Wisconsin Broadcaster Clinic 2022

October 2022

Who is Orban?

- Founded 50 years ago by Robert Orban
- Today – Audio Processing Experts with offices in Stuttgart, Philadelphia and San Francisco; US and Germany production
- Processing over 14,800 Broadcasts and Live Events every year

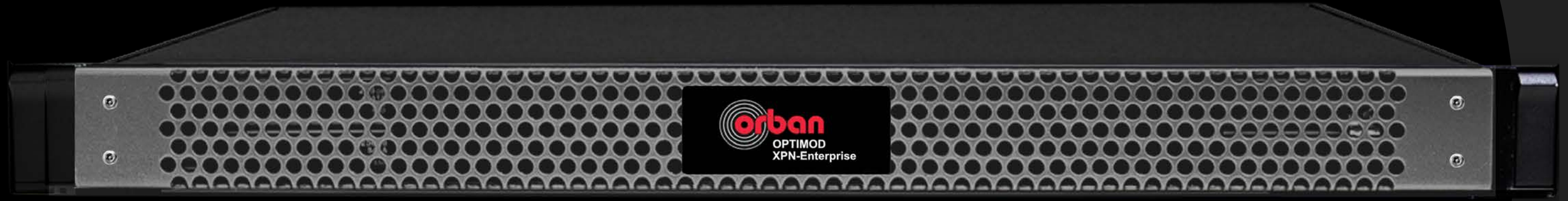


We Are Audio Processing

- Loudness + Dynamic Range measurement and control
- Stereo and multi-channel surround technologies
- Broadcast, consumer and content creation applications

Introducing: Orban XPN-Enterprise

- Linux-based Dell Blade
- Processing power of 8 OPTIMOD 8700i in 1RU using FM/HD Nodes



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STL Use

- FM: 950 MHz composite STL was the “standard” for FM until HD Radio came along
- AM: Used everything from equalized lines to 950 MHz STL to telco dry pair to you name it
- HD Radio made things more complex
- Fast Forward to today - we are looking at a much more complex “last mile” problem with Cloud broadcasting

What at your transmitter site - How many of you?

- Have fiber to your transmitter sites
- Have reliable 5G coverage at your transmitter sites (greater than 4 bars)
- Have both at the same site
- Have remote sites fed via satellite (or something else)
- Have EAS receivers at transmitter sites
- Are encoding Nielsen PPM

The last mile problem

- If Cloud based radio is going to work, we are going to have to look at delivery systems
- Sites with fiber are going to be easier than sites without
- Sites with 5G are going to be easier than sites without but it’s going to be a lot more expensive than fiber
- Sites without either are going to be looking at different delivery options
  - ✓ StarLink
  - ✓ Microwave to a point of presence (POP)
- Combinations of the above for improved reliability

Other Considerations

- RDS
- EAS
- Nielsen PPM encoding
- Local insertion

All have to be considered

How Much Bandwidth Do You Need?

The usual answer is: **More! - s**ome of that will depend on what you need to send:

- FM & HD-1
- HD-2, HD-3, HD-4, HD-5 & HD-6?
- Send the HD’s as audio or PAD (E2X)?
- AoIP?
- Lossy Compressed Composite (uMPX and APTmpx)?
- RDS (very low bandwidth)

