Advanced New Technologies at IP Radio

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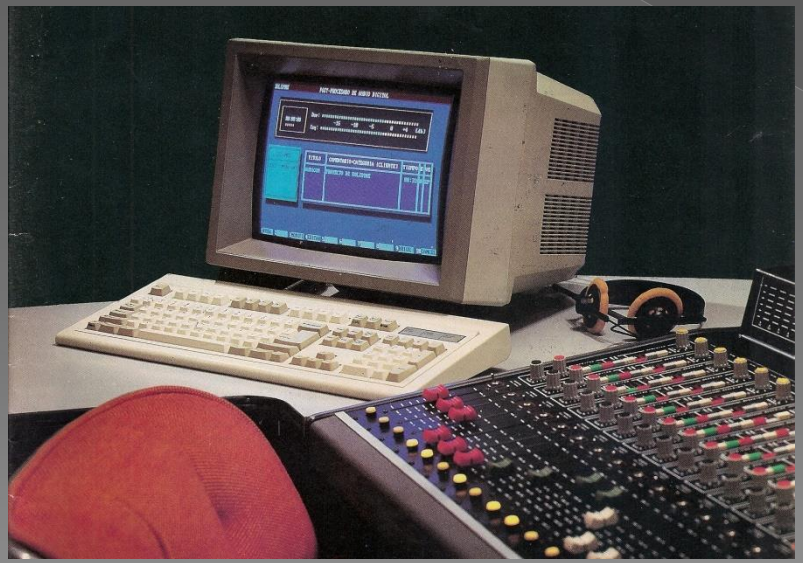
- The industry of the broadcasting begins in 1920, using electronic tubes.
- The Radio has advanced using solid state technologies over the 1960's and 1970's
- But the entry of the Radio to the digital world has an exact date...

It was on June 27,1989, when Solidyne shows the Audicom® system at the National Communications Secretary of Argentina



- **It was the first digital device to be introduced at a Radio station**

- The shock was such that at NAB 1990 a famous American engineer told us:
- "... it's an amazing invention, but nobody will use it in a radio station because audio and computer are like oil and water; they never mix "

- Fortunately, he was wrong !

- The NAB President at the opening ceremony of the NAB 1990 stated:

"It is not only a great advance...
It is the Re-Invention of the Radio"

Audicom technology makes Solidyne enters the History of the great world innovations

- Solidyne in 1989 already had eleven invention patents. At the beginning we thought Audicom would be the number 12

- But the sad legal experience of the great American inventor Edwin Armstrong discouraged us of following this route...

Because this history lessons, we decided donate to the world the rights from use of the 3 key technologies that allows us to use a PC like a Play and Rec audio device

- Solidyne decided to keep the manufacturing commercial secret. This way we got years of advantage over USA and Europe. But NEVER we apply for any Audicom invention patent. We get that finally this invention have been used in all the world

- Argentina followed the example of France in 1839, that liberated for free the Louis Daguerre invention patents and the photography becomes universal.

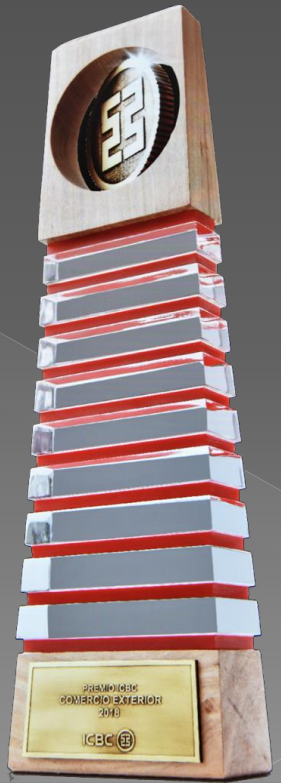
Over time, analog devices disappeared from radio studios.

