

Sociedade Brasileira de Engenharia de Televisão

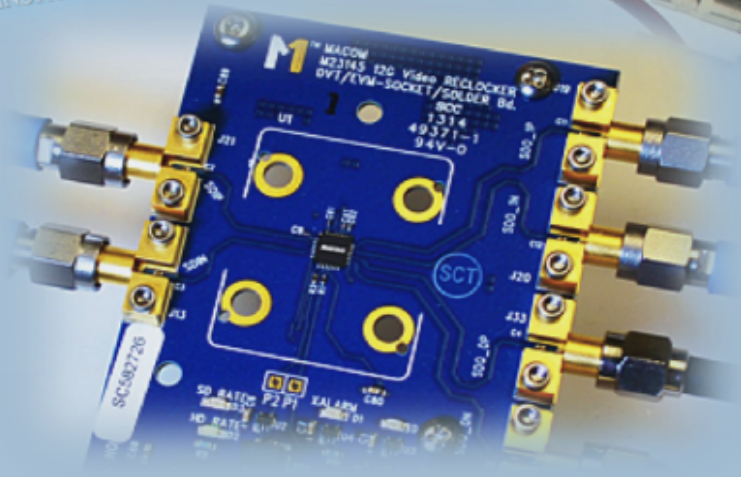
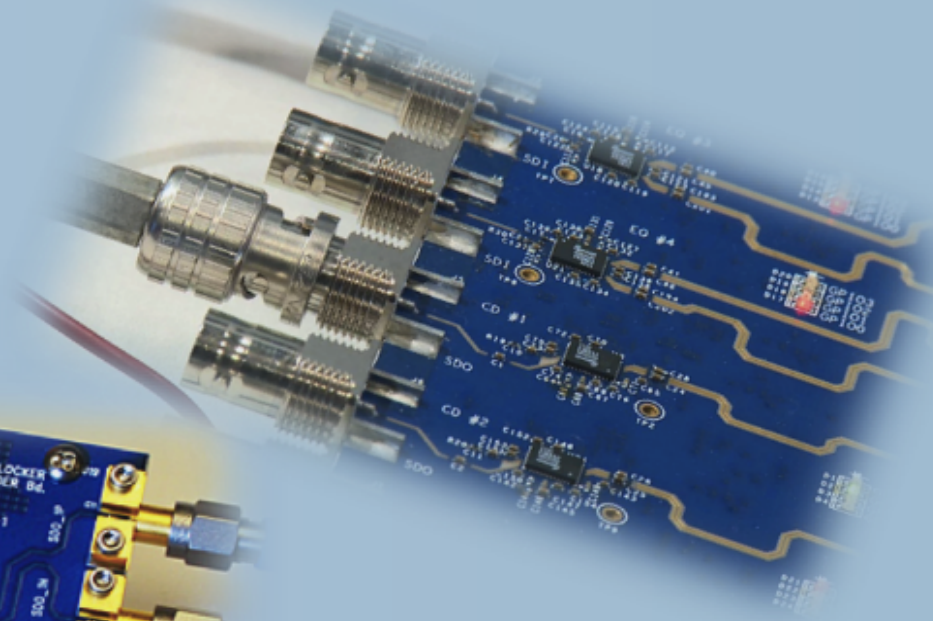


4K
ULTRA HD



First 12G UHD-SDI Reclocker

Send 4K video at 60 Hz over single coaxial cable link



HD



Resolution

HD 1080i60

HD 1080p60

UHD -4K
60 FPS / 100 FPS

UHD – 8K
60 FPS / 100 FPSSD

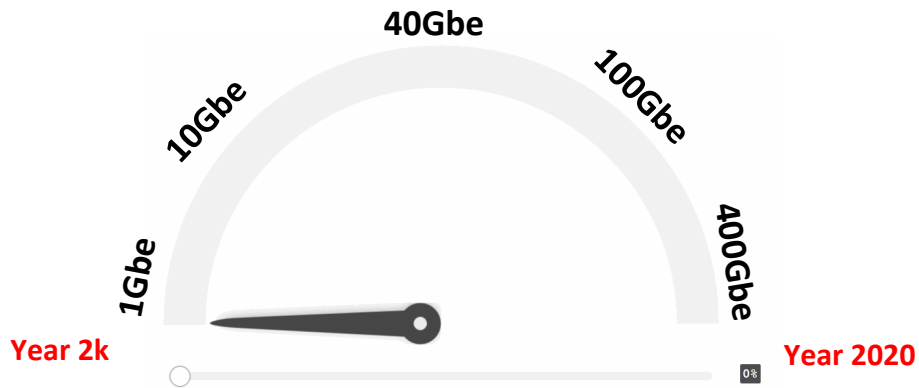
SDI
DATA RATE

1.5 Gbps

3.0 Gbps

12 Gbps / 24 Gbps

48 Gbps / 96 Gbps



Cisco's Nexus 400 GbE (bottom) and 100 GbE 32 port switches in action in the demo



Juniper Networks announces
400GbE transition with
comprehensive roadmap

7060X4 Provides Choice of 400G Systems

- 32 x 400G OSFP
 - 128 x 100G with parallel optics and cables
 - 32 x 100G with OSFP to QSFP Adapter
 - 100% Compatible with QSFP28 optics
- 32 x 400G QSFP-DD
 - 128 x 100G with parallel optics and cables
 - 32 x 100G with QSFP28 optics
 - 100% Compatible with QSFP28 optics



Consistent Architecture with choice of industry standard interfaces

Source: Arista Networks

Por quê IP ?