Early Solutions

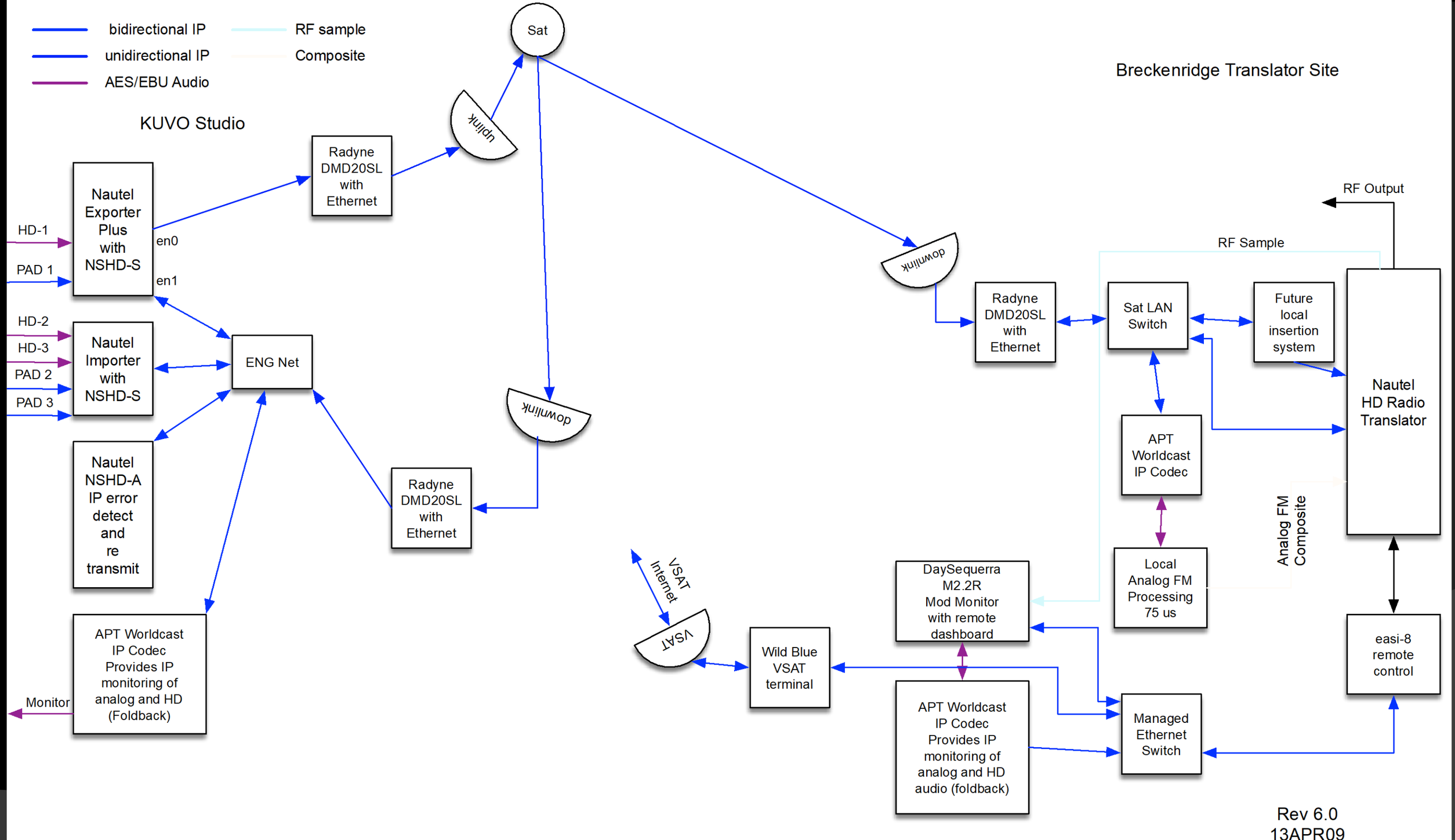
In 2009 we needed to feed a translator site in Breckenridge CO and a full power FM station in Vail:

- T-1 would have had to traverse three carriers and then microwave up to the translator
- No reliable, cost-effective solution for Vail
- And we needed FM and HD-1, HD-2 & HD-3

It Worked

HD Radio PAD/E2X was the transport stream

- Shipped via C-Band satellite - better weather performance than KU-Band
- Data stream fits into a standard C-Band 192 kbps channel
- Recovered the FM audio from the HD-1 stream locally
- Cheaper and more reliable than T-1 across three different carriers!
- That was 2009 – **there are many more options today**


bidirectional IP
unidirectional IP
AES/EBU Audio
RF sample
Composite
Breckenridge Translator Site
KUVO Studio
Sat
uplink
downlink
Radyne DMD20SL with Ethernet
Nautel Exporter Plus with NSHD-S
HD-1
PAD 1
en0
en1
HD-2
HD-3
PAD 2
PAD 3
Nautel Importer with NSHD-S
ENG Net
Nautel NSHD-A IP error detect and re transmit
APT Worldcast IP Codec Provides IP monitoring of analog and HD (Foldback)
Monitor
Radyne DMD20SL with Ethernet
downlink
Radyne DMD20SL with Ethernet
RF Output
RF Sample
Sat LAN Switch
Future local insertion system
Nautel HD Radio Translator
APT Worldcast IP Codec
Analog FM Composite
Local Analog FM Processing 75 us
VSAT Internet
VSAT
Wild Blue VSAT terminal
DaySequerra M2.2R Mod Monitor with remote dashboard
APT Worldcast IP Codec Provides IP monitoring of analog and HD audio (foldback)
Managed Ethernet Switch
easi-8 remote control
Rev 6.0
13APR09

