

*Better
Faster
Cheaper* *and
Happier!*

Using Today's Lower-Cost Technology
for Perfect Audio Now
and TOMORROW

Kirk Anders HARNACK
The Telos Alliance

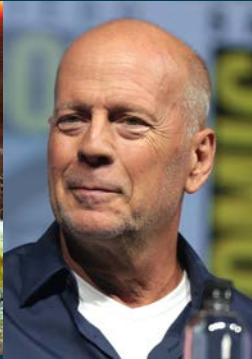
Technologies



- It won't work
- It may work, but that's not meant for broadcast.
- Ch, we do that, too.



Disruptive Challenges

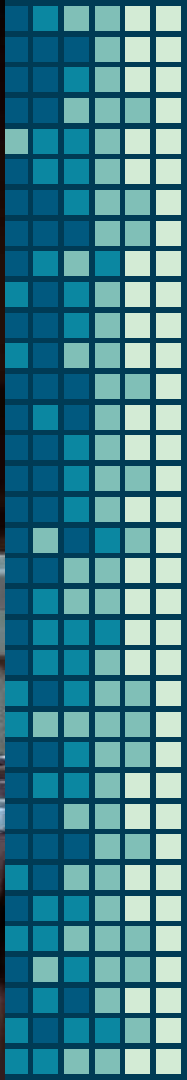


The Purpose-Built Paradigm

Individual devices in an audio distribution and processing rack.
1992, Orleans, France







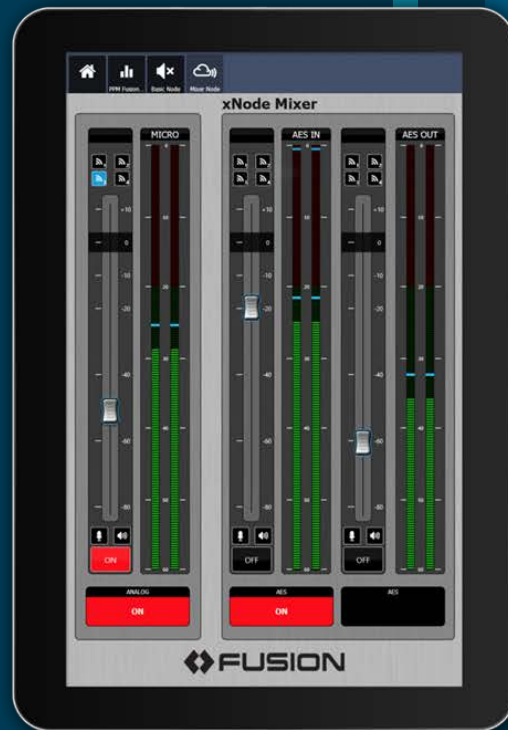


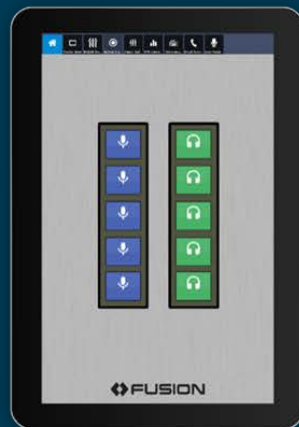
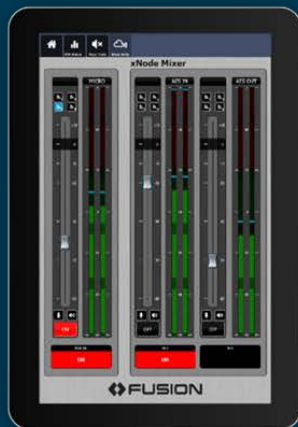
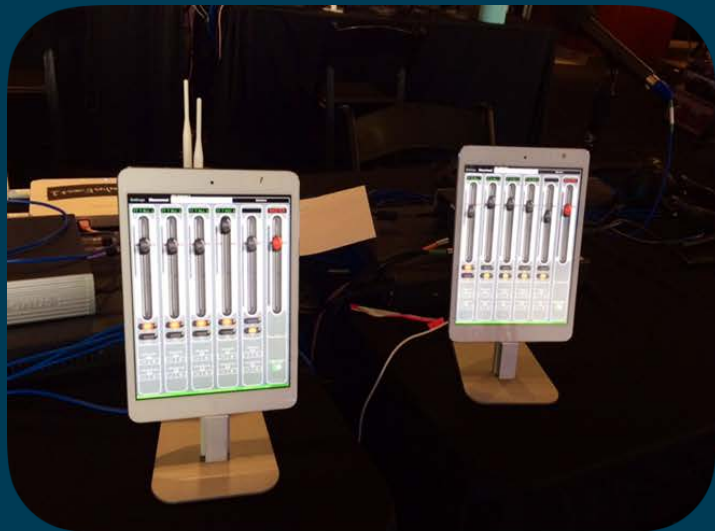
Early Virtualization

KLIN-AM		Jan-03-2000 Monday		4-ABS	
6A	Time 2:30/15:30 (16%)	Units 5/15 (33%)		↓	0 bumps
:00	TOP-OF-HOUR NEWS/ID {2:30}				
1:30↓	6:01a DataStar, Inc.	0:30	c1234	15.00	#14
	6:02a				
	6:03a Lincoln Lighting Center	0:30	321	19.00	#4
	6:04a				
:15	Block #2 {3:00}				
3:00↓	6:15a				
	6:16a				
	6:17a				
	6:21a				
:30	Block #3 {3:30}				
2:30↓	6:30a Drugs R Us	0:30	1	3.68	#45
	6:31a				
	6:32a Darrell's Dice Shop	0:30	1234	32.45	#24
	6:40a				
:45	Block #4 {3:00}				
2:30↓	6:44a Duvall's Cave of Wax	0:30	405	12.00	#46
	6:46a				
	6:47a				



Recent Virtualization





Radio Shack
AMERICA'S TECHNOLOGY STORE

PRESIDENT'S BIRTHDAY SALE!

DON'T DELAY! 3-DAY SPECIALS ABOVE GOOD SATURDAY THRU MONDAY ONLY!

0% \$5,225 in 2013 dollars for 13 products in this ad

INTRODUCTORY SPECIAL!

Save \$670
\$1599

BONUS PACKAGE

Save \$100
\$799

3-Way Speaker With Massive 15" Woofer

Save \$110
\$14995

Mobile Cellular Telephone

Save \$100
\$199

Deluxe Portable CD Player

Save \$40
\$15995

Tiny Dual-Superhet Radar Detector

Save \$60
\$7995

Compact 10-Channel Desktop Scanner

Save \$30
\$9995

Mobile CB With Channel Controls on Mike

HALF PRICE!
\$4995

Our Easiest-to-Use Phone Answerer

Cut 17%
\$4995

Handheld Voice-Activated Cassette Tape Recorder

40% Off
\$2995

20-Memory Speed-Dial Phone

Cut 33%
\$2995

Check Your Phone Book for the Radio Shack Store or Dealer Nearest You.

