

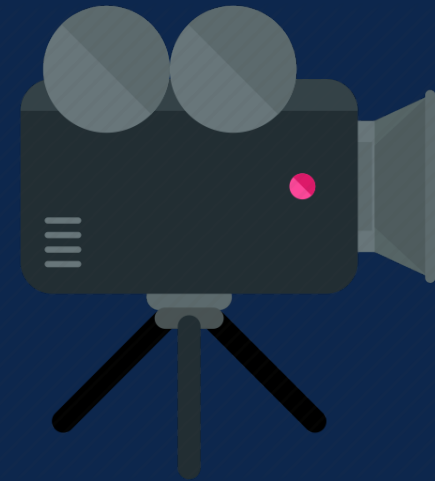


# IP for Broadcasters

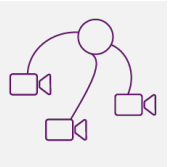
SDI to IP Migration with Cisco and  
Grass Valley

Matt Salvidge  
EMEA Sales Engineering Manager  
Grass Valley

Rahul Parameswaran  
Sr. Manager, Technical Marketing  
Cisco Systems



# Grass Valley and Cisco Application Areas



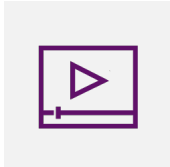
Remote/  
At Home



Mobile/Live  
Production



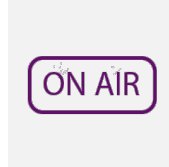
Media  
Workflows



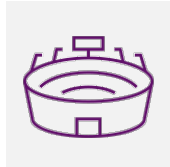
Playout



**IP  
Workflows**



Studio  
Production

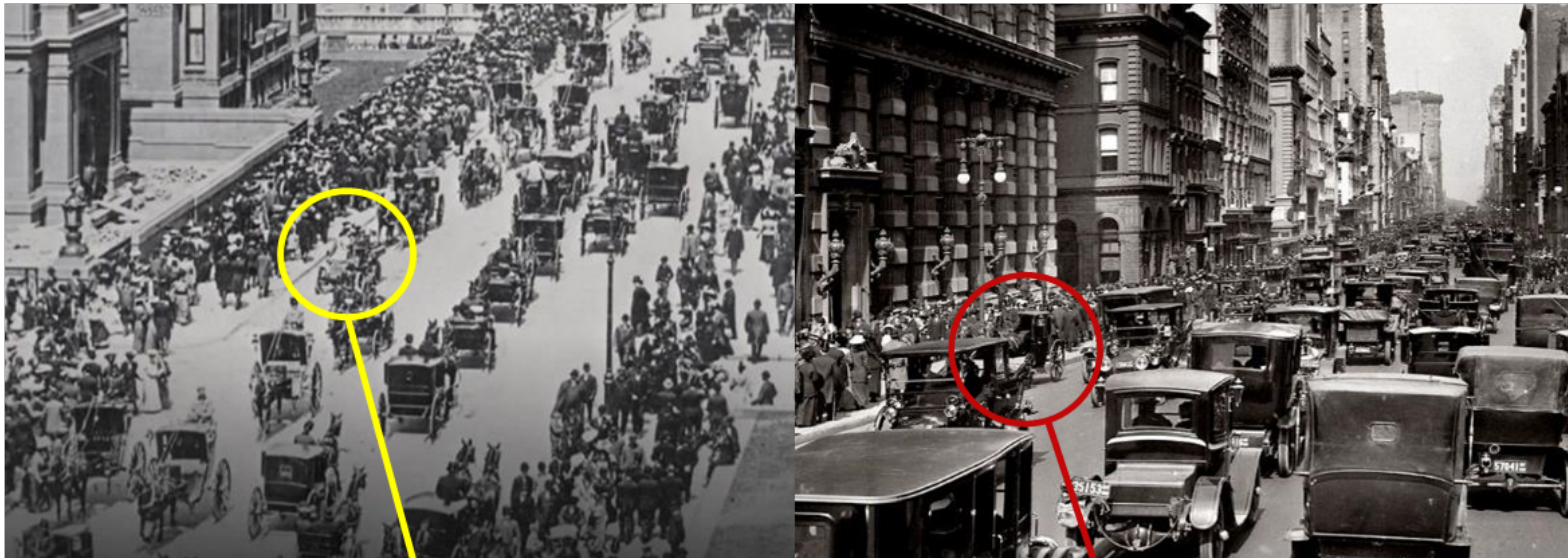


Venues

# IP – It's no longer 'If' but 'When'

5<sup>th</sup> Avenue NY, Easter 1900

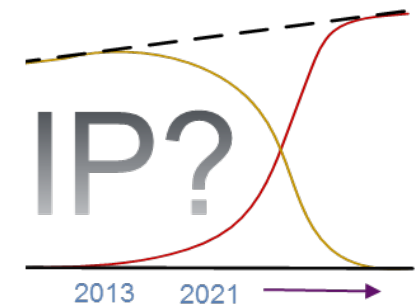
5<sup>th</sup> Avenue NY, Easter 1913



Spot the car!

Spot the horse!

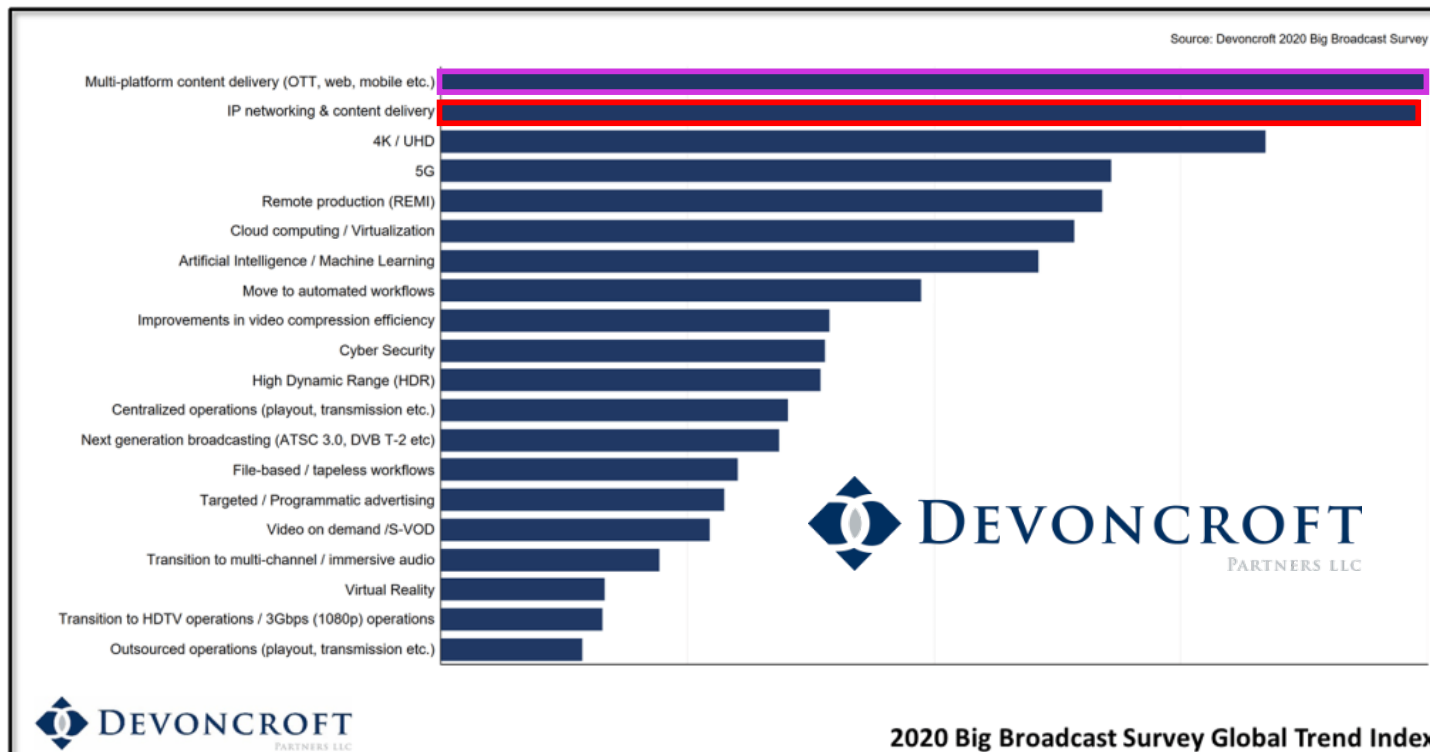
- Disruptive technologies typically 15 years to full adoption
- If true for IP, we are about half way there!