- Cassettes and the cartridge machines were the first in say goodbye towards the Museum.
- The open reel recorders, the CD player and the analog audio processors followed to the exile soon
- And finally the analog audio consoles are leaving away slowly…

Still are working high quality digital + analog audio consoles like this Solidyne models

We were awarded several times due the innovation and global coverage of our products

1992 First National Award for Technological Innovation



2018 First Prize ICBC for exporting high-tech technology with sales in 67 countries

At the present, most of the radios are into the process of converting from analog consoles to Digital IP

- Because the analog wires connection are increasingly complex

The consoles gradually go accepting remote controls through Ethernet networking

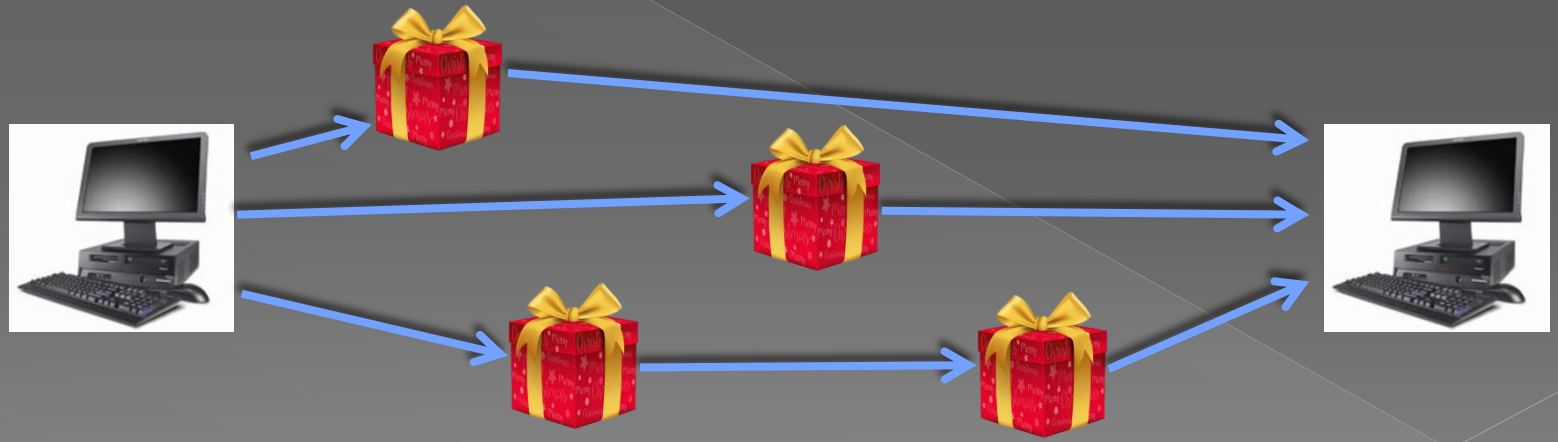
Solidyne introduce this technology in radio consoles worldwide in late 2012. This allows to remotely control faders and switches using a tablet or cell phone

The Solidyne consoles can be operated by HTML from WiFi, even from remote sites

CAPER Show 2013

RTP audio Interconnection

- The digital technology allows shipping audio at distance through a data flow (streaming). It is usual send it by Internet in the form of "packets" of bits.



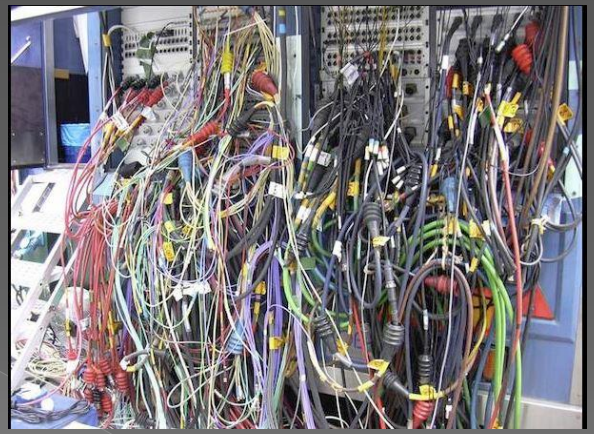
The information packages follow different roads inside Internet and it must be numbered when received to keep the same order.

RTP audio interconnection

- The **RTP** transmission (Real Time Protocol) is a solution for working with audio MP3, AAC, Opus, etc. But the delay due to wait the bit packages and re-ordering it has a time delay that in many aplications is unacceptable.