Most Major Credit Cards Welcome

Those products now fit in your pocket with a \$200 iPhone



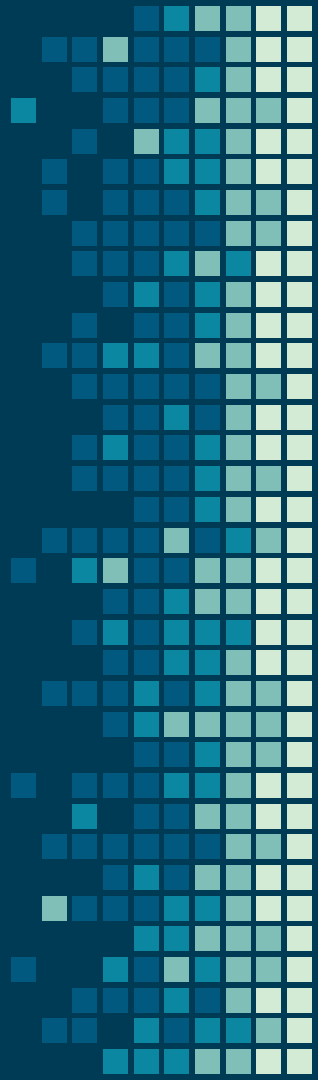
Technologies

VoIP=Voice Over IP

AoIP=Audio Over IP

IoIP=Intercom Over IP

MbIP=MPX Over IP

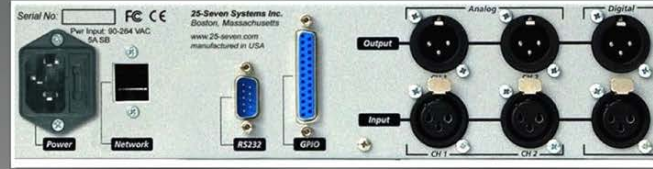


VoIP = Voice Over IP



AoIP=Audio Over IP

ETHERNET EVERYWHERE



THE TELOS ALLIANCE™



AoIP=Audio Over IP



AoIP=Audio Over IP

MORE SERENDIPITY

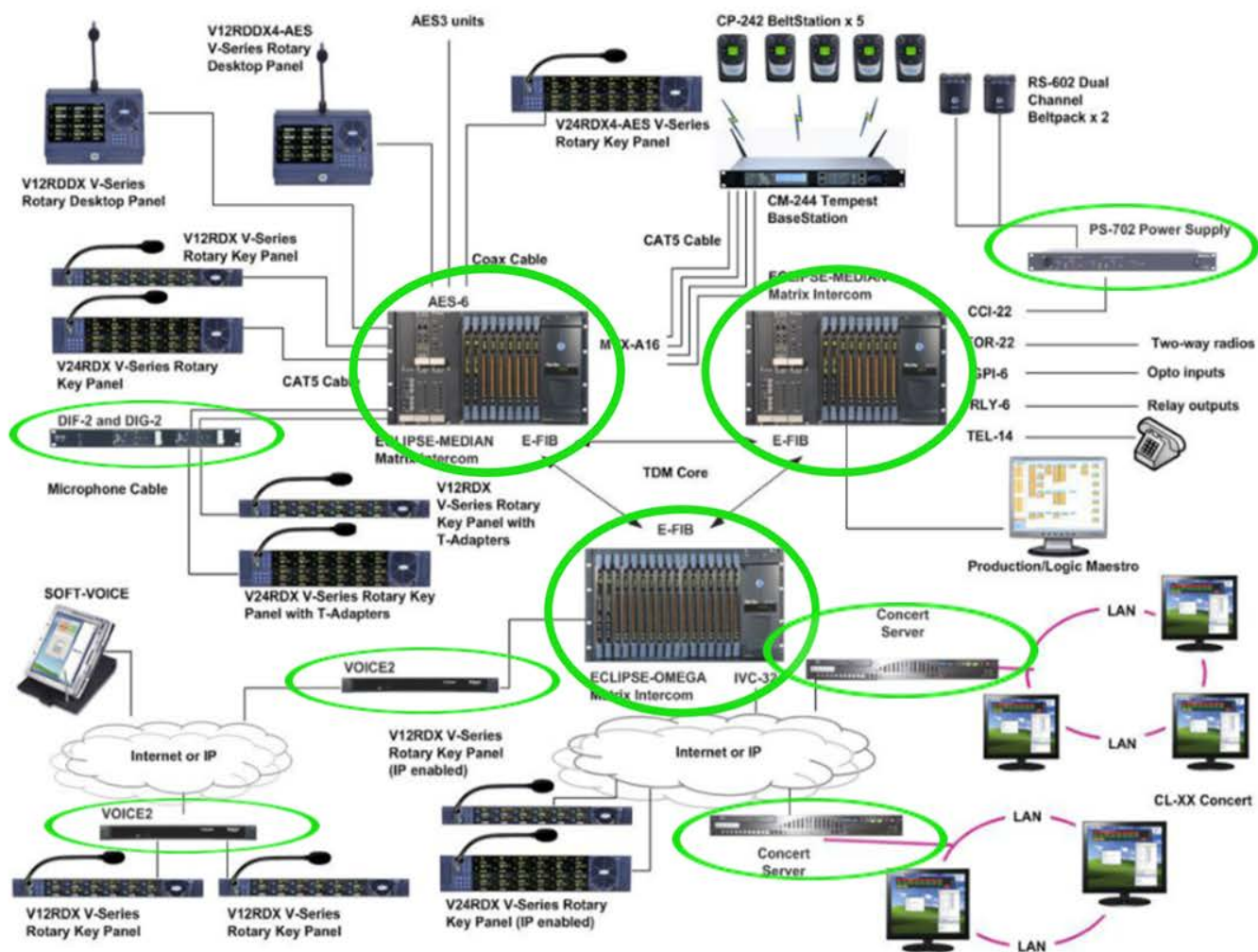


IoIP=Intercom Over IP



Diagram showing how traditional Matrix Intercom connects

All of the components pieces with a green highlight are replaced by AoIP connectivity using network distributed DSP from the Telos Infinity System, or by a software product that is part of the Dashboard software suite

