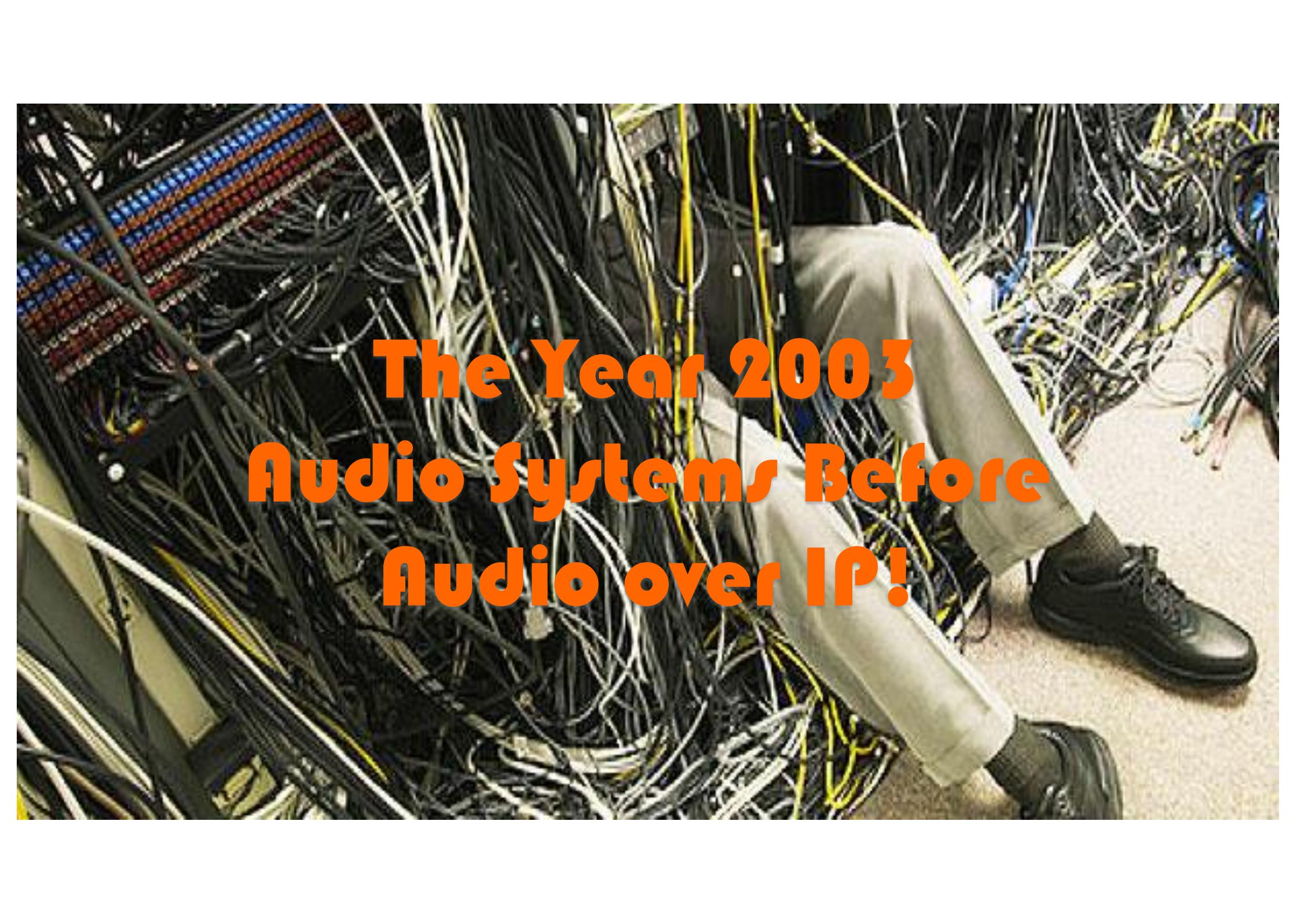




A SHORT HISTORY LESSON



A photograph of a person sitting on the floor in a server room, surrounded by a chaotic and dense mess of black, white, and yellow cables. The person is wearing light-colored trousers and black shoes. The cables are tangled and appear to be connected to various pieces of equipment, possibly network switches or servers, in the background. The overall scene suggests a complex and messy network environment.

**The Year 2003
Audio Systems Before
Audio over IP!**

Audio over IP – A Brief History

- 2002: The Telos Alliance (Axia) Introduces Livewire, The First AoIP Protocol
- 2004: First AoIP Broadcast Studio Created: Auburn University's WEGL-FM 91.1 in Alabama
- 2006: Audinate Introduces Dante IP Audio Protocol into Pro Audio Market
- 2008: Wheatstone AoIP Protocol Comes to Market
- 2010: The Audio Engineering Society Forms the x192 Working Group

Audio over IP – A Brief History

- 2010: ALC Networks Introduces Ravenna
- 2013: The AES67 Standard Is Ratified
- 2014: Media Networking Alliance Launches
- 2015: Alliance for IP Media Solutions Formed
- 2017: SMPTE publishes SMPTE ST 2110, adapting AES67 as the audio format 2110-30

The Telos Alliance & AoIP

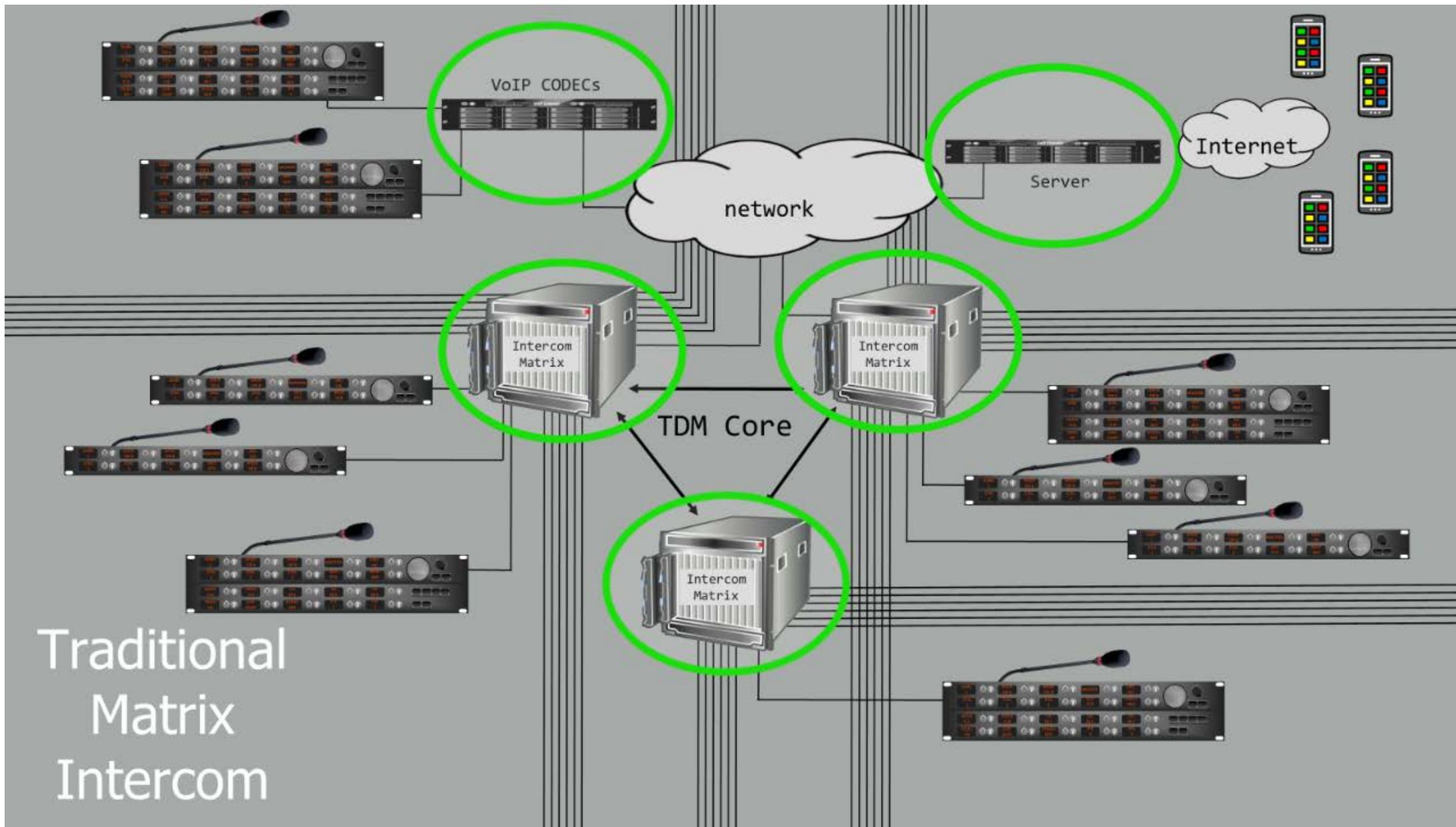
- Started developing AoIP in 1998
- Launched first AoIP protocol for broadcast in 2003: Called Livewire
- Unparalleled 22 Years of AoIP experience
- More than 100,000 devices deployed globally
- Founder member of the AES x192 committee whose work became the AES67 standard
- Livewire+ AES67 protocol is fully AES67 compliant
- Fully committed to the SMPTE 2110 Suite





INTERCOM

LIFE AS WE KNOW IT



Traditional
Matrix
Intercom

Matrix Intercom, a practical solution?

- Crosspoint Switching and Mixing
- Partylines, IFBs and Groups all require mixing
- Matrices can store configurations
- Gain controllable I/O and crosspoints
- Signal detection and monitoring is easy
- Matrices are resilient – Dual Power/Dual CPU
- Wide range of connectivity options
- A known commodity

When Matrix Intercom is not such a practical solution ...

- Lack of flexibility – size limited by port count
- Channel handling limited by outdated TDM buss structure
- Difficult (and expensive) to trunk multiple frames
- Takes up rack space
- Everything cables back to central point
- AoIP connected devices also need Ethernet fabric
- Single points of failure
- Heavy – an issue when used in OB trucks



MATRIX-LESS INTERCOM
A DIFFERENT APPROACH

NO COSTLY



Central Matrix

Designing an IP Intercom from the ground up

The challenge for Telos Alliance Development Team

- Produce 'Familiar' Software and Hardware components
- Meet or exceed expected Intercom functionality
- Use standards-based protocols natively – AES67 / SIP / VoIP
- Interface with baseband and AoIP equipment seamlessly
- Develop a scalable and resilient solution
- Achieve all of the above with no Matrix or Engine whatsoever
- Use a purely distributed architecture

How does Infinity 'Break the Matrix'?