Interconnecting IP audio by LAN (Ethernet)

- As new technologies and high audio quality requirements appear, wired inter-connections becomes complicated ...
- For a perfect sound quality it should be use 24-bit audio data of uncompressed WAV format at 48 kHz sampling
- In many applications delays less than 1 ms are required



Interconnecting audio by LAN (Ethernet)

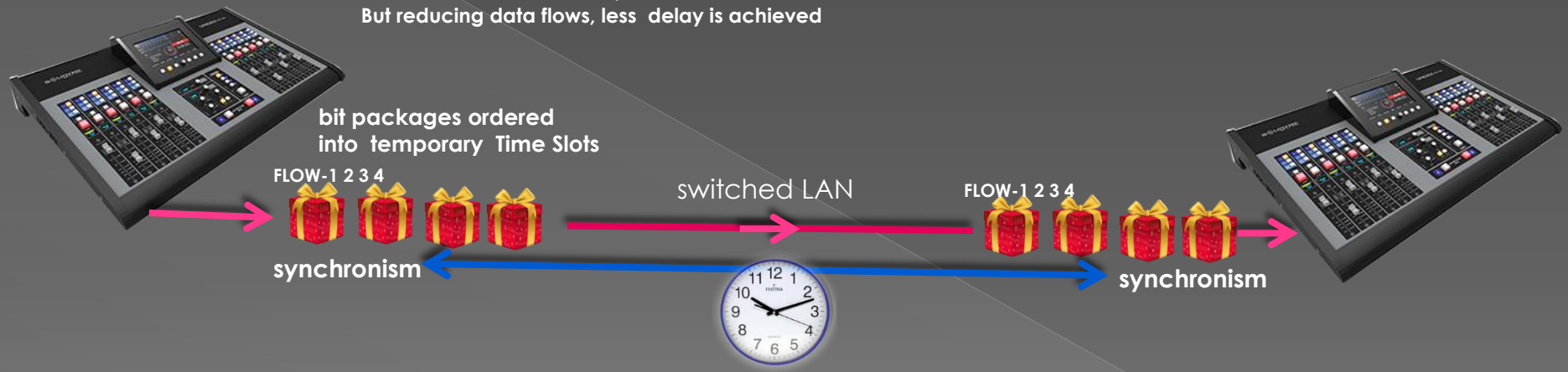
- It must be use a switched network . In this kind of network the data flows to the recipients setting a momentary bridge that makes a fusion of the two networks in a single one. This increases its speed with respect to the routers that keeps separated the networks.

- In IP networks all the devices should be synchronized with the same clock to keep the order of the bit packets

- The IP netwoks born from research conducted originally in IEEE, such as the systems AVB and IEEE 1588 protocol

Principles of the IP audio transport

Transmission is by encapsulating the audio data (payload) With routing flows . The more audio data is at each flow, more efficient is the communication.
But reducing data flows, less delay is achieved



The packets are sent and received on the LAN network clock-synchronized across all devices accessing it. In this way they are transported with delays less than one millisecond.
1024 channels can be managed in a 1 GB LAN. Any of the 512 transmitters can be received by 512 recipients. However this synchronization does not allow use of Wi-Fi or Internet; so the UX24 manages separate RTP outputs, an advantage that other consoles usually do not offer.

DANTE AES67 system

- Since the beginning of this technology several protocols have existed for interconnection as the CobraNet, LiveWire, Ravenna, etc. Currently there are a bias of the audio industry in favor of the DANTE AES67 created by the company Audinate.

- Solidyne has been licensed for use this protocol for interconnection in our mixers and processors. Then we are compatible with many products sold by 350 manufacturers around the world

