## **A New Way Forward**

## Radio Air-Chain INNOVATION

## **NAULEI** Telos Alliance

Webinar 3 of 3, September 10, 2020

### Your questions please?

(if you don't see the control panel, click on the orange arrow icon to expand it)

Please enter your questions in the text box of the webinar control panel (remember to press send)



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Remember: The completion of a Nautel webinar qualifies for ½ SBE re-certification credit, identified under Category I of the Re-certification Schedule for SBE Certifications.



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Panelist Philipp Schmid Chief Technology Officer Nautel



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Webinar production by Ed Sylvester



## Today's topics

- Nautel and Telos Alliance Collaboration
- Virtualization and the cloud
- The HD Radio opportunity
- Review HD Radio<sup>™</sup> Drift Elimination Solution
  - Solution ingredients:
    - Telos Alliance Omnia Enterprise 9s
    - Software HD Radio Server
    - Made for Radio: E2X and MPX
- Demo 1: FM+HD Time Locked in the cloud
- Cloud Hosted Air-Chain: flexible, easy deployment
  - Architecture options and resiliency considerations
- Demo 2: Cloud Hosted Air-Chain
- Panel Discussion/Questions



## So why this current collaboration and why now?

### Nautel and Telos Alliance: Passion & innovation









Radio's 1st Composite FM Codec High quality MPX over a 720klops IP connection

- Change:
  - Industry & technology
- Challenges:
  - Listeners, locations, competition, complexity
- Fresh approaches
  - Apply new technologies, reduce complexity, drive out costs



# •65 Million HD Radio cars

### • Opportunities:

- Podcasts/Streams On-Air
- Ethnic broadcasting
- Leased channels
- Sports coverage
- Over 2300 HD Radio stations
  - but 13,000 Analog only
- Challenging for many:
  - Too complex? Too expensive? ROI?

# Radio<sup>®</sup> Ahead

## Cheaper, Easier, More Flexible Air-Chain Solutions





## About 23% (almost one in four) of all cars on the road in America have an HD Radio receiver.



## Consumers have gotten used to all their in-cabin entertainment sources offering images and metadata...



## ... except for analog radio.



#### This is your station in analog ...





#### This is your station in digital ...





... and this is your station in digital ...





... and this is your station in digital ...





#### ... these are your digital presets ...



... and this is your satellite competition.



#### Radio now shares the dash with a myriad of competitors



#### Radio now shares the dash with a myriad of competitors





#### Radio now shares the dash with a myriad of competitors





The moral of this story?

With all the media choices now available to the consumer, radio digital metadata & images can help level the playing field.



The moral of this story?

### The message is very simple . . .



#### Don't be the "Blank Screen"!



### **HD RADIO DIGITAL BROADCASTING UPGRADE COSTS IN PERSPECTIVE**



In equivalent dollars, HD Radio technology now costs less to implement today than converting an FM station from mono to stereo did back in 1965.

There was the expectation that higher quality audio would keep existing listeners for longer periods of time. That increased TSL came to pass.

Stereo broadcasting quickly became the "table stakes" that all FM music broadcasters needed to remain fully competitive by the end of the century. Digital broadcasting has become the 21<sup>st</sup> century equivalent of FM stereo.



## Why virtualization?



## Why cloud? Virtualization vs Physical Equipment

- Alignment with the IT industry (IP Based)
  - The source of many of our standards (incl security)
  - The source of much of our hardware
- Customizable and Flexible
  - Workflows vary widely and can change (hybrid options)
  - Spin up and down instances as needed
  - Example: Telos Alliance Omnia Enterprise 9s
- More future friendly as standards and operating systems change
- Reliability/Availability/Maintainability
  - Reduce traditional dedicated broadcast hardware
    - (ie one box per purpose) for greater redundancy
  - Less wiring / fewer site visits / remote management



### **Omnia Enterprise 9s**



- Built from the Omnia 9
- Highest quality audio
- Common feature "DNA"
  - Undo
  - Advanced Signal analytics
  - Flexible Monitoring
  - Embedded pilot & RDS



## Why cloud? Virtualization vs Physical Equipment

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## HD Radio Diversity Delay Solved with Software HD Server

**Review from Last Webinar** 



## HD Radio FM/HD Diversity Delay Challenges

Initially Importer and Exporter at studio to minimize HD STL bandwidth



FM and HD audio must be within **<u>3 audio samples</u>** 



## Audio Filtering Effects during Blending

Best blend within 68µs or 3 audio samples (NRSC-5 specification)

> 12 to 50 samples (272µs to 1.1ms) notches significant audio content (comb filter effect)

