REDBLACKADM-2.1

Red/Black Administration Guide

Isode

Table of Contents

1 Software version

This guide is published in support of Red/Black R2.1. It may also be pertinent to later releases. Please consult the release notes for further details.

2 Readership

This guide is intended for administrators who plan to configure and manage Red/Black services using Red/Black R2.1.

3 Typographical conventions

The text of this manual uses different typefaces to identify different types of objects, such as file names and input to the system. The typeface conventions are shown in the table below.

Object	Example
File and directory names	*/var/isode/log*
Program and macro names	isode.redblack
Input to the system	`cd newdir`
Cross references	see Section 4, “Support queries and bug reporting”
Additional information to note, or a warning that the system could be damaged by certain actions.	Notes are additional information; cautions are warnings.

4 Support queries and bug reporting

A number of email addresses are available for contacting Isode. Please use the address relevant to the content of your message.

- For all account-related inquiries and issues: customer-service@isode.com. If customers are unsure of which list to use then they should send to this list. The list is monitored daily, and all messages will be responded to.
- For all licensing related issues: support@isode.com.
- For all technical inquiries and problem reports, including documentation issues from customers with support contracts: support@isode.com. Customers should include relevant contact details in initial calls to speed processing. Messages which are continuations of an existing call should include the call ID in the subject line. Customers without support contracts should not use this address.
- For all sales inquiries and similar communication: sales@isode.com.

Bug reports on software releases are welcomed. These may be sent by any means, but electronic mail to the support address listed above is preferred. Please send proposed

fixes with the reports if possible. Any reports will be acknowledged, but further action is not guaranteed. Any changes resulting from bug reports may be included in future releases.

Isode sends release announcements and other information to the Isode News email list, which can be subscribed to from the address: http://www.isode.com/company/subscribe.html

5 Export controls

Red/Black uses TLS (Transport Layer Security) to encrypt data in transit. This means that Red/Black is subject to UK Export Controls. For some countries (at the time of shipping this release, these comprise all EU countries, United States of America, Canada, Australia, New Zealand, Switzerland, Norway, Japan), these Export Controls can be handled by administrative process as part of evaluation or purchase.

For other countries, a special Export License is required. This can be applied for only in context of a purchase order for Red/Black.

The TLS feature of Red/Black is enabled by a TLS Product Activation feature. This feature may be turned off, and Red/Black without this TLS feature is not export controlled. This can be helpful to support evaluation of Red/Black in countries that need a special export license.

Red/Black is used to administer sensitive data and so Isode strongly recommends that all operational deployments of Red/Black use the export-controlled TLS feature.

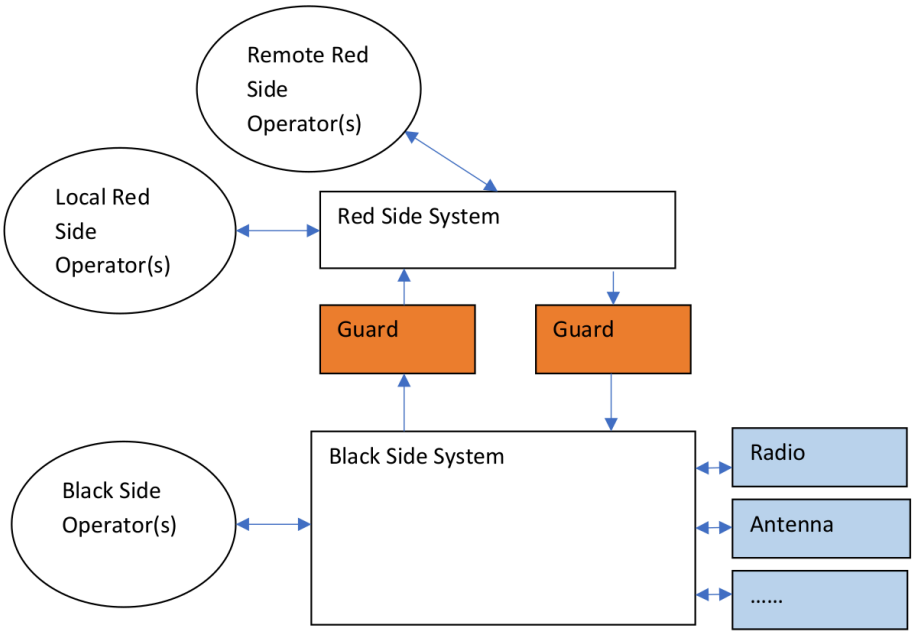
You must ensure that you comply with these Export Controls where applicable, i.e. if you are licensing or re-selling Isode products. All Isode Software is subject to a license agreement and your attention is also called to the export terms of your Isode license.

Chapter 1 Introduction to Red/Black

Red/Black provides a system for Web monitoring and control of devices across a secure boundary.

1.1 The Problem Addressed

Figure 1.1. The Red/Black Issue



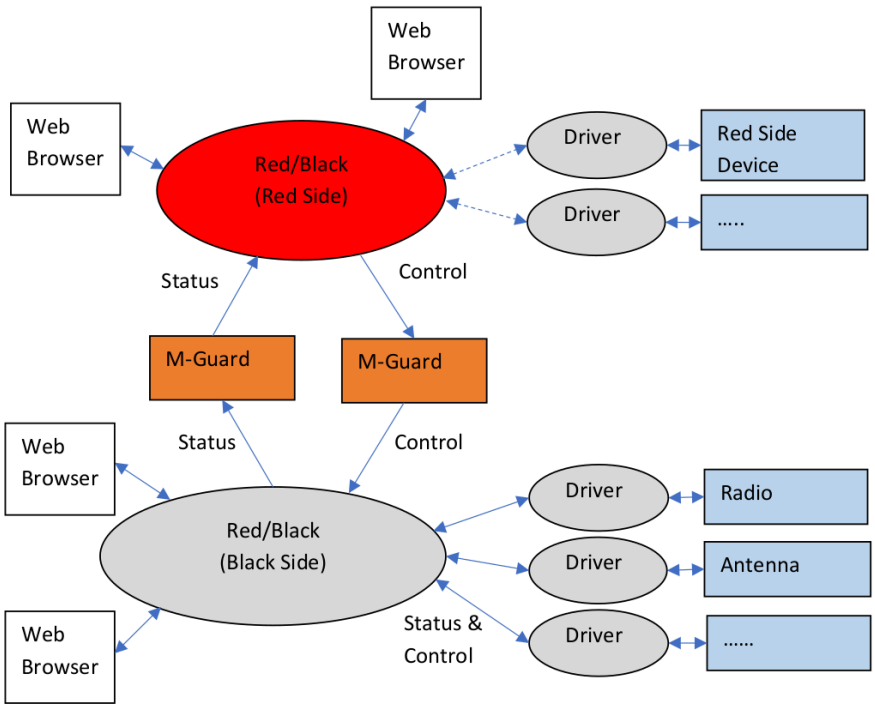
Red/Black is designed to operate across a security boundary. The sides are termed “red” (the secure side) and “black”, which is terminology that is commonly used in target environments. A key target for Red/Black is HF Radio systems, where there are a range of devices that sit on the black side (e.g., Radios, Amplifiers, Antennae) which it is desirable to monitor and manage from the red side.

The target architecture is shown in the diagram above. There are devices that sit black side and are managed by black side operators. Communication with the red side is constrained to use secure guards with information flow in one direction only.

The goal is to provide Red Side operators (both local and remote to the devices being managed) with the ability to monitor and manage key capabilities of the black side devices.

1.2 Managing Devices across a Secure Boundary

Figure 1.2. Red/Black Architecture



The above diagram shows the Red/Black architecture to address the requirement, which is described in the following sections.

1.2.1 Web Monitoring and Control of Devices

The core of Red/Black is a server. A standard deployment will use two Red/Black servers, one on each side of the boundary, communicating with each other across the boundary. A single Red/Black server can be deployed standalone to provide a web interface to monitor and control devices.

Each device is connected to the Red/Black server with a special driver that sends control information to the device and receives back status information from the device. This will typically be a subset of device control/status information that it is desirable to handle across the boundary. Devices will generally have their own management tools to provide full management capabilities. The goal with Red/Black is to give access to key control and monitoring information in a manner consistent across all the managed devices.

Because the red and black side servers are the same, Red/Black allows red side devices which can be managed from red side only. Red/Black will provision the list of locally connected devices, so that adding a device to be managed is a Red/Black configuration choice.

Status and control information are communicated across the Red/Black boundary using a pair of XML Guards each acting as an application level data diode. Status information sent from black to red enables red side to work out the set of devices provisioned black side.

Red/Black provides a simple view of all provisioned devices, and enable devices to be monitored and controlled. This includes:

- Basic device status and uptime.
- Heartbeat, to validate active monitoring.
- Device Status information.
- Control of device parameter settings.

1.2.2 Device Connectivity

A key target for Red/Black is support of HF installations and other systems with “chains” of products linked together. Red/Black shows this connectivity, as shown above. This connectivity is managed by Red/Black, so that the managed devices are not aware of connectivity.

Where connectivity cannot be changed by Red/Black (e.g., cables) a Red/Black administrator can configure Red/Black so that it reflects the actual device connectivity and enables fixed communication chains to be shown.

Where connectivity can be changed by Red/Black (e.g., changing TCP configuration or changing switch configuration), a Red/Black Operator can make valid changes to the configuration.

1.2.3 Use of XML Guard

The Red/Black architecture uses a pair of XML Guards acting as application level data diodes to separate red and black sides. XML Guards are chosen as an industry standard that can provide good separation and flexible secure checks of information being passed across the boundary.

Red/Black communicates using the GCXP (Guard Content eXchange Protocol), which is supported by Isode’s M-Guard product. Red/Black is designed to be used with M-Guard, but can be used with any XML Guard using GCXP.

1.3 Specifying Devices

It is important to be able to add new devices easily to Red/Black. Device types are specified in a generic manner, so that devices can be added without change to Red/Black.