- Flexível (Workflow dinâmico) e virtualização
- Formato agnóstico
- Redução de cabeamento
- Inovação e Escala do Mercado TI

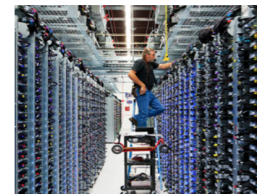


HD

Full HD
1080p

4K
UHD

Ultra HD
8K

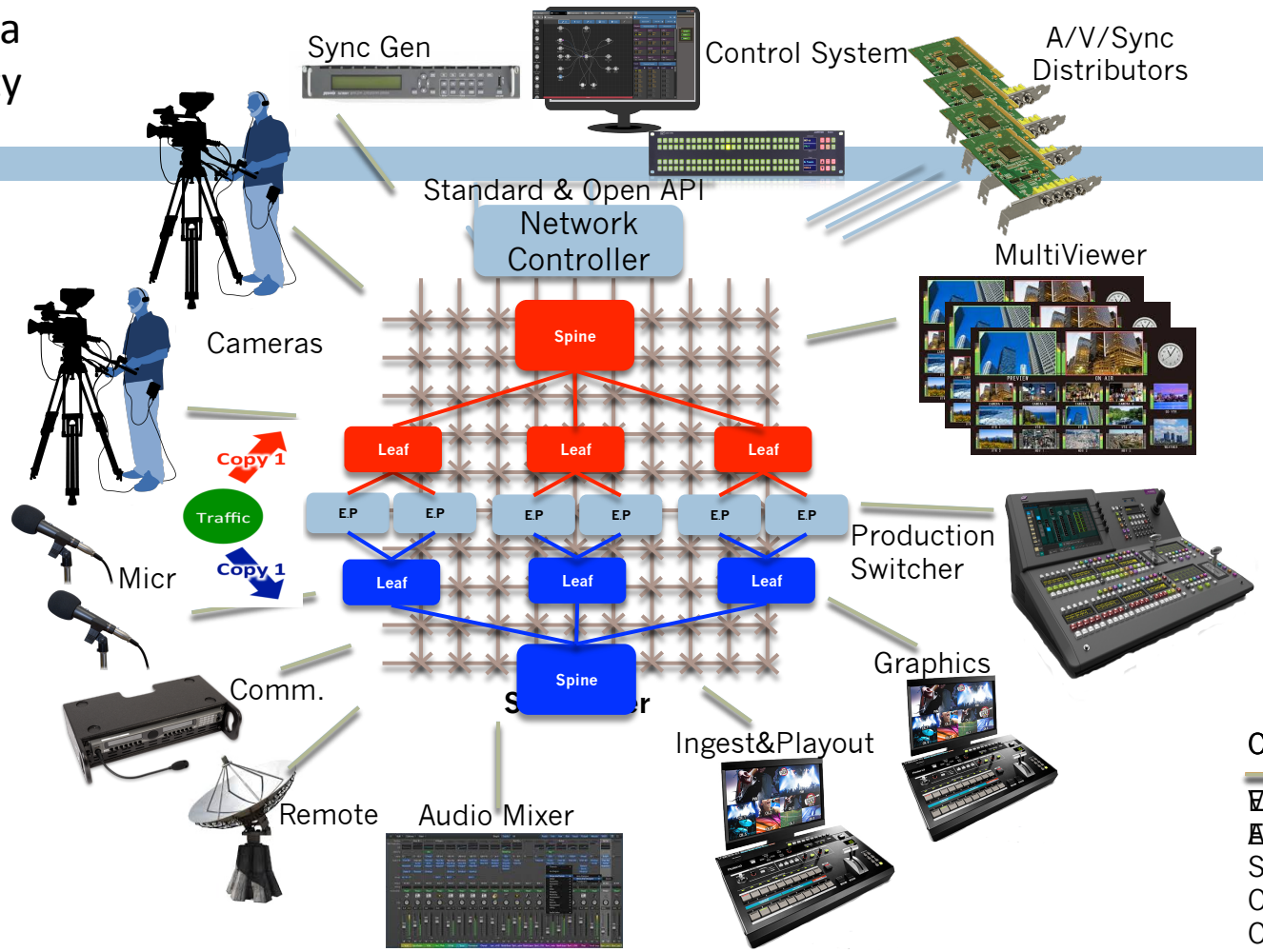


Quando utilizar IP?

- Grande reprojeto/expansão, ou projeto novo
- Produção remota
- Iniciando suporte ao 4K (Principalmente O.B.Van)
- Quando puder usar as vantagens do IP
- Padrões em Evolução!



