



FAB Application Profile for use with XML Guard

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1 Overview

This white paper specifies an Application Profile for use of Isode’s Frequency Assignment Broadcast (FAB) XML protocol with an XML Guard. It defines:

- Schema for the Application Profile
- Normalization Requirements
- Rules which can be used to constrain the base profile

Application Profiles are summarized in the Isode white paper [“XML Guard Application Profiles”](#). They define a product-independent approach to specify functionality across an XML Guard.

Goals of this specification:

- To provide a clear specification to enable system accreditation of a system using Isode’s M-Guard and Isode’s FAB products.
- To enable use of a third party XML Guard with Isode’s FAB server.

2 The Isode FAB XML Protocol



FAB is an unencrypted broadcast protocol generated by Isode’s FAB Server which sits black side of a security boundary. FAB Server is sold as a part of Isode’s M-Switch product.

FAB messages are generated red side by an operator using the ACP 127 view in MConsole which is the management UI of Isode’s M-Switch core product.

M-Switch and FAB server communicate using Isode’s open GCXP (Guard Content Exchange Protocol) with a set of XML messages specified in this document. This is a control protocol flowing from red to black, which enables operator control of the FAB broadcast.

This communication can use M-Guard or another XML Guard to provide red/black separation.

3 Profile Summary

This profile is based on the FAB XML schema, which defines the XML messages exchanged and is specified below. The Schema, specified as an XML Schema Definition (XSD), specifies an “outer bound” for what is allowed through the guard.

The associated rules then constrain this schema, by blocking elements of the schema. This allows the messages being passed to be reduced.

4 Red to Black Protection Requirements

A key security requirement is to prevent leakage of sensitive information from Red to Black. The minimal information contained in the messages supports this. It is basic information necessary to provide FAB.

Another security concern may be covert channel, where extraneous information in the protocol is used to convey other information. M-Guard Rate Control is a key tool to minimize this risk.

Rules as part of this application can constrain the information further, in order to reduce potential for covert signaling.

5 Normalization

This profile requires the following normalization of FAB messages:

- Prohibition of XML Comments and XML Processing Instructions.
- Use of Canonical XML. Following [Canonical XML Version 1.1](#) of May 2008.
- Unicode Normalization following [UNICODE NORMALIZATION FORMS](#) 13.0.0 using Normalization Form C (NFC) “Canonical Decomposition, followed by Canonical Composition”

6 Rules

This version of the Application Profile defines the following associated rules, that may be enabled to further constrain the base schema. These rules are set out to broadly correspond to the schema order, but grouping related functions together. The choice of rules will be deployment-specific.

Rule	Notes
Prohibit SVCLINE	Do not allow SVCLINE messages. Not all deployments need these and they should be blocked if not used
Prohibit SVCLINE with free text	Do not allow SVCLINE messages with free text.
Limit SVCLINE Catalog References	Specified an upper bound for the SVCLINE catalog reference number, which is expected to be the size of the configured catalog.

Rule	Notes
Restrict Channel Designators	<p>The protocol allows any value for a Channel Designator, which identified a frequency being listened on.</p> <p>This rule constrains the Channel Designator values to a specified list, thus minimizing options for covert channel.</p>

7 Isode Application Profile Product

Isode provides a FAB Application Profile product that follows this specification. This profile will enable M-Guard to provide a guard compliant to this profile.

8 Schema

The FAB protocol schema is specified below. It allows messages to go from ACP 127 server that contain:

- The FAB Message identified as <Message/>
 - Check and Retransmit messages have integer parameters constrained to FAB protocol limits
 - Service line message specifies the message either as an integer reference to a catalog (configured on ACP 127 and FAB Server) or as a string
- Channel Designator, specified as <ChannelDesignator/>
- Ship identified by single letter (optional).

8.1 Example Messages

This section shows some sample messages, correctly normalized following this specification, but folded to make easier to read.