1.3.1 Abstract Devices

Abstract Device Types are specified in XML using a generic format specified in Appendix D. An example abstract device is shown below:

```
        <?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>IsodeRadio</DeviceType>
  <DeviceFamily>Radio</DeviceFamily>
  <DeviceTypeSummary>Basic Radio</DeviceTypeSummary>
  <DeviceTypeDescription>
    This models a generic Radio, looking at key target parameters.
  </DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
```

```
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>ModemType</ParameterName>
      <ParameterSummary>The type of the modem</ParameterSummary>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>VSWR</ParameterName>
      <ParameterSummary>The Forward Voltage Standing Wave Ratio
      </ParameterSummary>
      <ParameterIcon>waveform-path</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <LowerBound>1</LowerBound>
        <UpperBound>1000</UpperBound>
        <Shift>3</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>rvsVSWR</ParameterName>
      <ParameterSummary>The reverse Voltage Standing Wave Ratio
      </ParameterSummary>
      <ParameterIcon>waveform-path</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <LowerBound>1</LowerBound>
        <UpperBound>1000</UpperBound>
        <Shift>3</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>PowerSupplyVoltage</ParameterName>
      <ParameterSummary>Power Supply Voltage</ParameterSummary>
      <Units>Volts</Units>
      <Integer>
        <LowerBound>100</LowerBound>
        <UpperBound>400</UpperBound>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>PowerSupplyConsumption</ParameterName>
      <ParameterSummary>Power Supply Consumption
      </ParameterSummary>
      <Units>Amperes</Units>
      <Integer>
        <LowerBound>1</LowerBound>
        <UpperBound>100000</UpperBound>
        <Interval>1000</Interval>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>Temperature</ParameterName>
      <ParameterSummary>Temperature of Radio</ParameterSummary>
      <Units>Degrees Celsius</Units>
      <Integer>
        <LowerBound>-20</LowerBound>
```

```
        <UpperBound>200</UpperBound>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>SignalLevel</ParameterName>
      <ParameterSummary>Signal Level (Baseband)</ParameterSummary>
      <Units>dBm</Units>
      <Integer>
        <LowerBound>-40</LowerBound>
        <UpperBound>15</UpperBound>
      </Integer>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Reset</Ref>
    <Ref>PowerOff</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>Frequency</ParameterName>
      <ParameterSummary>Radio Frequency</ParameterSummary>
      <ParameterDescription>
        Setting frequency as control parameter -
        allows operator to set frequency.
        If frequency is always controlled by ALE, -
        this would be moved to a status parameter.
        The frequency integer is in kHz, shifted three places
      </ParameterDescription>
      <ParameterIcon>wave-sine</ParameterIcon>
      <Units>MHz</Units>
      <SetByOperator/>
      <DisplayPriority/>
      <Integer>
        <LowerBound>3000</LowerBound>
        <UpperBound>30000</UpperBound>
        <Shift>3</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>TransmissionPower</ParameterName>
      <ParameterSummary>Transmission Power</ParameterSummary>
      <ParameterIcon>broadcast-tower</ParameterIcon>
      <Units>dBm</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>-15</LowerBound>
        <UpperBound>20</UpperBound>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>Modem</ParameterName>
      <ParameterSummary>A modem</ParameterSummary>
      <RedBlackManaged -/>
      <Connection>
        <Fixed/>
        <DirectType>Audio</DirectType>
        <IndirectType>Modem</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>Antenna</ParameterName>
      <ParameterSummary>Connected Antenna or PA</ParameterSummary>
      <!-- <RedBlackManaged/> --->
      <Connection>
```

```
        <Fixed/>
        <ConnectTo/>
        <DirectType>Sync Serial</DirectType>
        <IndirectType>PA</IndirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

It can be seen that this is a straightforward and extensible specification. If there is a desire to monitor or control additional parameters, these can be easily added to the abstract device specification. Changing an abstract device specification does not impact Red/Black.

1.3.2 Device Provisioning

A Red/Black server will be configured with a known list of Abstract Device Types, which will be updated to handle new or modified Abstract Device Types. Red/Black can provision one or more instances of any of these types, so that multiple devices of the same type can be managed. The Red/Black UI is entirely driven from this provisioning information and the Abstract Device Types.

There is a special “mock” driver provided with Red/Black which can emulate a device of any type. This enables Red/Black to be set up and Abstract Devices tested, without the need for any real devices.

1.3.3 Device Drivers

For each provisioned (real) device, Red/Black will need to use a Driver that manages the device and conforms to the Abstract Device Type associated with the device.

There is a standard protocol for communicating with devices, which is specified in Appendix F . This is a simple protocol that is closely related to the Abstract Device specification.

Device drivers can be written in any languages, and a language appropriate to the management interface provided by the device should be chosen. Information on how to write a device driver is set out in Appendix G . Isode provides open source libraries and example device drivers in a number of popular languages to facilitate device driver writing. Device driver writers are encouraged to “open source” driver code, to avoid duplication of effort.

Chapter 2 Red/Black: Getting Started

For those unfamiliar with Red/Black, the recommended starting point is the Red/Black Evaluation Guide, which provides a straightforward introduction with detailed help on putting in place a basic setup.

Red/Black installation and upgrade procedure is covered in the release notes.

This manual provides reference information on Red/Black, with reference material structured as follows:

- Chapter 3, *Using Red/Black* provides information for the operator or administrator using a configured Red/Black system.
- Chapter 4, *Configuring Red/Black* provides information to configure a Red/Black system.
- Appendices C, D & E provide information on defining new device definitions.
- Appendices F, G & H provide information on writing device drivers.

2.1 Manual Startup

The system should start running after the installation is finished. However if the server needs to be restarted or has failed to start it can be started manually.

2.1.1 Manual Windows startup

The server can be stopped and restarted through the services menu.

2.1.2 Manual Linux startup

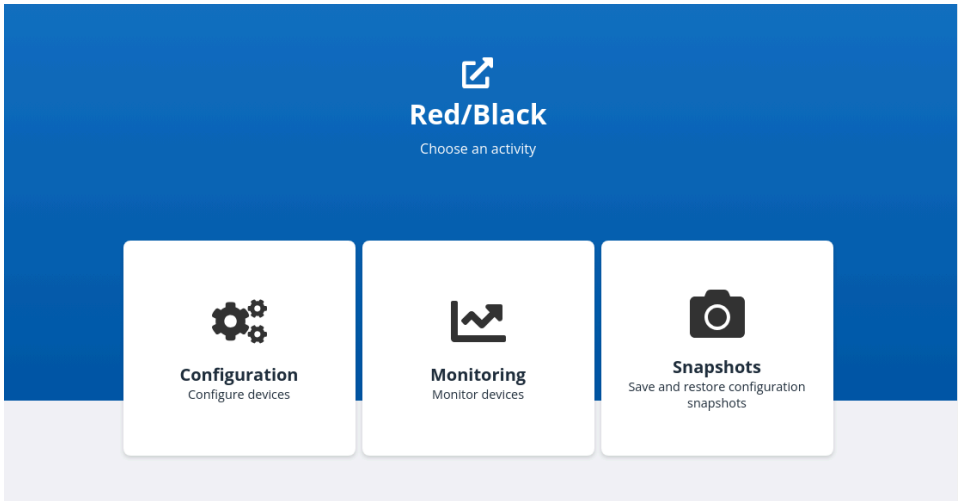
On Linux based systems, the server is run under the systemd manager. Therefore to stop/start/restart the server is done through that subsystem.

- To stop the server, **systemctl stop redblack**
- To restart the server, **systemctl restart redblack**

2.2 Bootstrapping the system

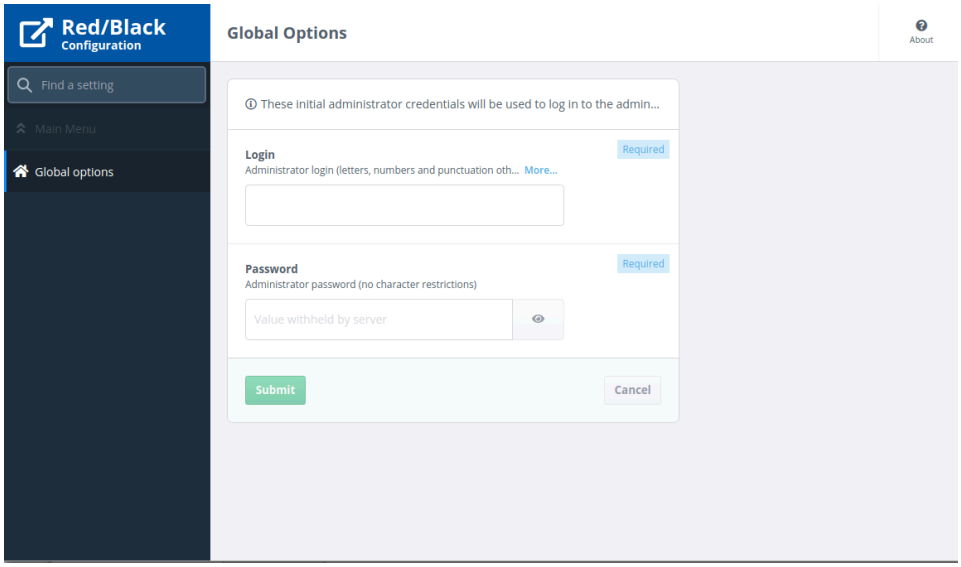
The system will attempt to bootstrap itself on first use. If there is no previous configuration detected the system will create a new configuration file, load in a default set of schemas and drivers and start running with no configured devices. Once running the server will be listening as a web server on the default port **8080**. When connecting to this with a web browser, you should see the display in Figure 2.1, “Red/Black Bootstrap stage 1”. Select the **configuration** option.

Figure 2.1. Red/Black Bootstrap stage 1



After selecting the Configuration option, you will be taken to the authentication configuration screen shown in Figure 2.2, “Red/Black Bootstrap stage 2”. Here you can configure a default username and password. These will be the default administration credentials to manipulate the system. These are usually an interim step before switching to **OAuth** authorisation which is described in Section 4.2.1.4, “OAuth Settings” .

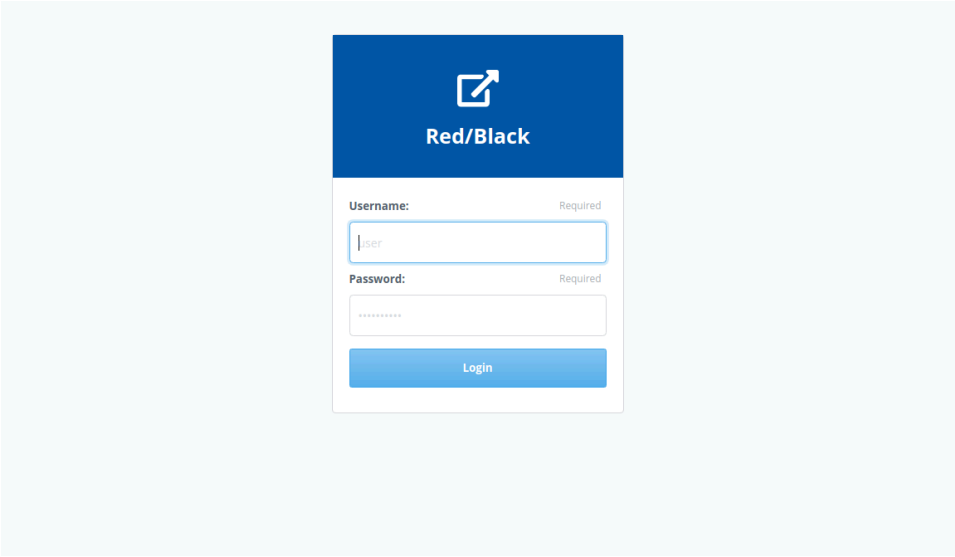
Figure 2.2. Red/Black Bootstrap stage 2



Once you have entered these details, the server will ask for product activation.

After you have registered an activation key, the next step is to then login using the username and password entered in Figure 2.2, “Red/Black Bootstrap stage 2” in the screen shown in Figure 2.3, “Red/Black Basic Authentication”. After this you should be connected with administrator privileges which allow the modification of the configuration.

Figure 2.3. Red/Black Basic Authentication



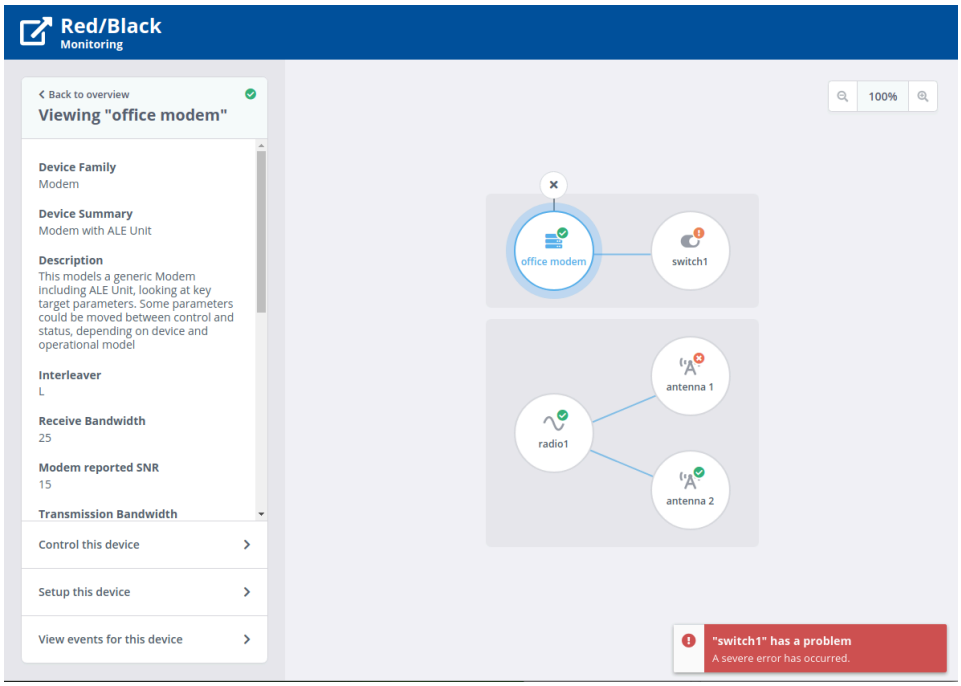
Chapter 3 Using Red/Black

The section discusses the Operator and Administration interface for running a configured Red/Black

3.1 Operator Interfaces

The operator interface allows devices to be inspected, and for issues to be flagged up as shown in Figure 3.1, “The Operator Monitoring View”.

Figure 3.1. The Operator Monitoring View



3.1.1 Monitoring Devices

Devices have to be configured initially using the configuration interface described in Section 4.2.1.2.1, “Devices”. Once configured, they can be dragged into the main area of display and connections between them made. The screen will show the status of the device, and any alerts will pop up to indicate issues. The devices will also be flagged with a status indicating good, marginal or failing, using green, amber, red traffic light-like colours.

3.1.2 Controlling Devices

Devices may be controlled by setting allowable parameters. These are device specific, and are only suitable for devices and drivers that support the modification. Those parameters that can be adjusted have a **Change** label associated with them.

3.1.2.1 Control the Device

There is an option for more control of the device under the label **Control this device**. This has the options to **Reset Device** which will prompt the device to be reset itself, which the driver will attempt to do.

The **Send Parameters** asks the device to resend all its current parameters, in case there is a loss of synchronisation between the device and the user interface.

3.1.2.2 Setup this Device

This option takes the user to the configuration section where changes can be made to be raw configuration of the device.

3.1.2.3 View events for this device

This option allows inspection of all the saved event messages. Each event has an information message string, a level (**Critical**,**Severe**,**Error**,**Warning**,**Info**), and a timestamp. Only the most recent messages are kept by the system.

3.1.3 Changing Device Connectivity

The devices may be dragged and dropped to form a chain of connectivity. However devices "know" within their schema what they can be connected to, so there are constraints upon exactly how the chain can be built up.

3.2 Administrator Interfaces

The administration view allows for the control of the overall system by setting up configuration, and registering devices to be monitored.

3.2.1 Adding New Device Types

New devices are added through the admin screen, as shown in Section 4.2.1.2.1, “Devices”. For each device there must be a suitable schema and a suitable driver.

3.2.1.1 Mock Devices

Mock devices are device drivers that do not manage a real device, but instead make a fake instance of a device for testing purposes. Generally they generate random values for the supported attributes and handle the control parameters in a suitable fashion. They are often generic in nature, and useful for prototyping a system. They otherwise look the same as a regular driver as far as configuration.

3.2.1.2 Device Drivers

Full featured device drivers manage an individual device, using whatever methods are suitable for the device in question and issue status about managed parameters and respond to control messages by altering the device in some manner.

3.2.2 Connecting Devices

Devices are provisioned by adding them in Section 4.2.1.2.1, “Devices”. Once they are defined here, they can then be integrated into the full picture by connecting them together. This is done by dragging and dropping in the monitoring UI (3.1.1).

The devices must be configured on the correct side, so *red side* devices should be configured on the red side, and *black side* devices configured on the black side.

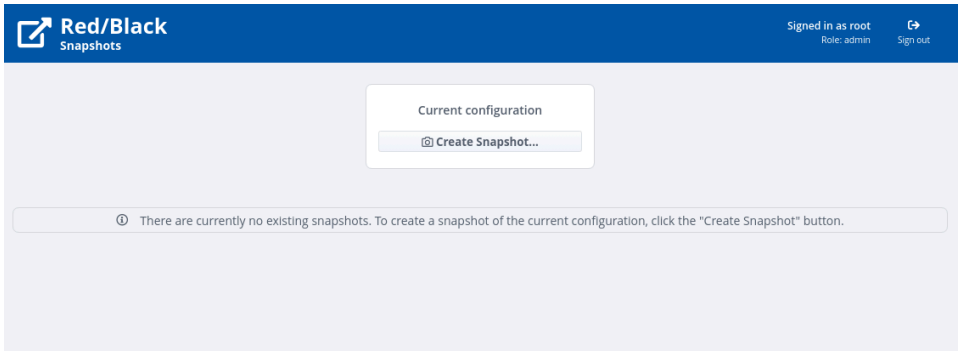
3.2.3 Administrator-only Parameters

Currently all properties are modifiable by all, but in the future these will be constrained by the credentials of the user viewing the devices.

3.2.4 Snapshots

There is an option to save and restore the configuration by saving a snapshot of the current state, and restoring it later.

Figure 3.2. The Snapshot management View



Chapter 4 Configuring Red/Black

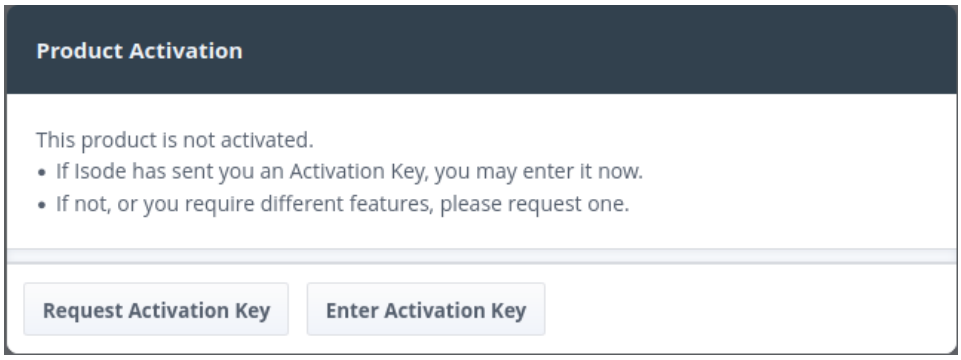
This chapter describes how Red/Black is configured.

4.1 Product Activation

The first time Red/Black is started, it will require a product activation key to enable it to work. This screen will prompt for the details if the product has not yet been activated.

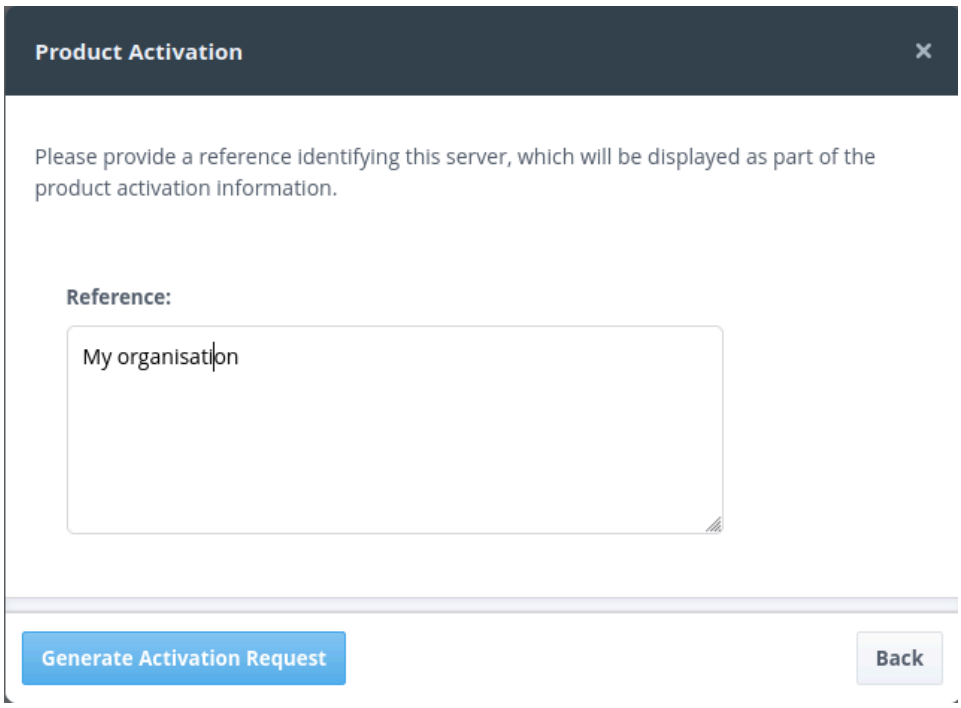
This starts with the dialog shown in Figure 4.1, “Product Activation stage 1”.

Figure 4.1. Product Activation stage 1



At this point it is necessary to generate an activation request to send to the support address support@isode.com. This is shown in Figure 4.2, “Product Activation stage 2”.

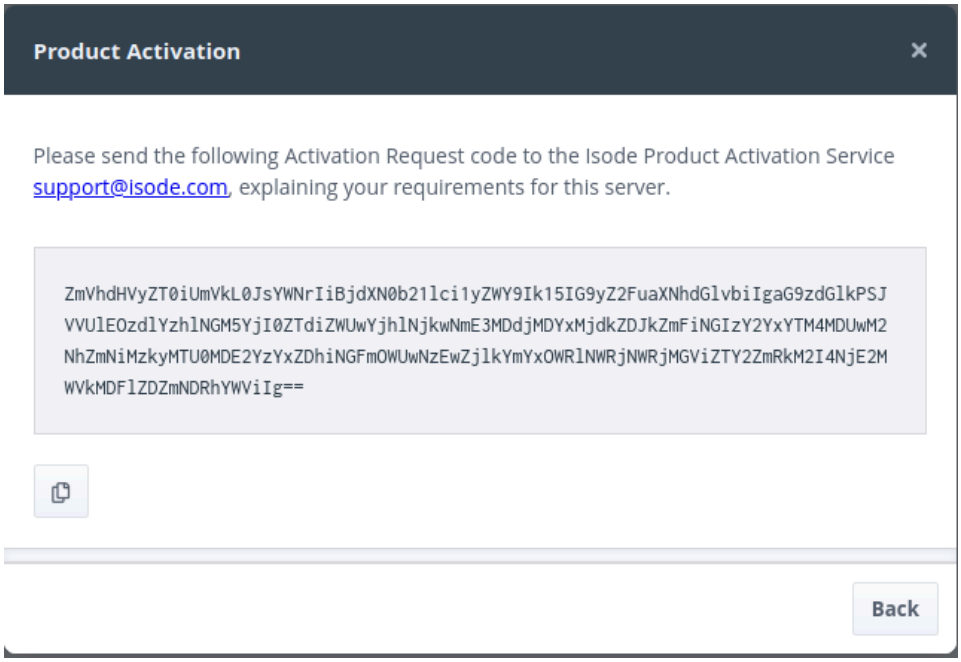
Figure 4.2. Product Activation stage 2



The reference should be filled in an then a request generated.

After the request is generated, it should be sent to the license address for a product activation to be issued.

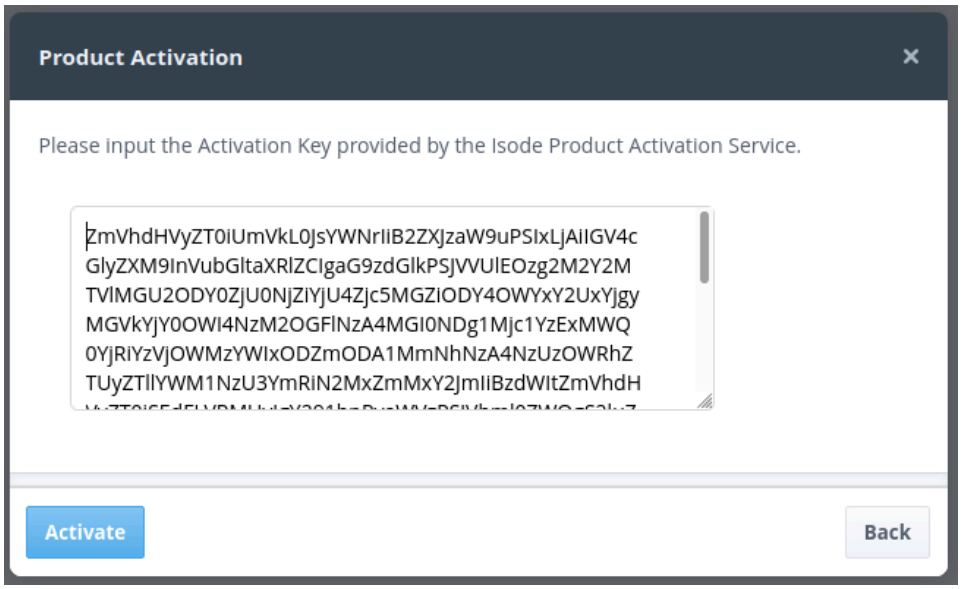
Figure 4.3. Product Activation stage 3



There is a button to copy the data to the clipboard ready for sending.

When the activation result is received from the license desk, it can be entered into the activation box, and the product activated as shown in Figure 4.4, “Product Activation stage 4”.

Figure 4.4. Product Activation stage 4

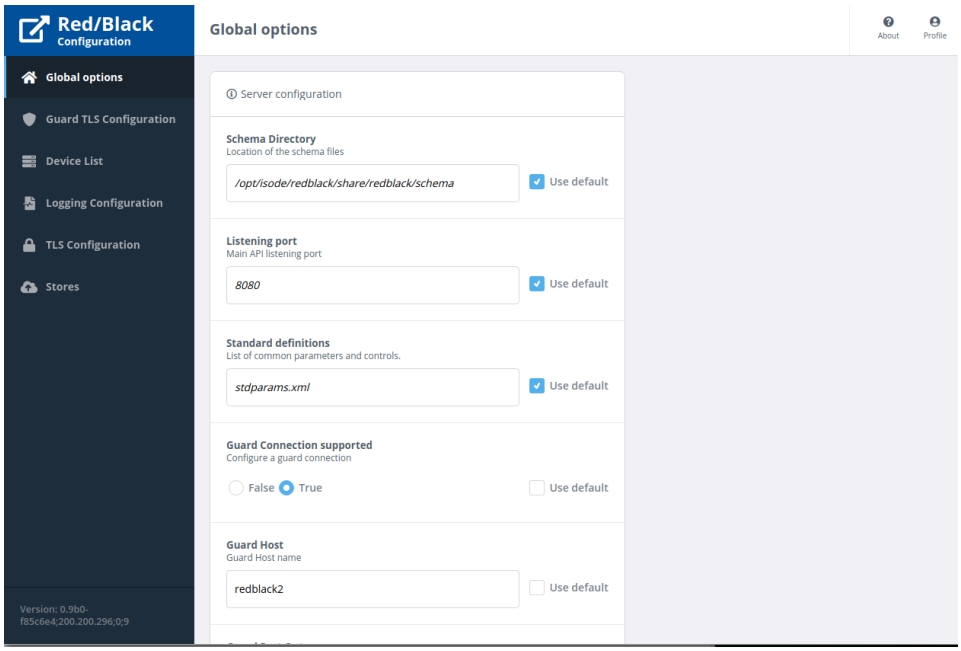


4.2 Red/Black Configuration Options

4.2.1 Global Options

The following are global options that control the configuration of the Red/Black server.

Figure 4.5. Global Configuration Options



Listening port (unsigned short)
: Main HTTP API listening port for the inbuilt web server

HTTP Server URL (string)
: The url of the server as seen externally

Standard definitions (string)
: This is the file containing the standard definitions for common *Status* and *Control* messages.

JSON Schema (string)
: JSON Schema file

Use HTTPS (bool)
: When enabled the administrative interface will be exposed over HTTPS. If disabled, plaintext HTTP will be used instead - this is only likely to be appropriate in production if you are protecting the interface behind a reverse proxy that itself provides TLS.

Certificate for administrative HTTPS interface (string)
: This certificate is used when serving the admin interface over HTTPS.

Key for administrative HTTPS interface (string)
: This key is used when serving the admin interface over HTTPS.

Passphrase for administrative HTTPS key (string)
: This passphrase is used to unlock the HTTPS key.

Red/Black (enum)
: Whether this server is being the role of the *red* or the *black* side.

  One of the following values (default is BLACK):

  RED
  : This represents the Red side

  BLACK
  : This represents the Black side

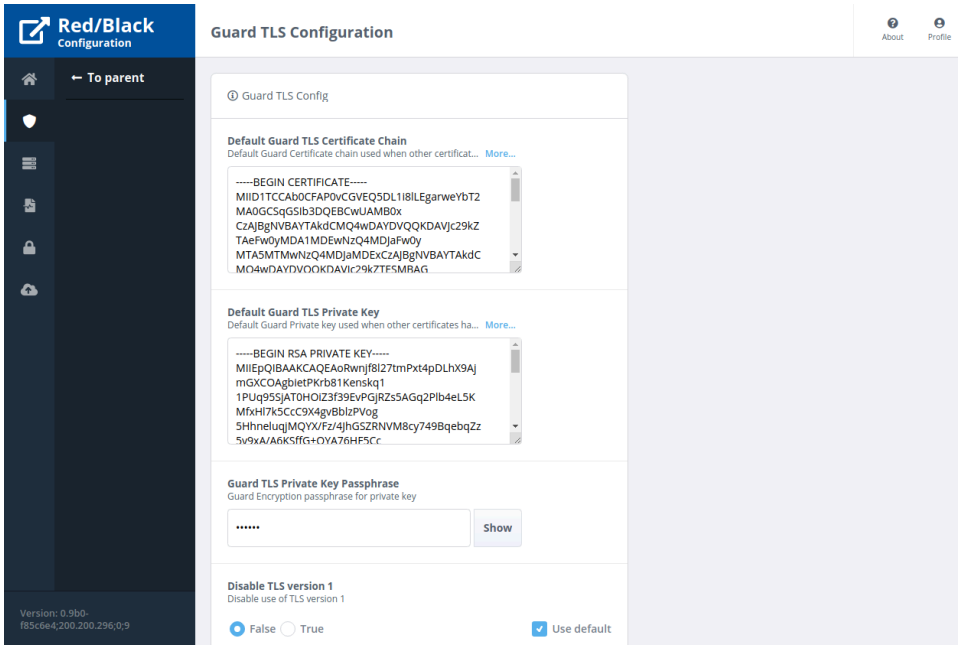
Browser title (string)
: Title for display in a browser running the manager, will be visible to un-authenticated users. You must refresh the browser to see update.

ObjectStore Path (string)
: Location ObjectStore files are stored

4.2.1.1 Guard Configuration

The Guard configuration settings.

Figure 4.6. Guard Configuration Options



Guard Connection supported (bool)
: Configure a guard connection to be enabled.

Outbound Guard hostname (string)
: The hostname of the outbound Guard, through which will be made to the remote Red/Black server.

Outbound Guard port number. (unsigned short)
: The port number of the outbound Guard, through which connections will be made to the remote Red/Black server.

Listen port for Inbound Guard (unsigned short)
: Port number to listen on, for connections from the inbound Guard.

Default Guard TLS Certificate Chain (string)
: Default Guard Certificate chain used when other certificates have not been configured, encoded as PEM

Default Guard TLS Private Key (string)
: Default Guard Private key used when other certificates have not been configured, encoded as PEM

Guard TLS Private Key Passphrase (string)
: Guard Encryption passphrase for private key

Disable TLS version 1 (bool)
: Disable use of TLS version 1

Cipher Suites (string)
: Standard OpenSSL cipher suite string

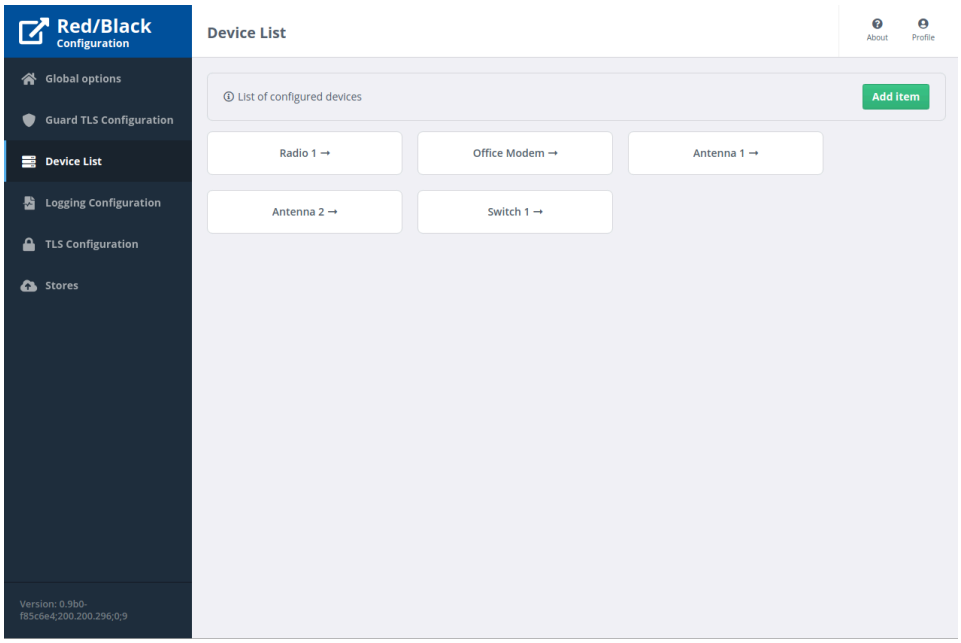
Override Default DH Parameters. (bool)
: DH Parameters are used during TLS. You will not generally need to do this.

DH Parameters (string)
: These are used during TLS, and should be specified in PEM format.

4.2.1.2 Device List

The device list is where the list of known devices and drivers are configured, together with their schema. New devices can be added with Add...

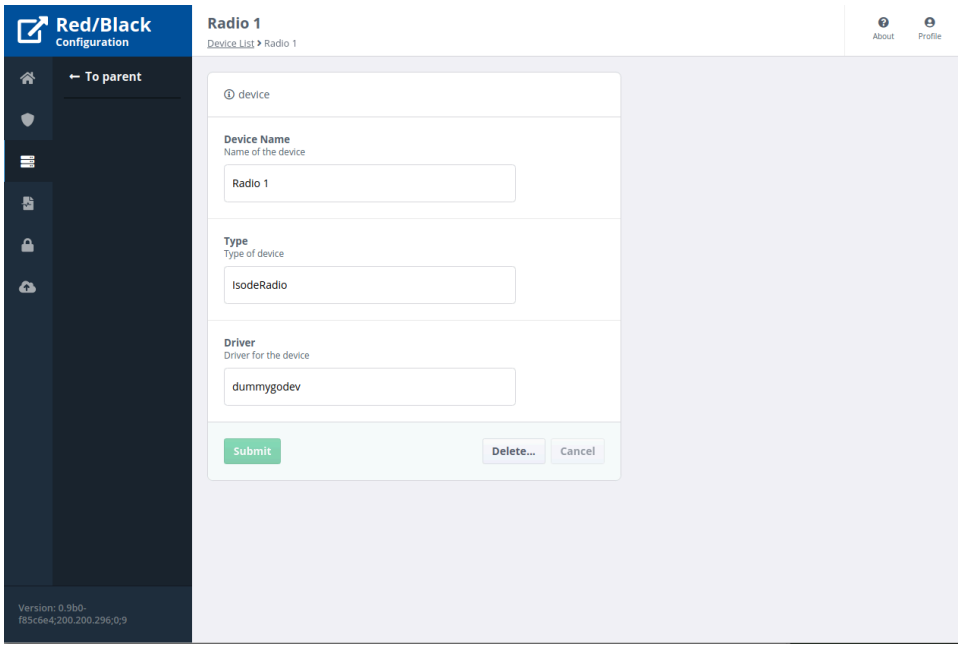
Figure 4.7. Device List Configuration



4.2.1.2.1 Devices

Individual device configuration

Figure 4.8. Device List Entry



Device Name (string)
: Name of the device

Template (string)
: Template Name

Driver Options (enum)
: Alternative drivers

One of the following values (default is standard):

standard
: Default driver as configured

nulldriver
: Null driver

mock
: Mock driver

custom
: Custom driver

Driver (string)
: Driver for the device

Additional arguments (string)
: Optional additional driver command line arguments. These will be added to the default arguments. Use $1, $2, $3, $4, $5 for senstive options; these will be replaced by the Password fields below, e.g. ".. -username tommy -password $1..".

Password 1 (string)
: Password One. This value will replace "$1" wherever that occurs in the "Additional arguments" above.

Password 2 (string)
: Password Two. This value will replace "$2" wherever that occurs in the "Additional arguments" above.

Password 3 (string)
: Password Three. This value will replace "$3" wherever that occurs in the "Additional arguments" above.

Password 4 (string)
: Password Four. This value will replace "$4" wherever that occurs in the "Additional arguments" above.

Password 5 (string)
: Password Five. This value will replace "$5" wherever that occurs in the "Additional arguments" above.

4.2.1.2.1.1 List of active rules

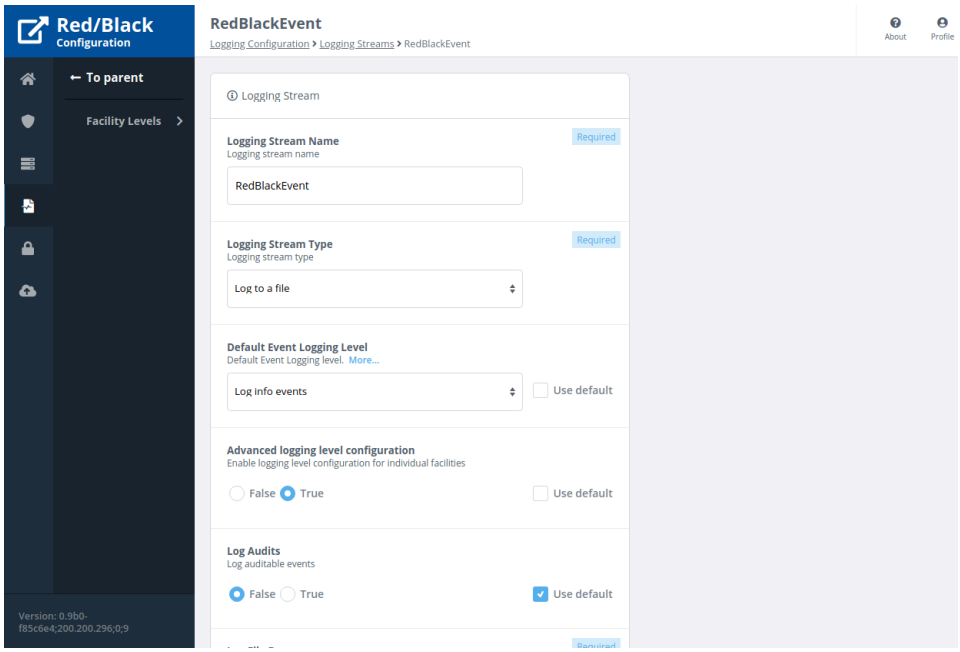
The rules to be run for changes

Rule (string)
: The name of the rule

4.2.1.3 Logging Configuration

The following settings allow the configuration of the logging to be fine tuned. The default setting is to have two logging streams of **RedBlackEvent** for the general logging, and **RedBlackAudit** for the auditable events. Other streams can be added with the **Add item** button. For any of the logging streams the following options are allowed.

Figure 4.9. Logging Configuration Options



Logging Path (string)
: Folder into which to log

4.2.1.3.1 Logging Streams

Logging Streams

4.2.1.3.1.1 Log Stream Configuration

Individual log stream configuration.

Logging Stream Name (string)
: Logging stream name

Logging Stream Type (enum)
: Logging stream type
One of the following values:

file
: Log to a file

unixSyslog
: Log to the Unix Syslog

windowsEventLog
: Log to the Windows Event Log

tty
: Log to TTY

xmppExt
: Log to XMPP

Default Event Logging Level (enum)
: Default Event Logging level. The hierarchy (most severe to least) is critical, fatal, error, warning, notice, info, success, detail, debug. Selecting a level implies selecting all higher logging levels as well. This logging level will be applied to all logging facilities.
One of the following values (default is error):

none
: Do not log events

critical
: Log critical events

fatal
: Log fatal events

error
: Log error events

warning
: Log warning events

notice
: Log notice events

info
: Log info events

success
: Log success events

detail
: Log detail events

trace
: Log trace events

debug
: Log debug events

Advanced logging level configuration (bool)
: Enable logging level configuration for individual facilities

Log Audits (bool)
: Log auditable events

Log File Basename (string)
: Log file name. This should not include a path: the file will be written to the configured logging path. If rollover is configured, the output file name will include time and date fields.

Windows Event Category (string)
: Windows Event category

File Descriptor Number (unsigned int)
: File descriptor number to log to

Log File Rollover Interval (enum)
: Log file rollover interval
One of the following values (default is daily):

none
: Do not roll log files over

weekly
: Roll log files over every week

daily
: Roll log files over every day

hourly
: Roll log files over every hour

fiveMinutes
: Roll log files over every five minutes

Log File Rollover Offset (unsigned int)
: Log file rollover offset from midnight (minutes)

Date Format (enum)
: Date format
One of the following values (default is year4):

none
: Do not log date

month
: Log date in MM/DD format

year2
: Log date in YY-MM-DD format

year4
: Log date in YYYY-MM-DD format

Close Log File After Write (bool)
: Close log file after each write

Log Microseconds In Timestamp (bool)
: Include microseconds in timestamp

Log Thread Identifier (bool)
: Include thread ID when logging

Use UTC For Timestamps (bool)
: Use UTC for timestamps instead of local time

Logging level configuration for individual facilities

Per-facility logging level. Note that per-facility logging levels add to the default logging level rather than replacing it.

Facility Name (enum)
: The facility which generates this set of event log entries.
One of the following values:

asn1
: ASN.1 library

base
: Base library

compat
: Compatibility library

redblack
: RedBlack application

rfc4158
: RFC4158 library

sasl
: SASL library

x509
: X509 library

Event Logging Level (enum)
: Event Logging level. The hierarchy (most severe to least) is critical, fatal, error, warning, notice, info, success, detail, debug. Selecting a level implies selecting all higher logging levels as well.
Has the same values as Default Event Logging Level (enum).

4.2.1.4 OAuth Settings

OAuth configuration

Enable OAuth Authentication (bool)
: Require users to authenticate using OAuth. If OAuth is enabled, you can still use "simple" authentication (e.g. if OAuth configuration is broken) by using a URL of the form "https://redblack.example.net:8080/configure?fallbackLogin".

Application Name (string)
: Used to identify this server to the OAuth service. This value, as well as the OAuth Secret and the Red/Black Redirect URI, must match this Red/Black server's configuration in the OAuth service.

Application's OAuth Secret (string)
: Secret shared with the OAuth service. This value, as well as the Application Name and Red/Black Redirect URI, must match this Red/Black server's configuration in the OAuth service.

OAuth Service Authorize URL (string)
: Location of the OAuth authorization endpoint. Red/Black redirects users to this address when they first attempt to authenticate. It should be a URL ending in "/authorize" which contains a hostname or IP address that is reachable by users of Red/Black. For example, "https://oauth.example.net:19443/authorize".

Red/Black Redirect URI (string)
: Where the OAuth server directs users after authentication. After completing user authentication, the OAuth server provides this redirect URI to the user's web browser to send it back to Red/Black. It should be a URL ending in "/callback" which contains a hostname or IP address that is reachable by users of Red/Black. For example, "https://redblack.example.net:8080/callback". This value, as well as the Application Name and OAuth Secret, must match this Red/Black server's configuration in the OAuth service.

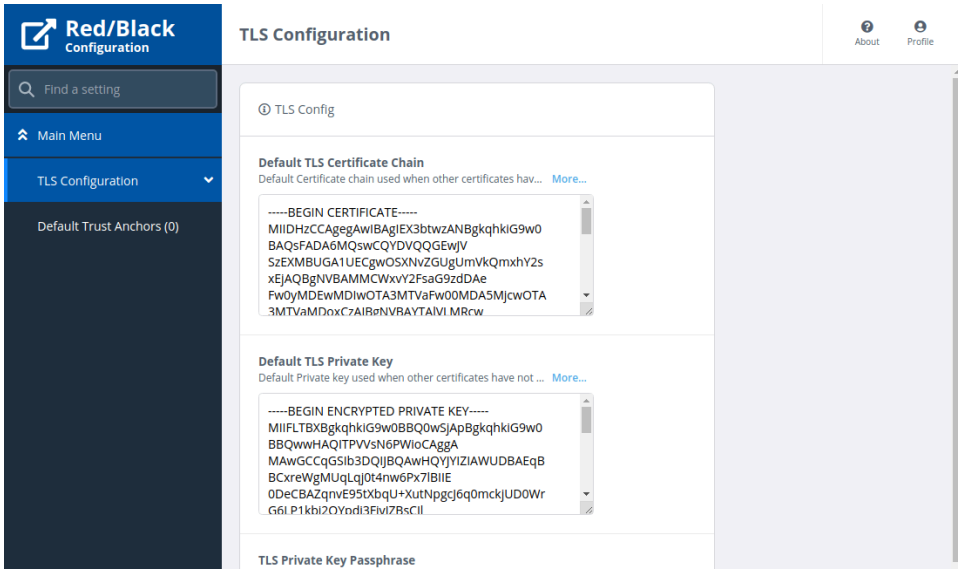
OAuth Service URL (string)
: The URL of the OAuth service used by Red/Black. The Red/Black server uses this address to communicate with the OAuth service for token and user information. It should be a URL which contains a hostname or IP address that is reachable by the system where Red/Black is running. For example, "https://oauth.example.net:19543".

Cipher Suites (string)
: Standard OpenSSL cipher suite string used in OAUTH Access

4.2.1.5 TLS Configuration

TLS Default Configuration Parameters

Figure 4.10. TLS Default configuration



Default TLS Certificate Chain (string)
: Default Certificate chain used when other certificates have not been configured, encoded as PEM

Default TLS Private Key (string)
: Default Private key used when other certificates have not been configured, encoded as PEM

TLS Private Key Passphrase (string)
: Encryption passphrase for private key

Disable TLS version 1 (bool)
: Disable use of TLS version 1

Cipher Suites (string)
: Standard OpenSSL cipher suite string

Override Default DH Parameters. (bool)
: DH Parameters are used during TLS. You will not generally need to do this.

DH Parameters (string)
: These are used during TLS, and should be specified in PEM format.

Ignore system trust anchors (bool)
: Disregard any pre-installed Trust Anchor certificates

4.2.1.5.1 Default Trust Anchors

Default Trust Anchors which can be used by all domains

4.2.1.5.1.1 Trust Anchor

Default trust anchors used to validate the certificate path.

Trust Anchor Identifier (string)
: A suitable identifier for this Trust Anchor. This is used for display and logging purposes only.

Trust Anchor (string)
: Trust Anchor certificate encoded as PEM

4.3 Certificate Verification

A certificate which is presented as part of a TLS handshake is verified via a multi-stage process. The first stage takes place during the handshake itself, and checks (among other things) that the certificate has been signed by one of the Trust Anchors which have been configured for the current TLS context. Even if the certificate fails one or more of these checks, the TLS handshake may still complete successfully, with an encrypted TLS session being established.

Once the TLS handshake is complete, secondary checks are performed on the presented certificate, if the configuration of the domain or link requires a valid certificate. These are:

- If a Pinned Certificate is configured, the results of the first-stage verification are ignored and a direct comparison between this and the presented certificate is performed. If they match, the presented certificate is considered valid. If they do not match, the presented certificate is considered invalid. In either case, no further verification of the presented certificate is performed.
- A check of the result of the first-stage verification, described above. If this first-stage verification has failed, no further action is taken, and the certificate is considered invalid.
- For Server-to-Server connections which use a Link, a Subject Alternative Name match against the Link's remoteHost configuration setting is attempted. If this match fails, the certificate is considered invalid.
- If the appropriate checks described above succeed, the certificate is considered valid.

A certificate can contain multiple Subject Alternative Names, of varying types. When attempting to match a domain name, DNS name or hostname against these, a number of different comparisons are performed:

- A match against one of the certificate's DNS Names. This includes wildcard matching, so that a certificate with a DNS Name of `*.isode.com` would match `mary.isode.com`.
- A match against one of the certificate's SRV Names. SRV Names are prefixed with `_Red/Black-server` if the certificate belongs to a Red/Black server or `_Red/Black-client` if presented by a Red/Black client. Thus an SRV name of `_Red/Black-server.mary.isode.com` would match the domain `mary.isode.com`.
- A match against one of the certificate's Red/Black Addresses.
- If the certificate has no other Subject Alternative Names, a match against one of the certificate's Common Name values.

4.4 Trust Anchors

Trust Anchors are certificates which identify trusted signing entities. These are used by Red/Black to verify that a chain of certificates (up to and including an end-entity certificate) received from another Red/Black server or client is valid.

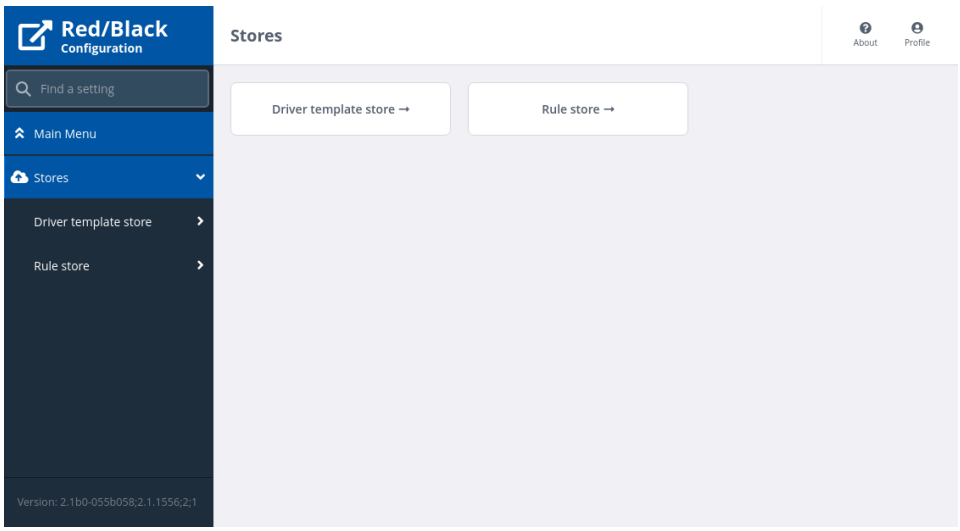
Most operating systems provide a built-in set of Trust Anchors which identify commercial Certification Authorities. The location and format of these is system-specific. By default, Red/Black will make use of these Trust Anchors. Use of system Trust Anchors can be overridden via configuration either for the whole Red/Black installation.

A set of private Trust Anchors may be specified as part of Red/Black's configuration, across the whole installation. Use of private Trust Anchors is required when the end-entity certificates being presented have been signed by Certification Authorities whose CA certificates are not configured as part of the operating system.

4.5 Stores

There are a possible number of stores which the server has access to that provide a mechanism to keep slightly larger elements that the server may need. Currently this is limited to the storage of the schema files but may be expanded in the future.

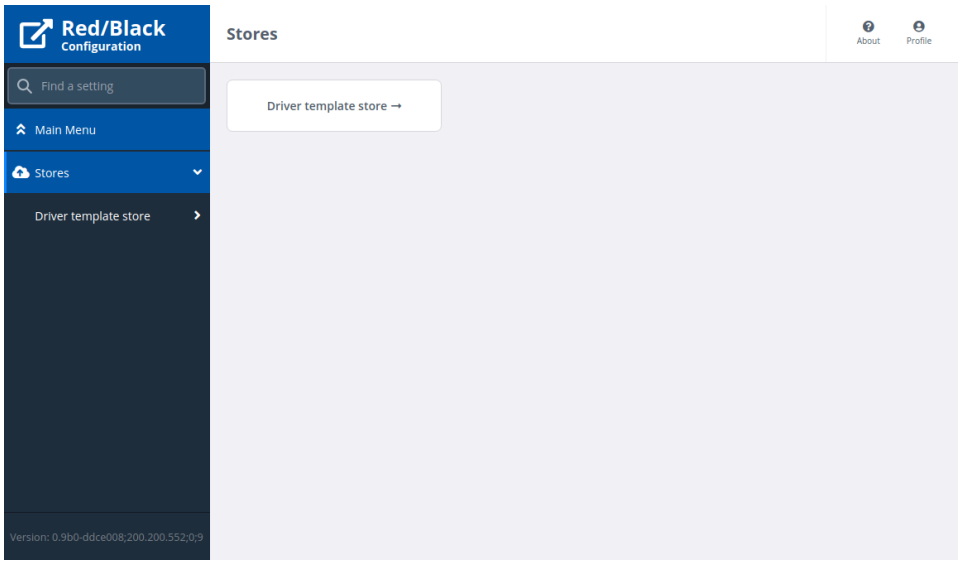
Figure 4.11. Stores Configuration Options



4.5.1 Driver Template Store

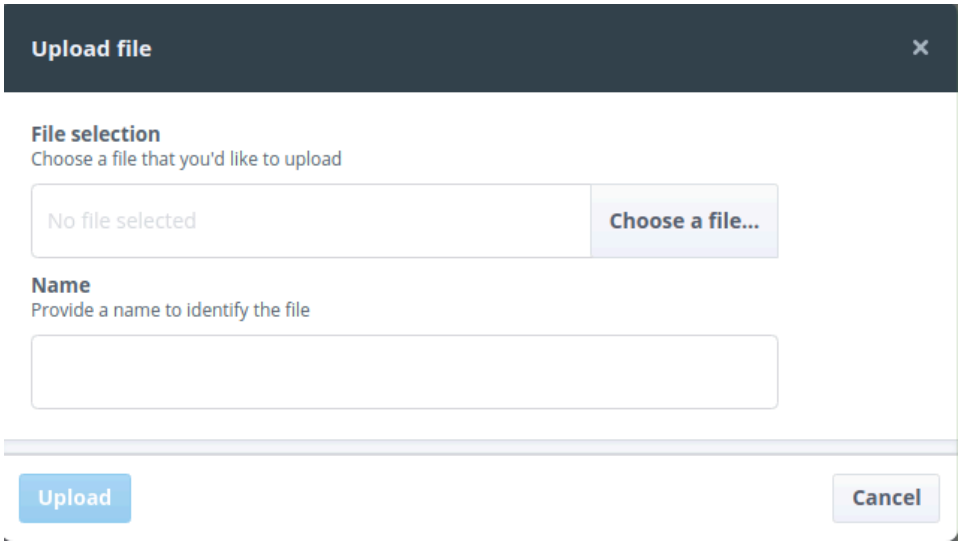
This is the storage of the related schema and driver properties that the server knows about. This is populated on first boot to contain the distributed example schema data, but can be amended as required.

Figure 4.12. Driver Template Store Options



New schema entries can be added with the **Add Item** button.

Figure 4.13. Schema Upload Dialog



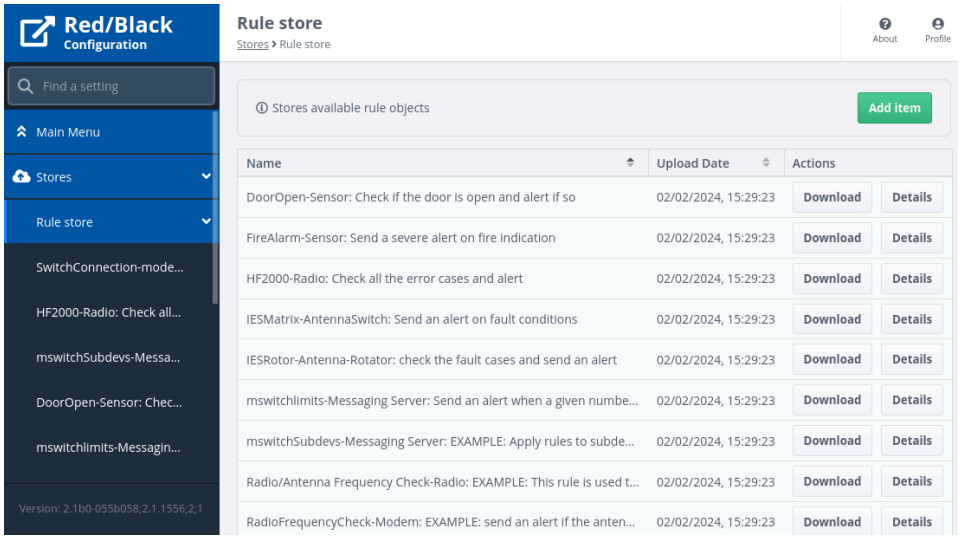
File Selection
: This will be the file containing the XML schema for a device.

Name
: The Name of the schema. This must be without spaces or non-ascii characters to identify it. It must also be unique.

4.5.2 Rule Template Store

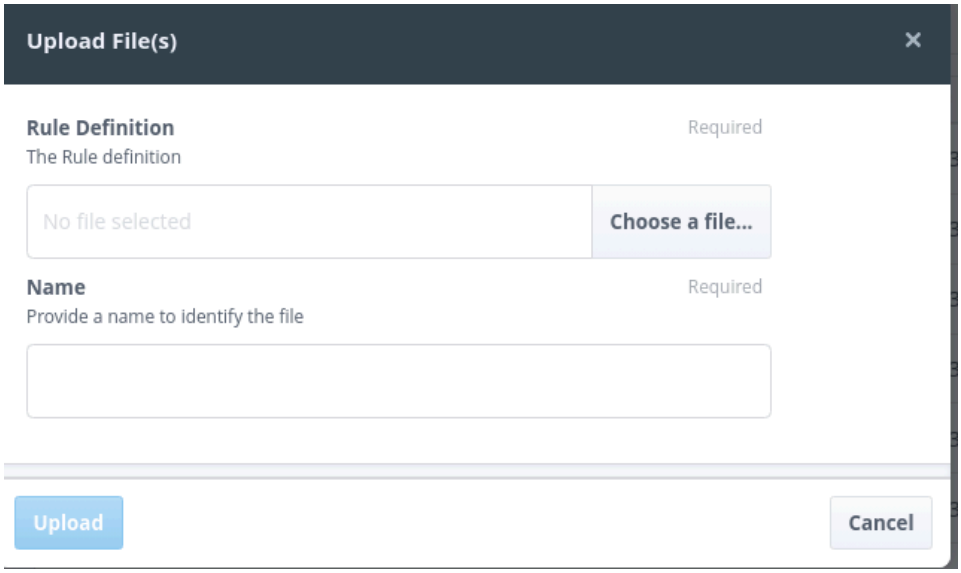
This is the storage of the rules that can be attached to a device. See Chapter 5, *Rules for Red/Black* for details of the rule language.

Figure 4.14. Rule Template Store Options



New schema entries can be added with the **Add Item** button.

Figure 4.15. Rule Upload Dialog



File Selection
: This will be the file containing the rule.

Name
: The Name of the rule. This must be without spaces or non-ascii characters to identify it. It must also be unique.

4.6 Configuring a Pair of Red/Black Servers

Red/Black servers usually work in pairs, fulfilling the idea of a *red* and *black* side. Each side is configured independently, however they must share a common set of abstract device definitions to allow the accurate transfer of status messages to match up. Therefore if a custom device specification is added to one side, it must be added to the other side to allow interoperability.

4.7 M-Guard Configuration

4.7.1 GCXP Links

The Red/Black servers are usually connected by a guard process, to ensure good separation of the two. The configuration of the connection to the guard is covered in Section 4.2.1.1, “Guard Configuration” . The connections are based on use of M-Guard but other guard applications supporting GCXP communication are also possible.

4.7.2 M-Guard Rules

The guard rules are specific to the application and environment, but in general a number of common rules are used as a baseline. See the M-Guard manual for more details on their specification. The common rules usually include such things as:

- Adherence to the schema, in this case the Red/Black schema that is distributed with the application.
- No XML comments to be included within the content. Comments are a clear side channel of communication that should be disabled.
- Other rules might consider excessive sized content or restriction of the schema, to remove for example JPEG images.

Chapter 5 Rules for Red/Black

This chapter describes how Red/Black rules are configured.

5.1 Rule language

The language of the rules is based on the LUA language, which is a general purpose embedded language. Rules are stored in a storage section controlled by the configuration UI, and can be updated and loaded. The rules have to have a common header to mark them as acceptable. A sample program that show how the rules work is shown below.

