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AMWA NMOS IS-04 & IS-05: Things You Might Not Know

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Background

- IS-04 and IS-05 are becoming available in an increasing number of products
- Whilst any implementation will support the basics, some features are optional, and the purpose of others isn't necessarily obvious at first glance

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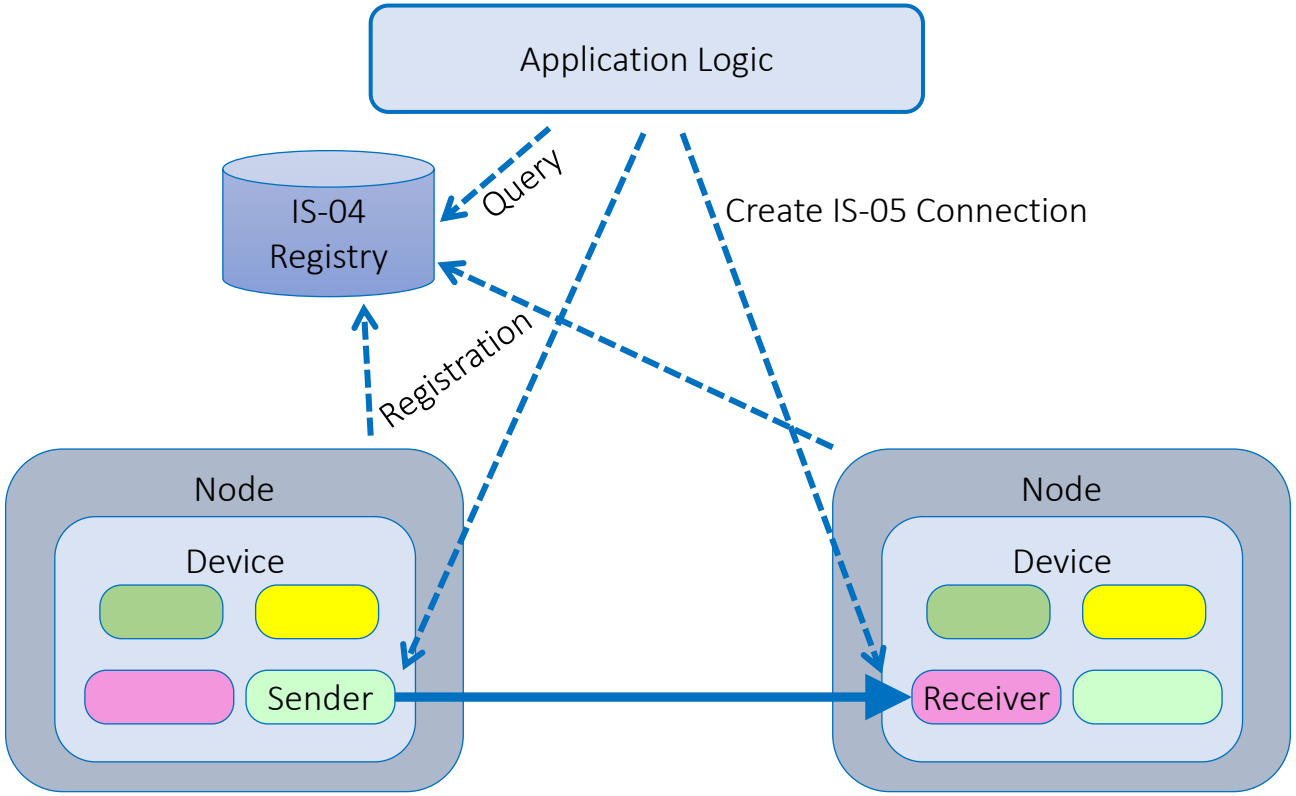
What are IS-04 and IS-05?

- IS-04: Discovery & Registration
  - Allows Media Nodes and their capabilities to be discovered
- IS-05: Connection Management
  - Allows Media Nodes to be configured to send and receive IP streams
- They share a common data model
  - Nodes, Devices, Sources, Flows, Senders, Receivers
- They are built upon proven Internet technologies
  - RESTful APIs accessible via HTTP and discovered via DNS

What are IS-04 and IS-05?

