

AES @192kHz - digital Composite/MPX over IP

Kevin Campbell
k.campbell@worldcastsystems.com

Digital Composite/MPX over AES over IP

WHAT?

WHY?

HOW?

WHAT?

Composite/MPX over AES | what is it about?

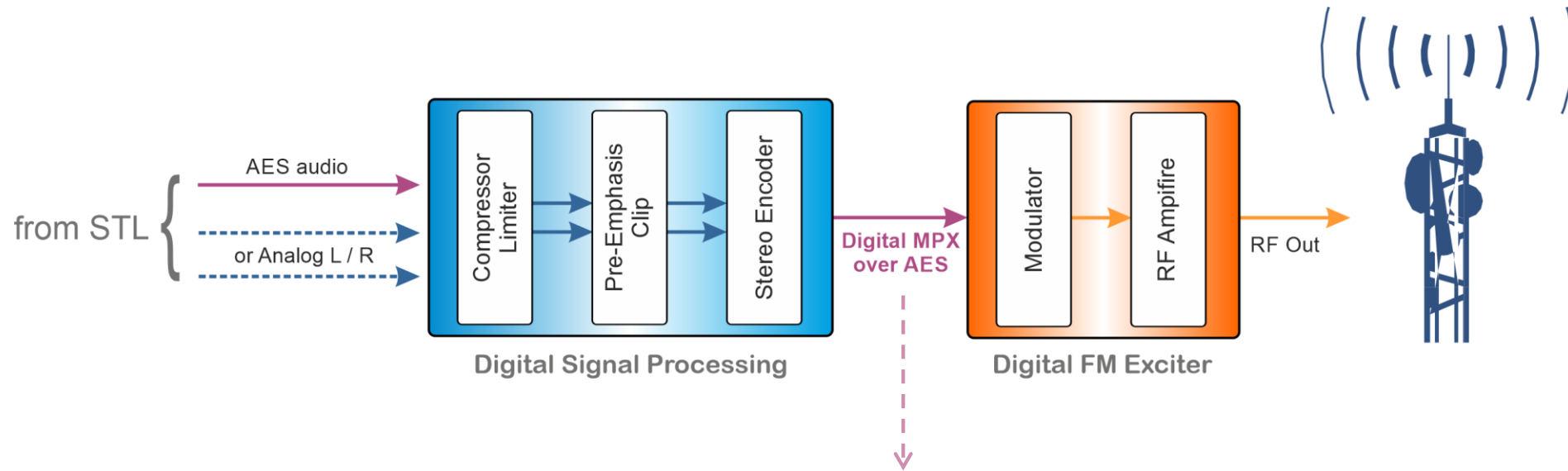
The Context

- » In an **all-digital** broadcast facility, an **all-digital transmission** path is desired. Mainly manufactures of sound processors are the driving force of the all-digital connection on a transmitter site.
- » With the Composite/MPX over AES interface, a **single AES-EBU cable** between the sound processor and the transmitter carries the baseband signal in digital form. **This 100% digital path** eliminates the noise and distortion of A/D converters and reduces potential overshoots, while ensuring full mask compliance.
- » It allows easy point-to-multipoint MPX connectivity on a **single site** utilizing the standard AES3 distribution at 192kHz FS.

Composite/MPX over AES | what is it about?

1) Digital Composite/MPX over AES

- Describes the connection of a digital Composite/MPX signal over an AES link. This connection can be between a Sound Processor and digital Exciter, locally on a transmitter site.