```
--name: TemperatureCheck
--family: Sensor

function main()
    name = GetAttr("DeviceName")
    temp = GetAttr("Temperature")
    print(string.format("Found %s with temperature %s\n", name, temp))
    if tonumber(temp) > 30 then
        SendAlert("Temperature exceeded 30 at -" -.. temp, -"Warning")
    end
    return true
end
```

5.2 Rule specific functions

There are a number of functions registered with the LUA runtime that are available to help construct rules. The following all work as stand alone calls that can be issued. They either work globally or are specific to the current device the rule has triggered on.

5.2.1 Global or current device functions

GetAttr

This takes one argument, a string, which is the name of an attribute. It returns the value of that attribute as a string if it exists.

Example:

```
family = GetAttr("DeviceFamily")
```

SendAlert

This takes two arguments, a string, which is the contents of the alert message to be sent. The second string is a level, which should be one of `Info`, `Warning`, `Error`, `Severe`, or `Critical`.

There is an optional third parameter which is an integer and is used in rate limiting. So for instance if this is 1, then another alert with this parameter will only be allowed to be sent after a delay of 30 seconds. This will probably change.

Example:

```
SendAlert("The value has been exceeded", -"Warning", 2)
```

GetDevice
: This takes no arguments, and returns an object that is the current device.

Example:

```
dev = GetDevice()
```

FindDeviceByName
: This takes one argument, a string, which is the name of a device. It returns an object that is that device if it is found.

Example:

```
device = FindDeviceByName("Thermometer")
```

FindDeviceById
: This takes one argument, a string, which is the id of a device. It returns an object that is that device if it is found.

Example:

```
device = FindDeviceById("72437f4e-d64b-4c2b-b13e-712d5c778f69")
```

FindSuccessorByName
: This takes one argument and searches forward through all the links from the current device to see if it can find a device with the given name or id that is in the chain.

Example:

```
aerialdevice = FindSuccessorByName("aerial")
```

FindSuccessorByFamily
: This takes one argument and searches forward through all the links from the current device to see if it can find a device of the given family type that is in the chain.

Example:

```
aerialdevice = FindSuccessorByFamily("Antenna")
```

FindSubdeviceByName
: This takes one argument and searches forward through all the links from the current device that are subdevices of the current device to see if it can find a device with the given name or id that is in the chain.

Example:

```
aerialdevice = FindSubdeviceByName("smtp-MSWITCH")
```

FindSubdeviceByFamily
: This takes one argument and searches forward through all the links from the current device that are subdevices of the current device to see if it can find a device of the given family type that is in the chain.

Example:

```
aerialdevice = FindSubdeviceByFamily("M-Switch Channel")
```

RBLog
This takes two arguments, the first being the message and the second the level, which is a string, from one of `"info"`, `"warning"`, `"error"`, `"debug"`, `"trace"`.

Example:

```
RBLog(
    string.format("This is a message from %s",
    GetAttr("DeviceName")),
    -"info")
```

5.2.2 Device object functions

The following calls all work on a device object returning features of it.

GetName
This takes no arguments. It returns the name of the device related to this object.

Example:

```
device = FindDeviceByName("Thermometer")
name = device:GetName()
```

GetId
This takes no arguments. It returns the id of the device related to this object.

Example:

```
device = FindDeviceByName("Thermometer")
id = device:GetId()
```

GetAttr
This takes one argument, a string, which is the name of an attribute. It returns the value of that attribute as a string if it exists.

Example:

```
device = FindDeviceByName("Thermometer")
family = device:GetAttr("DeviceFamily")
```

SetAttr
This takes two arguments, a string, which is the name of an attribute and another string the new value for that attribute.

Example:

```
device = FindDeviceByName("Thermometer")
device:SetAttr("Temperature", -"50")
```

Disable
This takes no arguments and disables the device. This is a short cut for setting the attribute Enabled to false.

Example:

```
device = FindDeviceByName("Thermometer")
device:Disable()
```

GetLowerBound

This takes a single argument which is an integer parameter name, and finds an associated lower bound defined in the schema. This will fail if it is not an integer. It may return -1 if there is no lower bound set.

Example:

```
device = FindDeviceByName("Thermometer")
lb = device:GetLowerBound("Temperature")
```

GetUpperBound

GetInterval

This takes a single argument which is an integer parameter name, and finds an associated interval defined in the schema. This will fail if it is not an integer. It may return -1 if there is no interval set.

Example:

```
device = FindDeviceByName("Thermometer")
intv = device:GetInterval()
```

GetShift

This takes a single argument which is an integer parameter name, and finds an associated shift defined in the schema. This will fail if it is not an integer. It may return -1 if there is no shift set.

Example:

```
device = FindDeviceByName("Thermometer")
shiftv = device:GetShift()
```

SendAlert

This takes two arguments, a string, which is the contents of the alert message to be sent. The second string is a level, which should be one of `Info`, `Warning`, `Error`, `Severe`, or `Critical`.

There is an optional third parameter which is an integer and is used in rate limiting. So for instance if this is 1, then another alert with this parameter will only be allowed to be sent after a delay of 30 seconds. This will probably change.

Example:

```
dev = FindDeviceByName("Thermometer")
dev:SendAlert("We have a thermometer", -"Info", 2)
```

ReconnectTo

This takes up to 5 arguments, and makes a connection between this device and another one. The parameters are `devicetoconnectto`, `parameter`, `fromConnection`, `toConnection`, `fromPort` an optional port if the device supports multiple connections from it, it can be -1 if this is not required and the next argument is, `toPort` an optional port if the destination supports more than one connection. This can be specified as -1 too for completeness.

Example:

```
device = GetDevice()
device:ReconnectTo("antenna", -"Antenna",
        -"Antenna", -"ConnectionFromRadio")
```

ChangeSwitch

This takes 4 arguments, and adjusts the internal switches for what is connected to what. The parameters are `fromParameter`, `fromPort`, `toConnection`, `toPort`.

Example:

```
device = GetDevice()
device:ChangeSwitch("InboundConnections",1,
                -"OutboundConnections", 2)
```

DeleteSwitch

This takes 4 arguments, and removes an internal switch connection to. The parameters are `fromParameter`, `fromPort`, `toConnection`, `toPort`.

Example:

```
device = GetDevice()
device:DeleteSwitch("InboundConnections",1,
                -"OutboundConnections", 2)
```

Appendix A Glossary

This appendix provides a glossary of terms.

Technical Terms used

Abstract Device
A device definition that describes what status and control messages

Black Side (BLACK)
The black side is the public facing side of the installation. This is usually where the communication devices reside.
See Also Red Side.

Control
Control messages are the way that the Red/Black server communicates with devices and with other Red/Black servers.
See Also Status.

Driver
A driver is a process that interfaces between the Red/Black server and a particular device. It is responsible for issuing status messages and interpreting control messages.

Red Side (RED)
The red side is the internal side of the installation, and usually where the control is managed from.
See Also Black Side.

Status
Status messages are the principle way that devices communicate with the Red/Black server and with other Red/Black servers.
See Also Control.

Appendix B References

The documents listed in this appendix provide references to the appropriate standards and other sources of information.

If documents can be obtained electronically, the location is stated as part of the reference.

B.1 RFCs

RFC 8259
The JavaScript Object Notation (JSON) Data Interchange Format [https://tools.ietf.org/html/rfc8259]. T. Bray, December 2017

RFC 6901
JavaScript Object Notation (JSON) Pointer [https://tools.ietf.org/html/rfc6901]. P. Bryan, April 2013

RFC 6902
JavaScript Object Notation (JSON) Patch [https://tools.ietf.org/html/rfc6902]. P. Bryan, M. Nottingham, April 2013

B.2 Recommendations and standards

XML
Extensible Markup Language (XML) 1.0 [https://www.w3.org/TR/xml/]. W3C Recommendation 26 November 2008

B.3 Other publications

JSON Schema [https://json-schema.org/].

Appendix C Specifying an Abstract Device

An abstract device is defined by an XML document that follows the redblack schema definition which gives the full detail about what is allowed and what is not.

C.1 The XML Definition

The XML abstract device consists of the following sections.

`AbstractDeviceSpecification`
: This is the root of the XML specification of the abstract definition.

`DeviceType`
: This is the type of the device, it is usually specific to type of device. Therefore AcmeModem rather than Modem. It has to be a single word, but can be in CamelCase

`DeviceFamily`
: This is the family that the device belongs to, so might be a radio, antenna, modem or similar..

`DeviceTypeSummary`
: This is a short description of the device, suitable for showing in a GUI as a label.

`DeviceTypeDescription`
: This is a more descriptive text describing the device which is suitable for a help dialog, or tooltip.

`ReferencedStatusParameters`
: This is a list of referenced status parameters that are defined in the common definitions file. They are simply referenced by name as in

Example C.1. Referencing a standard Status

```
<Ref>name</Ref>
```

`DeviceStatusParameters`
: This is a list of definitions of a status parameter specific to this device. The details are given in Section C.1.1, “DeviceStatusParameter and DeviceControlParameter” .

`ReferencedControlParameters`
: This is a list of referenced control messages that are defined in the common definitions file using the same notation as Example C.1, “Referencing a standard Status”.

`DeviceControlParameters`
: This is a list of controls suitable specifically for the device. The details are also given in Section C.1.1, “DeviceStatusParameter and DeviceControlParameter” .

C.1.1 DeviceStatusParameter and DeviceControlParameter

The components of the Device Status Parameters and Control Parameters are very similar, and all *`Control`* messages have an implicit *`Status`* equivalent message. They are a list of *`Parameter`* XML nodes, which have the following parts:

`ParameterName`
: This is the name of the parameter.

`ParameterSummary`
: This is the short summary description of the parameter.

ParameterDescription
This is the longer description of the parameter.

Units (optional)
This is the an optional section where the units for the parameter can be specified if applicable. For example volts, hertz, minutes etc.

RedBlackManaged (optional)
If this is present, then the parameter is managed by the server, rather than by the device.

Special (optional)
This parameter is handled by the device in some special way.

SetByOperator (optional)
This is not used for Status message.

BlackSideControlOnly (optional)
This parameter can only be set on the black side.

RedToBlackRate (optional)
This parameter allows the rate between the red and black servers to be limited to a rate. There are two subnodes of this:

NumberMessagesInPeriod
How many messages can be passed between the servers in a given time.

PeriodLength
The time in which the number of messages are restricted to.

MultiValue (optional)
This parameter indicates there may be multiple values.

Then there has to be one of the following present.

Integer
This parameter carries integer data, with optional constraints.

LowerBound
The lower limit of the value that is allowed.

UpperBound
The upper limit of the value that is allowed.

AllowedValue
This is a multi valued list of the possible values for the case where only certain values are allowed.

Multiplier
A multiplier indicating that values are only allowed in these increments.

Shift
Indicates that when displayed the value should be shifted by this amount, such as a shift of 2, with a value of 5398 would be displayed as 53.98.

DateTime
This parameter carries a date/time data. There are optional attributes that can be attached specifying it is one of *Days,Minutes,Seconds,MilliSeconds*

String
This parameter carries a string. There are a couple of options that can be applied to limit this.

MaximumLength
The maximum number of characters allowed in the string.

IA5
The string is limited to the IA5 character set.

UpperCaseLettersAndDigits
The string is limited to the upper case characters and digits.

JPEGPhoto
: This parameter carries a JPEG Image.

Boolean
: This parameter carries a true/false boolean data.

Enumerated
: This parameter carries a value from a list given. The *EnumValue* contains a list of allowed values.

Empty
: This parameter carries no content, as the action is implied from the type.

Connection
: This parameter carries connection information between two devices.

AlertType (*Status* only)
: This parameter carries an alert information. There are two parts to this.

  MaximumDescriptionLength
  : The maximum number of characters allowed in the string.

Appendix D Sample Abstract Devices

The following are some sample device definitions that are given as examples.

D.1 Antenna

This models a single endpoint antenna

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>Antenna</DeviceType>
  <DeviceFamily>Antenna</DeviceFamily>
  <DeviceTypeSummary>An antenna placeholder</DeviceTypeSummary>
  <DeviceTypeDescription>
    This models a single endpoint antenna
  </DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>FrequencyLowerBound</ParameterName>
      <ParameterSummary>Lower Bound Frequency Supported</ParameterSummary>
      <ParameterIcon>wave-sine</ParameterIcon>
      <Units>MHz</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>3000</LowerBound>
        <UpperBound>29999</UpperBound>
        <Shift>3</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>FrequencyUpperBound</ParameterName>
      <ParameterSummary>Upper Bound Frequency Supported</ParameterSummary>
      <ParameterDescription>This is a placeholder that gives limits on frequencies supported</Parame
      <ParameterIcon>wave-sine</ParameterIcon>
      <Units>MHz</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>3000</LowerBound>
        <UpperBound>29999</UpperBound>
        <Shift>3</Shift>
      </Integer>
```

```
    </Parameter>
    <Parameter>
      <ParameterName>ConnectionFromRadio</ParameterName>
      <ParameterSummary>Connection from Radio</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <DirectType>RF</DirectType>
        <IndirectType>Antenna</IndirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```


D.2 AudioToTCP

This device converts an audio stream to TCP. It is used to enable operator switching of audio streams.