Typical Media Studio Facility

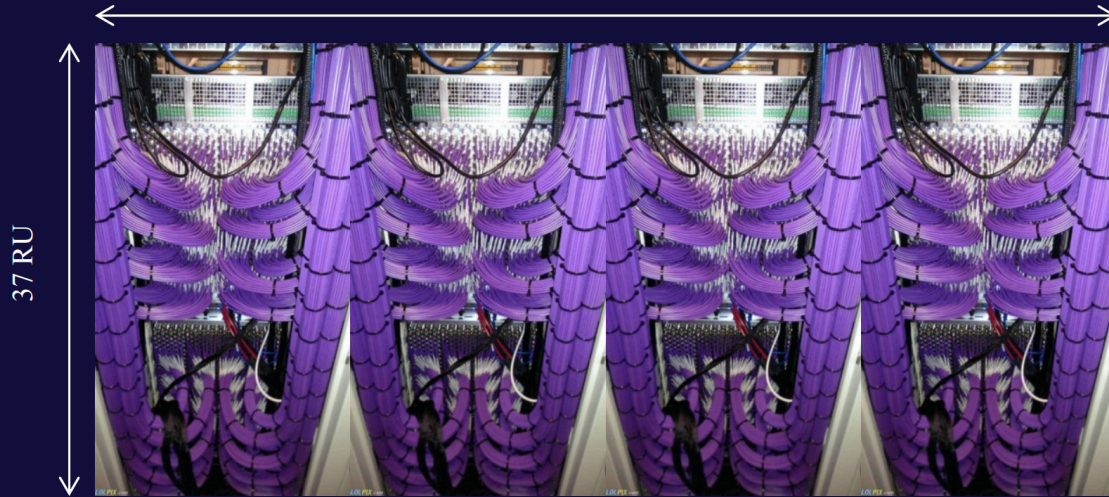


- Cables
- Video
 - Audio
 - Sync
 - Ctrl
 - Communication

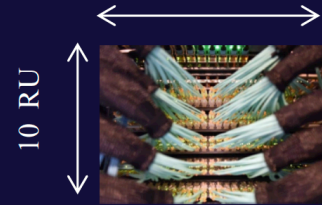
SIMPLIFY & REDUCE CABLING

COMPARISON: UHD OB Truck

4 Racks



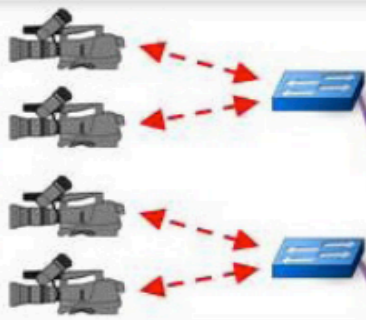
1 Rack



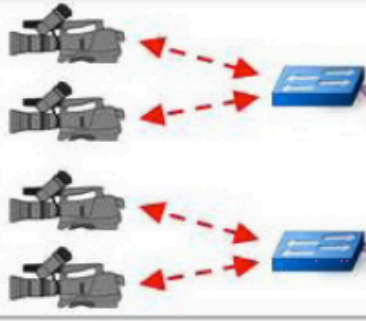
IP

Equivalent amount of **3G SDI cabling** required

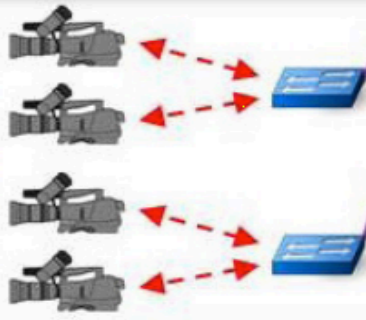
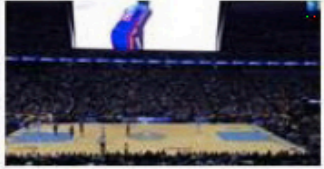
Production site 1



Production site 2



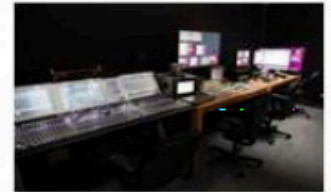
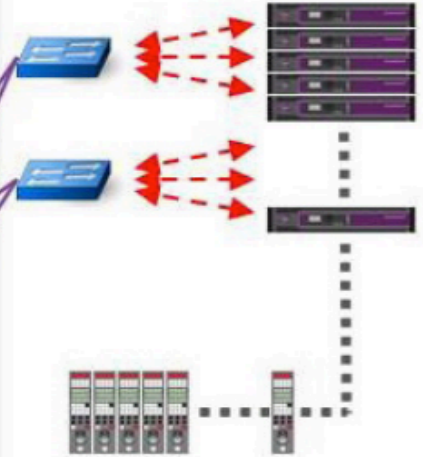
Production site 3



REMOTE PRODUCTION

RESOURCES SHARING

Centralized control room



The Transition Path is Paved with IP



Physical "Big Iron"

SDI

IP

Software
& Virtual

IP enables **Operating at Scale**
IP enables **Software/Virtual**

IMAGINE
LIVE!

Sobre os Padrões

HDTV SDI (Serial Digital Interface)

SMPTE 274M - 2008



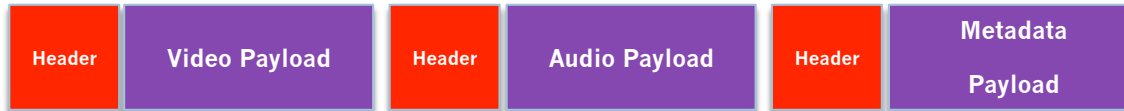
Sobre os Padrões

SMPTE ST 2022-6 (2012) - maps the whole SDI payload



Sobre os Padrões

Sony NMI -Essence-Independent Mapping RDD40

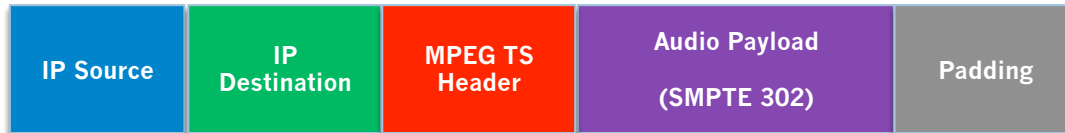


Frame-Boundary Aware



Sobre os Padrões

ASPEN EVERTZ Packet Format 2022-2 (2007)





