



NMOS

Beyond Discovery & Registration: *An Open Solution for Control & Monitoring*

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NMOS Control & Monitoring



➤ What

A family of open, free of charge specifications that enable interoperability between media devices on an IP infrastructure.

➤ Why

Enables end-users and SIs to create best of breed solutions from a greater pool of vendors which interoperate at different layers



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NMOS "Layers"



Roadmap

Resource management

- Discovery and Registration (IS-04)
- Annotation (IS-13)
- Natural grouping (BCP-002-01)
- Asset Distinguishing Information (BCP-002-02)

Specs

Connection management

- Connection management (IS-05)
- Channel mapping (IS-08)
- Receiver capabilities (BCP-004-01)
- JPEG-XS (BCP-006-01)
- H264 (BCP-006-02)
- H265 (BCP-006-03)
- MPEG-TS (BCP-006-04)
- NDI (BCP-007-01)

Device Control & monitoring

- Event & tally (IS-07)
- Control protocol (IS-12)
- Control architecture (MS-05-01)
- Control framework (MS-05-02)
- Receiver status (BCP-008-01)
- Sender status (BCP-008-02)

Device Configuration

- Stream compatibility management (IS-11)
- Device configuration (IS-14)

Security

- Authorization API (IS-10)
- Secure comms (BCP-003-01)
- Authorization (BCP-003-02)
- Certificate provisioning (BCP-003-03)

NMOS Testing framework



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NMOS Control & Monitoring – An Open Solution



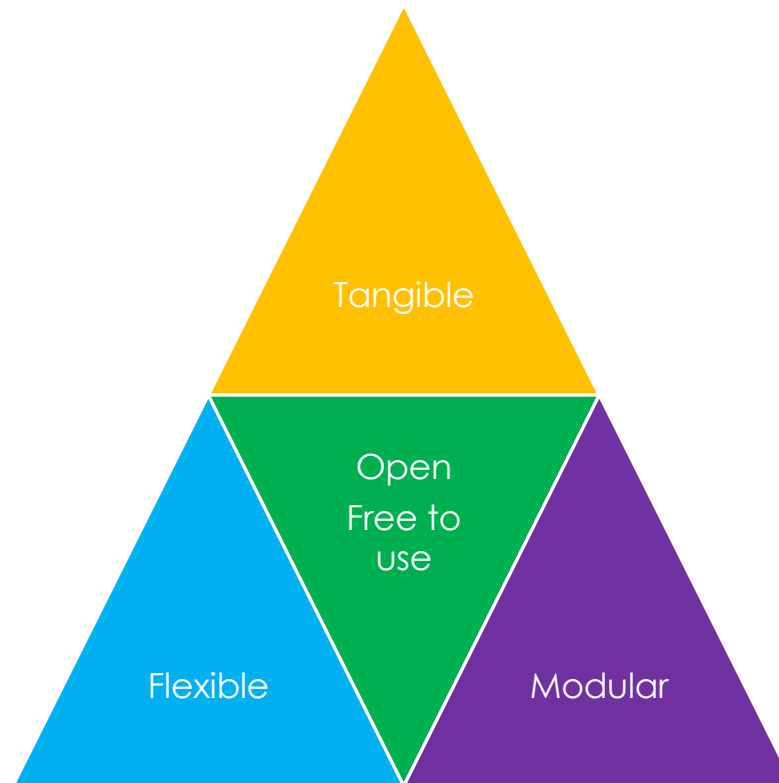
Establishes a standard, interoperable vision, philosophy, and platform for device control and monitoring within the NMOS ecosystem and community.

- Secure by design with [BCP-003](#) and [IS-10](#) specifying the requirements
- Architecture and roadmap are governed not by a single entity but by the NMOS community
- Benefits from [interoperability testing](#) within the NMOS ecosystem
- Benefits from a forum where vendors, end users and integrators can provide feedback about any concerns/improvements/integration issues they may have



