Standardized Connection Management for Essences and Network Flows in SMPTE ST 2110 and AES67

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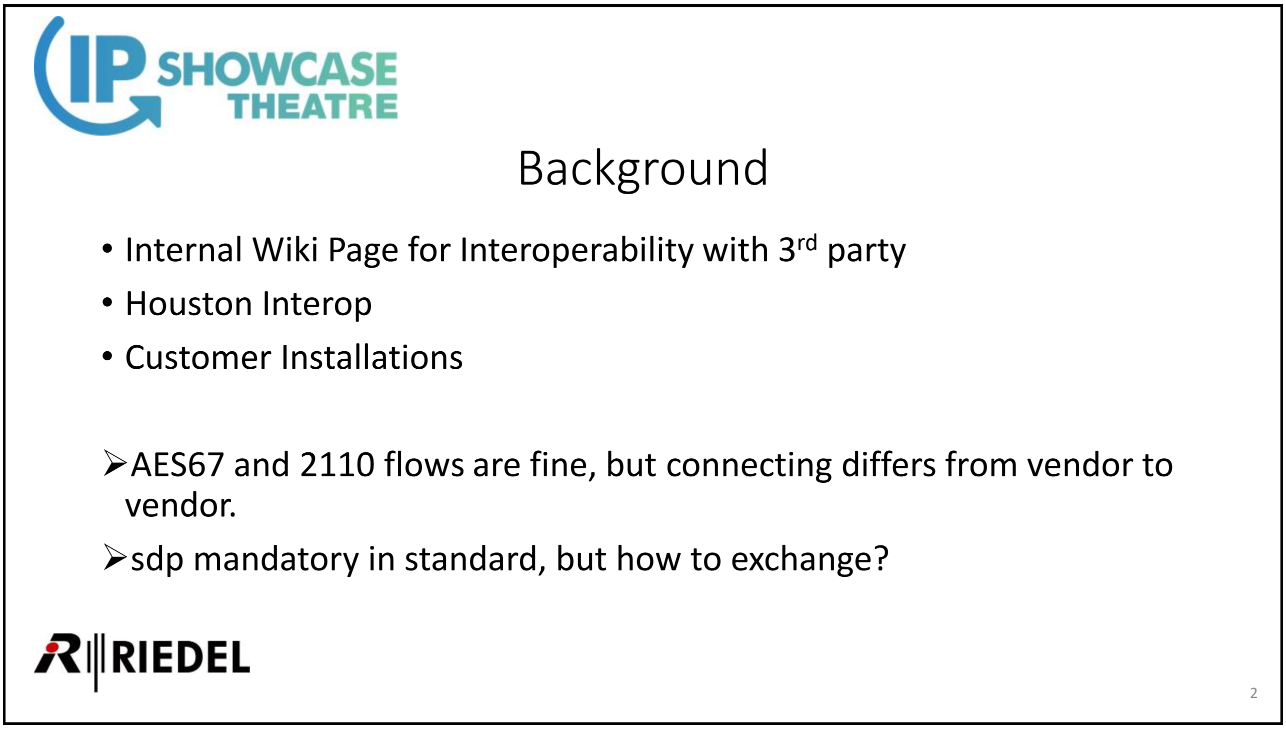
Riedel Communications GmbH & Co. KG

IP SHOWCASE THEATRE AT IBC – SEPT. 14-18, 2018



Background

- Internal Wiki Page for Interoperability with 3rd party
- Houston Interop
- Customer Installations

➢AES67 and 2110 flows are fine, but connecting differs from vendor to vendor.

➢sdp mandatory in standard, but how to exchange?

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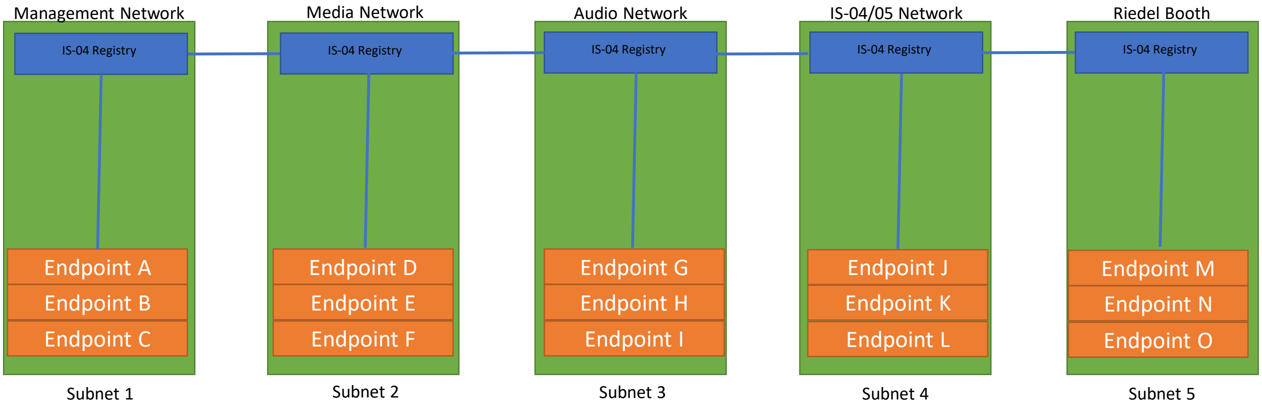

Management Network	Media Network	Audio Network	IS-04/05 Network	Riedel Booth
IS-04 Registry	IS-04 Registry	IS-04 Registry	IS-04 Registry	IS-04 Registry
Endpoint A	Endpoint D	Endpoint G	Endpoint J	Endpoint M
Endpoint B	Endpoint E	Endpoint H	Endpoint K	Endpoint N
Endpoint C	Endpoint F	Endpoint I	Endpoint L	Endpoint O
Subnet 1	Subnet 2	Subnet 3	Subnet 4	Subnet 5

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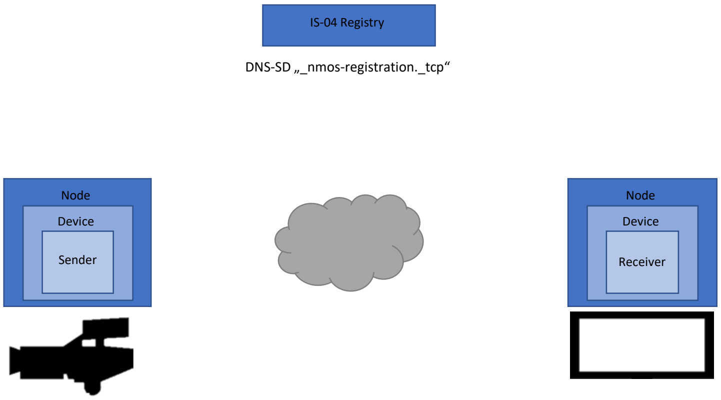
IP SHOWCASE THEATRE



IS-04 Registry

DNS-SD „_nmos-registration._tcp“

Node

Device

Sender

Node

Device

Receiver

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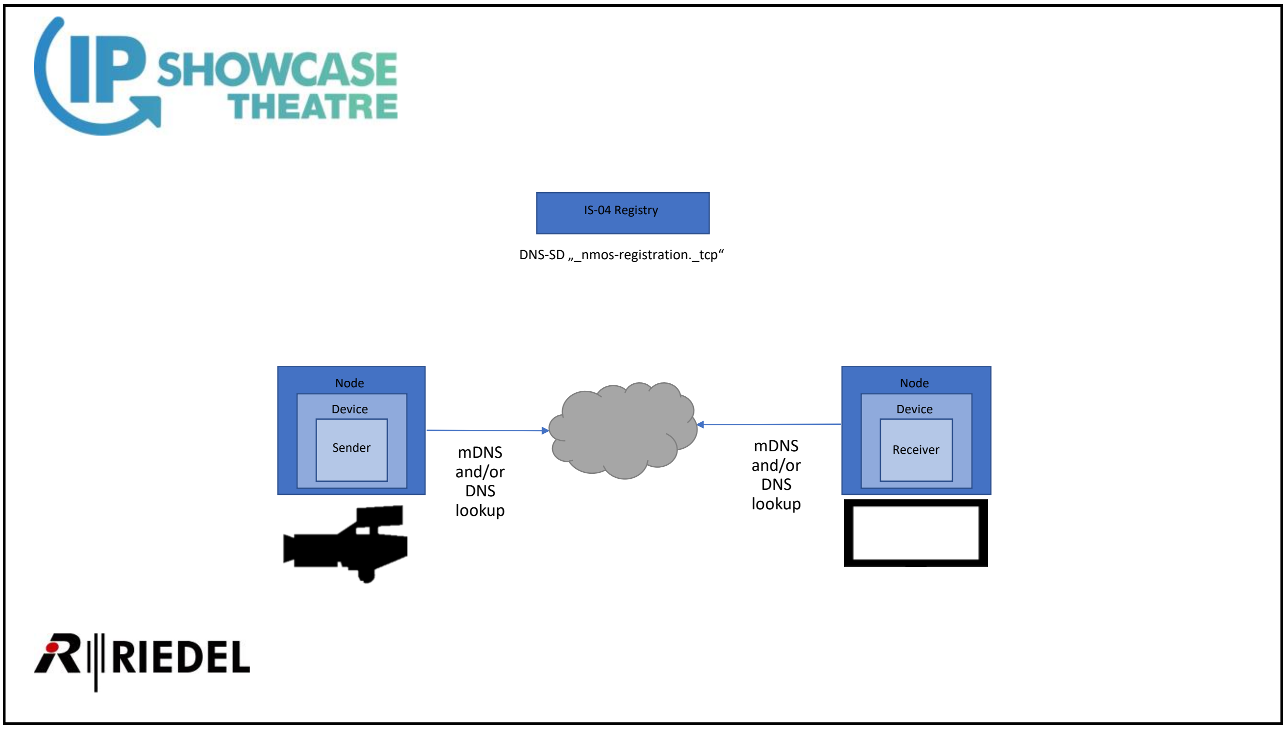