Better blend with selective notches 300 samples / 6.8 ms





## Typical Diversity Delay Drift Measurements\*

#### Without 10 MHz GPS Synchronization



200 samples / 4.5 ms swing

### With 10 MHz Exciter Synchronization



#### 15 samples / 340 μs swing

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\*NRSC-G203 NRSC IBOC Time and Level Alignment Guideline

## Approaches for Optimizing FM/HD Blend Experience

All HD equipment AND audio processor is suggested to be at the transmitter site\* STL must now carry all HD1-HD4 audio streams, high bandwidth Single FM+HD audio processor for best alignment and blend



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\*NRSC-G203 NRSC IBOC Time and Level Alignment Guideline



### Synchronous System from SPLIT to JOIN



## Last Webinar Demonstration

Long distance IP delivery over public Internet Stable delay without GPS synchronization



Freedom

nauter

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FM-HD1 Alignment

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Sofia RX



## Demonstration: What you'll see



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## Demonstration: What you'll see

Client CPU Usage: 19% Menu 1 2 3 4 5 6		4 5 6 🛃	← → C ▲ Not secure   stc.monitorallthesignals.com:3000/#		~ ☆ O \$ 🍪 O
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			> SysApp	Svnc state	
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-42 -24 -24 -24 -24 -24 -24 -24 -24 -24	-60	-72-	CfgUtility		Sync
Client Client ID			Restant system	Active Config.	
Options Undo Proc MPX	Strm System Cl Aud Mic Input File F	Rec Options	> Exporter	FM_MP3_4HI, HD1-HI_AE	
Stereo Generator RDS	Station ID Progr	ram Type	EmbExp	FM_MP3_4HD_HD1-HI_AE	~
		MPS	Set active config		
Flags Alternative Freq	quencies TCP Link Status Displa	y Settings	PSD	Active Services	
			TSM	Nautel Demo	✓ Update
- + Output Delay: 5714.56 ms Coarse		ADD			
		> NodeServ	Run state		
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- +	- + Output Delay: 5714.56 ms Medium		> AudioClients	STARTED	
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			> MSAC Clients		C Refresh
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			MOTO T Olicit		
			MSAU Z Glieni	Gen4 System Messages	<b>•</b>





## **Cloud Hosted Air-Chain**



## Virtualization in the Cloud

- Global presence
- Replicate Virtual Machine globally in seconds, online in a few minutes
- Built-in redundancy within Availability Zones
  - Transparent failover
- Modern IT Infrastructure
  - High Availability and Load Balancers
- Evaluated on Amazon Web Services
  - Founded in 2006
  - 35% market share
  - Largest datacenter deployment
    worldwide





## Cloud Scalability: We cloned 4 Cloudporters



### AWS Load Balancers: Redundancy in the Cloud



### AWS Load Balancers: Health Check



### Nation Wide Fallback



## Stress Test: 132 ms ping to Brazil





### Demonstration: What you'll see







0s

## But what about ...

• Transmitter fleet scalability?

- Cloud availability / redundancy?
- TX IP link reliability?

IT security?

Workflow flexibility?

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demonstrated today demonstrated today Dual homed routers and ISPs TX site fallback on HD MultiCast+ **On-going development Cloud VPNs** Looking at private/public key authentication and/or SSL/TSL Demonstrated cloud playout with webstreams and RadioJar More to come from Nautel and Telos Alliance...



## Implementation topologies





## Can we Centralize the Entire Radio Air-Chain? Yes

Our demo showed many air chains across the globe to a single transmitter In reality: many (centralized) air chains to many transmitters





## Summary

### • Cloud opportunity:

- Availability / Resiliency
- Flexibility
- Manageability
- Easier deployments
- Flexible workflows
- FM+HD Time locked
- Potential for location flexibility
  - Studio, transmitter, local or cloud datacenter
- Concept demo stage showing technology direction
  - Future: betas, product, availability, standards initiatives





## Panel Discussion/Questions



## Summary

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## Thank you



## Implementation topologies

• Today:

• New:

• New:

Existing 4<sup>th</sup> generation equipment with reactive receiver, GPS required Location agnostic importer/exporter anywhere (studio, ...) Software implemented Importer Exporter Audio Processing

Resilient backup with HD MultiCast+ 1: Cloud connectivity as main with HD MultiCast+ backup 2: HD MultiCast+ as main with cloud support

• New:

Importer/exporter in virtual environment1: Hosted in on-premise data center2: Hosted with cloud service provider

Traditional site located Importer, Exporter.