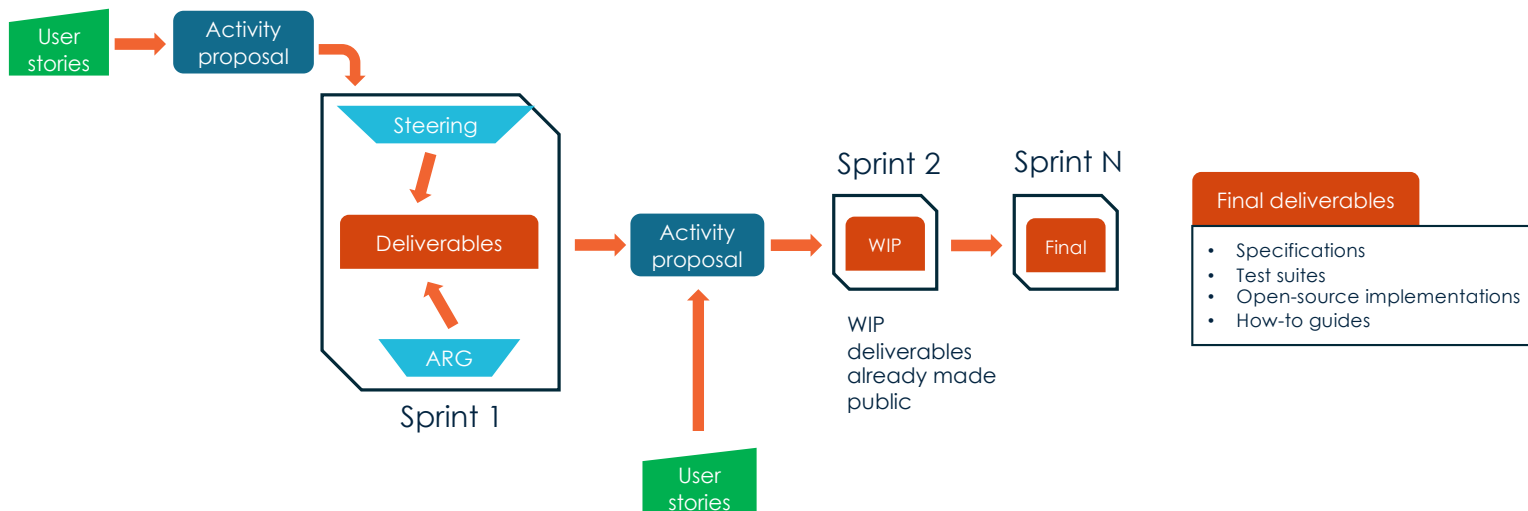
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NMOS Distinguishing Attributes



Open

- A truly open solution every step of the way.



