Isode

Icon-5066 Application Profiles for use with XML Guard

3rd April 2025

1 Overview

This white paper specifies two Application Profiles to support use with Isode's Icon-5066 product with an XML Guard. It defines:

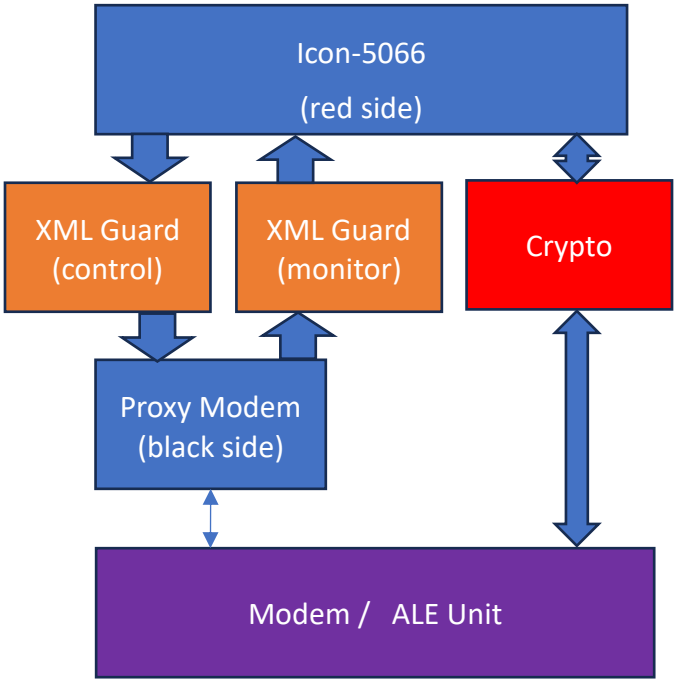
- Schemas for each Application Profile
- Normalization Requirements
- Rules which can be used to constrain the base profiles

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 Icon-5066 products.
- To enable use of a third party XML Guard with Isode's Icon-5066 product.

2 The Icon-5066 XML Protocols



Icon-5066 is Isode's STANAG 5066 server, providing most functions as a red side product. Data communication with modem (black side) goes through a crypto device.

Proxy Modem is a part of Icon-5066 that sits black side and provides control/monitoring to Modem/ALE units using modem-vendor-specific protocol. It communicates with Icon-5066 through a pair of XML Guards providing control and monitoring flows. There are three broad functions provided:

1. Modem Control. Control of the modem for sending and receiving data. Key functions:
    a. Control: set speed, interleaver, and other parameters before starting a transmission.
    b. Monitoring:
        i. Report if modem is transmitting, receiving or both
        ii. Report SNR and other quality parameters of received data
        iii. Report speed and interleaver for received transmissions

2. ALE Unit Control for managing ALE links. Key functions:
    a. Control
        i. Set target ALE address to link to and frequencies to use if frequency prediction is used. Black side will attempt to link, using the frequencies

in order if specified. If linking fails, black side will Scan for a period and then try linking again.
ii. Release an active ALE link

b. Monitoring:
i. Report current ALE status (connected; linking; scanning or sounding).
ii. Report ALE provided LQA (Link Quality Analysis).
iii. Report linking failure information.

3. ALE Unit Configuration. ALE frequencies and addresses can be configured red side. This is important for supporting Mobile Unit mobility, which needs updating of ALE addressing and scheduling for frequency changes. This configuration information is sent over the control channel when ALE configuration changes.

3 Summary of the Profiles

There are two profiles, one associated with the monitoring flow and the other associated with the control flow.

These profiles are based on XML schemas, which defines the XML messages exchanged and are specified below. The Schemas, specified as an XML Schema Definition (XSD), specify an "outer bound" for what is allowed through the guard.

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

4 Normalization

Both profiles require the following message normalization:

- 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"

5 Isode Icon-5066 Application Profile Products

Isode provides two Application Profile products that follow the two profiles defined in his specification. These profiles enable M-Guard to provide guards compliant to these profiles.

6 Icon-5066 Monitoring Profile

6.1 Black to Red Protection Requirements

The primary security requirement for black to red information flow is to prevent malware or other attacks. The Icon-5066 monitor protocol messages are highly structured XML and this structure is an effective way to prevent malware.

No rules are needed in addition to the base schema.

6.2 Schema

The Icon-5066 Monitoring protocol schema is specified below. It defines the <Icon-5066Monitor/> message sent from black to red.

6.2.1 Example Messages

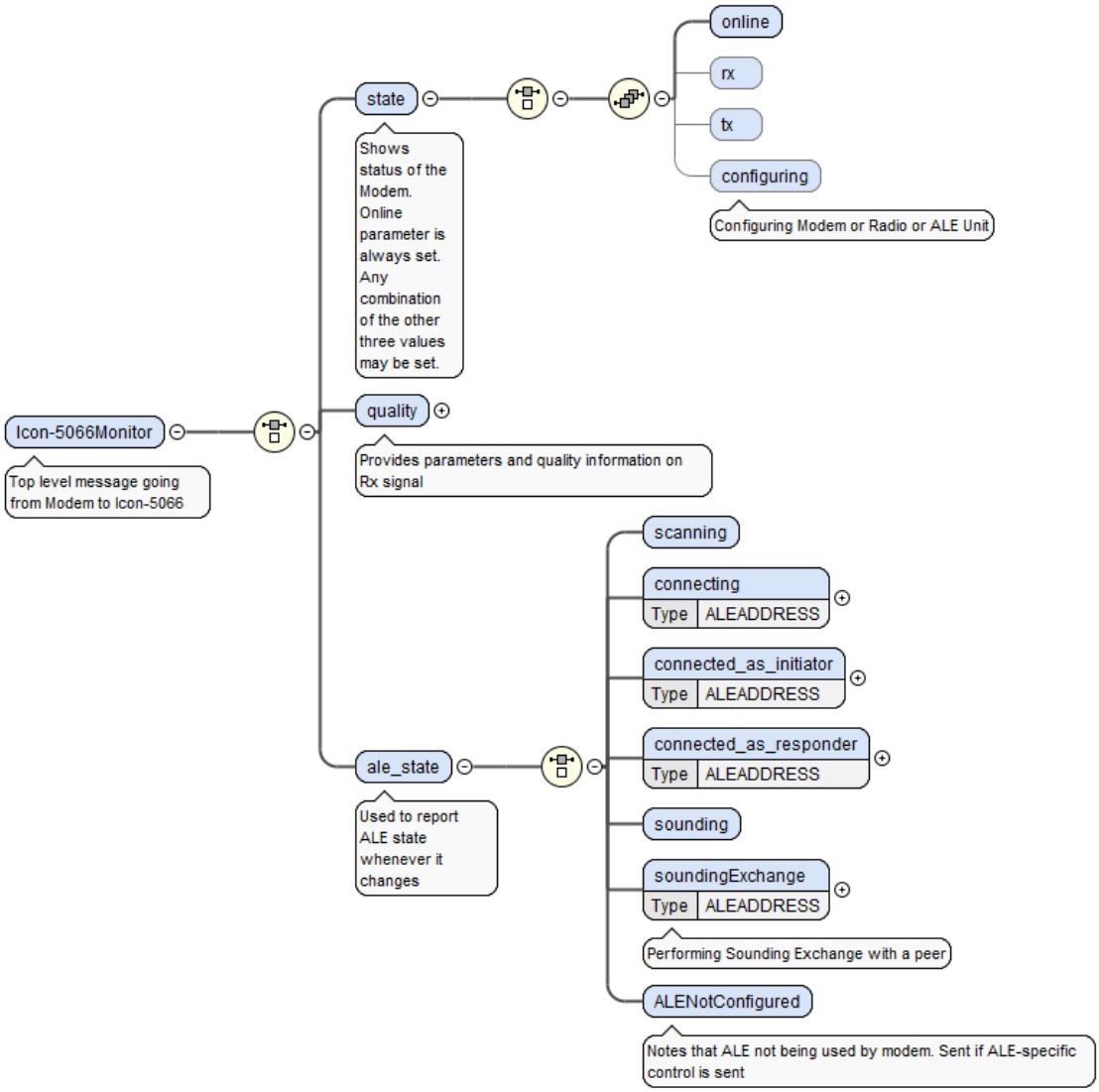
This section shows an example message, correctly normalized following this specification, but folded to make easier to read. This message shows a reported SNR of 5.66. Note that the integer represents SNR*100, so that SNR can be specified to two decimal places.

