any device where you are looking for a simple way to connect and pass data (such as tag data) to the Rifidi Edge Server. Ways in which we have used the Generic adapter is with handheld and smartphone applications.
This reader will open up a ServerSocket at the port specified, and it will receive data in according to a certain format that is outlined below. It has no properties except for the port, and it has no commands. You can either send the data directly, if the reader supports pushing and the data can be formatted as you choose, or you can write a small module that will receive data from the reader and send it to the Generic reader from there.
If you need to get a handheld reader to work with Rifidi Edge, use this as a base. The general outline to create a Generic Reader Session can be found in the 'Rifidi Getting Started Guide'. The only differences are the properties set which are outlined below.

Properties

There is only one property for the Generic reader: the port. When you start the reader, it will create and start a TCP ServerSocket at this port.

- Port: The port that the ServerSocket will listen to.

```
> setproperties Generic_1 Port 2121
```

Commands

There are no commands for the Generic reader. Instead, it will listen for data coming in to the specified ServerSocket in this format:

```
ID:(tag ID)|Antenna:(antenna)|Timestamp:(millis since epoch)
```

It is assumed the tags being read in are Gen2 tags. All data will be formed into a TagReadEvent and put into Esper.

If you like, you can specify other information which can be added into the TagReadEvent. Simply add more key:value pairs, separated by pipes. For instance, if you wanted to give the Speed and RSSI values as well as the regular values, you could format the incoming messages like this:

```
ID:(tag ID)|Antenna:(antenna)|Timestamp:(millis since
epoch)|Speed:(speed value)|RSSI:(rssi value)
```

So an incoming tag might look like this:

```
ID:350009080001|Antenna:1|Timestamp:123456789|Speed:.03|RSSI:8
85.7
```

Any values besides the ID, Antenna, and Timestamp will go in the ExtraInformation, which is a String:String hashmap. The value will be inserted as a value for the corresponding key (so, “Speed” would be inserted with the key “Speed” and the value “0.3”.

Awid Reader Guide

This section represents the user's guide for communicating with an AWID reader through Rifidi Edge. There are separate readers for the 2010 and the 3014, however the steps are almost exactly the same unless otherwise specified. All examples given here will use the 2010 reader.

Properties

- ReconnectionInterval: The amount of time in milliseconds that the Edge Server will wait after failing to connect before attempting to reconnect to a reader.
- Port: The port that the physical reader uses to connect with the Edge Server.
- Host: The IP of the physical reader.
- MaxNumConnectionAttempts: The number of connections that the Edge Server will try to connect to the reader before giving up. -1 is equivalent to infinite.
- DisplayName: The name that will be displayed for this reader.

Commands

Awid-Read-Block-Data

This command will read a specific memory bank of tags in view of the reader.

- MemoryBank: The memory bank to read from.
- createcommand Awid-Read-Block-Data
- setproperties Awid_Read_Block_Data_1 MemoryBank 2

```
> executecommand Awid2010_1 1 Awid_Read_Block_Data_1 -1
```

Awid-Mask-Poll

This command configures the Awid reader to send back tags using the Gen 2 Portal ID With Mask command. For more on this command, refer to the Awid documentation for a detail listing of the properties. The general usage of properties is to first list the property name followed by the value.

- Timeout: Execute this command for timeout*100 ms. If set to 0x00, execute until stop command is sent.
- Repeat: Return results every repeat*100ms. If set to 0, continuously return tags.

Refer to the Awid documentation for the properties not specified. See below for an example of how to use the Awid-Mask-Poll command to "push" data back to the edge server.

Awid3014-Poll/Awid2010-Poll

This command polls the Awid reader for any tags on its field. It has no properties. See below for an example.

Awid3014-Push-Stop/Awid2010-Push-Stop

This command should be sent if you wish to stop an Awid-Mask-Poll command that is pushing tags back (this will only happen if the "Timeout" value is set to 0).

Common Usage Scenario:

For push:

```
//Create the poll command
> createcommand Awid-Mask-Poll

//Set the Timeout to 0.  Now the Awid will push back tags.
> setproperties Awid_Mask_Poll_1 MemoryBank 3 Timeout 0

//Execute the command as a one-time
> executecommand Awid2010_1 1 Awid_Mask_Poll_1 -1

//Create the stop command
> createcommand Awid2010-Push-Stop

//Stop the Awid from pushing
> executecommand Awid2010_1 1 Awid2010_Push_Stop_1
```

For poll:

```
//Create the poll command
> createcommand Awid2010-Poll

//Execute the poll command every 1000 milliseconds
> executecommand Awid2010_1 1 Awid2010_Poll_1 1000

//Delete the poll command to stop it
> deletecommand Awid2010_Poll_1
```

Opticon Reader Guide

This document represents an updated user's guide for communicating with an Opticon Barcode reader. In order to get an Opticon reader to work, you will have to connect it to your computer and set it to USB-to-Serial bridge mode. This will create a virtual serial port which you may receive barcode information from.