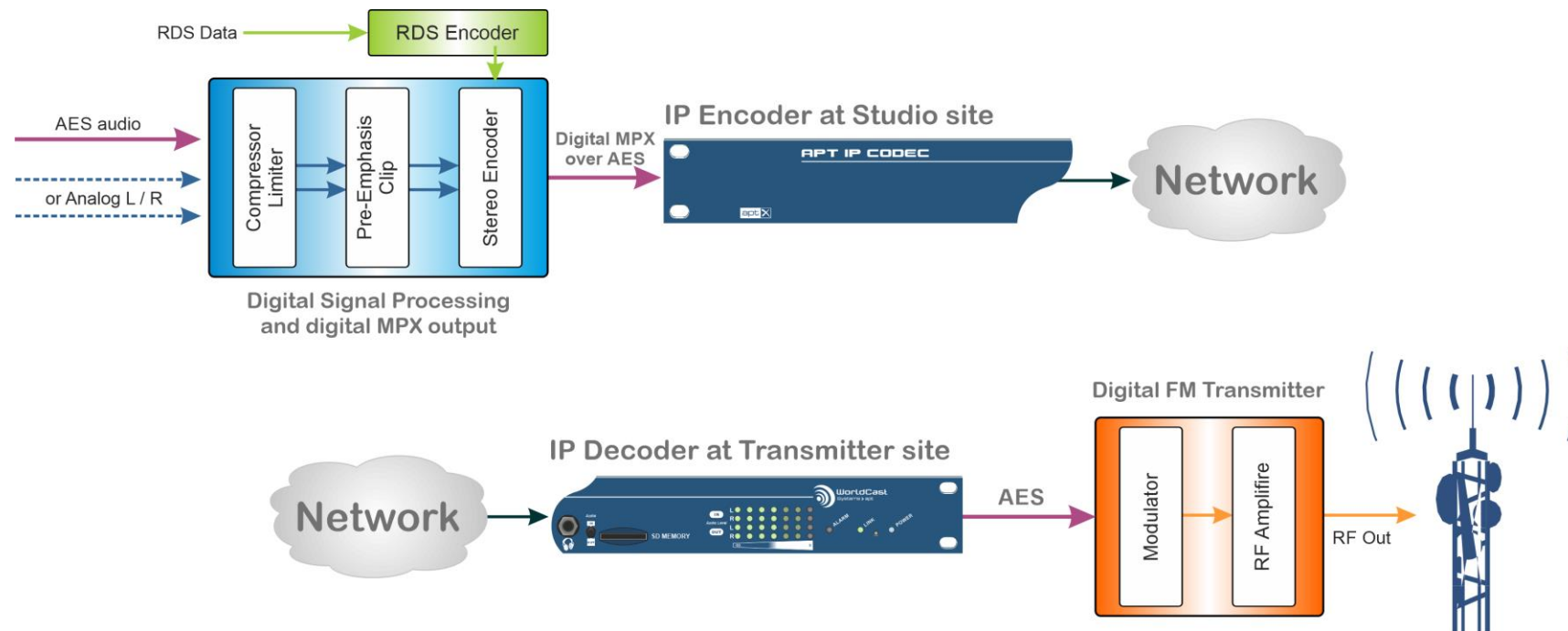


Linear PCM for digital composite/MPX @ 192kHz FS	3072 kbps (16bit) 4608 kbps (24bit)
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Composite/MPX over AES over IP | what is it about?

2) Digital Composite/MPX over AES over IP

-))) Describes **the transmission** of a digital Composite/MPX signal over **an IP link** or network and utilizes local “Digital Composite/MPX over AES” connections at the studio and the Tx site.
-))) The combination of both methods provide an **all-digital transmission path** throughout the FM network.



WHY?

Composite/MPX over AES | why?

The Context

- » We are seeing **many audio processors** being released **with the AES @192kHz output capacity**, like the major players Wheatstone, Omnia and Orban – and there are many others.
- » On the other side the **FM transmitters increasingly are also being fitted** with the new AES @192kHz format.
- » With the **entire digital transmission path**, courtesy of APT Codecs and others, that allows you to break the rules with the positioning of certain elements in the broadcast chain.
- » It is **no longer necessary** to place the **audio processor or RDS encoder at the transmitter site** as we can control influences on stereo separation and minimize overshoot behavior.
- » In addition to the **big reduction in legacy hardware** by moving to the new AES @192kHz format you can realize a **major saving in new hardware**.

Composite/MPX over AES | why?