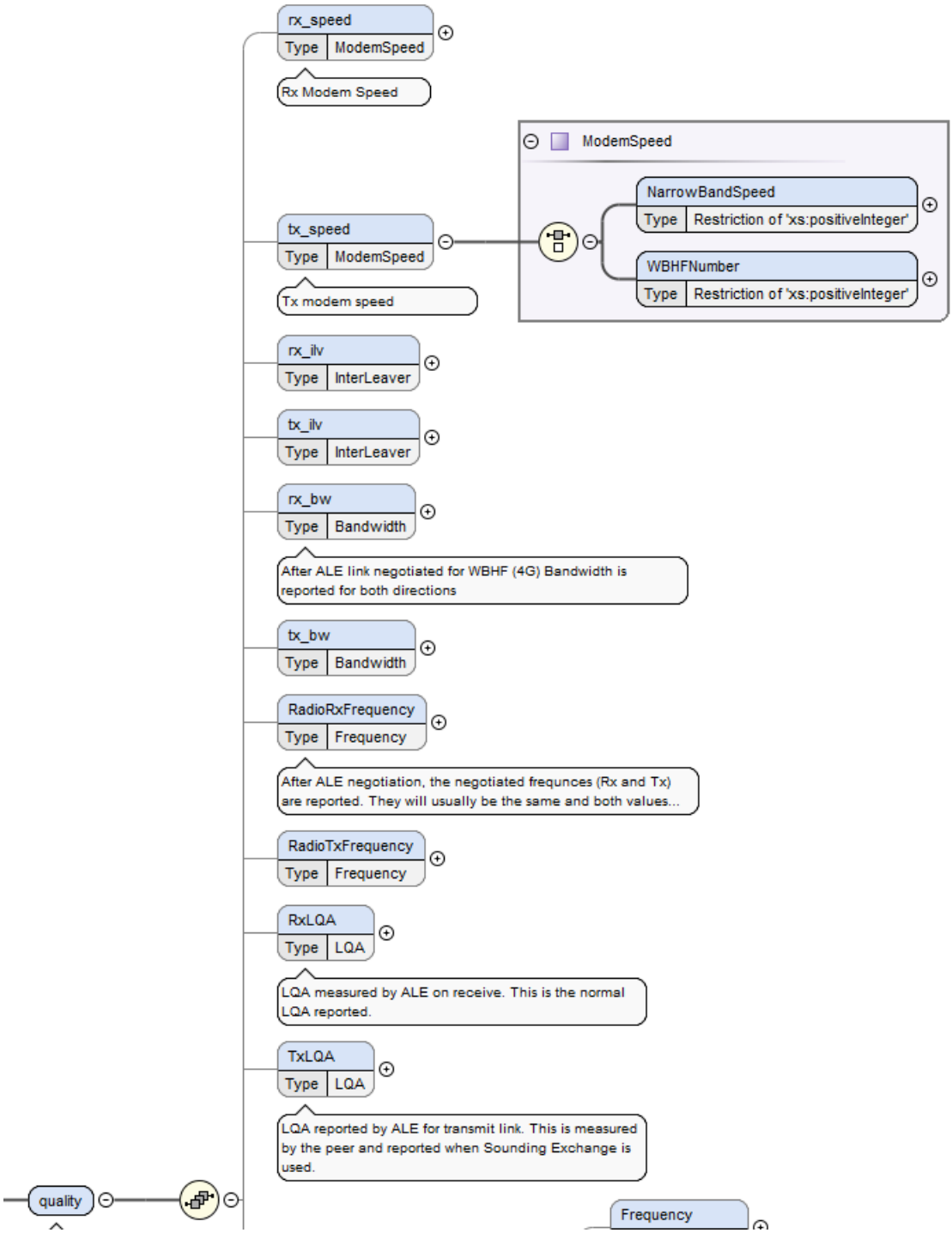
```
<Icon-5066Monitor xmlns="http://isode.com/icon-5066/monitor/0">
<quality>
<snr>566</snr>
</quality>
</Icon-5066Monitor>
```