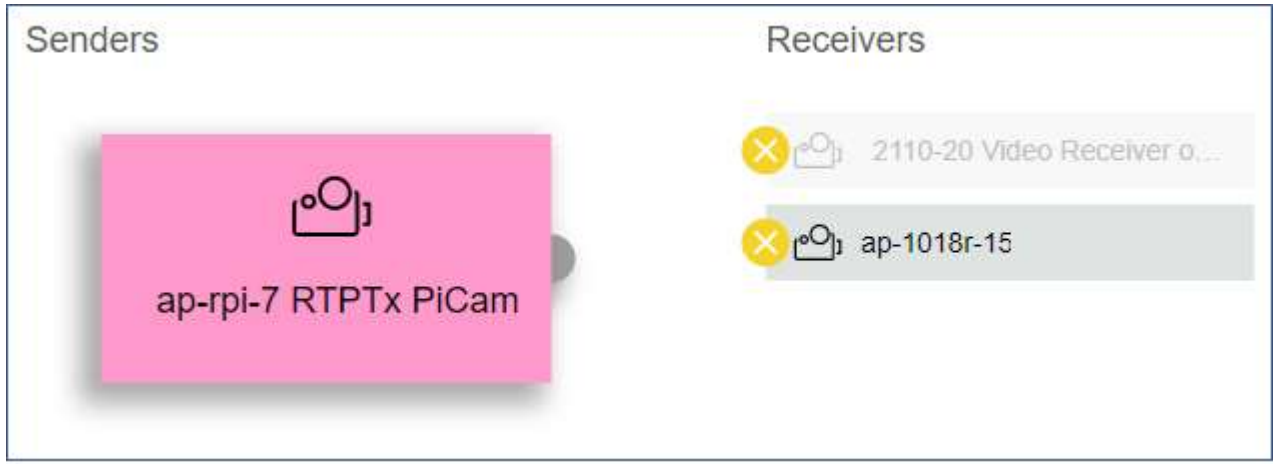


Multi-Format & Multi-Stream

- UHD, HD, SD, HDR, HFR, Codecs, Data
- ST.2110, ST.2022-6, ST.2022-7, AES67, RTP, WebSocket, MQTT
- **Flow** attributes indicate resolutions, codecs and similar
- **Sender** attributes indicate stream types
- **Receiver** capabilities inform control systems of what is acceptable

Multi-Format & Multi-Stream


```
{
    "description": "Pi Camera Video Fl
    "format": "urn:x-nmos:format:video
    "colorspace": "BT709",
    "frame_width": 1920,
    "label": "Video Flow",
    "source_id": "2fe727b7-ddb4-30f0-8
    "frame_height": 1080,
    "parents": [],
    "version": "1551953683:20448000",
    "grain_rate": {
        "denominator": 1,
        "numerator": 25
    },
    "media_type": "video/H264",
    "id": "5c220262-6c06-3e28-a377-a13
    "tags": {},
    "device_id": "5549ceb8-d9c8-3979-8
}
```


```
"version": "1552995110:624839
"device_id": "6c5adedc-6993-1
"caps": {
    "media_types": [
        "video/raw"
    ]
},
"interface_bindings": [
    "mmc0",
    "mmc1"
],
```

```
"version": "1551369731:453100
"device_id": "27541445-9eae-3
"caps": {
    "media_types": [
        "video/raw",
        "video/H264",
        "video/vc2",
        "video/x-vc2",
        "video/x-pgf",
        "video/VP8"
    ]
},
"interface_bindings": [
    "ens1f0"
],
```