# Big Broadcast Survey

## Media Technology Global Trend Index - 2020

- What's most commercially important to media businesses?



No. 2 priority  
2020  
IP Networking &  
Content Delivery

No. 1 in 2019  
No. 2 in 2018  
No. 2 in 2017

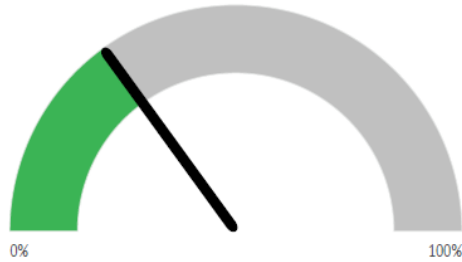
Multi-platform Content  
Delivery  
(OTT, web, mobile etc.)

No. 1 2010 -2020  
except 2019 !!!



# IP Adoption Tracker

## iabm Special Report - Sept 2020



● % of companies that have adopted IP



30%

of companies have already adopted/transitioned to IP



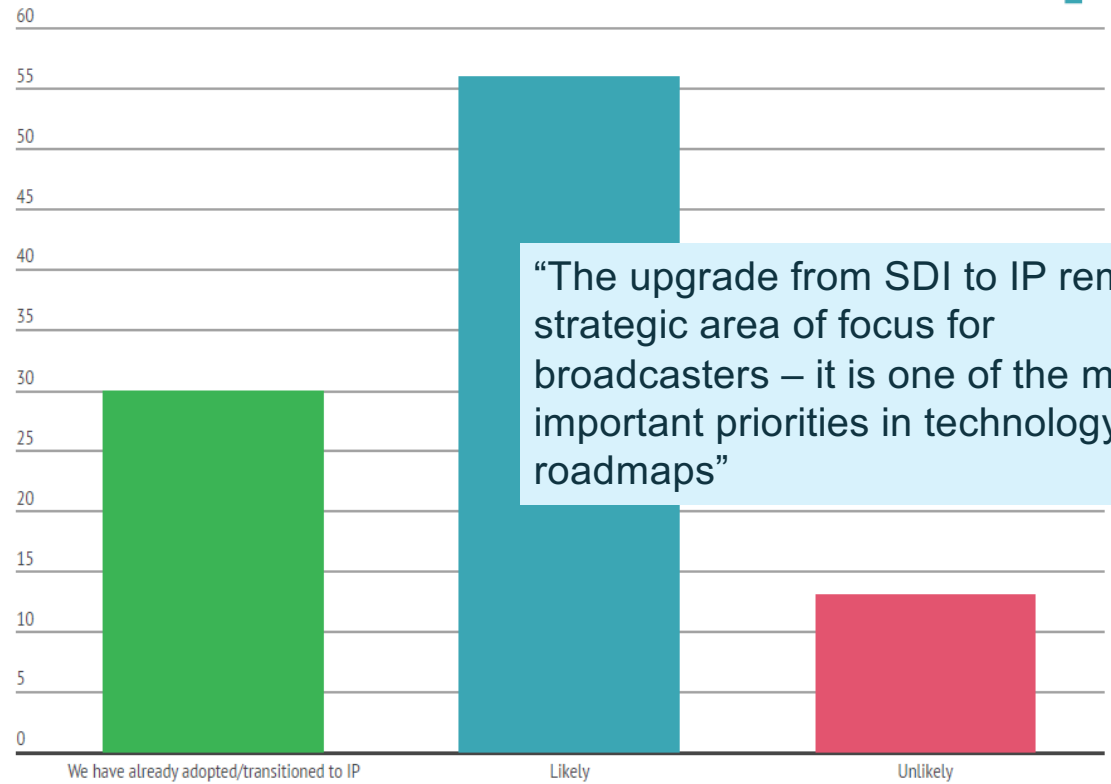
56%

of companies likely to deploy IP



13%

of companies saying they are unlikely to transition to IP



“The upgrade from SDI to IP remains a strategic area of focus for broadcasters – it is one of the most important priorities in technology roadmaps”

# IP benefits outweigh reservations

## Reservations

- Complexity
- Technology shift
  - Re-training a big concern
- Compatibility
  - Vendor interoperability
  - Standards still maturing
- Cost- *See next slide!*

## Motivations

- Signal/Data Agnostic
- Huge Bandwidth (Multi-Channel)
- Superb Resource Sharing
- Reduced Cabling (& 'All-Fiber')
- Leverage IT COTs Hardware
- Ethernet Connectivity/Cloud

# SDI v IP Routing Cost Comparison

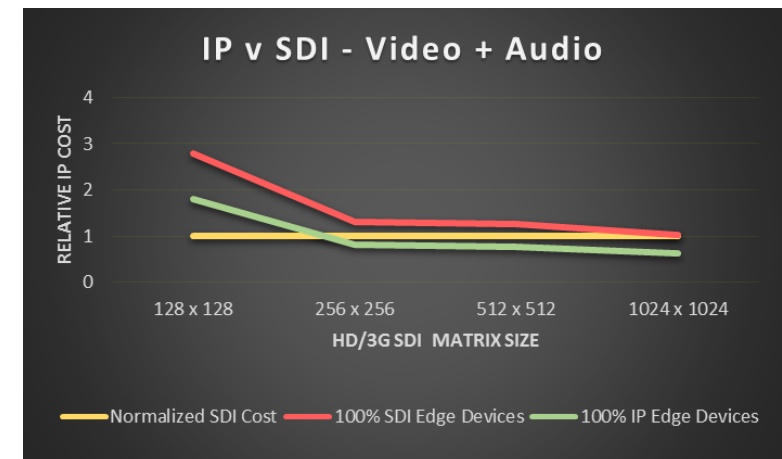
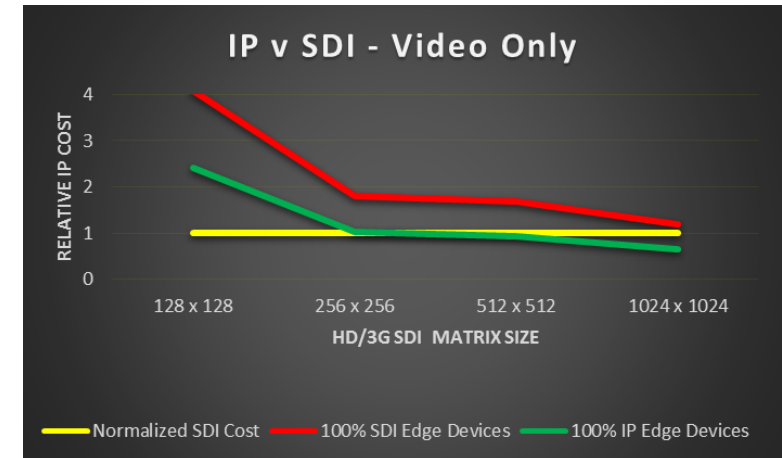
## Parameters

- Uses GV and COTS equipment prices
- **Red line** = 100% SDI Edge Devices (i.e. use of gateways)
- **Green line** = 100% IP Edge Devices (i.e. no SDI gateways)
- Control system & licensing not included

## Conclusions

- IP begins to look OK @ 256x256 and above
- SDI<>IP Gateway costs a major factor
- IP significantly improved when adding multi-channel audio!