```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>AudioToTCP</DeviceType>
  <DeviceFamily>AudioToTCP</DeviceFamily>
  <DeviceTypeSummary>Converts Audio to TCP</DeviceTypeSummary>
  <DeviceTypeDescription>
This device converts an audio stream to TCP.
It is used to enable operator switching of audio streams.
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Reset</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>AudioIn</ParameterName>
      <ParameterSummary>Audio Inbound</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <DirectType>Audio</DirectType>
```

```
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>TCPOut</ParameterName>
      <ParameterSummary>TCP to Peer</ParameterSummary>
      <ParameterDescription>
This is the link to a peer -"TCP-to-Audio" converter.
The operator sets this end of the TCP connection to match
the other end (which is set by administrator).
</ParameterDescription>
      <SetByOperator/>
      <Connection>
        <TCP/>
        <ConnectTo/>
        <DirectType>AudioOverTCP</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.3 Cobalt

Cobalt performs directory provisioning. Cobalt is not part of the communication chain and so has no connections defined.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>Cobalt</DeviceType>
  <DeviceFamily>Directory Provisioning</DeviceFamily>
  <DeviceTypeSummary>Isode Cobalt</DeviceTypeSummary>
  <DeviceTypeDescription>
Cobalt performs directory provisioning.
Cobalt is not part of the communication chain and so has no connections defined.
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>ActivationInfo</Ref>
  </ReferencedStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Enabled</Ref>
    <Ref>Reset</Ref>
  </ReferencedControlParameters>
```

```
  <DeviceDriverInfo>
    <DriverPath>netgo</DriverPath>
    <DriverOptions>-t Cobalt</DriverOptions>
    <DriverArgumentHelp>
      Specify the cobalt server to monitor. Arguments are
      --p host:port (e.g., --p localhost:8001)
      --U updatetime (optional, in seconds)
      </DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.4 DoorSensor

Simple Status

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>DoorSensor</DeviceType>
  <DeviceFamily>Sensor</DeviceFamily>
  <DeviceTypeSummary>Check if Door is Open</DeviceTypeSummary>
  <DeviceTypeDescription>Simple Status</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>DoorOpen</ParameterName>
      <ParameterSummary>Is it open?</ParameterSummary>
      <ParameterIcon>door-open</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <AllowedValue>
          <Value>0</Value>
          <Label>Closed</Label>
          <Colour>Green</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>1</Value>
          <Label>Open</Label>
          <Colour>Red</Colour>
        </AllowedValue>
      </Integer>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
  </ReferencedControlParameters>
```

```
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.5 FabServer

FAB Server

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>FabServer</DeviceType>
  <DeviceFamily>Fab Server</DeviceFamily>
  <DeviceTypeSummary>A FAB Server</DeviceTypeSummary>
  <DeviceTypeDescription>FAB Server</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>GCXPData</ParameterName>
      <ParameterSummary>ACP127 FAB status via guard</ParameterSummary>
      <RedBlackManaged -/>
      <Connection>
        <Fixed -/>
        <DirectType>GCXP</DirectType>
        <IndirectType>FAB Status</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>ModemData</ParameterName>
      <ParameterSummary>Modem Data</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Sync Serial</DirectType>
        <IndirectType>Modem Data</IndirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>netgo</DriverPath>
```

```
    <DriverOptions>-t FabBServer</DriverOptions>
    <DriverArgumentHelp>
      Specify the fabsever to monitor. Arguments are:
      --p host:port (e.g. localhost:8180)
      --U updatetime (in seconds)
    </DriverArgumentHelp>
  </DeviceDriverInfo>