- Implementing a distributed model – DSP in every device
- Dashboard Software Agent creates and maintains database of configuration – not required for system operation
- Dashboard Software UI designed for users at all skill levels
- Resilient architecture
- Telos Alliance xNode baseband to AoIP convertors
- Telos VX for integrated telephony
- Native AES67 connection to anything on network
- Proven technology – thousands of devices in 24/7 service

Additional benefits

- Plug and Play connectivity
- Daisy-chain Panels and Beltpacks
- HTML5 based UI means control and configure from any device
- Infinite scalability - never run out of ports
- Planned or ad-hoc changes made simple
- Uses existing Media over IP infrastructure
- Local, Regional, National, even Global virtualized 'matrix' coverage
- Lower Total Cost of Ownership
- Communication and contribution audio on the same network

Telos Infinity Intercom ... Current Range

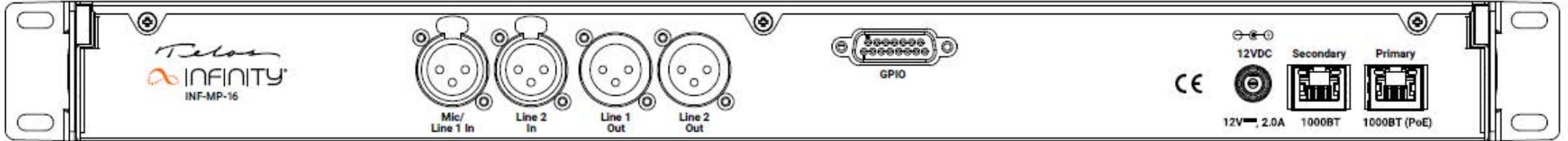
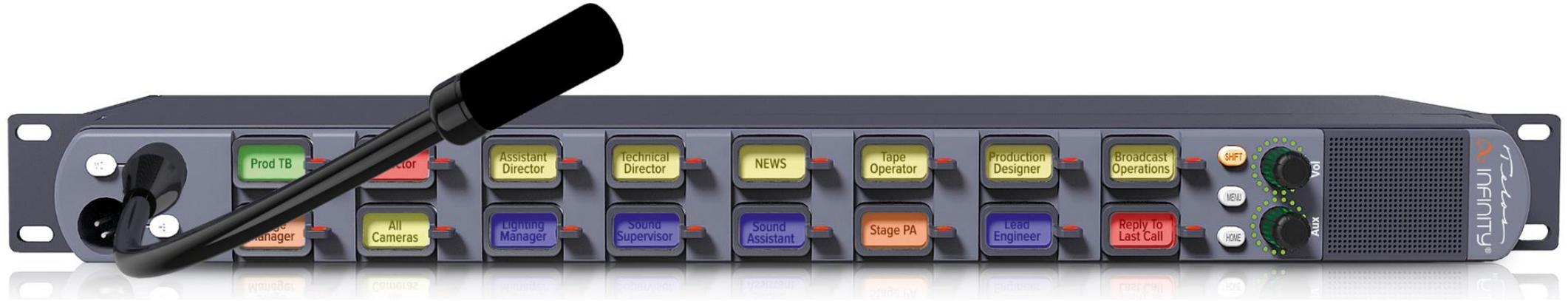
Hardware and Software Products

- 1ru Master Intercom Panel – Full and Base Versions
- 1ru Expansion Panel
- Desktop Station – Full and Base Versions
- BP-2 Wired Partyline Beltpack / BP-4 in May 2020
- Feature Rich Dashboard Software
- Infinity Link OPUS VoIP Codec Licenses and Gateway
- Branded Infinity Headsets

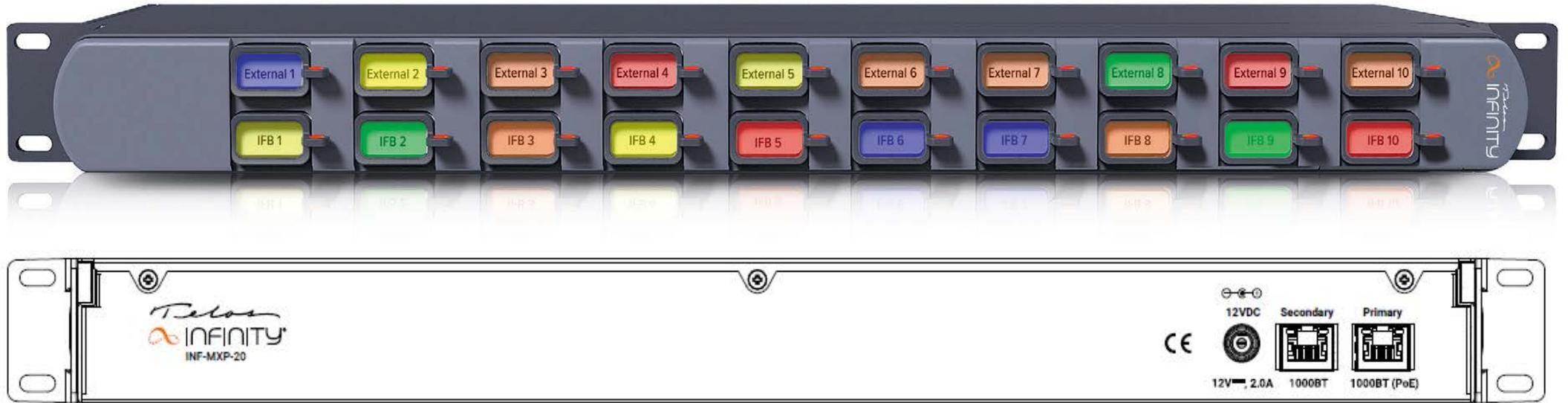


Telos Infinity IP Intercom Product Family

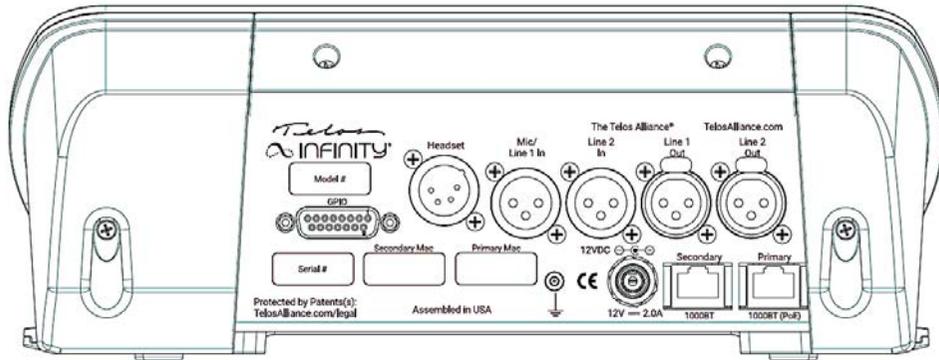




1RU Master Panel: INF-MP-16



1RU Master Expansion Panel: INF-MXP-20



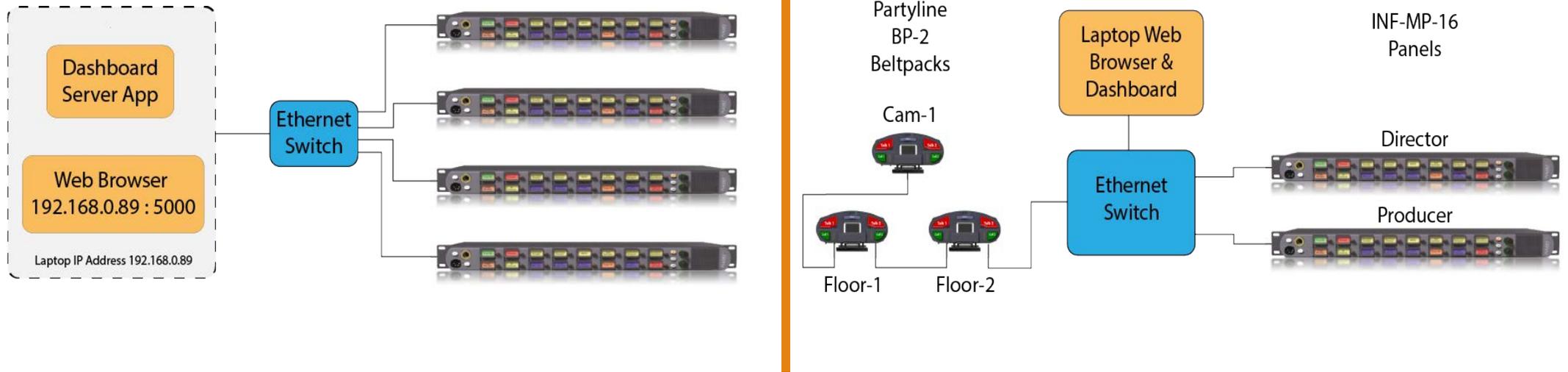
Desktop Intercom Panel: INF-DS-16



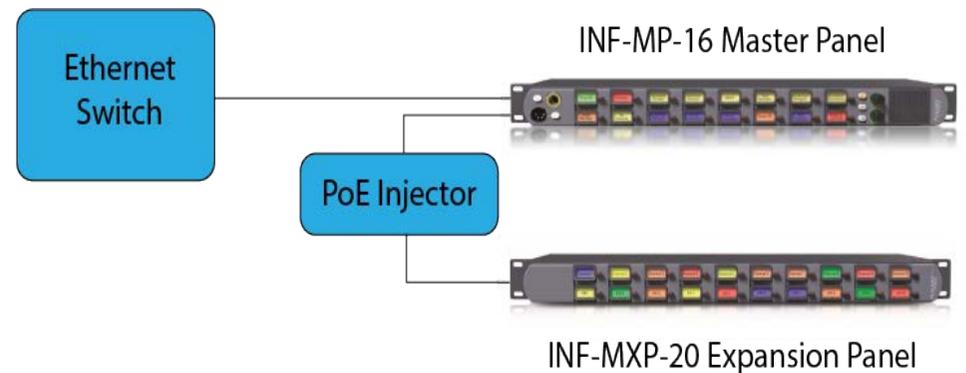
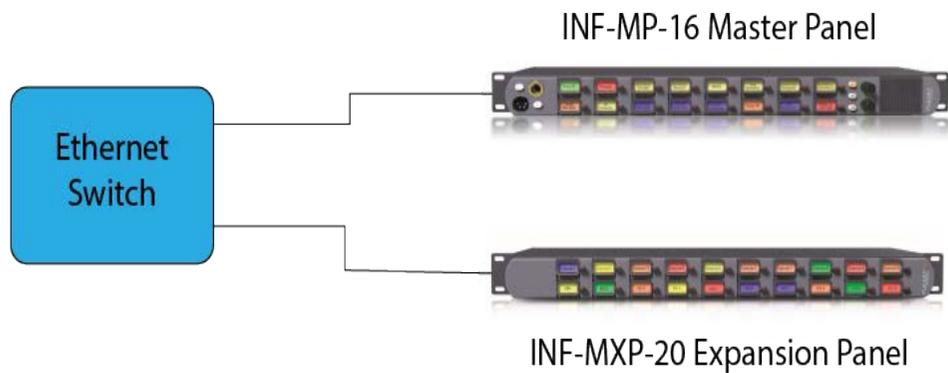
Digital Intercom Beltpack: INF-BP-2