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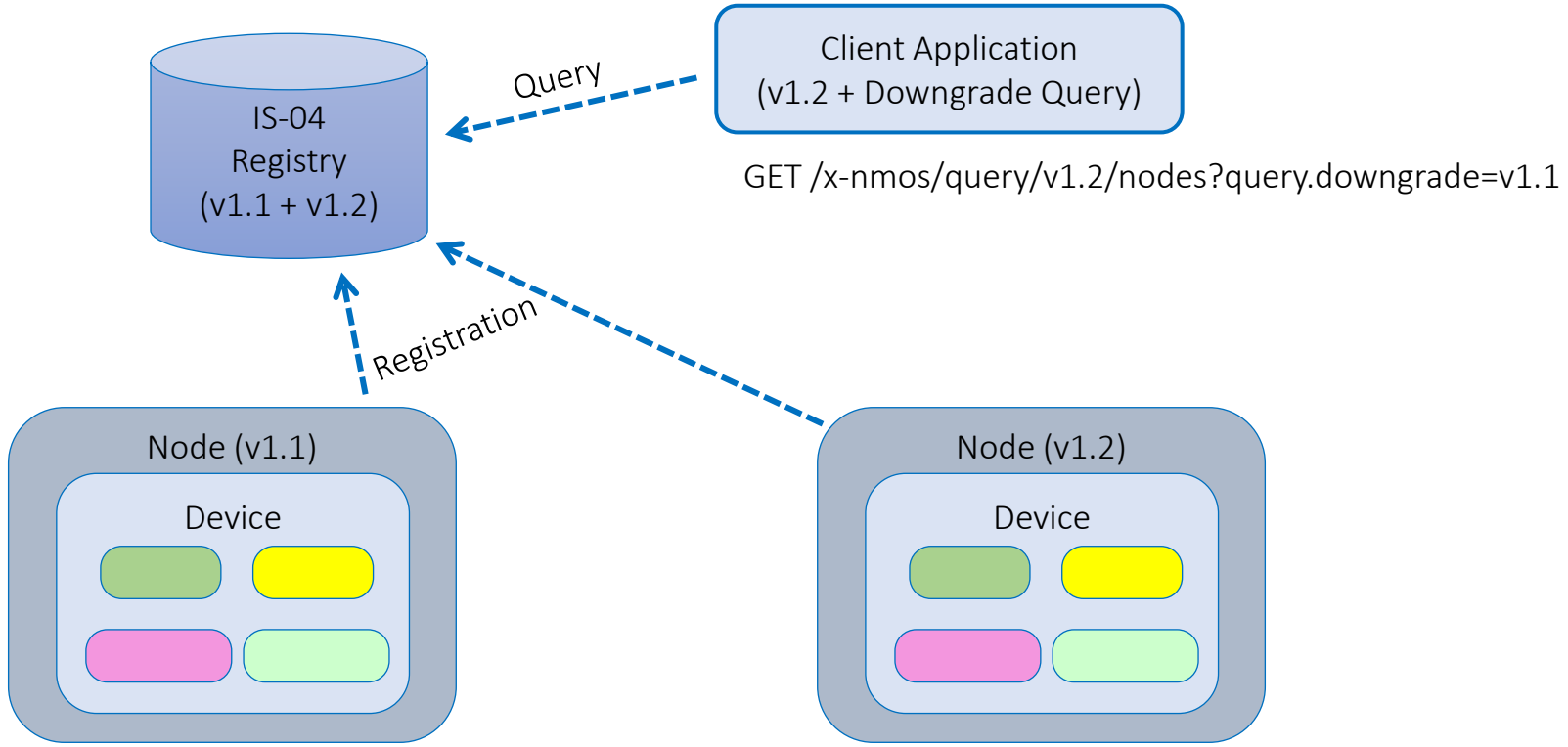
Multi-Version Support

- Technology doesn't stop moving, but it's impossible to upgrade everything in a facility at the same rate
- API versioning ensures that the latest equipment can be used alongside older components without adversely affecting operation
- You should only have to upgrade when you need to take advantage of a new feature