*[Audio Mux/DeMux and processing for SDI is expensive!]*



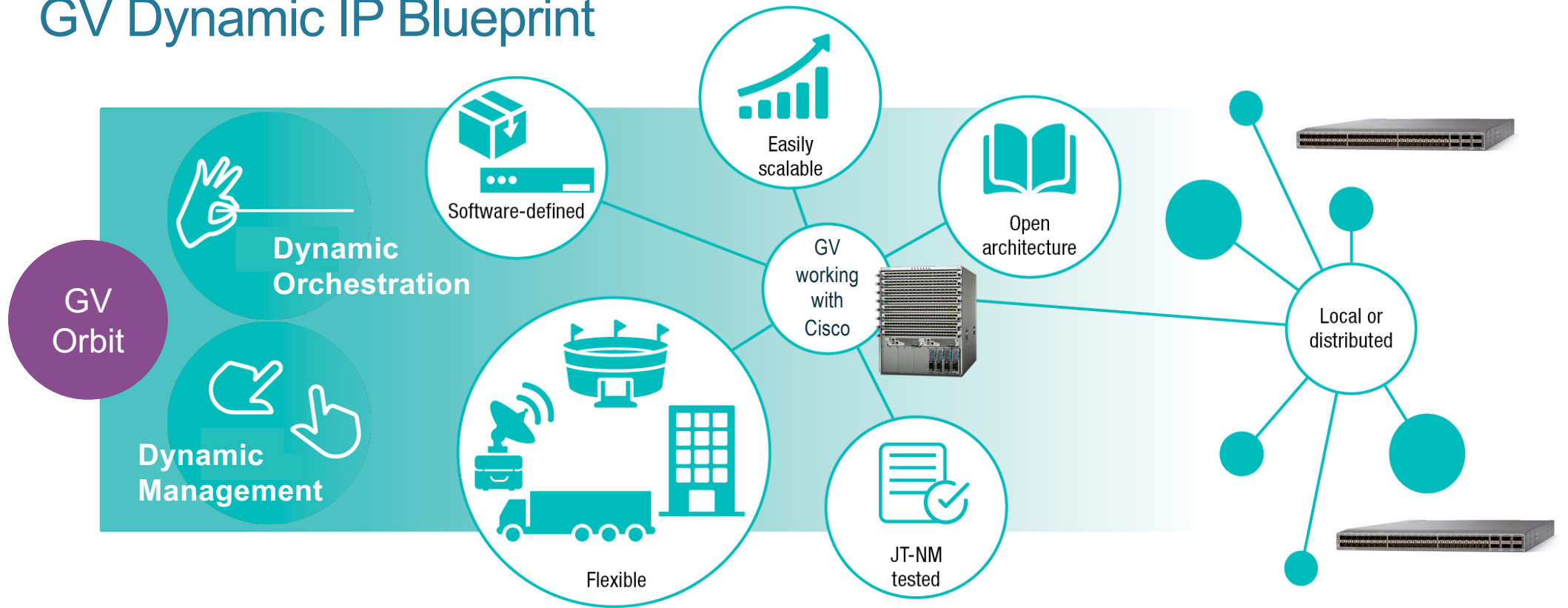
# Unlocking IP's real benefits

But what the Media Industry wants is...

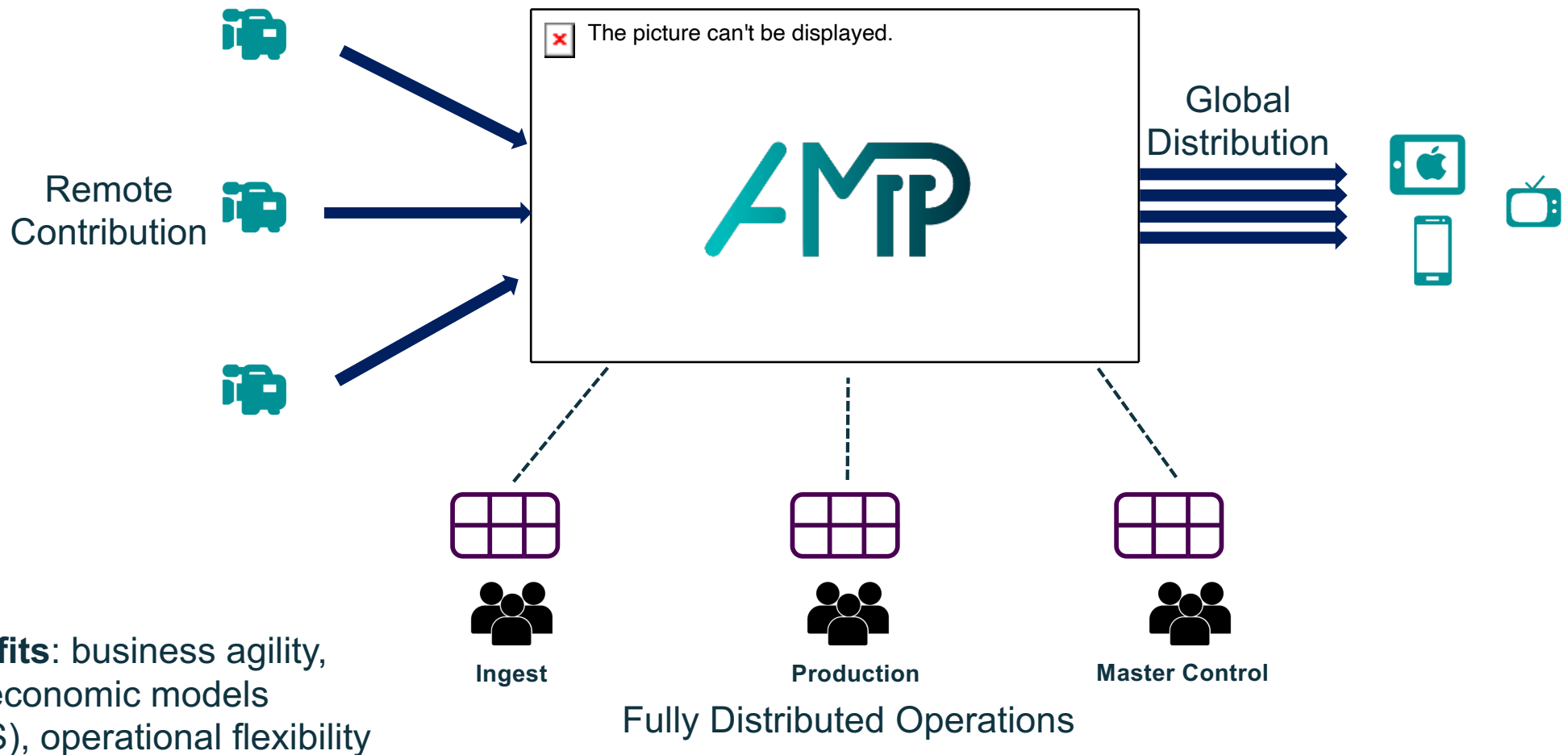
- **Easy scalability** to enable more revenue streams, services and distributed resources
- **Flexible utilization**, deployment and management of resources
- **Dynamic, Agile methods** for changing functionality as business needs change
- **Software-defined** generic hardware platforms and COTS based equipment
- **Pay-as-you-go** and/or flexible 'on-off' licensing models



# GV Dynamic IP Blueprint



# An example of IP enabling new workflows



**Benefits:** business agility, new economic models (SaaS), operational flexibility

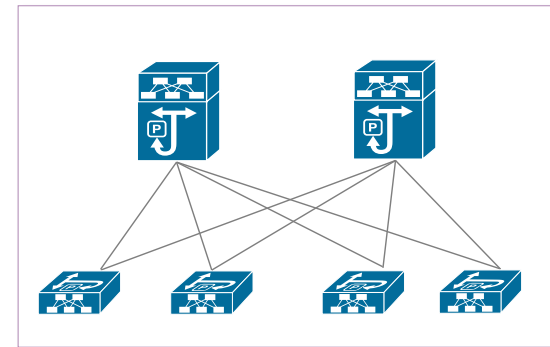
# Cisco IP fabric for Media

- **Cisco IPFM enables**

- Flexible IP fabric for SDI to IP transition
- Automation through open APIs/ DCNM to simplify deployment
- Real Time Telemetry for flow health monitoring