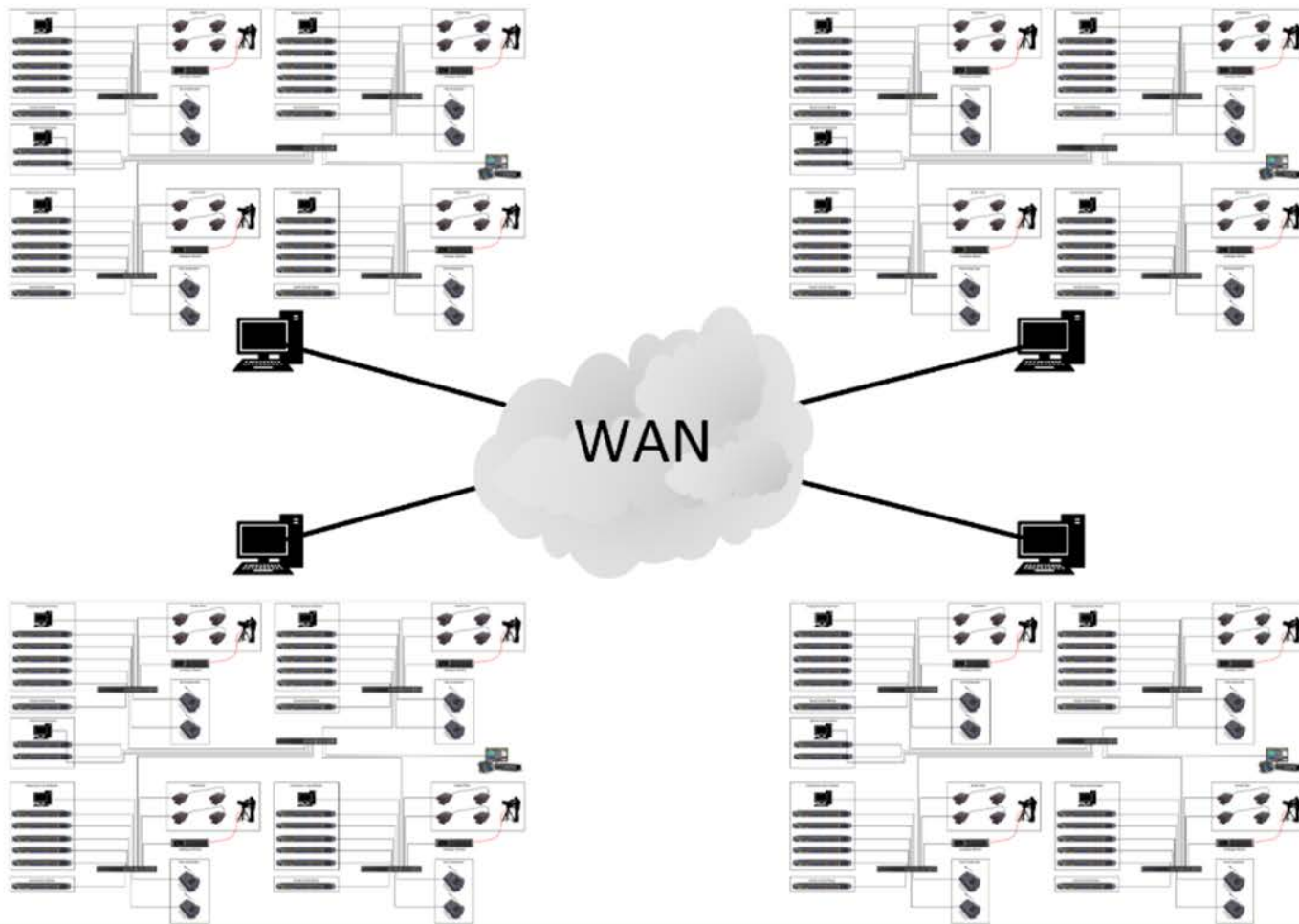


Multi Site System

Sites are connected using Telos Infinity Trunkmaster software servers equipped with the adaptive OPUS VoIP codec

Dashboard manages each local client with overall administrative control assigned to one or more Master Control operations

Transparent high bandwidth WAN connections should work directly via either Multicast or Unicast connections



MbIP=Multiplex Over IP

Omnia MPX Node - Delivers FM MPX over IP

Any FM Processor
with Stereo Generator



Analog
MPX



MPX or μ MPX
Encode to IP

Private IP Link
Public Internet
WAN, etc.

FM Transmitter



Analog
MPX



IP Decode
to MPX

Omnia MPX Node - Decodes μ MPX

Omnia.9 FM Processor
with μ MPX Option



Private IP Link
Public Internet
WAN, etc.

