



NMOS IS-07 GPI Replacement and Much, Much More...

Miroslav Jeras, CTO
Pebble Beach Systems

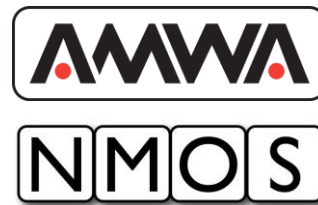


IP SHOWCASE THEATRE AT IBC2019 : 13-17 SEPT 2019



What is IS-07?

- AMWA Interface specification
- Full name: AMWA IS-07 NMOS Event & Tally
- A protocol that allows a source to publish its state and communicate its state changes to subscribed receivers
- Published on GitHub:
 - <https://github.com/AMWA-TV/nmos-event-tally>
 - <https://amwa-tv.github.io/nmos-event-tally/>

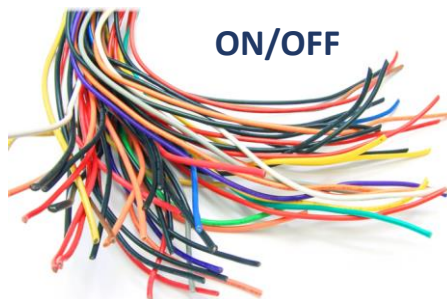


IP SHOWCASE THEATRE AT IBC2019 : 13-17 SEPT 2019 2



GPI Signals

- What is the traditional GPI?
 - Electrical ON/OFF signal used by the sending device to trigger an action on the receiving device
 - Carried by a physical cable
 - Not very practical for modern IP environments
 - Impossible on virtualized platforms



IP SHOWCASE THEATRE AT IBC2019 : 13-17 SEPT 2019 3



GPI Replacement

- How does this translate into the modern IT world?
 - Logical (boolean) data type: true/false
 - Carried over the IP network
 - Formatted in a modern message format (JSON)
- But what about timing, networks introduce delays?
 - Messages contain a timing section with PTP (SMPTE ST-2059) based timestamps allowing for frame and sample accurate precision
 - Creation timestamp
 - Origin timestamp
 - Activation timestamp

true/false



JSON

ST-2059



IP SHOWCASE THEATRE AT IBC2019 : 13-17 SEPT 2019 4



Extending the APIs

- Now that we have a nice JSON message, why not use additional types available?

- string
- number

"Amsterdam"

3.14159

- That's very nice, but how would a receiver know what to expect?

- Type definition

- Value lists (enumerations)
- Ranges
- Units of measure

"John", "Frank", "Mike"

-20°C – 100°C



IP SHOWCASE THEATRE AT IBC2019 : 13-17 SEPT 2019 5



Example IS-07 Message and Type Definition

```
{
  "identity": {
    "source_id": "1ea39324-a32b-4e1d-86e9-33f9956ebc60",
    "flow_id": "0d4a3430-ed34-42f2-9242-580409b5cafa"
  },
  "event_type": "string",
  "timing": {
    "creation_timestamp": "1532504241:10400200"
  },
  "payload": {
    "value": "ok"
  },
  "message_type": "state"
}
```

```
{
  "type": "string",
  "values": [
    {
      "value": "unknown",
      "label": "Device state is unknown",
      "description": "Device state is unknown. Check extension card is plugged in correctly."
    },
    {
      "value": "ok",
      "label": "Device state is ok",
      "description": "Device state is ok."
    },
    {
      "value": "warn",
      "label": "Device state is warning",
      "description": "Device state is warning. PSU 1 shows signs of failure."
    },
    {
      "value": "fail",
      "label": "Device state is fail",
      "description": "Device state is fail. No PTP reference found."
    }
  ]
}
```



IP SHOWCASE THEATRE AT IBC2019 : 13-17 SEPT 2019 6



Transport Mechanisms

- We have the JSONs, but how do we carry them across the network?

MQTT

- Common IoT protocol
- Broker based
- One-to-many
- Scalable

WebSocket

- Existing NMOS protocol
- Brokerless
- One-to-one
- Optimal speed



IP SHOWCASE THEATRE AT IBC2019 : 13-17 SEPT 2019 7



Routing and Grouping

- So, how does all this fit together with the rest of NMOS?
 - IS-07 uses the NMOS object model
 - Extending the existing senders and receivers with new transports
 - IS-04 registration in the registry
 - IS-05 connection management
 - BCP-003-01 transport layer security

IS-04

IS-05

BCP-003-01

- What about linking to the video and audio flows?
 - IS-07 resources are subject to BCP-002-01 – Natural Grouping