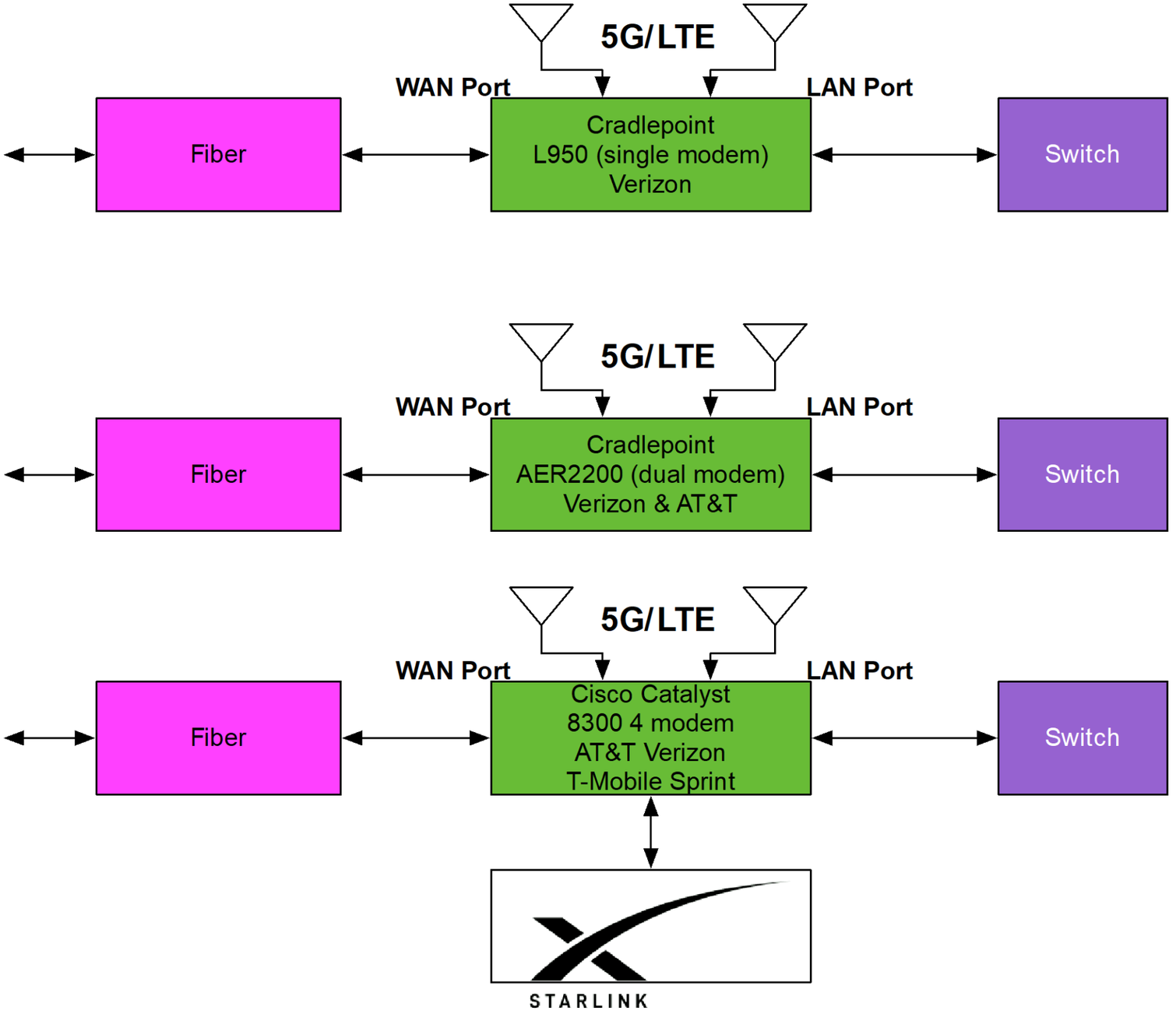
Cloud-based radio broadcasting and the last mile problem

- The first thing to consider is what you need to get to the site in what format and at what data rate
- Then consider anything else you need to get to and from the site:
  - ✓ EAS
  - ✓ RDS
  - ✓ Local insertion
  - ✓ What else?