</AbstractDeviceSpecification>
```

D.6 FireAlarm

An example device which is capable of sending alerts

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>FireAlarm</DeviceType>
  <DeviceFamily>Sensor</DeviceFamily>
  <DeviceTypeSummary>Simple Fire Alarm</DeviceTypeSummary>
  <DeviceTypeDescription>
An example device which is capable of sending alerts
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
   <DeviceStatusParameters>
    <Parameter>
      <ParameterName>FireAlarm</ParameterName>
      <ParameterSummary>Fire alarm active</ParameterSummary>
      <ParameterIcon>fire</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <AllowedValue>
          <Value>0</Value>
          <Label>---</Label>
          <Colour>Green</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>1</Value>
          <Label>Alarm</Label>
          <Colour>Red</Colour>
        </AllowedValue>
      </Integer>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
```

```
  </ReferencedControlParameters>
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.7 FixedMonitoringCamera

A fixed camera that takes repeated stills at configurable intervals

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>FixedMonitoringCamera</DeviceType>
  <DeviceFamily>Camera</DeviceFamily>
  <DeviceTypeSummary>Fixed Monitoring Camera</DeviceTypeSummary>
  <DeviceTypeDescription>
    A fixed camera that takes repeated stills at configurable intervals
  </DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>Photo</ParameterName>
      <ParameterSummary>Interval Photo</ParameterSummary>
      <JPEGPhoto>
        <MaximumSize>8000000</MaximumSize>
      </JPEGPhoto>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Enabled</Ref>
    <Ref>Reset</Ref>
    <Ref>AssociatedDevice</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>PhotoInterval</ParameterName>
      <ParameterSummary>Interval Between Photos</ParameterSummary>
      <Units>Seconds</Units>
      <SetByOperator/>
      <Integer>
        <LowerBound>1</LowerBound>
        <UpperBound>3600</UpperBound>
      </Integer>
    </Parameter>
  </DeviceControlParameters>
```

```
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.8 GenericCrypto

This represents a Crypto device that is not actively monitored. Monitoring Crypto devices is likely to be difficult, this abstract device is likely to be used in real deployments, in order to complete communication chains. A Crypto device that can be monitored would need additional parameters. This device will generally be provisioned red side, as it connects red and black side devices, and red side devices are not visible black side.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>GenericCrypto</DeviceType>
  <DeviceFamily>Crypto</DeviceFamily>
  <DeviceTypeSummary>This is a general purpose Crypto device with sync serial
    interfaces, which is not monitored</DeviceTypeSummary>
  <DeviceTypeDescription>
This represents a  Crypto device that is not actively monitored.

Monitoring Crypto devices is likely to be difficult, this abstract device is
likely to be used in real deployments, in order to complete communication chains.

A Crypto device that can be monitored would need additional parameters.

This device will generally be provisioned red side, as it connects
red and black side devices, and red side devices are not visible black side.

 </DeviceTypeDescription>
  <BoundaryDevice/>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>ModemData</ParameterName>
      <ParameterSummary>Red side link</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <DirectType>Sync Serial</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>BlackSideLink</ParameterName>
```

```
      <ParameterSummary>Black side link</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Sync Serial</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.9 Harrier

This device is Harrier.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>Harrier</DeviceType>
  <DeviceFamily>Web Messaging Server</DeviceFamily>
  <DeviceTypeSummary>Isode Harrier Server</DeviceTypeSummary>
  <DeviceTypeDescription>
This device is Harrier.  -
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>ActivationInfo</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>NumberClients</ParameterName>
      <ParameterSummary>Number of Active clients</ParameterSummary>
      <Integer -/>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>Enabled</Ref>
    <Ref>Reset</Ref>
    <Ref>URL</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>MBox</ParameterName>
      <ParameterSummary></ParameterSummary>
```

```
      <RedBlackManaged -/>
      <Connection>
        <Fixed -/>
        <ConnectTo -/>
        <DirectType>Message Access</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>netgo</DriverPath>
    <DriverOptions>-t Harrier</DriverOptions>
    <DriverArgumentHelp>
      Specify the harrier server to monitor. Arguments are
      --p host:port (e.g., --p localhost:9090)
      --U updatetime (optional, in seconds)
      </DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.10 Icon5066

This device is Icon-5066.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>Icon5066</DeviceType>
  <DeviceFamily>STANAG 5066 Server</DeviceFamily>
  <DeviceTypeSummary>Isode Icon-5066 Server</DeviceTypeSummary>
  <DeviceTypeDescription>This device is Icon-5066.</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>ActivationInfo</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>NumberClients</ParameterName>
      <ParameterSummary>Number of SIS Clients Bound</ParameterSummary>
      <ParameterIcon>users</ParameterIcon>
      <DisplayPriority -/>
      <Integer>
        <LowerBound>0</LowerBound>
        <UpperBound>16</UpperBound>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>FlowOn</ParameterName>
      <ParameterSummary>Flow for SIS Clients</ParameterSummary>
      <ParameterIcon>faucet-drip</ParameterIcon>
      <DisplayPriority -/>
      <Integer>
        <AllowedValue>
```

```
          <Value>0</Value>
          <Label>off</Label>
          <Colour>Orange</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>1</Value>
          <Label>on</Label>
          <Colour>Green</Colour>
        </AllowedValue>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>NodeAddress</ParameterName>
      <ParameterSummary>The 5066 Address of the Node</ParameterSummary>
      <ParameterIcon>server</ParameterIcon>
      <DisplayPriority -/>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>NodeName</ParameterName>
      <ParameterSummary>The name of the node</ParameterSummary>
      <ParameterDescription>The name of the node as reported by the
      Icon5066 server, or &lt;no name&gt; if no name has been set
      </ParameterDescription>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>CertificateSubject</ParameterName>
      <ParameterSummary>HTTPS certificate name</ParameterSummary>
      <ParameterDescription>The subject name of the certificate that
      this Icon5066 Server is using</ParameterDescription>
      <String>
        <MaximumLength>256</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>CertificateExpiry</ParameterName>
      <ParameterSummary>HTTPS certificate expiry</ParameterSummary>
      <ParameterDescription>The date that the server's HTTPS certificate expires</ParameterDescripti
      <DateTime/>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>Enabled</Ref>
    <Ref>URL</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>SISConnection</ParameterName>
      <ParameterSummary>SIS Connection</ParameterSummary>
      <MultiValue>
        <MaximumMembers>16</MaximumMembers>
      </MultiValue>
      <Connection>
        <TCP/>
        <DirectType>SIS</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>ModemControl</ParameterName>
      <ParameterSummary>Modem Control</ParameterSummary>
```

```
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>GCXP</DirectType>
        <IndirectType>Modem Control</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>ModemData</ParameterName>
      <ParameterSummary>Modem Data</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Sync Serial</DirectType>
        <IndirectType>Modem Data</IndirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>icon5066_ctrl</DriverPath>
    <DriverOptions></DriverOptions>
    <DriverArgumentHelp>
      Specify the Icon-5066 server to monitor. Arguments are
      --n &lt;node_address&gt; --p &lt;url&gt;
      --c &lt;string containing key and certificate PEM for client certificate&gt; (optional)
      --U updatetime (optional: in seconds, default 30)
      e.g. --n 10.50.66.0
      --p https://127.0.0.1:4001 --c $1 --U 60
      </DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.11 IconPEP

This is an Icon-PEP Server.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>IconPEP</DeviceType>
  <DeviceFamily>HF-PEP Server</DeviceFamily>
  <DeviceTypeSummary>Isode Icon-PEP Server</DeviceTypeSummary>
  <DeviceTypeDescription>
This is an Icon-PEP Server.
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Enabled</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>StartTime</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>AwaitingArgs</Ref>
  </ReferencedStatusParameters>
```

```
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>TCPCount</ParameterName>
      <ParameterSummary>TCP connections</ParameterSummary>
      <ParameterDescription>Number of active TCP connections</ParameterDescription>
      <ParameterIcon>users</ParameterIcon>
      <DisplayPriority/>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>BytesPerMin</ParameterName>
      <ParameterSummary>Bytes per minute (SIS)</ParameterSummary>
      <ParameterDescription>Traffic level in bytes per minute, measured at SIS interface</ParameterD
      <ParameterIcon>tachometer</ParameterIcon>
      <DisplayPriority/>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>GRECount</ParameterName>
      <ParameterSummary>GRE count</ParameterSummary>
      <ParameterDescription>Number of unique IP+protocol+port pathways at
      GRE interface)</ParameterDescription>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>Label</ParameterName>
      <ParameterSummary>Unit's label</ParameterSummary>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>LastErrorMsg</ParameterName>
      <ParameterSummary>Last error message</ParameterSummary>
      <ParameterDescription>The most recent error message to have been logged</ParameterDescription>
      <String>
        <MaximumLength>128</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>LastErrorTime</ParameterName>
      <ParameterSummary>Last error time</ParameterSummary>
      <ParameterDescription>The time when the most recent error was logged</ParameterDescription>
      <DateTime/>
    </Parameter>
    <Parameter>
      <ParameterName>LastWarningMsg</ParameterName>
      <ParameterSummary>Last warning message</ParameterSummary>
      <ParameterDescription>The most recent warning message to have been logged</ParameterDescriptio
      <String>
        <MaximumLength>128</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>LastWarningTime</ParameterName>
      <ParameterSummary>Last warning time</ParameterSummary>
      <ParameterDescription>The time when the most recent warning was logged</ParameterDescription>
      <DateTime/>
    </Parameter>
    <Parameter>
      <ParameterName>CertificateSubject</ParameterName>
      <ParameterSummary>HTTPS certificate name</ParameterSummary>
      <ParameterDescription>The subject name of the certificate that
      this M-Link Server is using</ParameterDescription>
      <String>
        <MaximumLength>256</MaximumLength>
      </String>
```

```
    </Parameter>
    <Parameter>
      <ParameterName>CertificateExpiry</ParameterName>
      <ParameterSummary>HTTPS certificate expiry</ParameterSummary>
      <ParameterDescription>The date that the server's HTTPS certificate expires</ParameterDescripti
      <DateTime/>
    </Parameter>
  </DeviceStatusParameters>

<ReferencedControlParameters>
    <Ref>DriverArgs</Ref>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>SIS</ParameterName>
      <ParameterSummary>SIS Connection</ParameterSummary>
      <ParameterDescription>
This is the link to Icon-5066 server. The data for this needs to be stored by M-Switch
      </ParameterDescription>
      <Connection>
        <TCP/>
        <ConnectTo/>
        <DirectType>SIS</DirectType>
      </Connection>
    </Parameter>
      <Parameter>
    <ParameterName>Reset</ParameterName>
    <ParameterSummary>Reset Device</ParameterSummary>
    <ParameterDescription>
      Restarts ALL units managed by the Icon-PEP server (not just the
      unit represented by this device).
      Rate control in support of covert channel protection.
      Reset max frequency of 10 minutes.
        </ParameterDescription>
    <Special/>
    <SetByOperator/>
    <RedtoBlackRate>
      <NumberMessagesInPeriod>1</NumberMessagesInPeriod>
      <PeriodLength>600</PeriodLength>
    </RedtoBlackRate>
    <Empty/>
  </Parameter>

  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>iconpep_driver</DriverPath>
    <DriverOptions></DriverOptions>
    <DriverArgumentHelp>Specify the Icon-PEP server to
    monitor. Arguments are
    --a URL the Red/Black server can use to connect to Icon PEP server
    --s &lt;secret auth-token&gt; (use a device secret password for
    this).
    --U updatetime (optional, in seconds)
    --u unit number (optional, default 0) E.g.
    --a https://iconpep.example.net:17636 --U 60 --s $1
    </DriverArgumentHelp>
    <ArgsOverProtocol/>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.12 IconTopoConfig

Icon-Topo supports Mobile Unit mobility between HF Networks. The configuration server supports management update. It is not a direct part of the communication chain and so has no connections defined.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>IconTopoConfig</DeviceType>
  <DeviceFamily>Mobility</DeviceFamily>
  <DeviceTypeSummary>Isode Icon-Topo Configuration Server</DeviceTypeSummary>
  <DeviceTypeDescription>
    Icon-Topo supports Mobile Unit mobility between HF Networks.
    The configuration server supports management update.
It is not a direct part of the communication chain and so has no connections defined.
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>ActivationInfo</Ref>
  </ReferencedStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Enabled</Ref>
    <Ref>Reset</Ref>
  </ReferencedControlParameters>
  <DeviceDriverInfo>
    <DriverPath>netgo</DriverPath>
    <DriverOptions>-t IconTopoConfig</DriverOptions>
    <DriverArgumentHelp>
      Specify the Icon Topo server to monitor. Arguments are
      --p host:port (e.g., --p localhost:17000)
      --U updatetime (optional, in seconds)
      </DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.13 IsodeAudioSwitch

An Audio Switch can be used to switch connections from modems to different radios.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>IsodeAudioSwitch</DeviceType>
  <DeviceFamily>Audio Switch</DeviceFamily>
  <DeviceTypeSummary>Audio Switch</DeviceTypeSummary>
  <DeviceTypeDescription>
    An Audio Switch can be used to switch connections from modems to different radios.
  </DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Reset</Ref>
    <Ref>PlugBoard</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>InboundConnections</ParameterName>
      <ParameterSummary>Inbound Audio Connections List</ParameterSummary>
      <RedBlackManaged/>
      <MultiValue>
        <ReferencedAuxilliaryParameter>
          ConnectToReference
        </ReferencedAuxilliaryParameter>
        <ConnectTo>Outbound Connections</ConnectTo>
        <MaximumMembers>10</MaximumMembers>
      </MultiValue>
      <Connection>
        <Fixed/>
        <DirectType>Audio</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>OutboundConnections</ParameterName>
      <ParameterSummary>Outbound Audio Connections List</ParameterSummary>
      <RedBlackManaged/>
      <MultiValue>
        <MaximumMembers>10</MaximumMembers>
      </MultiValue>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Audio</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.14 IsodeBalancedLoad

To connect a pair of Radios back to back. Passive device. Looks like a PA to the radio.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>IsodeBalancedLoad</DeviceType>
  <DeviceFamily>Balanced Load</DeviceFamily>
  <DeviceTypeSummary>RF Switch</DeviceTypeSummary>
  <DeviceTypeDescription>
To connect a pair of Radios back to back.
Passive device.
Looks like a PA to the radio.
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <ReferencedControlParameters>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>SendParameters</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>InboundConnections</ParameterName>
      <ParameterSummary>Balanced Load Connection List</ParameterSummary>
      <RedBlackManaged/>
      <MultiValue>
        <ReferencedAuxilliaryParameter>ConnectToReference</ReferencedAuxilliaryParameter>
        <MaximumMembers>2</MaximumMembers>
      </MultiValue>
      <Connection>
        <Fixed/>
        <DirectType>Sync Serial</DirectType>
        <IndirectType>PA</IndirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.15 IsodePA

Sits between Radio (or RF Switch) and Antenna

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>IsodePA</DeviceType>
  <DeviceFamily>PA</DeviceFamily>
  <DeviceTypeSummary>Power Amplifier</DeviceTypeSummary>
  <DeviceTypeDescription>
Sits between Radio (or RF Switch) and Antenna
</DeviceTypeDescription>
<DeviceTypeIcon>PAicon</DeviceTypeIcon>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>PowerSupplyVoltage</ParameterName>
      <ParameterSummary>Power Supply Voltage</ParameterSummary>
      <ParameterIcon>plug</ParameterIcon>
      <Units>Volts</Units>
      <DisplayPriority/>
      <Group>Primary</Group>
      <Integer>
        <LowerBound>100</LowerBound>
        <UpperBound>400</UpperBound>
        <AllowedValue>
          <Value>100</Value>
        </AllowedValue>
        <AllowedValue>
          <Value>200</Value>
        </AllowedValue>
        <AllowedValue>
          <Value>400</Value>
        </AllowedValue>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>PowerSupplyConsumption</ParameterName>
      <ParameterSummary> Power Supply Consumption </ParameterSummary>
      <ParameterIcon>bolt</ParameterIcon>
      <Units>Amperes</Units>
      <DisplayPriority/>
      <Group>Primary</Group>
      <Integer>
        <LowerBound>1</LowerBound>
        <UpperBound>1000000</UpperBound>
        <Shift>3</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>Temperature</ParameterName>
      <ParameterSummary>Temperature of Radio</ParameterSummary>
      <Units>Degrees Celsius</Units>
      <Group>Primary</Group>
      <Integer>
        <LowerBound>-20</LowerBound>
        <UpperBound>200</UpperBound>
      </Integer>
```

```
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Reset</Ref>
    <Ref>PowerOff</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>CurrentTransmissionPower</ParameterName>
      <ParameterSummary>Transmission Power</ParameterSummary>
      <ParameterIcon>broadcast-tower</ParameterIcon>
      <Units>dBm</Units>
      <DisplayPriority/>
      <Group>Primary</Group>
      <Integer>
        <LowerBound>-15</LowerBound>
        <UpperBound>20</UpperBound>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>Radio</ParameterName>
      <ParameterSummary>Radio connection</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <DirectType>Sync Serial</DirectType>
        <IndirectType>Radio</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>Antenna</ParameterName>
      <ParameterSummary>Connected Antenna</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Sync Serial</DirectType>
        <IndirectType>Antenna</IndirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.16 IsodeRadio

This models a generic Radio, looking at key target parameters.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>IsodeRadio</DeviceType>
  <DeviceFamily>Radio</DeviceFamily>
  <DeviceTypeSummary>Basic Radio</DeviceTypeSummary>
  <DeviceTypeDescription>
```

```
    This models a generic Radio, looking at key target parameters.
  </DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>ModemType</ParameterName>
      <ParameterSummary>The type of the modem</ParameterSummary>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>VSWR</ParameterName>
      <ParameterSummary>The Forward Voltage Standing Wave Ratio
      </ParameterSummary>
      <ParameterIcon>waveform-path</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <LowerBound>1</LowerBound>
        <UpperBound>1000</UpperBound>
        <Shift>3</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>rvsVSWR</ParameterName>
      <ParameterSummary>The reverse Voltage Standing Wave Ratio
      </ParameterSummary>
      <ParameterIcon>waveform-path</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <LowerBound>1</LowerBound>
        <UpperBound>1000</UpperBound>
        <Shift>3</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>PowerSupplyVoltage</ParameterName>
      <ParameterSummary>Power Supply Voltage</ParameterSummary>
      <Units>Volts</Units>
      <Integer>
        <LowerBound>100</LowerBound>
        <UpperBound>400</UpperBound>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>PowerSupplyConsumption</ParameterName>
      <ParameterSummary>Power Supply Consumption
      </ParameterSummary>
      <Units>Amperes</Units>
      <Integer>
        <LowerBound>1</LowerBound>
        <UpperBound>100000</UpperBound>
        <Interval>1000</Interval>
      </Integer>
```

```
    </Parameter>
    <Parameter>
      <ParameterName>Temperature</ParameterName>
      <ParameterSummary>Temperature of Radio</ParameterSummary>
      <Units>Degrees Celsius</Units>
      <Integer>
        <LowerBound>-20</LowerBound>
        <UpperBound>200</UpperBound>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>SignalLevel</ParameterName>
      <ParameterSummary>Signal Level (Baseband)</ParameterSummary>
      <Units>dBm</Units>
      <Integer>
        <LowerBound>-40</LowerBound>
        <UpperBound>15</UpperBound>
      </Integer>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Reset</Ref>
    <Ref>PowerOff</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>Frequency</ParameterName>
      <ParameterSummary>Radio Frequency</ParameterSummary>
      <ParameterDescription>
        Setting frequency as control parameter -
        allows operator to set frequency.
        If frequency is always controlled by ALE, -
        this would be moved to a status parameter.
        The frequency integer is in kHz, shifted three places
      </ParameterDescription>
      <ParameterIcon>wave-sine</ParameterIcon>
      <Units>MHz</Units>
      <SetByOperator/>
      <DisplayPriority/>
      <Integer>
        <LowerBound>3000</LowerBound>
        <UpperBound>30000</UpperBound>
        <Shift>3</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>TransmissionPower</ParameterName>
      <ParameterSummary>Transmission Power</ParameterSummary>
      <ParameterIcon>broadcast-tower</ParameterIcon>
      <Units>dBm</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>-15</LowerBound>
        <UpperBound>20</UpperBound>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>Modem</ParameterName>
      <ParameterSummary>A modem</ParameterSummary>
      <RedBlackManaged -/>
      <Connection>
        <Fixed/>
        <DirectType>Audio</DirectType>
        <IndirectType>Modem</IndirectType>
```

```
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>Antenna</ParameterName>
      <ParameterSummary>Connected Antenna or PA</ParameterSummary>
      <!-- <RedBlackManaged/> --->
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Sync Serial</DirectType>
        <IndirectType>PA</IndirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.17 NarrowbandALERadioModem

Narrowband Radio Modem with ALE

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>NarrowbandALERadioModem</DeviceType>
  <DeviceFamily>Modem</DeviceFamily>
  <DeviceTypeSummary>Narrowband ALE Radio Modem</DeviceTypeSummary>
  <DeviceTypeDescription>Narrowband Radio Modem with ALE</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>AwaitingArgs</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>ModemType</ParameterName>
      <ParameterSummary>The type of the modem</ParameterSummary>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>VSWR</ParameterName>
      <ParameterSummary>The forward Voltage Standing Wave Ratio
      </ParameterSummary>
      <ParameterIcon>waveform-path</ParameterIcon>
      <DisplayPriority/>
      <Integer>
```

```
        <LowerBound>1</LowerBound>
        <UpperBound>1000</UpperBound>
        <Shift>3</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>rvsVSWR</ParameterName>
      <ParameterSummary>The reverse Voltage Standing Wave Ratio
      </ParameterSummary>
      <ParameterIcon>waveform-path</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <LowerBound>1</LowerBound>
        <UpperBound>1000</UpperBound>
        <Shift>3</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>TransmissionPower</ParameterName>
      <ParameterSummary>Transmission Power</ParameterSummary>
      <ParameterIcon>broadcast-tower</ParameterIcon>
      <Units>dBm</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>-15</LowerBound>
        <UpperBound>20</UpperBound>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>WaveForm</ParameterName>
      <ParameterSummary>Current Waveform</ParameterSummary>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>Interleaver</ParameterName>
      <ParameterSummary>Interleaver</ParameterSummary>
      <Enumerated>
        <EnumValue>Z</EnumValue>
        <EnumValue>US</EnumValue>
        <EnumValue>VS</EnumValue>
        <EnumValue>S</EnumValue>
        <EnumValue>M</EnumValue>
        <EnumValue>L</EnumValue>
        <EnumValue>VL</EnumValue>
      </Enumerated>
    </Parameter>
    <Parameter>
      <ParameterName>Speed</ParameterName>
      <ParameterSummary>Transmission Speed</ParameterSummary>
      <ParameterIcon>tachometer-alt</ParameterIcon>
      <Units>bps</Units>
      <DisplayPriority/>
      <Integer>
        <AllowedValue><Value>75</Value></AllowedValue>
        <AllowedValue><Value>150</Value></AllowedValue>
        <AllowedValue><Value>300</Value></AllowedValue>
        <AllowedValue><Value>600</Value></AllowedValue>
        <AllowedValue><Value>1200</Value></AllowedValue>
        <AllowedValue><Value>2400</Value></AllowedValue>
        <AllowedValue><Value>3200</Value></AllowedValue>
        <AllowedValue><Value>4800</Value></AllowedValue>
        <AllowedValue><Value>8000</Value></AllowedValue>
        <AllowedValue><Value>9600</Value></AllowedValue>
      </Integer>
  </Parameter>
```

```
    <Parameter>
      <ParameterName>AleType</ParameterName>
      <ParameterSummary>Type of ALE Network</ParameterSummary>
      <Enumerated>
        <EnumValue>2G</EnumValue>
        <EnumValue>3G</EnumValue>
        <EnumValue>4G</EnumValue>
      </Enumerated>
    </Parameter>
    <Parameter>
      <ParameterName>AlePeer</ParameterName>
      <ParameterSummary>Peer ALE Address</ParameterSummary>
      <ParameterIcon>address-card</ParameterIcon>
      <DisplayPriority/>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>AleState</ParameterName>
      <ParameterSummary>ALE State</ParameterSummary>
      <ParameterIcon>satellite-dish</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <AllowedValue>
          <Value>0</Value>
          <Label>No ALE</Label>
        </AllowedValue>
        <AllowedValue>
          <Value>1</Value>
          <Label>Scanning</Label>
          <Colour>Blue</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>2</Value>
          <Label>Linking</Label>
          <Colour>Orange</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>3</Value>
          <Label>Sounding</Label>
          <Colour>Purple</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>4</Value>
          <Label>LNK-Init (Linked as Initiator)</Label>
          <Colour>Green</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>5</Value>
          <Label>LNK-Res (Linked as Responder)</Label>
          <Colour>Green</Colour>
        </AllowedValue>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>RadioTxFrequency</ParameterName>
      <ParameterSummary>Radio Tx Frequency</ParameterSummary>
      <ParameterIcon>wave-sine</ParameterIcon>
      <Units>MHz</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>3000</LowerBound>
        <UpperBound>29999</UpperBound>
        <Shift>6</Shift>
      </Integer>
    </Parameter>
```

```
    <Parameter>
      <ParameterName>RadioRxFrequency</ParameterName>
      <ParameterSummary>Radio Rx Frequency</ParameterSummary>
      <ParameterIcon>wave-sine fa-flip-vertical</ParameterIcon>
      <Units>MHz</Units>
      <DisplayPriority -/>
      <Integer>
        <LowerBound>3000</LowerBound>
        <UpperBound>29999</UpperBound>
        <Shift>6</Shift>
      </Integer>
    </Parameter>
  <Parameter>
      <ParameterName>SNR</ParameterName>
      <ParameterSummary>SNR</ParameterSummary>
      <ParameterIcon>waveform</ParameterIcon>
      <Units>dB</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>-20</LowerBound>
        <UpperBound>60</UpperBound>  -
      </Integer>
    </Parameter>
  <Parameter>
      <ParameterName>AleAttempts</ParameterName>
      <ParameterSummary>ALE Connection Attempts</ParameterSummary>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>StateTx</ParameterName>
      <ParameterSummary>Tx transmission state</ParameterSummary>
      <ParameterIcon>cloud-upload</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <AllowedValue>
          <Value>1</Value>
          <Label>Transmit</Label>
          <Colour>Green</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>0</Value>
          <Label>Not Transmit</Label>
          <Colour>#B0B0B0</Colour>
        </AllowedValue>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>StateRx</ParameterName>
      <ParameterSummary>Rx transmission state</ParameterSummary>
      <ParameterIcon>cloud-download</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <AllowedValue>
          <Value>1</Value>
          <Label>Receive</Label>
          <Colour>Green</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>0</Value>
          <Label>Not Receive</Label>
          <Colour>#B0B0B0</Colour>
        </AllowedValue>
      </Integer>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
```

```
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Enabled</Ref>
    <Ref>DriverArgs</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>ModemData</ParameterName>
      <ParameterSummary>Modem Data</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <DirectType>Sync Serial</DirectType>
        <IndirectType>Modem Data</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>ModemControl</ParameterName>
      <ParameterSummary>Modem Control</ParameterSummary>
      <Connection>
        <Fixed/>
        <DirectType>GCXP</DirectType>
        <IndirectType>Modem Control</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>Antenna</ParameterName>
      <ParameterSummary>Connected Antenna or PA</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>RF</DirectType>
        <IndirectType>PA</IndirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>modem_ctrl</DriverPath>
    <DriverOptions>-t a</DriverOptions>
    <DriverArgumentHelp>
      Specify the modem to monitor. Arguments are
      --n &lt;S5066 node address&gt;
      --p &lt;URL of Icon5066 server&gt;
      --m &lt;modem_type&gt; (tx, rx or single; default single)
      --c &lt;string containing key and certificate PEM for client certificate&gt; (optional)
      --U &lt;update time&gt; (optional: in seconds, default 30)
      e.g. --n 10.44.0.1 --p https://icon5066.example.net:4001 --m rx --U 60
    </DriverArgumentHelp>
  <ArgsOverProtocol/>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.18 NarrowbandRadioModem

Narrowband Radio Modem without ALE

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>NarrowbandRadioModem</DeviceType>
```

```
  <DeviceFamily>Modem</DeviceFamily>
  <DeviceTypeSummary>Narrowband Radio Modem</DeviceTypeSummary>
  <DeviceTypeDescription>Narrowband Radio Modem without ALE</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>AwaitingArgs</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>ModemType</ParameterName>
      <ParameterSummary>The type of the modem</ParameterSummary>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>VSWR</ParameterName>
      <ParameterSummary>The forward Voltage Standing Wave Ratio
      </ParameterSummary>
      <ParameterIcon>waveform-path</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <LowerBound>1</LowerBound>
        <UpperBound>1000</UpperBound>
        <Shift>3</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>rvsVSWR</ParameterName>
      <ParameterSummary>The reverse Voltage Standing Wave Ratio
      </ParameterSummary>
      <ParameterIcon>waveform-path</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <LowerBound>1</LowerBound>
        <UpperBound>1000</UpperBound>
        <Shift>3</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>TransmissionPower</ParameterName>
      <ParameterSummary>Transmission Power</ParameterSummary>
      <ParameterIcon>broadcast-tower</ParameterIcon>
      <Units>dBm</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>-15</LowerBound>
        <UpperBound>20</UpperBound>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>WaveForm</ParameterName>
      <ParameterSummary>Current Waveform</ParameterSummary>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
```

```
    </Parameter>
    <Parameter>
      <ParameterName>Interleaver</ParameterName>
      <ParameterSummary>Interleaver</ParameterSummary>
      <Enumerated>
        <EnumValue>Z</EnumValue>
        <EnumValue>US</EnumValue>
        <EnumValue>VS</EnumValue>
        <EnumValue>S</EnumValue>
        <EnumValue>M</EnumValue>
        <EnumValue>L</EnumValue>
        <EnumValue>VL</EnumValue>
      </Enumerated>
    </Parameter>
    <Parameter>
      <ParameterName>Speed</ParameterName>
      <ParameterSummary>Transmission Speed</ParameterSummary>
      <ParameterIcon>tachometer-alt</ParameterIcon>
      <Units>bps</Units>
      <DisplayPriority/>
      <Integer>
        <AllowedValue><Value>75</Value></AllowedValue>
        <AllowedValue><Value>150</Value></AllowedValue>
        <AllowedValue><Value>300</Value></AllowedValue>
        <AllowedValue><Value>600</Value></AllowedValue>
        <AllowedValue><Value>1200</Value></AllowedValue>
        <AllowedValue><Value>2400</Value></AllowedValue>
        <AllowedValue><Value>3200</Value></AllowedValue>
        <AllowedValue><Value>4800</Value></AllowedValue>
        <AllowedValue><Value>8000</Value></AllowedValue>
        <AllowedValue><Value>9600</Value></AllowedValue>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>RadioTxFrequency</ParameterName>
      <ParameterSummary>Radio Tx Frequency</ParameterSummary>
      <ParameterIcon>wave-sine</ParameterIcon>
      <Units>MHz</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>3000</LowerBound>
        <UpperBound>29999</UpperBound>
        <Shift>6</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>RadioRxFrequency</ParameterName>
      <ParameterSummary>Radio Rx Frequency</ParameterSummary>
      <Units>MHz</Units>
      <Integer>
        <LowerBound>3000</LowerBound>
        <UpperBound>29999</UpperBound>
        <Shift>6</Shift>
      </Integer>
    </Parameter>
  <Parameter>
      <ParameterName>SNR</ParameterName>
      <ParameterSummary>SNR</ParameterSummary>
      <ParameterIcon>waveform</ParameterIcon>
      <Units>dB</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>-20</LowerBound>
        <UpperBound>60</UpperBound>  -
      </Integer>
    </Parameter>
   <Parameter>
```

```
    <ParameterName>StateTx</ParameterName>
    <ParameterSummary>Tx transmission state</ParameterSummary>
    <ParameterIcon>cloud-upload</ParameterIcon>
    <DisplayPriority/>
    <Integer>
      <AllowedValue>
        <Value>1</Value>
        <Label>Transmit</Label>
        <Colour>Green</Colour>
      </AllowedValue>
      <AllowedValue>
        <Value>0</Value>
        <Label>Not Transmit</Label>
        <Colour>#B0B0B0</Colour>
      </AllowedValue>
    </Integer>
  </Parameter>
  <Parameter>
    <ParameterName>StateRx</ParameterName>
    <ParameterSummary>Rx transmission state</ParameterSummary>
    <ParameterIcon>cloud-download</ParameterIcon>
    <DisplayPriority/>
    <Integer>
      <AllowedValue>
        <Value>1</Value>
        <Label>Receive</Label>
        <Colour>Green</Colour>
      </AllowedValue>
      <AllowedValue>
        <Value>0</Value>
        <Label>Not Receive</Label>
        <Colour>#B0B0B0</Colour>
      </AllowedValue>
    </Integer>
  </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Enabled</Ref>
    <Ref>DriverArgs</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>ModemData</ParameterName>
      <ParameterSummary>Modem Data</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <DirectType>Sync Serial</DirectType>
        <IndirectType>Modem Data</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>ModemControl</ParameterName>
      <ParameterSummary>Modem Control</ParameterSummary>
      <Connection>
        <Fixed/>
        <DirectType>GCXP</DirectType>
        <IndirectType>Modem Control</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>Antenna</ParameterName>
      <ParameterSummary>Connected Antenna or PA</ParameterSummary>
      <RedBlackManaged/>
```

```
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>RF</DirectType>
        <IndirectType>PA</IndirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>modem_ctrl</DriverPath>
    <DriverOptions>-t n</DriverOptions>
    <DriverArgumentHelp>
      Specify the modem to monitor. Arguments are
      --n &lt;S5066 node address&gt;
      --p &lt;URL of Icon5066 server&gt;
      --m &lt;modem_type&gt; (tx, rx or single; default single)
      --c &lt;string containing key and certificate PEM for client certificate&gt; (optional)
      --U &lt;update time&gt; (optional: in seconds, default 30)
      e.g. --n 10.44.0.1 --p https://icon5066.example.net:4001 --m rx --U 60
    </DriverArgumentHelp>
  <ArgsOverProtocol/>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.19 WidebandRadioModem

Wideband Radion Modem with ALE

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>WidebandRadioModem</DeviceType>
  <DeviceFamily>Modem</DeviceFamily>
  <DeviceTypeSummary>Wideband Radio Modem</DeviceTypeSummary>
  <DeviceTypeDescription>Wideband Radion Modem with ALE</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>AwaitingArgs</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>ModemType</ParameterName>
      <ParameterSummary>The type of the modem</ParameterSummary>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>ModemType</ParameterName>
      <ParameterSummary>The type of the modem</ParameterSummary>
```

```
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>VSWR</ParameterName>
      <ParameterSummary>The forward Voltage Standing Wave Ratio
      </ParameterSummary>
      <ParameterIcon>waveform-path</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <LowerBound>1</LowerBound>
        <UpperBound>1000</UpperBound>
        <Shift>3</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>rvsVSWR</ParameterName>
      <ParameterSummary>The reverse Voltage Standing Wave Ratio
      </ParameterSummary>
      <ParameterIcon>waveform-path</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <LowerBound>1</LowerBound>
        <UpperBound>1000</UpperBound>
        <Shift>3</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>TransmissionPower</ParameterName>
      <ParameterSummary>Transmission Power</ParameterSummary>
      <ParameterIcon>broadcast-tower</ParameterIcon>
      <Units>dBm</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>-15</LowerBound>
        <UpperBound>20</UpperBound>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>WaveForm</ParameterName>
      <ParameterSummary>Current Waveform</ParameterSummary>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>Interleaver</ParameterName>
      <ParameterSummary>Interleaver</ParameterSummary>
      <Enumerated>
        <EnumValue>Z</EnumValue>
        <EnumValue>US</EnumValue>
        <EnumValue>VS</EnumValue>
        <EnumValue>S</EnumValue>
        <EnumValue>M</EnumValue>
        <EnumValue>L</EnumValue>
        <EnumValue>VL</EnumValue>
      </Enumerated>
    </Parameter>
    <Parameter>
      <ParameterName>Speed</ParameterName>
      <ParameterSummary>Transmission Speed</ParameterSummary>
      <ParameterIcon>tachometer-alt</ParameterIcon>
      <Units>bps</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>75</LowerBound>
```

```
        <UpperBound>240000</UpperBound>
        <AllowedValue><Value>75</Value></AllowedValue>
        <AllowedValue><Value>150</Value></AllowedValue>
        <AllowedValue><Value>300</Value></AllowedValue>
        <AllowedValue><Value>600</Value></AllowedValue>
        <AllowedValue><Value>1200</Value></AllowedValue>
        <AllowedValue><Value>2400</Value></AllowedValue>
        <AllowedValue><Value>4800</Value></AllowedValue>
        <AllowedValue><Value>6400</Value></AllowedValue>
        <AllowedValue><Value>8000</Value></AllowedValue>
        <AllowedValue><Value>9600</Value></AllowedValue>
        <AllowedValue><Value>19200</Value></AllowedValue>
        <AllowedValue><Value>57600</Value></AllowedValue>
        <AllowedValue><Value>240000</Value></AllowedValue>
      </Integer>
  </Parameter>
    <Parameter>
      <ParameterName>AleType</ParameterName>
      <ParameterSummary>Type of ALE Network</ParameterSummary>
      <Enumerated>
        <EnumValue>2G</EnumValue>
        <EnumValue>3G</EnumValue>
        <EnumValue>4G</EnumValue>
      </Enumerated>
    </Parameter>
    <Parameter>
      <ParameterName>AlePeer</ParameterName>
      <ParameterSummary>Peer ALE Address</ParameterSummary>
      <ParameterIcon>address-card</ParameterIcon>
      <DisplayPriority/>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>AleState</ParameterName>
      <ParameterSummary>ALE State</ParameterSummary>
      <ParameterIcon>satellite-dish</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <AllowedValue>
          <Value>0</Value>
          <Label>No ALE</Label>
        </AllowedValue>
        <AllowedValue>
          <Value>1</Value>
          <Label>Scanning</Label>
          <Colour>Blue</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>2</Value>
          <Label>Linking</Label>
          <Colour>Orange</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>3</Value>
          <Label>Sounding</Label>
          <Colour>Purple</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>4</Value>
          <Label>LNK-Init (Linked as Initiator)</Label>
          <Colour>Green</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>5</Value>
          <Label>LNK-Res (Linked as Responder)</Label>
```

```
          <Colour>Green</Colour>
        </AllowedValue>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>AleTxBW</ParameterName>
      <ParameterSummary>ALE Tx BW</ParameterSummary>
      <ParameterIcon>upload</ParameterIcon>
      <Units>kHz</Units>
      <DisplayPriority/>
      <Enumerated>
        <EnumValue>3</EnumValue>
        <EnumValue>6</EnumValue>
        <EnumValue>9</EnumValue>
        <EnumValue>12</EnumValue>
        <EnumValue>15</EnumValue>
        <EnumValue>18</EnumValue>
        <EnumValue>24</EnumValue>
        <EnumValue>30</EnumValue>
        <EnumValue>36</EnumValue>
        <EnumValue>42</EnumValue>
        <EnumValue>48</EnumValue>
      </Enumerated>
    </Parameter>
    <Parameter>
      <ParameterName>AleRxBW</ParameterName>
      <ParameterSummary>ALE Rx BW</ParameterSummary>
      <ParameterIcon>download</ParameterIcon>
      <Units>kHz</Units>
      <DisplayPriority/>
      <Enumerated>
        <EnumValue>3</EnumValue>
        <EnumValue>6</EnumValue>
        <EnumValue>9</EnumValue>
        <EnumValue>12</EnumValue>
        <EnumValue>15</EnumValue>
        <EnumValue>18</EnumValue>
        <EnumValue>24</EnumValue>
        <EnumValue>30</EnumValue>
        <EnumValue>36</EnumValue>
        <EnumValue>42</EnumValue>
        <EnumValue>48</EnumValue>
      </Enumerated>
    </Parameter>
    <Parameter>
      <ParameterName>RadioTxFrequency</ParameterName>
      <ParameterSummary>Radio Tx Frequency</ParameterSummary>
      <ParameterIcon>wave-sine</ParameterIcon>
      <Units>MHz</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>3000</LowerBound>
        <UpperBound>29999</UpperBound>
        <Shift>6</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>RadioRxFrequency</ParameterName>
      <ParameterSummary>Radio Rx Frequency</ParameterSummary>
      <Units>MHz</Units>
      <Integer>
        <LowerBound>3000</LowerBound>
        <UpperBound>29999</UpperBound>
        <Shift>6</Shift>
      </Integer>
    </Parameter>
  <Parameter>
```

```
      <ParameterName>SNR</ParameterName>
      <ParameterSummary>SNR</ParameterSummary>
      <ParameterIcon>waveform</ParameterIcon>
      <Units>dB</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>-20</LowerBound>
        <UpperBound>60</UpperBound>  -
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>AleAttempts</ParameterName>
      <ParameterSummary>ALE Connection Attempts</ParameterSummary>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>StateTx</ParameterName>
      <ParameterSummary>Tx transmission state</ParameterSummary>
      <ParameterIcon>cloud-upload</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <AllowedValue>
          <Value>1</Value>
          <Label>Transmit</Label>
          <Colour>Green</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>0</Value>
          <Label>Not Transmit</Label>
          <Colour>#B0B0B0</Colour>
        </AllowedValue>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>StateRx</ParameterName>
      <ParameterSummary>Rx transmission state</ParameterSummary>
      <ParameterIcon>cloud-download</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <AllowedValue>
          <Value>1</Value>
          <Label>Receive</Label>
          <Colour>Green</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>0</Value>
          <Label>Not Receive</Label>
          <Colour>#B0B0B0</Colour>
        </AllowedValue>
      </Integer>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Enabled</Ref>
    <Ref>DriverArgs</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>ModemData</ParameterName>
      <ParameterSummary>Modem Data</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <DirectType>Sync Serial</DirectType>
```

```
        <IndirectType>Modem Data</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>ModemControl</ParameterName>
      <ParameterSummary>Modem Control</ParameterSummary>
      <Connection>
        <Fixed/>
        <DirectType>GCXP</DirectType>
        <IndirectType>Modem Control</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>Antenna</ParameterName>
      <ParameterSummary>Connected Antenna or PA</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>RF</DirectType>
        <IndirectType>PA</IndirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>modem_ctrl</DriverPath>
    <DriverOptions>-t w</DriverOptions>
    <DriverArgumentHelp>
      Specify the modem to monitor. Arguments are
      --n &lt;S5066 node address&gt;
      --p &lt;URL of Icon5066 server&gt;
      --m &lt;modem_type&gt; (tx, rx or single; default single)
      --c &lt;string containing key and certificate PEM for client certificate&gt; (optional)
      --U &lt;update time&gt; (optional: in seconds, default 30)
      e.g. --n 10.44.0.1 --p https://icon5066.example.net:4001 --m tx --U 60
    </DriverArgumentHelp>
  <ArgsOverProtocol/>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.20 IsodeRFSwitch

An RF Switch can be used to switch connections from Radios to Antennae.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>IsodeRFSwitch</DeviceType>
  <DeviceFamily>RF Switch</DeviceFamily>
  <DeviceTypeSummary>RF Switch</DeviceTypeSummary>
  <DeviceTypeDescription>
    An RF Switch can be used to switch connections from Radios to Antennae.
  </DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
```

```
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>PlugBoard</Ref>
  </ReferencedStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Reset</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>InboundConnections</ParameterName>
      <ParameterSummary>Inbound RF Connections List</ParameterSummary>
      <RedBlackManaged/>
      <MultiValue>
        <ReferencedAuxilliaryParameter>
          ConnectToReference
        </ReferencedAuxilliaryParameter>
        <ConnectTo>Outbound Connections</ConnectTo>
        <MaximumMembers>10</MaximumMembers>
      </MultiValue>
      <Connection>
        <Fixed/>
        <DirectType>Sync Serial</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>OutboundConnections</ParameterName>
      <ParameterSummary>Outbound RF Connections List</ParameterSummary>
      <RedBlackManaged/>
      <MultiValue>
        <MaximumMembers>10</MaximumMembers>
      </MultiValue>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Sync Serial</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.21 IsodeSyncSerialSwitch

A Sync Serial Switch can be used to switch connections from crypto boxes to different modems.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>IsodeSyncSerialSwitch</DeviceType>
  <DeviceFamily>Sync Serial Switch</DeviceFamily>
  <DeviceTypeSummary>Sync Serial Switch</DeviceTypeSummary>
  <DeviceTypeDescription>
    A Sync Serial Switch can be used to switch connections from crypto boxes to different
```

```
    modems.
  </DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>PlugBoard</Ref>
  </ReferencedStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Reset</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>InboundConnections</ParameterName>
      <ParameterSummary>Inbound Sync Serial Connections List</ParameterSummary>
      <RedBlackManaged/>
      <MultiValue>
        <ReferencedAuxilliaryParameter>
          ConnectToReference
        </ReferencedAuxilliaryParameter>
        <ConnectTo>Outbound Connections</ConnectTo>
        <MaximumMembers>10</MaximumMembers>
      </MultiValue>
      <Connection>
        <Fixed/>
        <DirectType>Sync Serial</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>OutboundConnections</ParameterName>
      <ParameterSummary>Outbound Sync Serial Connections List</ParameterSummary>
      <RedBlackManaged/>
      <MultiValue>
        <MaximumMembers>10</MaximumMembers>
      </MultiValue>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Sync Serial</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.22 NarrowbandALEModem

Narrowband Modem with ALE

```xml
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>NarrowbandALEModem</DeviceType>
  <DeviceFamily>Modem</DeviceFamily>
  <DeviceTypeSummary>Narrowband ALE Modem</DeviceTypeSummary>
  <DeviceTypeDescription>Narrowband Modem with ALE</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>AwaitingArgs</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>WaveForm</ParameterName>
      <ParameterSummary>Current Waveform</ParameterSummary>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>Interleaver</ParameterName>
      <ParameterSummary>Interleaver</ParameterSummary>
      <Enumerated>
        <EnumValue>Z</EnumValue>
        <EnumValue>US</EnumValue>
        <EnumValue>VS</EnumValue>
        <EnumValue>S</EnumValue>
        <EnumValue>M</EnumValue>
        <EnumValue>L</EnumValue>
        <EnumValue>VL</EnumValue>
      </Enumerated>
    </Parameter>
    <Parameter>
      <ParameterName>Speed</ParameterName>
      <ParameterSummary>Transmission Speed</ParameterSummary>
      <ParameterIcon>tachometer-alt</ParameterIcon>
      <Units>bps</Units>
      <DisplayPriority/>
      <Integer>
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        <AllowedValue><Value>150</Value></AllowedValue>
        <AllowedValue><Value>300</Value></AllowedValue>
        <AllowedValue><Value>600</Value></AllowedValue>
        <AllowedValue><Value>1200</Value></AllowedValue>
        <AllowedValue><Value>2400</Value></AllowedValue>
        <AllowedValue><Value>3200</Value></AllowedValue>
        <AllowedValue><Value>4800</Value></AllowedValue>
        <AllowedValue><Value>8000</Value></AllowedValue>
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      </Integer>
  </Parameter>
    <Parameter>
      <ParameterName>AleType</ParameterName>
      <ParameterSummary>Type of ALE Network</ParameterSummary>
      <Enumerated>
```

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        <EnumValue>2G</EnumValue>
        <EnumValue>3G</EnumValue>
        <EnumValue>4G</EnumValue>
      </Enumerated>
    </Parameter>
    <Parameter>
      <ParameterName>AlePeer</ParameterName>
      <ParameterSummary>Peer ALE Address</ParameterSummary>
      <ParameterIcon>address-card</ParameterIcon>
      <DisplayPriority/>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>AleState</ParameterName>
      <ParameterSummary>ALE State</ParameterSummary>
      <ParameterIcon>satellite-dish</ParameterIcon>
      <DisplayPriority/>
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        <AllowedValue>
          <Value>0</Value>
          <Label>No ALE</Label>
        </AllowedValue>
        <AllowedValue>
          <Value>1</Value>
          <Label>Scanning</Label>
          <Colour>Blue</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>2</Value>
          <Label>Linking</Label>
          <Colour>Orange</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>3</Value>
          <Label>Sounding</Label>
          <Colour>Purple</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>4</Value>
          <Label>LNK-Init (Linked as Initiator)</Label>
          <Colour>Green</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>5</Value>
          <Label>LNK-Res (Linked as Responder)</Label>
          <Colour>Green</Colour>
        </AllowedValue>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>RadioTxFrequency</ParameterName>
      <ParameterSummary>Radio Tx Frequency</ParameterSummary>
      <ParameterIcon>wave-sine</ParameterIcon>
      <Units>MHz</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>3000</LowerBound>
        <UpperBound>29999</UpperBound>
        <Shift>6</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>RadioRxFrequency</ParameterName>
      <ParameterSummary>Radio Rx Frequency</ParameterSummary>
      <ParameterIcon>wave-sine fa-flip-vertical</ParameterIcon>
```

```
      <Units>MHz</Units>
      <DisplayPriority -/>
      <Integer>
        <LowerBound>3000</LowerBound>
        <UpperBound>29999</UpperBound>
        <Shift>6</Shift>
      </Integer>
    </Parameter>
  <Parameter>
      <ParameterName>SNR</ParameterName>
      <ParameterSummary>SNR</ParameterSummary>
      <ParameterIcon>waveform</ParameterIcon>
      <Units>dB</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>-20</LowerBound>
        <UpperBound>60</UpperBound>  -
      </Integer>
    </Parameter>
  <Parameter>
      <ParameterName>AleAttempts</ParameterName>
      <ParameterSummary>ALE Connection Attempts</ParameterSummary>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>StateTx</ParameterName>
      <ParameterSummary>Tx transmission state</ParameterSummary>
      <ParameterIcon>cloud-upload</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <AllowedValue>
          <Value>1</Value>
          <Label>Transmit</Label>
          <Colour>Green</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>0</Value>
          <Label>Not Transmit</Label>
          <Colour>#B0B0B0</Colour>
        </AllowedValue>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>StateRx</ParameterName>
      <ParameterSummary>Rx transmission state</ParameterSummary>
      <ParameterIcon>cloud-download</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <AllowedValue>
          <Value>1</Value>
          <Label>Receive</Label>
          <Colour>Green</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>0</Value>
          <Label>Not Receive</Label>
          <Colour>#B0B0B0</Colour>
        </AllowedValue>
      </Integer>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Enabled</Ref>
    <Ref>DriverArgs</Ref>
```

```
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>ModemData</ParameterName>
      <ParameterSummary>Modem Data</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <DirectType>Sync Serial</DirectType>
        <IndirectType>Modem Data</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>ModemControl</ParameterName>
      <ParameterSummary>Modem Control</ParameterSummary>
      <Connection>
        <Fixed/>
        <DirectType>GCXP</DirectType>
        <IndirectType>Modem Control</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>PrimaryRadio</ParameterName>
      <ParameterSummary>Primary Radio (Rx if two radios)</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Audio</DirectType>
        <IndirectType>Radio</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>SecondRadio</ParameterName>
      <ParameterSummary>Optional Second Radio (Tx)</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Audio</DirectType>
        <IndirectType>Radio</IndirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>modem_ctrl</DriverPath>
    <DriverOptions>-t a</DriverOptions>
    <DriverArgumentHelp>
      Specify the modem to monitor. Arguments are
      --n &lt;S5066 node address&gt;
      --p &lt;URL of Icon5066 server&gt;
      --m &lt;modem_type&gt; (tx, rx or single; default single)
      --c &lt;string containing key and certificate PEM for client certificate&gt; (optional)
      --U &lt;update time&gt; (optional: in seconds, default 30)
      e.g. --n 10.44.0.1 --p https://icon5066.example.net:4001 --m rx --U 60
    </DriverArgumentHelp>
  <ArgsOverProtocol/>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.23 NarrowbandModem

Narrowband Modem without ALE