FM Transmitter



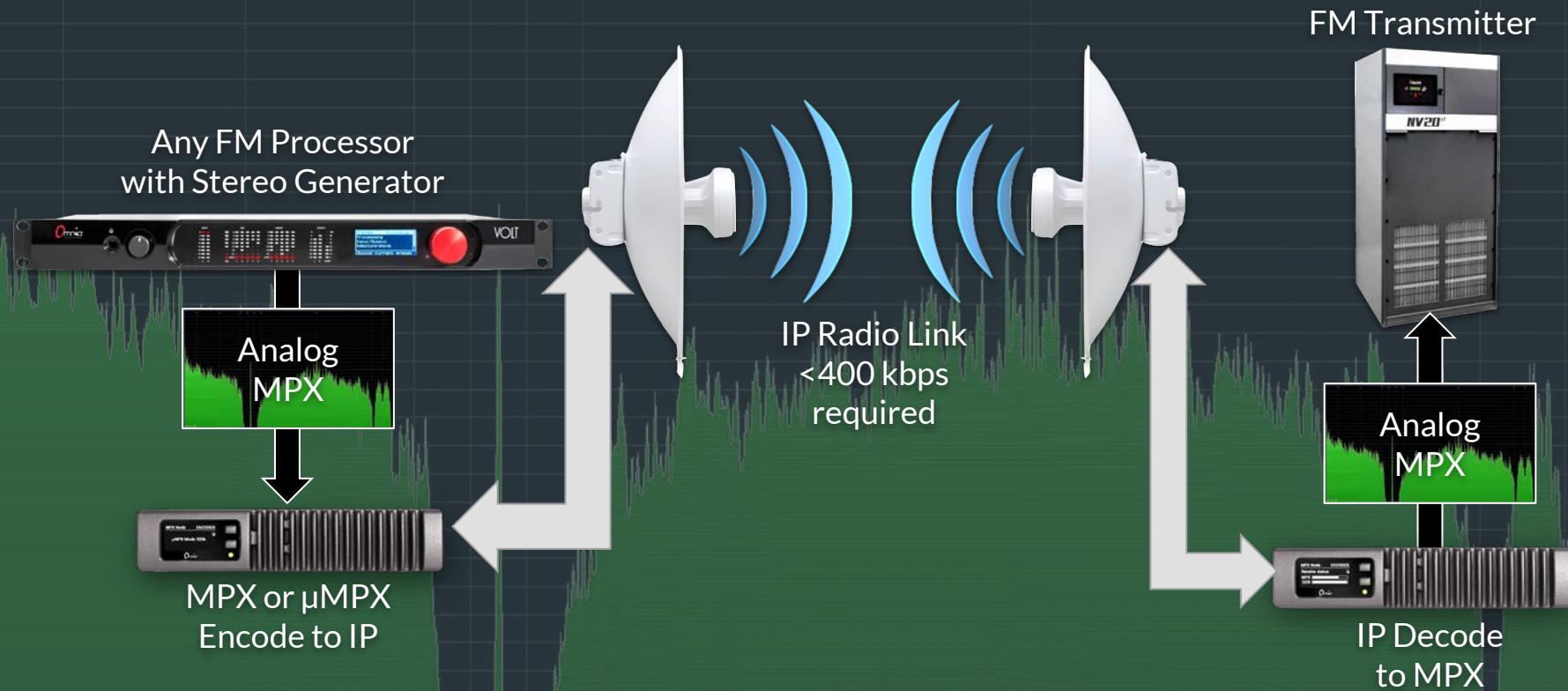
Analog
MPX



IP Decode
to MPX



Omnia MPX Node - Applications - Main or Backup STL

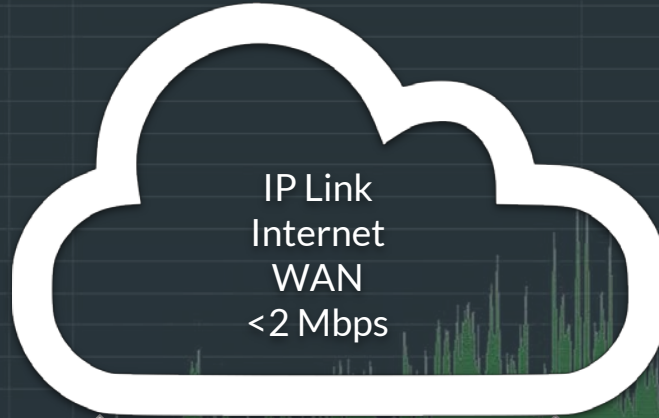


Omnia MPX Node - μ MPX- 5 FM Stations - <2 Mbps

Example:
5 FM Stations'
Processing



Router



IP Link
Internet
WAN
<2 Mbps

Example:
To 5 FM
Transmitters

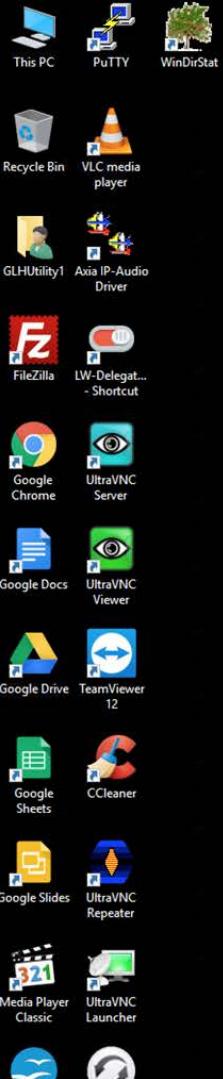


Router

Disrupting Technologies

=

Enabling Technologies



WIBT Silence Detector

Levels: Audio Left -10 dB, Audio Right -10 dB, Threshold: -25 dB

Status: Alarm not active, Last silence: 18.01 18:41, Since: 12.01.2018 3:57

Mixer, Setup, Hide, Exit

WIQQ Silence Detector

Levels: Audio Left -11 dB, Audio Right -18 dB, Threshold: -25 dB

Status: Alarm not active, Last silence: 12.01 7:07, Since: 12.01.2018 3:57

Mixer, Setup, Hide, Exit

WDTL Silence Detector

Levels: Audio Left -11 dB, Audio Right -10 dB, Threshold: -25 dB

Status: Alarm not active, Last silence: 12.01 3:58, Since: 12.01.2018 3:57

Mixer, Setup, Hide, Exit

WNIX Silence Detector

Levels: Audio Left -12 dB, Audio Right -12 dB, Threshold: -30 dB

Status: Alarm not active, Last silence: 17.01 7:59, Since:

Mixer, Setup, Hide, Exit

KZYQ Silence Detector

Levels: Audio Left -12 dB, Audio Right -13 dB, Threshold: -29 dB

Status: Alarm not active, Last silence: Since:

Mixer, Setup, Hide, Exit

Z/IPStream X/2

localhost

Apps, CLE, GLH, GWO, Heads, IND, PPG, Other bookmarks

Control Panel

+ New

KZYQ-FM

Source: KZYQ-FM

Preset: Omnia 3: Sparkle

Encode: HE-AAC v2, 48 Kbps, stereo

Status: Started: All streams online

WDTL Tuner

Source: WDTL Tuner

Preset: None

Encode: HE-AAC v2, 56 Kbps, stereo

Status: Started: All streams online

WDTL-FM

Source: WDTL-FM

Preset: Omnia 3: Sparkle

Encode: HE-AAC v2, 48 Kbps, stereo

Status: Started: All streams online

WIBT Tuner

Source: WIBT Tuner

Preset: None

Encode: HE-AAC v2, 56 Kbps, stereo

Status: Started: All streams online

WIBT-FM

Source: WIBT-FM

Preset: Omnia 3: Sparkle

Encode: HE-AAC v2, 48 Kbps, stereo

Status: Started: All streams online

WIQQ-FM

Source: WIQQ-FM

Preset: Omnia 3: Sparkle

Encode: HE-AAC v2, 48 Kbps, stereo

Status: Started: All streams online

WNIX

Source: WNIX

Preset: Omnia 3: Talk

Encode: HE-AAC v2, 48 Kbps, stereo

Status: Started: All streams online

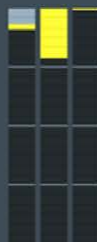
AGC



MULTIBAND 1



MULTIBAND 2



SB



CLIPPER



Multiband 1

Band Controls

Bands



Band Controls

BAND CONTROLS

Speed

Levels

Sound

Gate

Density

+0.00 dB



+0.00 dB



-0.37 dB

**Threshold**

-15.49 dB



-11.17 dB



-11.36 dB

**Limit**

+0.24 dB



+4.41 dB



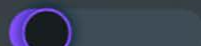
+6.34 dB

**Band Mix**

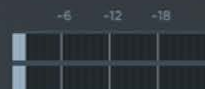
-3.35 dB



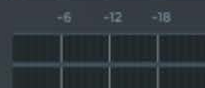
-1.21 dB



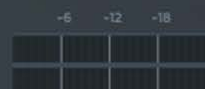
-1.41 dB



46 Hz



81 Hz



221 Hz

Bands

BANDS



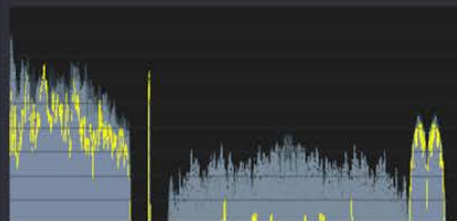
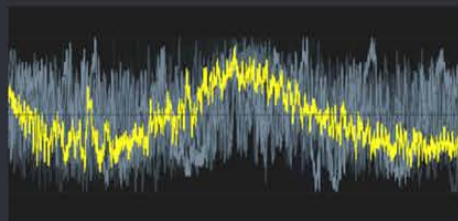
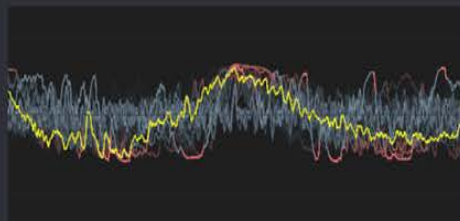
INPUT