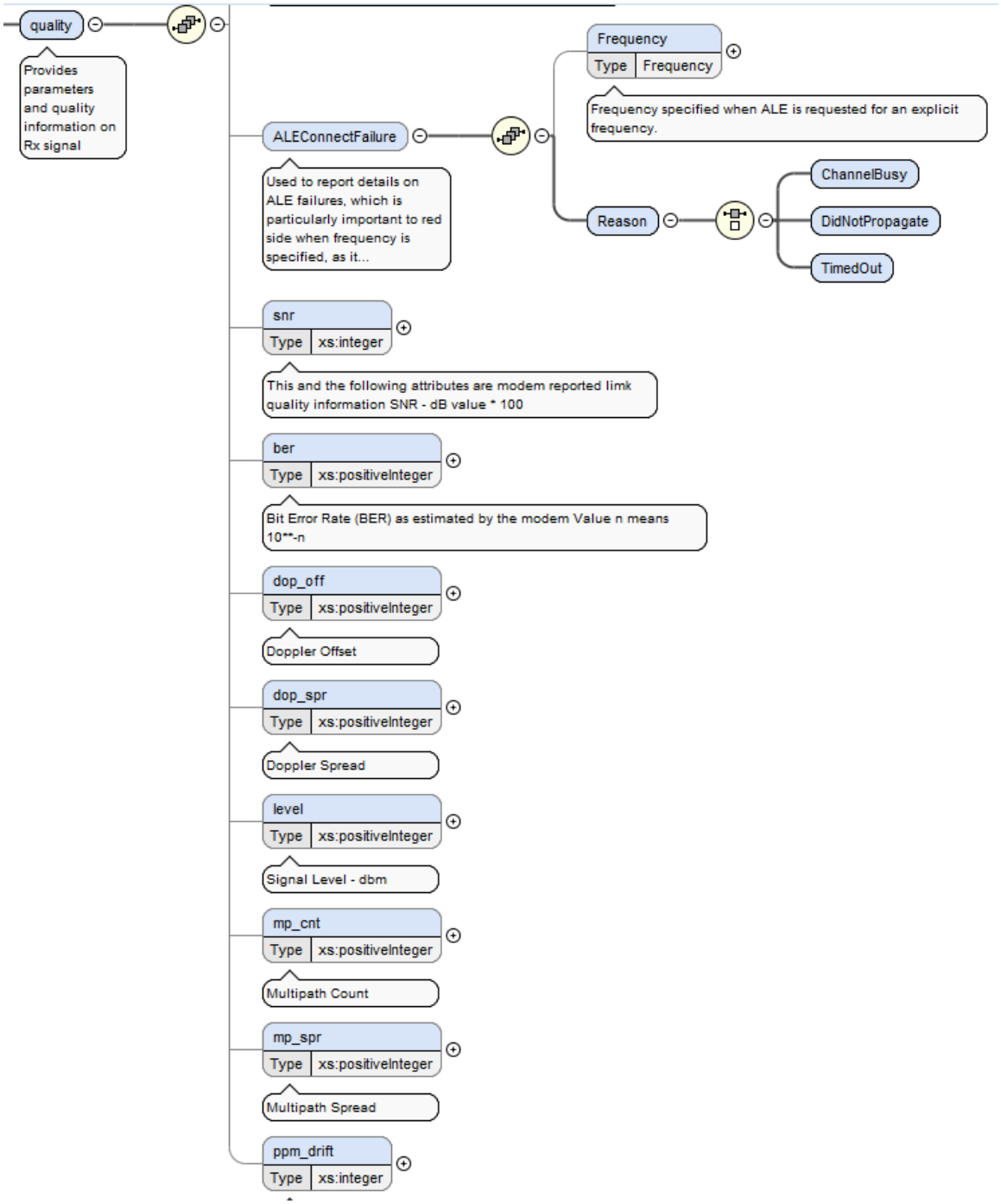
6.2.2 Schema Visualisation

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

This is the overall schema showing structure of the messages


Icon-5066Monitor
Top level message going from Modem to Icon-5066
state
Shows status of the Modem. Online parameter is always set. Any combination of the other three values may be set.
online
rx
tx
configuring
Configuring Modem or Radio or ALE Unit
quality
Provides parameters and quality information on Rx signal
ale_state
Used to report ALE state whenever it changes
scanning
connecting
Type ALEADDRESS
connected_as_initiator
Type ALEADDRESS
connected_as_responder
Type ALEADDRESS
sounding
soundingExchange
Type ALEADDRESS
Performing Sounding Exchange with a peer
ALENotConfigured
Notes that ALE not being used by modem. Sent if ALE-specific control is sent


rx_speed
Type ModemSpeed
Rx Modem Speed
ModemSpeed
NarrowBandSpeed
Type Restriction of 'xs:positiveInteger'
WBHFNumber
Type Restriction of 'xs:positiveInteger'
tx_speed
Type ModemSpeed
Tx modem speed
rx_ilv
Type InterLeaver
tx_ilv
Type InterLeaver
rx_bw
Type Bandwidth
After ALE link negotiated for WBHF (4G) Bandwidth is reported for both directions
tx_bw
Type Bandwidth
RadioRxFrequency
Type Frequency
After ALE negotiation, the negotiated frequnces (Rx and Tx) are reported. They will usually be the same and both values...
RadioTxFrequency
Type Frequency
RxLQA
Type LQA
LQA measured by ALE on receive. This is the normal LQA reported.
TxLQA
Type LQA
LQA reported by ALE for transmit link. This is measured by the peer and reported when Sounding Exchange is used.
quality
Frequency


quality
Provides parameters and quality information on Rx signal
ALEConnectFailure
Used to report details on ALE failures, which is particularly important to red side when frequency is specified, as it...
Frequency
Type
Frequency
Frequency specified when ALE is requested for an explicit frequency.
Reason
ChannelBusy
DidNotPropagate
TimedOut
snr
Type
xs:integer
This and the following attributes are modem reported limk quality information SNR - dB value * 100
ber
Type
xs:positiveInteger
Bit Error Rate (BER) as estimated by the modem Value n means 10**-n
dop_off
Type
xs:positiveInteger
Doppler Offset
dop_spr
Type
xs:positiveInteger
Doppler Spread
level
Type
xs:positiveInteger
Signal Level - dbm
mp_cnt
Type
xs:positiveInteger
Multipath Count
mp_spr
Type
xs:positiveInteger
Multipath Spread
ppm_drift
Type
xs:integer

6.2.3 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/icon-5066/monitor/0"
    xml:lang="en" targetNamespace="http://isode.com/icon-5066/monitor/0"
    elementFormDefault="qualified" attributeFormDefault="unqualified">
    <xs:annotation>
        <xs:documentation/>
    </xs:annotation>
    <xs:import namespace="http://www.w3.org/XML/1998/namespace"
        schemaLocation="http://www.w3.org/2009/01/xml.xsd"/>
    <xs:element name="Icon-5066Monitor">
        <xs:annotation>
            <xs:documentation>Top level message going from Modem to Icon-5066</xs:documentation>
        </xs:annotation>
        <xs:complexType>
            <xs:choice>
                <xs:element name="state">
                    <xs:annotation>
                        <xs:documentation>Shows status of the Modem.
Online parameter is always set.
Any combination of the other three values may be set.</xs:documentation>
                    </xs:annotation>
                    <xs:complexType>
                        <xs:choice>
                            <xs:sequence>
                                <xs:element name="online"/>
                                <xs:element minOccurs="0" name="rx">
                                    <xs:complexType/>
                                </xs:element>
                                <xs:element minOccurs="0" name="tx">
                                    <xs:complexType/>
                                </xs:element>
                                <xs:element minOccurs="0" name="configuring">
                                    <xs:annotation>
                                        <xs:documentation>Configuring Modem or Radio or ALE Unit</xs:documentation>
                                    </xs:annotation>
                                    <xs:complexType/>
                                </xs:element>
                            </xs:sequence>
                        </xs:choice>
                    </xs:complexType>
                </xs:element>
                <xs:element name="quality">
                    <xs:annotation>
                        <xs:documentation>Provides parameters and quality information on Rx signal</xs:documentation>
                    </xs:annotation>
```

```
                    <xs:complexType>
                        <xs:sequence>
                            <xs:element minOccurs="0" name="rx_speed" type="ModemSpeed">
                                <xs:annotation>
                                    <xs:documentation>Rx Modem Speed</xs:documentation>
                                </xs:annotation>
                            </xs:element>
                            <xs:element minOccurs="0" name="tx_speed" type="ModemSpeed">
                                <xs:annotation>
                                    <xs:documentation>Tx modem speed</xs:documentation>
                                </xs:annotation>
                            </xs:element>
                            <xs:element minOccurs="0" name="rx_ilv" type="InterLeaver"/>
                            <xs:element minOccurs="0" name="tx_ilv" type="InterLeaver"/>
                            <xs:element minOccurs="0" name="rx_bw" type="Bandwidth">
                                <xs:annotation>
                                    <xs:documentation>After ALE link negotiated for WBHF (4G) Bandwidth is reported for
both directions</xs:documentation>
                                </xs:annotation>
                            </xs:element>
                            <xs:element minOccurs="0" name="tx_bw" type="Bandwidth"/>
                            <xs:element minOccurs="0" name="RadioRxFrequency" type="Frequency">
                                <xs:annotation>
                                    <xs:documentation>After ALE negotiation, the negotiated frequnces (Rx and Tx) are
reported.