Infinity Link OPUS VoIP: Gateway 8 / Gateway 16
Infinity Device 2 / 4 / 8 VoIP Codec Licenses



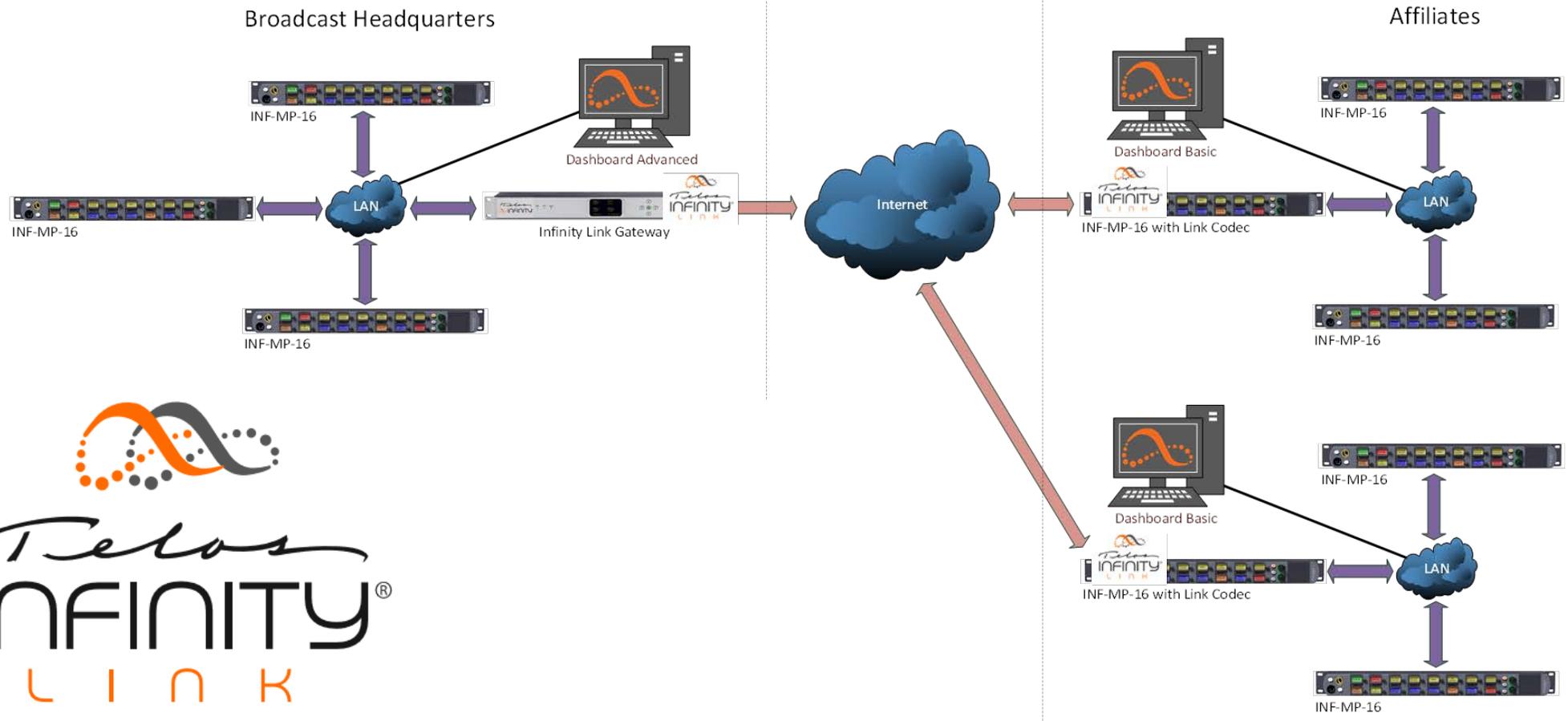
Telos Infinity IP Intercom – Basic Connectivity

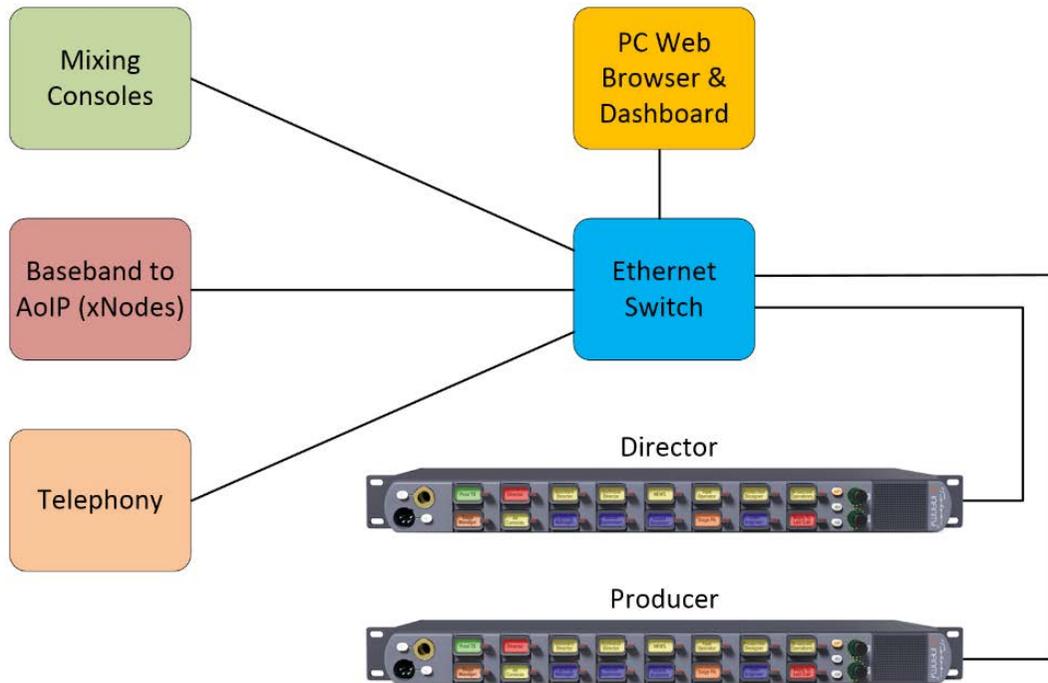


Expansion Panel – Connectivity



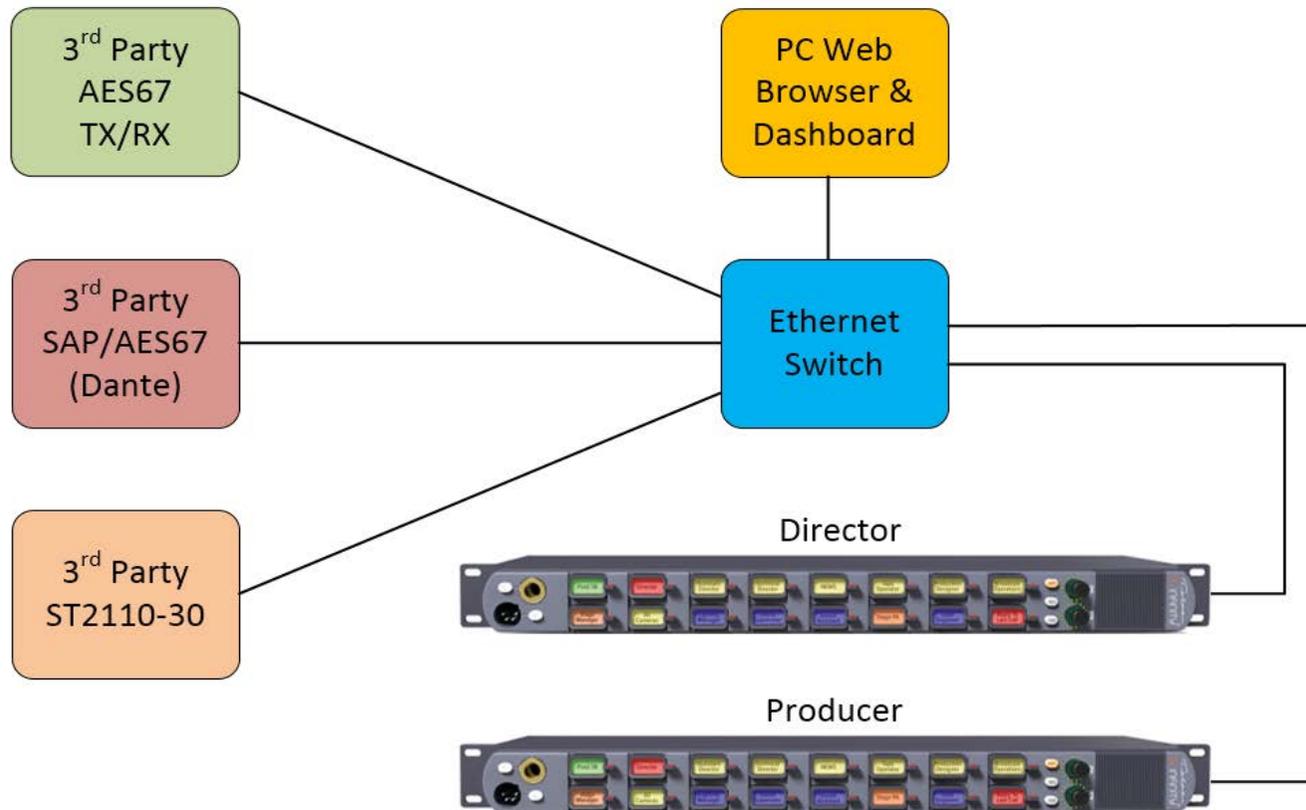
Infinity Link using Gateway and Device Licenses





