

HD Radio Update

Nautel Users Group

April 23, 2017

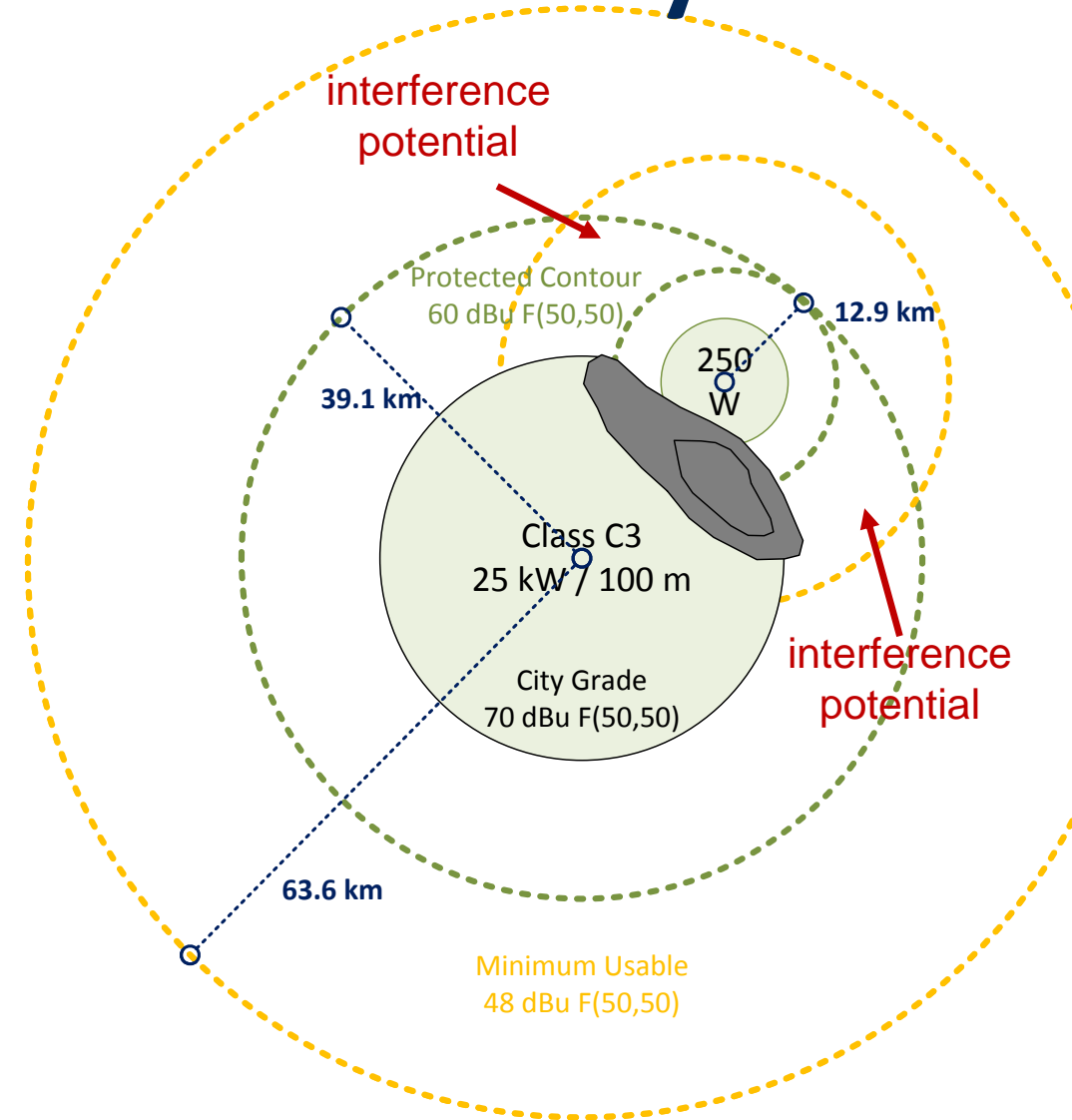


Philipp Schmid

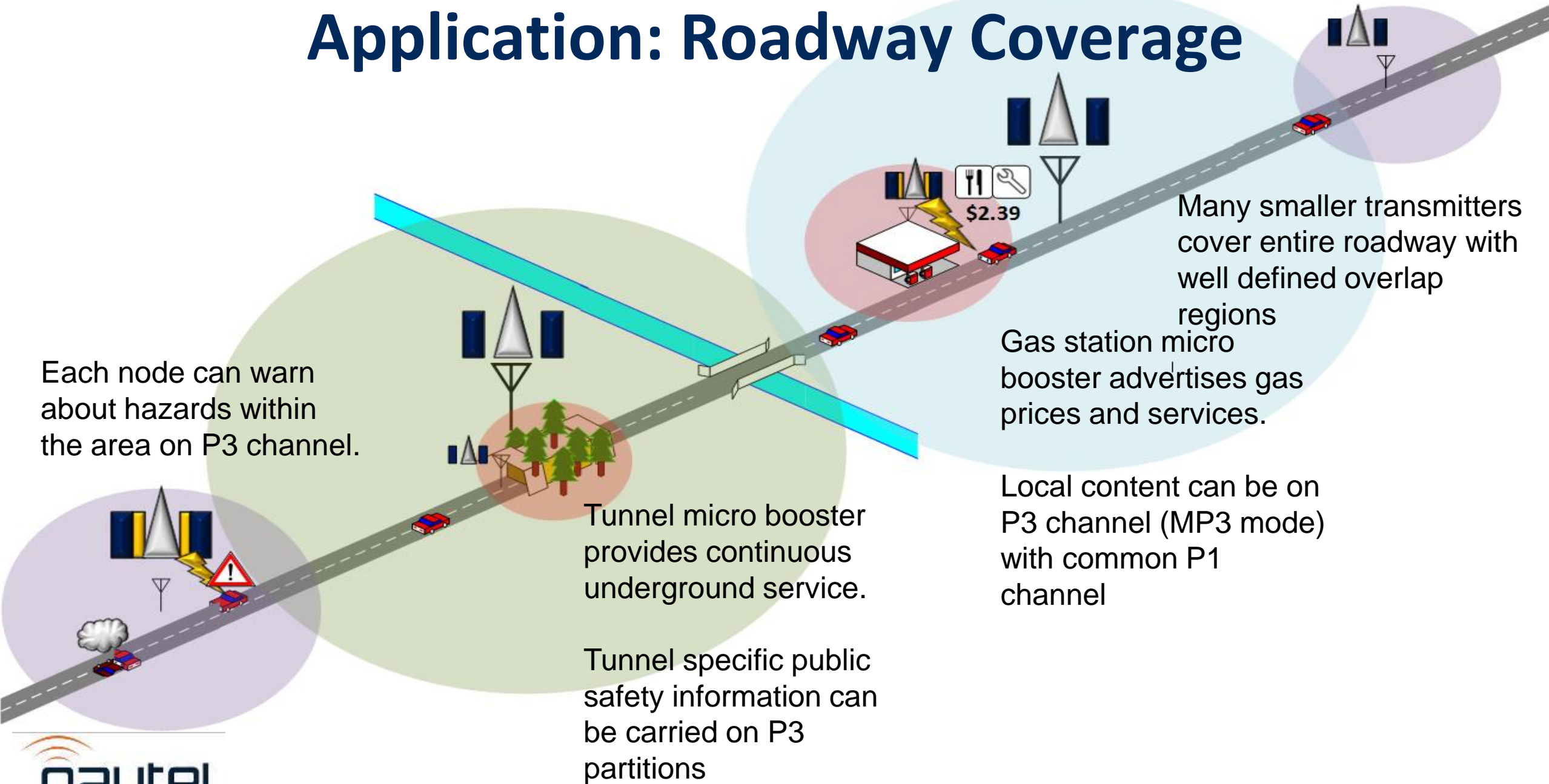
Research Engineer
Nautel Ltd.

FM Single Frequency Networks Today

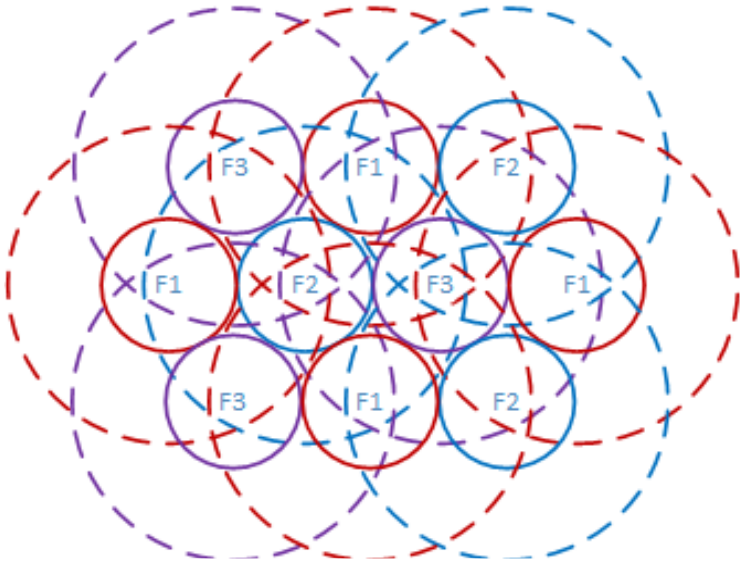
- SFNs are typically used today to address coverage shortage due to terrain obstruction.
- **FM Booster stations** are treated as "fill-in" translator stations on the same frequency as the main station.
- Booster protected contour must be contained within primary contour.
- Interference potential exists in overlap region.