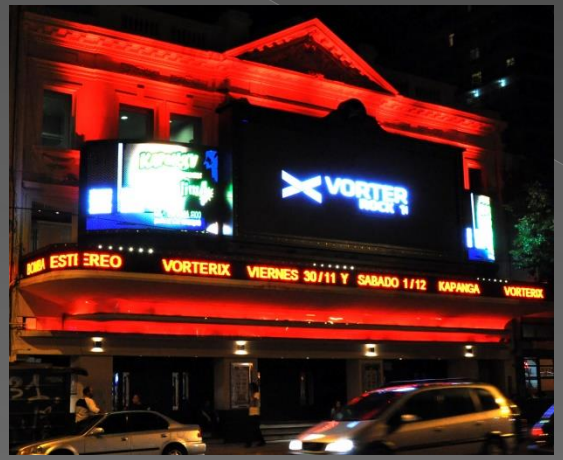
Standalone and IP consoles

- We have seen that IP audio consoles with Dante AES67 is a very good solution
- But it is also true that forcing ALL the audio channels to IP connections is risky matter because EVERYTHING that goes to the Air will go through a single network cable. So if the network goes down ... the radio will be out of the air
- In addition numerous devices such as microphones, headphones, computers, phone lines, cell phone, etc are very near of the console ... So the ideal is connecting them directly, allowing wiring the studios more economicaly and fully compatible with the analog mixer that must be replaced
- A digital console that manages inputs and outputs connected directly to it is called "standalone"
- For these reasons we have chosen the creation of a new technology named UNIDEX (**UNI**versal-**D**ESK-with-**EX**ternal adapters) which is a major advance over other products at the market. UNIDEX is used for IP with Dante AES67, but at the same time is a standalone console

It has the best of both technologies.

Thus your radio will always be on the air, even if the LAN network fails
And your investment will be much lower using UNIDEX

IP example: FM Vorterix in Buenos Aires



When Solidyne conducted the installation of FM Vorterix station, using the software Audicom Audio + Video, as well we turned to IP consoles for cover the large distances between the studios and the Theater

Theater for rock bands

main study

AoIP

Rack control

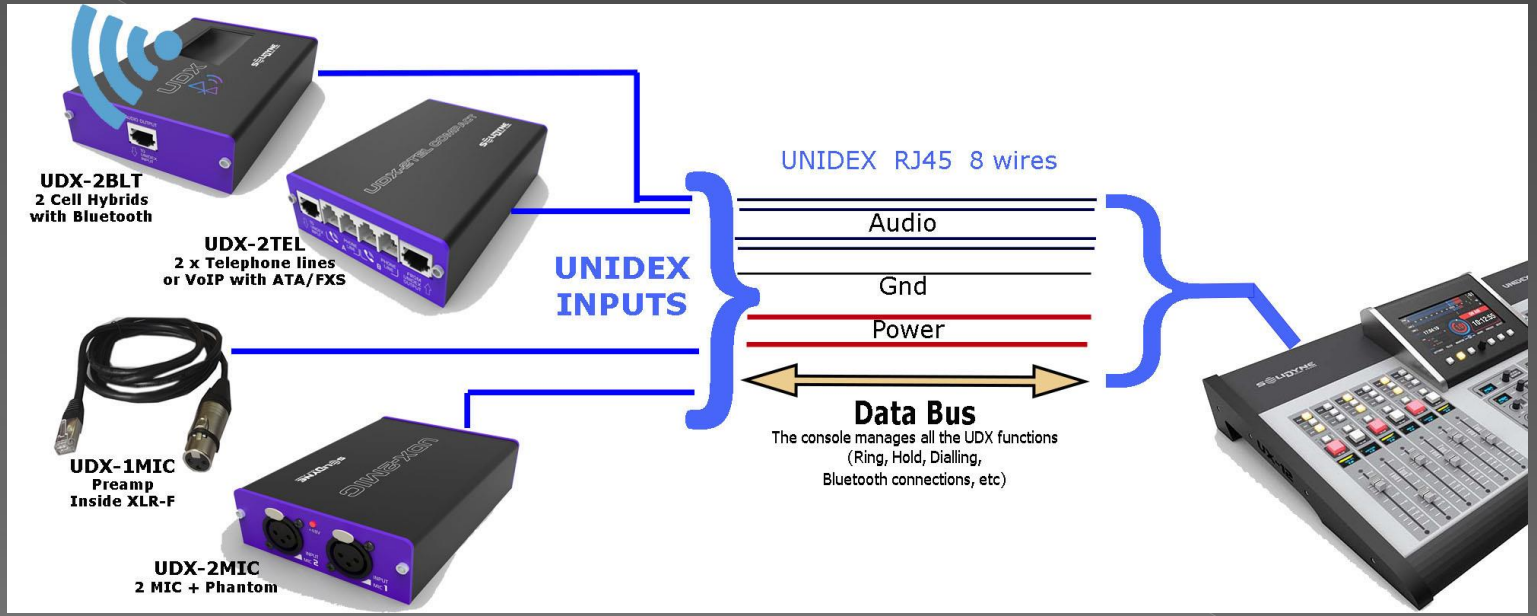
Transmission remote with Audicom of the festival Lollapaluza