Customer Challenge

- » IP networks are the preferred distribution networks today. The **advantages of flexible routing and casting modes (unicast/multicast)** are obvious. However, this also involves challenges that should not be underestimated.
- » There is the question of **bandwidth optimization** for network usage. How many stereo programs can I safely transmit as a composite/MPX signal? Are there optimization mechanisms?
- » What happens to my composite/MPX signal if **packet losses** occur despite all protection of the transmission? How does this affect the carrier deviation, and do I have to expect **overshoots**?
- » Can I control the **latencies** of the IP transmissions?
- » Which possibilities are there to transmit composite/MPX signals of the analog and the digital domain (**hybrid**) and still achieve hardware savings?.

Composite/MPX over AES | why?

Our Solution

- » For the composite/MPX signal a spectrum bandwidth of theoretically 100kHz is specified. In most continents the range above the RDS signal is not used. For these cases, the APT composite/MPX codecs offer a **low pass function which limits the spectrum to 64kHz**. This is not done at the expense of quality (bit-depth reduction), but by reducing the sampling frequency.
- » Packet losses can occur even if this is largely prevented by **APT SureStream** or similar mechanisms. When it happens, the effects on a second layer of protection must be rendered ineffective. APT has therefore attached great importance to the **Over Modulation Cancellation algorithm**. This does not prevent packet loss, but overmodulation of the carrier.
- » APT codecs have a **low latency** when transmitting the composite/MPX signal. In addition, the program's playback time can be controlled with the NTP time.
- » Analog and digital composite/MPX signals or even normal stereo audio and RDS can be combined in a single codec frame, **enabling hybrid transmissions**. The encoder hardware remains modular and therefore cannot influence each other.

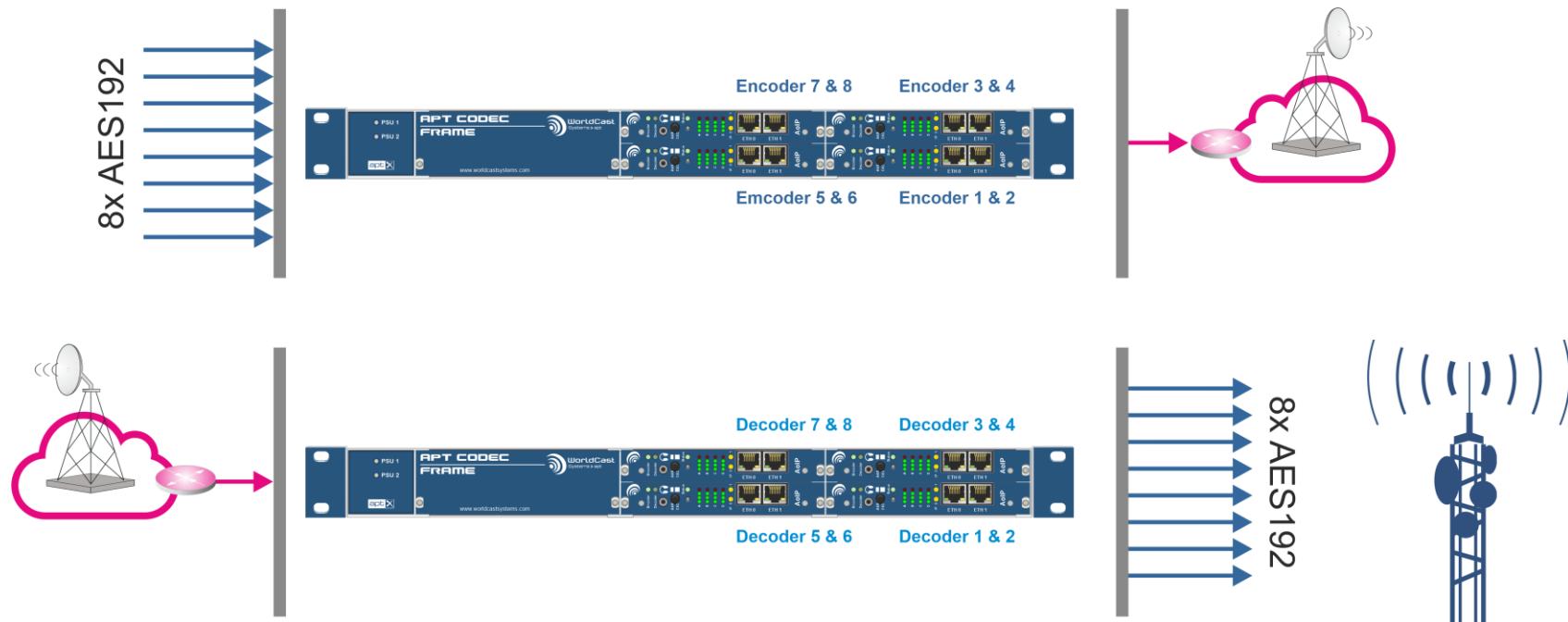
HOW?