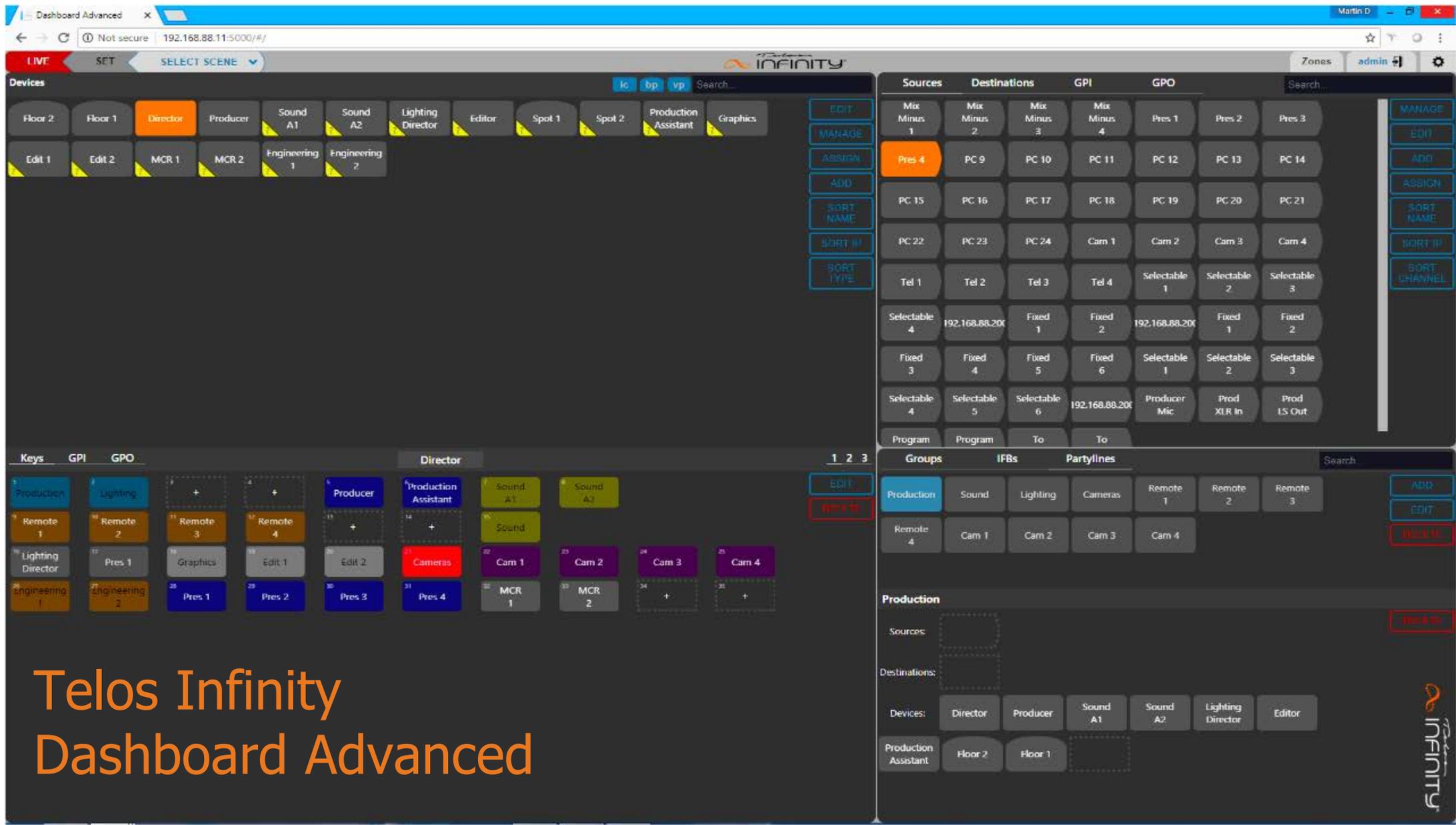
Telos AoIP Device – Connectivity

Analog / AES-3 / SDI / Mic / GPIO / VoIP



3rd Party AoIP Stream Connectivity

Mixing Consoles / Wireless RX/TX / Codecs / Monitors / Mics / Format Converters



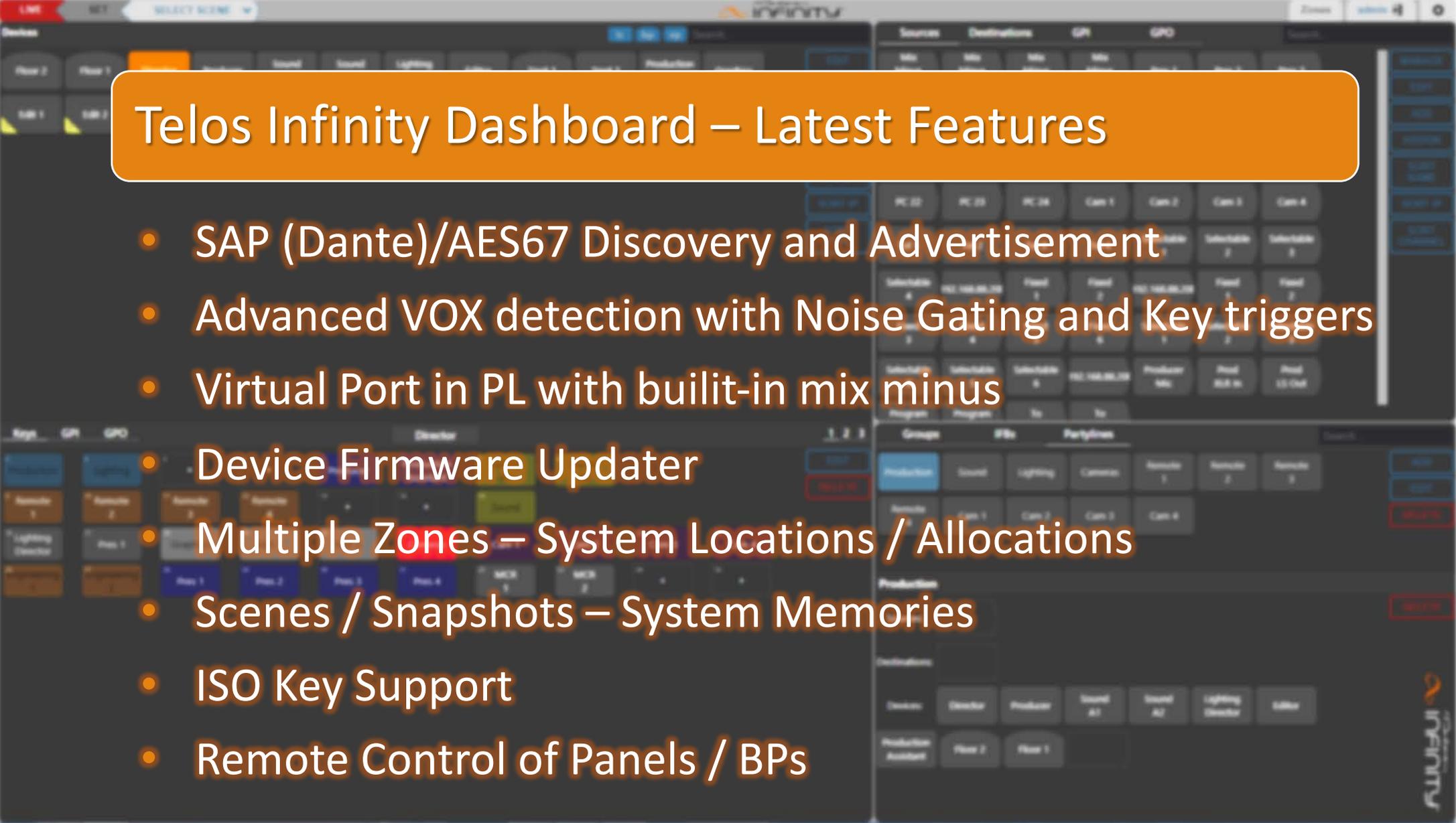
Telos Infinity Dashboard Advanced

Managing Telos Infinity with Dashboard Advanced

- Infinity Dashboard AGENT runs as a service – maintains a config database
- Dashboard HOST runs as a service – user interface to database
- System Admin connects to Server, manages system via HTML 5
- System Admin and Users use login credentials to access system
- Physical and virtual systems can be divided in ZONES (Studios etc.)
- System elements (Devices, Groups, PL etc.) can be divided into SCENES (V1.6 onwards) – think Snapshots for different show profiles
- Each Login client can be given restricted access to specific ZONES/SCENES
- Scenes can be edited 'live' or offline
- Dashboard Advanced logs all system activity (alarm conditions etc.)