A simple Busy message, with channel designator “RECV”:

```
<FABMessage xmlns="http://isode.com/m-switch/fab-control/0">
  <Message><Busy></Busy></Message><ChannelDesignator>RECV</ChannelDesignator>
</FABMessage>
```

A Message Received message, with ship specified:

```
<FABMessage xmlns="http://isode.com/m-switch/fab-control/0">
  <Message><Received></Received></Message><ChannelDesignator>RECV</ChannelDesignator><Ship>E</Ship>
</FABMessage>
```

A Check message, as example of message with a parameter:

```
<FABMessage xmlns="http://isode.com/m-switch/fab-control/0">
  <Message><Check><FirstFL>3</FirstFL></Check></Message>
  <ChannelDesignator>RECV</ChannelDesignator>
```

```
</FABMessage>
```

A Service Line message with free text specification:

```
<FABMessage xmlns="http://isode.com/m-switch/fab-control/0">  
<Message><Svcline><SVCtext>HELLO WORLD</SVCtext></Svcline></Message>  
<ChannelDesignator>RECV</ChannelDesignator><Ship>E</Ship>  
</FABMessage>
```

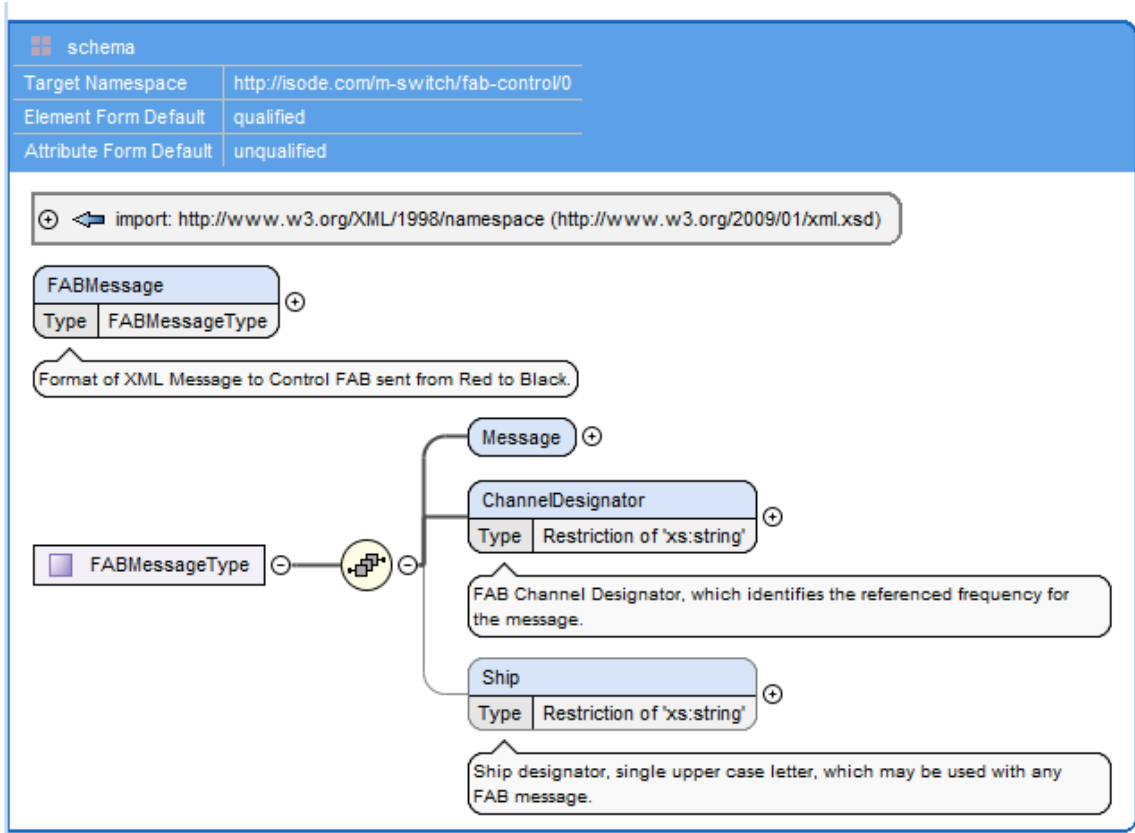
A Service Line message with catalog reference:

```
<FABMessage xmlns="http://isode.com/m-switch/fab-control/0">  
<Message><Svcline><SVCcatalog>1</SVCcatalog></Svcline></Message>  
<ChannelDesignator>RECV</ChannelDesignator>  
</FABMessage>
```