Control room

UNIDEX UX24 Console

The console Solidyne UX24 provides a clean master control room. Elegant as you see, like a space ship...
With no wires in sight

UNIDEX adapters



UNIDEX is a technology that allows TOTAL FLEXIBILITY; something what neither other console of the market has.
It supports 16 inputs UNIDEX what can become microphone inputs, telephone lines, IP telephony, cell phones connected by Bluetooth, Bluetooth Stereo audio inputs and all the technologies that will be invented at future
Everything is managed from the mixer desk allowing the use in conference mode with Mix-Minus bus

The UX24 has 16 USB channels. It can be used as 24 bits audio IN/Outs, but it also can be used for TELCO communications. The USB channels appears at the PC as 4 x audio cards that allows using VST free software for reverberation, FX effects and every processor or device you wish to have on the Air!
UNIDEX is a new technology that allows you to perform everything what your imagination dreams...

UNIDEX adapters

The UX24 console allows for 8 TELCO simultaneous communications in conference

The UNIDEX technology is the only at the market that is able to convert its front panel in a true Communication Center where is possible to get PERFECT journalism conferences by Skype, Linphone, WhatsApp, POT telephone lines, IP telephony, cell phones with Bluetooth and future systems

Everything is managed from the UX24 mixer desk!

You can handle up to eight phone or cell calls from the touch screen of the mixer

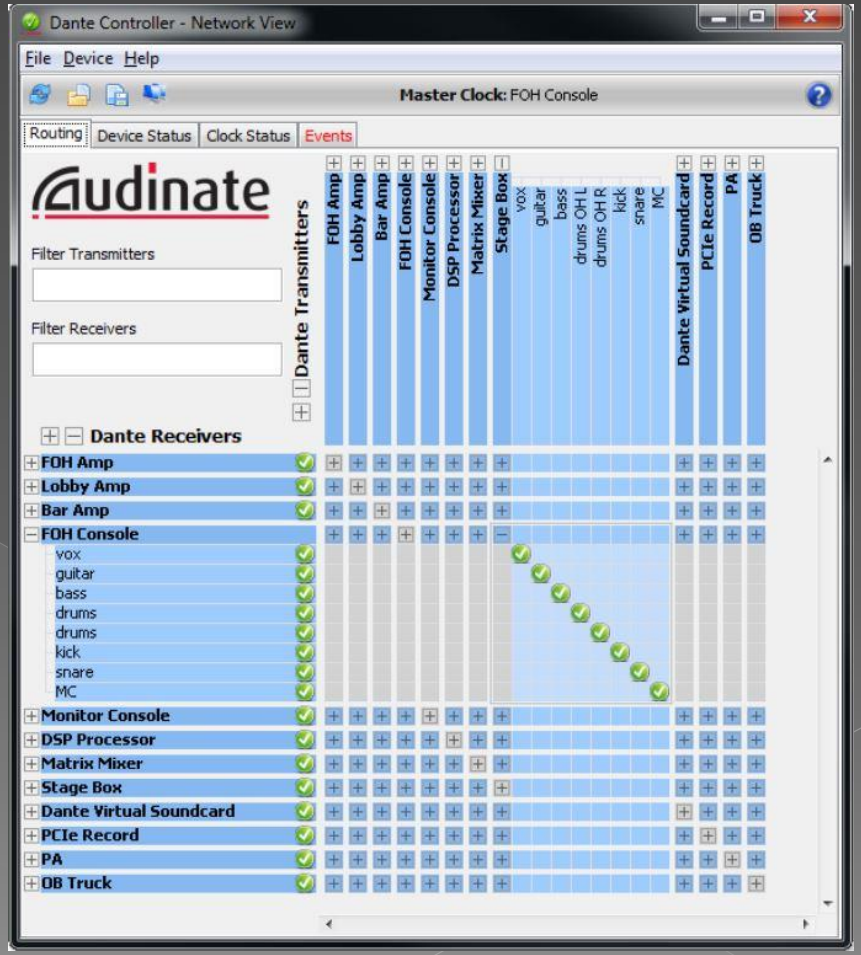
The internal CPU with touch screen can dial and manage telephone lines or receive calls from cellular or any other future communication tech.