Reliability & Cost Tradeoff

The question becomes how much reliability are you willing to pay for?
Every solution has its vulnerabilities (and costs)

- Fiber (backhoe and other problems)
- 5G (multiple instances of millions of customers being off air for days)
- StarLink (weather and other potential vulnerabilities)
- Microwave (weather and interference)
- Or a combination of solutions to improve reliability?


5G/LTE
WAN Port
LAN Port
Fiber
Cradlepoint
L950 (single modem)
Verizon
Switch
5G/LTE
WAN Port
LAN Port
Fiber
Cradlepoint
AER2200 (dual modem)
Verizon & AT&T
Switch
5G/LTE
WAN Port
LAN Port
Fiber
Cisco Catalyst
8300 4 modem
AT&T Verizon
T-Mobile Sprint
Switch
STARLINK

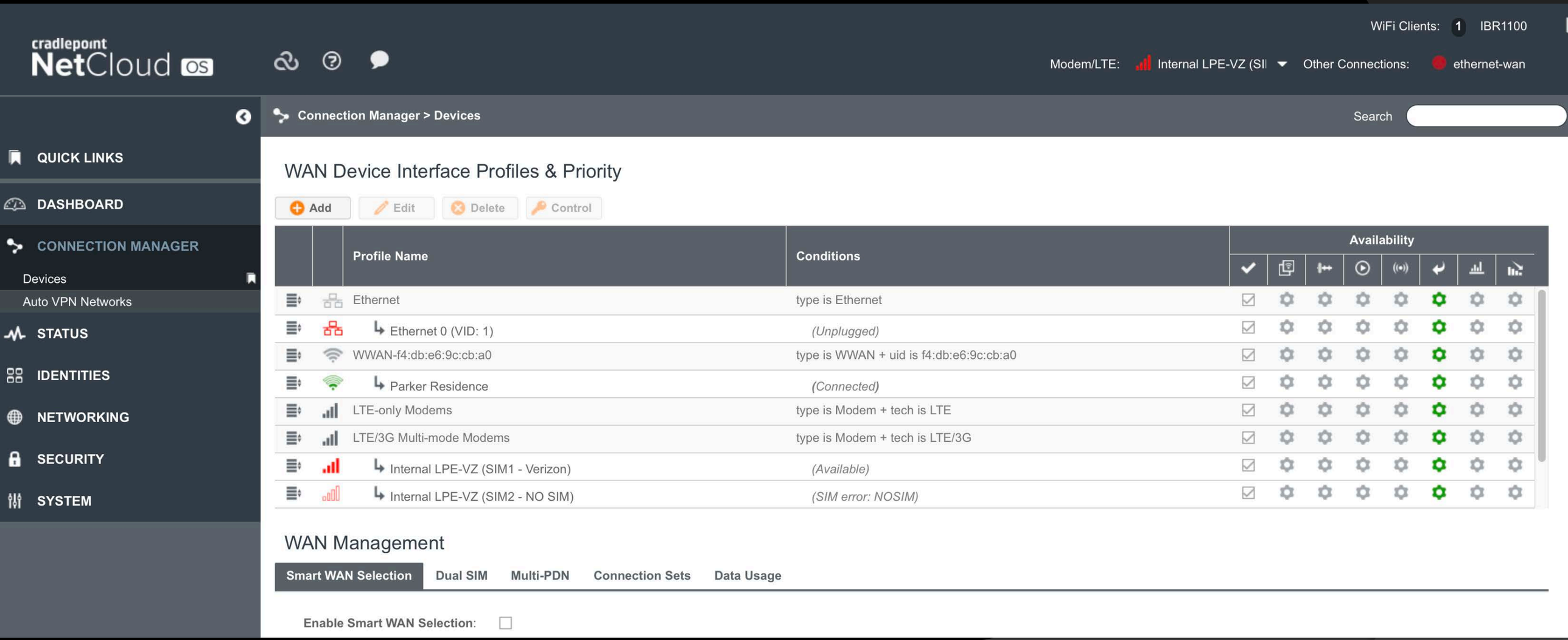
Speed Test results

	Down	Up	Ping
Fiber	913	809	17
StarLink Consumer	20	2.5	125
Verizon (1 bar)	10	1	135