Multi-Version Support



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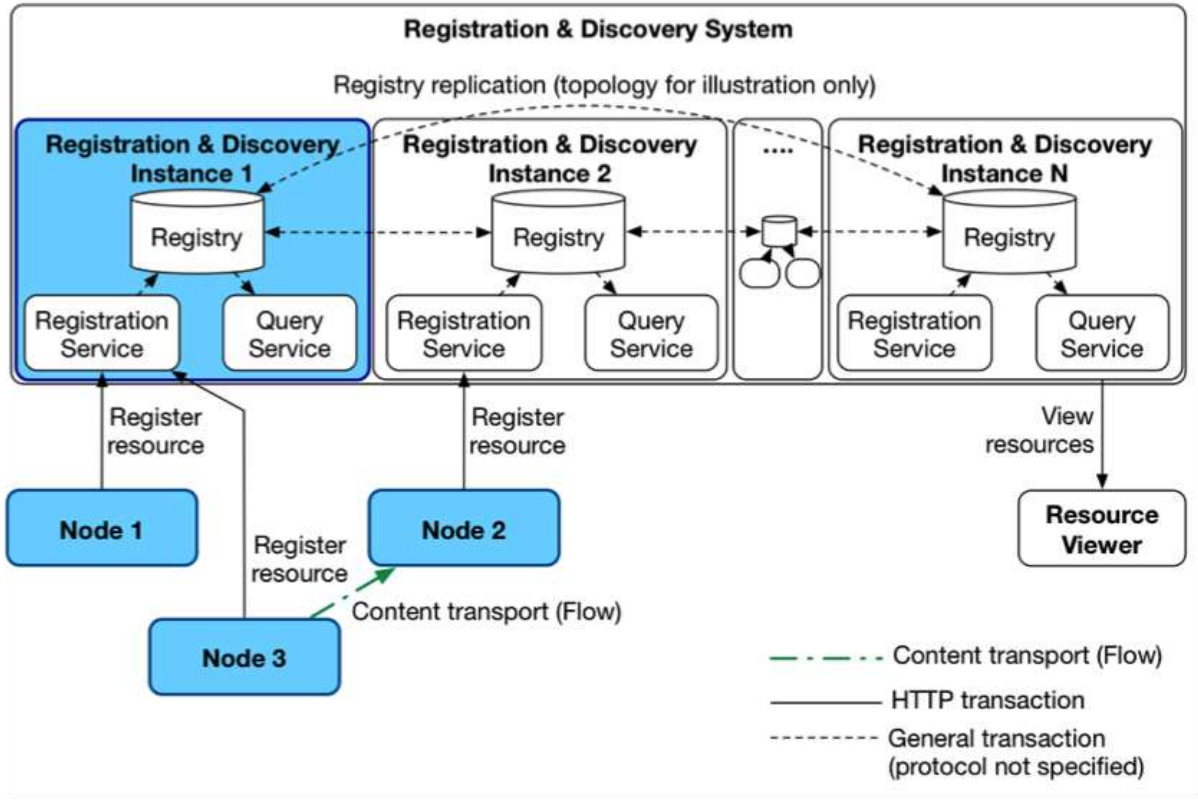
Clustering & Failover

- Registration API, Query API and registry data store components can be scaled independently
- Nodes can dynamically switch between available registry instances upon failure, with zero downtime
- Priority mechanism allows specific APIs to be favoured



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Scalable Discovery

- All approaches aim for zero or near-zero configuration, with flexibility in the architecture to suit different deployments
  - Multicast DNS provides a simple approach for small setups, including a peer to peer mode
  - Unicast DNS enables scalability and tighter control over configuration for larger deployments, as required by JT-NM TR-1001-1

- Example
  - Subdomains can provide logical segmentation within a shared network
  - Priorities ensure Nodes can still find a registry if their preferred one fails