- **Cisco Media Data Center**

- For post-production workflows

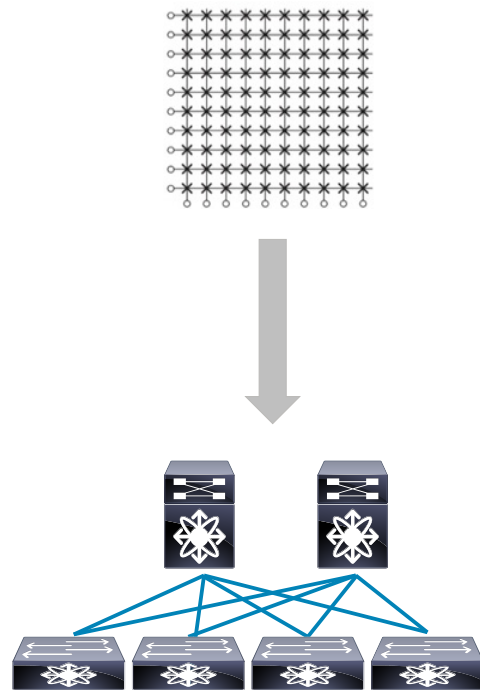


Nexus 9000



# Industry Challenges and Requirements

## SDI to IP Migration



### Zero Packet Loss

Reservation of network resources across redundant paths for zero congestion loss

### Network Security

Protect network from unauthorized endpoints and request

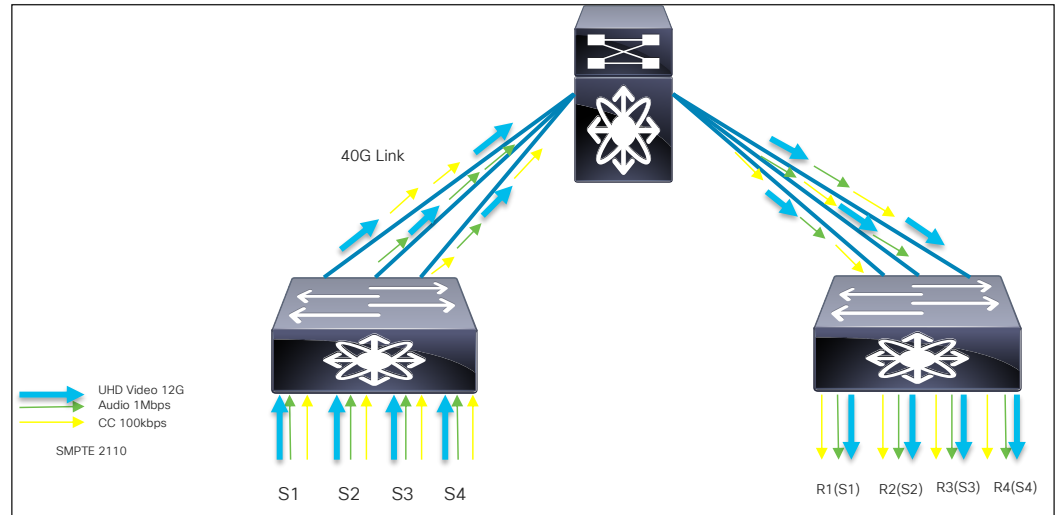
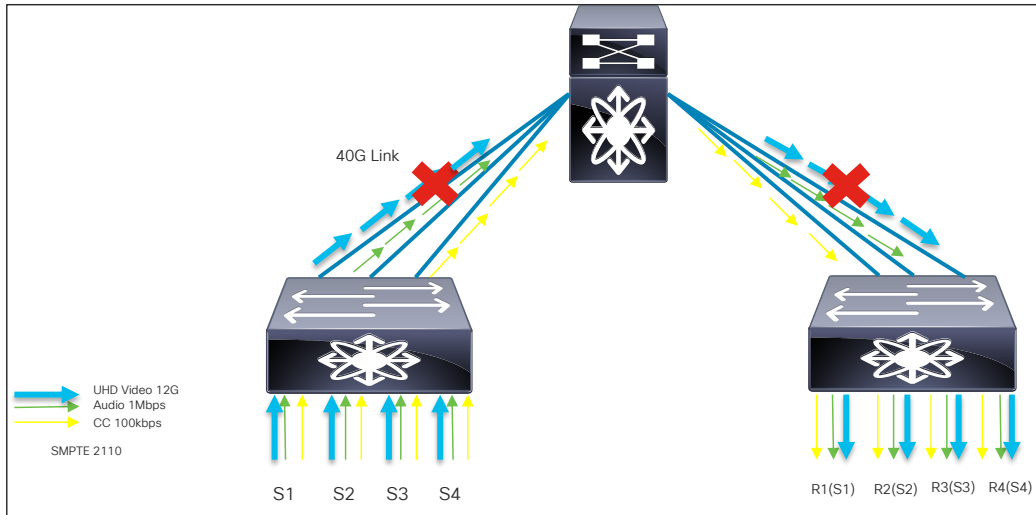
### Video/ Audio End Point Sync