Application: Roadway Coverage

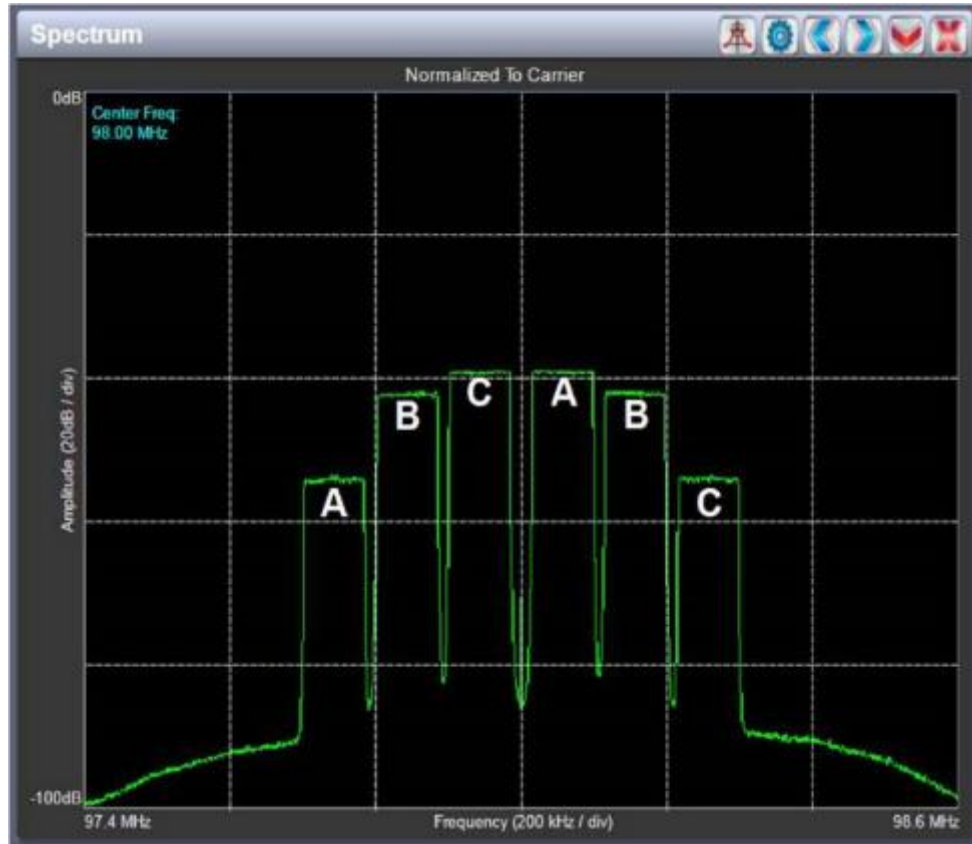


Application: Wide Area Coverage



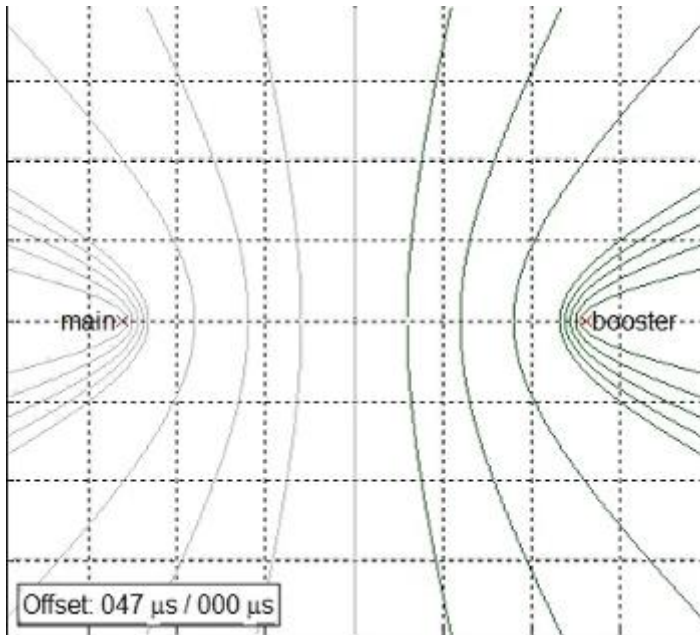
- Public broadcasters with a mandate for national, state–wide, or wide area coverage
 - Often mandated to cover almost the entire population
- Near SFN Translator network requires at least 3 channel allocations – more in difficult terrain
- Also consider adjacent channels
- SFN is spectrum efficient

Application: All Digital IBOC SFN



- Hybrid HD radio will remain limited by the FM carrier
- All Digital IBOC is ideally suited for SFN operation
- HD Multiplex combines multiple IBOC signals without the FM carrier
 - 380 kbps, 9-15 audio services
- HD Multiplex SFNs provide an **in-band DAB alternative** but using standard HD Radio receivers
 - Stations A,B, or C are optional in SFN

Single Frequency Networks for HD Radio



Broadcast Engineering and
Information Technology
Conference

Sunday, April 23 at 4:00pm

Room N260

Presenter: Philipp Schmid

Live Demo: Hear seamless HD Radio “hand off” from one transmitter to the next at the Nautel booth N8324.

New HD Radio Importer



Exporter 2 Engine Link (E2X)

4th Generation HD Radio System Architecture

Importer

- Windows based 2RU
- HD2,3,4 audio capture and encode
- Program Service Data
- Artist Experience (req. automation support)
- Station Logo (req. automation support)
- Data Services (req. automation support)

Exporter

- HD1 audio capture and encode
- HD1 Program Service Data
- Integrated GPS time base (heart beat)
- FM audio capture and diversity delay

Introducing ...



HD *MULTICAST+* HD Radio IMPORTER/EXPORTER



making digital broadcasting work

A Look Inside the Box



A Look Inside the Box

Comes with outdoor
GPS antenna and
feed line.