DANTE AES67 connection to one PC

LAN radio network connected to UX24

Nearby PCs can be connected to UX24 using the USB connector with 4 channels stereo.

But remote PCs can be connected using the DANTE driver



With the Dante Controller software it can seen the entire network devices, up to 1024 channels. This way with a simple click all the channels are connected; the receivers and the channels that transmit signals. This matrix is the most flexible way of controlling a modern radio station replacing the old patch panel

UNIDEX UX24 Mixer

NEW UNIVERSAL TECHNOLOGY FOR RADIO

DANTE AES67

16 x 16

8 channels Dante

UX24 STANDALONE

28 in x 32out

16 channels Stand alone

convertible to **24** if you don't use DANTE network

With a single UX24 may drive several studios remotely by IP

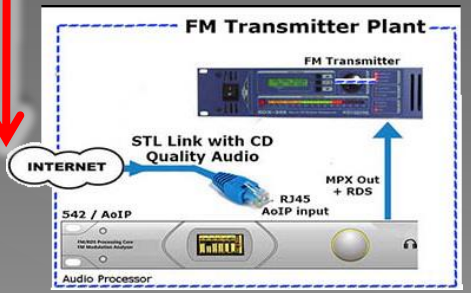
With a touchscreen PC may control music, effects and all the console UX24

Discovery

Out Stream AoIP

Out streaming Icecast /Shoutcast

Studios and remote auditoriums. Connection with others devices DANTE compatible



RTP-AoIP output for connect with transmitter plant

Studio microphones connected By STP CAT5 cable

Adapters for telephone lines, cell phones by Bluetooth, VoIP and future technologies

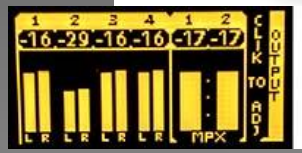
The UX24 mixer may be enlarged in minutes

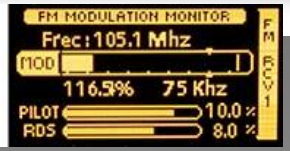
The standard 24 channels includes 12 faders at the mixer desk and 12 virtual faders from the touchscreen or from remote PC's of studios. But if you want more faders, it can be easily added in 6 faders blocks in only a few minutes

IP Audio Processors

The new technology of the
Solidyne 542
digital FM audio processor is
Self aligned and IP controlled
A new invention for the best audio quality on air

New technologies in digital audio processing





The Solidyne 542 five-band is the only processor at the world that uses ***Self aligned*** technology
It has a DSP FM signal analyzer connected to a FM antenna.

The antenna receives the FM signal and mathematically analyzed data generating HTML pages to remotely adjust the modulation, pilot tone, channel separation, etc

The *Self Aligned* processors

542 APC TECHNICAL REPORT - FM RECEIVER DATA - DATE(D/M/Y - 24hr):15/03/2018,

Frec sint:105.3 Mhz
Valid: true
Stereo: true
MODULATION: 126.35 %
PILOT Mod: 6.5 %
RDS Mod : 4.8 %
RF Level Input : 92 dBuV
Multipath : 1 %
AUDIO L: 2.30 dB
AUDIO R: 2.30 dB
Carrier Offset : -4.4 Khz
usn: -53 dB (ultra sonic noise)
assi200: -45 dB (SNR at 200 kHz offset relative to carrier)
lassi: -4 dB (Low Side Adjacent 100Khz offset , SNR relative to carrier)
hassi: -9 dB (High Side Adjacent 100Khz offset , SNR relative to carrier)
RDS BER (RDS- Bit Error Rate) : 0 %
RDS Data:
RT: Maroon 5 Wait (Videooficial)
PS:
PTY: 0
PI:FFEE

ON-AIR FM MEASUREMENT:
SEPARATION L>>R: 26.1 dB
SEPARATION R>>L: 21.42 dB
SEPARATION Label: Poor !!
THD+N : 0.7 % Fair

Pressing a button at the screen, in 3 seconds you get the 24 parameters measurement of transmission quality
All while the radio is on air and without bother to the listeners