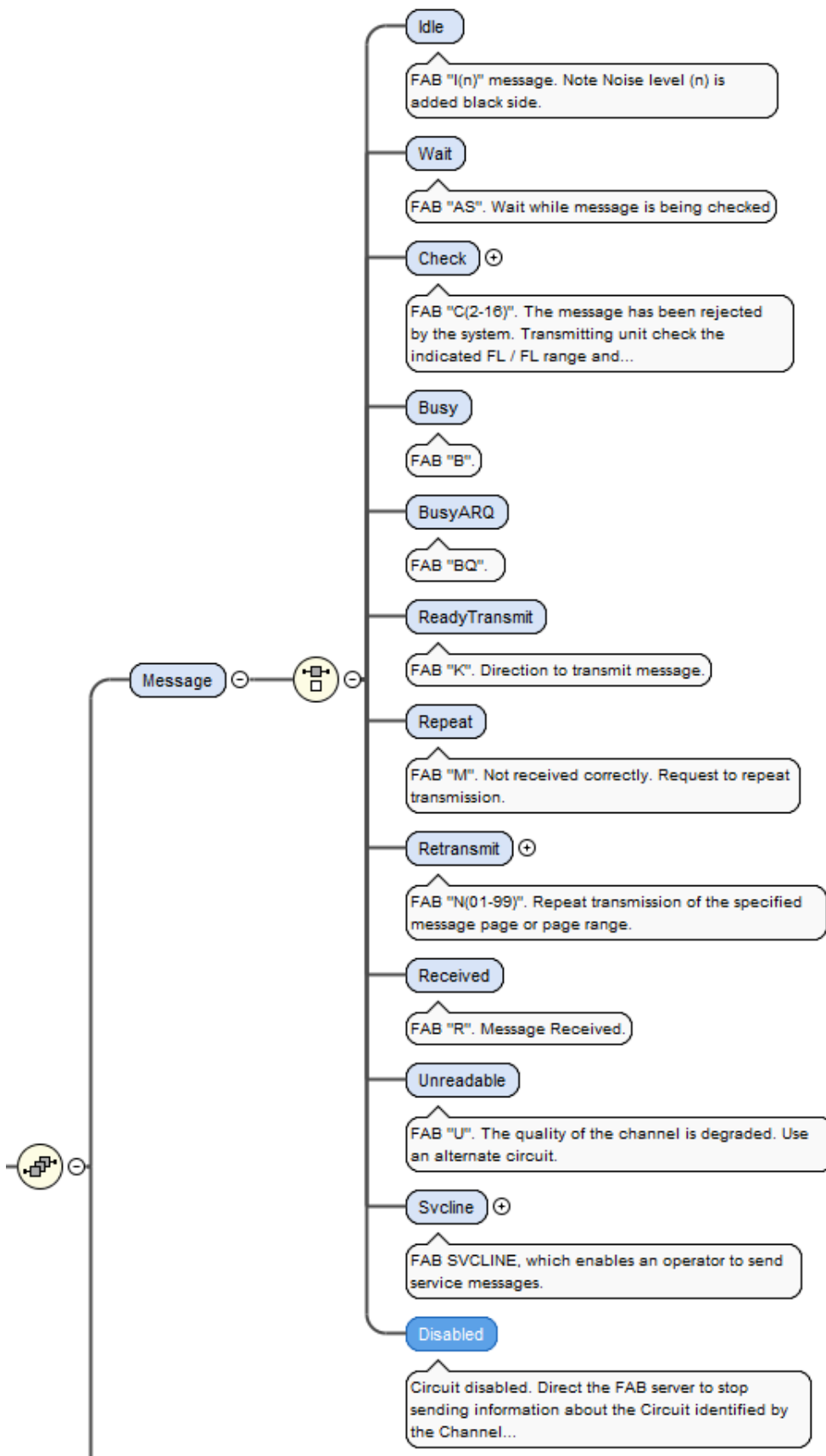
8.2 Schema Visualisation

This section shows the schema, as visualised by the oXygen XML editor.

This is the overall schema showing structure of the messages



Expansion of Message:



8.3 Schema Specification

This is the formal XML Schema Definition:

```
<?xml version="1.0"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="http://isode.com/m-switch/fab-control/0" xml:lang="en"
  targetNamespace="http://isode.com/m-switch/fab-control/0" elementFormDefault="qualified"
  attributeFormDefault="unqualified">
  <xs:import namespace="http://www.w3.org/XML/1998/namespace"
    schemaLocation="http://www.w3.org/2009/01/xml.xsd"/>
  <xs:element name="FABMessage" type="FABMessageType">
    <xs:annotation>
      <xs:documentation>Format of XML Message to Control FAB sent from Red to Black.</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:complexType name="FABMessageType">
    <xs:sequence>
      <xs:element name="Message">
        <xs:complexType>
          <xs:choice>
            <xs:element name="Idle">
              <xs:annotation>
                <xs:documentation>FAB "I(n)" message. Note Noise level (n) is added black
side.</xs:documentation>
              </xs:annotation>
            <xs:complexType/>
          </xs:element>
            <xs:element name="Wait">
              <xs:annotation>
                <xs:documentation>FAB "AS". Wait while message is being checked</xs:documentation>
              </xs:annotation>
            <xs:complexType/>
          </xs:element>
            <xs:element name="Check">
              <xs:annotation>
                <xs:documentation>FAB "C(2-16)". The message has been rejected by the system.
Transmitting unit check the indicated FL / FL range and retransmit in the correct format.</xs:documentation>
              </xs:annotation>
            <xs:complexType>
              <xs:sequence>
                <xs:element name="FirstFL">
                  <xs:simpleType>