Precision Timing and Synchronization

### Unchanged/Simplified Operator Workflow

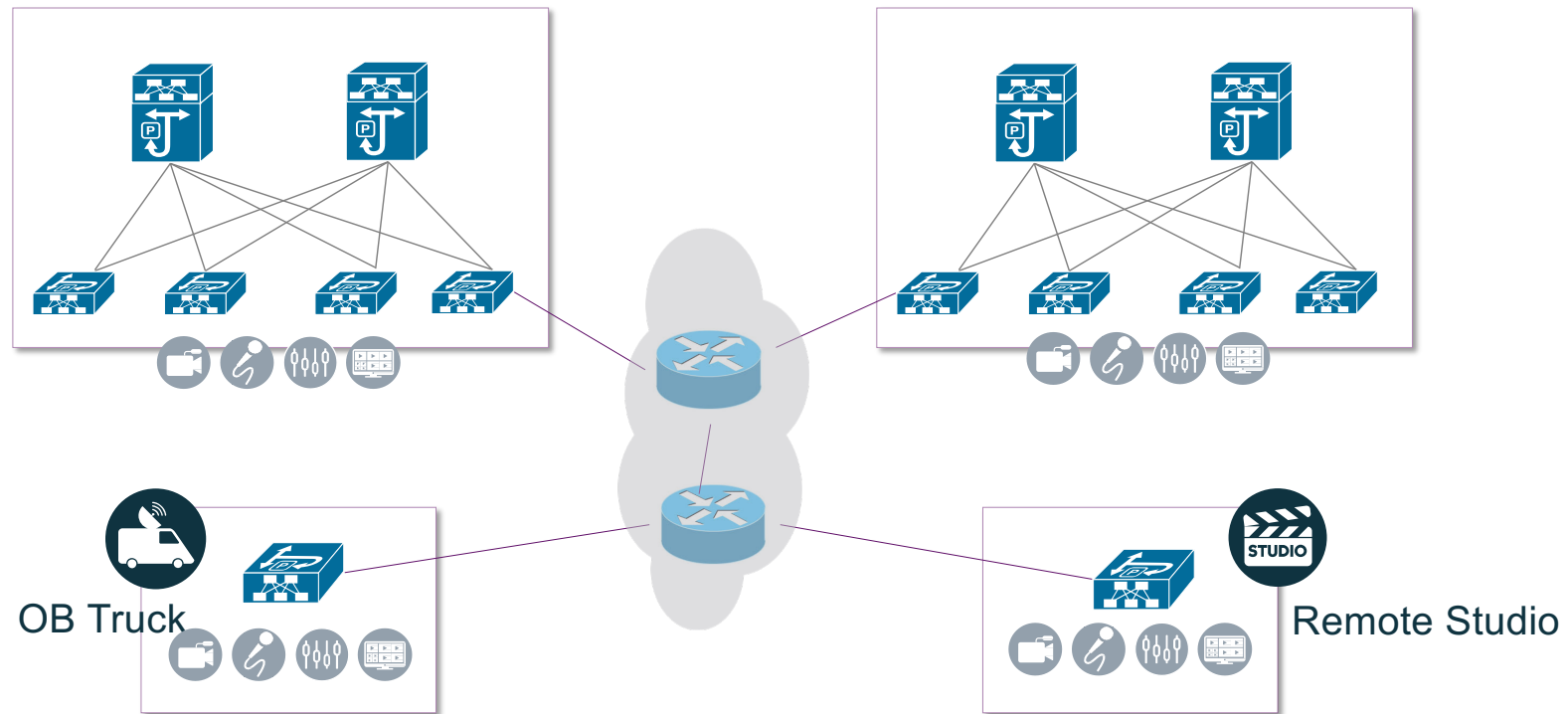


# Reliable Network

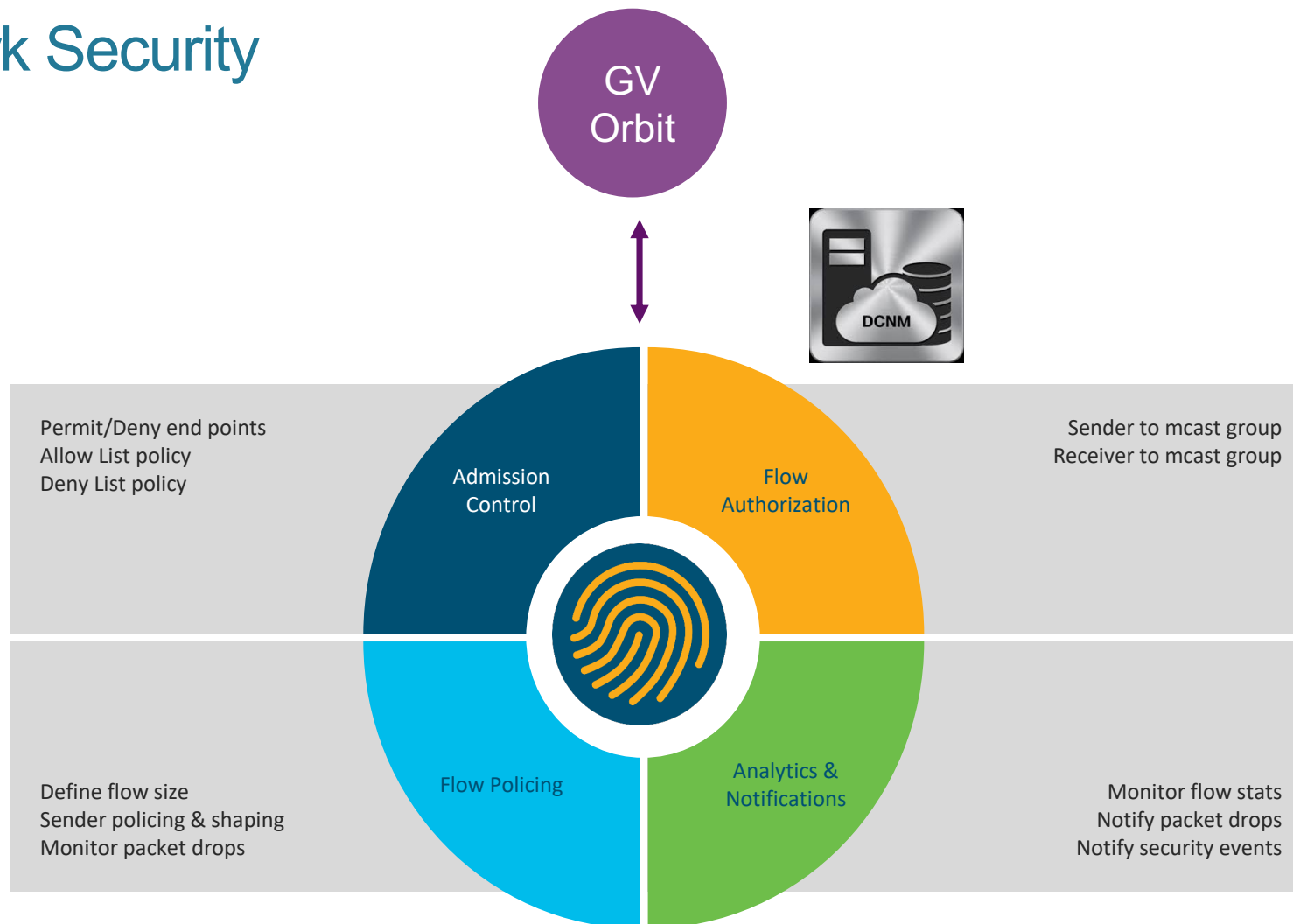


- Cisco Non-Blocking Multicast (NBM Active mode)
- Brings bandwidth awareness to network
- End to End Reliable flow setup with bandwidth guarantee