Cellular - LTE/5G

- Managing multiple carriers and hard IP addressing can be an issue
- KORE Wireless can provide remote carrier changes and provide firewall protected hard IP addresses that are carrier agnostic
- DNAV can provide setup and installation
- Others can provide these types of services, too

IBR 1100


cradlepoint NetCloud OS
WiFi Clients: 1 IBR1100
Modem/LTE: Internal LPE-VZ (SI
Other Connections: ethernet-wan
Connection Manager > Devices
Search
QUICK LINKS
DASHBOARD
CONNECTION MANAGER
Devices
Auto VPN Networks
STATUS
IDENTITIES
NETWORKING
SECURITY
SYSTEM
WAN Device Interface Profiles & Priority
Add
Edit
Delete
Control
Profile Name
Conditions
Availability
Ethernet
type is Ethernet
Ethernet 0 (VID: 1)
(Unplugged)
WWAN-f4:db:e6:9c:cb:a0
type is WWAN + uid is f4:db:e6:9c:cb:a0
Parker Residence
(Connected)
LTE-only Modems
type is Modem + tech is LTE
LTE/3G Multi-mode Modems
type is Modem + tech is LTE/3G
Internal LPE-VZ (SIM1 - Verizon)
(Available)
Internal LPE-VZ (SIM2 - NO SIM)
(SIM error: NOSIM)
WAN Management
Smart WAN Selection
Dual SIM
Multi-PDN
Connection Sets
Data Usage
Enable Smart WAN Selection:

Public Internet, InfoSec & Management

- Managing latency
  - APT SureStream (Always-On Redundancy)
  - Next-Gen AoIP interfaces can handle 500 ms of latency
- Security
  - Hardware VPN
    - Setup for Site-to-Site
- Management
  - Separate network from AoIP

Cellular Carriers - FirstNet

- AT&T Dedicated Band 14 for “Public Safety” “First Responders”
- I asked the NAB if they could get Broadcasters listed for FirstNet as Broadcasters provide critical communications to the public during disasters
- David Layer @ NAB
- Potential for better service that is more resilient
- More cost effective
- If Broadcasters can get access

Reduced Bandwidth

- Just some sample ideas on how to provide backup to primary STL using everything from 5G on multiple carriers to StarLink
- Which now gets us to running reduced bandwidth