New monitor app:



GPS MONITOR	
SATELLITES	8
HDOP	1.7
NAV VALID	YES
LATITUDE	44.5712
LONGITUDE	-63.9170
UTC	2017/5/01 14:15:16



Integrated GPS receiver
1 PPS is system heart beat

Ovenized 10 MHz Crystal

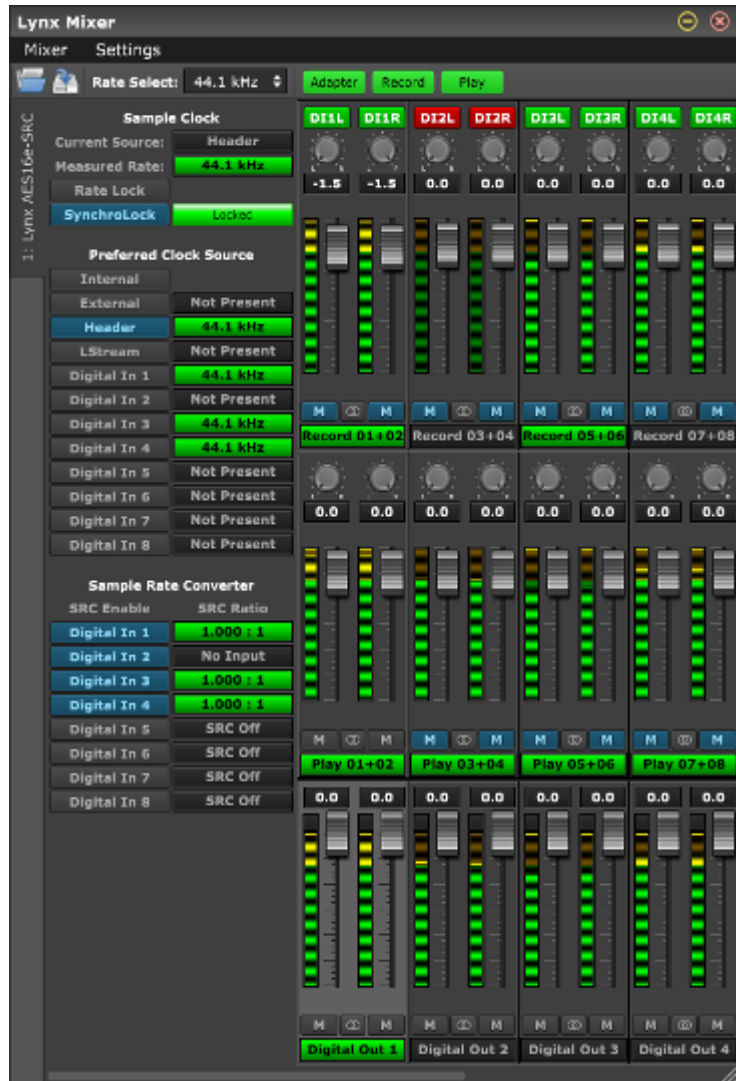
- 10 ppb temperature stability
- great holdover capability

2 External BNCs

- 10 MHz or 44.1 kHz word clock

Internal 44.1 kHz word clock

A Look Inside the Box



Lynx AES16e PCIe card
8 audio capture and play
asynchronous sample rate
converters (ASRCs)

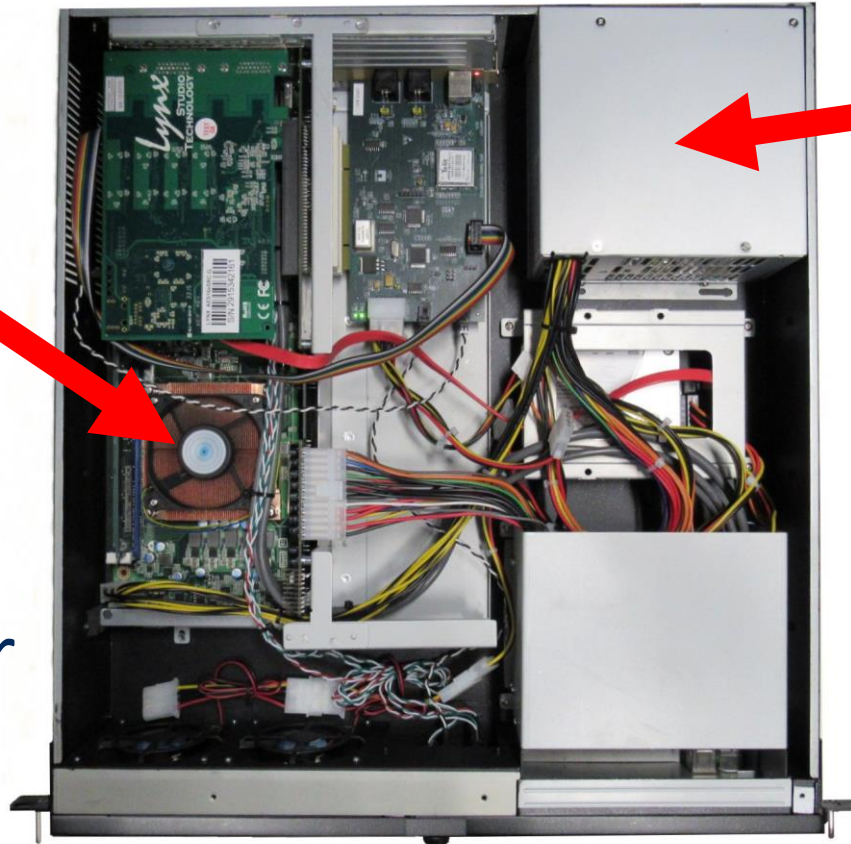
Internal 44.1 kHz word
clock from GPS card