You will also need to configure the barcode reader to send the data back in the correct format. Here is a sample configuration which will configure the options correctly. The first 7 options, starting with USB VCP and ending with ^C (ETX) are mandatory, but the last 5 are optional and can be changed or eliminated.

The default port in Linux that the Opticon will connect to is /dev/ttyUSB0. If that port is in use, it will instead default to /dev/ttyUSB1, and so on. If the Opticon is using /dev/ttyUSB0 and it becomes unplugged while it is running, once it is plugged back in it would go to /dev/ttyUSB1. This means that your SerialPort property will be incorrect, and the Opticon won't work. To solve this, stop the reader session first if you ever want to unplug the Opticon. This will release the /dev/ttyUSB0 port, and once the Opticon is plugged back in it will use /dev/ttyUSB0 again.

Properties

- SerialPort : This is the virtual serial port that the Opticon will connect to.
- DisplayName : The name that will be displayed for this reader.

Commands

There are no commands for the Opticon reader, as you cannot send data back to it directly.

ThingMagic Reader Guide

This section represents an updated user's guide for communicating with a Thingmagic reader. This plugin should work with both Mercury 4 and Mercury 5 readers; it may work with other Thingmagic readers as well.

Properties

- ReconnectionInterval : The amount of time in milliseconds that the Edge Server will wait after failing to connect before attempting to reconnect to a reader.
- Port : The port that the physical reader uses to connect with the Edge Server.
- IpAddress : The IP of the physical reader.
- MaxNumConnectionAttempts : The number of connections that the Edge Server will try to connect to the reader before giving up. -1 is equivalent to infinite.
- DisplayName : The name that will be displayed for this reader.

Commands

ThingMagic-Poll:

This command will poll the reader for tags at a rate you specify. You may specify to search for certain types of tags, however if you set all of the values to 0, all tags will be returned.

- Epc0 : Should the reader look for EPC Class 0 tags? 0 if no, 1 if yes.
- Epc1 : Should the reader look for EPC Class 1 tags? 0 if no, 1 if yes.
- Gen2 : Should the reader look for EPC Gen2 tags? 0 if no, 1 if yes.

- Iso860006b : Should the reader look for ISO860006b tags? 0 if no, 1 if yes.
- Timeout : The amount of time in milliseconds that must pass before the reader stops looking for tags and returns its results.

```
> createcommand ThingMagic-Poll
> setproperties ThingMagic_Poll_1 Ep0 0 Epc1 0 Gen2 0
Iso860006b 0 Timeout 1000
> executecommand ThingMagic_1 1 ThingMagic_Poll_1 -1
```

This sequence of commands will create a ThingMagic-Poll command and search for all tags, returning every 1000 milliseconds.

Thinkify Reader Guide

This section represents a guide for connecting to a Thinkify TR-50 or TR-200 reader over USB. This reader has no commands: rather it simply starts reading as soon as you connect to it.

```
osgi> createreader Thinkify50 Port COM4
Reader Created with ID Thinkify50_1
```

After creating the reader you need to create and start the session. Note: the readertype “Thinkify50” is also valid for the Thinkify TR-200 reader.

Properties

- ReconnectionInterval : The amount of time in milliseconds that the Edge Server will wait after failing to connect before attempting to reconnect to a reader.
- Port : The port that the physical reader uses to connect with the Edge Server. This will be the address of a serial port that will link to the USB device. On windows it shows on my machine as COM6. On linux it shows as /dev/ttyACM0. Please refer to Thinkify's documentation to figure out what the name of the port is for your device.
- MaxNumConnectionAttempts : The number of connections that the Edge Server will try to connect to the reader before giving up. -1 is equivalent to infinite.
- DisplayName : The name that will be displayed for this reader.
- Duration: The amount of time in milliseconds between fetching the tag list. Default is 1000 ms.

