IEEE C37.118 and IEC

Resolution process of joint logo request by IEEE (harmonization)

NASPI Meeting
Arlington, VA
Joint IEEE and IEC Task force has decided:

• IEEE C37.118 is being split into:
  – Measurement/testing section (e.g. how to take/calculate a synchrophasor)
  – Communications
    • Current C37.118 protocol will be documented and “frozen”
    • IEC 61850-90-5 will be a new part
    • Neither will address serial based synchrophasor communications.

  – IEC 61850-90-5 will be developed to address new features/functions.

• Need to develop a migration roadmap and document it as part of IEC 61850-90-5.
# How to migrate from C37.118 to IEC 61850-90-5

<table>
<thead>
<tr>
<th></th>
<th>C37.118</th>
<th>C37.118 Initial Migration</th>
<th>“Lite” 61850</th>
<th>“Full” 61850</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current State + Error Corrections</td>
<td>+ SCL CID file</td>
<td>Preconfigured in SCL CID file and automatically enabled.</td>
<td>Control Blocks + SCL</td>
<td></td>
</tr>
<tr>
<td>Enable/Disable data frames</td>
<td>+ SCL CID File (description fields) for C37.118 have header information</td>
<td>SCL CID File (description fields)</td>
<td>File Transfer + SCL CID File (description fields)</td>
<td></td>
</tr>
<tr>
<td>Header exchange</td>
<td>+ SCL ICD File</td>
<td>SCL ICD File</td>
<td>SCL ICD File + Discovery</td>
<td></td>
</tr>
<tr>
<td>CFG-1 Exchange</td>
<td>+SCL CID File</td>
<td>SCL CID File</td>
<td>SCL CID File + DataSets + DataObjects</td>
<td></td>
</tr>
<tr>
<td>CFG-2 Exchange</td>
<td>No migration indicated</td>
<td>Not Standardized but could use GOOSE or other 61850 Mechanism</td>
<td>Not Standardized but could use GOOSE or other 61850 Mechanism</td>
<td></td>
</tr>
<tr>
<td>Extended Frame</td>
<td>No change</td>
<td>GOOSE or SV over UDP/IP</td>
<td>GOOSE or SV over UDP/IP</td>
<td></td>
</tr>
</tbody>
</table>
IEC 61850-90-5 (still under development)

- Allows for transmission of time aligned and non-time aligned information (e.g. multiple PDU transmission support).
- Use of UDP/IPv4/IPv6 allows for the use of multicast addresses,
- Should allow for “late” information to be delivered.
- Will support event driven messaging and streaming.
Other features being discussed...

- Needs to provide substation-to-substation and substation-control center
- Designed for control center-to-control center
- Does not require/expect time alignment to be provided by PDCs or other intermediate systems
- Needs to be able to support 120 samples/second (might need 240/second)
- Security
  - Application level digital signature on data to detect tamper and to provide “chain” of trust capability.
Assumptions

• What goes out comes in for Relays and PMUs
  – Minimizes protocol support
  – Eases debug/diagnostics

• Intermediate Systems (e.g. PDCs and Phasor Gateways)
  – Provide up/down sampling
  – May not provide time alignment function
  – Implication: Applications/System designers must provide a time alignment function.
Phasor Gateways can (based on IEC 61850-90-5):

- Deliver of late arrival information. Increases operational awareness.

- Are basically publish/subscribe/event emitters.
  - Can also support streaming of analogs if needed*.

- Addresses one of the deficiencies in C37.118 based PDCs of not being able to indicate that information has not been delivered (done by implementation agreement for Not-A-Number/NAN). NAN does not help with digitals!

- Use of IEC 61850 DataSet constructs can allow subsets of information to be disseminated.

- Can function in a PDC like mode.

* - The other competing technology is only publish/subscribe (non-standards based).
How it will probably work (IEC 61850-90-5)

- Tot Msg Length
- Msg Num
- SubSqNum
- Length of Segment
- EOM
- N+1 PDU (APDU)
- IECHdr
- PDUs
- PDUType (Tunnel, …)
- Secure HMAC
- Dst Mac Address
- Tunnel PDU
- Length
- GOOSE or SV
- IPv4
- IPv6
- IP QOS to IEEE Priority and VLAN Mappings
- UDP or Other
A closer look at the A-Profile

Reserves Port 102 (same port as used by other parts of IEC 61850)

<table>
<thead>
<tr>
<th>Modeled after connectionless Session:</th>
<th>IEC 61850-8-1 GOOSE</th>
<th>IEC 61850-9-2 Sampled Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>SI=80 (Tunnel)</td>
<td>IEC 61850 Protocol for sending GOOSE and SV over OSI Connectionless Transport</td>
<td></td>
</tr>
<tr>
<td>SI=81 (GOOSE)</td>
<td>ITU X.234 (OSI Connectionless Transport)</td>
<td></td>
</tr>
<tr>
<td>SI=82 (SV)</td>
<td>RFC-1240 (OSI Connectionless Transport over UDP)</td>
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