new GUI

A Look Inside the Box

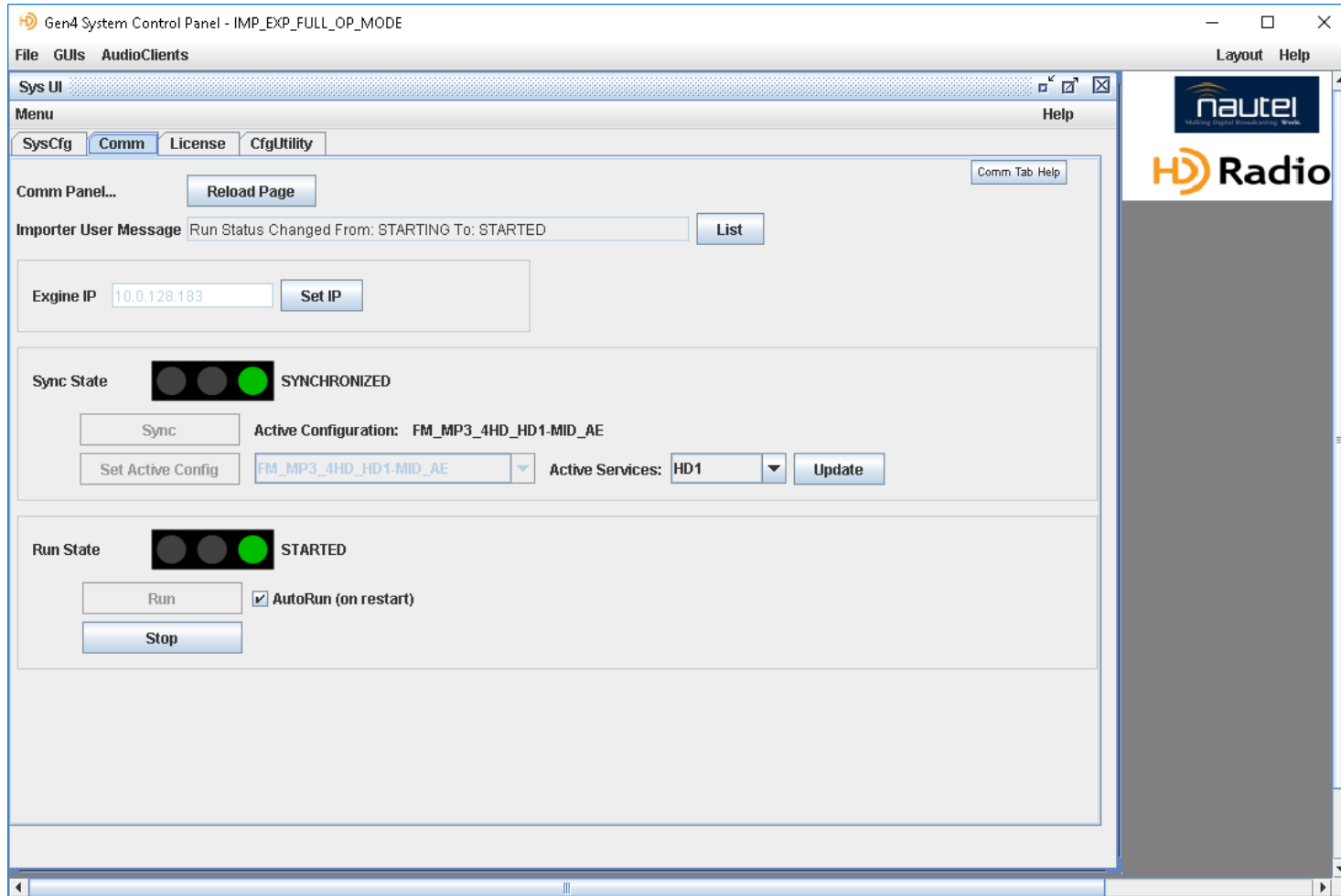


Intel Core i5-6500
6th Generation Intel
Quad-Core i5 processor



Option:
Dual redundant hot
swappable power
supplies

New Exporter/Importer Application

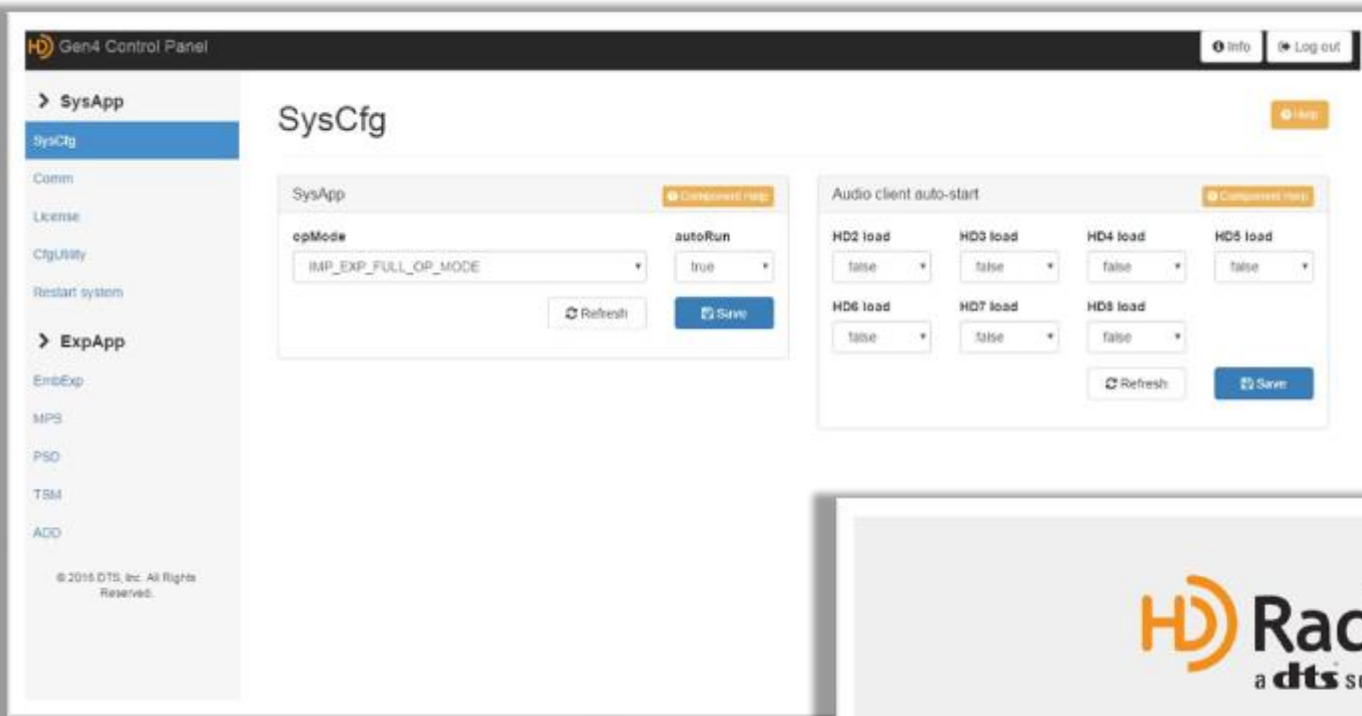


Fully functional desktop application

- exporter control for HD1
- service modes
 - hybrid MP1-MP3
 - all digital MP5-MP6
- bandwidth allocations
- audio capture clients
 - HD2,3,4
- SW Version 5.0.4

New Web Interface

Remote status and control
Works on mobile devices




Nautel Reliable HD Transport

MainWindow

Reliable HD Transport Configuration

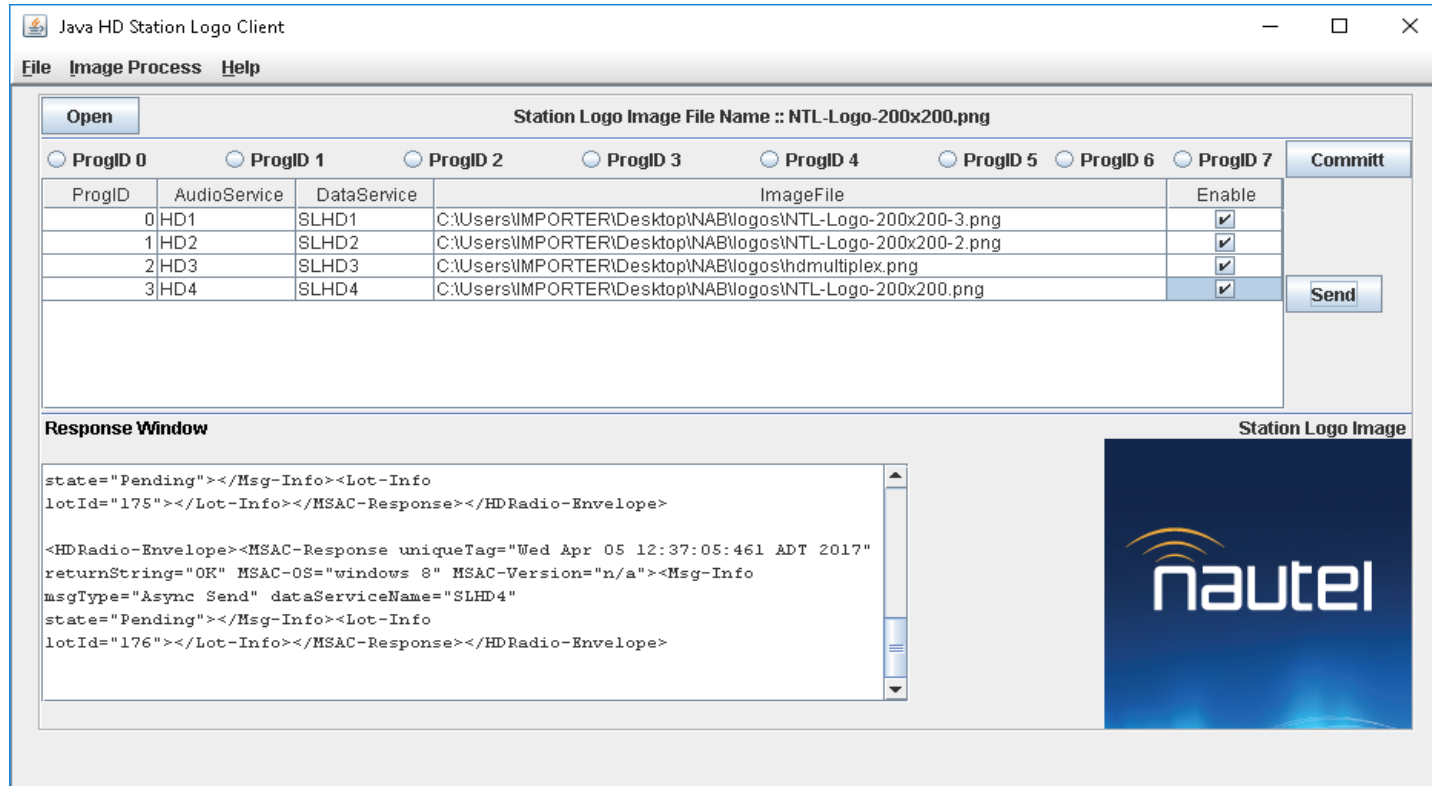
Subject Title	Parameter	Note
exginelp0	10.0.64.151	Exgine's IP address (255.255.255.25
exgineMac0	00:00:00:00:00:00	Exgine MAC address (0-uses ARP)
exginelp1	0.0.0.0	Exgine's IP address (255.255.255.25
exgineMac1	00:00:00:00:00:00	Exgine MAC address (0-uses ARP)
exginelp2	0.0.0.0	Exgine's IP address (255.255.255.25
exgineMac2	00:00:00:00:00:00	Exgine MAC address (0-uses ARP)
exginelp3	0.0.0.0	Exgine's IP address (255.255.255.25
exgineMac3	00:00:00:00:00:00	Exgine MAC address (0-uses ARP)
exginelp4	0.0.0.0	Exgine's IP address (255.255.255.25
exgineMac4	00:00:00:00:00:00	Exgine MAC address (0-uses ARP)
exginelp5	0.0.0.0	Exgine's IP address (255.255.255.25
exgineMac5	00:00:00:00:00:00	Exgine MAC address (0-uses ARP)
exginelp6	0.0.0.0	Exgine's IP address (255.255.255.25
exgineMac6	00:00:00:00:00:00	Exgine MAC address (0-uses ARP)
exginelp7	0.0.0.0	Exgine's IP address (255.255.255.25
exgineMac7	00:00:00:00:00:00	Exgine MAC address (0-uses ARP)