```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>NarrowbandModem</DeviceType>
  <DeviceFamily>Modem</DeviceFamily>
  <DeviceTypeSummary>Narrowband Modem</DeviceTypeSummary>
  <DeviceTypeDescription>Narrowband Modem without ALE</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>AwaitingArgs</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>WaveForm</ParameterName>
      <ParameterSummary>Current Waveform</ParameterSummary>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>Interleaver</ParameterName>
      <ParameterSummary>Interleaver</ParameterSummary>
      <Enumerated>
        <EnumValue>Z</EnumValue>
        <EnumValue>US</EnumValue>
        <EnumValue>VS</EnumValue>
        <EnumValue>S</EnumValue>
        <EnumValue>M</EnumValue>
        <EnumValue>L</EnumValue>
        <EnumValue>VL</EnumValue>
      </Enumerated>
    </Parameter>
    <Parameter>
      <ParameterName>Speed</ParameterName>
      <ParameterSummary>Transmission Speed</ParameterSummary>
      <ParameterIcon>tachometer-alt</ParameterIcon>
      <Units>bps</Units>
      <DisplayPriority/>
      <Integer>
        <AllowedValue><Value>75</Value></AllowedValue>
        <AllowedValue><Value>150</Value></AllowedValue>
        <AllowedValue><Value>300</Value></AllowedValue>
        <AllowedValue><Value>600</Value></AllowedValue>
        <AllowedValue><Value>1200</Value></AllowedValue>
        <AllowedValue><Value>2400</Value></AllowedValue>
        <AllowedValue><Value>3200</Value></AllowedValue>
```

```
        <AllowedValue><Value>4800</Value></AllowedValue>
        <AllowedValue><Value>8000</Value></AllowedValue>
        <AllowedValue><Value>9600</Value></AllowedValue>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>RadioTxFrequency</ParameterName>
      <ParameterSummary>Radio Tx Frequency</ParameterSummary>
      <ParameterIcon>wave-sine</ParameterIcon>
      <Units>MHz</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>3000</LowerBound>
        <UpperBound>29999</UpperBound>
        <Shift>6</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>RadioRxFrequency</ParameterName>
      <ParameterSummary>Radio Rx Frequency</ParameterSummary>
      <Units>MHz</Units>
      <Integer>
        <LowerBound>3000</LowerBound>
        <UpperBound>29999</UpperBound>
        <Shift>6</Shift>
      </Integer>
    </Parameter>
  <Parameter>
      <ParameterName>SNR</ParameterName>
      <ParameterSummary>SNR</ParameterSummary>
      <ParameterIcon>waveform</ParameterIcon>
      <Units>dB</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>-20</LowerBound>
        <UpperBound>60</UpperBound>  -
      </Integer>
    </Parameter>
   <Parameter>
    <ParameterName>StateTx</ParameterName>
    <ParameterSummary>Tx transmission state</ParameterSummary>
    <ParameterIcon>cloud-upload</ParameterIcon>
    <DisplayPriority/>
    <Integer>
      <AllowedValue>
        <Value>1</Value>
        <Label>Transmit</Label>
        <Colour>Green</Colour>
      </AllowedValue>
      <AllowedValue>
        <Value>0</Value>
        <Label>Not Transmit</Label>
        <Colour>#B0B0B0</Colour>
      </AllowedValue>
    </Integer>
   </Parameter>
   <Parameter>
    <ParameterName>StateRx</ParameterName>
    <ParameterSummary>Rx transmission state</ParameterSummary>
    <ParameterIcon>cloud-download</ParameterIcon>
    <DisplayPriority/>
    <Integer>
      <AllowedValue>
        <Value>1</Value>
        <Label>Receive</Label>
        <Colour>Green</Colour>
      </AllowedValue>
```

```
      <AllowedValue>
        <Value>0</Value>
        <Label>Not Receive</Label>
        <Colour>#B0B0B0</Colour>
      </AllowedValue>
    </Integer>
  </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Enabled</Ref>
    <Ref>DriverArgs</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>ModemData</ParameterName>
      <ParameterSummary>Modem Data</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <DirectType>Sync Serial</DirectType>
        <IndirectType>Modem Data</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>ModemControl</ParameterName>
      <ParameterSummary>Modem Control</ParameterSummary>
      <Connection>
        <Fixed/>
        <DirectType>GCXP</DirectType>
        <IndirectType>Modem Control</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>PrimaryRadio</ParameterName>
      <ParameterSummary>Primary Radio (Rx if two radios)</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Audio</DirectType>
        <IndirectType>Radio</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>SecondRadio</ParameterName>
      <ParameterSummary>Optional Second Radio (Tx)</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Audio</DirectType>
        <IndirectType>Radio</IndirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>modem_ctrl</DriverPath>
    <DriverOptions>-t n</DriverOptions>
    <DriverArgumentHelp>
      Specify the modem to monitor. Arguments are
      --n &lt;S5066 node address&gt;
      --p &lt;URL of Icon5066 server&gt;
      --m &lt;modem_type&gt; (tx, rx or single; default single)
      --c &lt;string containing key and certificate PEM for client certificate&gt; (optional)
```

```
      --U &lt;update time&gt; (optional: in seconds, default 30)
      e.g. --n 10.44.0.1 --p https://icon5066.example.net:4001 --m rx --U 60
    </DriverArgumentHelp>
  <ArgsOverProtocol/>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.24 WidebandModem

Wideband Modem with ALE

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>WidebandModem</DeviceType>
  <DeviceFamily>Modem</DeviceFamily>
  <DeviceTypeSummary>Wideband Modem</DeviceTypeSummary>
  <DeviceTypeDescription>Wideband Modem with ALE</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>AwaitingArgs</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>WaveForm</ParameterName>
      <ParameterSummary>Current Waveform</ParameterSummary>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>Interleaver</ParameterName>
      <ParameterSummary>Interleaver</ParameterSummary>
      <Enumerated>
        <EnumValue>Z</EnumValue>
        <EnumValue>US</EnumValue>
        <EnumValue>VS</EnumValue>
        <EnumValue>S</EnumValue>
        <EnumValue>M</EnumValue>
        <EnumValue>L</EnumValue>
        <EnumValue>VL</EnumValue>
      </Enumerated>
    </Parameter>
    <Parameter>
      <ParameterName>Speed</ParameterName>
      <ParameterSummary>Transmission Speed</ParameterSummary>
      <ParameterIcon>tachometer-alt</ParameterIcon>
      <Units>bps</Units>
      <DisplayPriority/>
      <Integer>
```

```
        <LowerBound>75</LowerBound>
        <UpperBound>240000</UpperBound>
        <AllowedValue><Value>75</Value></AllowedValue>
        <AllowedValue><Value>150</Value></AllowedValue>
        <AllowedValue><Value>300</Value></AllowedValue>
        <AllowedValue><Value>600</Value></AllowedValue>
        <AllowedValue><Value>1200</Value></AllowedValue>
        <AllowedValue><Value>2400</Value></AllowedValue>
        <AllowedValue><Value>4800</Value></AllowedValue>
        <AllowedValue><Value>6400</Value></AllowedValue>
        <AllowedValue><Value>8000</Value></AllowedValue>
        <AllowedValue><Value>9600</Value></AllowedValue>
        <AllowedValue><Value>19200</Value></AllowedValue>
        <AllowedValue><Value>57600</Value></AllowedValue>
        <AllowedValue><Value>240000</Value></AllowedValue>
      </Integer>
  </Parameter>
    <Parameter>
      <ParameterName>AleType</ParameterName>
      <ParameterSummary>Type of ALE Network</ParameterSummary>
      <Enumerated>
        <EnumValue>2G</EnumValue>
        <EnumValue>3G</EnumValue>
        <EnumValue>4G</EnumValue>
      </Enumerated>
    </Parameter>
    <Parameter>
      <ParameterName>AlePeer</ParameterName>
      <ParameterSummary>Peer ALE Address</ParameterSummary>
      <ParameterIcon>address-card</ParameterIcon>
      <DisplayPriority/>
      <String>
        <MaximumLength>64</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>AleState</ParameterName>
      <ParameterSummary>ALE State</ParameterSummary>
      <ParameterIcon>satellite-dish</ParameterIcon>
      <DisplayPriority/>
      <Integer>
        <AllowedValue>
          <Value>0</Value>
          <Label>No ALE</Label>
        </AllowedValue>
        <AllowedValue>
          <Value>1</Value>
          <Label>Scanning</Label>
          <Colour>Blue</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>2</Value>
          <Label>Linking</Label>
          <Colour>Orange</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>3</Value>
          <Label>Sounding</Label>
          <Colour>Purple</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>4</Value>
          <Label>LNK-Init (Linked as Initiator)</Label>
          <Colour>Green</Colour>
        </AllowedValue>
        <AllowedValue>
          <Value>5</Value>
```

```
          <Label>LNK-Res (Linked as Responder)</Label>
          <Colour>Green</Colour>
        </AllowedValue>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>AleTxBW</ParameterName>
      <ParameterSummary>ALE Tx BW</ParameterSummary>
      <ParameterIcon>upload</ParameterIcon>
      <Units>kHz</Units>
      <DisplayPriority/>
      <Enumerated>
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        <EnumValue>6</EnumValue>
        <EnumValue>9</EnumValue>
        <EnumValue>12</EnumValue>
        <EnumValue>15</EnumValue>
        <EnumValue>18</EnumValue>
        <EnumValue>24</EnumValue>
        <EnumValue>30</EnumValue>
        <EnumValue>36</EnumValue>
        <EnumValue>42</EnumValue>
        <EnumValue>48</EnumValue>
      </Enumerated>
    </Parameter>
    <Parameter>
      <ParameterName>AleRxBW</ParameterName>
      <ParameterSummary>ALE Rx BW</ParameterSummary>
      <ParameterIcon>download</ParameterIcon>
      <Units>kHz</Units>
      <DisplayPriority/>
      <Enumerated>
        <EnumValue>3</EnumValue>
        <EnumValue>6</EnumValue>
        <EnumValue>9</EnumValue>
        <EnumValue>12</EnumValue>
        <EnumValue>15</EnumValue>
        <EnumValue>18</EnumValue>
        <EnumValue>24</EnumValue>
        <EnumValue>30</EnumValue>
        <EnumValue>36</EnumValue>
        <EnumValue>42</EnumValue>
        <EnumValue>48</EnumValue>
      </Enumerated>
    </Parameter>
    <Parameter>
      <ParameterName>RadioTxFrequency</ParameterName>
      <ParameterSummary>Radio Tx Frequency</ParameterSummary>
      <ParameterIcon>wave-sine</ParameterIcon>
      <Units>MHz</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>3000</LowerBound>
        <UpperBound>29999</UpperBound>
        <Shift>6</Shift>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>RadioRxFrequency</ParameterName>
      <ParameterSummary>Radio Rx Frequency</ParameterSummary>
      <Units>MHz</Units>
      <Integer>
        <LowerBound>3000</LowerBound>
        <UpperBound>29999</UpperBound>
        <Shift>6</Shift>
      </Integer>
    </Parameter>
```

```
<Parameter>
     <ParameterName>SNR</ParameterName>
     <ParameterSummary>SNR</ParameterSummary>
     <ParameterIcon>waveform</ParameterIcon>
     <Units>dB</Units>
     <DisplayPriority/>
     <Integer>
       <LowerBound>-20</LowerBound>
       <UpperBound>60</UpperBound>  -
     </Integer>
   </Parameter>
<Parameter>
     <ParameterName>AleAttempts</ParameterName>
     <ParameterSummary>ALE Connection Attempts</ParameterSummary>
     <Integer/>
   </Parameter>
   <Parameter>
     <ParameterName>StateTx</ParameterName>
     <ParameterSummary>Tx transmission state</ParameterSummary>
     <ParameterIcon>cloud-upload</ParameterIcon>
     <DisplayPriority/>
     <Integer>
       <AllowedValue>
         <Value>1</Value>
         <Label>Transmit</Label>
         <Colour>Green</Colour>
       </AllowedValue>
       <AllowedValue>
         <Value>0</Value>
         <Label>Not Transmit</Label>
         <Colour>#B0B0B0</Colour>
       </AllowedValue>
     </Integer>
   </Parameter>
   <Parameter>
     <ParameterName>StateRx</ParameterName>
     <ParameterSummary>Rx transmission state</ParameterSummary>
     <ParameterIcon>cloud-download</ParameterIcon>
     <DisplayPriority/>
     <Integer>
       <AllowedValue>
         <Value>1</Value>
         <Label>Receive</Label>
         <Colour>Green</Colour>
       </AllowedValue>
       <AllowedValue>
         <Value>0</Value>
         <Label>Not Receive</Label>
         <Colour>#B0B0B0</Colour>
       </AllowedValue>
     </Integer>
   </Parameter>
 </DeviceStatusParameters>
 <ReferencedControlParameters>
   <Ref>SendParameters</Ref>
   <Ref>DeviceDescription</Ref>
   <Ref>URL</Ref>
   <Ref>Enabled</Ref>
   <Ref>DriverArgs</Ref>
 </ReferencedControlParameters>
 <DeviceControlParameters>
   <Parameter>
     <ParameterName>ModemData</ParameterName>
     <ParameterSummary>Modem Data</ParameterSummary>
     <RedBlackManaged/>
     <Connection>
       <Fixed/>
```

```
        <DirectType>Sync Serial</DirectType>
        <IndirectType>Modem Data</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>ModemControl</ParameterName>
      <ParameterSummary>Modem Control</ParameterSummary>
      <Connection>
        <Fixed/>
        <DirectType>GCXP</DirectType>
        <IndirectType>Modem Control</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>PrimaryRadio</ParameterName>
      <ParameterSummary>Primary Radio (Rx if two radios)</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Audio</DirectType>
        <IndirectType>Radio</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>SecondRadio</ParameterName>
      <ParameterSummary>Optional Second Radio (Tx)</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Audio</DirectType>
        <IndirectType>Radio</IndirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>modem_ctrl</DriverPath>
    <DriverOptions>-t w</DriverOptions>
    <DriverArgumentHelp>
      Specify the modem to monitor. Arguments are
      --n &lt;S5066 node address&gt;
      --p &lt;URL of Icon5066 server&gt;
      --m &lt;modem_type&gt; (tx, rx or single; default single)
      --c &lt;string containing key and certificate PEM for client certificate&gt; (optional)
      --U &lt;update time&gt; (optional: in seconds, default 30)
      e.g. --n 10.44.0.1 --p https://icon5066.example.net:4001 --m tx --U 60
    </DriverArgumentHelp>
  <ArgsOverProtocol/>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.25 MBox

This device is M-Box.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>MBox</DeviceType>
  <DeviceFamily>IMAP Message Store</DeviceFamily>
```

```
  <DeviceTypeSummary>Isode M-Box Server</DeviceTypeSummary>
  <DeviceTypeDescription>
This device is M-Box.  -
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>ActivationInfo</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>NumberClients</ParameterName>
      <ParameterSummary>Number of Clients Bound</ParameterSummary>
      <Integer/>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>Enabled</Ref>
    <Ref>Reset</Ref>
    <Ref>URL</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>MSwitch</ParameterName>
      <ParameterSummary>M-Switch</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Message Submission</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>Access</ParameterName>
      <ParameterSummary>Access</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <DirectType>Message Access</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>netgo</DriverPath>
    <DriverOptions>-t MBox</DriverOptions>
    <DriverArgumentHelp>
      Specify the mbox server to monitor. Arguments are
      --p host:port (e.g., --p localhost:143)
      --U updatetime (optional, in seconds)
      </DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.26 MGuard

This represents an M-Guard Guard. Connectivity always follows the communication chain (red to black), noting that a Guard will only send data in one direction. This device will generally be provisioned red side, as it connects red and black side devices, and red side devices are not visible black side. The connection is specified as fixed, of direct type GCXP (Guard Content eXchange Protocol). Although this is a TCP protocol, it will always be configured with two way strong authentication. This will need to be configured on both M-Guard (DMZ) and Black Side device locally. So it will not be possible to manage this connection with Red/Black.


```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>MGuard</DeviceType>
  <DeviceFamily>M-Guard</DeviceFamily>
  <DeviceTypeSummary>Represents a single M-Guard Guard.</DeviceTypeSummary>
  <DeviceTypeDescription>
This represents an M-Guard Guard.
Connectivity always follows the communication chain (red to black),
noting that a Guard will only send data in one direction.

This device will generally be provisioned red side,
as it connects red and black side devices,
and red side devices are not visible black side.

The connection is specified as fixed, of direct type
GCXP (Guard Content eXchange Protocol).
Although this is a TCP protocol, it will always be
configured with two way strong authentication.
This will need to be configured on both M-Guard (DMZ)
and Black Side device locally.
So it will not be possible to manage this connection with Red/Black.
 </DeviceTypeDescription>
  <BoundaryDevice/>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Reset</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>RedSideDevice</ParameterName>
      <ParameterSummary>Red Side device</ParameterSummary>
      <RedBlackManaged/>
      <MultiValue>
```

```
        <ReferencedAuxilliaryParameter>Description</ReferencedAuxilliaryParameter>
        <MaximumMembers>-1</MaximumMembers>
      </MultiValue>
      <Connection>
        <Fixed/>
        <DirectType>GCXP</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>BlackSideDevice</ParameterName>
      <ParameterSummary>Black Side device</ParameterSummary>
      <RedBlackManaged/>
      <MultiValue>
        <ReferencedAuxilliaryParameter>Description</ReferencedAuxilliaryParameter>
        <MaximumMembers>-1</MaximumMembers>
      </MultiValue>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>GCXP</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.27 MLink

This device is an Isode M-Link Server.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>MLink</DeviceType>
  <DeviceFamily>XMPP Server</DeviceFamily>
  <DeviceTypeSummary>Isode M-Link Server</DeviceTypeSummary>
  <DeviceTypeDescription>
    This device is an Isode M-Link Server.
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>ActivationInfo</Ref>
    <Ref>AwaitingArgs</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>NumberClients</ParameterName>
```

```
      <ParameterSummary>Number of XMPP Clients Bound</ParameterSummary>
      <ParameterIcon>users</ParameterIcon>
      <DisplayPriority/>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>QueuedStanzas</ParameterName>
      <ParameterSummary>Queued XMPP Stanzas</ParameterSummary>
      <ParameterDescription>The total number of stanzas queued for all
      the known peers</ParameterDescription>
      <ParameterIcon>layer-group</ParameterIcon>
      <DisplayPriority/>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>NumberPeerSessions</ParameterName>
      <ParameterSummary>Number of peer sessions</ParameterSummary>
      <ParameterIcon>network-wired</ParameterIcon>
      <DisplayPriority/>
      <Integer/>
    </Parameter>
    <!-- Not sure if this is available from M-Link
    <Parameter>
      <ParameterName>Rate</ParameterName>
      <ParameterSummary>Operation Rate</ParameterSummary>
      <Units>Operations per Minute</Units>
      <Integer/>
    </Parameter>
    --->
    <Parameter>
      <ParameterName>CertificateSubject</ParameterName>
      <ParameterSummary>HTTPS certificate name</ParameterSummary>
      <ParameterDescription>The subject name of the certificate that
      this M-Link Server is using</ParameterDescription>
      <String>
        <MaximumLength>256</MaximumLength>
      </String>
    </Parameter>
    <Parameter>
      <ParameterName>CertificateExpiry</ParameterName>
      <ParameterSummary>HTTPS certificate expiry</ParameterSummary>
      <ParameterDescription>The date that the server's HTTPS certificate expires</ParameterDescripti
      <DateTime/>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>DriverArgs</Ref>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>MLinkPeer</ParameterName>
      <ParameterSummary>M-Link Peer</ParameterSummary>
      <RedBlackManaged/>
      <MultiValue>
        <MaximumMembers>-1</MaximumMembers>
      </MultiValue>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>M-Link Peer</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>MLinkPeer</ParameterName>
```

```
      <ParameterSummary>M-Link Peer</ParameterSummary>
      <RedBlackManaged/>
      <MultiValue>
        <MaximumMembers>-1</MaximumMembers>
      </MultiValue>
      <Connection>
        <Fixed/>
        <DirectType>M-Link Peer</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>MLinkGuardedPeer</ParameterName>
      <ParameterSummary>M-Link Peer via guard</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>GCXP</DirectType>
        <IndirectType>M-Link</IndirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>SISConnection</ParameterName>
      <ParameterSummary>SIS Connection</ParameterSummary>
      <MultiValue>
        <MaximumMembers>16</MaximumMembers>
      </MultiValue>
      <Connection>
        <TCP/>
        <ConnectTo/>
        <DirectType>SIS</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>mlink_driver</DriverPath>
    <DriverOptions></DriverOptions>
    <DriverArgumentHelp>
      Specify the mlink server to monitor. Arguments are
      --a URL the Red/Black server can use to connect to the M-Link server
      --U updatetime (optional, in seconds)
      --s &lt;secret auth-token&gt; (use a device secret password for
      this). E.g.
    --a https://xmpp.example.net:5221 --U 60 --s $1
      </DriverArgumentHelp>
  <ArgsOverProtocol/>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.28 MoveableMonitoringCamera

A camera that can be pointed and takes photos at operator request.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>MoveableMonitoringCamera</DeviceType>
  <DeviceFamily>Camera</DeviceFamily>
  <DeviceTypeSummary>Moveable Monitoring Camera</DeviceTypeSummary>
  <DeviceTypeDescription>
    A camera that can be pointed and takes photos at operator request.
```

```
  </DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>Photo</ParameterName>
      <ParameterSummary>Photo</ParameterSummary>
      <JPEGPhoto>
        <MaximumSize>8000000</MaximumSize>
      </JPEGPhoto>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Reset</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>TakePhoto</ParameterName>
      <ParameterSummary>Take a Photo</ParameterSummary>
      <SetByOperator/>
      <Empty/>
    </Parameter>
    <Parameter>
      <ParameterName>Direction</ParameterName>
      <ParameterSummary>Direction to point camera</ParameterSummary>
      <ParameterDescription>
        Camera direction in degrees relative to North.
      </ParameterDescription>
      <Units>Degrees</Units>
      <SetByOperator/>
      <Integer>
        <LowerBound>0</LowerBound>
        <UpperBound>359</UpperBound>
      </Integer>
    </Parameter>
    <Parameter>
      <ParameterName>Elevation</ParameterName>
      <ParameterSummary>Angle to point camera</ParameterSummary>
      <Units>Degrees</Units>
      <SetByOperator/>
      <Integer>
        <LowerBound>0</LowerBound>
        <UpperBound>359</UpperBound>
      </Integer>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.29 MStore

This device is M-Store.


```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>MStore</DeviceType>
  <DeviceFamily>P7 Message Store</DeviceFamily>
  <DeviceTypeSummary>Isode M-Store Server</DeviceTypeSummary>
  <DeviceTypeDescription>
This device is M-Store.  -
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>ActivationInfo</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>NumberClients</ParameterName>
      <ParameterSummary>Number of P7 Clients Bound</ParameterSummary>
      <Integer/>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Reset</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>MSwitch</ParameterName>
      <ParameterSummary>M-Switch</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Message Submission</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>netgo</DriverPath>
    <DriverOptions>-t M-Store</DriverOptions>
    <DriverArgumentHelp>Specify the M-Store server to monitor. Arguments
    are --p host:port (e.g. --p localhost:3001)
    --U updatetime (optional, in seconds)</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.30 MSwitchAsyncSerialPort

This device is associated with an M-Switch device, and in an operational configuration will be provisioned by the M-Switch device. It represents an async serial port on a server running M-Switch (e.g., COM3) and enables Red/Black to bind the port to a modem or crypto with a fixed link. ACP 127 Serial Circuits can then be configured to use different ports to achieve different connectivity.


```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>MSwitchAsyncSerialPort</DeviceType>
  <DeviceFamily>M-Switch Async Serial Port</DeviceFamily>
  <DeviceTypeSummary>M-Switch Async Serial Port</DeviceTypeSummary>
  <DeviceTypeDescription>
This device is associated with an M-Switch device, and in an operational configuration
will be provisioned by the M-Switch device.
It represents an async serial port on a server running M-Switch (e.g., COM3) and enables
Red/Black to bind the port to a modem or crypto with a fixed link.
ACP 127 Serial Circuits can then be configured to use different ports to achieve
different connectivity.
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>ActivationInfo</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>Enabled</Ref>
    <Ref>Reset</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>ACP127Circuit</ParameterName>
      <ParameterSummary>ACP127 Circuit</ParameterSummary>
      <ParameterDescription>
This is a link from an ACP 127 circuit.
Data stored by M-Switch
</ParameterDescription>
      <Connection>
        <AsyncSerial/>
        <DirectType>Async Serial Port</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>ModemOrCrypto</ParameterName>
      <ParameterSummary>Modem or Crypto</ParameterSummary>
      <ParameterDescription>
```

```
This identifies the device to which the async serial port
is attached.
Note that devices will be sync serial, even though async is
used.
This parameter value is stored by M-Switch
</ParameterDescription>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Sync Serial</DirectType>
        <IndirectType>Modem Data</IndirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
</AbstractDeviceSpecification>
```

D.31 MSwitch

This device is M-Switch. It supports Message Access (submission and delivery) for servers earlier in the communication chain. This is a parent device, which will have a number of associated devices. These are primarily "Circuits" in support of HF connections, which can be ACP 127 circuits, ACP 142 channels, or other channels.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>MSwitch</DeviceType>
  <DeviceFamily>Messaging Server</DeviceFamily>
  <DeviceTypeSummary>Isode M-Switch Server</DeviceTypeSummary>
  <DeviceTypeDescription>
This device is M-Switch.
It supports Message Access (submission and delivery) for
servers earlier in the communication chain.