VSF
VIDEO SERVICES FORUM

ADVANCED MEDIA
WORKFLOW ASSOCIATION

nmi

*Technical
Recommendations*



SMPTE

EBU


AUDIO
A
ES

Standards



SAND
BOX+ **LIVE IP**

Implementation



JT-NM

SMPTE **EBU** **VSF**
VIDEO SERVICES FORUM

Reference Architecture



AIMS
Alliance for IP Media Solutions

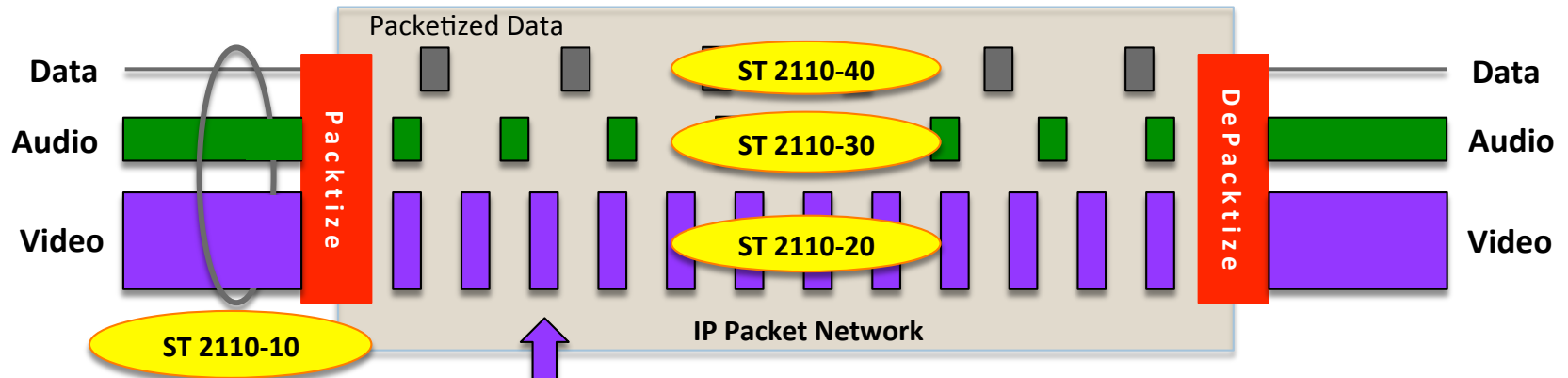
Market Adoption

Collaboration

Parameter	NDI	NDI HX	SMPTE 2022-6	ASPEN	NMI	SMPTE 2110
Transport	TCP/UDP	UDP	UDP	UDP	UDP	UDP
Image Format	Size/Aspect Independent	Size/Aspect Independent	SDI Formats Only			Size/Aspect Independent
Bidirectional Device Control	Yes	Yes	No	No		No
Alpha Channel	Yes	No	No			Yes
Compression	NDI Codec	NDO HX (h.264)		None	None/LLVC	To Be Defined
Connection	Socket, Unicast, Multicast,FEC	Unicast, Multicast	Multicast	Multicast	Multicast	Multicast
HD Data Rate	~100 MBPS	8-20 MBPS	>1.5 GBPS	>1.5 GBPS	>1.5 GBPS	1.2-1.5 GBPS
Essence Packing	Discret Audio, Metadata, Video frame packets	Discret Audio, Metadata, Video frame packets	Raw SDI bitstream	MPEG TS	Frame Aligned 2022-6	Discret Essence , Metadata
Service Discovery	Bonjour (mDNS) & NDI (manual)	Bonjour (mDNS) & NDI (manual)	NMOS	JSON-RPC	Plug & Play (NDCP)	NMOS

Sobre os Padrões

SMPTE ST 2110 (Essence streams)



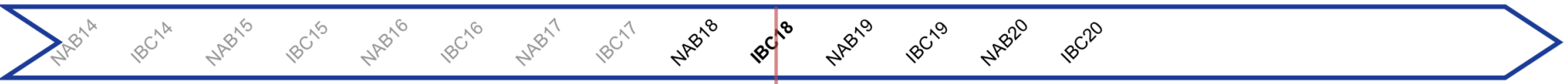
SDP
File



SDP = Session Definition Protocol File
One per Stream, defines stream parameters

Only Active video
300 Mbps less than raw SDI 1080P

JT-NM Roadmap of Networked Media Open Interoperability*



LEGEND:

- Standard / Specification (arrow icon)
- Published (arrow icon)
- Widely available (arrow icon)
- Study / Activity (rectangle icon)

IV. Dematerialized facilities**

Cloud-fit

Open, secure, public/private (on-premises) cloud solutions

- EBU R146 *Cloud Security for Media Companies*
- AMWA Content Model and APIs *Agile Media Machine Core*
- JT-NM Security Recommendations *"Top-Ten" Security Tests*
- EBU R148 *Recommended minimum Security Tests*