IS-04 Registry

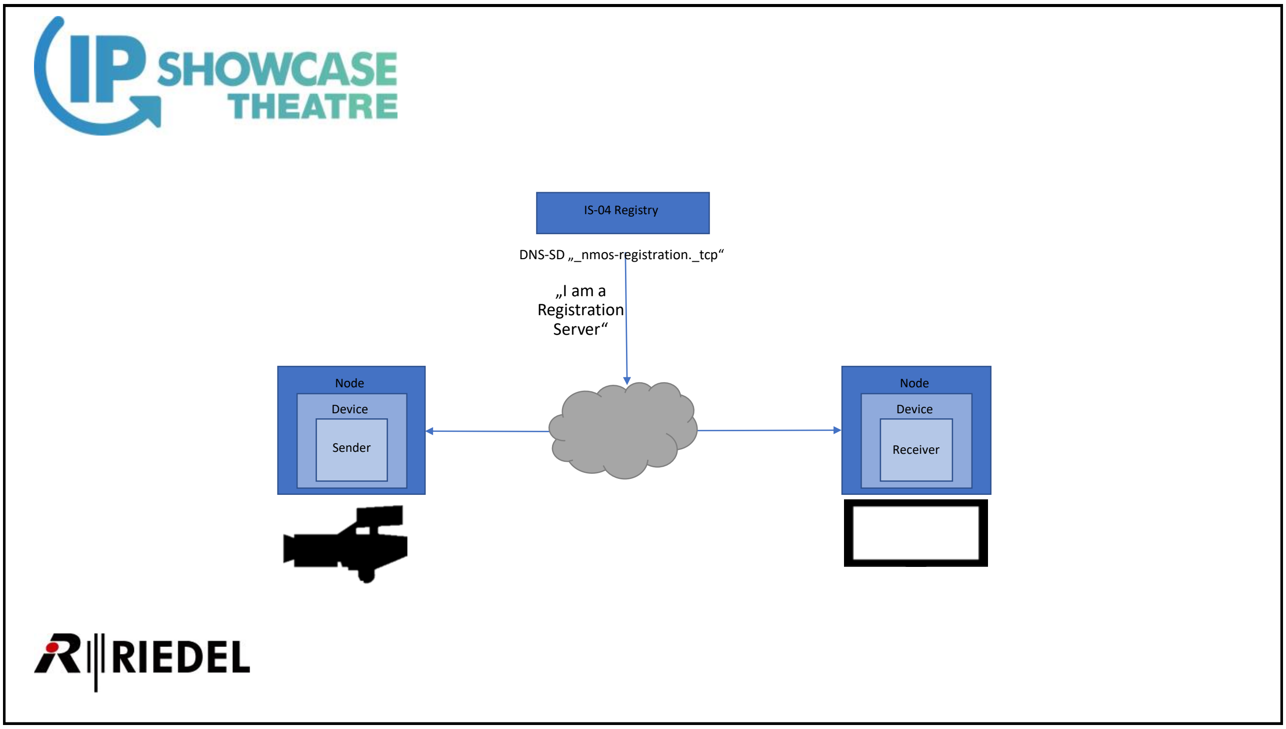
DNS-SD „_nmos-registration._tcp“

Node
Device
Sender

mDNS
and/or
DNS
lookup

mDNS
and/or
DNS
lookup

Node
Device
Receiver



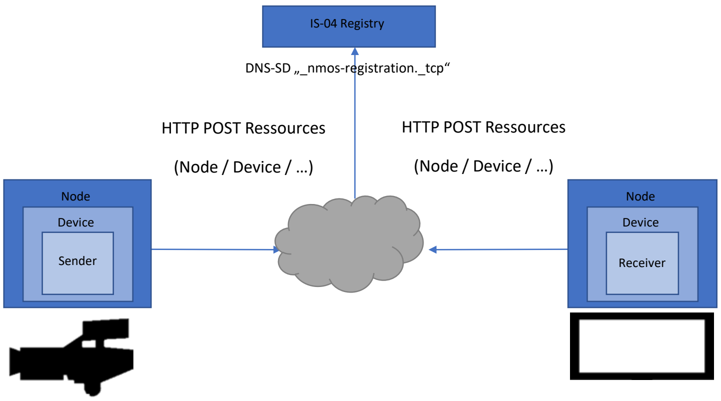
IS-04 Registry

DNS-SD „_nmos-registration._tcp“

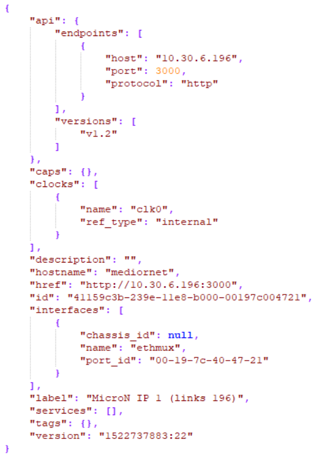
„I am a
Registration
Server“

Node
Device
Sender

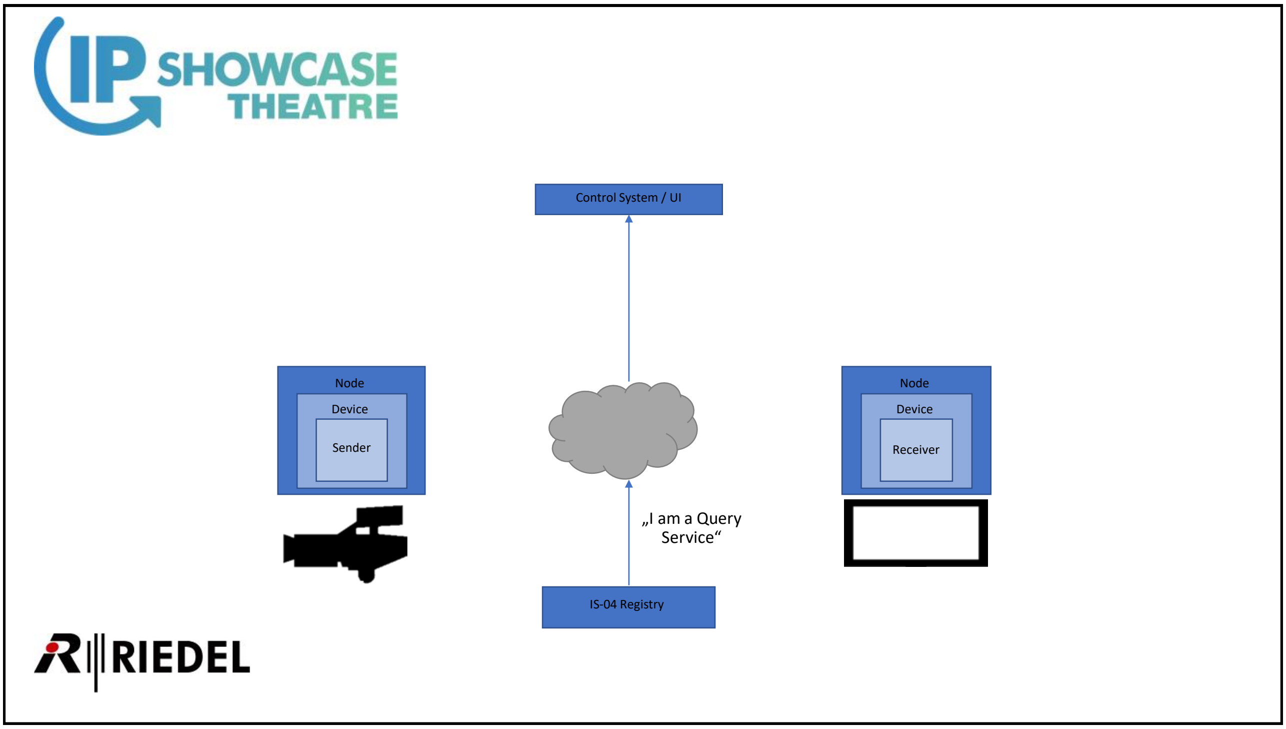
Node
Device
Receiver



IS-04 JSON Node Object



```
{
    "api": {
        "endpoints": [
            {
                "host": "10.30.6.196",
                "port": 3000,
                "protocol": "http"
            }
        ],
        "versions": [
            "v1.2"
        ]
    },
    "caps": {},
    "clocks": [
        {
            "name": "clk0",
            "ref_type": "internal"
        }
    ],
    "description": "",
    "hostname": "mediornet",
    "href": "http://10.30.6.196:3000",
    "id": "41159c3b-239e-11e8-b000-00197c004721",
    "interfaces": [
        {
            "chassis_id": null,
            "name": "ethmux",
            "port_id": "00-19-7c-40-47-21"
        }
    ],
    "label": "MicroN IP 1 (links 196)",
    "services": [],
    "tags": {},
    "version": "1522737883:22"
}
```



Control System / UI

Node

Device

Sender

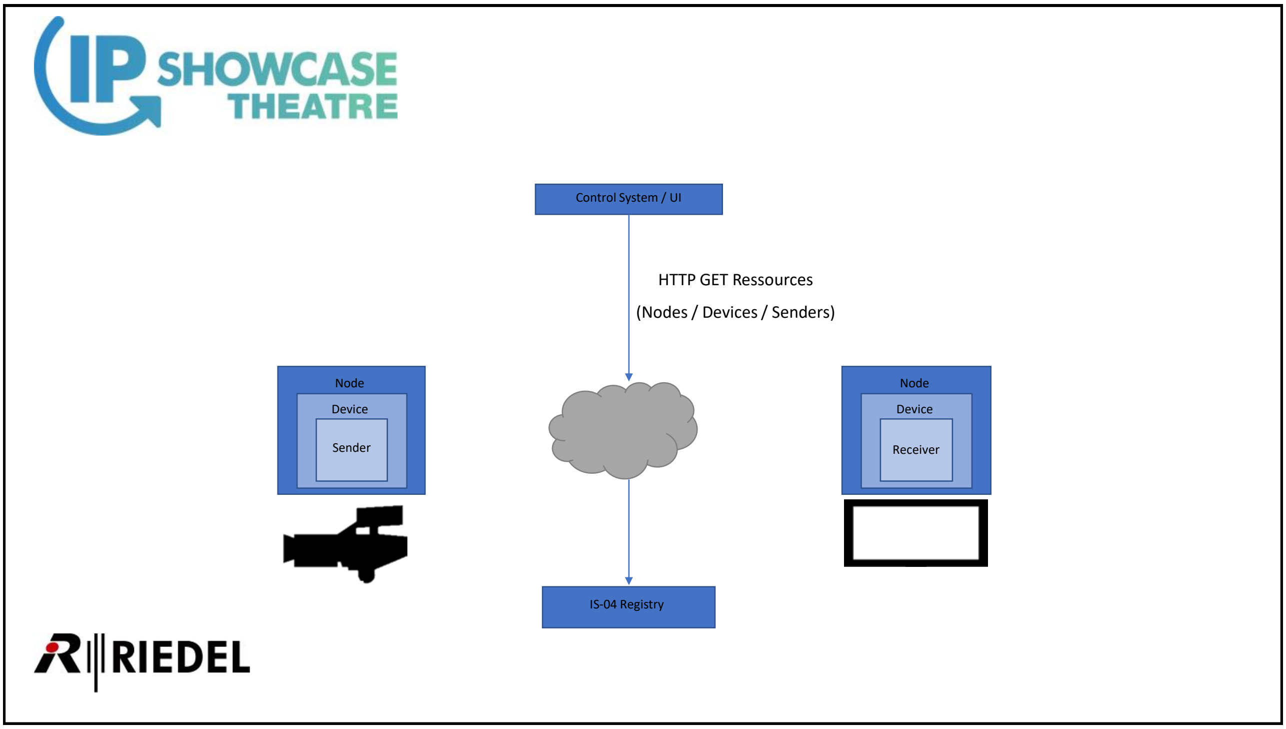
Node

Device

Receiver

„I am a Query Service“

IS-04 Registry



Control System / UI

HTTP GET Ressources

(Nodes / Devices / Senders)

Node

Device

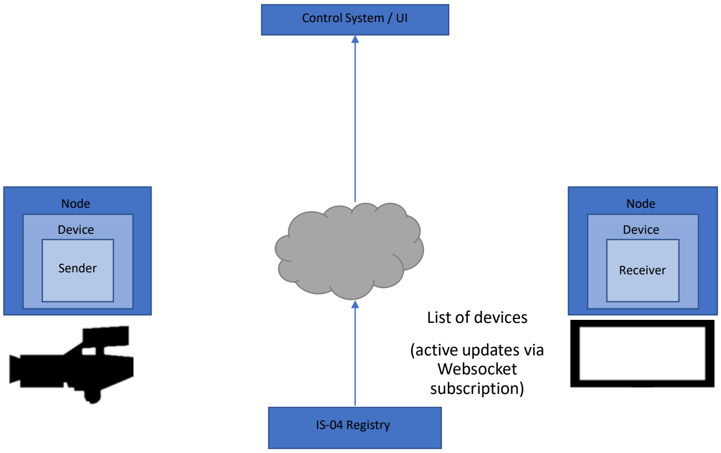
Sender

Node

Device

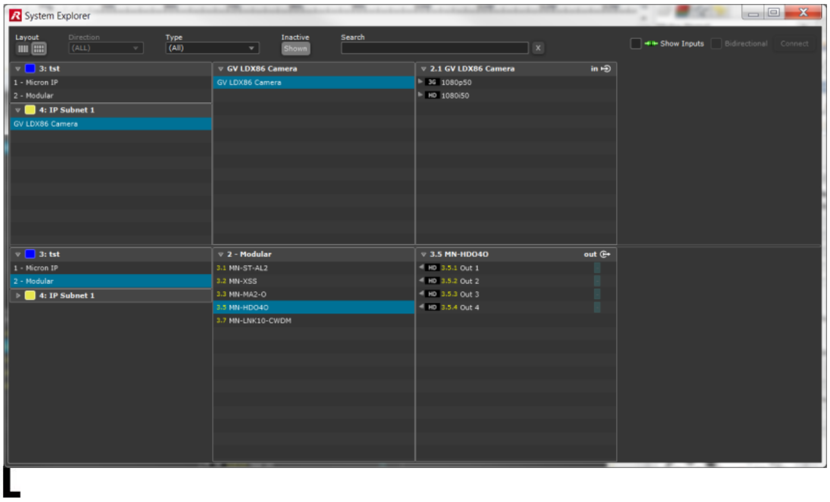
Receiver

IS-04 Registry



List of devices

(active updates via Websocket subscription)