No FM Monitor, yet the most expensive, can get these data with the radio on-air

It was the initial report
Notice that the channel separation is bad

Fig-1 Reporte inicial de la radio de Tierra del Fuego

This is a real example of a radio located at Tierra del Fuego at the southernmost city of the world. Note that we only have 21 dB of channel separation (a bad value) due to the normal standing waves in the coaxial cable and antenna. This is a poor value. Also the modulation level and pilots tones are NOT correct. These errors deteriorate audio quality and reduce the range of the transmitter Within minutes from 3,000 km away, while the radio radiates its normal programming, Solidyne was able to correct problems.

The new measure give us:

MODULATION: 109.08 %
PILOT Mod: 9.9 %
RDS Mod : 5.9 %

ON-AIR FM MEASUREMENT:
SEPARATION L>>R: 36.58 dB
SEPARATION R>>L: 36.72 dB
SEPARATION Label: Very Good
THD+N : 0.7 % Fair

NO audio processor at the world have been able to correct a bad channel separation due to standing waves!
Now the channel separation changes from "Poor" to "Very Good"
The modulation is below 110% (value accepted in many countries) and both pilot tones are correct

This "IP service" that Solidyne provides for free has allowed us to adjust remotely radios in USA and Europe. And also on the heights of NEPAL or in any of the 65 countries to which we export.

For the first time all radios worldwide, using the Solidyne 542, will be able to measure the sound quality of their FM station while there is On-Air without interrupting their program

The value of "THD + N" gives us the Percentage of Total Distortion due the transmitter and the aerial SWR

.

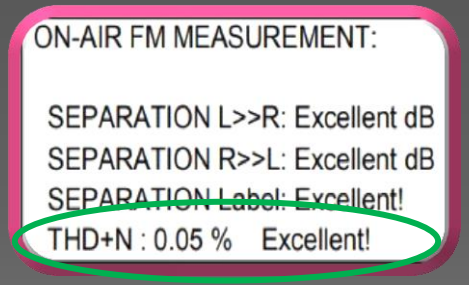
To be inaudible the distortion should be less than 0.1%

Here is the result of a transmitter of a popular economy brand. It has 7 times more distortion than the threshold of audibility.

A radio station needs to measure the THD in order to know the quality of the On-Air sound.

Before the 542 invention the only way to know the audio distortion value was stopping the program and keep the radio out of the air a long time, disappearing from the dial. Since no radio can afford this method, NONE of the radio station using other brands of audio processors knows its real sound quality

These measurements are performed while the radio is on-air, without disturbing the listeners



Almost all distortion is due to the transmitter, when the processor is digital and the antenna has low SWR

We can see here the excellent specifications of a 542 using a RVR transmitter with PTX-30 exciter:
NO AUDIBLE DISTORTION

Interconnection of IP processors

AoIP OUT

LAN

Internet or link microwave 5 GHz

LAN

Solidyne 542/AoIP

From this PC the 542 located at Xmter Plant is remotely operated. All the FM transmission parameters can be seen at screen due the FM monitor inside the 542

The link between the UX24 and transmitter plant is straightforward with perfect digital audio quality (CD quality)
It do not requires purchasing a digital link
Other Solidyne consoles with AoIP option can also be connected this way.

If the transmitter is located at the same building as the studios, you can connect a processor Model 542/A67 to the LAN network using DANTE AES67

Digital Remote transmission full duplex

Portable Mixers with the new technology:
Real Time Tunneling

The remote transmissions are the heart of a Sports or Journalism radio station

- In both FM radios and the new streaming WEBradio , outdoor transmissions are increasingly important

- Today many radios hold conferences of journalists located in studios of different cities or countries. A simple phone call is no longer enough. Synchronized conferences between remote studios with several professional microphones are necessary.

- In sports broadcasts, in addition to broadcasting the game, commercial advertisements must also be inserted in STEREO. In addition, journalists from the radio studios should interview important players and this requires working in full duplex without annoying delays.