Convergence Systems Limited (CSL) CS203 Reader Guide

This section represents a guide for connecting to a CSL CS203 reader. We show examples on how to create a CSL reader in Rifidi® and get it started. The commands below are the minimum set of commands you need to run with the default parameters. You can also change those defaults by using the setproperty command. You start by creating the reader in Rifidi®:

```
osgi> createreader CslCS203
Reader Created with ID CslCS203_1
```

After creating the reader you need to create a session and start the session.

```
osgi> createsession CslCS203
Session created: CslCS203_1:1
```

```
osgi> startsession CslCS203_1 1
Session CslCS203_1:1 started.
```

Properties

- displayName : The name that will be displayed for this reader.
- ipAddress : The IP of the physical reader.
- notifyAddrPort (Notify Address Port) : Edge Server Notify Port which CSL adaptor connects to. Please check the available port before use.
- country : The country / region where the CSL reader operates. Available options: FCC, ETSI, IN, G800, AU, BR1, BR2, HK, TH, SG, MY, ZA, ID, CN, CN1, CN2 .. CN12, TW, JP.
- power_ant (Reader Antenna Power) : Maximum up to 30 dBm. The value ranges from 0 to 300 (30 dBm)
- link_Profile : The value ranges from 0 to 4. Normally "2" is used for CSL reader.
- algorithm_Q (Q Algorithm) : Inventory Algorithm. Fixed Q Algorithm (Fix_Q) and Dynamic Q Algorithm (Dyn_Q) are available.
- startQ : Starting Q value. The value ranges from 0 to 15. Normally "7" is used for CSL reader.

The use of the CSL adapter from the Rifidi® Workbench is documented on the wiki. The installation guides include user guide sections. Please note that starting Rifidi® Edge Server 3.1 the CSL adapter is already included in Rifidi® out of the box.

Operations, Administration and Management

This section is a guide to OA&M features that the edge server exposes. It explains how to use each of the features. This chapter focuses on webservices and messaging features. The command line usage of Reader Adaptor capabilities is described in the previous chapter.

Management

Prior to version 3.1 Edge Management has been available only through RMI (currently used by Rifidi® Workbench, if you are looking for example code). Starting with version 3.1, Edge Management is now also accessible through Restful Services (leveraging Restlet plugin). Restlet allows all Rifidi® Edge Management operations that are available through workbench to be accessible via Restful Services.
The types of operations available through Restful Services include:

- All "session" commands (for stopping and starting reader/sensor sessions)
- ExecuteCommand and deleteCommand (for commands supported by a sensor such as a tag read)
- Readers (for getting a list of readers/sensors available on Edge Server instance)
- Commands (for issuing command line operations such as saving the Edge Server configuration currently in memory)

- Get and Set Properties (for setting and getting sensor properties such as Setting the LLRP Reader Configuration dynamically)
- Create Reader (for creating a new reader connection)
- Managing Rifidi® Applications (for stopping/starting, listing and deploying Rifidi® applications)

As an example, we want to use the “readers” command via a webservice call in order to list all readers managed by the edge server. First, the edge server has to be configured.

The port for the webservice call has to be configured, and the Restlet needs to be started:

```
-Dorg.rifidi.restlet.port=8111
-Dorg.rifidi.restlet.enabled=true
```

The “readers” command then can be used as:

```
http://localhost:8111/readers
```

And we get the following response:

```
<response>
<sensors>
<sensor>
<serviceID>Alien_1</serviceID>
<factoryID>Alien</factoryID>
</sensor>
<sensor>
<serviceID>Alien_2</serviceID>
<factoryID>Alien</factoryID>
</sensor>
</sensors>
</response>
```

For more examples and additional details please read the documentation on the wiki, or the jumpstart example here.

Monitoring

Prior to version 3.1, Edge Monitoring has been available only through JMX/MBeans via RMI. Starting with version 3.1 Edge Monitoring is now also accessible through Restful Services. Rifidi® leverages Jolokia which exposes all JMX/Mbeans via restful services.
The types of components which can be monitored include:

- Java Virtual Machine (Memory, CPU etc.)
- Sensors/Readers (Status, Properties etc.)
- OSGi (Status, Applications etc.)
- Messaging

For examples and additional details please read the documentation on the wiki.

Messaging

Prior to version 3.1 Edge Messaging has been available only through ActiveMQ/JMS Interface. Starting with version 3.1 Edge Messaging is now also accessible through MQTT (Lightweight IoT Messaging Protocol through leveraging Moquette-mqtt plugin). This new feature now enables Rifidi® Applications to publish events (captured via Rifidi® Services, for example Readzone Monitoring, Stable Set) to a lightweight MQTT messaging queue.
Services. Rifidi®

For examples and additional details please read the documentation on the wiki.

Failover

Starting with version 3.1 the Rifidi® Edge Server offers automatic failover from one server to a hot standby server (primary/secondary). This enables a Rifidi® Edge Server to be defined as a secondary node based on configuration described below. The secondary server will start and load the basic libraries. In the event a failure is detected based on thresholds configured the server will continue loading starting the necessary Rifidi Apps and connecting to the required sensors/readers to continue processing events.