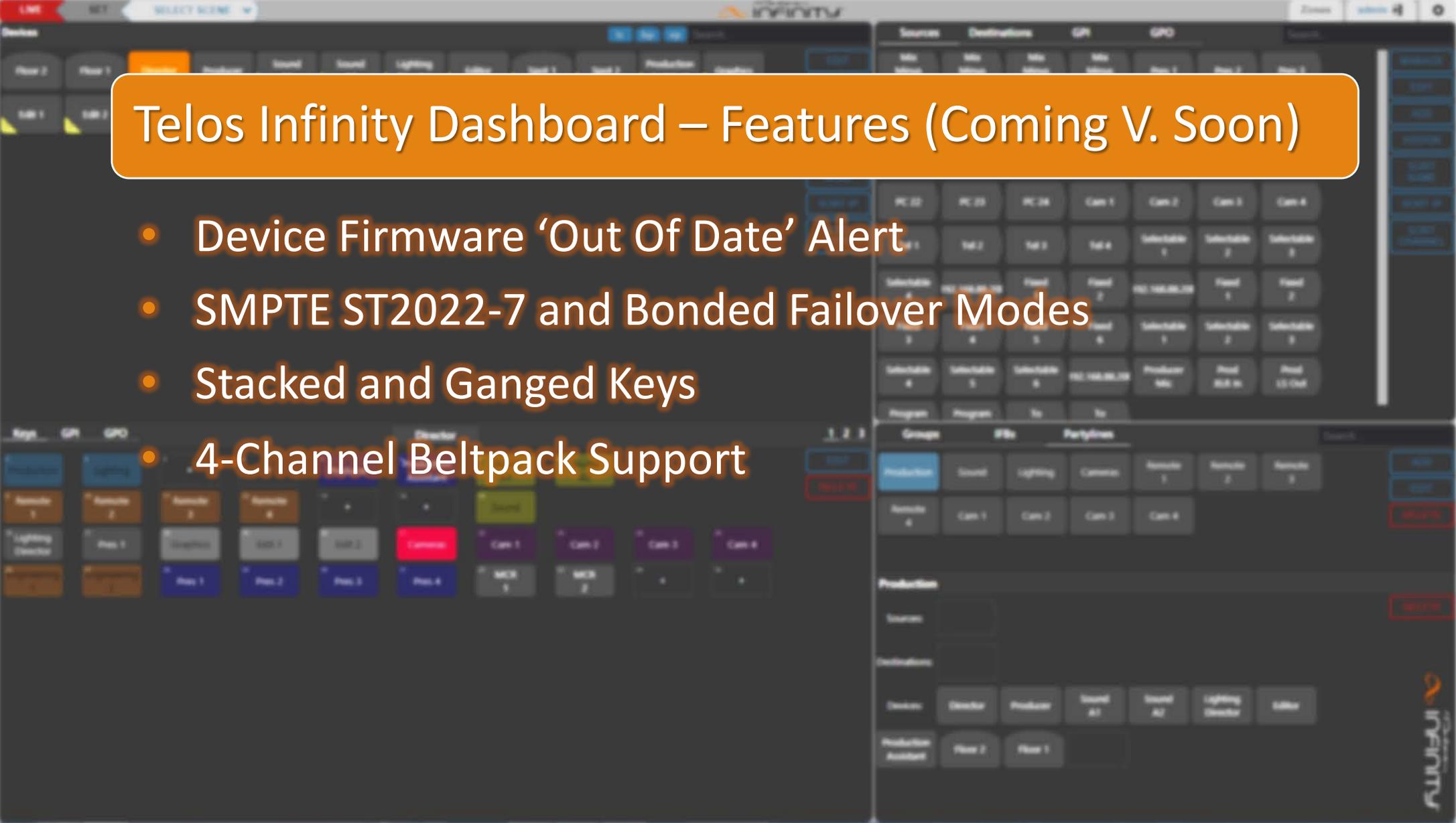
Telos Infinity Dashboard - Features

- Unlimited Partylines, Groups, IFBs, Virtual Ports
- Drag and Drop Key Configuration
- Native AES67 / SMPTE 2110-30 Four-Wires
- Multiple Simultaneous Users
- GPIO Support
- Device (Beltpack and Panel) Copy/Paste/Clone
- Intelligent Search Tools
- Live and Offline Configuration



Telos Infinity Dashboard – Latest Features

- SAP (Dante)/AES67 Discovery and Advertisement
- Advanced VOX detection with Noise Gating and Key triggers
- Virtual Port in PL with built-in mix minus
- Device Firmware Updater
- Multiple Zones – System Locations / Allocations
- Scenes / Snapshots – System Memories
- ISO Key Support
- Remote Control of Panels / BPs

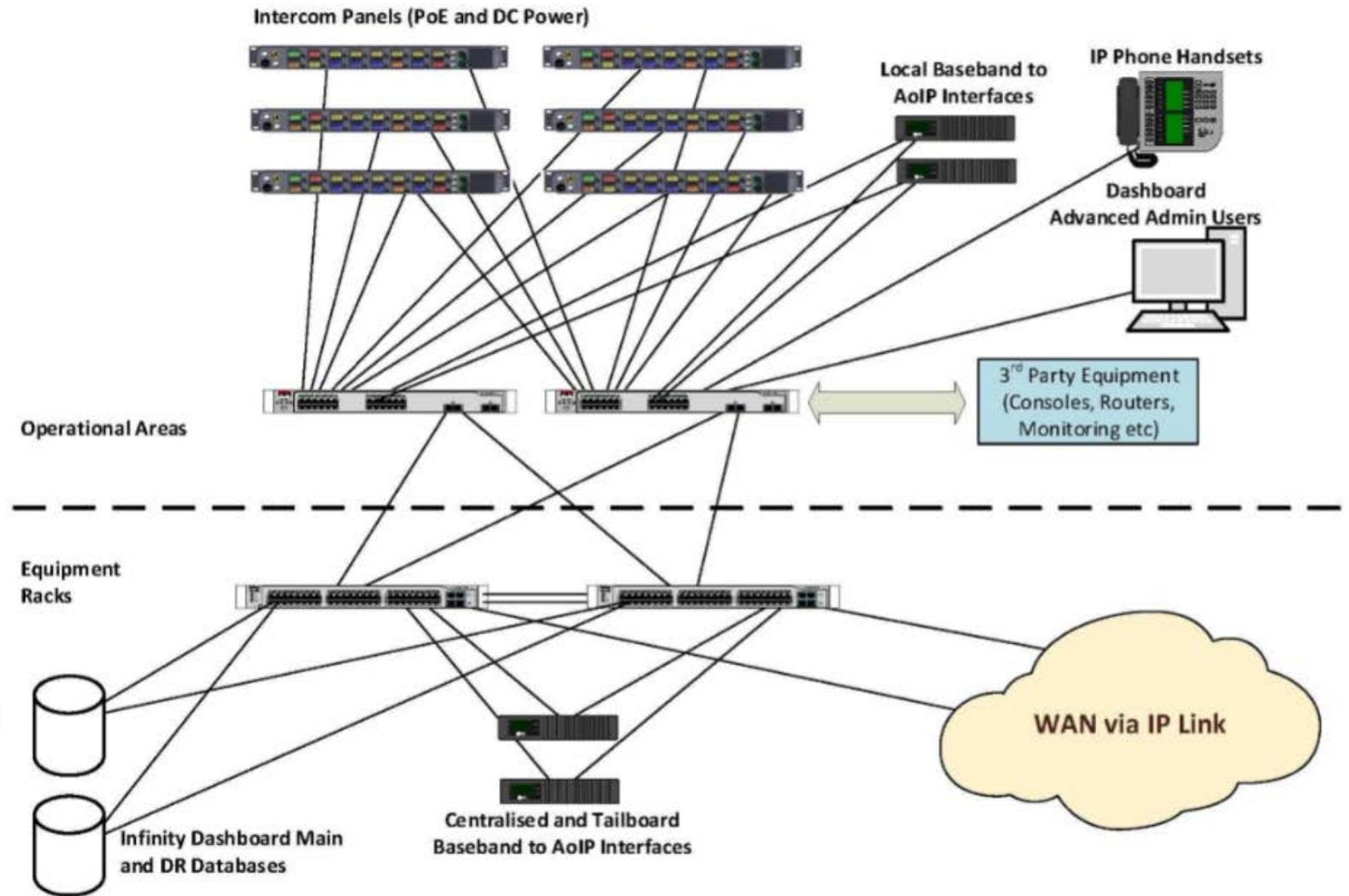


Telos Infinity Dashboard – Features (Coming V. Soon)

- Device Firmware 'Out Of Date' Alert
- SMPTE ST2022-7 and Bonded Failover Modes
- Stacked and Ganged Keys
- 4-Channel Beltpack Support

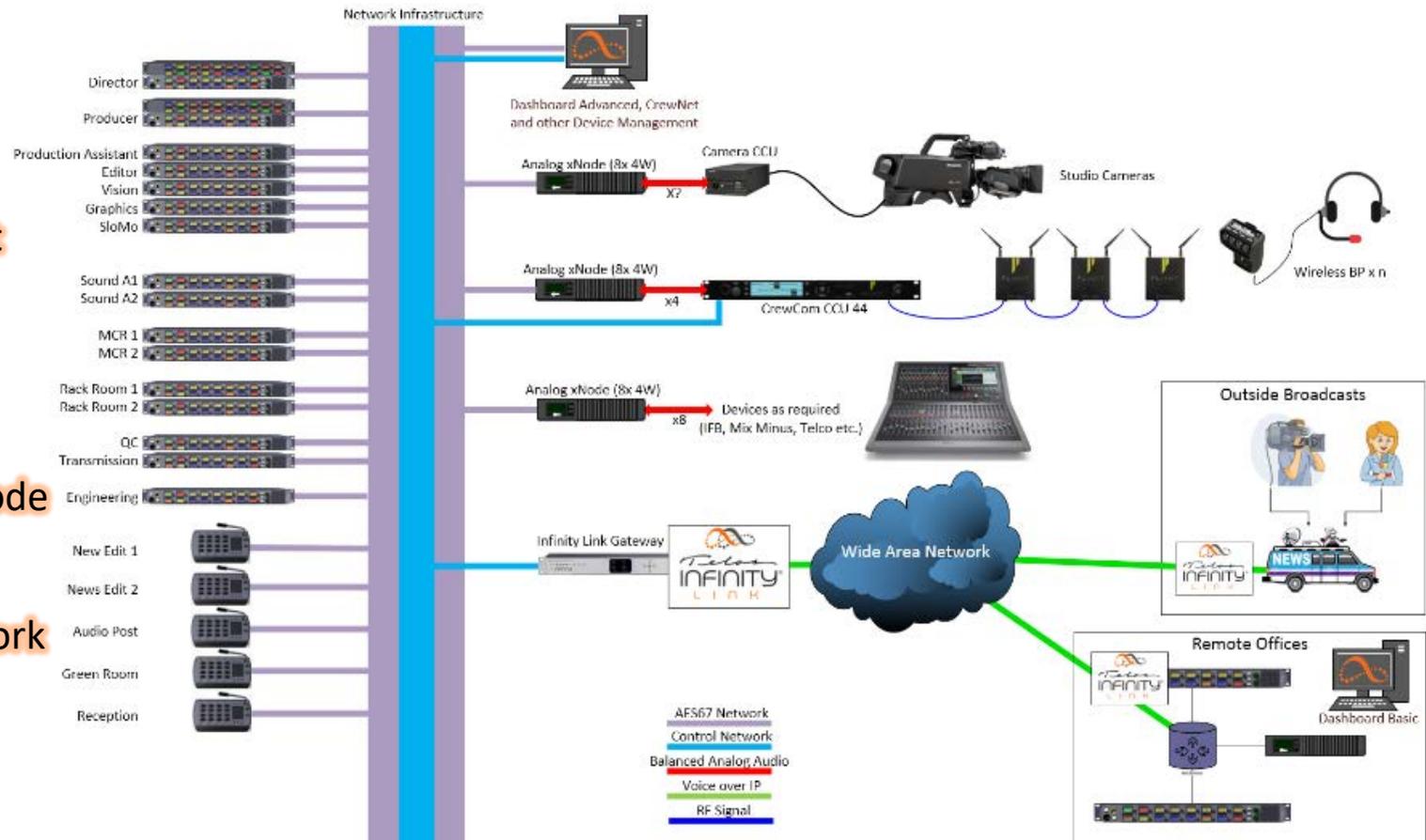
Network Resilience

1. Telos Infinity supports resilient network plans
2. Telos Infinity has dual NIC ports that can be used for dual connections or for separating media and control
3. Firmware Release V1.7 (due early 2020) will support both SMPTE ST2022-7 (redundant streaming) and Bonded Failover connection schemes
4. Beta version can be tried now!!!