Non-media-specific IT
Self-describing, open APIs suitable for virtualization

III. Network & Resource Management

- AMWA NMOS Audio *Simple broadcast audio manipulation*
- AMWA Timing and Identity *Including mapping to ST 2110*
- AMWA IS-07 *Event & Tally*
- AMWA IS-06 *Network Control*
- AMWA IS-05 *Connection management*
- AMWA IS-04 *Discovery & Registration*

System-level management and automated provisioning for flexible and sharable infrastructure at scale

II. Elementary flows

- VSF TR-03
- SMPTE ST 2110-22 *Transport of compressed video*
- SMPTE ST 2110 *Transport of separate essences*
- SMPTE ST 2059 *Timing profile*
- SMPTE ST 2022-8 *Bridging SDI over IP with Elementary flows*
- AES67
- SMPTE ST 2022-6

More flexible and efficient workflows
New formats like UHD and mezzanine compression

I. SDI over IP

0. SDI

Current and mature technology

**See Dematerialized Facilities FAQ at JT-NM.org for more information.

* JT-NM assumption as of August 2018 and will evolve over time. Visit JT-NM.org for the latest update. Feedback to jt-nm-info@videoservicesforum.org



Status dos Padrões



2110-10: System Timing (RTP, ST2059, SDP, AES67) – Describe Sincronismo e stream RTP

2110-20: Uncompressed Video – Active Video (No Vanc / ANC)

2110-21: Traffic Shaping Uncompressed Video-Performance of Transmitters (packet pacing, burts, gaps)

2110-30: PCM Audio – AES67 (Parcial)

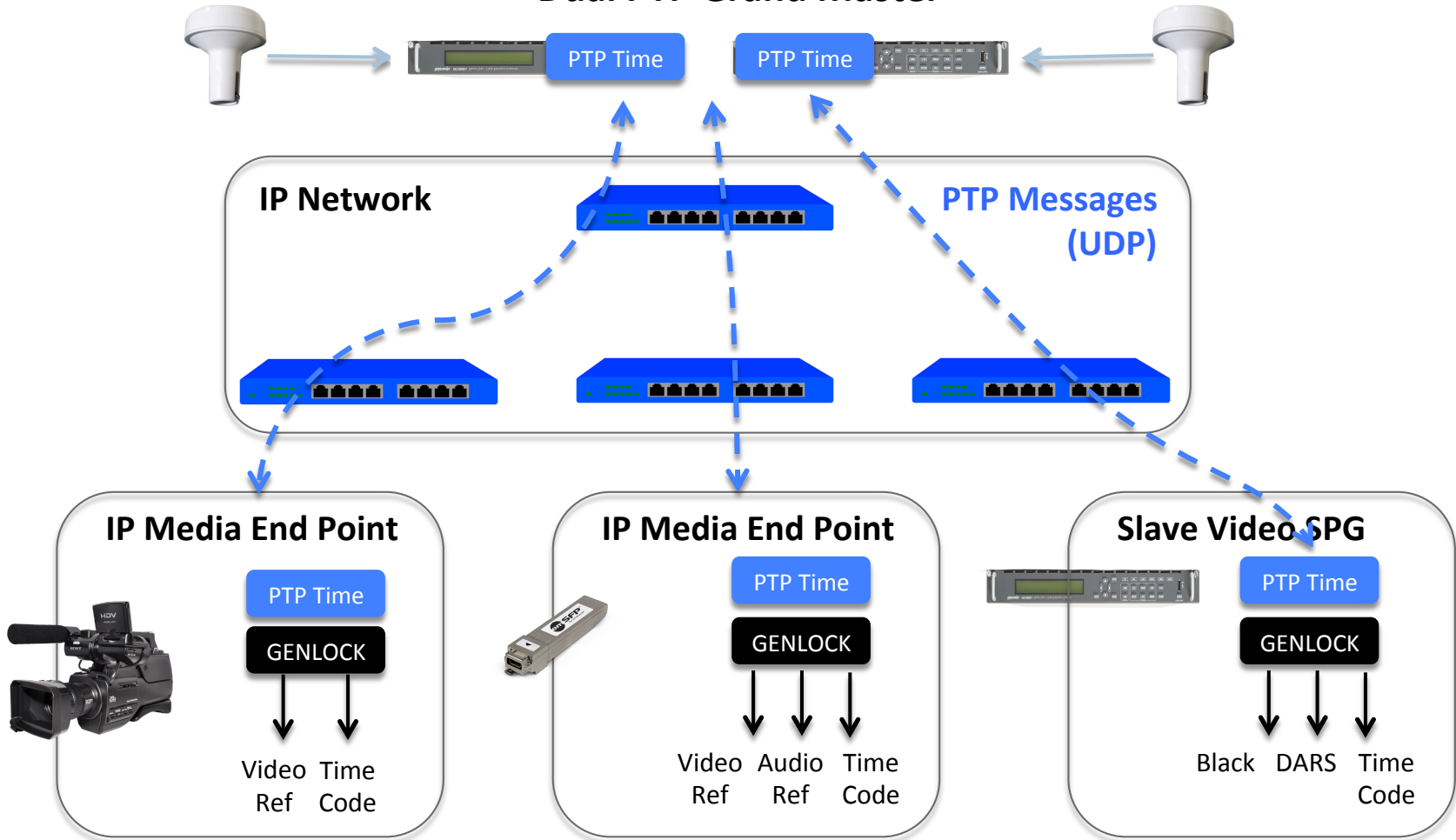
2110-31: AES3 – Compressed Audio - Transparent Transport

2110-40: Ancillary Data (IETF ANC 291) – CC, TC, etc as separate RTP streams

~~2110-50~~ --> ST 2022-8: Integration 2110 with ST 2022-6 (video + AES67 audio)

2110-xx: support for Compressed Audio and Video, will likely be published 1st half of 2019.