INPUT

OUTPUT

MPX

OUTPUT



μ MPX

Error correction

μ MPX

Bitrate

320 kbit/s (standard)

Keyframe Interval



Streams

On



IP

160.3.236.134

Port

8854

NIC

Automatic

On



Port

NIC



Enabling Technology

Platform Virtualization

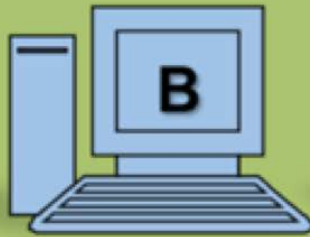
- Using software in efficient, resilient, and redundant scenarios.
- Using better hardware, and using it more fully.

LAYERS

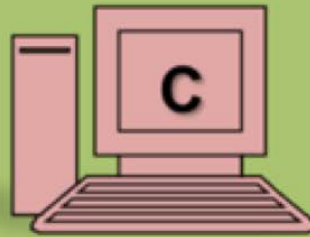
VIRTUALIZATION



Windows



Linux



Solaris x86

Virtual Machines

VMM

VMM

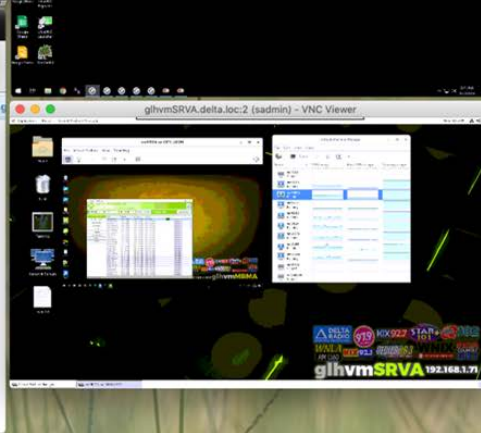
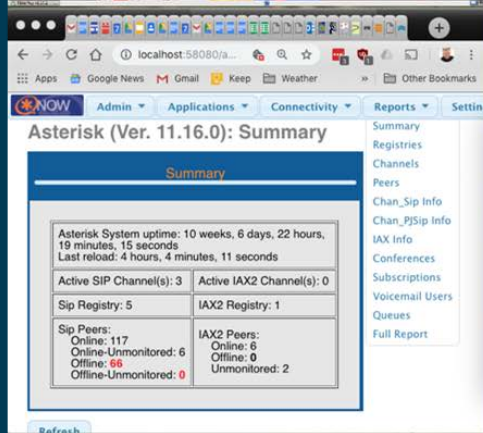
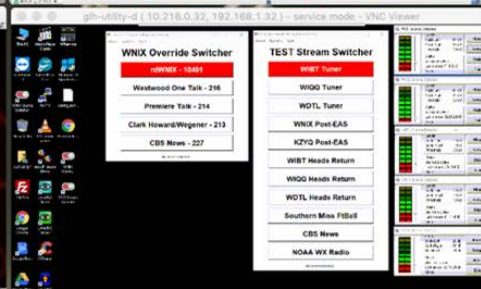
VMM