Edge Sever configuration example to support failover:

```
*-Dorg.rifidi.failover.primary=192.168.0.12:8111
   If the primary is set, this means the current server is
secondary. If not set, it is the primary.
   Note: The port number (8111 in this example, it is default) needs
to match Restlet port # on primary server (-Dorg.rifidi.restlet.

*-Dorg.rifidi.failover.frequency=10
   How often to call rest ping command in seconds

*-Dorg.rifidi.failover.failurecount=6
   Number of consecutive failures
```

For examples and additional details please read the documentation on the wiki.

Reference

This section contains a reference that documents the many system properties and command that can be used to configure the Rifidi® Edge Server.

System Properties

All properties can be found and edited in the rifidiserver.ini file (or the rifidi-server file in linux). Here are some examples of properties (for a full list of properties please see the wiki):

- -Dorg.rifidi.edge.configuration
  This is the path to the persistence file (i.e. rifidi.xml)
- -Dcom.sun.management.jmxremote.port
  The port to open up JMX on. This is important if you are using a program like VisualVM to profile the server
- -Djava.rmi.server.hostname
  The hostname to open up the RMI registry at. Default is `127.0.0.1`
- -Dorg.rifidi.edge.core.rmi.port
  The port of the RMI registry Default is `1101`
- -Dorg.rifidi.edge.autostart
  If set to true, will start saved sessions automatically if they were in the PROCESSING state when saved. If set to false, session will not automatically start, even if they were in the PROCESSING state. It might be useful to set to false for debugging purposes
- -Dorg.rifidi.edge.logging
  The path to the Log4J properties file to control logging
- -Dosgi.console
  The port to start the OSGi console at. If no argument is supplied, the console will not be bound to a port and will be available only to the process that executed the rifidiserver. If this argument is changed to another port besides 2020, the management console will be available to any computer on the same network as the Rifidi Box, which makes the application insecure.
- -Dorg.rifidi.ui.notify
  If set to true, reader adapters will automatically place tag read events on the JMS queue for the Workbench to consume. This comes at some performance cost, so set to false if you are concerned about performance
- -Dorg.rifidi.home
  The path to the RifidiHome directory, which includes the applications folder.

Configuration Commands

The following commands allow you to configure readers and query the edge server for its current state. They can be issued from the OSGi console. Starting with Rifidi® Edge Server v. 3.1 the commands are also exposed via REST, see wiki).

- loadApp <Application Name>
  Load an application that is deployed to the Rifidi® Edge Server. The application will be started.
- save
  Save the configuration to a file (config.xml in the config directory)
- setloglevel <loggerName> <logLevel>
  Set the log level for a given logger.

- readertypes
  Get the list of available reader types
- readers
  Get the list of configured readers
- createreader <readertype> [<propName> <propValue>]*
  Create a new reader
- deletereader <readerid>
  Delete a reader
- commandtypes
  Get the list of available command types
- commands
  Get the list of configured commands
- createcommand <commandtype> [<propName> <propValue>]*
  Create a new command
- deletecommand <commandid>
  Delete a command
- configurations
  Get the list of configurations (both reader and command configurations)
- getproperties <id>
  Get the properties of a configuration
- setproperties <id> [<propName> <propValue>]*
  Set the properties on a configuration
- applypropchanges <readerid>
  Apply the property changes on the configuration to the reader
- createsession <readerid>
  Create a new session on the given reader
- deletesession <readerid> <sessionid>
  Delete a session on the given reader
- startsession <readerid> <sessionid>
  Start a session on the given reader
- stopsession <readerid> <sessionid>
  Stop a session on the given reader
- executecommand <readerid> <sessionid> <commandid> <interval>
  Execute a command in a session
- killcommand <readerid> <sessionid> <commandid>
  Execute a command in a session

Diagnostic Commands

These commands help you to figure out if your application is working properly. They are also issued from the OSGi console:

- testGPI <readerID> <port>
  Returns the GPI value of the given reader's port

- setGPO <readerID> [<port>]* - Sets the given ports to high. Any ports not mentioned that are currently high will be set to low.
- flashGPO <readerID> <port>
  Flashes the given GPO port high for 4 seconds.
- simGPIHigh <readerID> <port1> [port2]*
  Simulates setting the given GPI ports to high for the given reader
- simGPILow <readerID> <port1> [port2]*
  Simulates setting the given GPI ports to low for the given reader
- simGPIFlashHigh <readerID> <seconds> <port1> [port2]*
  Simulates setting the given GPI ports to high for the given reader, then setting them back to high after the given duration has passed
- simGPIFlashLow <readerID> <seconds> <port1> [port2]*
  Simulates setting the given GPI ports to low for the given reader, then setting them back to high after the given duration has passed
- recenttags <readerID>
  Prints out a list of tags seen on the given reader within the last 5 minutes.
- currenttags <readerID>
  Prints out a list of tags currently seen by the given reader.