Leading radios work with Audicom working outdoors

Transmission from the Boca Stadium, 2019, Argentina

FM Vorterix
festival Lollapalooza 2019
Audience = 270.000 people

One Direction show in 2014, Buenos Aires, to 250,000 people
Stereo transmission by Coca Cola FM Radio

Remote transmissions are the heart of a FM radio, handling synchronized Sports studios in several cities

The handheld digital stereo MX2200 handles 4 MIC channels, 2 stereo line channels, one digital USB input and two telephone hybrids; one physical line (POTS) and a cell phone connected wirelessly using Bluetooth 4.0 (50 – 8.000 Hz)

The MX2200 can also be installed in studios because it has tally light and muting output for speakers. The ultra-low distortion of 0.01% provides the sound quality of a CD

A miniature computer includes four 64-bit cores @ 1.5GHz. A high contrast OLED display can operate at day light.
It is lightweight for the use of Lithium-Ion batteries and duralumin cabinet

Remote digital communication is instantaneous, like a telephone and is done without technical knowledge using the new technology:

Real Time tunneling

Real Time Tunneling

Solidyne free CLOUD Service

MX2200: Quick automatic connection in 3 steps:

1 Requests SIP URL

2 The hosting gets the SIP URL and sends it to the MX2200

3 Direct link without time delay by Tunnel full duplex

The journalist selected from a list stored on the MX2200, the name of the device to be connected.
For example: Choose the display:
SOL FM STUDIO
The MX2200 asks the cloud service to obtain the SIP address of the device. Once obtained is transferred to the MX2200 to create a VPN tunnel.
You get a connection without delay, full duplex, like the VoIP telephony but with high audio quality stereo

STUDIOS

The transmission is received in stereo in several ways:

1 – It may be received without any special equipment using a PC with Solidyne software

2 – It may be received with a console MX2200 for having a synchronized News or Sports studio

3 – It may be received using the AoIP input of the UX24. This mixer sends to the remote MX2200 the local audio of the Journalists in order to ask questions at the remote interviewed.

If you can't reach the Internet speed in a Stadium ... use **Channel Bonding**

There are great stadiums where the Internet is not good. Especially when the public begins to send pictures and messages ...
Then the solution is using *channel bonding* which is a service that allows you to add multiple inputs to speed up Internet and solves the problem
The MX2200 allows the use of this service from software version 2.0

1 - Internet connection by cable offered by the stadium

2- Stadium WiFi connection

3 - Mobile 4G cell phone at "share" mode. It sends to MX2200 Internet 3G / 4G using Wifi

Data connectivity using Solidyne devices

The advantages of this technology

The connectivity at the radio studios

- The digital systems always brings audio interconnection
- Then you can use devices of different brands
- But it is true only for AUDIO signals...
  IT DOES NOT ALLOW to exchange information between devices of different brands.

The connectivity at the radio studios

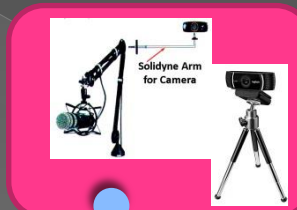
- The reason for this lack of exchange is that there are not international standards to do that.

- Since Solidyne is the only world company that manufactures **All** the studio IP devices, the automation software and IP Audio Processors with FM Monitor, we have created our own standard for data interconnection

The advantage of having an Intelligent Radio

The Audicom software informs the audio processor the style and theme of the On-Air song to change presets adjustment. Is not the same to play JAZZ or ROCK ...!

The UX24 informs to the CLOSE service which microphone is active to switch the TV camera



Internet or Microwave

Transmitter plant

542/AoIP processor located at Transmitter Plant receives data about:

1-Musical style (To change setting)

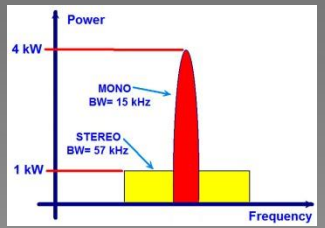
2-The UX24 informs when MICs are open to switch to "Voice Announcers" preset. There are not mistakes when voice and music are mixed!

3-From Control Room PC: informs to 542 if a Journalism program is aired to switch to MONO. This multiplies by four the effective radiated power increasing the transmission range and avoids interference from near FM stations

LAN

Mixer:
UNIDEX UX24
DX816 /
822/AoIP/cam

A remotely controlled PC processor sends messages about the transmission quality or devices failed



Thanks for your time…