                    <xs:restriction base="xs:positiveInteger">
                      <xs:minInclusive value="2"/>
                      <xs:maxInclusive value="16"/>
                    </xs:restriction>
                  </xs:simpleType>
                </xs:element>
                <xs:element minOccurs="0" name="LastFL">
                  <xs:annotation>
```

```

        <xs:documentation>If absent, one FL only</xs:documentation>
    </xs:annotation>
    <xs:simpleType>
        <xs:restriction base="xs:positiveInteger">
            <xs:minInclusive value="2"/>
            <xs:maxInclusive value="16"/>
        </xs:restriction>
    </xs:simpleType>
</xs:element>
</xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="Busy">
    <xs:annotation>
        <xs:documentation>FAB "B".</xs:documentation>
    </xs:annotation>
    <xs:complexType/>
</xs:element>
<xs:element name="BusyARQ">
    <xs:annotation>
        <xs:documentation>FAB "BQ".</xs:documentation>
    </xs:annotation>
    <xs:complexType/>
</xs:element>
<xs:element name="ReadyTransmit">
    <xs:annotation>
        <xs:documentation>FAB "K". Direction to transmit message.</xs:documentation>
    </xs:annotation>
    <xs:complexType/>
</xs:element>
<xs:element name="Repeat">
    <xs:annotation>
        <xs:documentation>FAB "M". Not received correctly. Request to repeat
transmission.</xs:documentation>
    </xs:annotation>
    <xs:complexType/>
</xs:element>
<xs:element name="Retransmit">
    <xs:annotation>
        <xs:documentation>FAB "N(01-99)". Repeat transmission of the specified message page or
page range.</xs:documentation>
    </xs:annotation>
    <xs:complexType>
        <xs:sequence>
            <xs:element name="StartPage">
                <xs:annotation>
                    <xs:documentation>First Page</xs:documentation>
                </xs:annotation>
                <xs:simpleType>
                    <xs:restriction base="xs:positiveInteger">