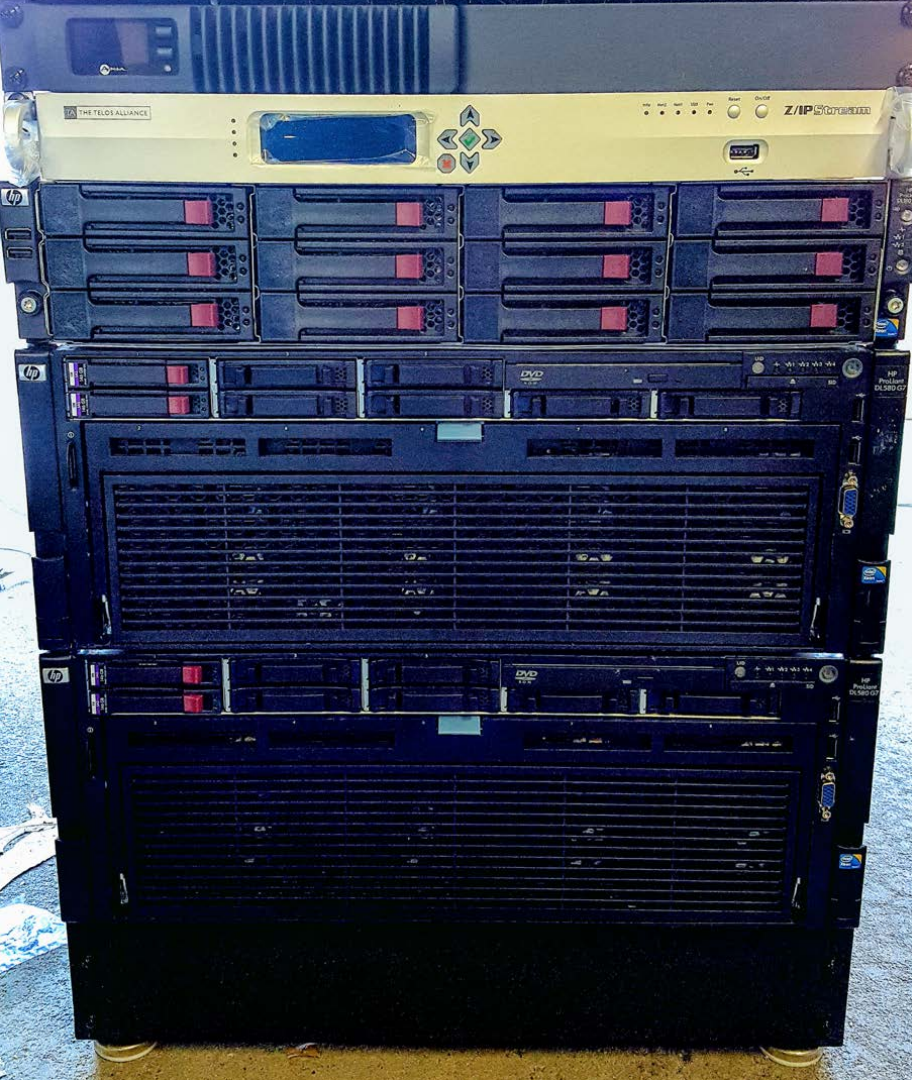
Hypervisor

PHYSICAL

Physical Hardware





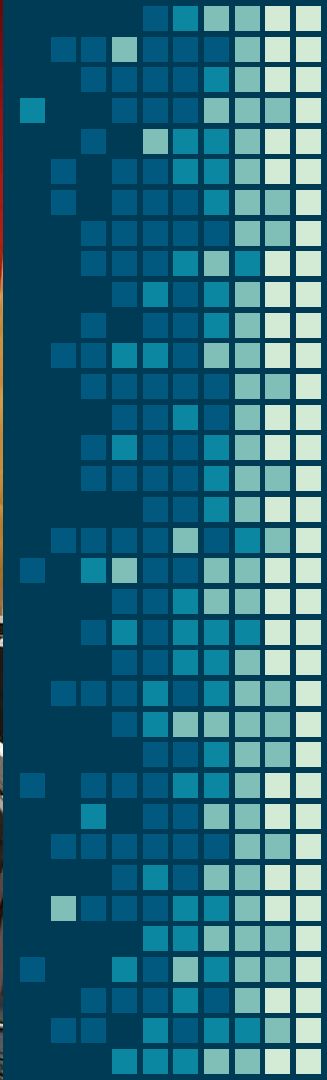


Virtualized Station Clusters

- 30 Radio Stations in 18 Rack Units
- All Livewire AoIP
- Connect Axia Fusion to any of them
- Experimental

BBC

BBC Local Radio has Virtualized Playout, Cloud Mixing, Phones, and Codecs. Many resources are shared, allocated dynamically as needed.



Pathfinder Core PRO Appliance or VM?

The image displays several screenshots of the Xcira Pathfinder Core Control Center software interface, illustrating its capabilities for network management and security.

Top Left Screenshot: Shows the main dashboard with a sidebar menu on the left containing options like Audio Alarms, Clusters, Device Emulators, Email Messages, Logic Flows, Logs, Memory Slots, Routers, Scenes, Systems, Backup/Restore, Bank Control, Configuration, Email Settings, Services, Time, Upload Update, Timers, User Panels, Users, and Vmxc Control. The main area displays a rack of network devices.

Top Right Screenshot: Shows the "Select Source" dialog box, which lists various network devices and their IP addresses. The table includes columns for Availability, Name, Location, IP Address, and Host.

Bottom Left Screenshot: Shows the "Router Details: Axis Audio" configuration screen, which includes a table for "Add Available Sources" and a table for "Router Details: Axis Audio".

Bottom Right Screenshot: Shows the "Logic Flows" configuration screen, which displays a complex logic flow diagram with various components like Delay, AND, OR, and Memory Slot, connected by lines to represent logical operations.

NPM Summary

All Nodes managed by NPM

GROUPED BY REGION

- APAC
- EMEA
- North America
- South America

Active Alerts (143)

ALL UNACKNOWLEDGED ALERTS

ALERT NAME	MESSAGE	TRIGGERING OBJECT	ACTIVE TIME	RELATED NODE
High packet loss	High packet loss	R1	2h 1m	R1
Alert me when an application goes into warning or critical state	Alert me when an application goes into warning or critical state	MSSQLSERVER	2h 7m	vman-2008R2-SQL
High response time	High response time	dev-brn-mkun-01	2h 37m	dev-brn-mkun-01
High response time	High response time	R1	2h 59m	R1
High response time	High response time	R9	3h 4m	R9

Page 1 of 29 Items on page 5 Show all

Displaying objects 1 - 5 of 143

Top 10 Multicast Traffic (6 records)

NODE	MULTICAST TRAFFIC (BPS)	MULTICAST TRAFFIC (PPS)
Router1.lab.local	60.47 kbps	57
Router3.lab.local	60.47 kbps	57
Router4.lab.local	60.45 kbps	57
Router2.lab.local	60.41 kbps	57
Core Router	33.10 kbps	31
Router5.lab.local	0.00 bps	0

List of all VLANs

VLAN ID	NAME	NODE NAME
1	default	
100		
101	Development	
102	R&D	
103	Accounting	
104	Operations	
105	Shipping	
106	Product	
107	IT	
108	Finance	

Page 1 of 5 Items on page 10 Show all

Displaying objects 1 - 10 of 41

NetPath™ - Every Node, Every Path, Every Network

HOP BY HOP ANALYSIS ALONG CRITICAL PATHS

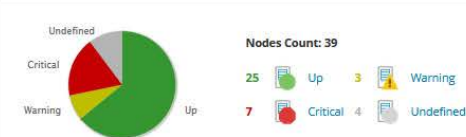
With NetPath™ you can view performance, traffic, and configuration details of devices and applications that are on-premises, in the cloud, or across hybrid environments.

[CHECK OUT THE NETPATH™ DEMO](#)

Like what you see? Get NetPath™ and visually analyze your network.

[DOWNLOAD A FREE TRIAL](#)

Hardware Health Overview



All Wireless Heat Maps

NAME	APS	CLIENTS	LAST GENERATED
1stFloorGood	5	23	1 days ago
2ndfloorMediocre	4	21	1 days ago
3rdFloorPoor	3	20	1 days ago
HQ	15	42	1 days ago

High Errors & Discards Today

Worldwide Map of Orion Nodes



List of Switch Stacks

CAPTION	IP ADDRESS	MAC ADDRESS	MEMBER COUNT	STATUS	DATA RING STATUS	POWER RING STATUS
BOCoreSwitch	10.196.200.250	E9:D6:C0:28:1D:BC	6	Up	Up	Up
EW-3750A	10.199.10.10	40:53:DB:69:A6:59	6	Warning	Warning	Warning
EW-3750B	10.199.10.11	3F:D3:F3:6F:A5:A8	6	Up	Up	Up
HQCoreSwitch	10.196.100.250	F4:33:A4:06:8E:B7	6	Up	Up	Up
Tex-3750a	10.199.1.10	85:44:09:BD:EE:02	6	Up	Up	Up

Interfaces with High Percent Utilization

NODE	INTERFACE	RECEIVE	TRANSMIT
LAB-CLUSTER-011	WAN Miniport (SSTP) - Local Area Connection*	94%	96%
Router3.lab.local	FastEthernet0/0 - Fa0/0	94%	96%
NPM_Cisco_Fibre Channel	vsn1 - iFC interface - vsan1	63%	100%
NPM_Cisco_Fibre Channel	fc1/7	63%	91%
NPM_Cisco_Fibre Channel	fc1/10	62%	91%
Internet Gateway	Ethernet1 - WAN (NetFlow)	85%	65%



Name: 'KHKU-FM DASDEC-1F EAS'



DASDEC-1EN
Analog/Digital EAS
Encoder/Decoder

Software Version: 2.6-0

'2018 05 12 10 26 03 dasdec config'

[Encoder](#)

Decoder

[Server](#)

[Setup](#)

☒ Incoming/Decoded Alerts ☐ Forwarded Alerts ☐ Originated/Forwarded Alerts ☐ All Alerts

WARNING: Change Default Password for user 'Admin'!