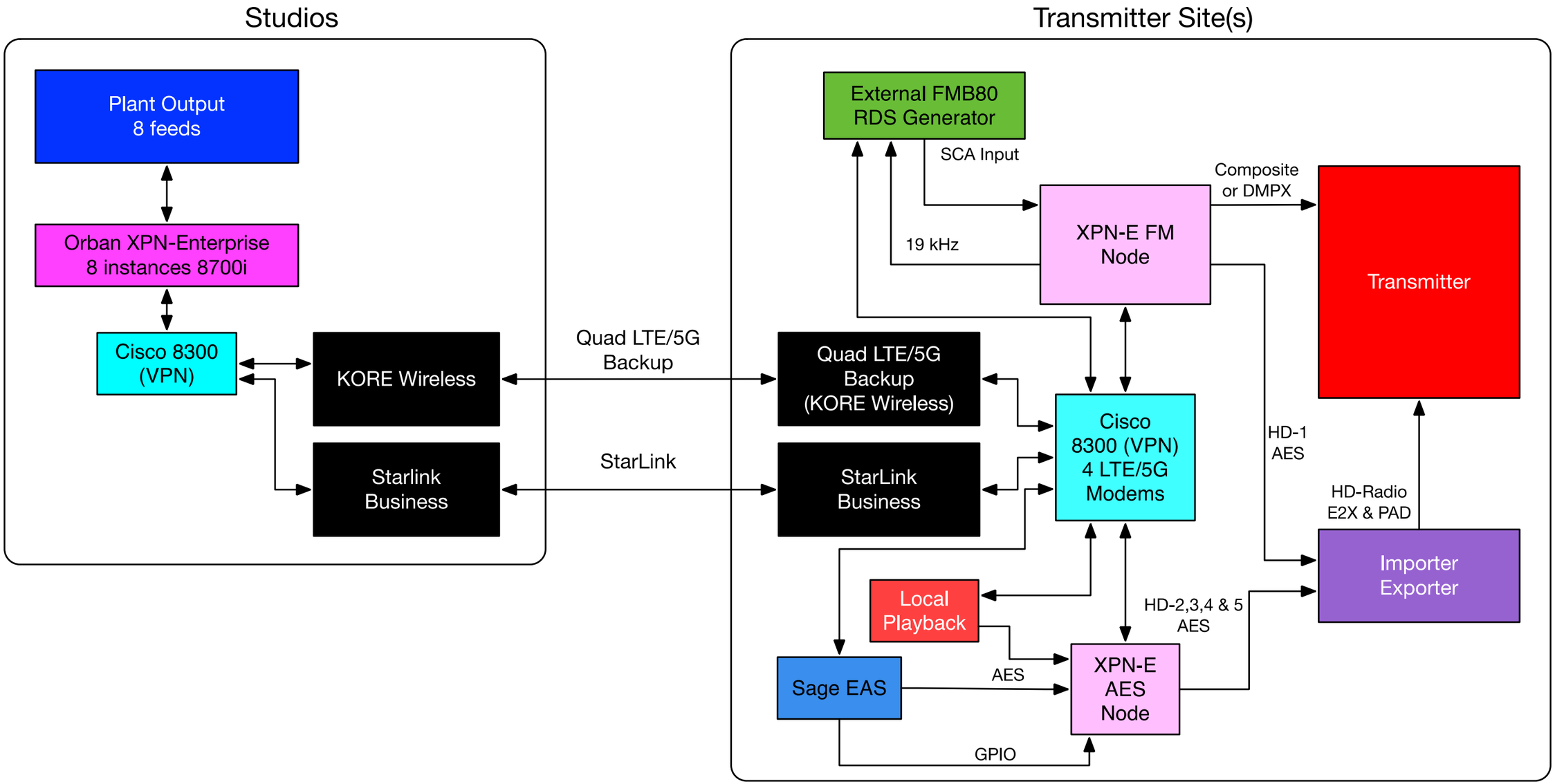
Lossy Compressed Composite

- uMPX
- APTmpx
- Note that care has to be taken with Nielsen PPM encoding with lossy compression
- You can get down to below 500 kbps
  - ✓ Audio is going to be impacted at very low data rates
  - ✓ Nielsen PPM encoding may be impacted

Lossy Compressed Audio

- If you are processing audio in the Cloud
- Most codecs do not “enjoy” 75 us pre-emphasis
- You will end up with peak control issues
- That’s going to have to be fixed at the transmitter site
- Then you need to turn that into something that can drive a transmitter

XPN-Enterprise Simplified System Block Diagram

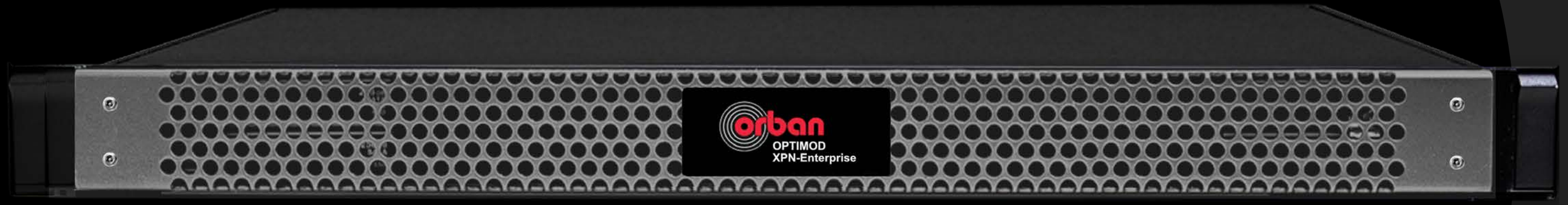


DEMO

- DNAV Booth has a Cradlepoint being fed with a Sports Talk station
- The audio is being fed to ENCO's booth to demonstrate their automated radio captioning system called enCaption

Introducing: Orban XPN-Enterprise

- Linux-based Dell Blade
- Uses Ross Video's softGear platform



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Questions?

Thank You!

Resources

- CradlePoint: https://cradlepoint.com
- APT: https://www.worldcastsystems.com/en/c57p7/secured-ip-transport/surestream
- KORE Wireless: https://www.korewireless.com
- DNAV: https://dnavinc.com