```



```

                <xs:maxInclusive value="99"/>
            </xs:restriction>
        </xs:simpleType>
    </xs:element>
    <xs:element minOccurs="0" name="EndPage">
        <xs:annotation>
            <xs:documentation>End Page. If not present, single page
requested</xs:documentation>
        </xs:annotation>
    </xs:element>
    <xs:simpleType>
        <xs:restriction base="xs:positiveInteger">
            <xs:maxInclusive value="99"/>
        </xs:restriction>
    </xs:simpleType>
</xs:element>
</xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="Received">
    <xs:annotation>
        <xs:documentation>FAB "R". Message Received.</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element name="Unreadable">
    <xs:annotation>
        <xs:documentation>FAB "U". The quality of the channel is degraded. Use an alternate
circuit.</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element name="Svcline">
    <xs:annotation>
        <xs:documentation>FAB SVCLINE, which enables an operator to send service
messages.</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:choice>
    <xs:element name="SVCatalog">
        <xs:annotation>
            <xs:documentation>Integer identifying a message number in catalog
configured in ACP 127 and FAB Server.</xs:documentation>
        </xs:annotation>
    </xs:element>
    <xs:simpleType>
        <xs:restriction base="xs:positiveInteger">
            <xs:minInclusive value="1"/>
            <xs:maxInclusive value="256"/>
        </xs:restriction>
    </xs:simpleType>
</xs:element>
<xs:element name="SVText">

```

```

        <xs:annotation>
            <xs:documentation>Free form text value specified by operator. Limited to 64
characters. Char set limited to uppercase letters, digits, space, colon, full stop, comma, hyphen and question
mark.</xs:documentation>
        </xs:annotation>
        <xs:simpleType>
            <xs:restriction base="xs:string">
                <xs:maxLength value="64"/>
                <xs:minLength value="1"/>
                <xs:pattern value="[A-Z0-9 ,-\.\?]+"/>
            </xs:restriction>
        </xs:simpleType>
    </xs:element>
</xs:choice>
</xs:complexType>
</xs:element>
<xs:element name="Disabled">
    <xs:annotation>
        <xs:documentation>Circuit disabled. Direct the FAB server to stop sending information
about the Circuit identified by the Channel Designator.</xs:documentation>
    </xs:annotation>
    <xs:complexType/>
</xs:element>
</xs:choice>
</xs:complexType>
</xs:element>
<xs:element name="ChannelDesignator">
    <xs:annotation>
        <xs:documentation>FAB Channel Designator, which identifies the referenced frequency for the
message.</xs:documentation>
    </xs:annotation>
    <xs:simpleType>
        <xs:restriction base="xs:string">
            <xs:pattern value="[A-Z0-9]+"/>
            <xs:maxLength value="10"/>
        </xs:restriction>
    </xs:simpleType>
</xs:element>
<xs:element name="Ship" minOccurs="0">
    <xs:annotation>
        <xs:documentation>Ship designator, single upper case letter, which may be used with any FAB
message.</xs:documentation>
    </xs:annotation>
    <xs:simpleType>
        <xs:restriction base="xs:string">
            <xs:pattern value="[A-Z]"/>
            <xs:maxLength value="1"/>
        </xs:restriction>
    </xs:simpleType>
</xs:element>
</xs:sequence>

```

```
</xs:complexType>  
</xs:schema>
```