[Back](#)

[Refresh](#)

[OpLog](#)

<50.228.171.170>

[User:Admin](#)

Sun Aug 4 09:42:59 2019 HST

[Logout](#)

Auto-Refresh Off

Incoming, Active & Expired Decoded Alerts Status

[Decode Activity](#)

L1-Main Left

R1-Main Right

L2-Aux 1 Left

R2-Aux 1 Right

In Auto-Forward Mode [Configure](#)

Currently Active Decoded Alerts

Chnl/Orig	EAS Type	ID	Start Time	End Time	Location
-----------	----------	----	------------	----------	----------

No Active Decoded Alerts

☐ View alert forwarding action table.

☒ View expired alerts. (uncheck to remove view).

☐ Play audio alarm on browser when page has unacknowledged, active unforwarded alert. *Requires Flash plugin on host computer browser*

☐ View Direct Event Storage Access

Select Expired Alert View

☒ View Expired Alerts ☐ View Expired Alerts Pending Deletion ☐ View Deleted Expired Alerts

Expired Decoded Alerts

444 Records from : 'Fri Aug 3 06:13:23 2018 HST' through 'Fri Aug 2 09:19:59 2019 HST'

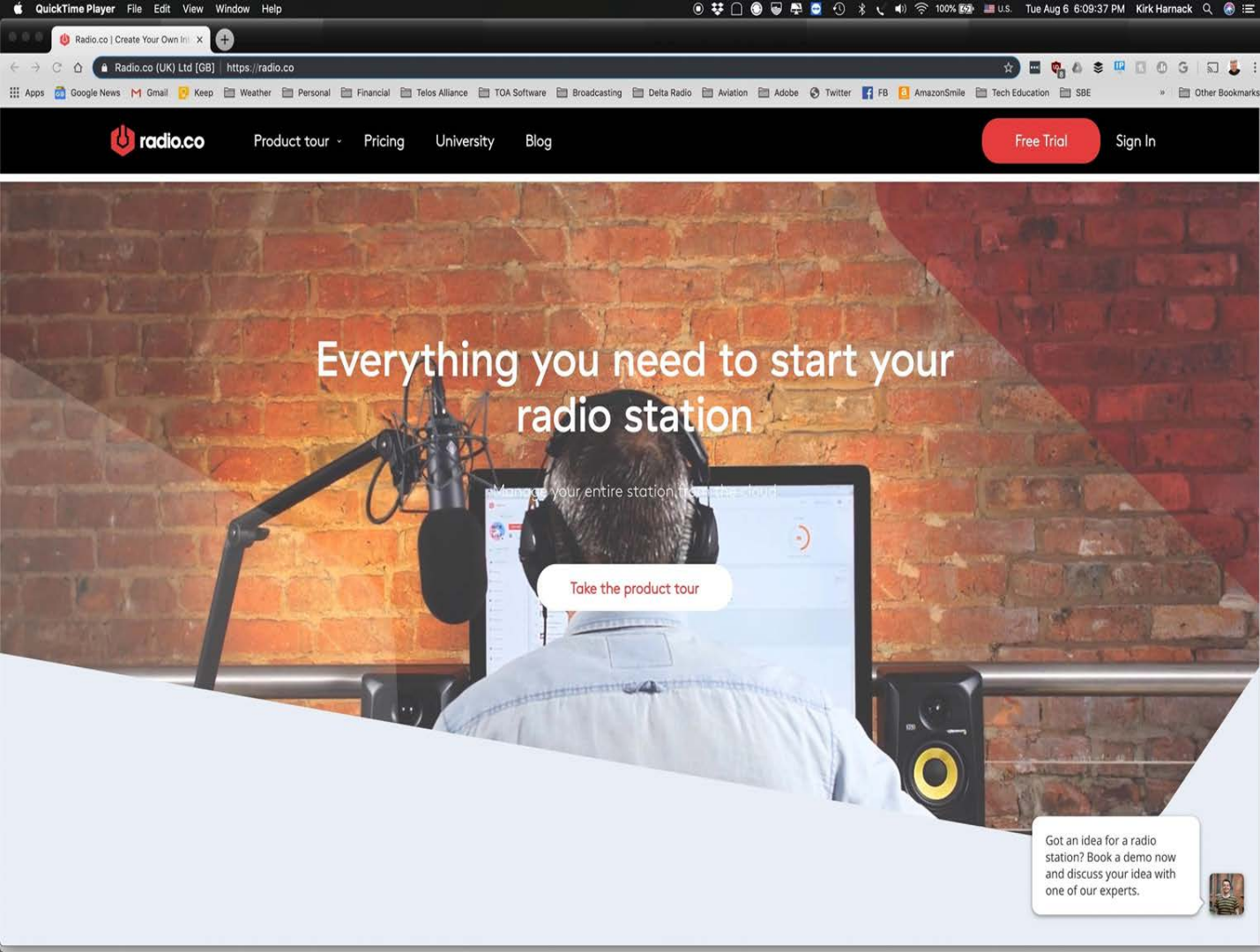
Past 7 Days Alerts

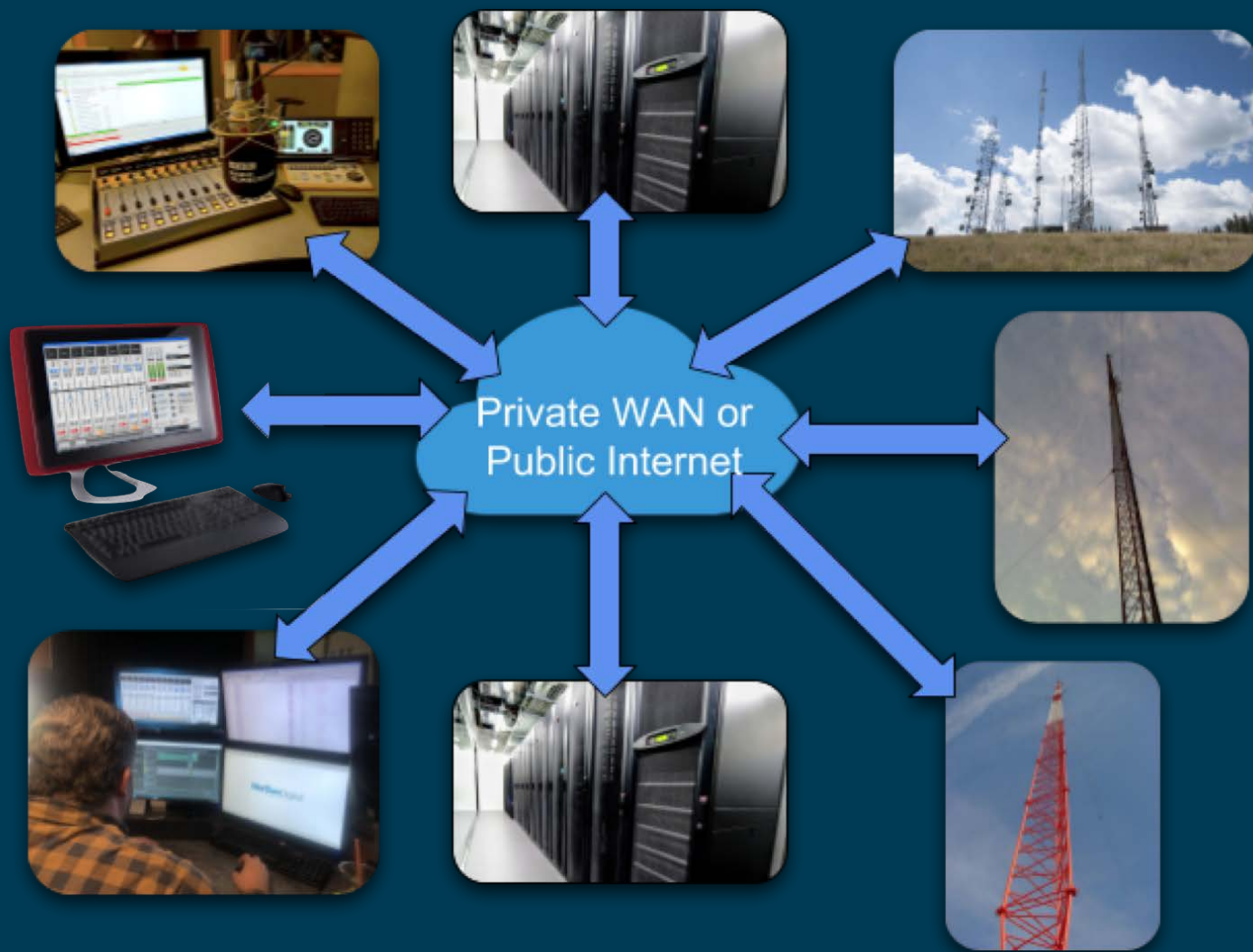
[Expired Alerts Display Control](#)