# End to End Reliable Networking

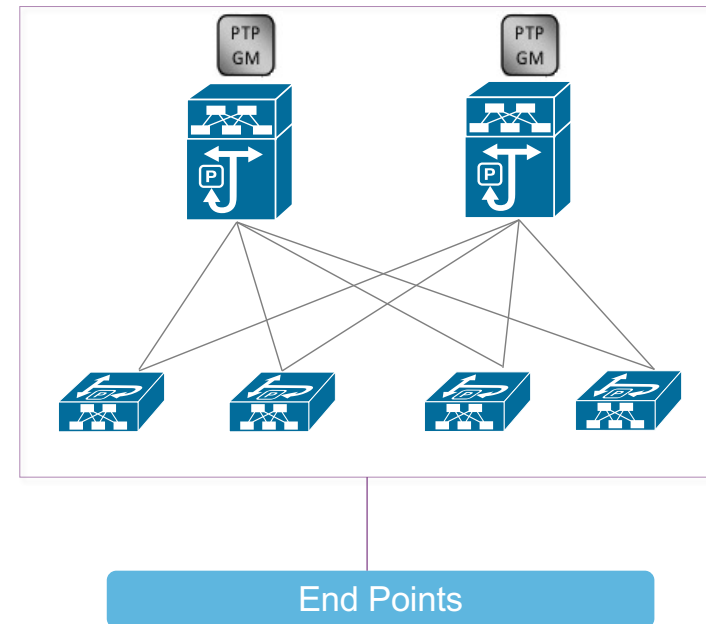


# Network Security

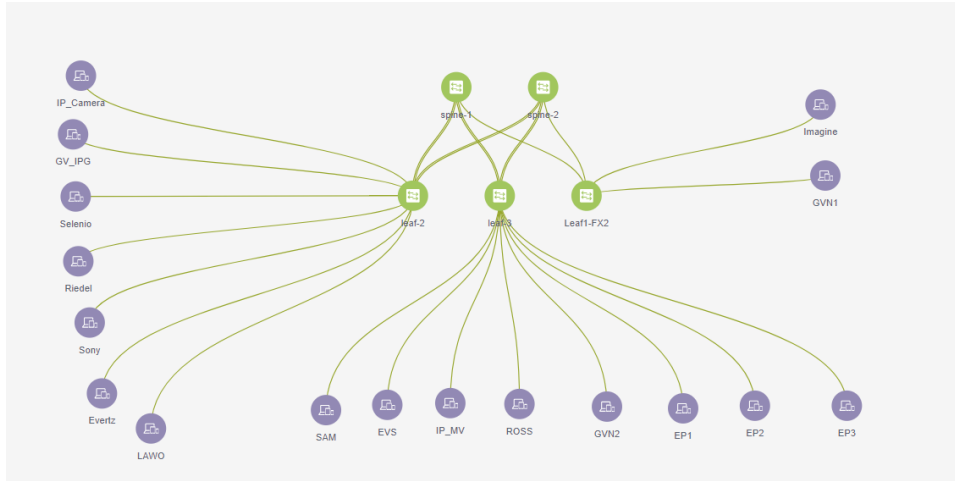


# Precision Time Protocol

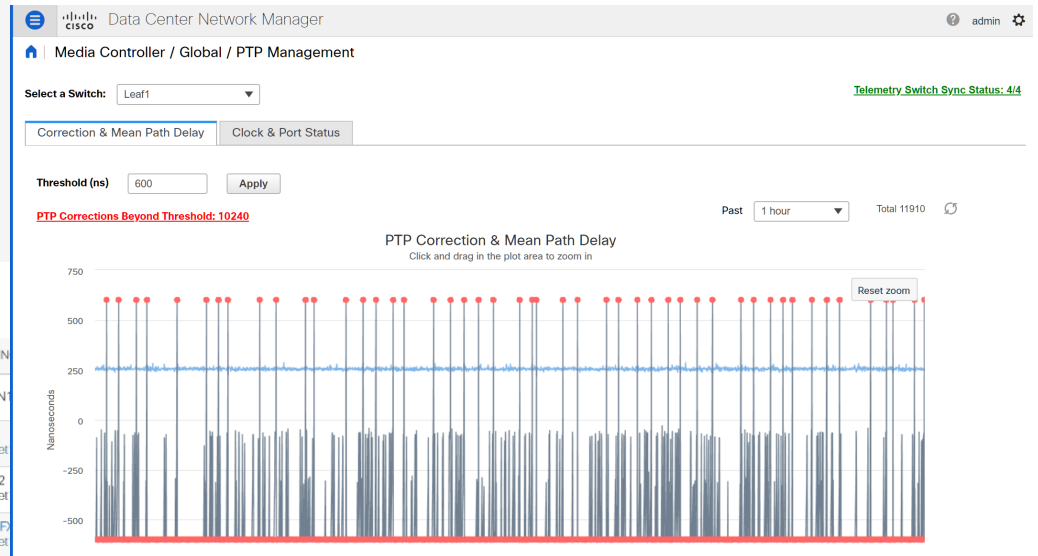
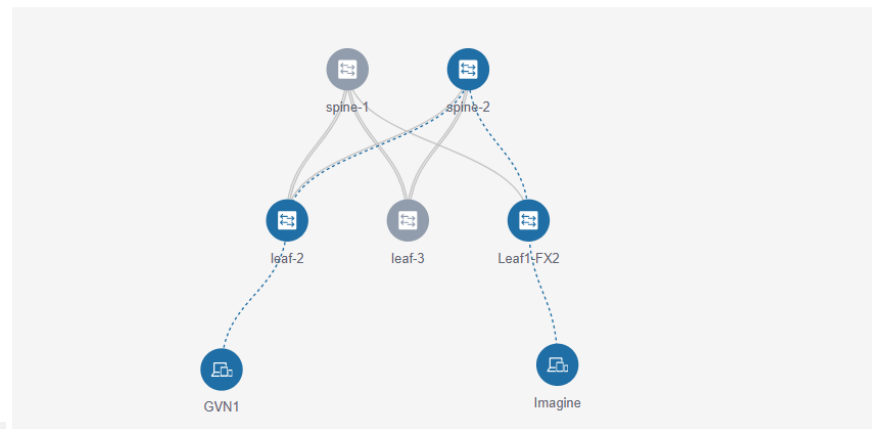
- PTP distribution through Boundary Clock
- ST 2059-2 and AES 67 profiles
- 9300 – Upto 144 PTP endpoints
- 9500-R – Upto 1152 PTP endpoints via PTP offload



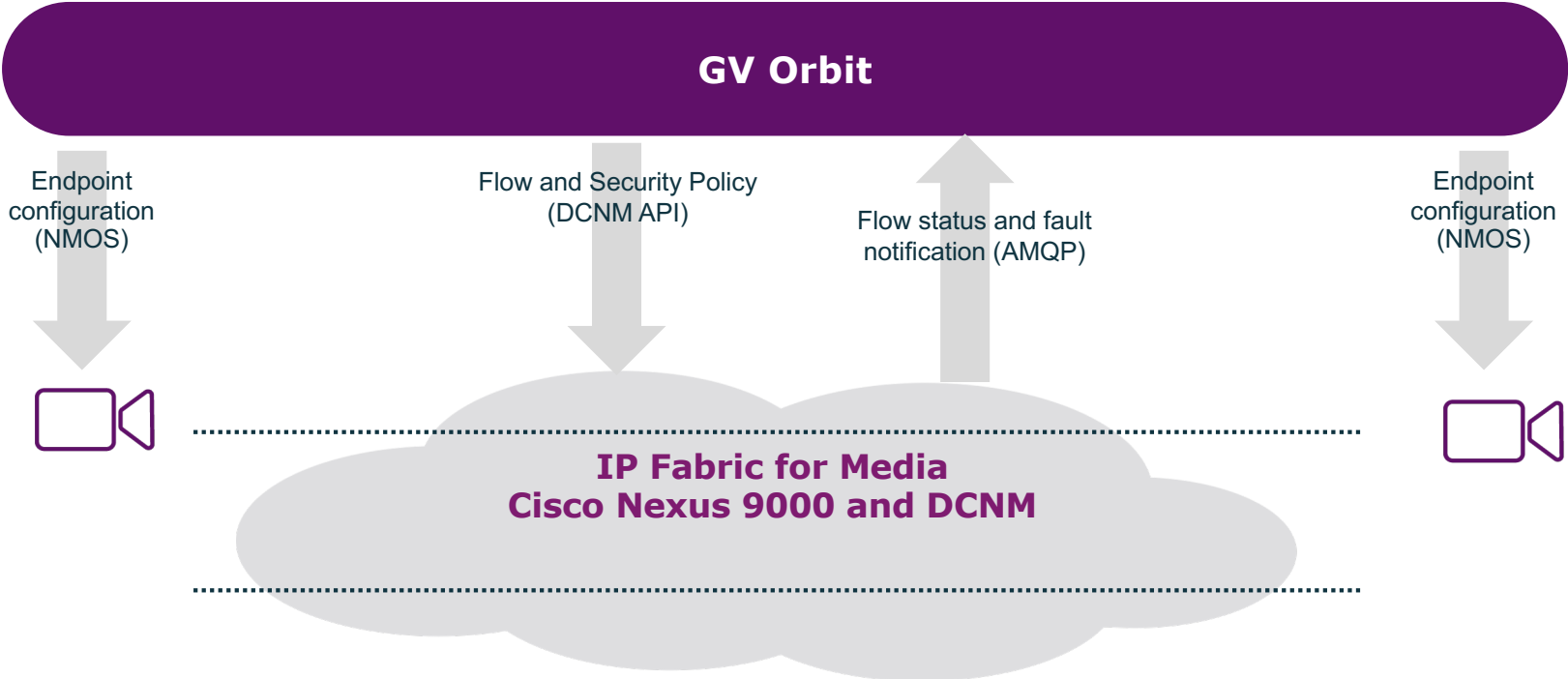
# Real Time Visibility through Telemetry



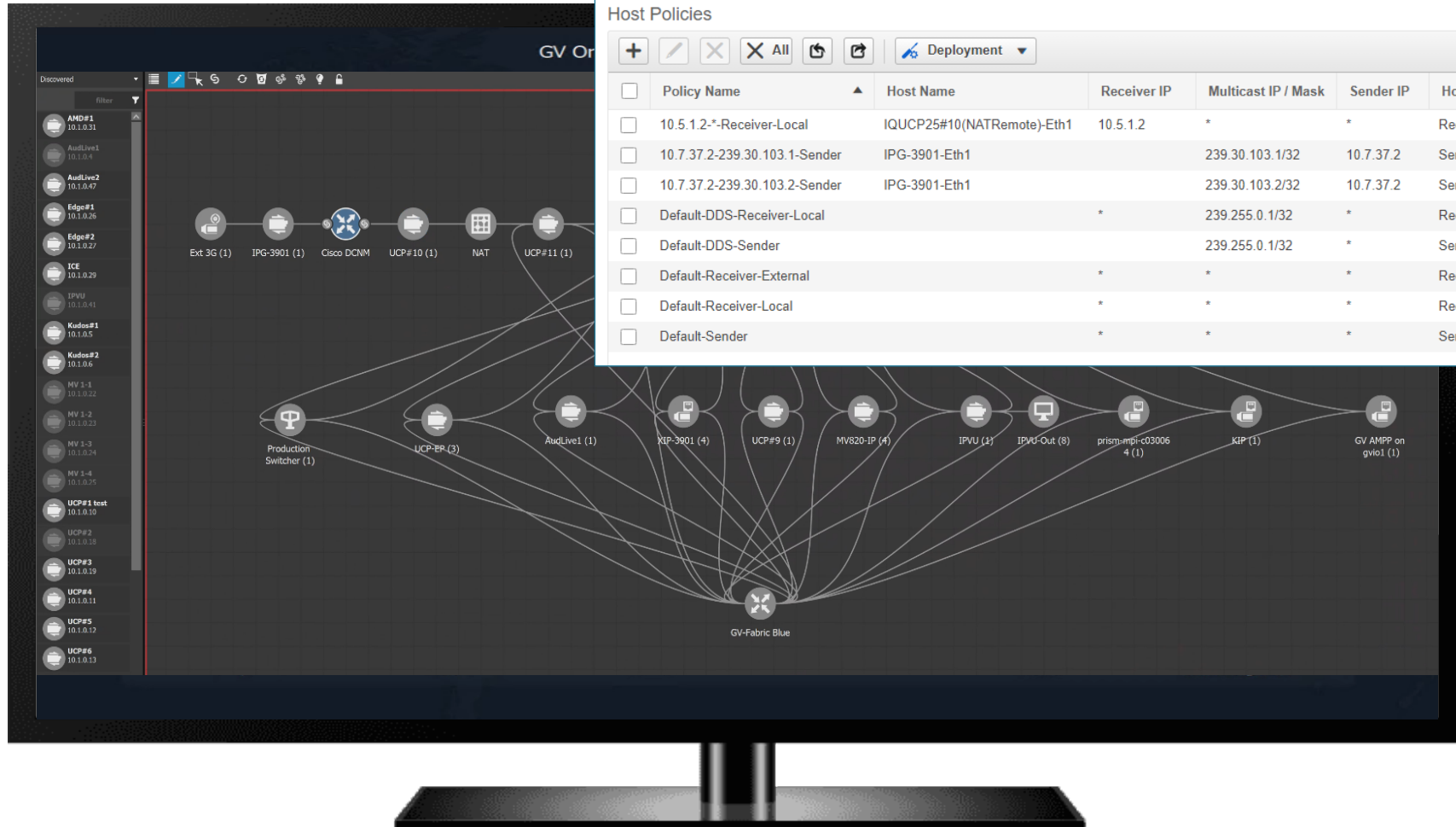
GVN1-Imagine (Channel1\_Video-239.1.20.1)