3: tst
1 - Micron IP
2 - Modular
4: IP Subnet 1
GV LDX86 Camera

GV LDX86 Camera
GV LDX86 Camera

2.1 GV LDX86 Camera in
3G 1080p50
HD 1080i50

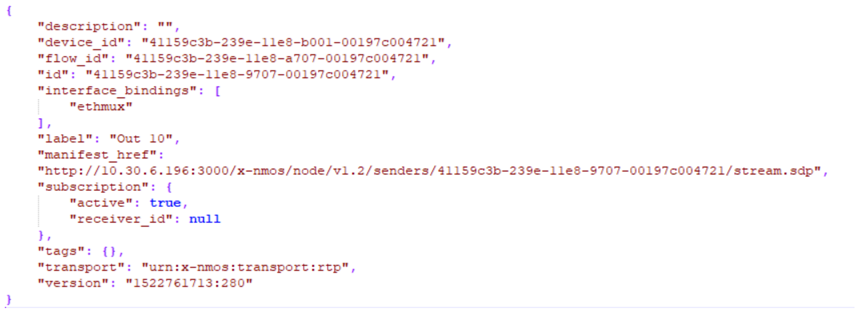
3: tst
1 - Micron IP
2 - Modular
4: IP Subnet 1

2 - Modular
3.1 MN-ST-AL2
3.2 MN-XSS
3.3 MN-MA2-O
3.5 MN-HDO4O
3.7 MN-LNK10-CWDM

3.5 MN-HDO4O out
HD 3.5.1 Out 1
HD 3.5.2 Out 2
HD 3.5.3 Out 3
HD 3.5.4 Out 4

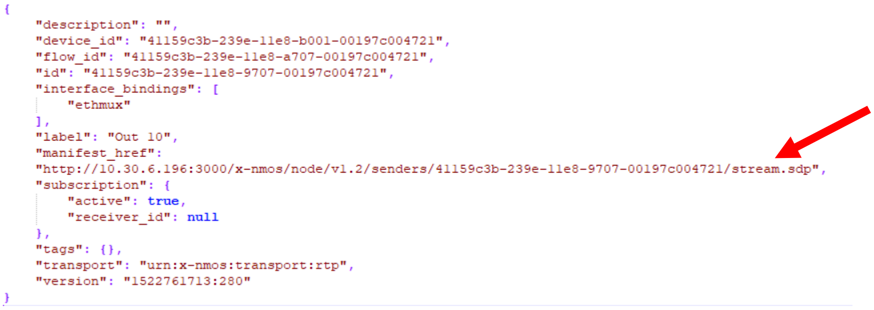
SDP File?

Sender Object



```
{
    "description": "",
    "device_id": "41159c3b-239e-11e8-b001-00197c004721",
    "flow_id": "41159c3b-239e-11e8-a707-00197c004721",
    "id": "41159c3b-239e-11e8-9707-00197c004721",
    "interface_bindings": [
        "ethmux"
    ],
    "label": "Out 10",
    "manifest_href":
    "http://10.30.6.196:3000/x-nmos/node/v1.2/senders/41159c3b-239e-11e8-9707-00197c004721/stream.sdp",
    "subscription": {
        "active": true,
        "receiver_id": null
    },
    "tags": {},
    "transport": "urn:x-nmos:transport:rtp",
    "version": "1522761713:280"
}
```

Sender Object



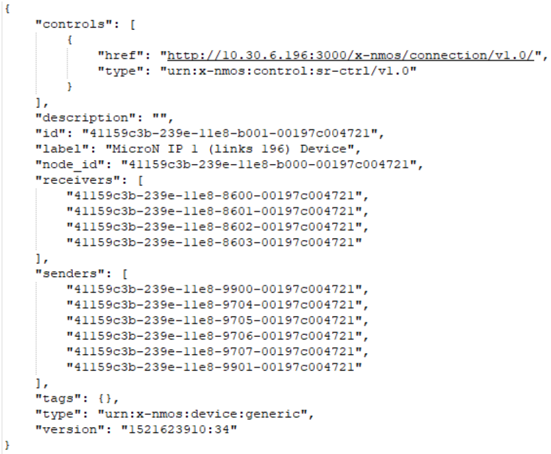
```
{
    "description": "",
    "device_id": "41159c3b-239e-11e8-b001-00197c004721",
    "flow_id": "41159c3b-239e-11e8-a707-00197c004721",
    "id": "41159c3b-239e-11e8-9707-00197c004721",
    "interface_bindings": [
        "ethmux"
    ],
    "label": "Out 10",
    "manifest_href":
    "http://10.30.6.196:3000/x-nmos/node/v1.2/senders/41159c3b-239e-11e8-9707-00197c004721/stream.sdp",
    "subscription": {
        "active": true,
        "receiver_id": null
    },
    "tags": {},
    "transport": "urn:x-nmos:transport:rtp",
    "version": "1522761713:280"
}
```

IS-05

Problem trying to solve:

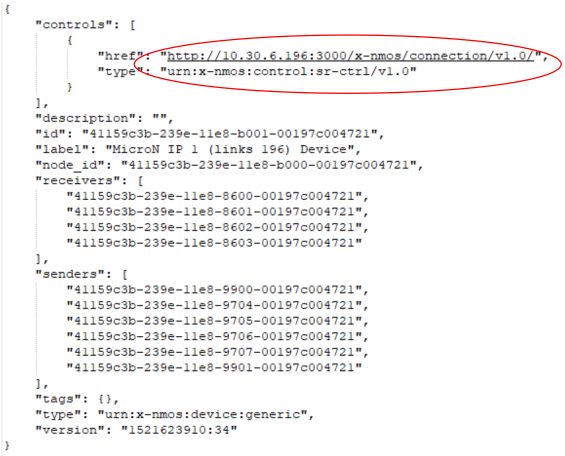
„How do I configure and connect senders and receivers of different vendors via a common interface?“

IS-04 JSON Device Object



```
{
    "controls": [
        {
            "href": "http://10.30.6.196:3000/x-nmos/connection/v1.0/",
            "type": "urn:x-nmos:control:sr-ctrl/v1.0"
        }
    ],
    "description": "",
    "id": "41159c3b-239e-11e8-b001-00197c004721",
    "label": "MicroN IP 1 (links 196) Device",
    "node_id": "41159c3b-239e-11e8-b000-00197c004721",
    "receivers": [
        "41159c3b-239e-11e8-8600-00197c004721",
        "41159c3b-239e-11e8-8601-00197c004721",
        "41159c3b-239e-11e8-8602-00197c004721",
        "41159c3b-239e-11e8-8603-00197c004721"
    ],
    "senders": [
        "41159c3b-239e-11e8-9900-00197c004721",
        "41159c3b-239e-11e8-9704-00197c004721",
        "41159c3b-239e-11e8-9705-00197c004721",
        "41159c3b-239e-11e8-9706-00197c004721",
        "41159c3b-239e-11e8-9707-00197c004721",
        "41159c3b-239e-11e8-9901-00197c004721"
    ],
    "tags": {},
    "type": "urn:x-nmos:device:generic",
    "version": "1521623910:34"
}
```

IS-04 JSON Device Object



```
{
    "controls": [
        {
            "href": "http://10.30.6.196:3000/x-nmos/connection/v1.0/",
            "type": "urn:x-nmos:control:sr-ctrl/v1.0"
        }
    ],
    "description": "",
    "id": "41159c3b-239e-11e8-b001-00197c004721",
    "label": "MicroN IP 1 (links 196) Device",
    "node_id": "41159c3b-239e-11e8-b000-00197c004721",
    "receivers": [
        "41159c3b-239e-11e8-8600-00197c004721",
        "41159c3b-239e-11e8-8601-00197c004721",
        "41159c3b-239e-11e8-8602-00197c004721",
        "41159c3b-239e-11e8-8603-00197c004721"
    ],
    "senders": [
        "41159c3b-239e-11e8-9900-00197c004721",
        "41159c3b-239e-11e8-9704-00197c004721",
        "41159c3b-239e-11e8-9705-00197c004721",
        "41159c3b-239e-11e8-9706-00197c004721",
        "41159c3b-239e-11e8-9707-00197c004721",
        "41159c3b-239e-11e8-9901-00197c004721"
    ],
    "tags": {},
    "type": "urn:x-nmos:device:generic",
    "version": "1521623910:34"
}
```

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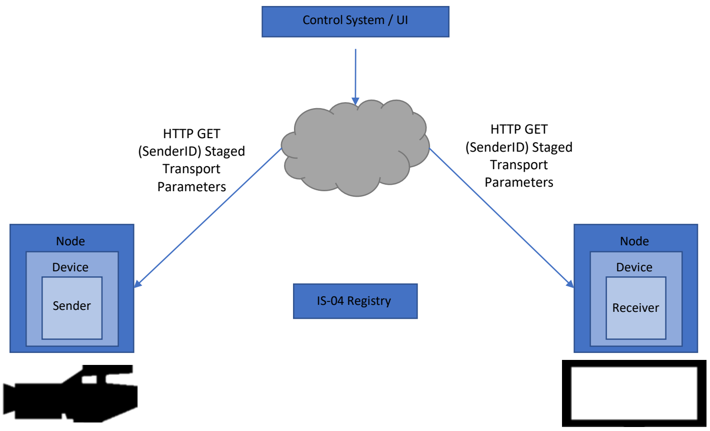
IS-05 Workflow



Control System / UI

HTTP GET (SenderID) Staged Transport Parameters

HTTP GET (SenderID) Staged Transport Parameters

Node

Device

Sender

IS-04 Registry

Node

Device

Receiver

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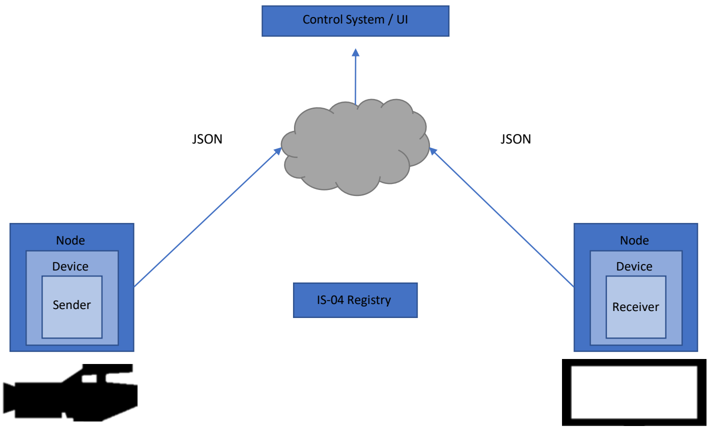
IP SHOWCASE THEATRE