This is a parent device, which will have a number of associated devices.
These are primarily -"Circuits" in support of HF connections,
which can be ACP 127 circuits, ACP 142 channels, or other channels.
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>ActivationInfo</Ref>
    <Ref>AwaitingArgs</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>Rate</ParameterName>
      <ParameterSummary>Message Switching Rate</ParameterSummary>
      <ParameterIcon>random</ParameterIcon>
      <Units>Messages per Hour</Units>
```

```
      <DisplayPriority/>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>QueueSize</ParameterName>
      <ParameterSummary>Number of Messages Queued</ParameterSummary>
      <ParameterIcon>list</ParameterIcon>
      <DisplayPriority/>
      <Integer/>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Reset</Ref>
    <Ref>DriverArgs</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>MessageSubmission</ParameterName>
      <ParameterSummary>Message Submission</ParameterSummary>
      <ParameterDescription>This provides inbound connections up the chain,
        which can be submission and/or delivery</ParameterDescription>
      <RedBlackManaged -/>
      <MultiValue>
        <MaximumMembers>-1</MaximumMembers>
      </MultiValue>
      <Connection>
        <Fixed/>
        <DirectType>Message Submission</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>SwitchChannel</ParameterName>
      <ParameterSummary>Switch Channel</ParameterSummary>
      <ParameterDescription>
        This is a list of supported channels/circuits
        </ParameterDescription>
      <MultiValue>
        <ReferencedAuxilliaryParameter>
     Description
     </ReferencedAuxilliaryParameter>
        <MaximumMembers>-1</MaximumMembers>
      </MultiValue>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>MSwitch Channel</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>mta-driver</DriverPath>
    <DriverArgumentHelp>
Specify the mta to monitor. Arguments are
-m host:port (e.g., --m localhost:18001)
-u username (e.g. --u pp@isode.com)
-p password
-l ldapurl (e.g. --l ldap://localhost:19389)
-M saslMechanism (e.g., --M DIGEST-MD5) if unset an appropriate one will be chosen
-A acp127server (e.g. localhost:18099)
-U acp127user (e.g, my.name@isode.com)
-P acp127passwd (e.g., secret)
    </DriverArgumentHelp>
    <ArgsOverProtocol/>
  </DeviceDriverInfo>
```

```
</AbstractDeviceSpecification>
```

D.32 MSwitchACP127SerialCircuit

This device is associated with an M-Switch device, and in an operational configuration will be provisioned by the M-Switch device. It represents an ACP 127 circuit that is connected to a modem or crypto using an async serial connection

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>MSwitchACP127SerialCircuit</DeviceType>
  <DeviceFamily>M-Switch Circuit</DeviceFamily>
  <DeviceTypeSummary>M-Switch ACP 127 Circuit using Async Serial</DeviceTypeSummary>
  <DeviceTypeDescription>
    This device is associated with an M-Switch device, and in an operational configuration
    will be provisioned by the M-Switch device.
    It represents an ACP 127 circuit that is connected to a modem or crypto using an async
    serial connection
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>ActivationInfo</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>Rate</ParameterName>
      <ParameterSummary>Message Switching Rate</ParameterSummary>
      <ParameterIcon>random</ParameterIcon>
      <Units>Messages per Hour</Units>
      <DisplayPriority -/>
      <Integer -/>
    </Parameter>
    <Parameter>
      <ParameterName>QueueSize</ParameterName>
      <ParameterSummary>Number of Messages Queued</ParameterSummary>
      <ParameterIcon>list</ParameterIcon>
      <DisplayPriority -/>
      <Integer -/>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>Enabled</Ref>
    <Ref>Reset</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>ParentMSwitch</ParameterName>
```

```
      <ParameterSummary>Parent MSwitch</ParameterSummary>
      <ParameterDescription> This is a link from M-Switch.
        There is no data associated with this parameter.
</ParameterDescription>
      <RedBlackManaged -/>
      <Connection>
        <Fixed -/>
        <DirectType>MSwitch Circuit</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>AsyncSerial</ParameterName>
      <ParameterSummary>ASync Serial Line</ParameterSummary>
      <ParameterDescription>
        This identifies the local serial port to which this circuit is connected.
        Changing this parameter will enable connection to different modems. (e.g, COM1 to COM3).
        This parameter value is stored by M-Switch.
</ParameterDescription>
      <SetByOperator -/>
      <Connection>
        <AsyncSerial -/>
        <ConnectTo -/>
        <DirectType>Sync Serial</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>GCXPStatus</ParameterName>
      <ParameterSummary>Send Status to FABserver</ParameterSummary>
      <RedBlackManaged -/>
      <Connection>
        <Fixed -/>
        <ConnectTo -/>
        <DirectType>GCXP</DirectType>
        <IndirectType>FAB Status</IndirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
</AbstractDeviceSpecification>
```

D.33 MSwitchACP127TCPCircuit

This device is associated with an M-Switch device, and in an operational configuration will be provisioned by the M-Switch device. It represents an ACP 127 circuit that is connected to a TCP destination.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>MSwitchACP127TCPCircuit</DeviceType>
  <DeviceFamily>M-Switch Circuit</DeviceFamily>
  <DeviceTypeSummary>M-Switch ACP 127 Circuit using TCP</DeviceTypeSummary>
  <DeviceTypeDescription>
This device is associated with an M-Switch device, and in an operational configuration
will be provisioned by the M-Switch device.
It represents an ACP 127 circuit that is connected to a TCP destination.
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
```

```
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>ActivationInfo</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>Rate</ParameterName>
      <ParameterSummary>Message Switching Rate</ParameterSummary>
      <ParameterIcon>random</ParameterIcon>
      <Units>Messages per Hour</Units>
      <DisplayPriority/>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>QueueSize</ParameterName>
      <ParameterSummary>Number of Messages Queued</ParameterSummary>
      <ParameterIcon>list</ParameterIcon>
      <DisplayPriority/>
      <Integer/>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>Enabled</Ref>
    <Ref>Reset</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>ParentMSwitch</ParameterName>
      <ParameterSummary>Parent MSwitch</ParameterSummary>
      <ParameterDescription> This is a link from M-Switch.
There is no data associated with this parameter.
</ParameterDescription>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <DirectType>MSwitch Circuit</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>TCPConn</ParameterName>
      <ParameterSummary>TCP Connection</ParameterSummary>
      <ParameterDescription>
This identifies the connection to a remote ACP127 server
This parameter value is stored by M-Switch.
</ParameterDescription>
      <SetByOperator/>
      <Connection>
 <TCP/>
        <ConnectTo/>
        <DirectType>ACP127 TCP</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
</AbstractDeviceSpecification>
```

D.34 MSwitchACP142HFChannel

This device is associated with an M-Switch device, and in an operational configuration will be provisioned by the M-Switch device. It represents an ACP 142 channel that is connected to STANAG 5066.


```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>MSwitchACP142HFChannel</DeviceType>
  <DeviceFamily>M-Switch Channel</DeviceFamily>
  <DeviceTypeSummary>M-Switch ACP 142 HF Channel</DeviceTypeSummary>
  <DeviceTypeDescription>
This device is associated with an M-Switch device, and in an operational configuration
will be provisioned by the M-Switch device.
It represents an ACP 142 channel that is connected to STANAG 5066.
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>ActivationInfo</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>Rate</ParameterName>
      <ParameterSummary>Message Switching Rate</ParameterSummary>
      <ParameterIcon>random</ParameterIcon>
      <Units>Messages per Hour</Units>
      <DisplayPriority/>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>QueueSize</ParameterName>
      <ParameterSummary>Number of Messages Queued</ParameterSummary>
      <ParameterIcon>list</ParameterIcon>
      <DisplayPriority/>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>FlowOn</ParameterName>
      <ParameterSummary>
Is the channel Flow Controlled by SIS
</ParameterSummary>
      <Boolean/>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>Enabled</Ref>
    <Ref>Reset</Ref>
  </ReferencedControlParameters>
```

```
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>ParentMSwitch</ParameterName>
      <ParameterSummary>Parent MSwitch</ParameterSummary>
      <ParameterDescription>
This is a link from M-Switch.
There is no data associated with this parameter.
</ParameterDescription>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <DirectType>MSwitch Channel</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>SIS</ParameterName>
      <ParameterSummary>SIS connection</ParameterSummary>
      <ParameterDescription>
This is the link to Icon-5066 server. The data for this needs to be stored by M-Switch
</ParameterDescription>
      <SetByOperator/>
      <Connection>
        <TCP/>
        <ConnectTo/>
        <DirectType>SIS</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
</AbstractDeviceSpecification>
```

D.35 MSwitchACP127COSSCircuit

This device is associated with an M-Switch device, and in an operational configuration will be provisioned by the M-Switch device. It represents an ACP 127 circuit that is connected to STANAG 5066 using COSS

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>MSwitchACP127COSSCircuit</DeviceType>
  <DeviceFamily>M-Switch Circuit</DeviceFamily>
  <DeviceTypeSummary>M-Switch ACP 127 Circuit using COSS</DeviceTypeSummary>
  <DeviceTypeDescription>
This device is associated with an M-Switch device, and in an operational configuration
will be provisioned by the M-Switch device.
It represents an ACP 127 circuit that is connected to STANAG 5066 using COSS
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
```

```
    <Ref>ActivationInfo</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>Rate</ParameterName>
      <ParameterSummary>Message Switching Rate</ParameterSummary>
      <ParameterIcon>random</ParameterIcon>
      <Units>Messages per Hour</Units>
      <DisplayPriority/>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>QueueSize</ParameterName>
      <ParameterSummary>Number of Messages Queued</ParameterSummary>
      <ParameterIcon>list</ParameterIcon>
      <DisplayPriority/>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>FlowOn</ParameterName>
      <ParameterSummary>Is the channel Flow Controlled by SIS</ParameterSummary>
      <Boolean/>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>Enabled</Ref>
    <Ref>Reset</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>ParentMSwitch</ParameterName>
      <ParameterSummary>Parent MSwitch</ParameterSummary>
      <ParameterDescription>
This is a link from M-Switch.
There is no data associated with this parameter.
</ParameterDescription>
      <Connection>
        <Fixed/>
        <DirectType>MSwitch Circuit</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>SIS</ParameterName>
      <ParameterSummary>SIS Connection</ParameterSummary>
      <ParameterDescription>
This is the link to Icon-5066 server. The data for this needs to be stored by M-Switch
</ParameterDescription>
      <Connection>
        <TCP/>
        <ConnectTo/>
        <DirectType>SIS</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
</AbstractDeviceSpecification>
```

D.36 MSwitchGenericChannel

This device is associated with an M-Switch device, and in an operational configuration will be provisioned by the M-Switch device. This is for channels that are not in the HF

communication chain, but may be of interest. The will typically be MTS Outbound Channels, such as SMTP or X.400 P1. Their presence in Red/Black is likely to be determined by an M-Switch configuration option. These channels enable the Red/Black operator to see a quick summary of queue status for high speed links.


```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>MSwitchGenericChannel</DeviceType>
  <DeviceFamily>M-Switch Channel</DeviceFamily>
  <DeviceTypeSummary>An M-Switch Outbound Channel</DeviceTypeSummary>
  <DeviceTypeDescription>
This device is associated with an M-Switch device, and in an operational configuration
will be provisioned by the M-Switch device.
This is for channels that are not in the HF communication chain, but may be of interest.
The will typically be MTS Outbound Channels, such as SMTP or X.400 P1.
Their presence in Red/Black is likely to be determined by an M-Switch
configuration option.
These channels enable the Red/Black operator to see a quick summary of
queue status for high speed links.
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>ActivationInfo</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>Rate</ParameterName>
      <ParameterSummary>Message Switching Rate</ParameterSummary>
      <ParameterIcon>random</ParameterIcon>
      <Units>Messages per Hour</Units>
      <DisplayPriority/>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>QueueSize</ParameterName>
      <ParameterSummary>Number of Messages Queued</ParameterSummary>
      <ParameterIcon>list</ParameterIcon>
      <DisplayPriority/>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>OldestMessage</ParameterName>
      <ParameterSummary>Timestamp of the oldest message</ParameterSummary>
      <ParameterIcon>hourglass-half</ParameterIcon>
      <DisplayPriority/>
      <DateTime>
      </DateTime>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>Enabled</Ref>
    <Ref>Reset</Ref>
  </ReferencedControlParameters>
```

```
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>ParentMSwitch</ParameterName>
      <ParameterSummary>Parent MSwitch</ParameterSummary>
      <ParameterDescription>
This is a link from M-Switch.
There is no data associated with this parameter.
</ParameterDescription>
      <Connection>
        <Fixed/>
        <DirectType>MSwitch Channel</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>MSwitchCircuit</ParameterName>
      <ParameterSummary>MSwitch Circuit</ParameterSummary>
      <ParameterDescription>
This is a link from M-Switch Channel to the circuit.
There is no data associated with this parameter.
</ParameterDescription>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>MSwitch Circuit</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
</AbstractDeviceSpecification>
```

D.37 MVault

M-Vault is the Isode LDAP/X.500/ACP 133 directory server. Although used by other products, it is not part of the communication chain and so has no connections defined.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>MVault</DeviceType>
  <DeviceFamily>Directory Server</DeviceFamily>
  <DeviceTypeSummary>Isode M-Vault Server</DeviceTypeSummary>
  <DeviceTypeDescription>
M-Vault is the Isode LDAP/X.500/ACP 133 directory server.
Although used by other products, it is not part of the communication
chain and so has no connections defined.
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
    <Ref>ActivationInfo</Ref>
    <Ref>AwaitingArgs</Ref>
    <Ref>DriverArgs</Ref>
  </ReferencedStatusParameters>
```

```
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>Version</ParameterName>
      <ParameterSummary>Product Version</ParameterSummary>
      <ParameterDescription>A string indicating the software/firmware/hardware version of the device
      Parameter which majority of devices are expected to use.
      This is a status parameter, with information coming from the device.    -
      </ParameterDescription>
      <ParameterIcon>shield-check</ParameterIcon>
      <DisplayPriority/>
      <String>
        <MaximumLength>1</MaximumLength>
      </String>
    </Parameter>
  </DeviceStatusParameters>
   <!--
  <DeviceStatusParameters>
    <Parameter>
      <ParameterName>NumberClients</ParameterName>
      <ParameterSummary>Number of Directory Clients Bound</ParameterSummary>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>NumberPeers</ParameterName>
      <ParameterSummary>Number of Replication and Chaining Peers</ParameterSummary>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>Rate</ParameterName>
      <ParameterSummary>Operation Rate</ParameterSummary>
      <Units>Operations per Minute</Units>
      <Integer/>
    </Parameter>
  </DeviceStatusParameters>
   --->
  <ReferencedControlParameters>
    <Ref>DriverArgs</Ref>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <!--
    <Ref>Enabled</Ref>
    --->
    <!--
    <Ref>Reset</Ref>
    --->
  </ReferencedControlParameters>
  <DeviceDriverInfo>
    <DriverPath>netgo</DriverPath>
    <DriverArgumentHelp>
Specify the directory to monitor. Arguments are
-l ldapurl (e.g., --l ldap://localhost:1234/)
-U updatetime (in seconds)
    </DriverArgumentHelp>
    <ArgsOverProtocol/>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.38 NetDevice

A network accessible device that can be polled by connecting to a tcp port.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>NetDevice</DeviceType>
  <DeviceFamily>Server</DeviceFamily>
  <DeviceTypeSummary>A Network accessible device</DeviceTypeSummary>
  <DeviceTypeDescription>
A network accessible device that can be polled by connecting to a tcp port.
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>AssociatedDevice</Ref>
  </ReferencedControlParameters>
  <DeviceDriverInfo>
    <DriverPath>netgo</DriverPath>
    <DriverArgumentHelp>
Specify the server to monitor. Arguments are:
-p host:port (e.g. localhost:1234)
-t -"type" (e.g. printer, router...)
-U updatetime (in seconds)
    </DriverArgumentHelp>
  </DeviceDriverInfo>

</AbstractDeviceSpecification>
```

D.39 RFToTCP

This device converts an RF stream to TCP. It is used to enable operator switching of RF streams.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>RFToTCP</DeviceType>
  <DeviceFamily>RFToTCP</DeviceFamily>
  <DeviceTypeSummary>Converts RF to TCP</DeviceTypeSummary>
  <DeviceTypeDescription>
This device converts an RF stream to TCP.
It is used to enable operator switching of RF streams.
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
```

```
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Reset</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>RFIn</ParameterName>
      <ParameterSummary>RF to TCP</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <DirectType>Sync Serial</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>TCPOut</ParameterName>
      <ParameterSummary>TCP to Peer</ParameterSummary>
      <ParameterDescription>
This is the link to a peer TCP to RF converter
This end of TCP set by operator to match other end, which is set by
administrator
</ParameterDescription>
      <SetByOperator/>
      <Connection>
        <TCP/>
        <ConnectTo/>
        <DirectType>RFOverTCP</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.40 SodiumSync

Isode Sodium Sync Server

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>SodiumSync</DeviceType>
  <DeviceFamily>Directory Sync</DeviceFamily>
  <DeviceTypeSummary>Isode Sodium Sync Server</DeviceTypeSummary>
  <DeviceTypeDescription>
Isode Sodium Sync Server
</DeviceTypeDescription>
```

```
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
    <DeviceStatusParameters>
    <Parameter>
      <ParameterName>NumberOfSyncs</ParameterName>
      <ParameterSummary>Number of syncs</ParameterSummary>
      <ParameterDescription>This shows how many syncs are being
      managed by this Sodium Sync server</ParameterDescription>
      <ParameterIcon>sync</ParameterIcon>
      <DisplayPriority/>
      <Integer/>
    </Parameter>
    <Parameter>
      <ParameterName>SyncNames</ParameterName>
      <ParameterSummary>Sync names</ParameterSummary>
      <ParameterDescription>This is a list of the
      syncs which are being managed by this Sodium Sync server
      </ParameterDescription>
        <String>
          <MaximumLength>256</MaximumLength>
        </String>
    </Parameter>
    <Parameter>
      <ParameterName>LastSyncModification</ParameterName>
      <ParameterSummary>Last reported modification</ParameterSummary>
      <ParameterDescription>The identity and time of the most recent
      sync to make changes.
      </ParameterDescription>
        <ParameterIcon>clock</ParameterIcon>
        <DisplayPriority/>
        <String>
          <MaximumLength>256</MaximumLength>
        </String>
    </Parameter>
    <Parameter>
      <ParameterName>FailingSyncNames</ParameterName>
      <ParameterSummary>Syncs currently broken</ParameterSummary>
      <ParameterDescription>This is a list of syncs which
      reported an error the last time they ran.
      </ParameterDescription>
        <ParameterIcon>exclamation</ParameterIcon>
        <DisplayPriority/>
        <String>
          <MaximumLength>256</MaximumLength>
        </String>
    </Parameter>
    <Parameter>
      <ParameterName>LastFailedSync</ParameterName>
      <ParameterSummary>Last sync to fail</ParameterSummary>
      <ParameterDescription>The name and time of the last sync which
      reported a failure
      </ParameterDescription>
        <String>
          <MaximumLength>256</MaximumLength>
        </String>
    </Parameter>
  </DeviceStatusParameters>
```

```
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>MSwitch</ParameterName>
      <ParameterSummary>M-Switch</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Message Submission</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>sodium_sync_driver</DriverPath>
    <DriverArgumentHelp>Specify the Sodium Sync Server to be monitored. Arguments
    are --h &lt;sync_server_url&gt; --U &lt;update-time-in-seconds&gt;. Default
    update time is 60s. E.g. --h http://ship.net:19899 --U 120
    </DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.41 TCPToAudio

This device converts a TCP stream to Audio. It is used to enable operator switching of audio streams.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>TCPToAudio</DeviceType>
  <DeviceFamily>TCPToAudio</DeviceFamily>
  <DeviceTypeSummary>Converts TCP to Audio</DeviceTypeSummary>
  <DeviceTypeDescription>
This device converts a TCP stream to Audio.
It is used to enable operator switching of audio streams.
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>Enabled</Ref>
```

```
    <Ref>Reset</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>TCPIn</ParameterName>
      <ParameterSummary>TCP Inbound audio</ParameterSummary>
      <Connection>
        <TCP/>
        <DirectType>AudioOverTCP</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>AudioOut</ParameterName>
      <ParameterSummary>Audio Outbound</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Audio</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.42 TCPToRF

This device converts a TCP stream to RF. It is used to enable operator switching of RF streams.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>TCPToRF</DeviceType>
  <DeviceFamily>TCPToRF</DeviceFamily>
  <DeviceTypeSummary>Converts TCP to RF</DeviceTypeSummary>
  <DeviceTypeDescription>
This device converts a TCP stream to RF.
It is used to enable operator switching of RF streams.
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
```

```
    <Ref>Enabled</Ref>
    <Ref>Reset</Ref>
  </ReferencedControlParameters>
  <DeviceControlParameters>
    <Parameter>
      <ParameterName>TCPIn</ParameterName>
      <ParameterSummary>TCP inbound</ParameterSummary>
      <Connection>
        <TCP/>
        <DirectType>RFOverTCP</DirectType>
      </Connection>
    </Parameter>
    <Parameter>
      <ParameterName>RFOut</ParameterName>
      <ParameterSummary>RF output</ParameterSummary>
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Sync Serial</DirectType>
      </Connection>
    </Parameter>
  </DeviceControlParameters>
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

D.43 Thermometer

A Thermometer is used to report temperature, and will cause the UI to display warnings if the temperature goes outside the LowerBound/UpperBound values.

```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
  <DeviceType>Thermometer</DeviceType>
  <DeviceFamily>Sensor</DeviceFamily>
  <DeviceTypeSummary>Simple Thermometer</DeviceTypeSummary>
  <DeviceTypeDescription>
    A Thermometer is used to report temperature, and will cause the UI to
    display warnings if the temperature goes outside the
    LowerBound/UpperBound values.
</DeviceTypeDescription>
  <ReferencedStatusParameters>
    <Ref>DeviceType</Ref>
    <Ref>Heartbeat</Ref>
    <Ref>Status</Ref>
    <Ref>StartTime</Ref>
    <Ref>MonitoringSince</Ref>
    <Ref>RunningSince</Ref>
    <Ref>Version</Ref>
    <Ref>Alert</Ref>
    <Ref>DeviceTypeHash</Ref>
    <Ref>UniqueID</Ref>
    <Ref>Deleted</Ref>
    <Ref>Exists</Ref>
  </ReferencedStatusParameters>
  <DeviceStatusParameters>
    <Parameter>
```

```
      <ParameterName>Temperature</ParameterName>
      <ParameterSummary>Temperature of Radio</ParameterSummary>
      <ParameterIcon>thermometer-half</ParameterIcon>
      <Units>Degrees Celsius</Units>
      <DisplayPriority/>
      <Integer>
        <LowerBound>-20</LowerBound>
        <UpperBound>200</UpperBound>
      </Integer>
    </Parameter>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
    <Ref>AssociatedDevice</Ref>
  </ReferencedControlParameters>
  <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```


D.44 VoiceController

A voice controller is used to pass calls through.


```
<?xml version="1.0"?>
<AbstractDeviceSpecification>
<DeviceType>VoiceController</DeviceType>
<DeviceFamily>Voice Controller</DeviceFamily>
<DeviceTypeSummary>Simple Voice Controller</DeviceTypeSummary>
<DeviceTypeDescription>
A voice controller is used to pass calls through.
</DeviceTypeDescription>
<ReferencedStatusParameters>
<Ref>DeviceType</Ref>
<Ref>Heartbeat</Ref>
<Ref>Status</Ref>
<Ref>StartTime</Ref>
<Ref>MonitoringSince</Ref>
<Ref>RunningSince</Ref>
<Ref>Version</Ref>
<Ref>Alert</Ref>
<Ref>DeviceTypeHash</Ref>
<Ref>UniqueID</Ref>
<Ref>Deleted</Ref>
<Ref>Exists</Ref>
</ReferencedStatusParameters>
<DeviceStatusParameters>
  </DeviceStatusParameters>
  <ReferencedControlParameters>
    <Ref>SendParameters</Ref>
    <Ref>DeviceDescription</Ref>
    <Ref>URL</Ref>
  </ReferencedControlParameters>
<DeviceControlParameters>
    <Parameter>
      <ParameterName>ModemData</ParameterName>
      <ParameterSummary>Modem Data</ParameterSummary>
```

```
      <RedBlackManaged/>
      <Connection>
        <Fixed/>
        <ConnectTo/>
        <DirectType>Sync Serial to eLogic</DirectType>
      </Connection>
    </Parameter>
</DeviceControlParameters>
    <DeviceDriverInfo>
    <DriverPath>NULL</DriverPath>
    <DriverArgumentHelp>Null device as default</DriverArgumentHelp>
  </DeviceDriverInfo>
</AbstractDeviceSpecification>
```