They will usually be the same and both values are always sent</xs:documentation>
                                </xs:annotation>
                            </xs:element>
                            <xs:element minOccurs="0" name="RadioTxFrequency" type="Frequency"/>
                            <xs:element minOccurs="0" name="RxLQA" type="LQA">
                                <xs:annotation>
                                    <xs:documentation>LQA measured by ALE on receive.  This is the normal LQA
reported.</xs:documentation>
                                </xs:annotation>
                            </xs:element>
                            <xs:element minOccurs="0" name="TxLQA" type="LQA">
                                <xs:annotation>
                                    <xs:documentation>LQA reported by ALE for transmit link.  This is measured by the
peer and reported when Sounding Exchange is used.</xs:documentation>
                                </xs:annotation>
                            </xs:element>
                            <xs:element minOccurs="0" name="ALEConnectFailure">
                                <xs:annotation>
                                    <xs:documentation>Used to report details on ALE failures, which is particularly
important to red side when frequency is specified, as it can help red side better select frequencies</xs:documentation>
                                </xs:annotation>
                                <xs:complexType>
                                    <xs:sequence>
                                        <xs:element minOccurs="0" name="Frequency" type="Frequency">
                                            <xs:annotation>
```

```
                                        <xs:documentation>Frequency specified when ALE is requested for an
explicit frequency.</xs:documentation>
                                    </xs:annotation>
                                </xs:element>
                                <xs:element name="Reason">
                                    <xs:complexType>
                                        <xs:choice>
                                          <xs:element name="ChannelBusy">
                                          <xs:complexType/>
                                          </xs:element>
                                          <xs:element name="DidNotPropagate">
                                          <xs:complexType/>
                                          </xs:element>
                                          <xs:element name="TimedOut">
                                          <xs:complexType/>
                                          </xs:element>
                                        </xs:choice>
                                    </xs:complexType>
                                </xs:element>
                            </xs:sequence>
                        </xs:complexType>
                    </xs:element>
                    <xs:element minOccurs="0" name="snr" type="xs:integer">
                        <xs:annotation>
                            <xs:documentation>This and the following attributes are modem reported limk quality
information

SNR - dB  value * 100</xs:documentation>
                        </xs:annotation>
                    </xs:element>
                    <xs:element minOccurs="0" name="ber" type="xs:positiveInteger">
                        <xs:annotation>
                            <xs:documentation>Bit Error Rate (BER) as estimated by the modem

Value n means 10**-n</xs:documentation>
                        </xs:annotation>
                    </xs:element>
                    <xs:element minOccurs="0" name="dop_off" type="xs:positiveInteger">
                        <xs:annotation>
                            <xs:documentation>Doppler Offset</xs:documentation>
                        </xs:annotation>
                    </xs:element>
                    <xs:element minOccurs="0" name="dop_spr" type="xs:positiveInteger">
                        <xs:annotation>
                            <xs:documentation>Doppler Spread</xs:documentation>
                        </xs:annotation>
                    </xs:element>
                    <xs:element minOccurs="0" name="level" type="xs:positiveInteger">
                        <xs:annotation>
                            <xs:documentation>Signal Level - dbm</xs:documentation>
```

```
                            </xs:annotation>
                        </xs:element>
                        <xs:element minOccurs="0" name="mp_cnt" type="xs:positiveInteger">
                            <xs:annotation>
                                <xs:documentation>Multipath Count</xs:documentation>
                            </xs:annotation>
                        </xs:element>
                        <xs:element minOccurs="0" name="mp_spr" type="xs:positiveInteger">
                            <xs:annotation>
                                <xs:documentation>Multipath Spread</xs:documentation>
                            </xs:annotation>
                        </xs:element>
                        <xs:element minOccurs="0" name="ppm_drift" type="xs:integer">
                            <xs:annotation>
                                <xs:documentation>PPM drift</xs:documentation>
                            </xs:annotation>
                        </xs:element>
                    </xs:sequence>
                </xs:complexType>
            </xs:element>
            <xs:element name="ale_state">
                <xs:annotation>
                    <xs:documentation>Used to report ALE state whenever it changes</xs:documentation>
                </xs:annotation>
                <xs:complexType>
                    <xs:choice>
                        <xs:element minOccurs="1" name="scanning">
                            <xs:complexType/>
                        </xs:element>
                        <xs:element name="connecting" type="ALEADDRESS"/>
                        <xs:element name="connected_as_initiator" type="ALEADDRESS"/>
                        <xs:element name="connected_as_responder" type="ALEADDRESS"/>
                        <xs:element name="sounding">
                            <xs:complexType/>
                        </xs:element>
                        <xs:element name="soundingExchange" type="ALEADDRESS">
                            <xs:annotation>
                                <xs:documentation>Performing Sounding Exchange with a peer</xs:documentation>
                            </xs:annotation>
                        </xs:element>
                        <xs:element minOccurs="1" name="ALENotConfigured">
                            <xs:annotation>
                                <xs:documentation>Notes that ALE not being used by modem.   Sent if ALE-specific
control is sent</xs:documentation>
                            </xs:annotation>
                            <xs:complexType/>
                        </xs:element>
                    </xs:choice>
                </xs:complexType>
            </xs:element>
```

```
        </xs:choice>
    </xs:complexType>
</xs:element>
<xs:simpleType name="Bandwidth">
    <xs:annotation>
        <xs:documentation>WBHF Bandwidth</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:positiveInteger">
        <xs:enumeration value="3"/>
        <xs:enumeration value="6"/>
        <xs:enumeration value="9"/>
        <xs:enumeration value="12"/>
        <xs:enumeration value="15"/>
        <xs:enumeration value="18"/>
        <xs:enumeration value="21"/>
        <xs:enumeration value="24"/>
        <xs:enumeration value="30"/>
        <xs:enumeration value="36"/>
        <xs:enumeration value="42"/>
        <xs:enumeration value="48"/>
    </xs:restriction>
</xs:simpleType>
<xs:complexType name="ModemSpeed">
    <xs:choice>
        <xs:element name="NarrowBandSpeed">
            <xs:simpleType>
                <xs:restriction base="xs:positiveInteger">
                    <xs:enumeration value="75"/>
                    <xs:enumeration value="150"/>
                    <xs:enumeration value="300"/>
                    <xs:enumeration value="600"/>
                    <xs:enumeration value="1200"/>
                    <xs:enumeration value="2400"/>
                    <xs:enumeration value="3200"/>
                    <xs:enumeration value="4800"/>
                    <xs:enumeration value="6400"/>
                    <xs:enumeration value="8000"/>
                    <xs:enumeration value="9600"/>
                </xs:restriction>
            </xs:simpleType>
        </xs:element>
        <xs:element name="WBHFNumber">
            <xs:simpleType>
                <xs:restriction base="xs:positiveInteger">
                    <xs:maxInclusive value="13"/>
                </xs:restriction>
            </xs:simpleType>
        </xs:element>
    </xs:choice>
```

```
</xs:complexType>
<xs:complexType name="InterLeaver">
    <xs:choice>
        <xs:element name="US">
            <xs:complexType/>
        </xs:element>
        <xs:element name="VS">
            <xs:complexType/>
        </xs:element>
        <xs:element name="S">
            <xs:complexType/>
        </xs:element>
        <xs:element name="M">
            <xs:complexType/>
        </xs:element>
        <xs:element name="L">
            <xs:complexType/>
        </xs:element>
        <xs:element name="VL">
            <xs:complexType/>
        </xs:element>
    </xs:choice>
</xs:complexType>
<xs:complexType name="LQA">
    <xs:annotation>
        <xs:documentation>Link Quality Analysis provided by ALE for a specific frequency</xs:documentation>
    </xs:annotation>
    <xs:sequence>
        <xs:element name="frequency" type="Frequency"/>
        <xs:element name="LQAvalue" type="xs:positiveInteger"/>
    </xs:sequence>
</xs:complexType>
<xs:simpleType name="ALEADDRESS">
    <xs:annotation>
        <xs:documentation>2-8 Chars uppercase</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
        <xs:minLength value="2"/>
        <xs:maxLength value="8"/>
        <xs:pattern value="[A-Z]*"/>
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name="Frequency">
    <xs:annotation>
        <xs:documentation>Frequency 3 to 30 Mhz</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:positiveInteger">
        <xs:maxInclusive value="30"/>
        <xs:minInclusive value="3"/>
```