Flexible

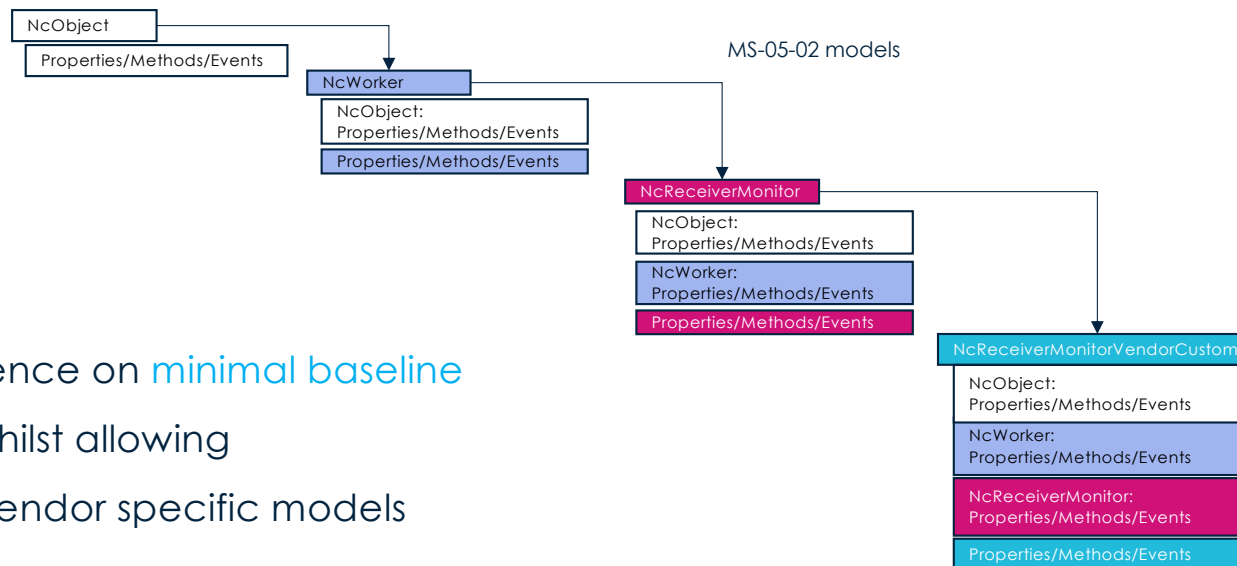


MS-05-01	Architecture <ul style="list-style-type: none"> • Vision • Philosophy • Overview
MS-05-02	Framework <ul style="list-style-type: none"> • Modelling language & rules • Core control classes & datatypes portfolio • Device control model discovery
IS-12	Protocol <ul style="list-style-type: none"> • Exposes and interacts with objects and properties • Commands and notifications • Transport and message encoding
BCPs	Feature sets Opt-in models and requirements for specific features
BCP-008-01	Receiver status Describes the status monitoring domains along with expectations, behaviour and conformance requirements
BCP-008-02	Sender status Describes the status monitoring domains along with expectations, behaviour and conformance requirements

- The problem space is explored at different levels offering the optimal amount of standardization whilst maintaining vendor freedom and ensuring interoperability.



Flexible



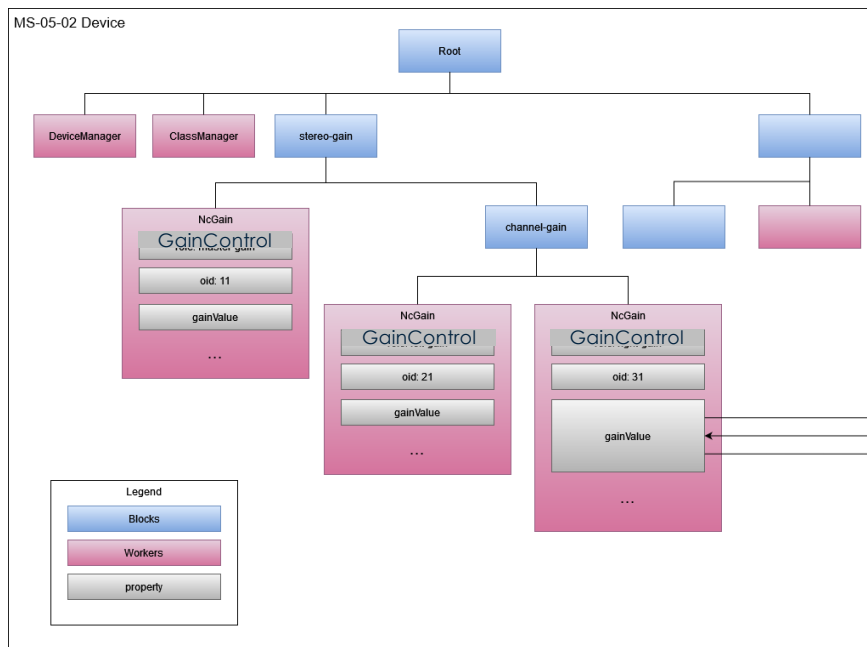
- Convergence on **minimal baseline** models whilst allowing custom/vendor specific models



Flexible



- Convergence on the **protocol**

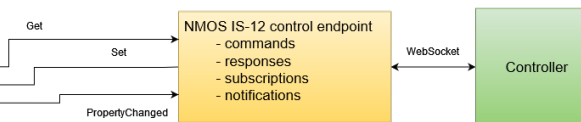


IS-12 messages are compact but still readable

```
{
  "messageType": 0,
  "commands": [
    {
      "handle": 2,
      "oid": 7777,
      "methodId": { "level": 1, "index": 2 },
      "arguments": { "id": { "level": 1, "index": 25 }, "value": 5 }
    }
  ]
}
```