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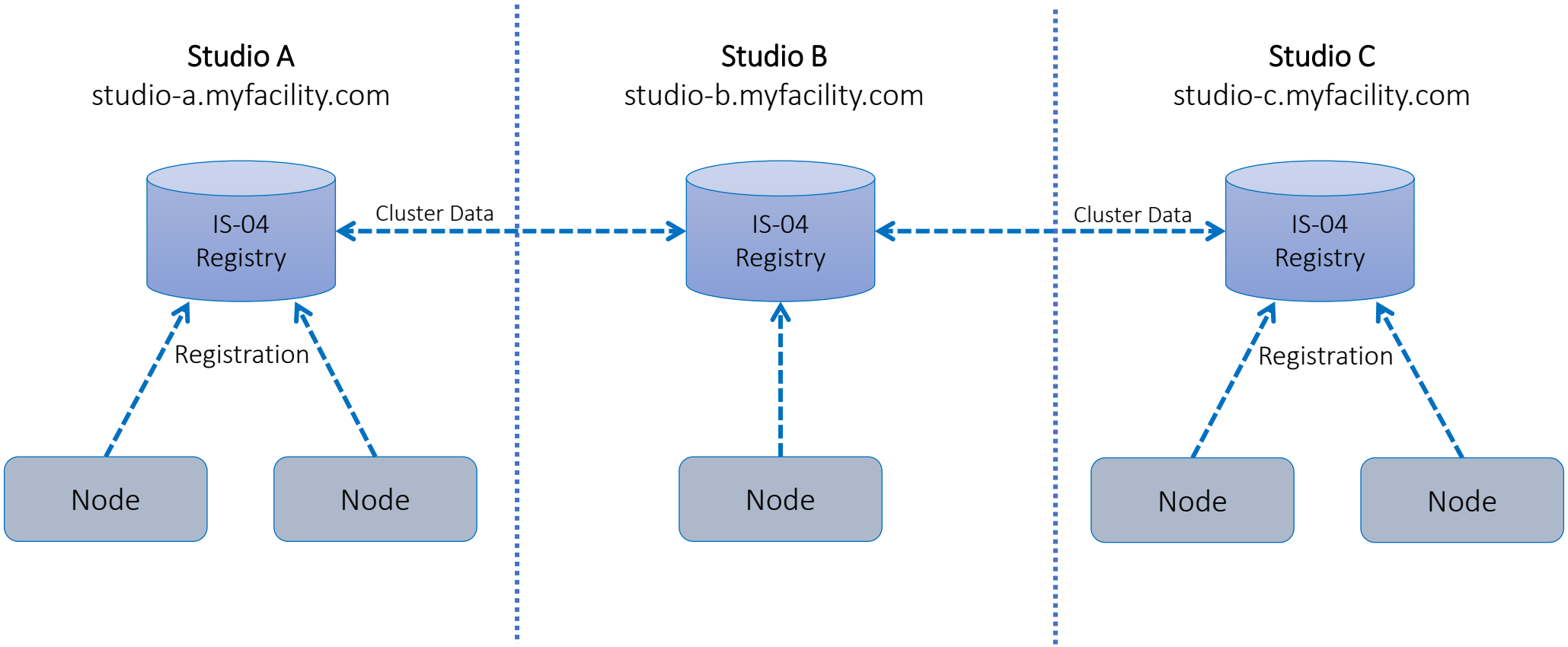
Scalable Discovery



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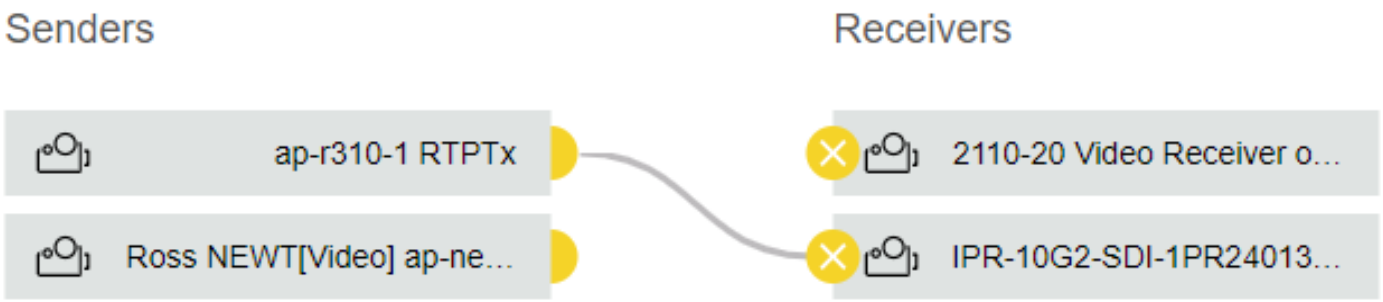
Query Language

- The Query API provides filtering mechanisms to aid client scaling
  - Pagination avoids API responses becoming too large to send or receive
    - GET /x-nmos/query/v1.2/nodes?paging.limit=50
  - Basic and advanced query languages allow clients to restrict the volume of data they process
    - GET /x-nmos/query/v1.2/flows?frame_width=1920&frame_height=1080
  - Downgrade queries allow data to be consumed from multiple API versions
  - Ancestry queries allow content processing operations to be tracked
- Filtering can be performed using one-shot HTTP GETs, or persistent WebSocket connections