IS-05 Workflow



Control System / UI

JSON

JSON

Node

Device

Sender

IS-04 Registry

Node

Device

Receiver

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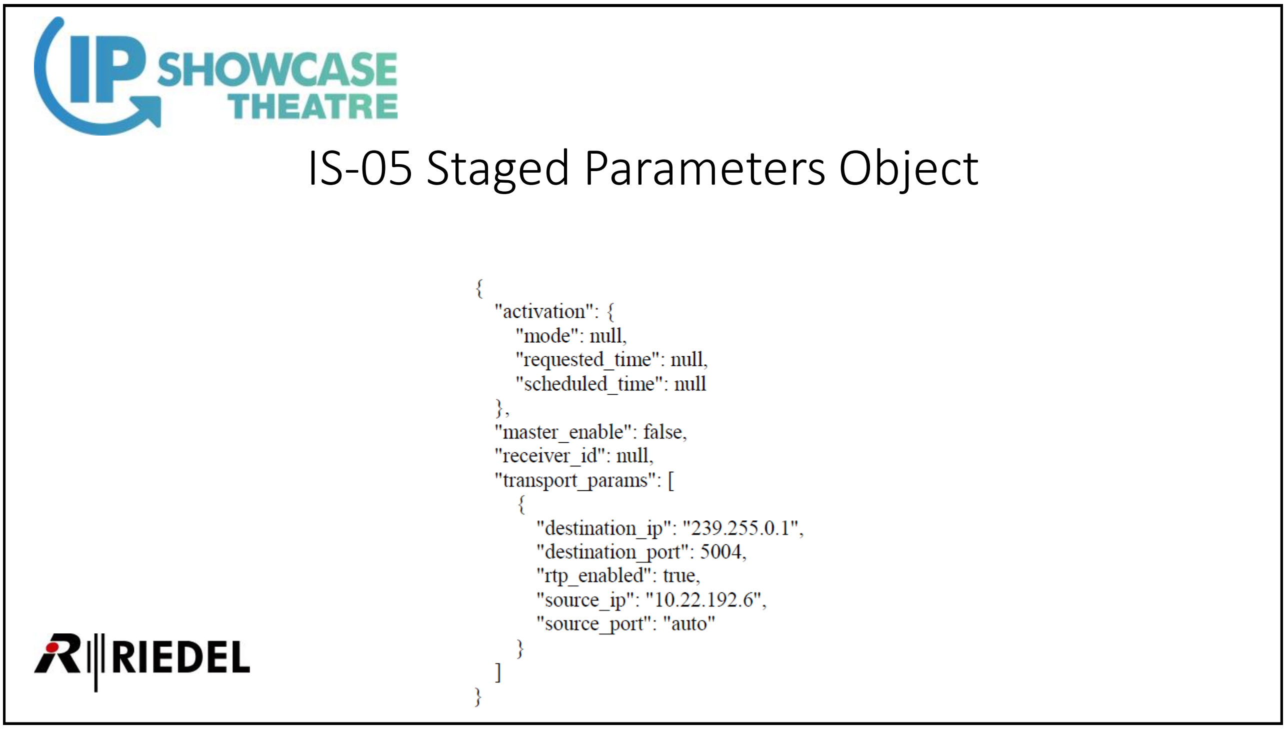

IP SHOWCASE THEATRE

IS-05 Staged Parameters Object

```
{
  "activation": {
    "mode": null,
    "requested_time": null,
    "scheduled_time": null
  },
  "master_enable": false,
  "receiver_id": null,
  "transport_params": [
    {
      "destination_ip": "239.255.0.1",
      "destination_port": 5004,
      "rtp_enabled": true,
      "source_ip": "10.22.192.6",
      "source_port": "auto"
    }
  ]
}
```

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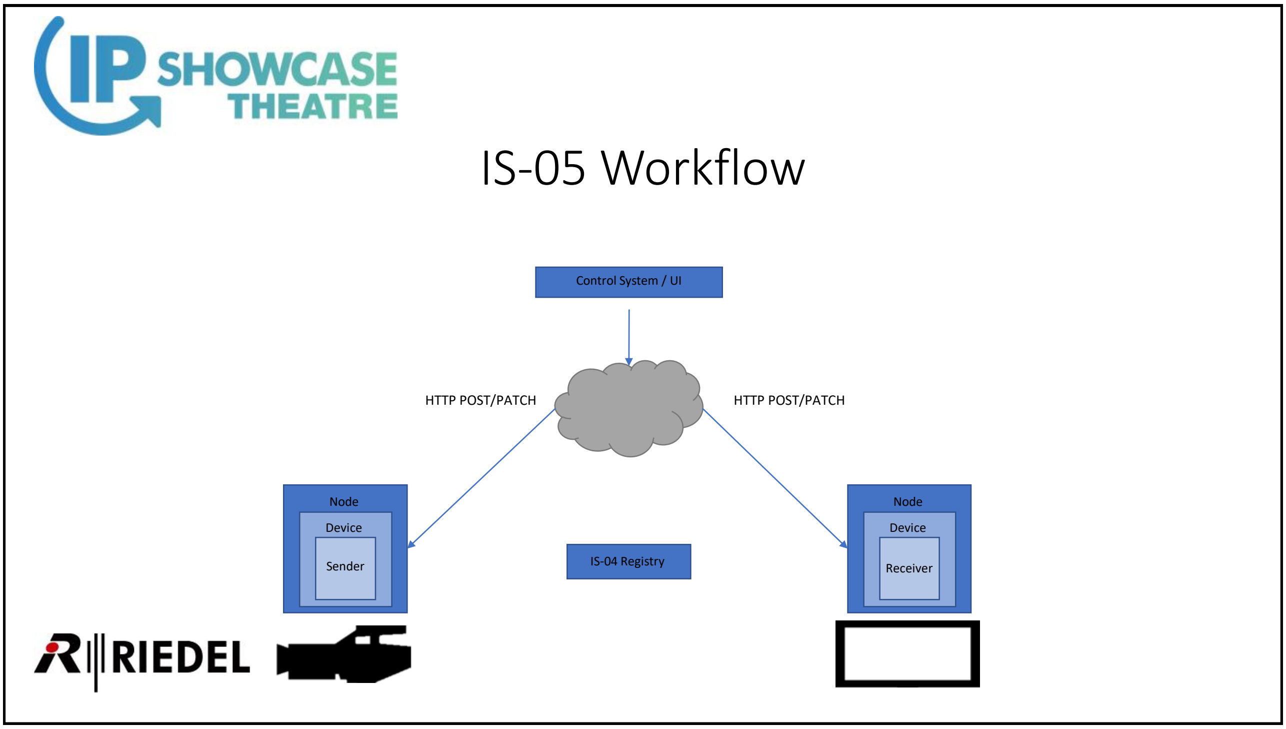

IP SHOWCASE THEATRE

IS-05 Workflow

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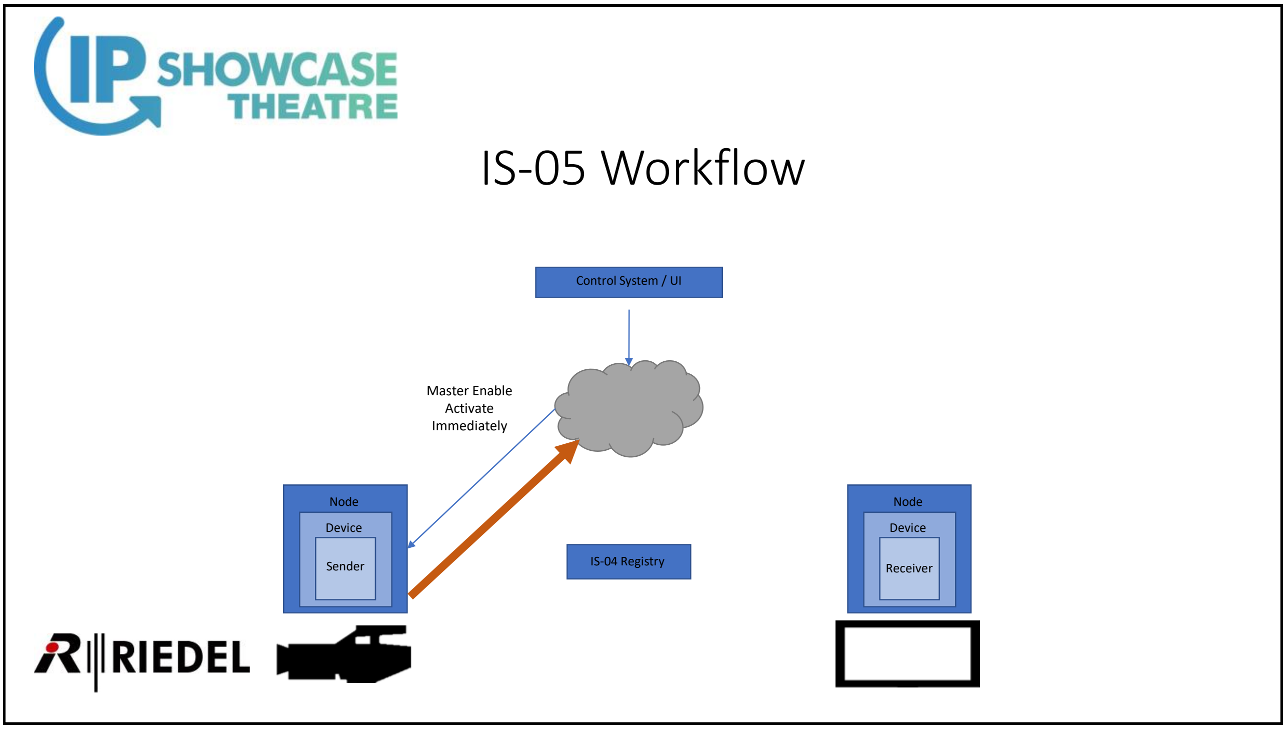