 Recover Save EXIT
Save and Restart RHDT

Nautel exclusive feature:

- Addresses packet loss in export to exgine (E2X) IP link.
- Improves exporter to exgine synchronization over remote IP links.
- Reduces link peak bandwidth requirements.
- Existing satellite link deployments

Integrated Station Logo (coming fall 2017)



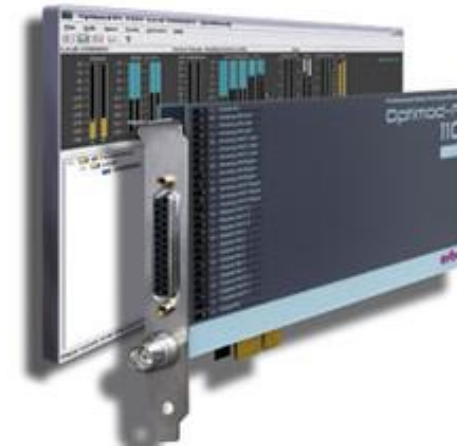
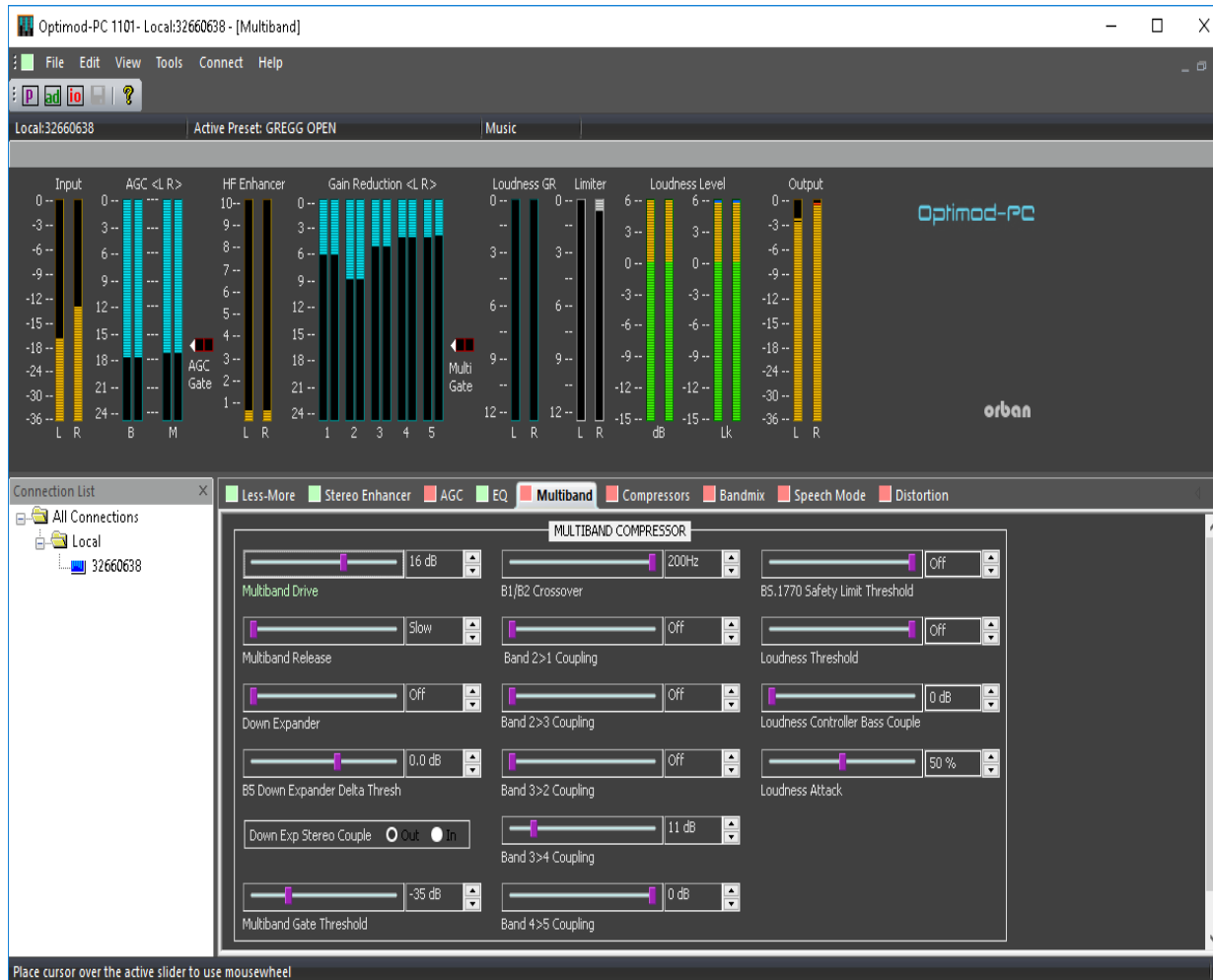
No automation support
required for basic
station logo