# Simplifying end User Operations



# GV-Orbit Topology



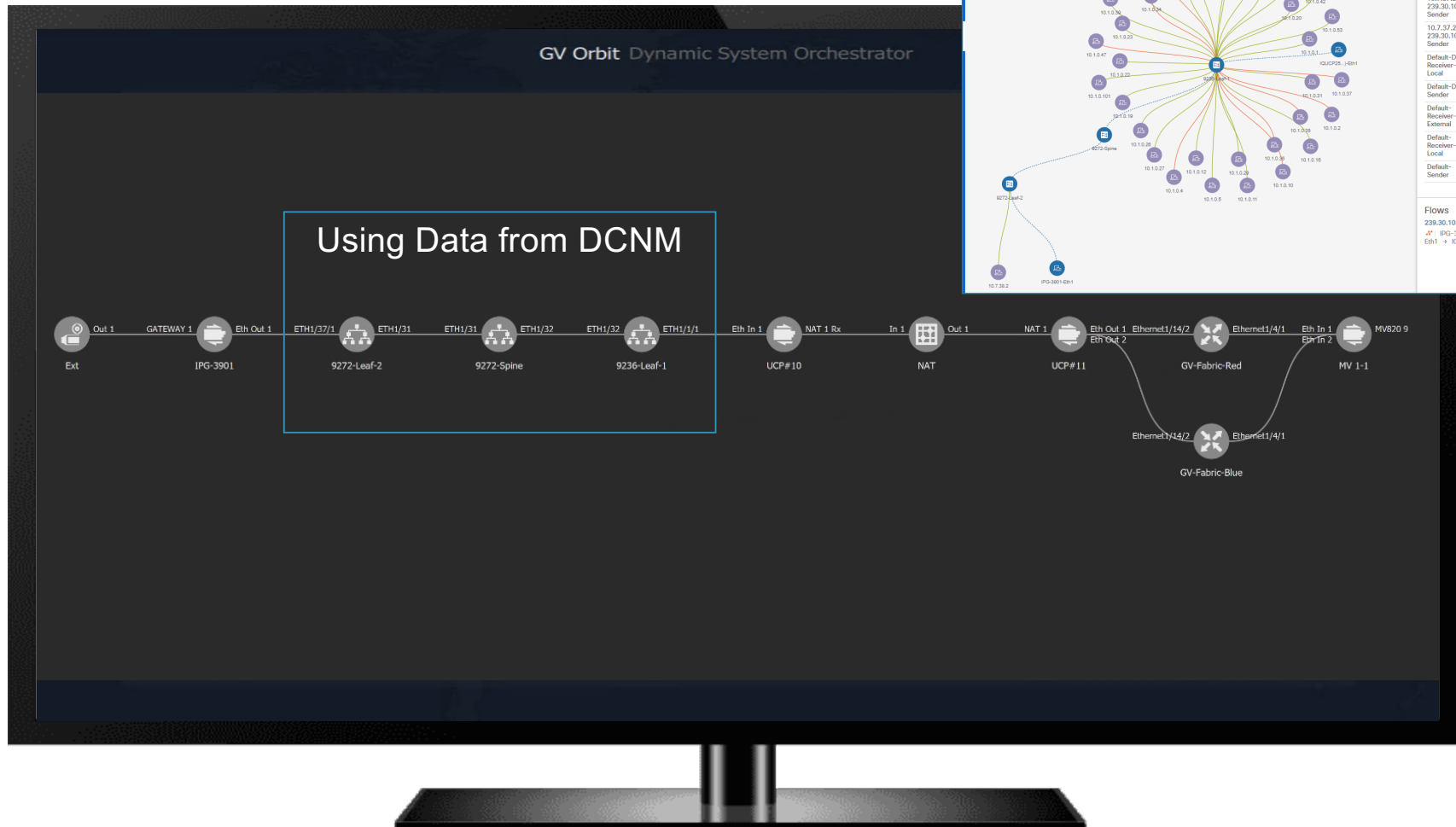
☰ 📶 🌐 Data Center Network Manager  
🏠 Media Controller / Host / Host Policies

Host Policies

+ ✂ ✕ ✕ All 🔄 📄 🔍 Deployment

<input type="checkbox"/>	Policy Name	Host Name	Receiver IP	Multicast IP / Mask	Sender IP	Host Role	Operation
<input type="checkbox"/>	10.5.1.2-*Receiver-Local	IQUCP25#10(NATRemote)-Eth1	10.5.1.2	*	*	Receiver-Local	Permit
<input type="checkbox"/>	10.7.37.2-239.30.103.1-Sender	IPG-3901-Eth1		239.30.103.1/32	10.7.37.2	Sender	Permit
<input type="checkbox"/>	10.7.37.2-239.30.103.2-Sender	IPG-3901-Eth1		239.30.103.2/32	10.7.37.2	Sender	Permit
<input type="checkbox"/>	Default-DDS-Receiver-Local		*	239.255.0.1/32	*	Receiver-Local	Permit
<input type="checkbox"/>	Default-DDS-Sender			239.255.0.1/32	*	Sender	Permit
<input type="checkbox"/>	Default-Receiver-External		*	*	*	Receiver-External	Deny
<input type="checkbox"/>	Default-Receiver-Local		*	*	*	Receiver-Local	Deny
<input type="checkbox"/>	Default-Sender		*	*	*	Sender	Deny

# GV-Orbit Path View



**Data Center Network Manager**

Quick Search:

**IPG-3901-Eth1**

10.7.37.2  
00:50:1E:04:CC:44  
Ethernet1/37/1

**Policies**

	Multicast IP	Sender IP	Receiver IP
10.7.37.2-239.30.103.1-239.30.103.2-239.30.103.2-239.30.103.2-239.30.103.2	239.30.103.1	10.7.37.2	
Default-DDS-Receiver-Local	239.255.0.1	*	*
Default-DDS-Sender	239.255.0.1	*	*
Default-Receiver-External	*	*	*
Default-Receiver-Local	*	*	*
Default-Sender	*	*	*

**Flows**

239.30.103.1  
\* - IPG-3901-Eth1 -> KUCP25810(NATRemote)-Eth1



# Orbit Advantages : One-Stop, Overarching Network Provisioning

Unified Configuration, Control & Monitoring

**GV Orbit – Dynamic System Orchestration**

Dynamic  
Infrastructure  
Management

Dynamic  
Device  
Management

Dynamic  
Software  
Processing

- **Control, Configuration & Monitoring**  
Unified in a single package
- **Dynamic Orchestration – WYSIWYG**  
'What You See Is What You Get'  
Real-time 'on-the-fly' configuration.
- **Extensive Configuration Toolset**  
Automated setup for COTS IP switches  
with 'zero-touch' device provisioning.
- **Automatic Pathfinding**  
Dynamic insertion of processing elements  
as they are needed.
- **Comprehensive Monitoring**  
Powerful, feature-rich toolset
- **Extensive range of**  
**Operational Control Panels**

The image shows a hand holding a stylus pointing to a computer monitor. The monitor displays a complex network management interface with various panels, including a grid of HD channels, a network topology diagram, and a control panel for an ATP-2000 device. The interface is dark-themed and contains numerous buttons, checkboxes, and data fields.