Dual PTP Grand Master





Master
PTP
Gen.



Slave
PTP
Gen.

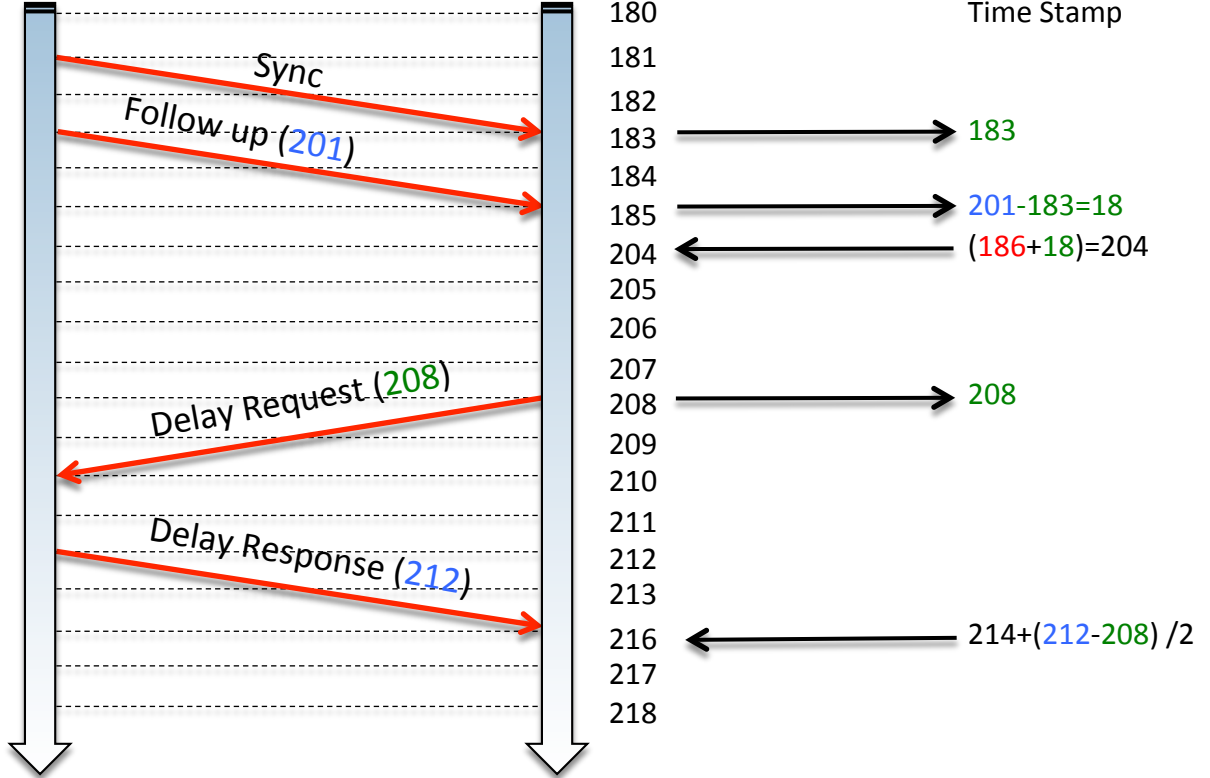
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Time Stamp