IS-05 Workflow

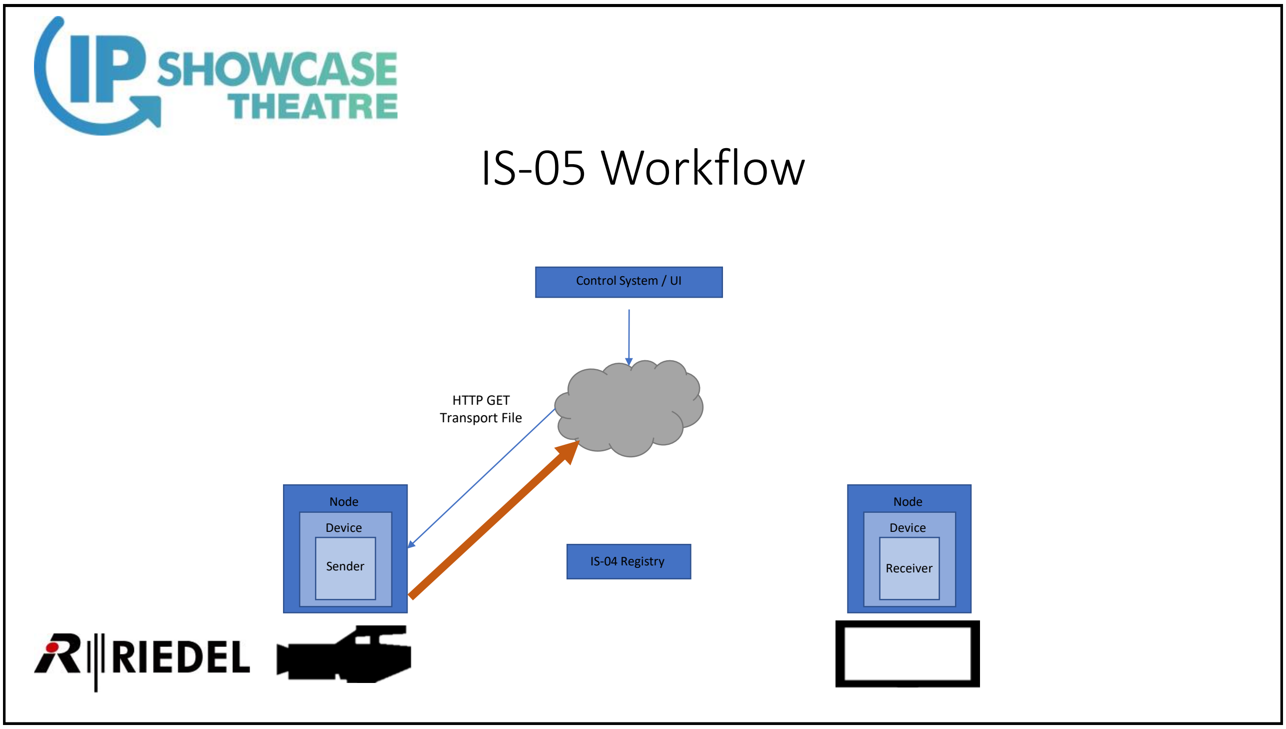
Control System / UI

Master Enable
Activate
Immediately

Node
Device
Sender

IS-04 Registry

Node
Device
Receiver



IS-05 Workflow

Control System / UI

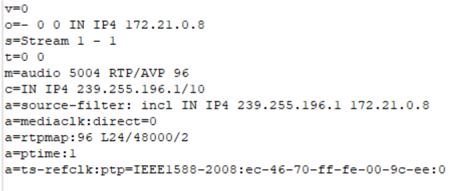
HTTP GET
Transport File

Node
Device
Sender

IS-04 Registry

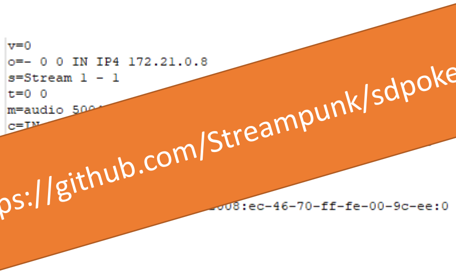
Node
Device
Receiver

SDP referenced via URL



```
v=0
o=- 0 0 IN IP4 172.21.0.8
s=Stream 1 - 1
t=0 0
m=audio 5004 RTP/AVP 96
c=IN IP4 239.255.196.1/10
a=source-filter: incl IN IP4 239.255.196.1 172.21.0.8
a=mediaclk:direct=0
a=rtpmap:96 L24/48000/2
a=ptime:1
a=ts-refclk:ptp=IEEE1588-2008:ec-46-70-ff-fe-00-9c-ee:0
```

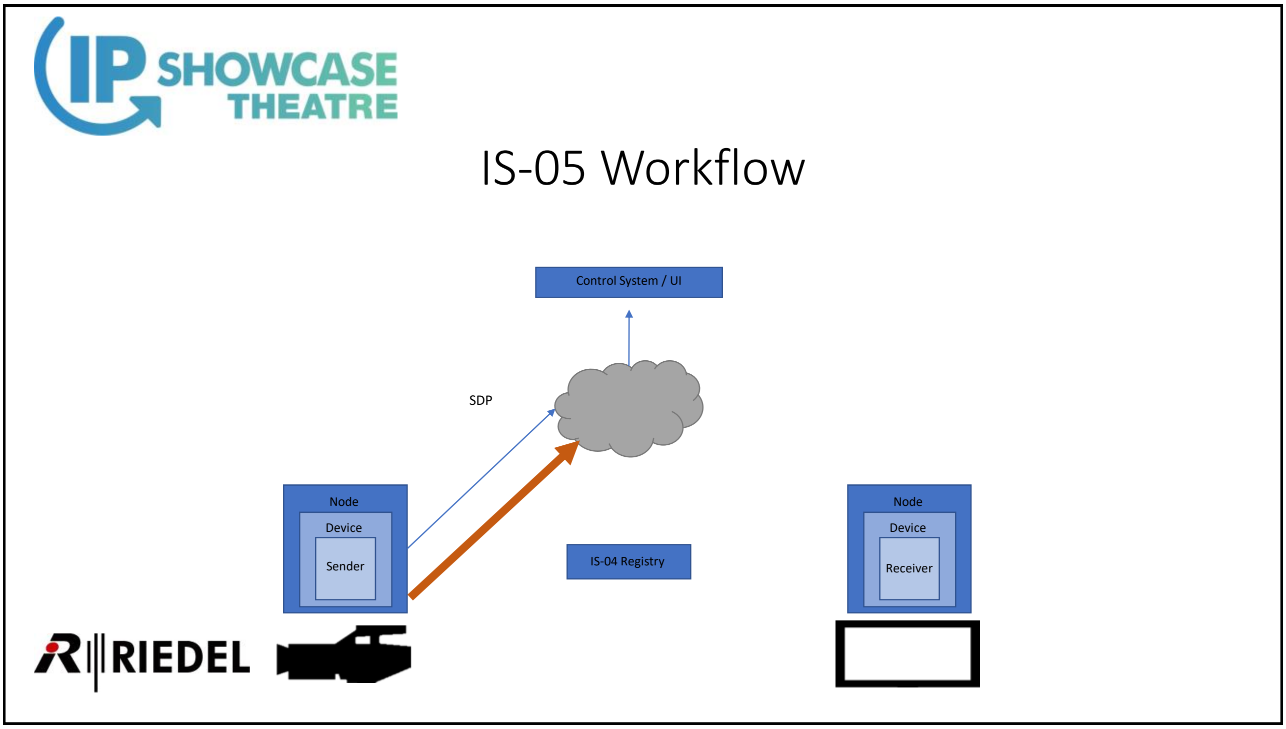
SDP referenced via URL



```
v=0
o=- 0 0 IN IP4 172.21.0.8
s=Stream 1 - 1
t=0 0
m=audio 500
c=IN

                        008:ec-46-70-ff-fe-00-9c-ee:0
```