Jul 29, 2019 to Aug 4, 2019

[Click for text version.](#) ☒ Text version: Categorize alerts. *Enabled.*

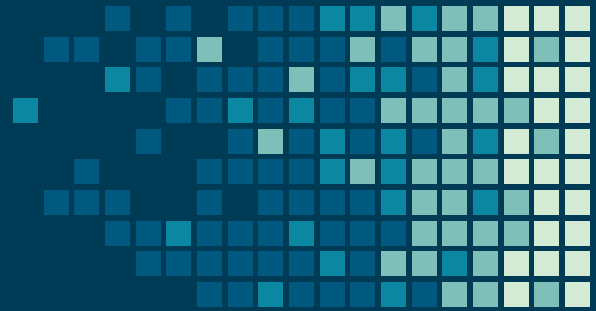
10 alert records displayed.







Inevitable:



IP-Connected
broadcast
infrastructure



Virtualization Provides:

- Flexible Workflows
- Commodity equipment
- Lower capital cost
- Full redundancy



Virtualization Provides:

- Local Virtualization
- Centralized Virtualization

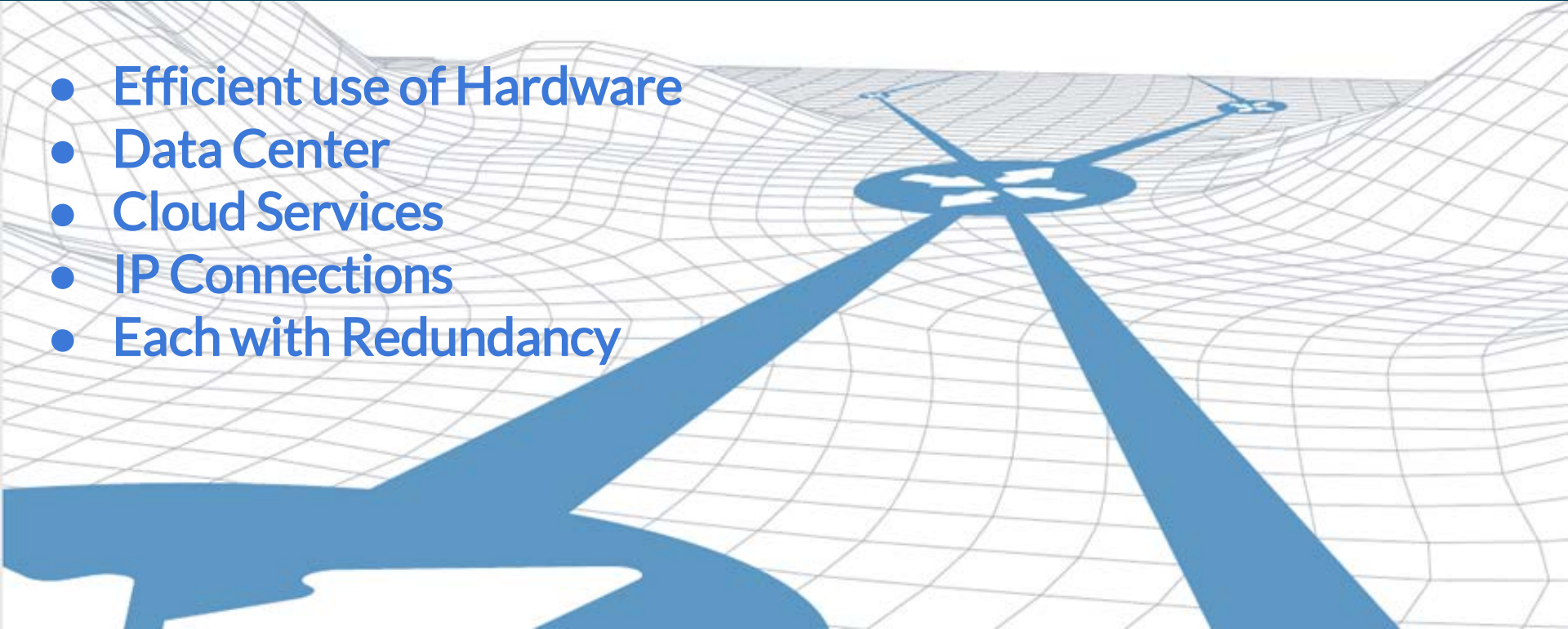


Virtualization Provides:

- Efficient use of Hardware
- Data Center
- Cloud Services
- IP Connections
- Each with Redundancy

Virtualization Provides:

- Efficient use of Hardware
- Data Center
- Cloud Services
- IP Connections
- Each with Redundancy



Take-Away Points:

- Virtualized Workflows imply...
 - Simple Local Studios
 - Talent & Sales can work from anywhere - even from home - effectively
 - Convenient syndicated program distribution - with no sun outages.
 - Even smaller stations can leverage large-scale data center efficiencies.

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Using Today's Lower-Cost Technology
for Perfect Audio Now
and TOMORROW

Kirk Anders HARNACK
The Telos Alliance