Composite/MPX over AES | how?

Good Reasons to look to APT for Composite/MPX over IP

1) Bandwidth Optimization

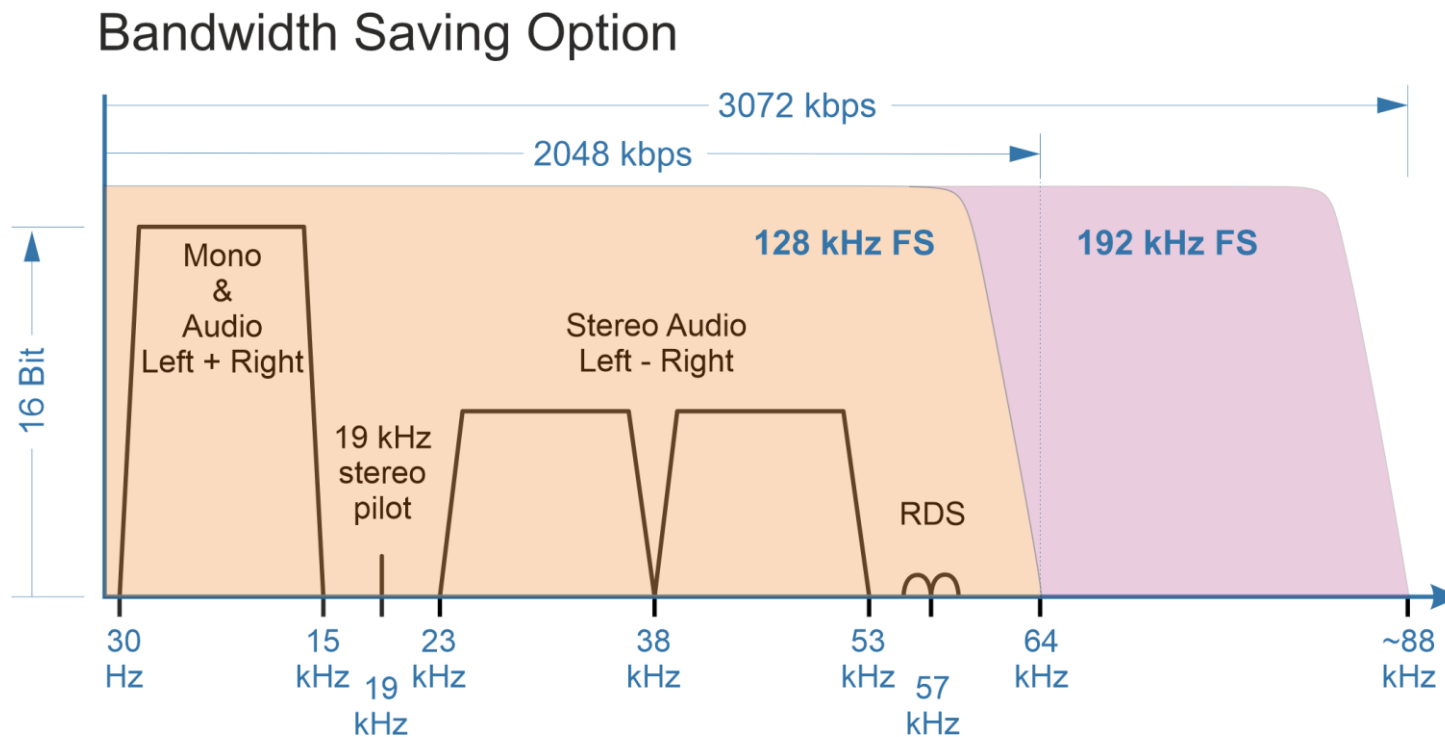
- Up to eight stereo programs can be transmitted as composite/MPX signals with a single 1u Modular Codec Frame. With APT's bandwidth optimization you can save over 8Mbps net bandwidth.