https://github.com/Streampunk/sdpoker



IS-05 Workflow

Control System / UI

SDP

Node

Device

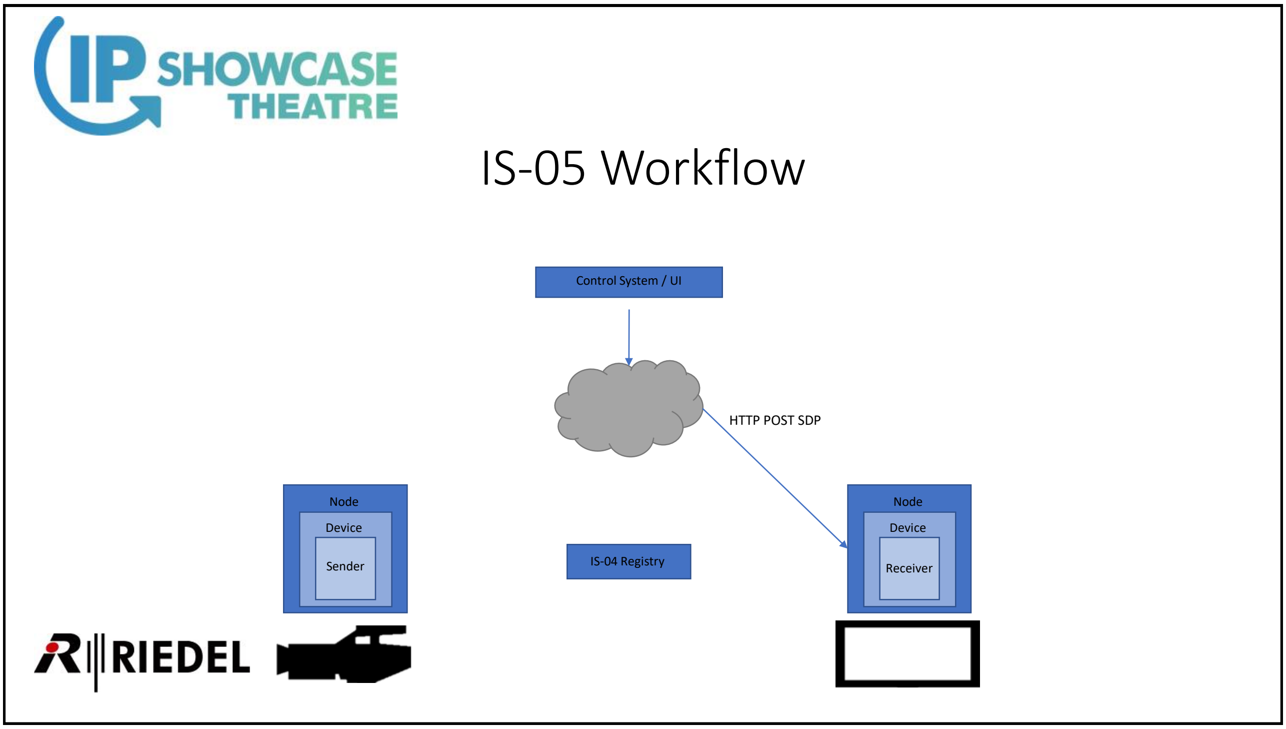
Sender

IS-04 Registry

Node

Device

Receiver



IS-05 Workflow

Control System / UI

HTTP POST SDP

Node

Device

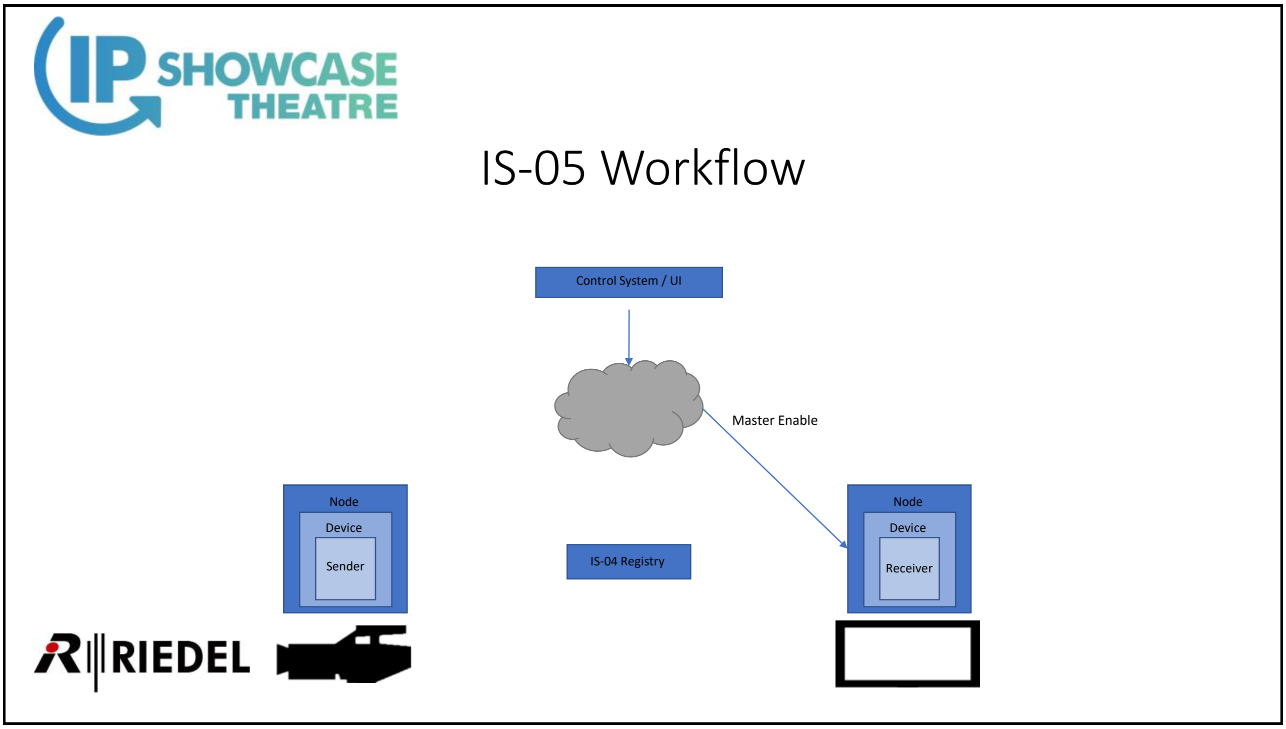
Sender

IS-04 Registry

Node

Device

Receiver



IP SHOWCASE THEATRE

IS-05 Workflow

Control System / UI

Master Enable

Node

Device

Sender

IS-04 Registry

Node

Device

Receiver

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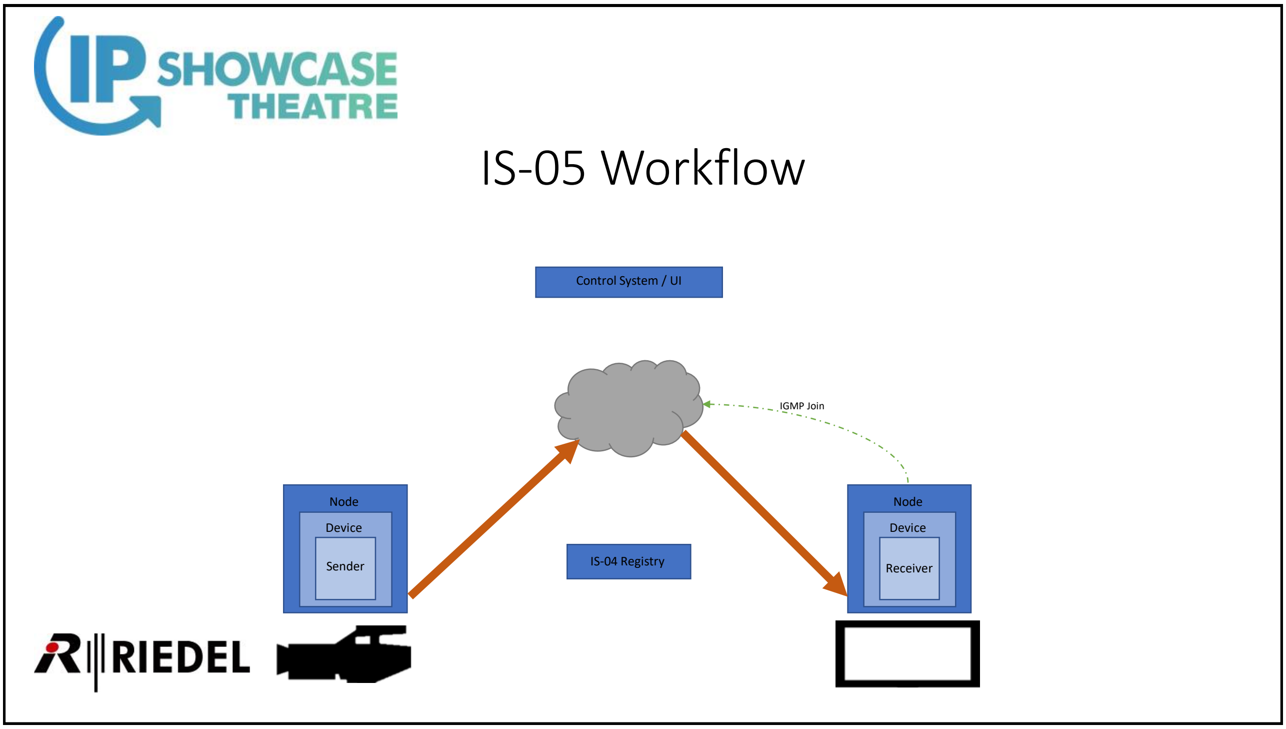

IP SHOWCASE THEATRE

IS-05 Workflow

Control System / UI

IGMP Join

Node

Device

Sender

IS-04 Registry

Node

Device

Receiver

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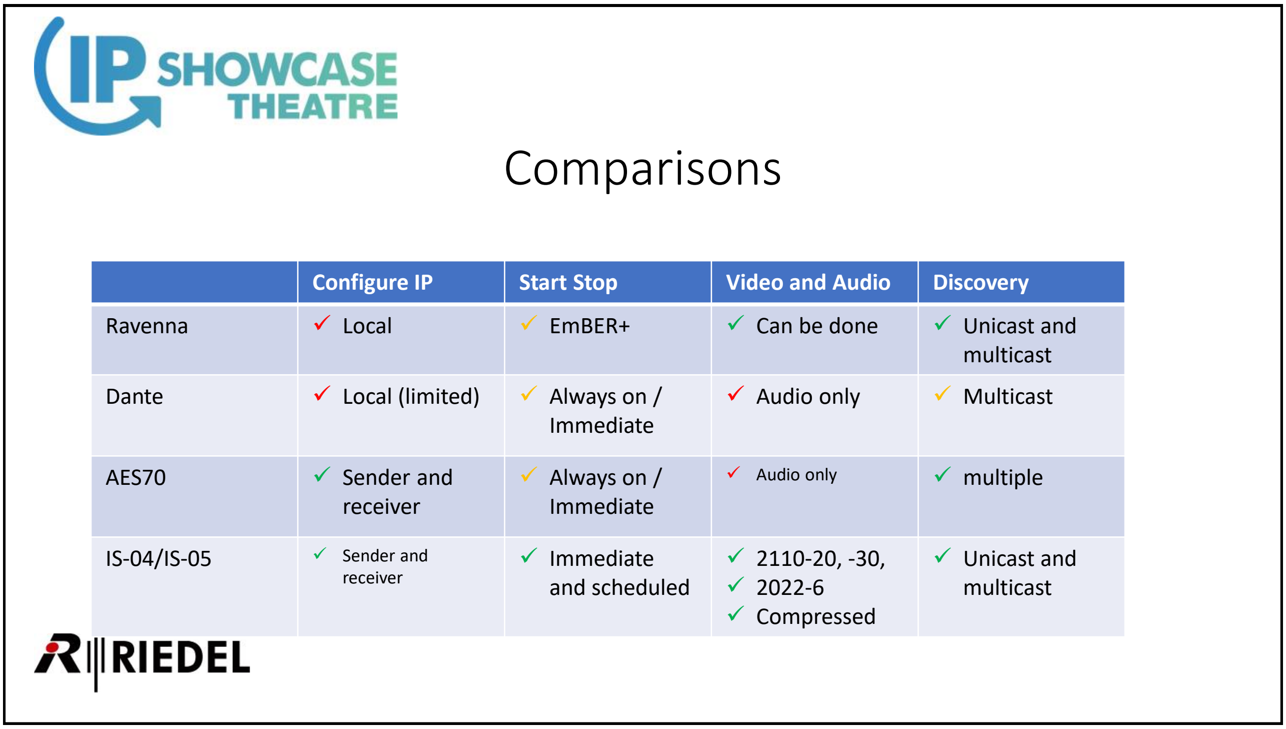

IP SHOWCASE THEATRE

Comparisons

	Configure IP	Start Stop	Video and Audio	Discovery
Ravenna	✓ Local	✓ EmBER+	✓ Can be done	✓ Unicast and multicast
Dante	✓ Local (limited)	✓ Always on / Immediate	✓ Audio only	✓ Multicast
AES70	✓ Sender and receiver	✓ Always on / Immediate	✓ Audio only	✓ multiple
IS-04/IS-05	✓ Sender and receiver	✓ Immediate and scheduled	✓ 2110-20, -30, ✓ 2022-6 ✓ Compressed	✓ Unicast and multicast

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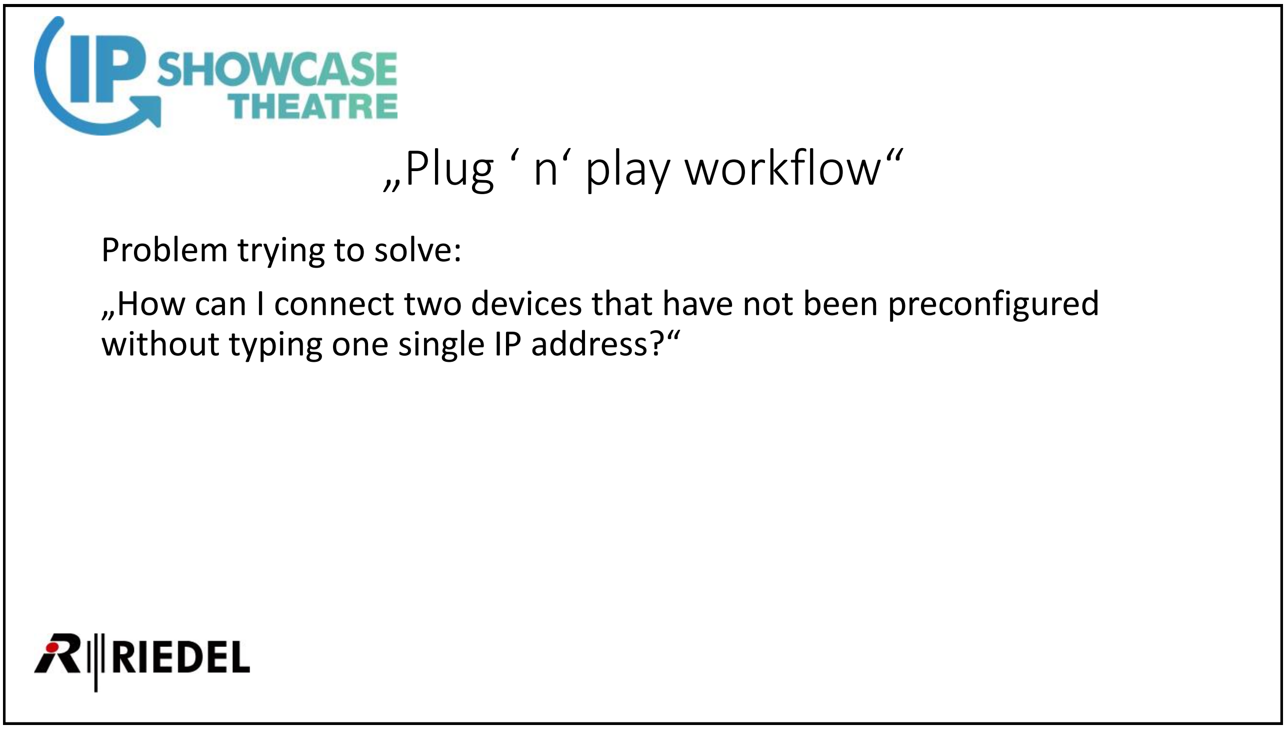

IP SHOWCASE THEATRE

„Plug ‘ n‘ play workflow“

Problem trying to solve:

„How can I connect two devices that have not been preconfigured without typing one single IP address?“