BCP-002-01



- Signal metadata grouped with audio/video streams
- Multiple IS-07 signals grouped together

IP SHOWCASE THEATRE AT IBC2019 : 13-17 SEPT 2019 8



Use Cases – A Real-Life Project

- Metecho project – tpc, Zurich, Switzerland
 - All-IP news, sports and technology centre for Swiss radio and television
- One of the main project requirements was the use of open standards:
 - NMOS IS-04 and IS-05 covered most of the RTP signal management requirements
 - There was a series of different requirements that were not covered by any open standards
 - IS-07 was in the process of approval at that time and it was proposed as a solution to those problems



IP SHOWCASE THEATRE AT IBC2019 : 13–17 SEPT 2019 ⁹



GPI triggers

- Problem:
 - Control of a downstream device (on/off)
 - Routing of the signal based on which machine is running the channel (main/backup/emergency)
- Solution:
 - Implementation of a Boolean IS-07 sender instead of a traditional GPI device
 - IS-05 routing of the signal, based on the input:
 - Name of the machine running the channel
 - Coming from the redundancy control logic, again as an IS-07 signal, this time string



IP SHOWCASE THEATRE AT IBC2019 : 13–17 SEPT 2019 ¹⁰



Audio/Video Preview Selection

- Problem:
 - Selecting the preview location of audio and video within the playout server
 - Selecting the desired audio shuffle:
 - language (Original/German)
 - sound field (Stereo/surround)
- Solution:
 - Exposing the automation software panel buttons as Boolean receivers
 - Control system “presses” them
 - Allows for simultaneous remote and local control
 - All the redundant playout servers listen to the same signal
 - Easily extensible to any other automation system command if needed



IP SHOWCASE THEATRE AT IBC2019 : 13–17 SEPT 2019 ¹¹



Automation Statistics Output

- Problem:
 - Exposing all the counters available in the automation system
 - Used by the control system and displayed on various devices
 - Counter to next event, counter to next live, etc.
 - Flag to indicate overruns, potentially changing the colour on the display
- Solution:
 - A series of string senders containing the timecode and the direction for each of the counters



- The same redundancy pattern as for GPIs
 - routing based on the name of the main machine
- Potential for replacing the string with a standard timecode complex object

IP SHOWCASE THEATRE AT IBC2019 : 13–17 SEPT 2019 ¹²



Synchronizing the GUI and Monitoring

- Problem:
 - Automatic reconfiguration of the monitoring based on the active channel
 - The signals displayed on the multiviewer correspond to the channel being controlled from the automation client
- Solution:
 - A string sender exposing the name of the layout in the GUI
 - Once a layout name linked to a channel (e.g. SRF1, SRF2) is received, the control system remaps the multiviewer



- In the future, this could be achieved using generic control logic issuing IS-05 switches to an IS-05/IS-07 compatible multiviewer (see the Future Zone demo)

IP SHOWCASE THEATRE AT IBC2019 : 13-17 SEPT 2019 ¹³



Network Port Status Logging (Telemetry)

- Problem:
 - Providing a constant stream of network port status measurements to the logging system and any other interested parties (e.g. network and/or broadcast controller)
- Solution:
 - A complex object sender with a payload that contains all the status data for all the interfaces on a node



- Addresses
- Datarates
- Errors
- Alarms

– Anyone can subscribe to the sender

IP SHOWCASE THEATRE AT IBC2019 : 13-17 SEPT 2019 ¹⁴



IS-07 - Swiss Army Knife for System Integration



IP SHOWCASE THEATRE AT IBC2019 : 13-17 SEPT 2019 15



IBC 2019 IP Showcase Future Zone Demo

- Components:
 - Hardware button panel
 - Software button panel
 - Playout automation
 - Multiviewer
 - Signal probe
 - Control system
 - NMOS Registry
- Data types:
 - Boolean
 - Button press
 - Number
 - Enumeration
 - Colour (RBG value)
 - String
 - Text
 - Timecode
 - Image (encoded)



IP SHOWCASE THEATRE AT IBC2019 : 13-17 SEPT 2019 16



What is next?

- Standardizing device models:
 - What is expected from devices of a specific type?
- Complex objects:
 - Type definition/validation
 - Incremental updates?
- More use cases and real-life projects



IP SHOWCASE THEATRE AT IBC2019 : 13–17 SEPT 2019 ¹⁷



Thank you

Miroslav Jeras, Pebble Beach Systems (8.B68)
 miroslav.jeras@pebble.tv

Thank you to our Media Partners



IP SHOWCASE THEATRE AT IBC2019 : 13–17 SEPT 2019 ¹⁸