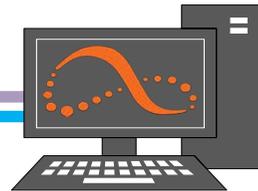
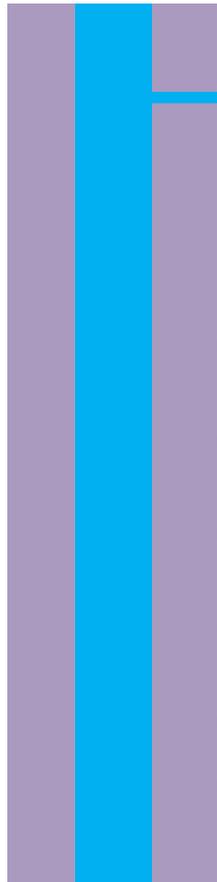
Telos Infinity - Typical Studio System

1. Telos Infinity has no Matrix, so communication between Intercom elements is via direct connection to the LAN/VLAN/WAN
2. Analog and other baseband audio is converted to IP by node devices and any ST2110-30/AES67 present on the network can connect natively without an external interface



Infinity Panel Engine Concept with External Control

Network Infrastructure

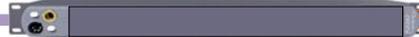


Dashboard Advanced and Other App PC

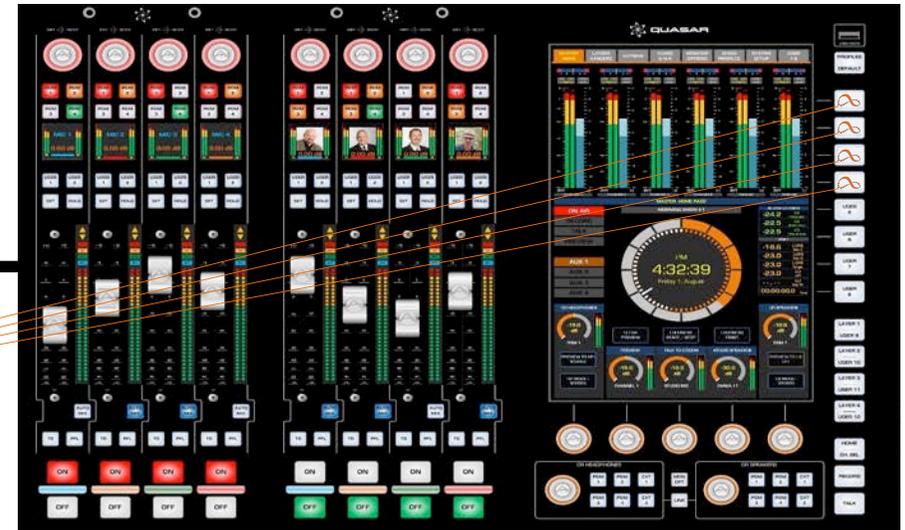
Axia Quasar Engine



Telos Infinity 'TC-1000'



Axia Quasar Console



User Report

Telos Infinity IP Intercom
Lollapalooza Brazil 2019



Case Study/User Report – Lollapalooza 2019, Brazil

1. Communications across six stages
2. Telos Alliance worked closely with New York Digital and Visom Digital (authorized reseller for Infinity IP Intercom in Brazil), to spec the Telos Infinity™ IP Intercom system
3. Grammy and Emmy award-winning Director of New York Digital Danny Littwin worked closely with Globosat's lead engineer, Fabio Costa de Almeida, to specify the Telos Infinity matrix-free IP intercom
4. Danny chose Infinity for its matrix-free design, giving the event's producers more flexibility while taking up less space in the truck
5. The Infinity system was set up with Partylines for both Lollapalooza's on-air directors and producers, allowing them to communicate clearly and instantaneously with any one of the event's stages. "Even in 120-degree heat inside the truck
6. "I will absolutely use Infinity again, the fact is, installation is minimal. Being all IP-based, it's very plug-and-play with none of the problems associated with matrix systems. That's a very big plus!" Danny Littwin, Sao Paulo, April 2019

Case Study

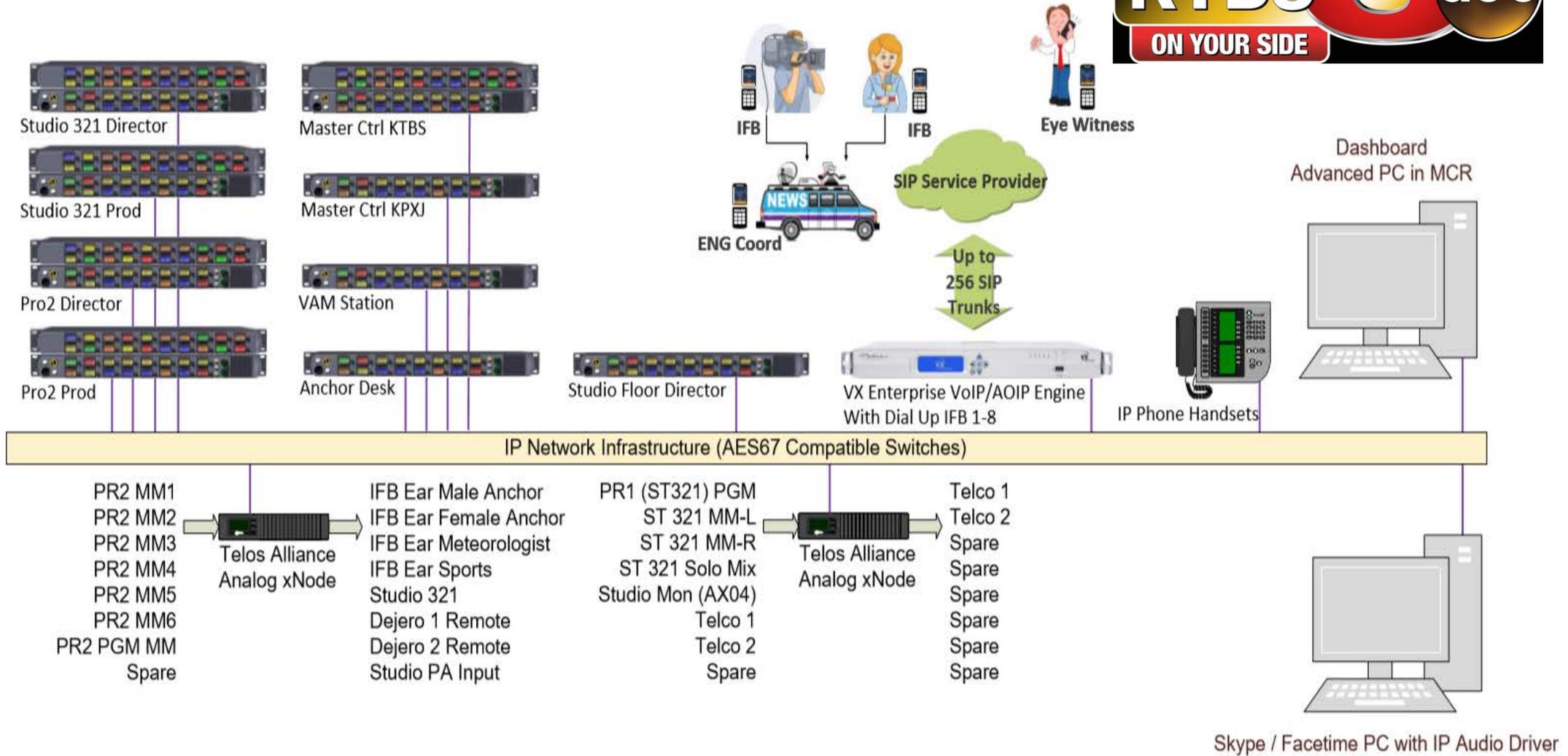
Telos Infinity IP Intercom

KTBS TV

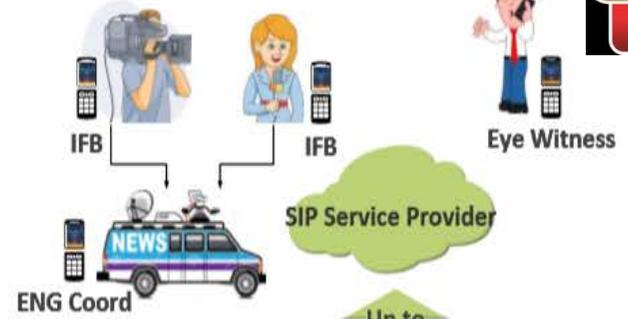
Shreveport Louisiana USA



KTBS Intercom System Schematic V2.0



- Studio 321 Director
- Master Ctrl KTBS
- Studio 321 Prod
- Master Ctrl KPXJ
- Pro2 Director
- VAM Station
- Pro2 Prod
- Anchor Desk