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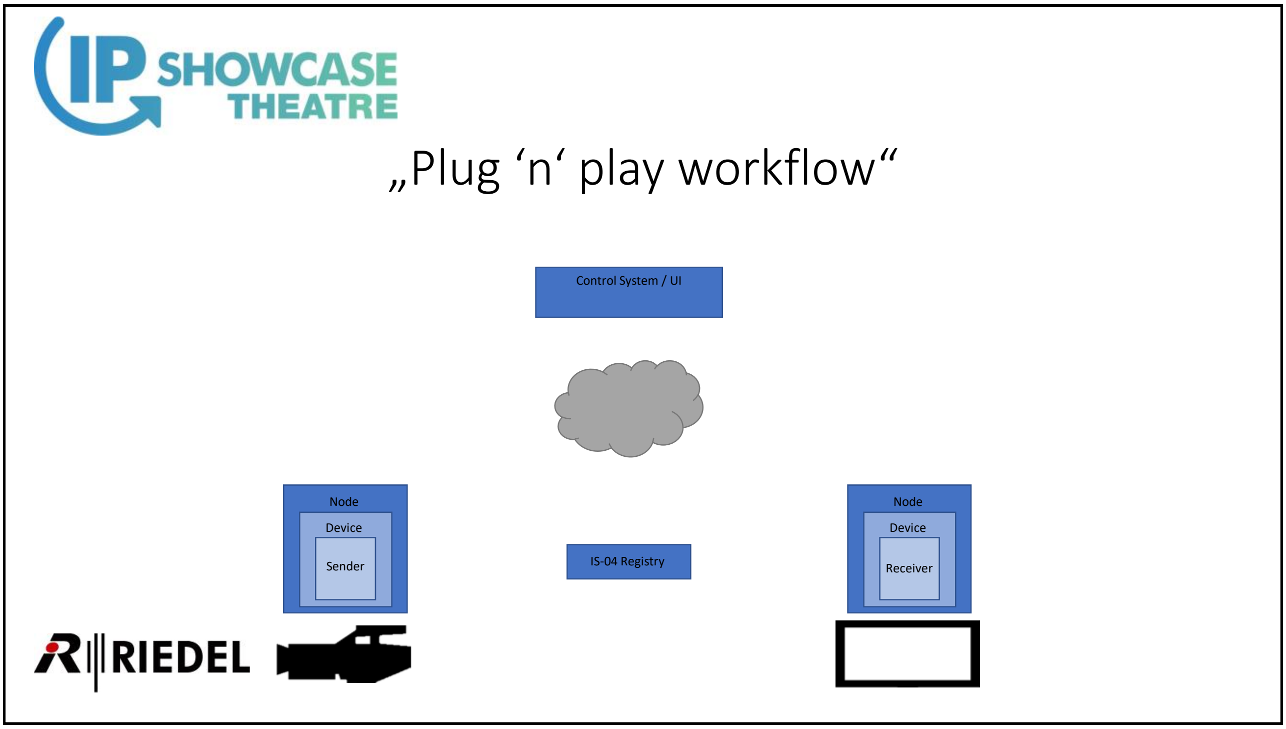


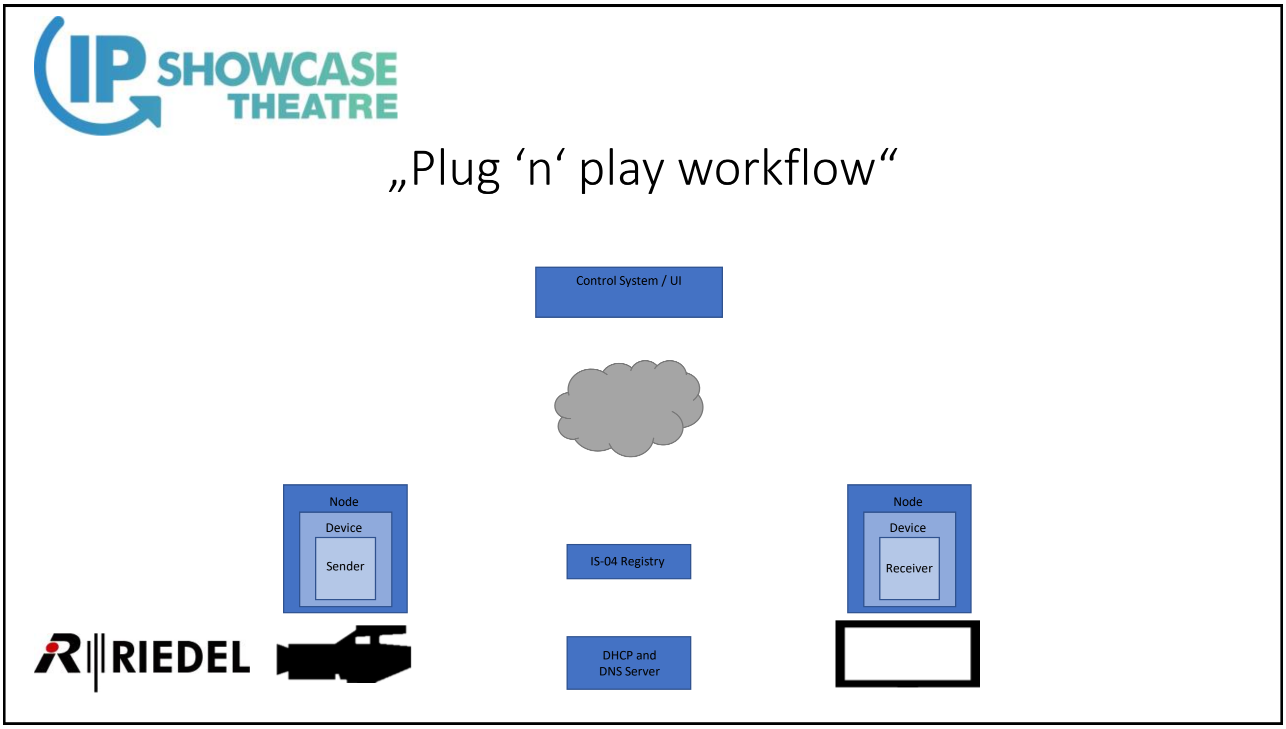
„Plug ‘n‘ play workflow“

Control System / UI

Node
Device
Sender

IS-04 Registry

Node
Device
Receiver



„Plug ‘n‘ play workflow“

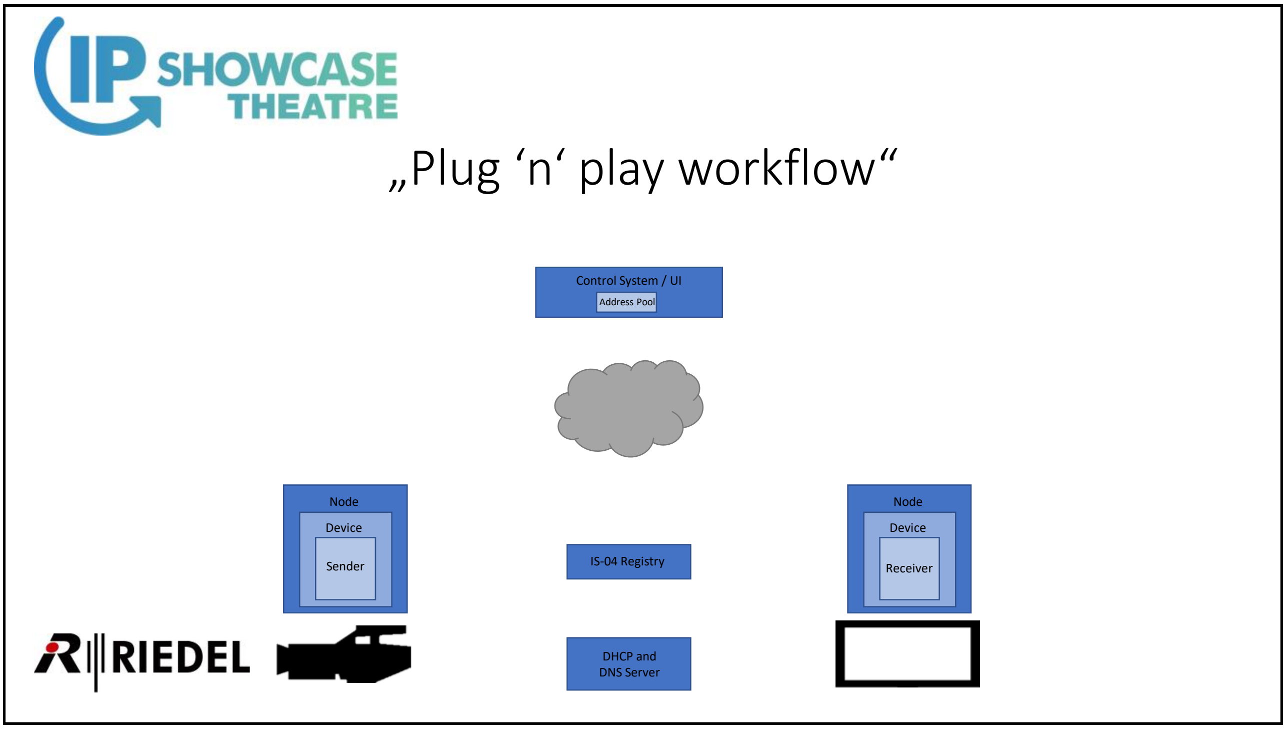
Control System / UI

Node
Device
Sender

IS-04 Registry

DHCP and
DNS Server

Node
Device
Receiver



IP SHOWCASE THEATRE

„Plug ‘n‘ play workflow“

Control System / UI

Address Pool

Node

Device

Sender

IS-04 Registry

Node

Device

Receiver

DHCP and DNS Server

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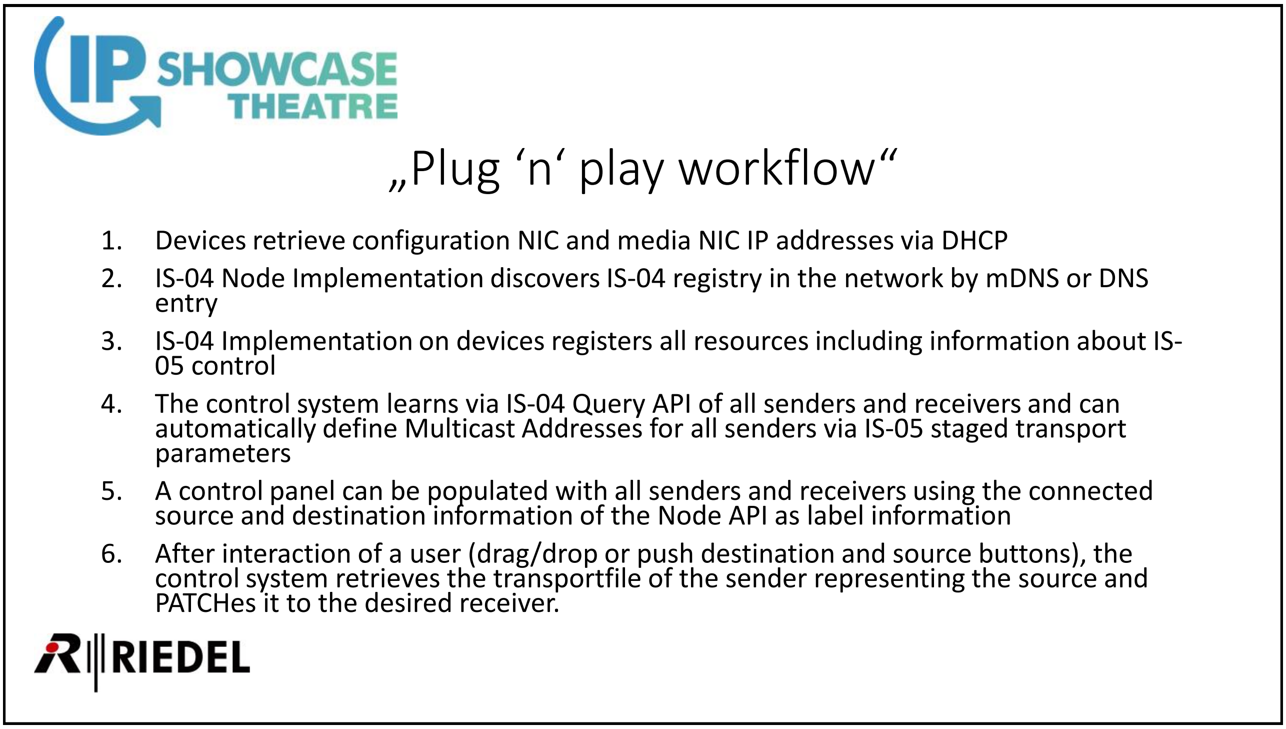

IP SHOWCASE THEATRE

„Plug ‘n‘ play workflow“

1. Devices retrieve configuration NIC and media NIC IP addresses via DHCP
2. IS-04 Node Implementation discovers IS-04 registry in the network by mDNS or DNS entry
3. IS-04 Implementation on devices registers all resources including information about IS-05 control
4. The control system learns via IS-04 Query API of all senders and receivers and can automatically define Multicast Addresses for all senders via IS-05 staged transport parameters
5. A control panel can be populated with all senders and receivers using the connected source and destination information of the Node API as label information
6. After interaction of a user (drag/drop or push destination and source buttons), the control system retrieves the transportfile of the sender representing the source and PATCHes it to the desired receiver.