Set method id

property id



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Flexible

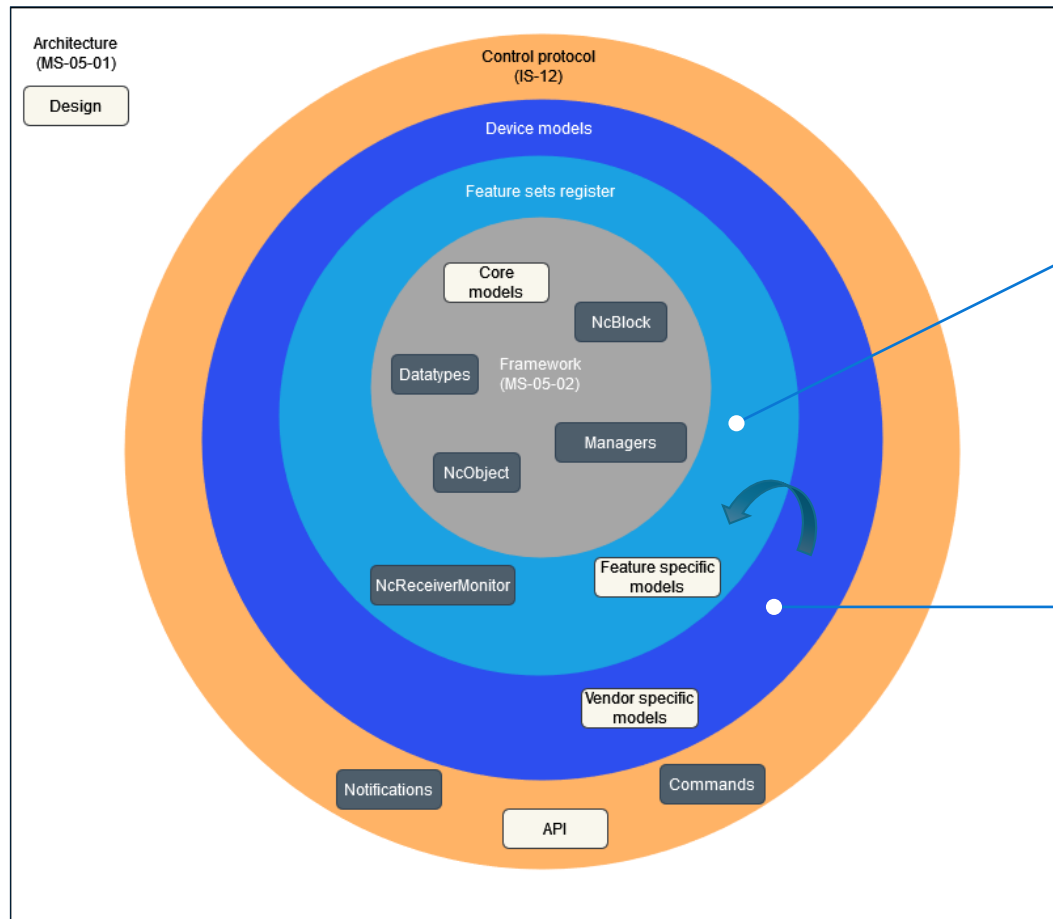
- Controller fully discovering an MS-05/IS-12 device(including vendor specific elements)

The screenshot displays the NMOS CONTROL web interface. On the left is a sidebar with navigation links: Alerts (1), Home, Host info, Manage, and Panels. The main area is titled 'Manage / Control / Device explorer' and includes a 'Show help' link. Below the title, there are filters for 'Device: NC-01 device', 'Configuration: NMOS IS-12', and 'Profile: NMOS', along with a '+ New profile' button. The 'Device Tree' tab is active, showing a hierarchical view of the device structure. The tree starts with 'root: root', which contains 'DeviceManager: Device manager', 'ClassManager: Class manager', and 'receivers: Receivers'. Under 'receivers', there is a 'monitor-01: Receiver monitor 01' entry, which is expanded to show several properties: 'connectionStatus', 'connectionStatusMessage', 'payloadStatus', 'payloadStatusMessage', 'enabled', and 'classId'. On the right side of the interface, a 'Details' panel provides a star icon and a list of properties for the selected 'connectionStatus' property. These properties include Path, Label, Description, Factory Label, Factory Description, Local id, Value type, Is readonly, Is nullable, Is array, Data type name, RAW Value, and Possible values. The 'Possible values' section is expanded, showing a table with four entries: 0 (Undefined), 1 (Connected), 2 (Disconnected), and 3 (ConnectionError).

Value	Name
0	Undefined
1	Connected
2	Disconnected
3	ConnectionError



Flexible



➤ More convergence around common feature models with **direct vendor and end-user involvement**

➤ **Vendors** propose existing vendor specific models for registration as a common feature set

Tangible



- All the deliverables end up in the public domain on GitHub
- WIP versions of the specifications are available publicly on GitHub from the very first few sprints



Tangible

Specs

- MS-05-01: NMOS Control Architecture
<https://specs.amwa.tv/ms-05-01/>
- MS-05-02: NMOS Control Framework
<https://specs.amwa.tv/ms-05-02/>
- IS-12: NMOS Control Protocol
<https://specs.amwa.tv/is-12/>
- BCP-008-01: Receiver status
<https://specs.amwa.tv/bcp-008-01/>
- BCP-008-02: Sender status
<https://specs.amwa.tv/bcp-008-02/>



Tangible

Developer resources and tools – Get started quickly, here's everything you need:

- INFO-006: Implementation guide for NMOS Device Control
<https://specs.amwa.tv/info-006/>
- NMOS Device Control Mock
<https://github.com/AMWA-TV/nmos-device-control-mock>
- nmos-cpp: Open-source Node SDK Framework Implementation
<https://github.com/sony/nmos-cpp>



Tangible



Comprehensive [test suite](#) covering:

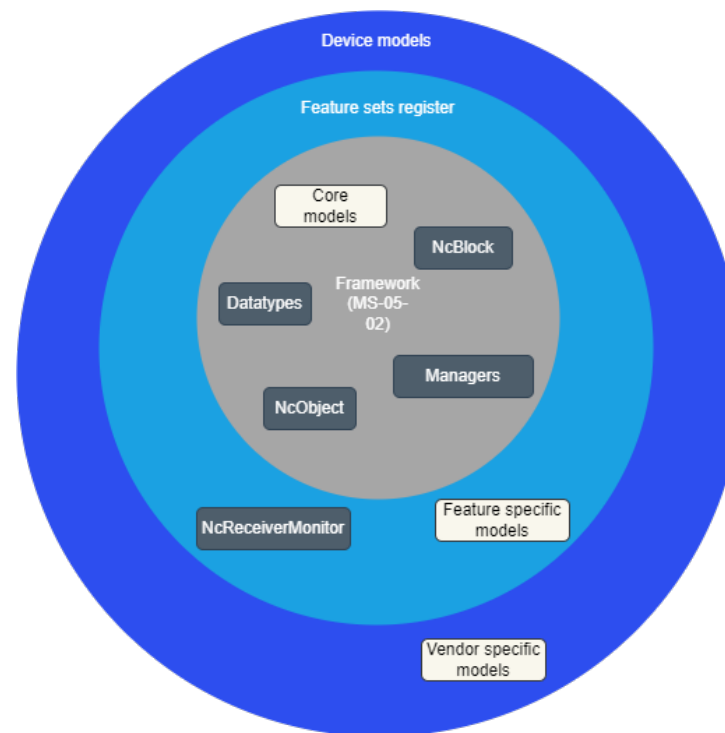
- MS-05-02 framework core model conformance
- IS-12 conformance including commands, responses, subscriptions, notifications and error reporting
- Feature sets model conformance testing where we can opt in each individual feature set through configuration
- Behaviour testing for specific features defined in a BCP (BCP-008-01/02)
- Vendor specific models to ensure compatibility and interoperability



Modular



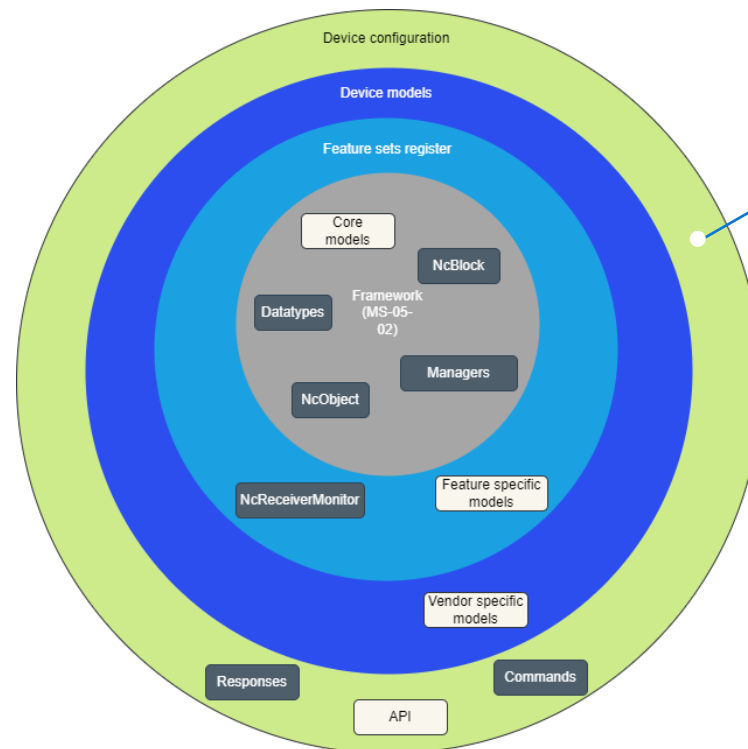
- Creating a multi layered solution means we can mix and match to best address the target user stories.