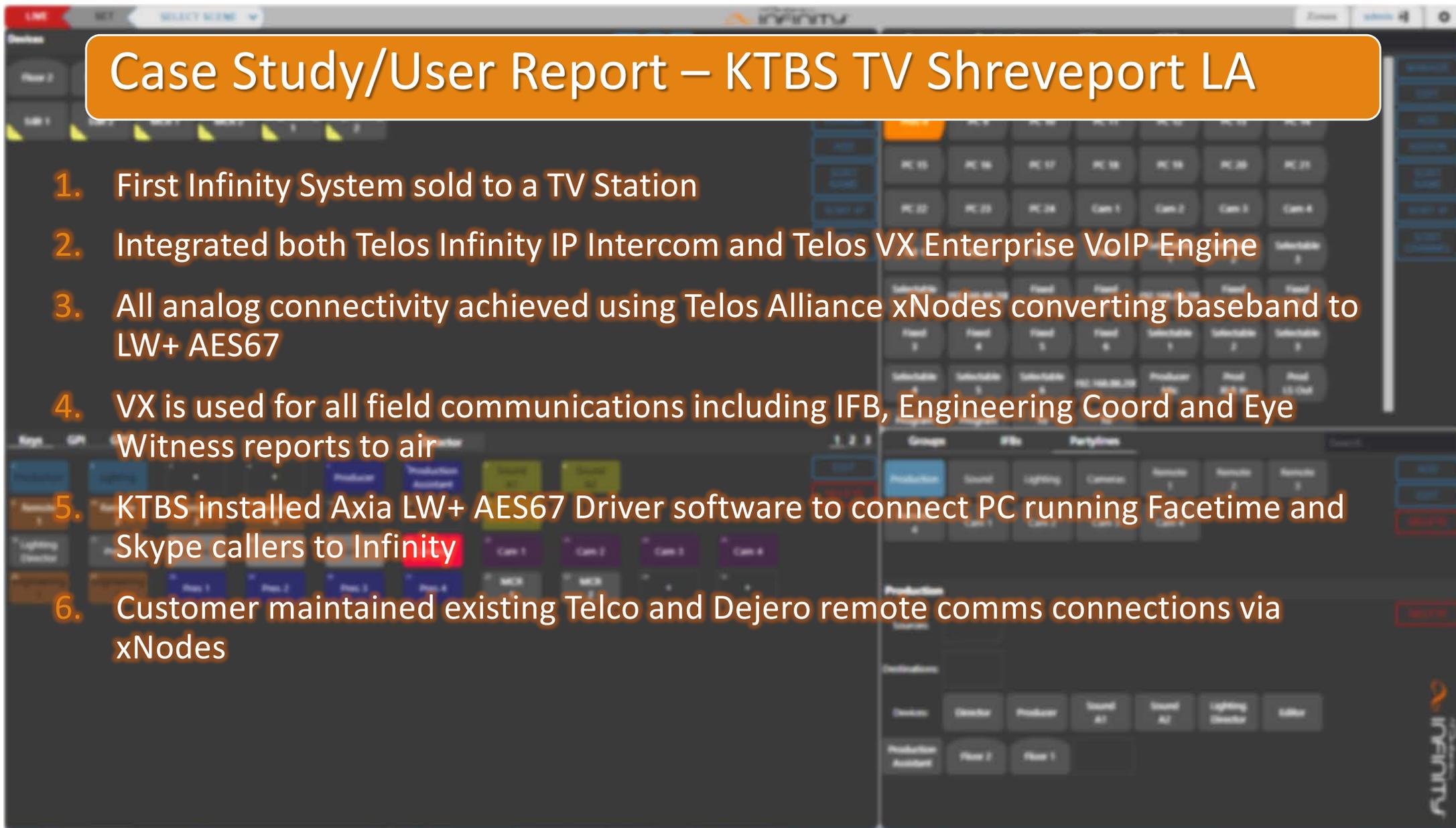
- Studio Floor Director
- VX Enterprise VoIP/AOIP Engine With Dial Up IFB 1-8

- | | | | |
|------------|-----------------------|-------------------|---------|
| PR2 MM1 | IFB Ear Male Anchor | PR1 (ST321) PGM | Telco 1 |
| PR2 MM2 | IFB Ear Female Anchor | ST 321 MM-L | Telco 2 |
| PR2 MM3 | IFB Ear Meteorologist | ST 321 MM-R | Spare |
| PR2 MM4 | IFB Ear Sports | Studio Mon (AX04) | Spare |
| PR2 MM5 | Studio 321 | Telco 1 | Spare |
| PR2 MM6 | Dejero 1 Remote | Telco 2 | Spare |
| PR2 PGM MM | Dejero 2 Remote | Spare | Spare |
| Spare | Studio PA Input | | Spare |

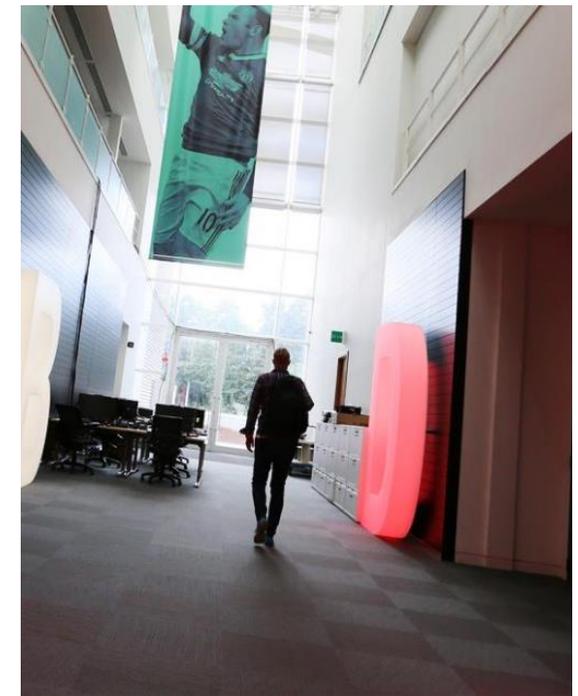
Skype / Facetime PC with IP Audio Driver

Case Study/User Report – KTBS TV Shreveport LA

1. First Infinity System sold to a TV Station
2. Integrated both Telos Infinity IP Intercom and Telos VX Enterprise VoIP Engine
3. All analog connectivity achieved using Telos Alliance xNodes converting baseband to LW+ AES67
4. VX is used for all field communications including IFB, Engineering Coord and Eye Witness reports to air
5. KTBS installed Axia LW+ AES67 Driver software to connect PC running Facetime and Skype callers to Infinity
6. Customer maintained existing Telco and Dejero remote comms connections via xNodes