200x200 pixels



Option: Optimod-PC 1101e for HD2,3,4



Option:
Supports up to 2 Orban
Optimod-PC 1101e PCIe cards
1 processed audio plus
1 AES captured audio

Demo: Sound4 Impact FM+HD Audio Processor

Single studio feed
for FM+HD

Ensures best HD
blend experience

Dual MPX output
for transmitter

Stable diversity
delay shown



Demo: Axia Livewire

Audio over IP delivery
Works with importer
capture clients

Axia IP-Audio - Version: 2.9.0.7

Livewire Network Card: 10.0.128.30 Intel(R) Ethernet Connection I219-LM

Sources (Send to Network)

#	Enable	Name	Channel (1-32767)	Mode
1	<input checked="" type="checkbox"/>	PC 1	1	STEREO
2	<input checked="" type="checkbox"/>	PC 2	2	STEREO
3	<input checked="" type="checkbox"/>	PC 3	3	STEREO
4	<input checked="" type="checkbox"/>	PC 4	4	STEREO
5	<input type="checkbox"/>			STEREO
6	<input type="checkbox"/>			STEREO
7	<input type="checkbox"/>			STEREO
8	<input type="checkbox"/>			STEREO
9	<input type="checkbox"/>			STEREO
10	<input type="checkbox"/>			STEREO
11	<input type="checkbox"/>			STEREO
12	<input type="checkbox"/>			STEREO
13	<input type="checkbox"/>			STEREO
14	<input type="checkbox"/>			STEREO
15	<input type="checkbox"/>			STEREO
16	<input type="checkbox"/>			STEREO

☐ Keep channel active when playback is stopped

Destinations (Receive from Network)

Channel (1-32767)	Type
1	Browse... From Source
2	Browse... From Source
3	Browse... From Source
4	Browse... From Source
5	Browse... From Source
6	Browse... From Source
7	Browse... From Source
8	Browse... From Source
9	Browse... From Source
10	Browse... From Source
11	Browse... From Source
12	Browse... From Source
13	Browse... From Source
14	Browse... From Source
15	Browse... From Source
16	Browse... From Source

GPIO

Channel (1-32767)
1
2
3

Audio Levels

Nominal level of PC audio recordings: -8.0 dBFS

Livewire audio nominal level: -20.0 dBFS

Record trim: +12.0 dB

Playback trim: -12.0 dB

ASIO

Livewire playback latency [ms]: 100

Statistics

Allocation

GPIO

OK Cancel Appl

F2 - fill in channel numbers in sequence.
Changing device mode requires Windows restart

Livewire Selector

Filter by category: (All)

Livewire network card: 10.0.128.30 Refresh

Channel	Name	Category
1	PC 1@DESKTOP-MJM9FQ9	
2	PC 2@DESKTOP-MJM9FQ9	
3	PC 3@DESKTOP-MJM9FQ9	
4	PC 4@DESKTOP-MJM9FQ9	
5	vsarm 5@vsarm	
6	vsarm 6@vsarm	
7	vsarm 7@vsarm	
8	vsarm 8@vsarm	

Take Stop

Clear

Playing channel #1 ... 00:00:45 (rate: 199 packets/s)

Online Information

- **Nautel Waves Newsletter**
<http://www.nautel.com/newsletter/>
- **Webinars**
<http://www.nautel.com/webinars/>
- **YouTube**
<http://www.youtube.com/user/NautelLtd>

Thanks!

www.nautel.com