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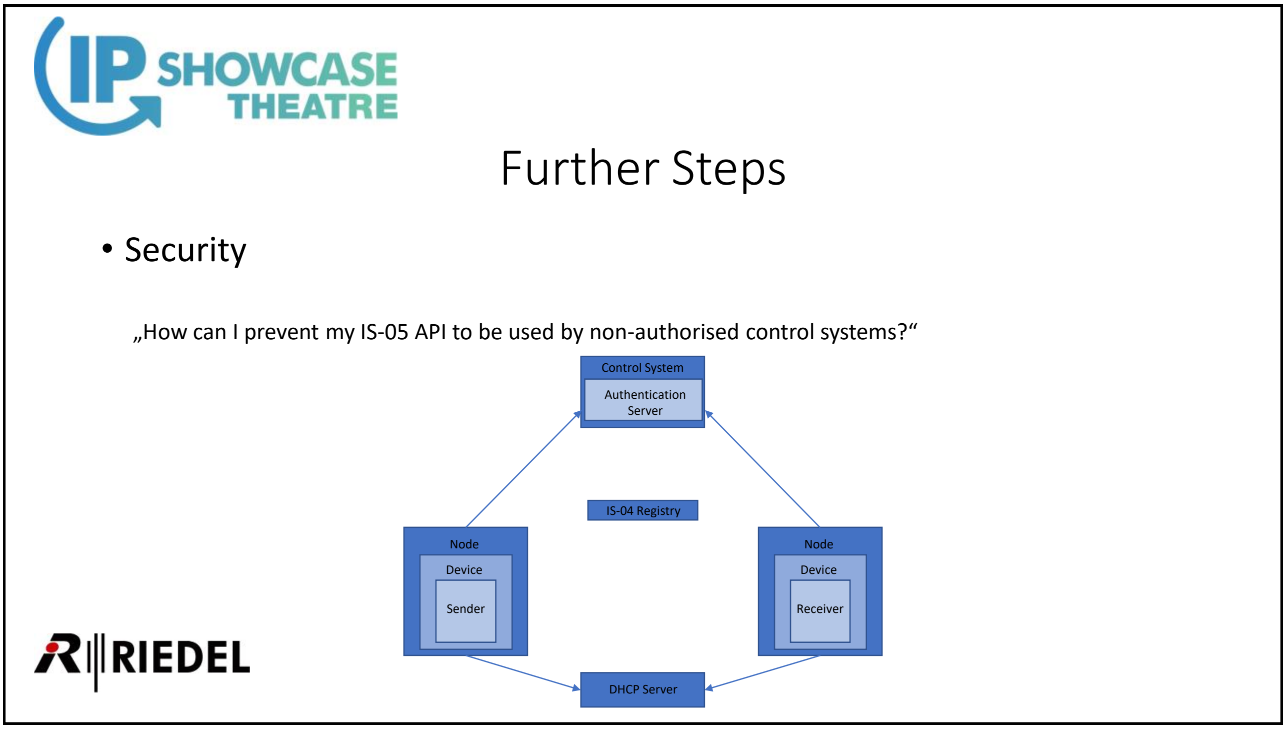

IP SHOWCASE THEATRE

Further Steps

- Security

„How can I prevent my IS-05 API to be used by non-authorised control systems?“

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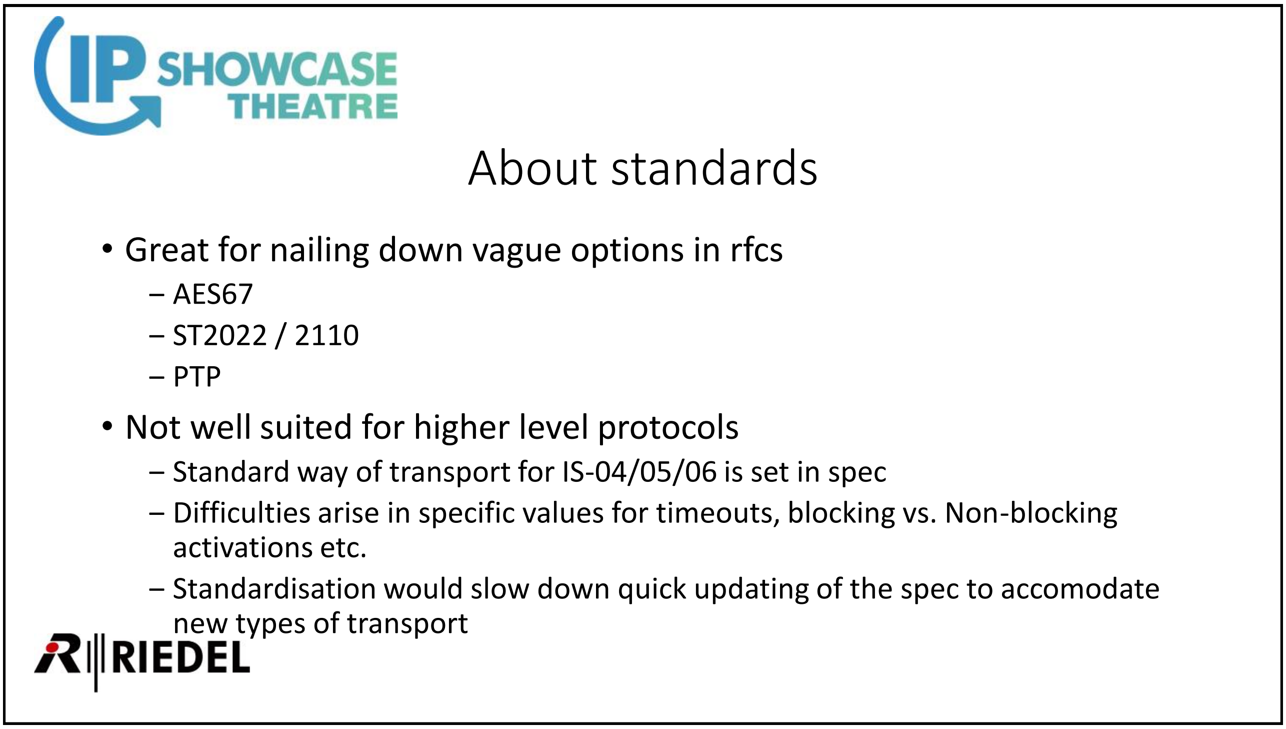

IP SHOWCASE THEATRE

About standards

- Great for nailing down vague options in rfcs
  - AES67
  - ST2022 / 2110
  - PTP
- Not well suited for higher level protocols
  - Standard way of transport for IS-04/05/06 is set in spec
  - Difficulties arise in specific values for timeouts, blocking vs. Non-blocking activations etc.
  - Standardisation would slow down quick updating of the spec to accomodate new types of transport

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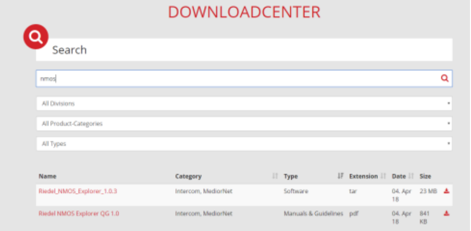
Conclusion

- AMWA IS 04-05 greatly completes ST2110 suite, as well as AES67 for missing handles to configure and connect
- Plug and play workflow can add value to IP for ad hoc installations
- IS-04 also complements larger routing systems
- Open questions remain in specific implementation details
- Engineering Guideline an option instead of a standard

Links

- Documentations:
  - https://amwa-tv.github.io/nmos/
- Open Source implementations:
  - https://github.com/AMWA-TV/nmos/blob/master/Implementations.md
- Freeware NMOS Explorer:
  - https://myriedel.riedel.net/



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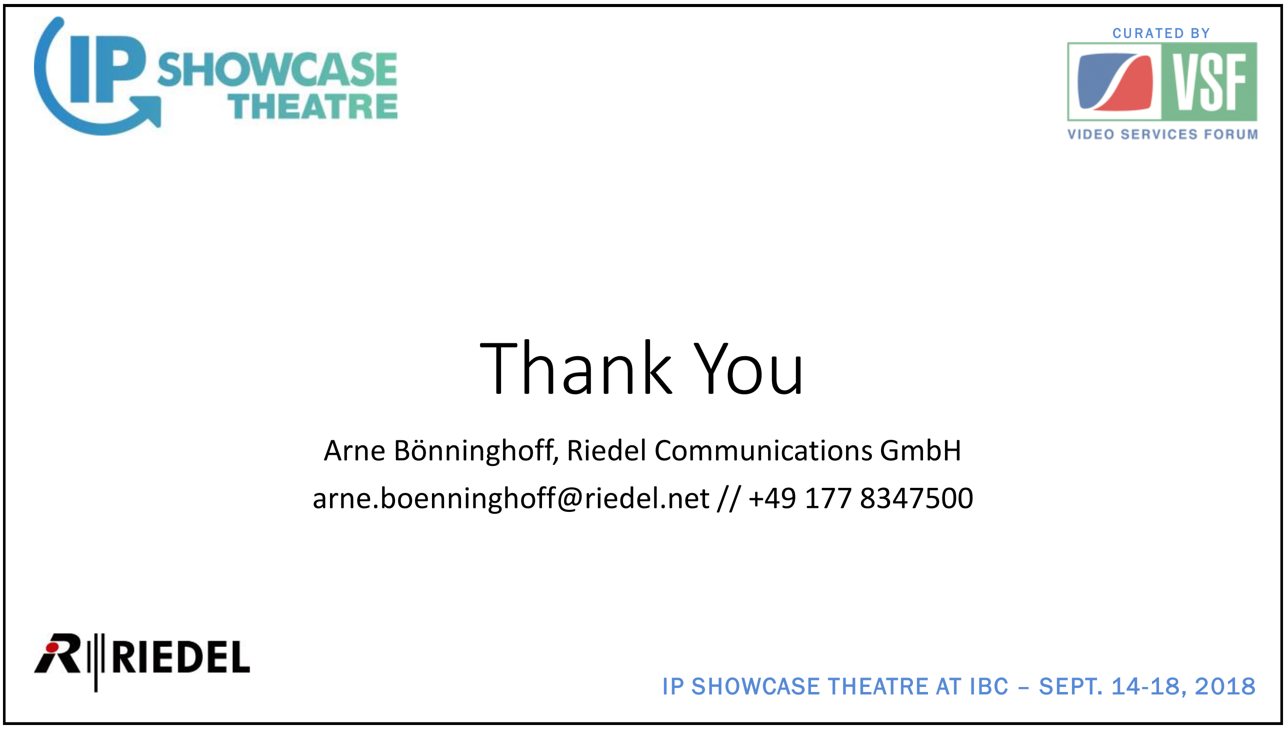
Riedel NMOS Explorer QG 1.0	Intercom, MediorNet	Manuals & Guidelines	pdf	04. Apr 18	841 KB



Thank You

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