Appendix E Abstract Device Reference Specification

See the redblack schema included here.

```
    <?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified">
  <xs:element name="AbstractDeviceList">
    <xs:complexType>
      <xs:sequence>
        <xs:element maxOccurs="unbounded" ref="AbstractDeviceSpecification"/>
        <xs:element minOccurs="0" ref="CommonParameterList"/>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="AbstractDeviceSpecification">
    <xs:annotation>
      <xs:documentation>Abstract Device Driver Specification
                for Red/Black</xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:sequence>
        <xs:element name="DeviceType">
          <xs:annotation>
            <xs:documentation>This string is the primary identification of
                            the Abstract Device Type

Character set restricted to letters and digits.</xs:documentation>
          </xs:annotation>
          <xs:simpleType>
            <xs:restriction base="xs:string">
              <xs:pattern value="[a-zA-Z0-9]+"/>
            </xs:restriction>
          </xs:simpleType>
        </xs:element>
        <xs:element name="DeviceFamily" type="xs:string">
          <xs:annotation>
            <xs:documentation>This is a generic type, such as -"Radio"
                            used to group specific devices that have broadly the
                            same characteristics</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="DeviceTypeSummary" type="xs:string">
          <xs:annotation>
            <xs:documentation>Short Description of device type
                            to be used in UI to summarize what the device
                        type is</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="DeviceTypeDescription" type="xs:string">
          <xs:annotation>
            <xs:documentation>Longer device type description for
                            use in tool tip or manual</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="DeviceTypeIcon" type="xs:string" minOccurs="0">
          <xs:annotation>
            <xs:documentation>The icon type to use for this type</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element minOccurs="0" name="SelfMonitor">
          <xs:annotation>
```

```
            <xs:documentation>If present, the Device Type is the
                            local Red/Black</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element minOccurs="0" name="BoundaryDevice">
          <xs:annotation>
            <xs:documentation>If present, the Device Type is the
              a device that sits on the Red/Black boundary.
            </xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element minOccurs="0" name="ReferencedStatusParameters">
          <xs:annotation>
            <xs:documentation>Standard Status Parameters,
                            referenced by name</xs:documentation>
          </xs:annotation>
          <xs:complexType>
            <xs:sequence>
              <xs:element maxOccurs="unbounded" name="Ref" type="xs:string"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element minOccurs="0" name="DeviceStatusParameters">
          <xs:complexType>
            <xs:sequence>
              <xs:element minOccurs="0" maxOccurs="unbounded" ref="Parameter"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element minOccurs="0" name="ReferencedControlParameters">
          <xs:complexType>
            <xs:sequence>
              <xs:element minOccurs="0" maxOccurs="unbounded" name="Ref" type="xs:string"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element minOccurs="0" name="DeviceControlParameters">
          <xs:complexType>
            <xs:sequence>
              <xs:element minOccurs="0" maxOccurs="unbounded" ref="Parameter"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element minOccurs="0" name="DeviceDriverInfo">
          <xs:complexType>
            <xs:sequence>
              <xs:element minOccurs="0" name="SNMPDriver" type="xs:boolean"/>
              <xs:element minOccurs="0" name="DriverPath" type="xs:string"/>
              <xs:element minOccurs="0" name="DriverOptions" type="xs:string"/>
              <xs:element minOccurs="0" name="DriverArgumentHelp" type="xs:string"/>
              <xs:element minOccurs="0" name="ArgsOverProtocol"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="CommonParameterList">
    <xs:annotation>
      <xs:documentation>This is a list of parameters,
                which can be referenced by name.
                This is for parameters used in many devices.
                It allows definitions to be shared, and helps UI
                present the same parameter in the same way.</xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:sequence>
```

```
        <xs:element maxOccurs="unbounded" ref="Parameter"/>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="Parameter">
    <xs:annotation>
      <xs:documentation>This is a generic parameter used
                for status and control</xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:sequence>
        <xs:element name="ParameterName">
          <xs:annotation>
            <xs:documentation>Name is an identifier of the Parameter.
                     Character Set restricted to IA5 letters and digits</xs:documentation>
          </xs:annotation>
          <xs:simpleType>
            <xs:restriction base="xs:string">
              <xs:pattern value="[a-zA-Z0-9]+"/>
            </xs:restriction>
          </xs:simpleType>
        </xs:element>
        <xs:element name="ParameterSummary" type="xs:string">
          <xs:annotation>
            <xs:documentation>Short summary of what the parameter is,
                             for use in UI</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element minOccurs="0" name="ParameterDescription" type="xs:string">
          <xs:annotation>
            <xs:documentation>Longer description of parameter for use in
                             tool tip or manual</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="ParameterIcon" type="xs:string" minOccurs="0">
          <xs:annotation>
            <xs:documentation>The icon type to use for this parameter</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element minOccurs="0" name="Units" type="xs:string">
          <xs:annotation>
            <xs:documentation>Units of parameter for use in UI.
                             E.g., -"seconds" or -"kg"</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element minOccurs="0" name="RedBlackManaged">
          <xs:annotation>
            <xs:documentation>If this is present, the parameter
                             is stored by Red/Black and is not
                             communicated with device driver</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element minOccurs="0" name="Special">
          <xs:annotation>
            <xs:documentation>If set, this parameter is handled by
                             device driver in a special manner</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element minOccurs="0" name="SetByOperator">
          <xs:annotation>
            <xs:documentation>If this is present, Operators
                             and Administrators can change this parameter.
                             Default is that only Administrators can change
                             the parameter.
Value only relevant for control parameters</xs:documentation>
          </xs:annotation>
        </xs:element>
```

```
        <xs:element minOccurs="0" name="BlackSideControlOnly">
          <xs:annotation>
            <xs:documentation>Present for control parameters that
                            can only be updated from black side</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element minOccurs="0" name="RedtoBlackRate">
          <xs:annotation>
            <xs:documentation>Control of Rate of Parameter
                            Control Messages from Red to Black Side through Guard
            </xs:documentation>
          </xs:annotation>
          <xs:complexType>
            <xs:sequence>
              <xs:element name="NumberMessagesInPeriod" type="xs:positiveInteger"/>
              <xs:element name="PeriodLength" type="xs:positiveInteger">
                <xs:annotation>
                  <xs:documentation>Period measured in seconds
                                        over which number of messages is controlled
                  </xs:documentation>
                </xs:annotation>
              </xs:element>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element minOccurs="0" name="DisplayPriority">
          <xs:annotation>
            <xs:documentation>This is used to indicate that this is
an important Parameter to display.  It is anticipated that the UI will show this
parameter on -"top screen"</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element minOccurs="0" name="Group" type="xs:string">
          <xs:annotation>
            <xs:documentation>This is used to add a Group Label, to facilitate grouping of parameter
          </xs:annotation>
        </xs:element>
        <xs:element minOccurs="0" name="MultiValue">
          <xs:complexType>
            <xs:sequence>
              <xs:element maxOccurs="unbounded" minOccurs="0" name="ReferencedAuxilliaryParameter"
                type="xs:string">
                <xs:annotation>
                  <xs:documentation>Allows additional information
                                        to be associated with each element of a
                                        multi-value.
                                        Most common ones are ConnectToReference and
                                        Description.</xs:documentation>
                </xs:annotation>
              </xs:element>
              <xs:element minOccurs="0" name="ConnectTo" type="xs:string"/>
              <xs:element name="MaximumMembers" type="xs:integer">
                <xs:annotation>
                  <xs:documentation>Upper Bound on the Number
                                         of Group Members</xs:documentation>
                </xs:annotation>
              </xs:element>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:choice>
          <xs:element name="Integer">
            <xs:annotation>
              <xs:documentation>Parameter encoded as XML Integer,
                                with upper and lower bound constraints as specified.
              </xs:documentation>
            </xs:annotation>
```

```
            <xs:complexType>
              <xs:sequence>
                <xs:element name="LowerBound" minOccurs="0" type="xs:integer"/>
                <xs:element name="UpperBound" minOccurs="0" type="xs:integer"/>
                <xs:element maxOccurs="unbounded" minOccurs="0" name="AllowedValue">
                  <xs:annotation>
                    <xs:documentation>List of allowed Values</xs:documentation>
                  </xs:annotation>
                  <xs:complexType>
                    <xs:sequence>
                      <xs:element name="Value" type="xs:integer"/>
                      <xs:element minOccurs="0" name="Label" type="xs:string">
                        <xs:annotation>
                          <xs:documentation>String label, to support enum types with explicit intege
                        </xs:annotation>
                      </xs:element>
                      <xs:element minOccurs="0" name="Colour" type="xs:string">
                        <xs:annotation>
                          <xs:documentation>Allows visual alerting of labels (e.g., Red for Fault).<
                        </xs:annotation>
                      </xs:element>
                    </xs:sequence>
                  </xs:complexType>
                </xs:element>
                <xs:element minOccurs="0" name="Interval" type="xs:positiveInteger">
                  <xs:annotation>
                    <xs:documentation>This specifies the required gap between values, relative to lo
                  </xs:annotation>
                </xs:element>
                <xs:element minOccurs="0" name="Shift" type="xs:positiveInteger">
                  <xs:annotation>
                    <xs:documentation>Mechanism to allow shift of numbers.  Implemented as a divisor
                  </xs:annotation>
                </xs:element>
                <xs:element minOccurs="0" name="DisplayAsHex">
                  <xs:annotation>
                    <xs:documentation>Display value in Hexadecimal</xs:documentation>
                  </xs:annotation>
                </xs:element>
                <xs:element minOccurs="0" name="FaultBitString">
                  <xs:annotation>
                    <xs:documentation>Value is a bit string.  Any bits set indicate there is a fault
                  </xs:annotation>
                </xs:element>
              </xs:sequence>
            </xs:complexType>
          </xs:element>
          <xs:element name="DateTime">
            <xs:annotation>
              <xs:documentation>String encoded Date + Time</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="Time">
            <xs:annotation>
              <xs:documentation>Time, with integer encoding and granularity specified by sub-element
              </xs:documentation>
            </xs:annotation>
            <xs:complexType>
              <xs:choice>
                <xs:element name="Days"/>
                <xs:element name="Hours"/>
                <xs:element name="Minutes"/>
                <xs:element name="Seconds"/>
                <xs:element name="MilliSeconds"/>
                <xs:element name="Ticks">
                  <xs:annotation>
                    <xs:documentation>SNMP Ticks (100th Sec)</xs:documentation>
```

```
                  </xs:annotation>
                </xs:element>
              </xs:choice>
            </xs:complexType>
          </xs:element>
          <xs:element name="String">
            <xs:complexType>
              <xs:sequence>
                <xs:element name="MaximumLength" type="xs:positiveInteger">
                  <xs:annotation>
                    <xs:documentation>Max Length in Bytes
                    </xs:documentation>
                  </xs:annotation>
                </xs:element>
                <xs:element minOccurs="0" name="CharacterSet">
                  <xs:annotation>
                    <xs:documentation>If specified, character set is constrained.
                    </xs:documentation>
                  </xs:annotation>
                  <xs:complexType>
                    <xs:choice>
                      <xs:element name="IA5"/>
                      <xs:element name="UpperCaseLettersAndDigits"/>
                    </xs:choice>
                  </xs:complexType>
                </xs:element>
              </xs:sequence>
            </xs:complexType>
          </xs:element>
          <xs:element name="JPEGPhoto">
            <xs:complexType>
              <xs:sequence>
                <xs:element name="MaximumSize" type="xs:positiveInteger">
                  <xs:annotation>
                    <xs:documentation>Maximum photo size in bytes</xs:documentation>
                  </xs:annotation>
                </xs:element>
              </xs:sequence>
            </xs:complexType>
          </xs:element>
          <xs:element name="Boolean"/>
          <xs:element name="Enumerated">
            <xs:complexType>
              <xs:sequence>
                <xs:element maxOccurs="unbounded" name="EnumValue" type="xs:string">
                  <xs:annotation>
                    <xs:documentation>List of the allowed Enumerated Values
                    </xs:documentation>
                  </xs:annotation>
                </xs:element>
              </xs:sequence>
            </xs:complexType>
          </xs:element>
          <xs:element name="Empty"/>
          <xs:element name="Connection">
            <xs:complexType>
              <xs:sequence>
                <xs:choice>
                  <xs:element name="Fixed">
                    <xs:annotation>
                      <xs:documentation>
                        This represents a fixed connection,
                        that is wired between two black side devices and cannot
                        be changed.
If
                        <ConnectTo/>
                        is NOT set, another device may be pointed at this one.
```

```
If
                        <ConnectTo/>
                        is set, the devices connected to is referenced.
                      </xs:documentation>
                    </xs:annotation>
                    <xs:complexType>
                      <xs:sequence>
                        <xs:element minOccurs="0" name="ConnectedToDevice" type="xs:string">
                          <xs:annotation>
                            <xs:documentation>The name of connectedTo device
                            </xs:documentation>
                          </xs:annotation>
                        </xs:element>
                        <xs:element minOccurs="0" name="SwitchReference" type="xs:positiveInteger">
                          <xs:annotation>
                            <xs:documentation>If device is pointed at switch,
                               need to identify which connection on the switch.
                              </xs:documentation>
                          </xs:annotation>
                        </xs:element>
                      </xs:sequence>
                    </xs:complexType>
                  </xs:element>
                  <xs:element name="TCP">
                    <xs:complexType>
                      <xs:sequence>
                        <xs:element minOccurs="0" name="DefaultPort" type="xs:positiveInteger">
                          <xs:annotation>
                            <xs:documentation>Specifies a default port.
                              If this is specified, port can be omitted for
                              TCP configurations, and this value is assumed.
                            </xs:documentation>
                          </xs:annotation>
                        </xs:element>
                        <xs:element name="DomainAllowed" minOccurs="0">
                          <xs:annotation>
                            <xs:documentation>Configuration can be specified with Domain
                            </xs:documentation>
                          </xs:annotation>
                        </xs:element>
                        <xs:element name="IPv4Allowed" minOccurs="0"/>
                        <xs:element name="IPv6Allowed" minOccurs="0"/>
                      </xs:sequence>
                    </xs:complexType>
                  </xs:element>
                  <xs:element name="AsyncSerial" type="xs:string">
                    <xs:annotation>
                      <xs:documentation>A configured Async Serial Link such as -"COM3"
                      </xs:documentation>
                    </xs:annotation>
                  </xs:element>
                </xs:choice>
                <xs:element name="ConnectTo" minOccurs="0">
                  <xs:annotation>
                    <xs:documentation>Connections are directional.
The type of connection reflects the entity that is being connected to.

By default, this is an object that is connected to and the type reflects the object.
  Administrators (but not Operators) can modify TCP and Internal parameters.
Where -"Connect To" is set, the the type of connection reflects the remote object.
 For fixed connections, Administrator can point the connection at another object
  (of the correct type) using Device ID.
For TCP connections, Operator (and administrator) can change the value to the
TCP settings of a a matching object.
                    </xs:documentation>
                  </xs:annotation>
                </xs:element>
```

```
                <xs:element name="DirectType" type="xs:string" minOccurs="0"/>
                <xs:element name="IndirectType" type="xs:string" minOccurs="0">
                  <xs:annotation>
                    <xs:documentation>Indirect Type May be explicitly specified
                    </xs:documentation>
                  </xs:annotation>
                </xs:element>
                <xs:element minOccurs="0" name="IndirectTypeConfigured">
                  <xs:annotation>
                    <xs:documentation>If set, Indirect Type is configured for devices
                    </xs:documentation>
                  </xs:annotation>
                </xs:element>
              </xs:sequence>
            </xs:complexType>
          </xs:element>
          <xs:element name="SwitchConnection">
          </xs:element>
          <xs:element name="AlertType">
            <xs:complexType>
              <xs:sequence>
                <xs:element name="MaximumDescriptionLength" type="xs:positiveInteger"/>
              </xs:sequence>
            </xs:complexType>
          </xs:element>
        </xs:choice>
        <xs:element minOccurs="0" name="SNMP">
          <xs:annotation>
            <xs:documentation>SNMP configuration if any</xs:documentation>
          </xs:annotation>
          <xs:complexType>
            <xs:sequence>
              <xs:element name="OID" type="xs:string">
                <xs:annotation>
                  <xs:documentation>SNMP Object ID associated with this element</xs:documentation>
                </xs:annotation>
              </xs:element>
              <xs:element name="TYPE" type="xs:string">
                <xs:annotation>
                  <xs:documentation>SNMP Object Type associated with this element</xs:documentation>
                </xs:annotation>
              </xs:element>
              <xs:element name="IndexedBy" minOccurs="0">
                <xs:annotation>
                  <xs:documentation>Table index for this element</xs:documentation>
                </xs:annotation>
                <xs:complexType>
                  <xs:sequence>
                    <xs:element name="IndexName" type="xs:string">
                      <xs:annotation>
                        <xs:documentation>SNMP Index name</xs:documentation>
                      </xs:annotation>
                    </xs:element>
                    <xs:element name="IndexType" type="xs:string">
                      <xs:annotation>
                        <xs:documentation>SNMP Index type Int/Ip etc</xs:documentation>
                      </xs:annotation>
                    </xs:element>
                    <xs:element name="IndexOid" type="xs:string">
                      <xs:annotation>
                        <xs:documentation>SNMP Index Object Identifier</xs:documentation>
                      </xs:annotation>
                    </xs:element>
                  </xs:sequence>
                </xs:complexType>
              </xs:element>
            </xs:sequence>
```

```
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="Status">
    <xs:annotation>
      <xs:documentation/>
    </xs:annotation>
    <xs:complexType>
      <xs:sequence>
        <xs:element name="Device" type="xs:string">
          <xs:annotation>
            <xs:documentation/>
          </xs:annotation>
        </xs:element>
        <xs:element name="DeviceType" type="xs:string"/>
        <xs:group ref="SetBy" minOccurs="0"/>
        <xs:group ref="MultiValue" minOccurs="0"/>
        <xs:element name="Param" type="xs:string">
          <xs:annotation>
            <xs:documentation/>
          </xs:annotation>
        </xs:element>
        <xs:choice>
          <xs:group ref="ParameterValue"/>
          <xs:group ref="Alert"/>
        </xs:choice>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="Control">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="Device" type="xs:string">
          <xs:annotation>
            <xs:documentation>Device ID -- name of device</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="DeviceType" type="xs:string"/>
        <xs:element name="Param" type="xs:string">
          <xs:annotation>
            <xs:documentation>Parameter Type
            </xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:group ref="MultiValue" minOccurs="0"/>
        <xs:group ref="ParameterValue"/>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:group name="MultiValue">
    <xs:sequence>
      <xs:element name="Element" type="xs:positiveInteger">
        <xs:annotation>
          <xs:documentation>Reference to element within Group
          </xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="AuxParam" type="xs:string" minOccurs="0">
        <xs:annotation>
          <xs:documentation>Used if the parameter being communicated is an
            auxiliary parameter</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:group>
```

```
  <xs:group name="SetBy">
    <xs:annotation>
      <xs:documentation>If omitted, parameter is status value inherent to device.
      </xs:documentation>
    </xs:annotation>
    <xs:choice>
      <xs:element name="RedSideOperator"/>
      <xs:element name="BlackSideOperator"/>
      <xs:element name="SetLocal">
        <xs:annotation>
          <xs:documentation>For example, set by operator using device front panel
          </xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:choice>
  </xs:group>
  <xs:group name="ParameterValue">
    <xs:annotation>
      <xs:documentation>Parameter Value used in Status and Control Messages
      </xs:documentation>
    </xs:annotation>
    <xs:choice>
      <xs:element name="Integer" type="xs:integer"/>
      <xs:element name="String" type="xs:string"/>
      <xs:element name="Time" type="xs:nonNegativeInteger"/>
      <xs:element name="DateTime" type="xs:dateTime"/>
      <xs:element name="Enumerated" type="xs:string">
        <xs:annotation>
          <xs:documentation>Enumerated Values defines by parameter type and
             enforced by device schema</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Boolean" type="xs:boolean"/>
      <xs:element name="JPEGPhoto" type="xs:base64Binary"/>
      <xs:element name="Empty"/>
      <xs:group ref="Connection"/>
    </xs:choice>
  </xs:group>
  <xs:group name="Connection">
    <xs:sequence>
      <xs:choice>
        <xs:group ref="FixedConnection" -/>
        <xs:group ref="SwitchConnection" -/>
        <xs:group ref="TCPConnection" -/>
        <xs:group ref="AsyncSerialConnection" -/>
      </xs:choice>
      <xs:element name="Delete" type="xs:boolean" minOccurs="0"/>
    </xs:sequence>
  </xs:group>
  <xs:group name="SwitchConnection">
    <xs:sequence>
      <xs:element name="InConstraint" type="xs:string">
        <xs:annotation>
          <xs:documentation>For
            a Connect To connection, this is set to the source connection interface that the
            connection is coming from.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="FromPort" type="xs:nonNegativeInteger">
        <xs:annotation>
          <xs:documentation>Reference
            to source element number, where the matching connection is multi-value</xs:documentation
        </xs:annotation>
      </xs:element>
      <xs:element name="OutConstraint" type="xs:string">
        <xs:annotation>
          <xs:documentation>For
```

```
            a Connect To connection, this is set to the connection interface chosen.</xs:documentati
        </xs:annotation>
      </xs:element>
      <xs:element name="ToPort" type="xs:nonNegativeInteger">
        <xs:annotation>
          <xs:documentation>Reference
            to element number, where the matching connection is multi-value</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:group>
  <xs:group name="FixedConnection">
    <xs:sequence>
      <xs:element name="ConnectedDevice" type="xs:string">
        <xs:annotation>
          <xs:documentation>For
            a Connect To connection, this is set to the Device ID of the device being connected to.
        </xs:annotation>
      </xs:element>
      <!-- <xs:sequence>
      <xs:element name="ConnectFromInterface" type="xs:string">
        <xs:annotation>
          <xs:documentation>For a Connect To connection, this is set to the
             source connection interface that the connection is coming from.</xs:documentation>
        </xs:annotation>
      </xs:element> --->
      <xs:element minOccurs="0" name="ConnectFromPort" type="xs:integer">
        <xs:annotation>
          <xs:documentation>Reference
            to source element number, where the matching connection is multi-value</xs:documentation
        </xs:annotation>
      </xs:element>
      <xs:element name="ConnectToInterface" type="xs:string">
        <xs:annotation>
          <xs:documentation>For
            a Connect To connection, this is set to the connection interface chosen.</xs:documentati
        </xs:annotation>
      </xs:element>
      <xs:element minOccurs="0" name="ConnectToPort" type="xs:integer">
        <xs:annotation>
          <xs:documentation>Reference
            to element number, where the matching connection is multi-value</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:group>
  <xs:group name="TCPConnection">
    <xs:sequence>
      <xs:element name="Port" type="xs:string" minOccurs="0">
        <xs:annotation>
          <xs:documentation>TCP
            parameters set with two values. One is port, and the other is a choice of domain, IP4 or
            IPv6 </xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Domain" type="xs:string" minOccurs="0"/>
      <xs:element name="IPv4" type="xs:string" minOccurs="0"/>
      <xs:element name="IPv6" type="xs:string" minOccurs="0"/>
      <xs:element name="FromPortIndex" type="xs:nonNegativeInteger" minOccurs="0"/>
      <xs:element name="ToPortIndex" type="xs:nonNegativeInteger" minOccurs="0"/>
    </xs:sequence>
  </xs:group>
  <xs:group name="AsyncSerialConnection">
    <xs:sequence>
      <xs:element name="AsyncSerialReference" type="xs:string"/>
    </xs:sequence>
  </xs:group>
```

```
  <xs:group name="Alert">
    <xs:sequence>
      <xs:group ref="Severity"/>
      <xs:element name="AlertMessage" type="xs:string"/>
      <xs:group ref="Source" minOccurs="0" maxOccurs="1"/>
    </xs:sequence>
  </xs:group>
  <xs:group name="Severity">
    <xs:choice>
      <xs:element name="Info"/>
      <xs:element name="Warning"/>
      <xs:element name="Error"/>
      <xs:element name="Severe"/>
      <xs:element name="Critical"/>
    </xs:choice>
  </xs:group>
  <xs:group name="Source">
    <xs:choice>
      <xs:element name="Driver"/>
      <xs:element name="Rule"/>
      <xs:element name="Server"/>
    </xs:choice>
  </xs:group>
  <xs:element name="StandardParameterList">
    <xs:complexType>
      <xs:sequence>
        <xs:element maxOccurs="unbounded" ref="Parameter"/>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
</xs:schema>
```

Appendix F Device Driver Protocol

This appendix specifies the protocol used to drive a device and its relationship to the abstract device specification.

F.1 Driver invocation

The device driver for an individual device is an executable program or script that will be invoked directory by the Red/Black server. The device driver communicates with the Red/Black server through pipes connected to the standard input for incoming control messages, and the standard output for status messages from the device. The device is invoked as follows:

```
<devicedriver> <name> <schema> <standarddefs>
```

where the details are

devicedriver
: The executable (or script) for the device driver. This as noted is expected to take binary data on input and output and monitor/control the device either directly or through some device specific protocol. This will be directly executed as a child of the server, and restarted if it fails.

name
: This is the name of the device as specified in the configuration section Chapter 4, *Configuring Red/Black*

schema
: This is the path to the XML schema file for the device. The device can use this for either schema validation, or to discover what settings are supported. Some devices may have hard coded definitions built in and won't use this.

standarddefs
: This is the path to the XML file of standard definitions for commonly used status and control messages which are referenced from the main schema.

An example invocation might be

```
radiodriver HFRadio1 isode-radio.xml stdparams.xml
```

F.2 Driver protocol

The core messages sent and received by the driver are based on the Red/Black Status and Control XML messages. These are then encapsulated in a thin CBOR encoding layer, similar in structure to the M-Guard *GCXP* protocol.

The XML Status and Control messages are wrapped in a CBOR simple binary wrapper.

CBOR allows a simple binary length to be computed and the packet encapsulated in it, so both driver and server are aware how much data will be arriving.

The XML is first encoded as a *CBOR* string (CBOR Major Text (3)) which includes the length. This is then further wrapped in a tagged type (major type 5) of type CBOR

Wrapped (24) and the included length. Thus a packet starts off looking something like this:

```
0xD8 # Tag type 6 + Wrapped(24)
0x18 # Tag type Number(0) + Wrapped(24)
0x4x # Tag type bytestring(2) + cbor length
```

On receipt of a control packet, the driver will attempt to make the appropriate change to the device and then issue a Status message with the result, or perhaps an alert if the change could not be made.

Some sample drivers are provided which don't control anything currently, but allow the protocol to be tested by issuing random changes and events.

F.3 Specific Status Packets

There are some commonly used status packets that are expected to be supported by most if not all device drivers. These include the following.

F.3.1 Heartbeat

The Heartbeat packet is designed to be sent at frequent intervals as a way of indicating the driver is still functioning.

```
<Status>
  <Device>radio</Device>
  <DeviceType>IsodeRadio</DeviceType>
  <Param>Heartbeat</Param>
  <Integer>1590662894</Integer>
</Status>
```

The Integer parameter is the unix time for when the next heartbeat is expected. This should be sufficiently short that malfunctioning drivers can be detected reasonably promptly, but not frequent enough to cause heavy load on the server. A time in range of the order of about a minute is suggested.

F.3.2 StartTime

The StartTime packet is designed to be sent at start up and when requested. It contains the time the device started up in unixtime format.

```
<Status>
  <Device>radio</Device>
  <DeviceType>IsodeRadio</DeviceType>
  <Param>StartTime</Param>
  <Integer>1590662894</Integer>
</Status>
```

F.3.3 Status

This status message informs the system of the current status, from `non-operation`, `partly operational`, to `operational`.

```
<Status>
  <Device>radio</Device>
```

```
  <DeviceType>IsodeRadio</DeviceType>
  <Param>Status</Param>
  <String>operational</String>
</Status>
```

F.4 Specific Control Packets

There are some commonly used control packets that are expected to be supported by most if not all device drivers.

F.4.1 SendParameters

This control message requests the device driver to send all the current status information, either to resynchronise, or to inform other servers of the current state.

```
<Control>
  <Device>radio</Device>
  <DeviceType>IsodeRadio</DeviceType>
  <Param>SendParameters</Param>
  <Empty/>
</Control>
```

F.4.2 Reset

This control requests the device to reset itself.

```
<Control>
  <Device>radio</Device>
  <DeviceType>IsodeRadio</DeviceType>
  <Param>Reset</Param>
  <Empty/>
</Control>
```

Appendix G Writing a Device Driver

There is an open source example device driver, consisting of a C++ device driver, and a "dummy" radio device written in Go, which is available at https://github.com/Isode-Ltd/redblack-demo-device.

We have two sample drivers that respond to `Control` messages and issue `Status` messages. These are written to be sample generic drivers, so they read the XML description of the device they are going to pretend to be, and issue random values from those allowed within the abstract specification.

One is written in perl and another in go.

These and other drivers will be published in due course.

Appendix H M-Guard Application Profile for Red/Black

This appendix will have a reference definition of M-Guard Application Profile