Composite/MPX over AES | how?

Bandwidth Optimization

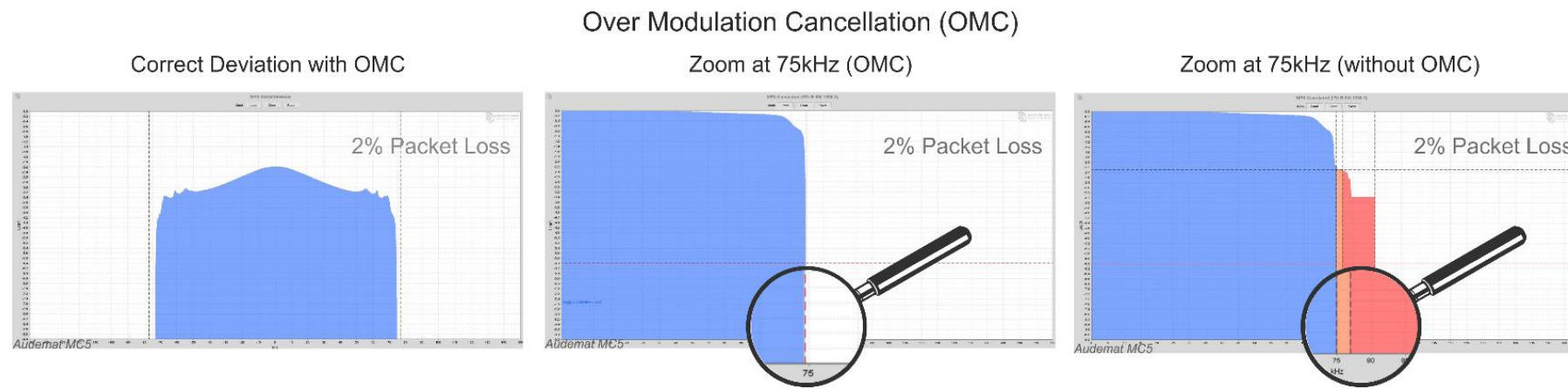
- FS 128kHz allows MPX bandwidth limitation to Audio and RDS – band limit at 64kHz. Saves network capacity: **@16Bit = 2048 kbps** (net 3072kbps for full bandwidth).



Composite/MPX over AES | how?

2) Overmodulation Cancellation

-))) A unique feature of APT composite/MPX Codecs is their ability to **cancel out undesired peaks and troughs** of the composite/MPX signal to reliably prevent overmodulation, **caused by dropped IP packets**.
-))) APT MPX codecs deploy a 'watchdog' service which ensures that, should there be any distortion or corruption of the signal due to packet losses, it will not lead to overmodulation.