# GV Orbit

## Dynamic System Orchestration

Specifically designed to exploit the advantages of IP

A circular gold seal with the text "JFAM.ORG" on the left, "TESTED" on the right, "NMOS TR-1001-1 CONTROLLERS" in the center, and "03 / 20" at the bottom.

# Grass Valley Global IP Footprint — 100+ major deployments in every continent



Grass Valley  
Working with  
Cisco





## Case Study : BBC

# BBC Cymru Wales Central Square

## Building a Live IP broadcast centre

Roger Crothers  
Senior Head of Engineering & Operations  
BBC Wales  
19 January 2021







# What we do?

- Content production in Welsh and English across all platforms
- TV for BBC1 / BBC2 / S4C including co-productions with network
- BBC Radio Wales, BBC Radio Cymru & Network radio
- Online/mobile: e.g. BBC News, BBC Sport, BBC iPlayer, Cymru Fyw
- BBC National Orchestra of Wales
- Production facilities – supporting all network and local programming and services
- Largest BBC newsroom outside of London
- Drama production at Roath Lock – the BBC's largest drama studio site



# New building objectives

- Replace an ageing broadcast centre
- Co-location with S4C
- Virtualisation of technology estate
- Modernisation of workflows
- Greater efficiency through automation
- Organisational design exercise
- Financial savings
- Adoption of IP



# BBC Central Square

- The BBC's newest broadcast centre
- The first fully IP broadcast centre the BBC has built based on SMPTE 2110
- Improved adjacencies between departments
- Designed for greater collaboration
- Open plan working
- Higher density – CSq is 50% of BH footprint
- Opportunity to modernise workflows, structures and technology
- Most open building in the BBC





# Technical facilities

- Building Size: 150,000ft<sup>2</sup> (~14,700m<sup>2</sup>, 72x72x33m)
- Studio Height 6.3m or 5.5m, Office Floor Height 3.5m
- 1x large general purpose studio with AR (230m<sup>2</sup>, 8 cameras)
- 1x flexible production area (168 m<sup>2</sup>, lit and gallery controlled)
- 1x VR/AR news studio (168m<sup>2</sup>, 3 cameras)
- 1x bulletin/social media studio (45m<sup>2</sup>, 2 cameras)
- 3x TV Galleries & 1x Drive in facility
- 4x Presentation Suites (BBC1W, BBC2W, S4C)
- 22x edit suites
- 3x dubbing suites with associated VO booths & 2x Tracklay suites
- 4x multi purpose suites (audio & TV)
- 6x flexible media areas
- 4x news edits with VO booth
- 4x live to air radio studios & workshops (incl. band area)
- 10x audio editing booths





# IP infrastructure considerations

- Will IP actually work in a live broadcast environment?
- How much more would it cost?
- What are the benefits of IP?
- Who else is using it?
- What is our risk appetite?
- What is our fall-back plan?
  - i.e. revert to a SMPTE 2022-6 if 2110 doesn't work?
  - Or revert to SDI if SMPTE 2022-6 doesn't work?
- What about interoperability?
- What equipment is available today to test so we are confident it will work together?
- What will the longevity of an SDI system be?



# IP Benefits

- Future Proofing
- Format agnostic
- Timing
- Scalability
- Cost

## And risks!

- Security
- Maturity of standards
- Reskilling requirement
- Implementation effort
- Refresh cycles





## IP Procurement

- IP rather than SDI
- Contract awarded to Grass Valley
- GV Convergent platform / Cisco switches (DCNM)
- GV nodes provide gateway where no IP support
- Adoption of SMPTE 2110 standard (2022-7 for resilience)
- ISO4 agreed
- Successful deployment following 4 rounds of intensive testing
- Playout platform is SDI although fed by IP core

# Technology selection

- Live Routing from Grass Valley = Cisco Switches & GV Nodes
- Comms System from Reidel = Artist 128
- TV Production Switches from SAM (GV) = Kahuna
- TV Audio Desks from Calrec = Artemis
- TV Playout from SAM (GV) = Ice & Morpheous
- Studio Cameras from Sony = HDC 4300 & P43
- Radio Studio Desks from DHD = 52 Series
- Radio Drama Desk from SSL = System T
- TV Systems Integrator = dB Broadcast
- Radio Systems Integrator = dB Broadcast
- dB Broadcast Procured all ancillary systems including
- Graphics = Viz
- Editing = Avid & Adobe

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Replay = EVS





# Lessons learned

- Careful vendor selection
- If joint collaboration, ensure all vendors are committed to successful IP deployment
- Careful SI selection - experience
- Use procurement process to drive industry
- Keep ambition realistic
- Interoperability





# Lessons learned

- Training of engineering team
- Design infosecurity from the ground up
- Build in plenty of time for testing
- Consider staging/test system
- Try to avoid global pandemics!

# What next?

- Fibre to Wales' Principality stadium
- Trial remote production from Principality stadium
- SMPTE 2110 across different production centres to reduce tech refresh costs
- Future move to more cloud based tech – transcode/storage etc.

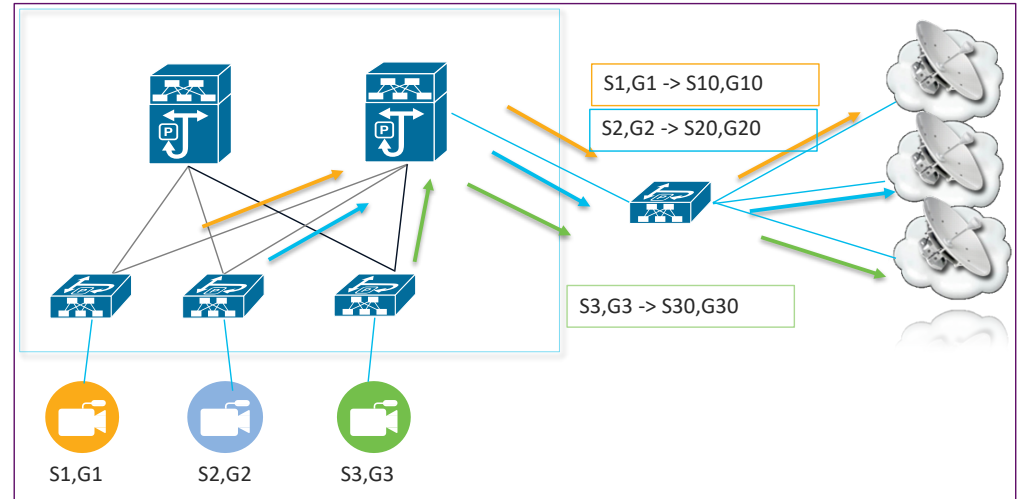




# What is coming next

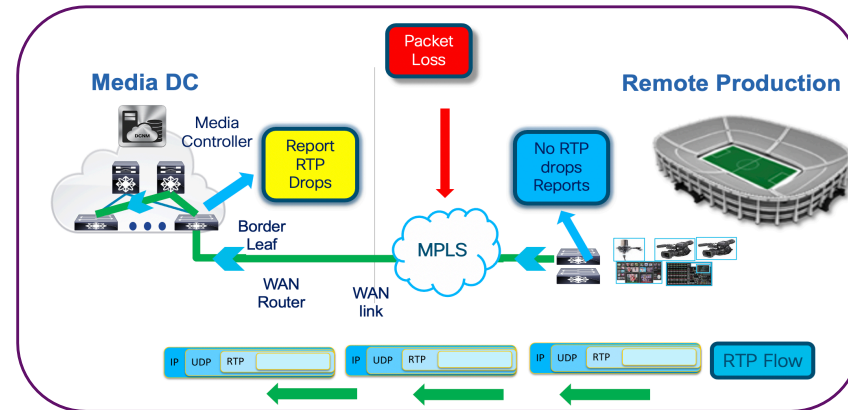
## Support Multicast NAT

- Ingest Content
- Content Distribution
- Destination Control



## Advance Flow Monitoring

- RTP flow monitoring support



# Cisco and Grass Valley – Stronger together



Best in class IP networking

Dynamic Orchestration of  
'glass-to-glass' open architecture IP

- Fully Validated & Proven Solution
- Bi-Weekly discussion between Product teams
- Joint Engineering Interop facility at Cisco and GV