```
        </xs:restriction>
    </xs:simpleType>
</xs:schema>
```

7 Icon-5066 Control Profile

7.1 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 control messages supports this.

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.

It is anticipated that the monitoring protocol will send many attributes from all devices with a wide range of encodings. Control over the red/black boundary will be much more restricted. Only selected devices will be controlled; only selected attributes on those devices will be changed. Generally attributes modified will have a tight syntax (typically integer) and often only a constrained set of values are allowed. Rules are specified to constrain the protocol in this way.

7.2 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.

The broad goal of rules is to restrict control messages to things that it is deemed necessary to control.

Rule	Notes
Narrowband only	Use for Narrowband only deployments. Blocks messages referencing Wideband parameters • Waveform must not be STANAG 5069 • Speed must not reference WBHF Number • No bandwidth in modem parameters or ALE options • No fec • No tlc • ALE must not be 4G • No walemode

Rule	Notes
Wideband only	Use for Wideband only deployments. Blocks messages referencing Narrowband parameters. • Waveform must be STANAG 5069 • Speed must not reference Narrowband speeds • ALE must not be a value other than 4G (Waveform must not be anything other than STANAG 5069; Speed must not reference narrowband speeds).
No ALE	Blocks ale_parameters, ale_release and ale_confguration
No ALE configuration	Blocks ALE configuration: ale_configuration
Valid ALE Addresses	Specifies a list of valid ALE addresses. Any other ALE addresses will be blocked if this list is set.
Valid Frequencies	Specified a list of valid Frequencies. Any other frequencies will be blocked.

7.3 Schema

The Red/Black control protocol schema is specified below. It specifies the <Icon-5066Control/> messages sent from red to black.

7.3.1 Example Messages

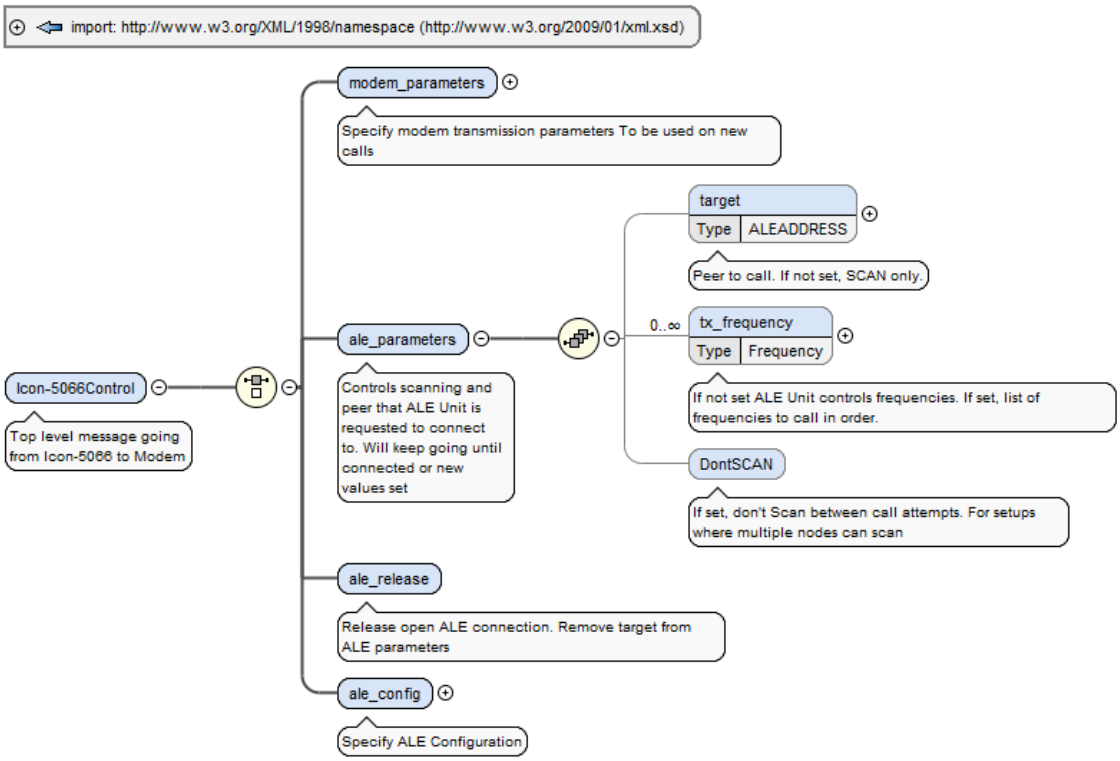
This section shows an example message, correctly normalized following this specification, but folded to make easier to read. This releases an ALE link.

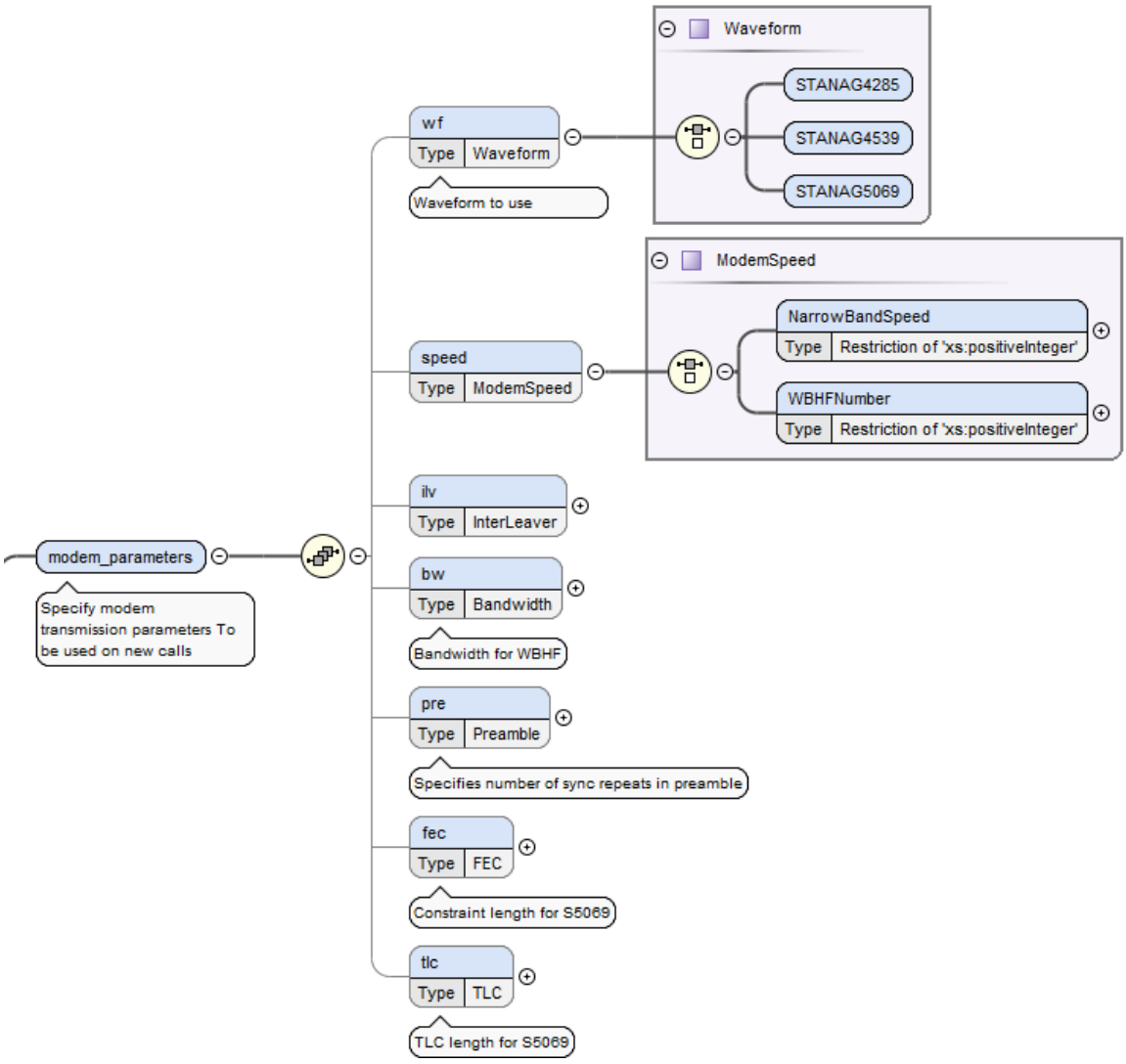
```
<Icon-5066Control xmlns="http://isode.com/icon-5066/control/0">
<ale_release>
</ale_release>
</Icon-5066Control>
```

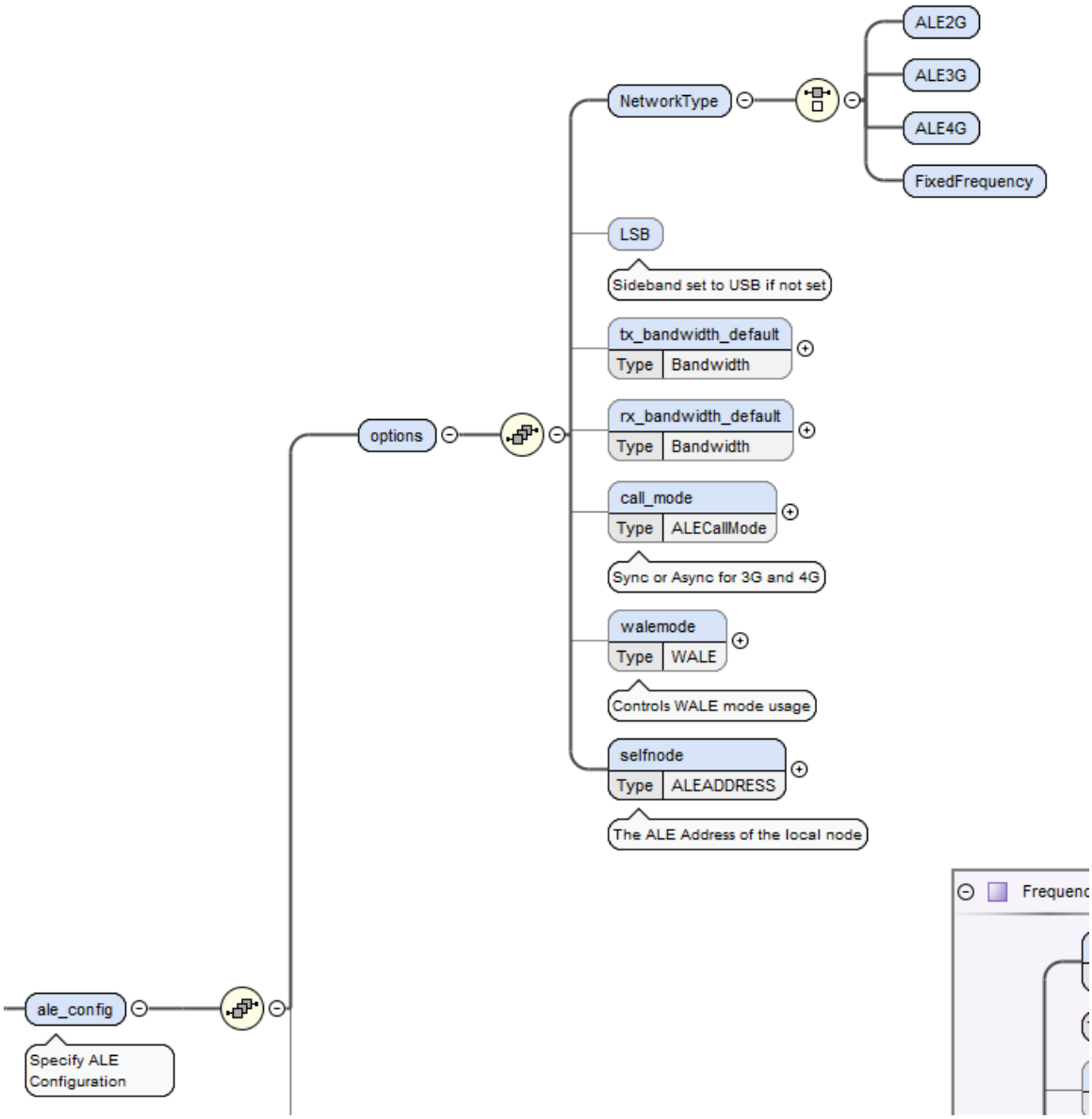
7.3.2 Schema Visualisation

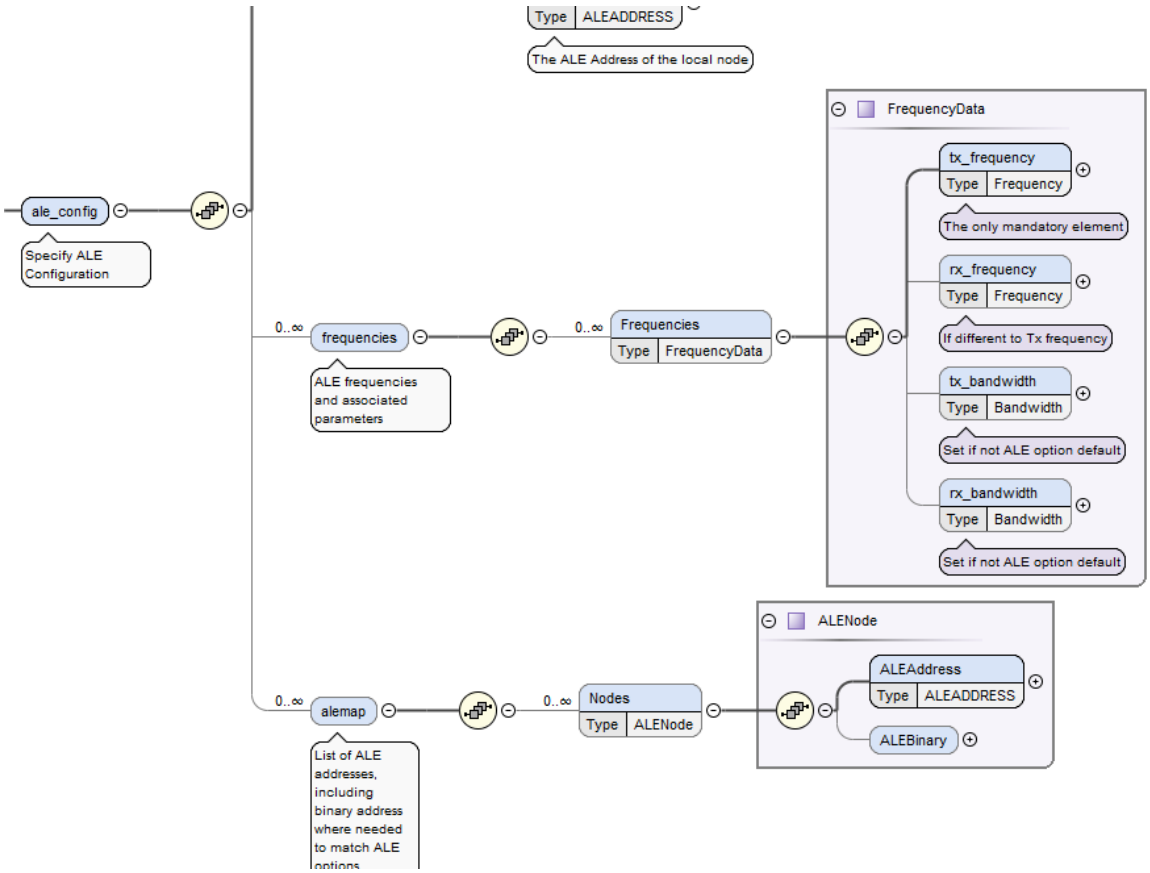
This section shows the schema, as visualised by the oXygen XML editor.

This is the overall schema showing structure of the messages


import: http://www.w3.org/XML/1998/namespace (http://www.w3.org/2009/01/xml.xsd)
modem_parameters
Specify modem transmission parameters To be used on new calls
target
Type
ALEADDRESS
Peer to call. If not set, SCAN only.
ale_parameters
0..∞
tx_frequency
Type
Frequency
If not set ALE Unit controls frequencies. If set, list of frequencies to call in order.
DontSCAN
If set, don't Scan between call attempts. For setups where multiple nodes can scan
Icon-5066Control
Top level message going from Icon-5066 to Modem
Controls scanning and peer that ALE Unit is requested to connect to. Will keep going until connected or new values set
ale_release
Release open ALE connection. Remove target from ALE parameters
ale_config
Specify ALE Configuration


modem_parameters
Specify modem transmission parameters To be used on new calls
wf
Type Waveform
Waveform to use
Waveform
STANAG4285
STANAG4539
STANAG5069
speed
Type ModemSpeed
ModemSpeed
NarrowBandSpeed
Type Restriction of 'xs:positiveInteger'
WBHFNumber
Type Restriction of 'xs:positiveInteger'
ilv
Type InterLeaver
bw
Type Bandwidth
Bandwidth for WBHF
pre
Type Preamble
Specifies number of sync repeats in preamble
fec
Type FEC
Constraint length for S5069
tlc
Type TLC
TLC length for S5069


ale_config
Specify ALE Configuration
options
NetworkType
ALE2G
ALE3G
ALE4G
FixedFrequency
LSB
Sideband set to USB if not set
tx_bandwidth_default
Type
Bandwidth
rx_bandwidth_default
Type
Bandwidth
call_mode
Type
ALECallMode
Sync or Async for 3G and 4G
walemode
Type
WALE
Controls WALE mode usage
selfnode
Type
ALEADDRESS
The ALE Address of the local node



7.3.3 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/icon-5066/control/0"
    xml:lang="en" targetNamespace="http://isode.com/icon-5066/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="Icon-5066Control">
        <xs:annotation>
            <xs:documentation>Top level message going from Icon-5066 to Modem</xs:documentation>
        </xs:annotation>
        <xs:complexType>
            <xs:choice>
                <xs:element name="modem_parameters">
                    <xs:annotation>
                        <xs:documentation>Specify modem transmission parameters

To be used on new calls</xs:documentation>
```

```
                    </xs:annotation>
                    <xs:complexType>
                        <xs:sequence>
                            <xs:element minOccurs="0" name="wf" type="Waveform">
                                <xs:annotation>
                                    <xs:documentation>Waveform to use</xs:documentation>
                                </xs:annotation>
                            </xs:element>