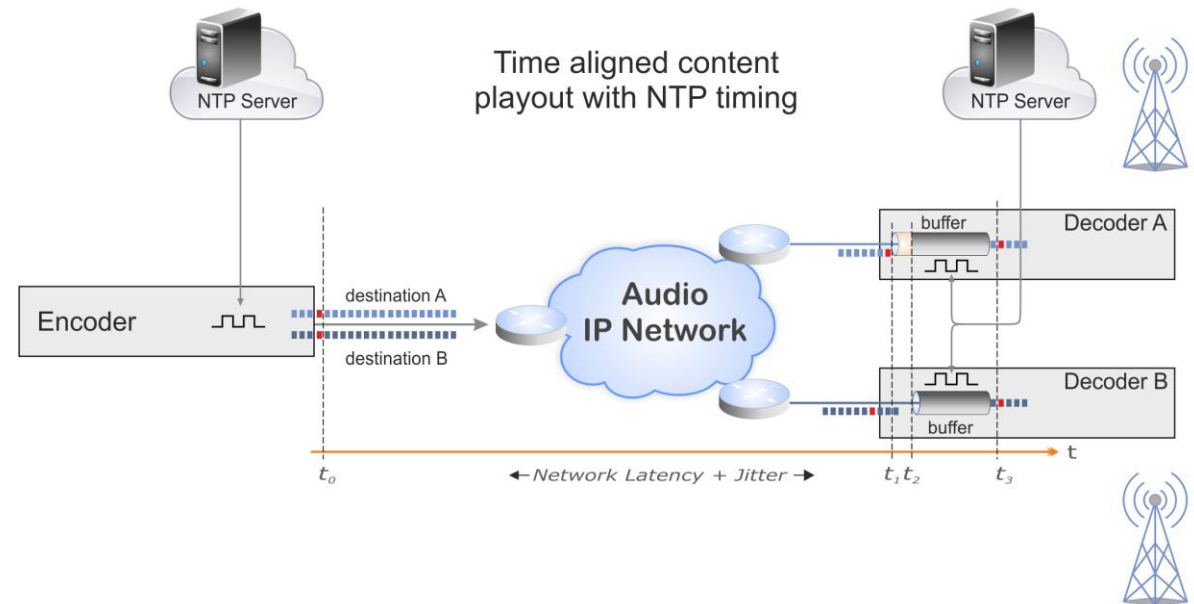
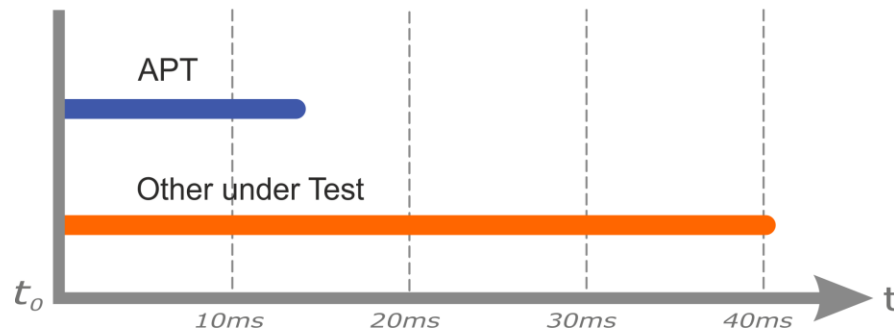


Composite/MPX over AES | how?

3) Low Latency and latency Control

- » APT codecs also have low latency for composite signals. In addition, the target delay can be determined by the NPT time.