Modular

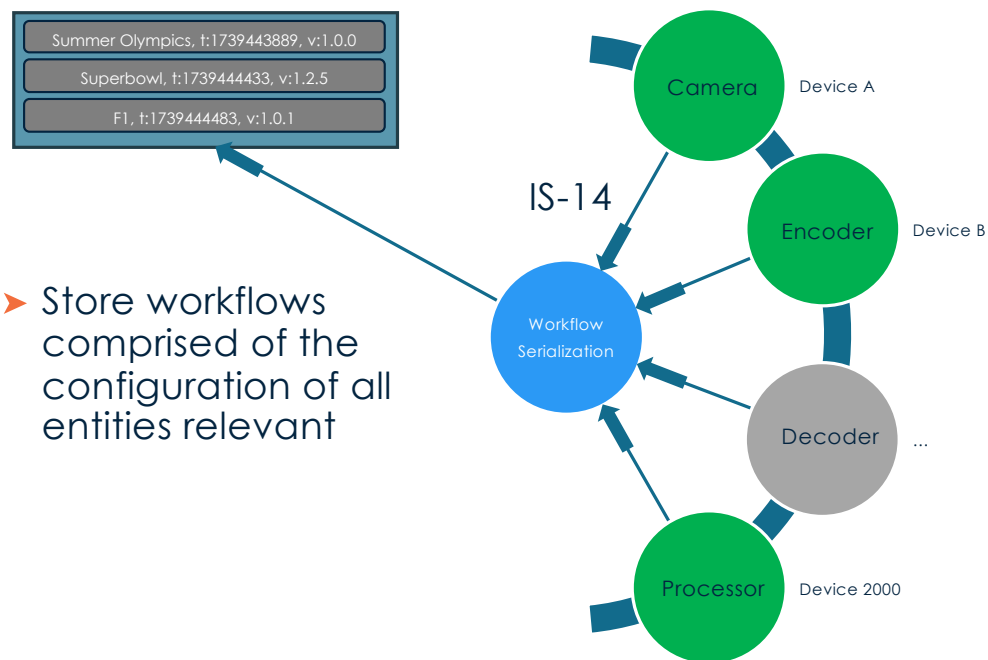


- [IS-14: Device configuration](#) uses the same underlying modelling language

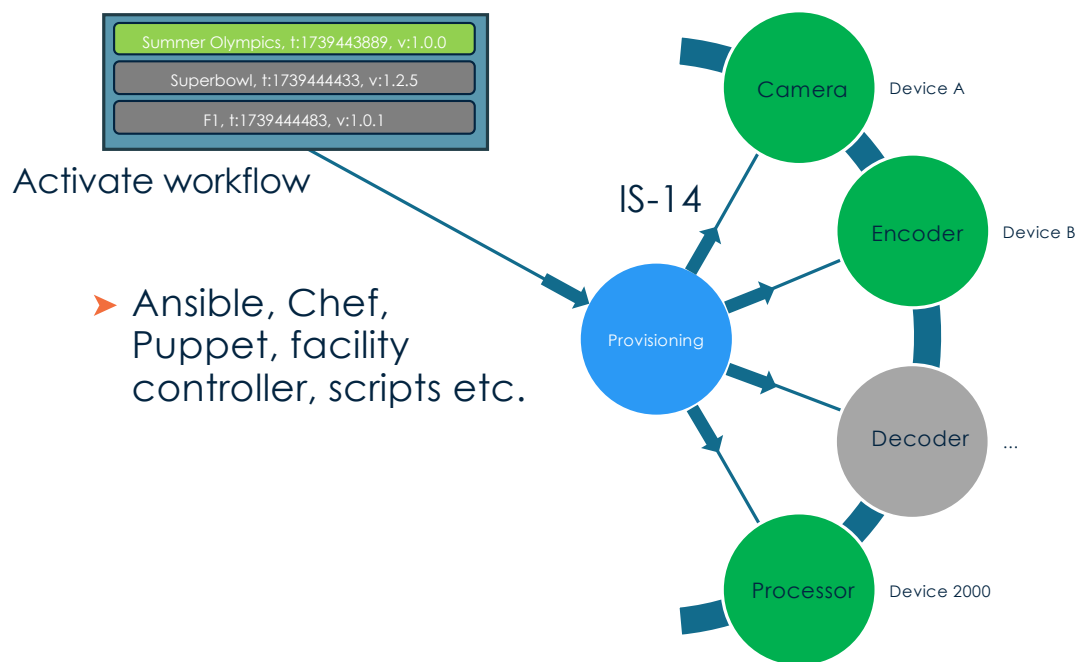


- HTTP based API with an emphasis on **retrieval** and **restoring** of configuration for backup, restore and other provisioning scenarios