                            <xs:element minOccurs="0" name="speed" type="ModemSpeed">
                                <xs:annotation>
                                    <xs:documentation/>
                                </xs:annotation>
                            </xs:element>
                            <xs:element minOccurs="0" name="ilv" type="InterLeaver"/>
                            <xs:element minOccurs="0" name="bw" type="Bandwidth">
                                <xs:annotation>
                                    <xs:documentation>Bandwidth for WBHF</xs:documentation>
                                </xs:annotation>
                            </xs:element>
                            <xs:element minOccurs="0" name="pre" type="Preamble">
                                <xs:annotation>
                                    <xs:documentation>Specifies number of sync repeats in preamble</xs:documentation>
                                </xs:annotation>
                            </xs:element>
                            <xs:element minOccurs="0" name="fec" type="FEC">
                                <xs:annotation>
                                    <xs:documentation>Constraint length for S5069</xs:documentation>
                                </xs:annotation>
                            </xs:element>
                            <xs:element minOccurs="0" name="tlc" type="TLC">
                                <xs:annotation>
                                    <xs:documentation>TLC length for S5069</xs:documentation>
                                </xs:annotation>
                            </xs:element>
                        </xs:sequence>
                    </xs:complexType>
                </xs:element>
                <xs:element name="ale_parameters">
                    <xs:annotation>
                        <xs:documentation>Controls scanning and peer that ALE Unit is requested to connect to.   Will
keep going until connected or new values set</xs:documentation>
                    </xs:annotation>
                    <xs:complexType>
                        <xs:sequence>
                            <xs:element name="target" type="ALEADDRESS" minOccurs="0">
                                <xs:annotation>
                                    <xs:documentation>Peer to call.  If not set, SCAN only.</xs:documentation>
                                </xs:annotation>
                            </xs:element>
                            <xs:element name="tx_frequency" type="Frequency" maxOccurs="unbounded"
```

```
                                minOccurs="0">
                                <xs:annotation>
                                    <xs:documentation>If not set ALE Unit controls frequencies.  If set, list of
frequencies to call in order.</xs:documentation>
                                </xs:annotation>
                            </xs:element>
                            <xs:element minOccurs="0" name="DontSCAN">
                                <xs:annotation>
                                    <xs:documentation>If set, don't Scan between call attempts.   For setups where
multiple nodes can scan</xs:documentation>
                                </xs:annotation>
                                <xs:complexType/>
                            </xs:element>
                        </xs:sequence>
                    </xs:complexType>
                </xs:element>
                <xs:element name="ale_release">
                    <xs:annotation>
                        <xs:documentation>Release open ALE connection.  Remove target from ALE
parameters</xs:documentation>
                    </xs:annotation>
                </xs:element>
                <xs:element name="ale_config">
                    <xs:annotation>
                        <xs:documentation>Specify ALE Configuration</xs:documentation>
                    </xs:annotation>
                    <xs:complexType>
                        <xs:sequence>
                            <xs:element name="options">
                                <xs:complexType>
                                    <xs:sequence>
                                        <xs:element name="NetworkType">
                                            <xs:complexType>
                                                <xs:choice>
                                                  <xs:element name="ALE2G">
                                                  <xs:complexType/>
                                                  </xs:element>
                                                  <xs:element name="ALE3G">
                                                  <xs:complexType/>
                                                  </xs:element>
                                                  <xs:element name="ALE4G">
                                                  <xs:complexType/>
                                                  </xs:element>
                                                  <xs:element name="FixedFrequency">
                                                  <xs:complexType/>
                                                  </xs:element>
                                                </xs:choice>
                                            </xs:complexType>