Connection Mapping

- IS-04 and IS-05 advertise which Senders connect to which Receivers, including indication of connections to non-NMOS devices



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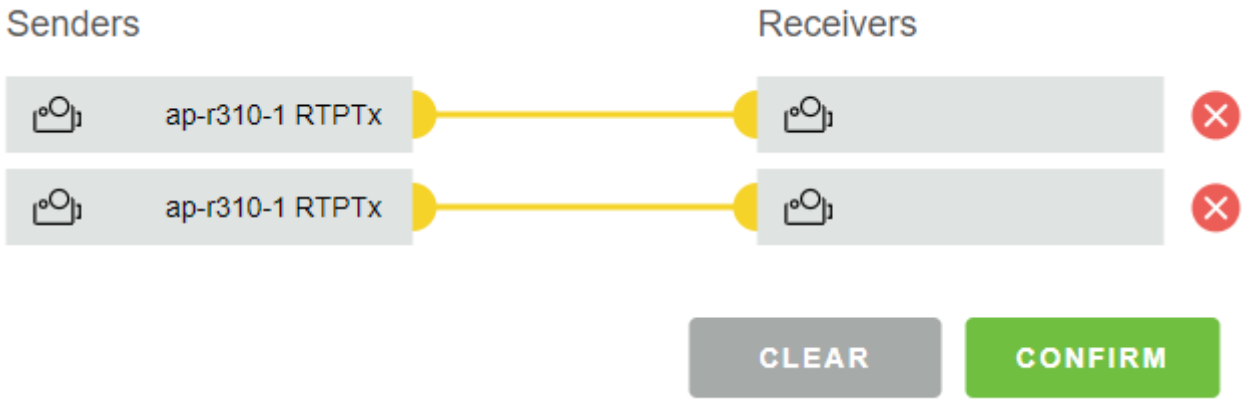
Bulk & Scheduled Routing

- Multiple Senders or Receivers can be re-configured at the same time via ‘bulk’ mode
- Connections can be made immediately, after a relative time offset or at an absolute time instant



Extensibility

- Services, controls and tags
  - The Grouping specification builds upon IS-04 without changing it
  - IS-05/07/08 are advertised using the Device ‘controls’ array
- Opportunities to add value
  - The specifications only define the interfaces


```
"controls": [
    {
        "href": "ws://172.29.80.31:38714/",
        "type": "urn:x-ipstudio:control:ws.ipp_rtptx"
    },
    {
        "href": "ws://172.29.80.31:39275/",
        "type": "urn:x-ipstudio:control:ws.ipp_sdimulticapture"
    },
    {
        "href": "http://172.29.80.31/x-nmos/connection/v1.1/",
        "type": "urn:x-nmos:control:sr-ctrl/v1.1"
    },
    {
        "href": "http://172.29.80.31/x-nmos/connection/v1.0/",
        "type": "urn:x-nmos:control:sr-ctrl/v1.0"
    }
],
```

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Common Ground

- All NMOS specifications share common components
  - Including: API structure, versioning, discovery and data models
  - Work is underway to provide these common specification elements as a separate entity (NMOS Core) in order to avoid duplication
- This means we can apply a common approach to security
  - IS-04 v1.1+ and IS-05 v1.0+ support Transport Layer Security (TLS) via BCP-003-01, with authorisation coming soon via BCP-003-02
  - There's no need to worry about how to secure each individual control endpoint given a shared approach

Summary

- Multi-format and multi-stream support
- Multi-version support to aid upgrades and compatibility
- Registry clustering and failover mechanisms
- Scalable discovery and querying options
- Connection mapping
- Bulk and scheduled routing
- Common foundations

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More Information

- What does each implementation support?
  - Enquire with manufacturers, or test them out for yourself using the test suite
- Which features might I need to ask for explicitly?
  - The wiki details each specification along with any optional features
- I have another question!
  - Ask away, find me after this presentation, or if you can't find what you need in the wiki or documentation, then we'd welcome an issue report via GitHub

Further documentation @ https://amwa-tv.github.io/nmos

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Thank You

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