Case Study
Telos Infinity IP
Intercom
IMG Studios,
London, UK





Stockley Park, London UK

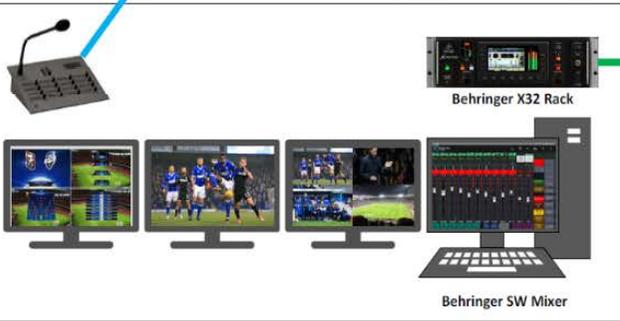
Local or Remote Match Commentary



IMG House Riedel Artist Matrix



Production POD – 1 of 10



Net Insight Nimbra S2110 Transport Infrastructure

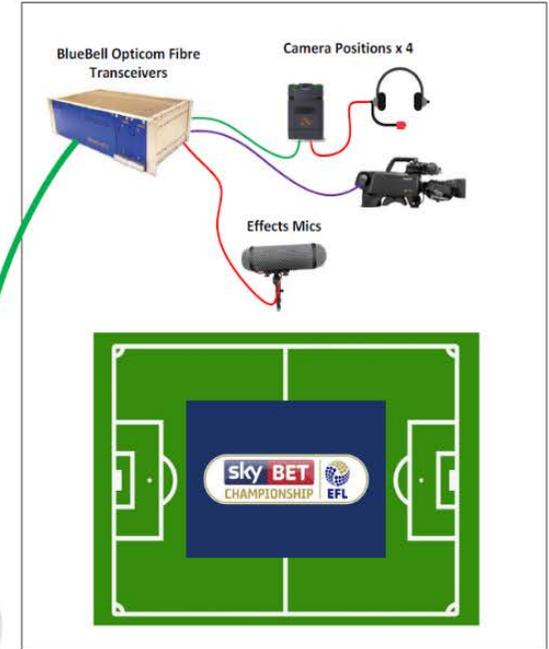


Camera/Vision Engineering For all matches



Dedicated VLAN

1 of 10 English Football League Stadiums

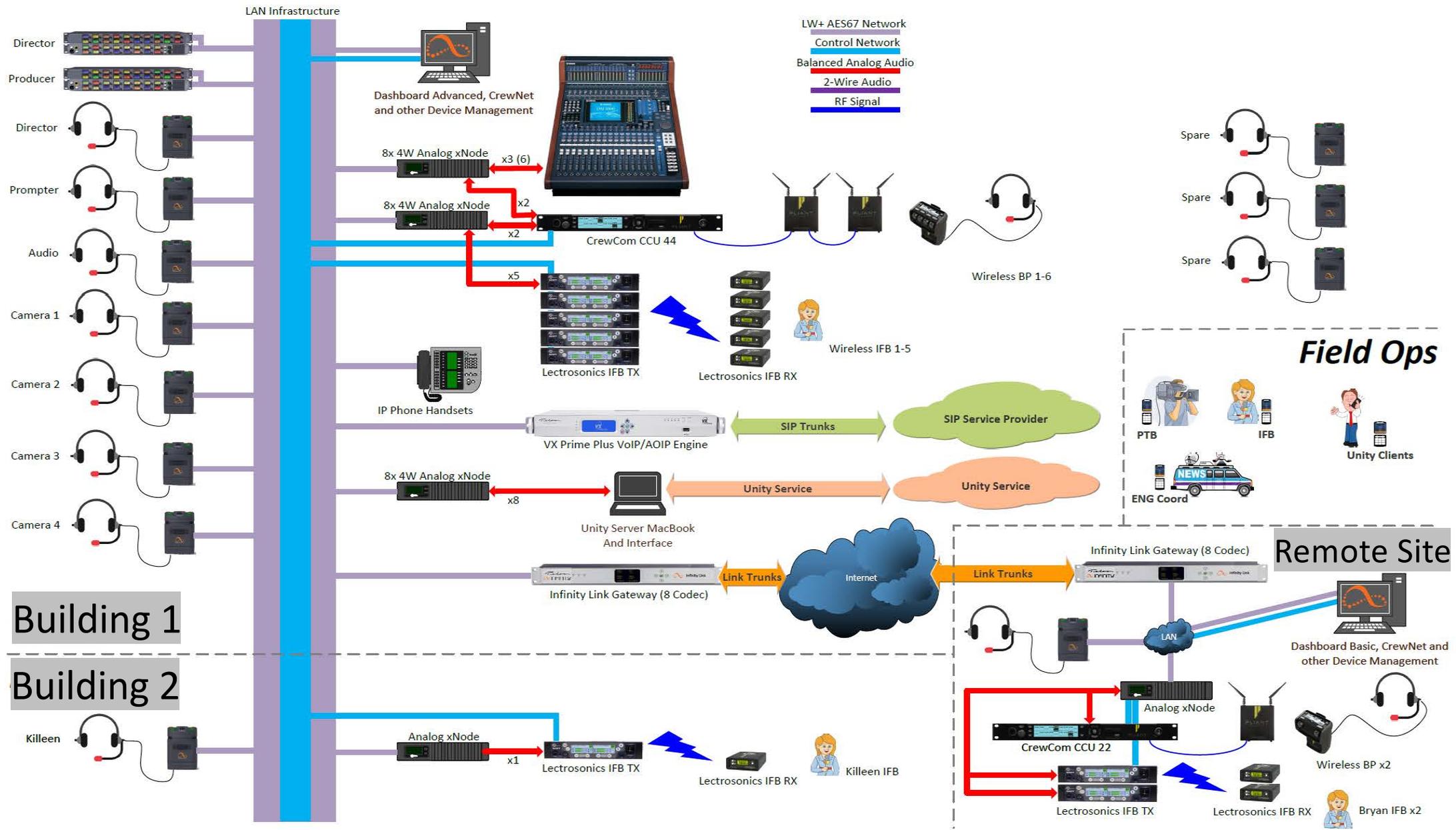


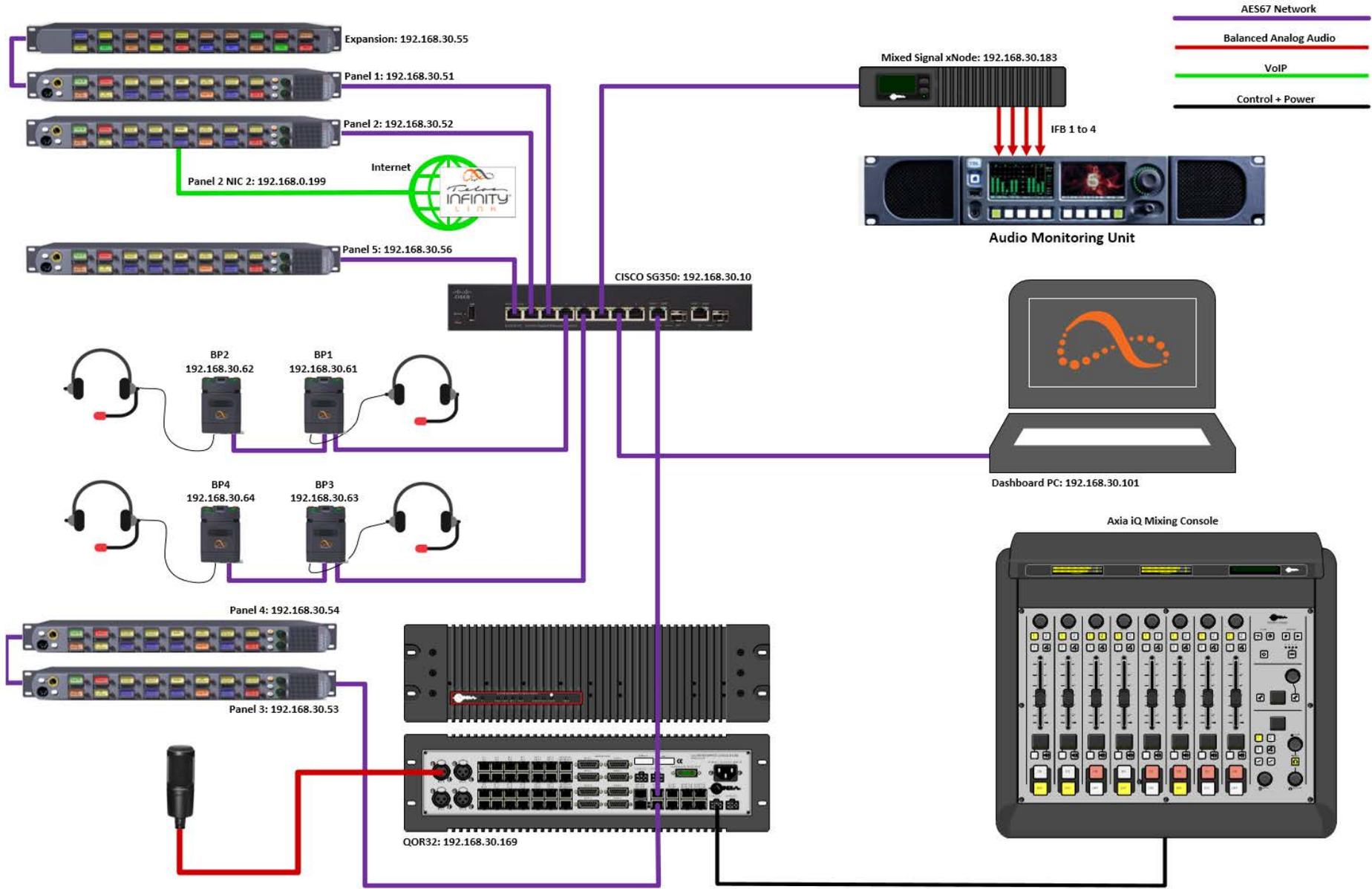
SMPTE 2110

Proprietary Connections

Balanced Analog Audio

SDI Video





AES67 Network

Balanced Analog Audio

VoIP

Control + Power

Mixed Signal xNode: 192.168.30.183

IFB 1 to 4

Audio Monitoring Unit

Dashboard PC: 192.168.30.101

Axia iQ Mixing Console

CISCO SG350: 192.168.30.10

QOR32: 192.168.30.169

Expansion: 192.168.30.55

Panel 1: 192.168.30.51

Panel 2: 192.168.30.52

Panel 5: 192.168.30.56

Panel 2 NIC 2: 192.168.0.199



BP2: 192.168.30.62

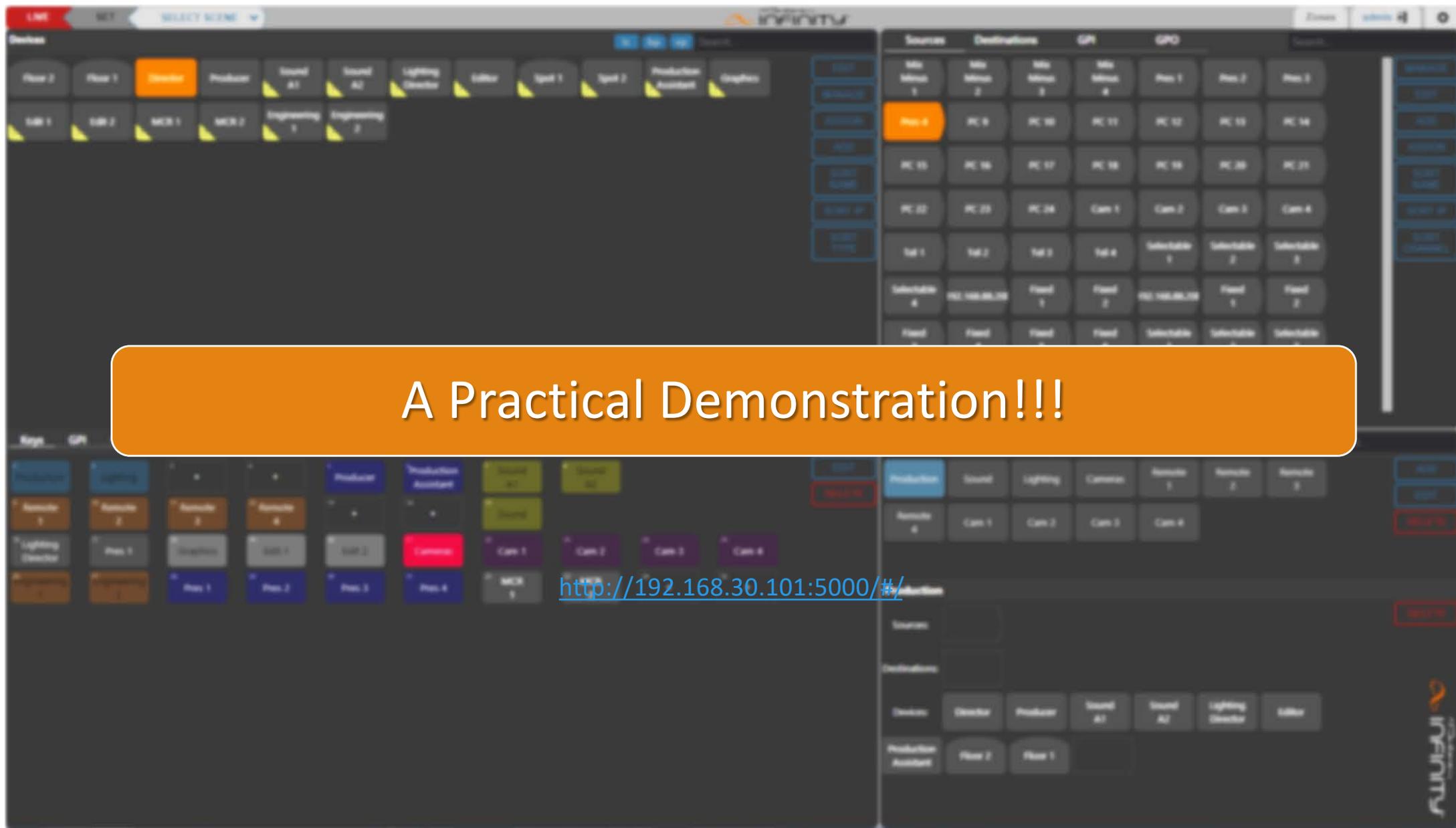
BP1: 192.168.30.61

BP4: 192.168.30.64

BP3: 192.168.30.63

Panel 4: 192.168.30.54

Panel 3: 192.168.30.53



A Practical Demonstration!!!

<http://192.168.30.101:5000/#/>