                                        </xs:element>
                                        <xs:element minOccurs="0" name="LSB">
                                            <xs:annotation>
```

```
                                        <xs:documentation>Sideband set to USB if not set</xs:documentation>
                                    </xs:annotation>
                                    <xs:complexType/>
                                </xs:element>
                                <xs:element minOccurs="0" name="tx_bandwidth_default"
                                    type="Bandwidth"/>
                                <xs:element minOccurs="0" name="rx_bandwidth_default"
                                    type="Bandwidth"/>
                                <xs:element name="call_mode" type="ALECallMode"
                                    minOccurs="0">
                                    <xs:annotation>
                                        <xs:documentation>Sync or Async for 3G and 4G</xs:documentation>
                                    </xs:annotation>
                                </xs:element>
                                <xs:element name="walemode" type="WALE" minOccurs="0">
                                    <xs:annotation>
                                        <xs:documentation>Controls WALE mode usage</xs:documentation>
                                    </xs:annotation>
                                </xs:element>
                                <xs:element name="selfnode" type="ALEADDRESS">
                                    <xs:annotation>
                                        <xs:documentation>The ALE Address of the local node</xs:documentation>
                                    </xs:annotation>
                                </xs:element>
                            </xs:sequence>
                        </xs:complexType>
                    </xs:element>
                    <xs:element name="frequencies" maxOccurs="unbounded" minOccurs="0">
                        <xs:annotation>
                            <xs:documentation>ALE frequencies and associated parameters</xs:documentation>
                        </xs:annotation>
                        <xs:complexType>
                            <xs:sequence>
                                <xs:element maxOccurs="unbounded" minOccurs="0"
                                    name="Frequencies" type="FrequencyData"/>
                            </xs:sequence>
                        </xs:complexType>
                    </xs:element>
                    <xs:element name="alemap" maxOccurs="unbounded" minOccurs="0">
                        <xs:annotation>
                            <xs:documentation>List of ALE addresses, including binary address where needed to
match ALE options</xs:documentation>
                        </xs:annotation>
                        <xs:complexType>
                            <xs:sequence>
                                <xs:element maxOccurs="unbounded" minOccurs="0" name="Nodes"
                                    type="ALENode"/>
                            </xs:sequence>
                        </xs:complexType>
                    </xs:element>
```

```
                    </xs:sequence>
                </xs:complexType>
            </xs:element>
        </xs:choice>
    </xs:complexType>
</xs:element>
<xs:complexType name="ModemSpeed">
    <xs:choice>
        <xs:element name="NarrowBandSpeed">
            <xs:simpleType>
                <xs:restriction base="xs:positiveInteger">
                    <xs:enumeration value="75"/>
                    <xs:enumeration value="150"/>
                    <xs:enumeration value="300"/>
                    <xs:enumeration value="600"/>
                    <xs:enumeration value="1200"/>
                    <xs:enumeration value="2400"/>
                    <xs:enumeration value="3200"/>
                    <xs:enumeration value="4800"/>
                    <xs:enumeration value="6400"/>
                    <xs:enumeration value="8000"/>
                    <xs:enumeration value="9600"/>
                </xs:restriction>
            </xs:simpleType>
        </xs:element>
        <xs:element name="WBHFNumber">
            <xs:simpleType>
                <xs:restriction base="xs:positiveInteger">
                    <xs:maxInclusive value="13"/>
                </xs:restriction>
            </xs:simpleType>
        </xs:element>
    </xs:choice>
</xs:complexType>
<xs:complexType name="WALE">
    <xs:choice>
        <xs:element name="DEEPonly">
            <xs:complexType/>
        </xs:element>
        <xs:element name="FASTonly">
            <xs:complexType/>
        </xs:element>
        <xs:element name="FASTthenDEEP">
            <xs:complexType/>
        </xs:element>
    </xs:choice>
</xs:complexType>
<xs:complexType name="ALECallMode">
    <xs:choice>
```

```
        <xs:element name="ASYNC">
            <xs:complexType/>
        </xs:element>
        <xs:element name="SYNC">
            <xs:complexType/>
        </xs:element>
    </xs:choice>
</xs:complexType>
<xs:complexType name="Waveform">
    <xs:choice>
        <xs:element name="STANAG4285">
            <xs:complexType/>
        </xs:element>