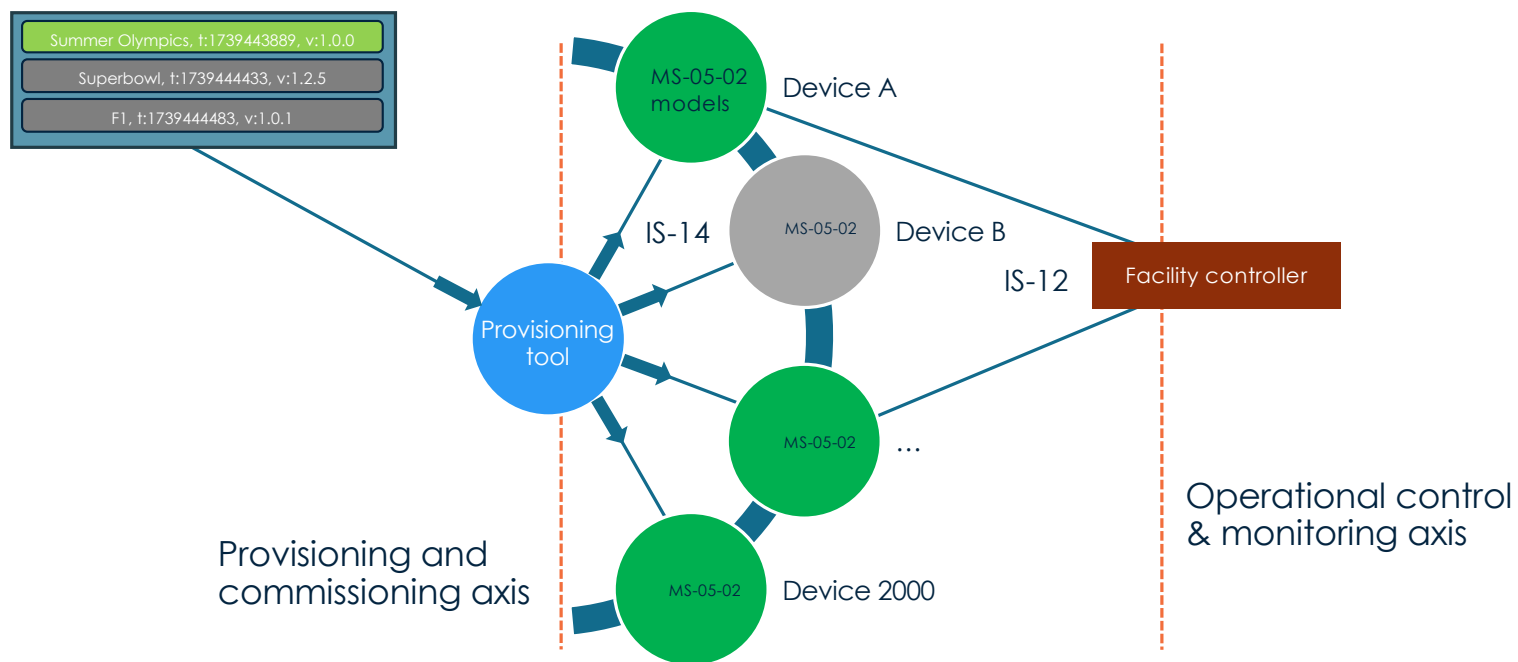
Shared Model Synergy



Shared Model Synergy



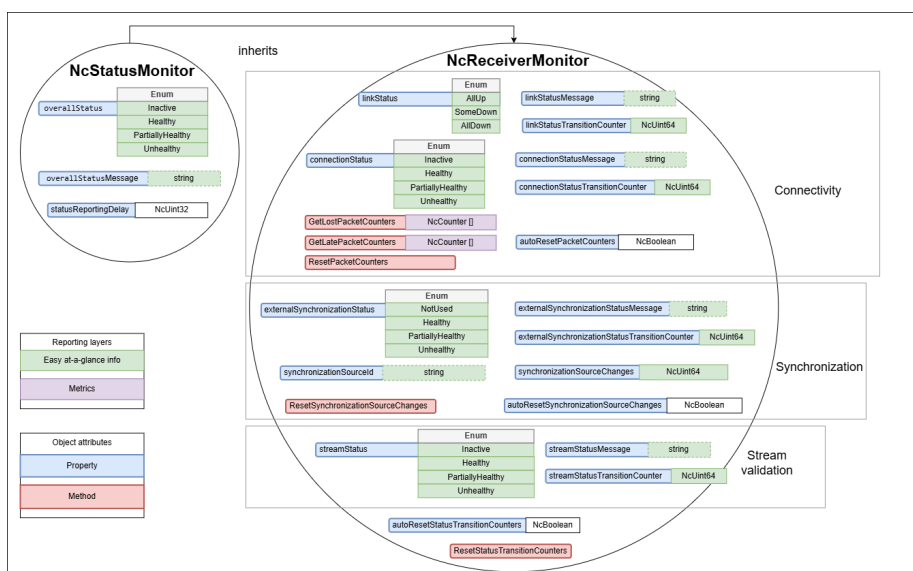
Shared Model Synergy



Models Solve Problems



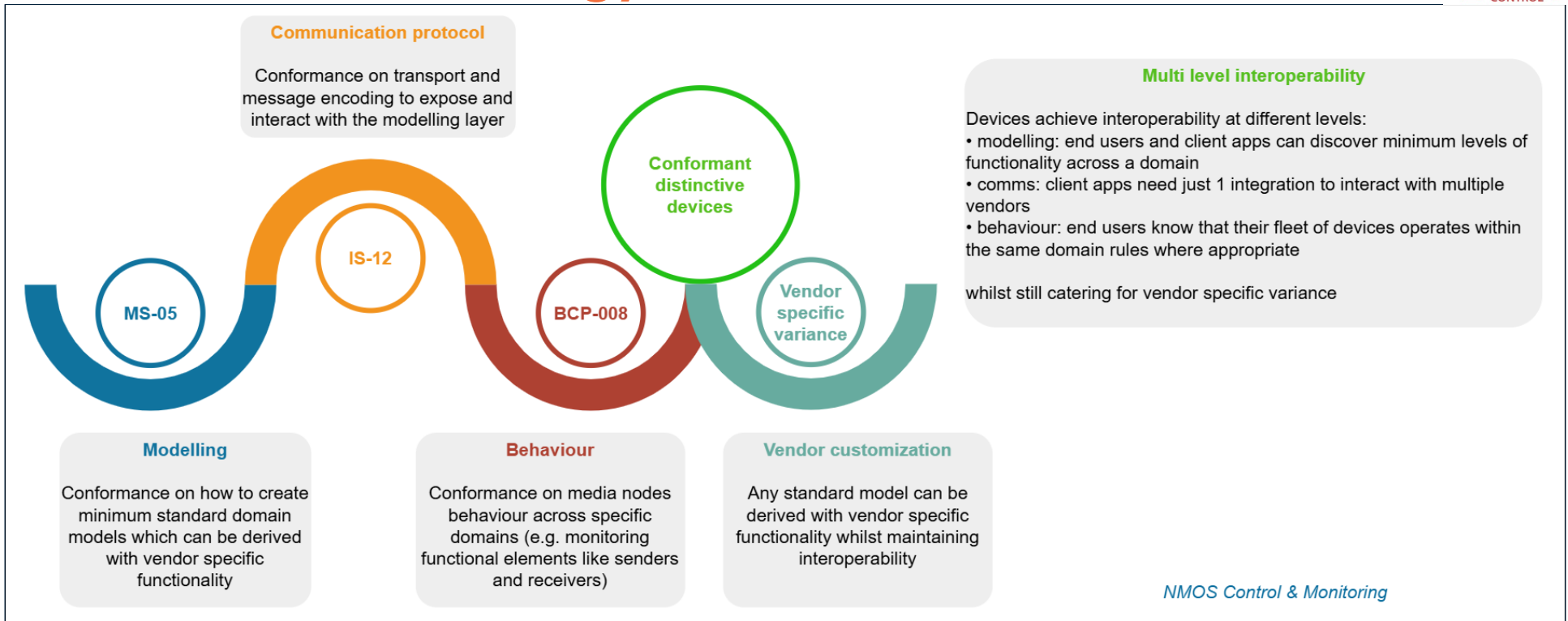
Receiver status (BCP-008-01)
models diagram



- People think in entities/objects/interactions (not in bytes).
- IS-12 is very simple – it's a thin wrapper around the models. You can build another protocol in a couple of hours.
- Industry bodies, system integrators, problem solvers need to be able to describe a problem and solution requirements using a modelling language which **feels natural**.
- The solution models are published by a communication protocol which is an enabler.



Conformance Strategy



Thank you!

NMOS



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