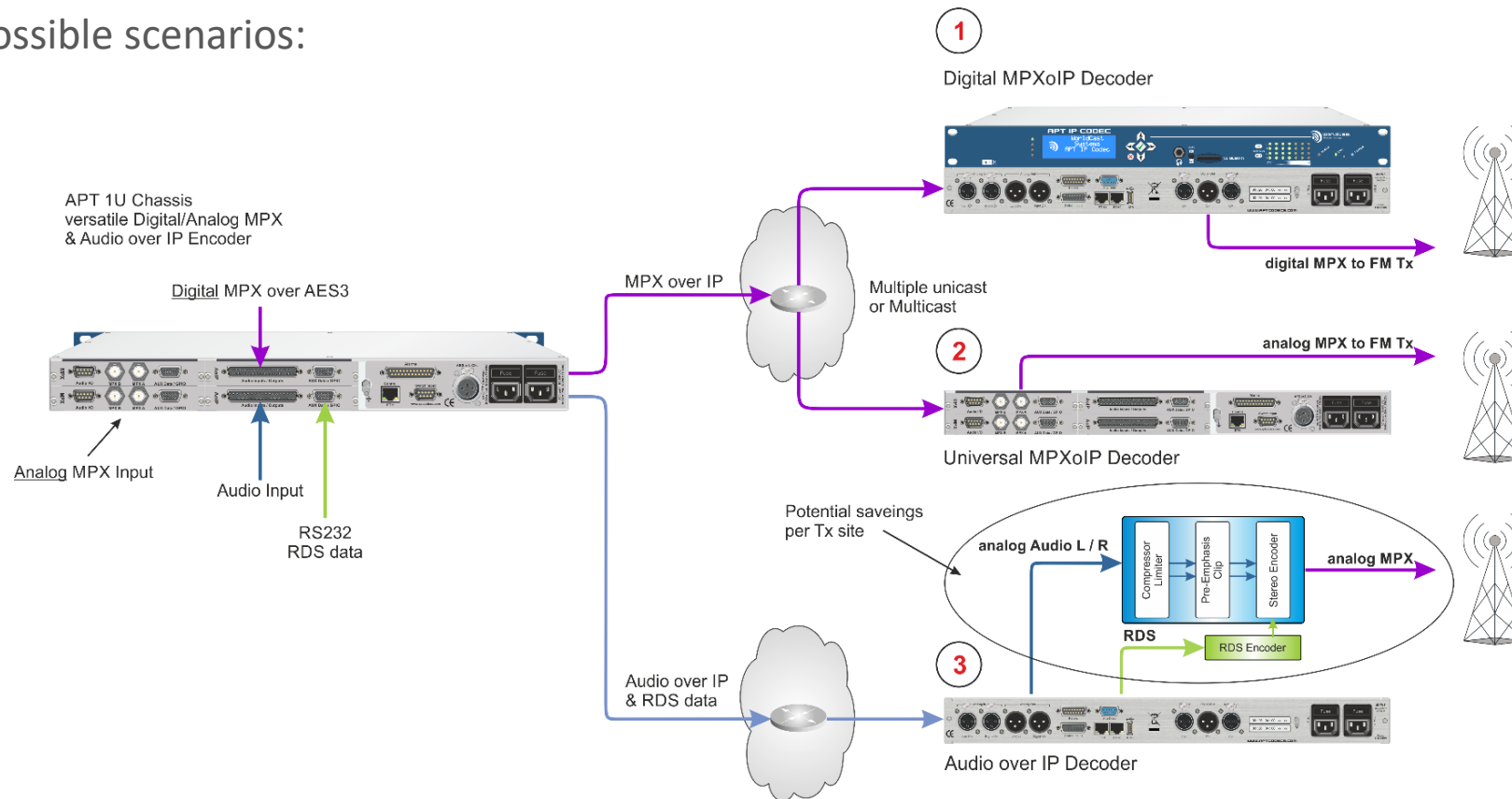
MPX over IP Link Latency



Composite/MPX over AES | how?

4) Simultaneous Analog and digital Domain Signals

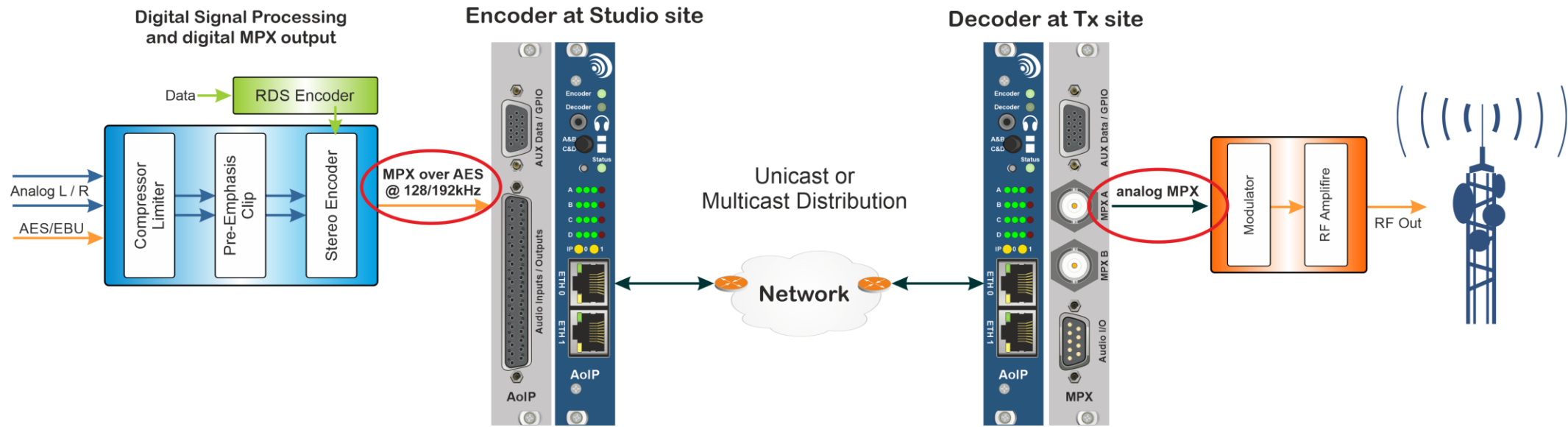
- Simultaneous analog & digital composite/MPX and baseband audio program over IP
- Three possible scenarios:



Composite/MPX over AES | how?

5) Digital to Analog composite/MPX transmission with 1U Codec Frame

- » The mix of **digital** and **analog composite/MPX** transmission allows seamless migration from central analog signal processing to digital processing regardless of the transmitter generation in use.



Digital Composite/MPX over AES over IP

New Zealand -Case Study



New Zealand – Why, Composite AES 192

- » Long Linear country with many high sites
- » Geographical characteristic of the country mean highest power FM Transmitter is 5KW
- » Many sites are inaccessible for many months except by helicopter
- » Most links to the site are microwave (LOS), many are provided by Kordia (national Telco)
- » Kordia tariff these links per MB
- » Single FM content is required to be delivered to multiple sites, Main FM Transmitter and repeater / gap filler FM Transmitters
- » Many co-located stations with multiple frequencies and multiple transmitter sites
- » End destination is the full digital chain BUT many aging analogue transmitters still to be replaced

New Zealand – AES 192 Checklist

Scenario (Problem)	Benefit	Savings
Inaccessible Sites	Remove equipment from the transmitter site (Processors, RDS Encoders etc.)	-Site visits (by helicopter)
Kordia Tariffed Microwave Links at 2Mbits	-bandwidth optimization (3072kbits -> 2048kbits) + fits in 2Mbit pricing	-Kordia Telco Costs not increased in migration
Single FM Frequency to Multiple sites	Unicast and Multiple-unicast over IP	-Reduce dramatically the audio processing hardware
Multiple FM signals collocated at a single studio	-APT 1U Frame provides the highest density MPX-Composite on the market	-Reduce the audio codec hardware
Analog MPX gear	-APT can provide Analog and AES MPX – Composite over IP (Hybrid)	-Maintain legacy gear along side newer transmitters and processors

New Zealand – AES192



Ottaga Site - 1,500Meters up



New Zealand – AES192



Otaga Site – APT MPX-Composite IP
Codec + Ecreso 1KW FM Transmitter



Key Takeaways

A long-exposure photograph of a city street at night. The image shows light trails from cars and buildings illuminated with blue and yellow lights. The scene is a dense urban environment with tall skyscrapers and a multi-level road system. The overall color palette is dominated by deep blues and bright yellows from the streetlights.

**Composite/MPX over
AES @192kHz**

Composite/MPX over AES | summary

AES @192kHz: The **drivers are varied** but can be summarized as:

- Density of signals means you can **reduce drastically the amount of hardware** making up the STL portion of your broadcast chain;
- IP topologies **including unicast and multicast** mean **you can do more with less**; one encoder can hit multiple composite/MPX decoders;
- **Cost reduction** in new hardware related to audio processing and traditional discrete STL; **one top-end audio processor** can now serve multiple sites and still employ the essential composite processing elements such as clippers etc., not to mention those with built-in RDS;
- **Flexibility – hybrid technologies** mixing analog composite with AES @192kHz composite/MPX are easily achievable.
- **Studio positioning of audio processors** means **easy access for servicing and adjustments**, post processing in-ear monitoring for talent is achievable in an IP environment.

Your Questions!



THANK YOU!

 Kevin Campbell

 k.campbell@worldcastsystems.com

 Kcampbell_apt

 +44 7545 921603 / +1 305 809 0374

www.worldcastsystems.com



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