        <xs:element name="STANAG4539">
            <xs:complexType/>
        </xs:element>
        <xs:element name="STANAG5069">
            <xs:complexType/>
        </xs:element>
    </xs:choice>
</xs:complexType>
<xs:complexType name="InterLeaver">
    <xs:choice>
        <xs:element name="US">
            <xs:complexType/>
        </xs:element>
        <xs:element name="VS">
            <xs:complexType/>
        </xs:element>
        <xs:element name="S">
            <xs:complexType/>
        </xs:element>
        <xs:element name="M">
            <xs:complexType/>
        </xs:element>
        <xs:element name="L" minOccurs="1">
            <xs:complexType/>
        </xs:element>
        <xs:element name="VL">
            <xs:complexType/>
        </xs:element>
    </xs:choice>
</xs:complexType>
<xs:simpleType name="Bandwidth">
    <xs:annotation>
        <xs:documentation>WBHF Bandwidth</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:positiveInteger">
        <xs:enumeration value="3"/>
```

```
        <xs:enumeration value="6"/>
        <xs:enumeration value="9"/>
        <xs:enumeration value="12"/>
        <xs:enumeration value="15"/>
        <xs:enumeration value="18"/>
        <xs:enumeration value="21"/>
        <xs:enumeration value="24"/>
        <xs:enumeration value="30"/>
        <xs:enumeration value="36"/>
        <xs:enumeration value="42"/>
        <xs:enumeration value="48"/>
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name="ALEADDRESS">
    <xs:annotation>
        <xs:documentation>2-8 Chars uppercase</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
        <xs:minLength value="2"/>
        <xs:maxLength value="8"/>
        <xs:pattern value="[A-Z]*"/>
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name="Binary3GAddress">
    <xs:annotation>
        <xs:documentation>ALE 3G binary address of the node (0-1023) </xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:nonNegativeInteger">
        <xs:maxInclusive value="1023"/>
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name="Binary4GAddress" final="">
    <xs:annotation>
        <xs:documentation>ALE 4G binary address of the node (0-65535) </xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:nonNegativeInteger">
        <xs:maxInclusive value="65535"/>
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name="FEC">
    <xs:annotation>
        <xs:documentation>Constraint length for S5069 (7 or 9)</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:positiveInteger">
        <xs:enumeration value="7"/>
        <xs:enumeration value="9"/>
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name="TLC">
```

```
    <xs:restriction base="xs:positiveInteger">
        <xs:maxInclusive value="255"/>
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name="Preamble">
    <xs:annotation>
        <xs:documentation>Preamble length for 4539 and 5069</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:positiveInteger">
        <xs:minInclusive value="1"/>
        <xs:maxInclusive value="32"/>
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name="DataRateStrategy">
    <xs:annotation>
        <xs:documentation>Data Rate Recommendation Strategy</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
        <xs:enumeration value="CONSERVATIVE"/>
        <xs:enumeration value="MODERATE"/>
        <xs:enumeration value="AGGRESSIVE"/>
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name="Frequency">
    <xs:annotation>
        <xs:documentation>Frequency 3 to 30 MHz</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:positiveInteger">
        <xs:maxInclusive value="30"/>
        <xs:minInclusive value="3"/>
    </xs:restriction>
</xs:simpleType>
<xs:complexType name="ALENode">
    <xs:sequence>
        <xs:element name="ALEAddress" type="ALEADDRESS"/>
        <xs:element name="ALEBinary" minOccurs="0">
            <xs:complexType>
                <xs:choice minOccurs="0">
                    <xs:element name="binary_addr_3g" type="Binary3GAddress"/>
                    <xs:element name="binary_addr_4g" type="Binary4GAddress"/>
                </xs:choice>
            </xs:complexType>
        </xs:element>
    </xs:sequence>
</xs:complexType>
<xs:complexType name="FrequencyData">
    <xs:sequence>
        <xs:element name="tx_frequency" type="Frequency">
            <xs:annotation>
```

```
                <xs:documentation>The only mandatory element</xs:documentation>
            </xs:annotation>
        </xs:element>
        <xs:element name="rx_frequency" type="Frequency" minOccurs="0">
            <xs:annotation>
                <xs:documentation>If different to Tx frequency</xs:documentation>
            </xs:annotation>
        </xs:element>
        <xs:element minOccurs="0" name="tx_bandwidth" type="Bandwidth">
            <xs:annotation>
                <xs:documentation>Set if not ALE option default</xs:documentation>
            </xs:annotation>
        </xs:element>
        <xs:element minOccurs="0" name="rx_bandwidth" type="Bandwidth">
            <xs:annotation>
                <xs:documentation>Set if not ALE option default</xs:documentation>
            </xs:annotation>
        </xs:element>
    </xs:sequence>
</xs:complexType>
</xs:schema>
```