SMPTE ST 2059-2

- Devices synced in 5 secs
- Accuracy between devices 1us



IP System



Cam 1
Vendor A

Multicast Group
e.g.
238.6.74.22:20000

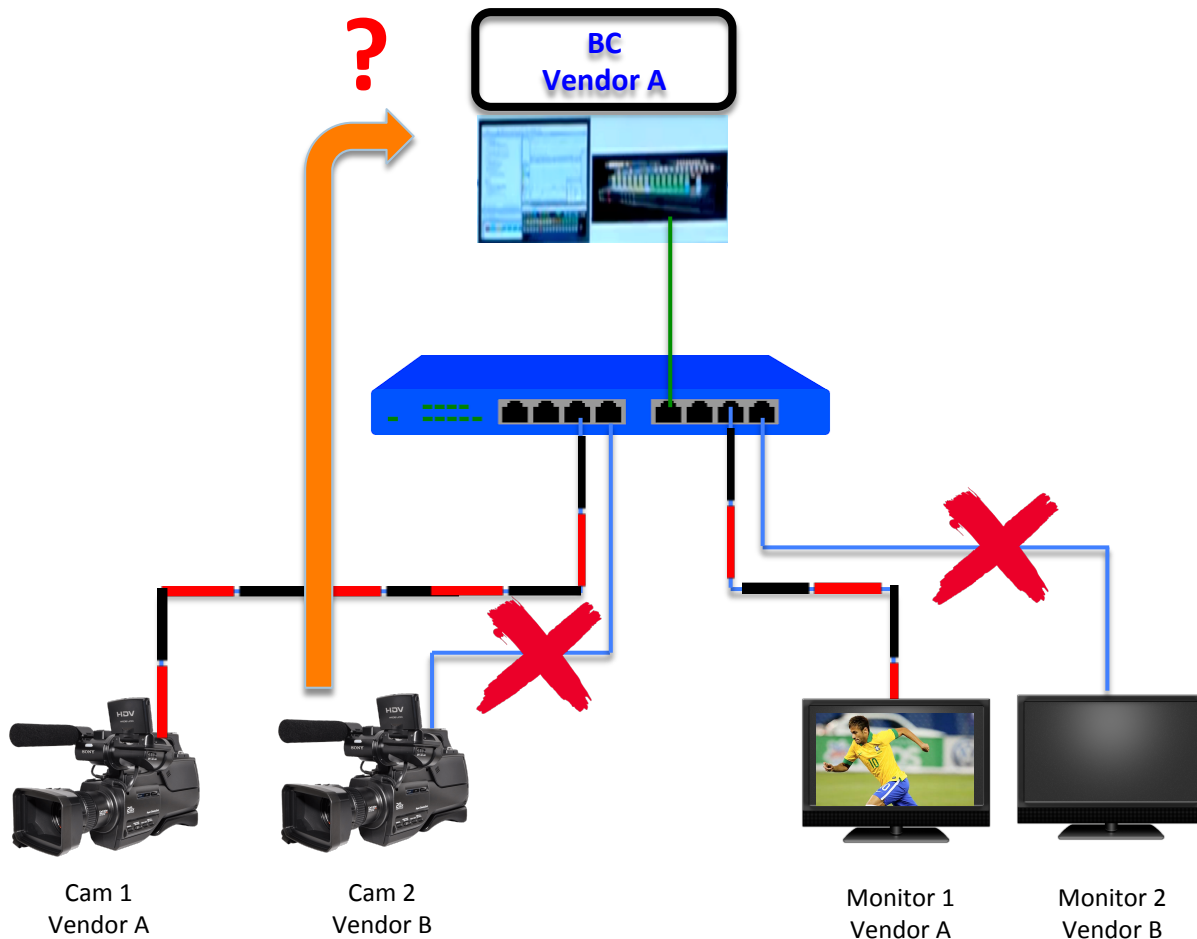


Monitor 1
Vendor A

Hey Monitor 1, switch your video to
Group 238.6.74.22:20000

IP System

- Controller
 - Network
- ### Timing
- Sender
 - Receiver



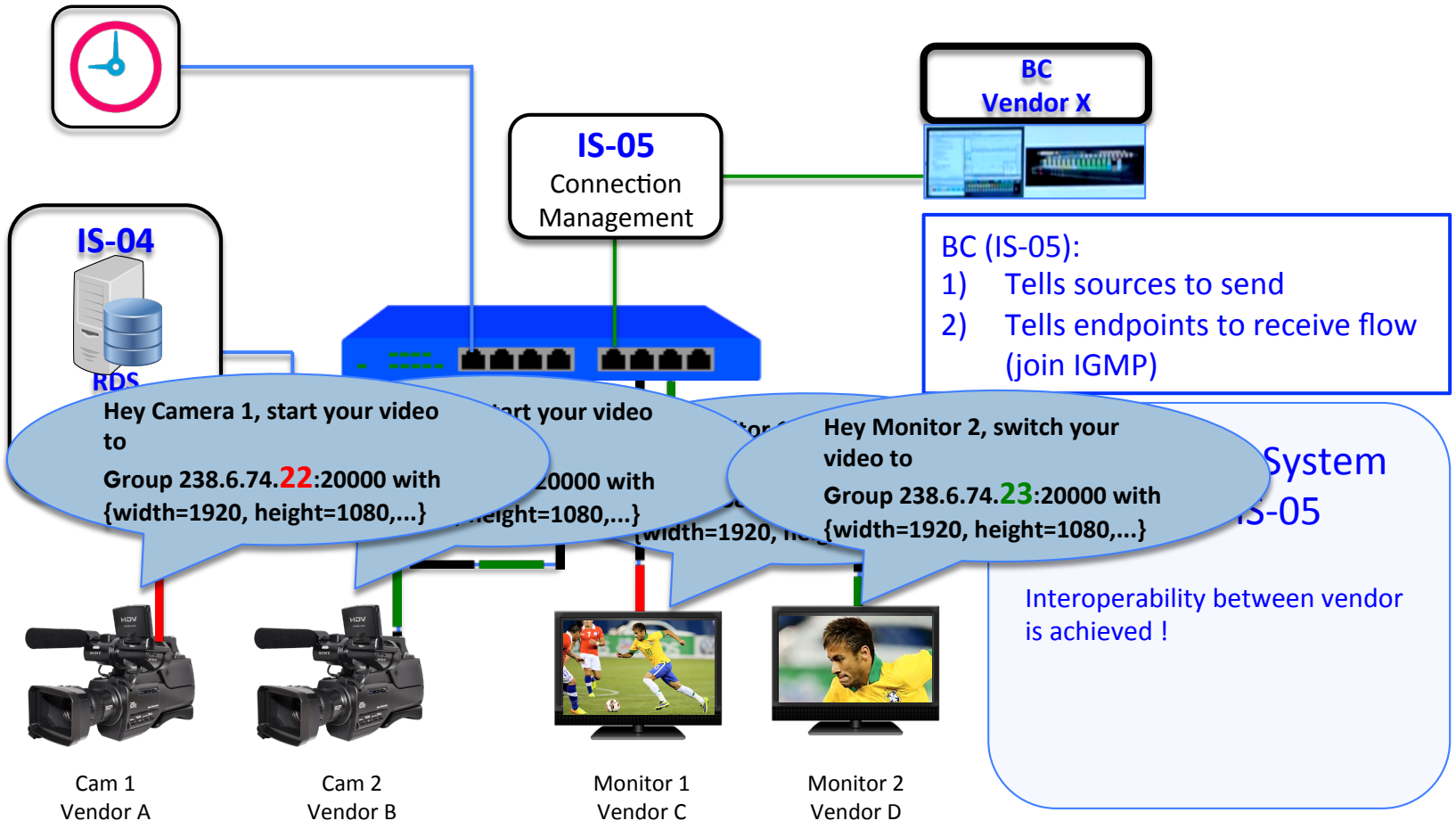
Multi Vendor IP Solution

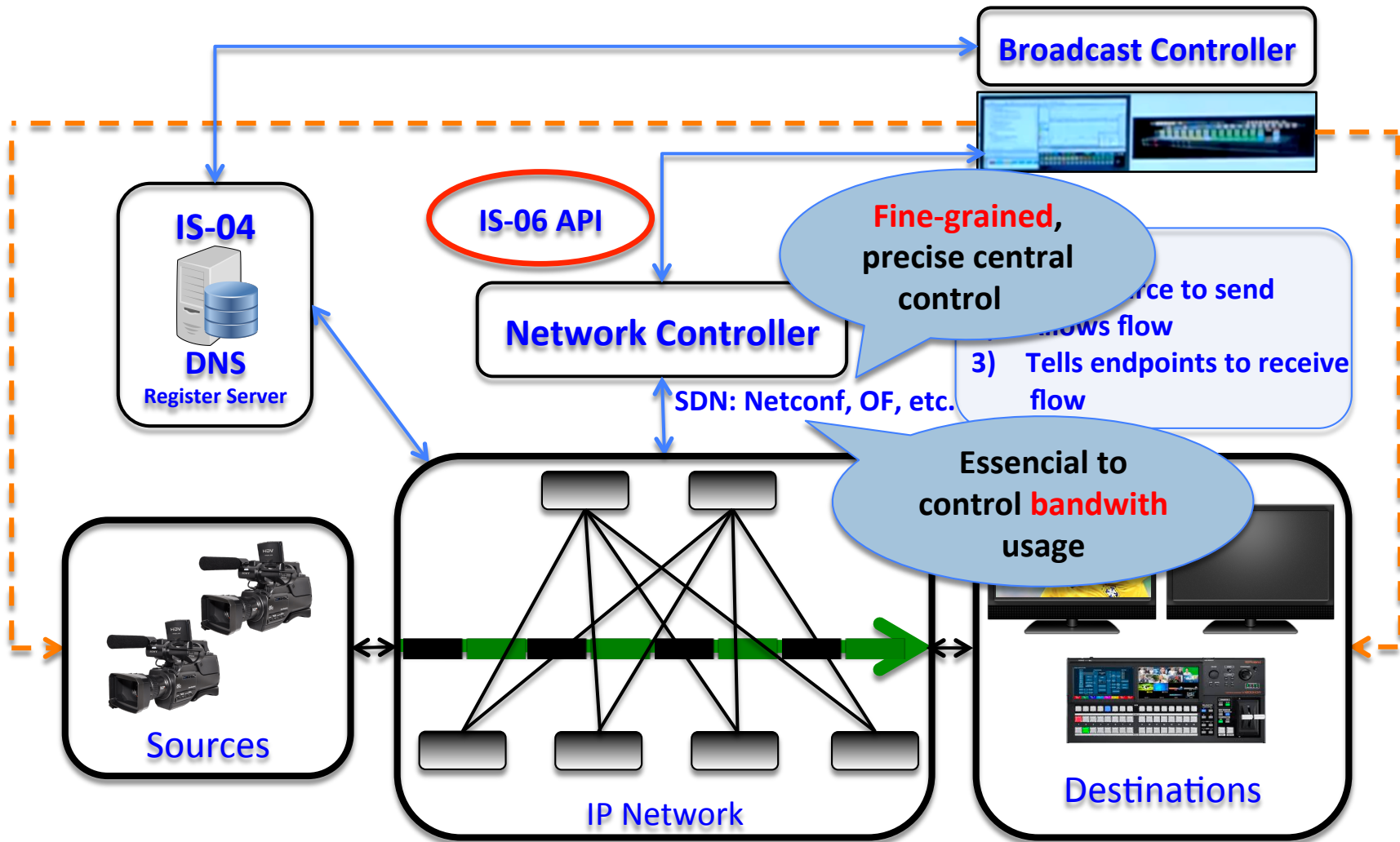
What if I want to use a second vendor's camera?

Connect B Camera to the network

Camera cannot find compatible Broadcast Controller

Connection not possible





Podemos trabalhar com o ST 2110 sem o NMOS IS-04/05 ?

- Claro que sim – e fazemos hoje
 - O sistema de controle tem diferentes “*drivers*” para cada dispositivo que controla
 - Identificar cada “*drive*” necessário e construí-lo, faz parte do projeto
 - Há sempre o risco de um fabricante atualizar um protocolo e invalidar o “*driver*”

VRT SANDBOX

LIVE IP PROJECT

Obrigado!

José Antonio Garcia

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SET Grupo de Estudos IP