IP Based GMDSS Webinar

11:00 am CET

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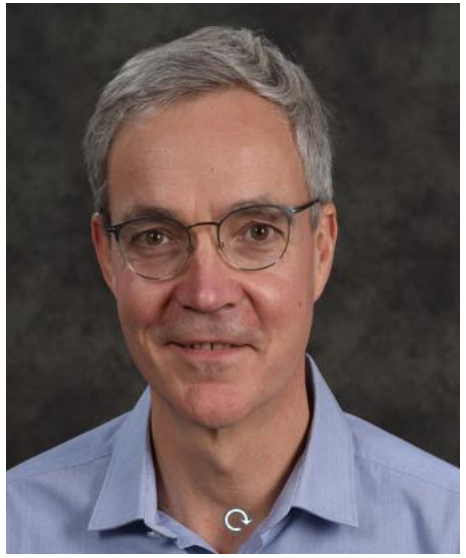
Agenda

- Introduction
- Terrestrial GMDSS
- Leveraging standards
  - IP protocols
  - ED137B & SIP
- Live Demonstration: GMDSS Server
- Questions and answers



Hermann ZENSEN
Sales & Marketing

Marc DUMONT
R&D

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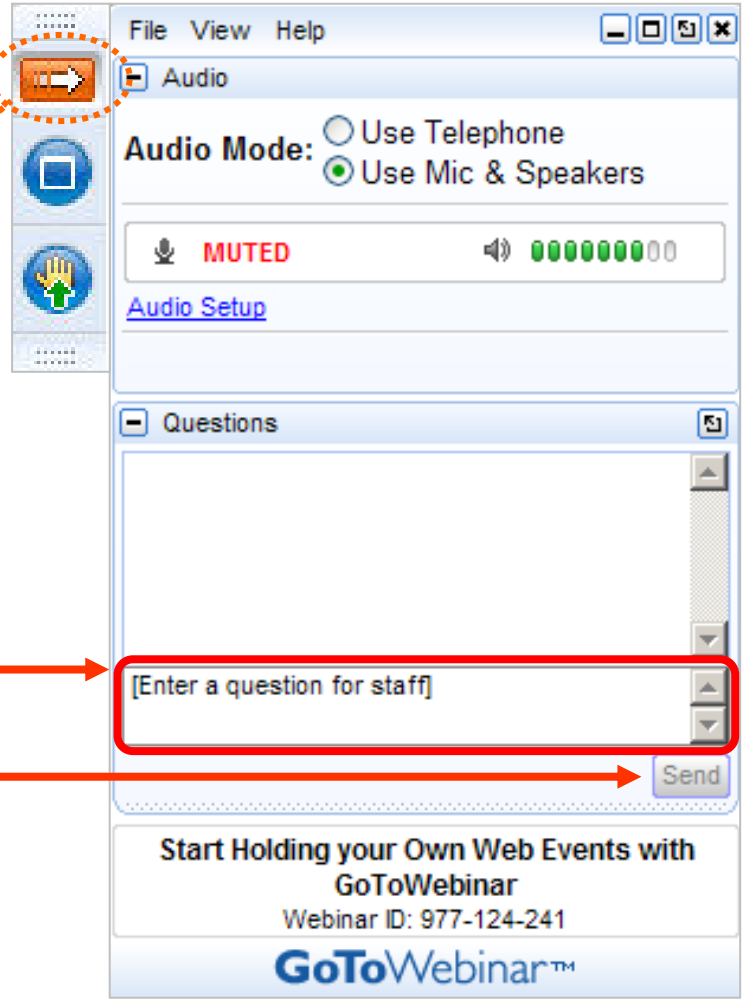
Questions & Answers

Click on  *to open/close webinar panel*



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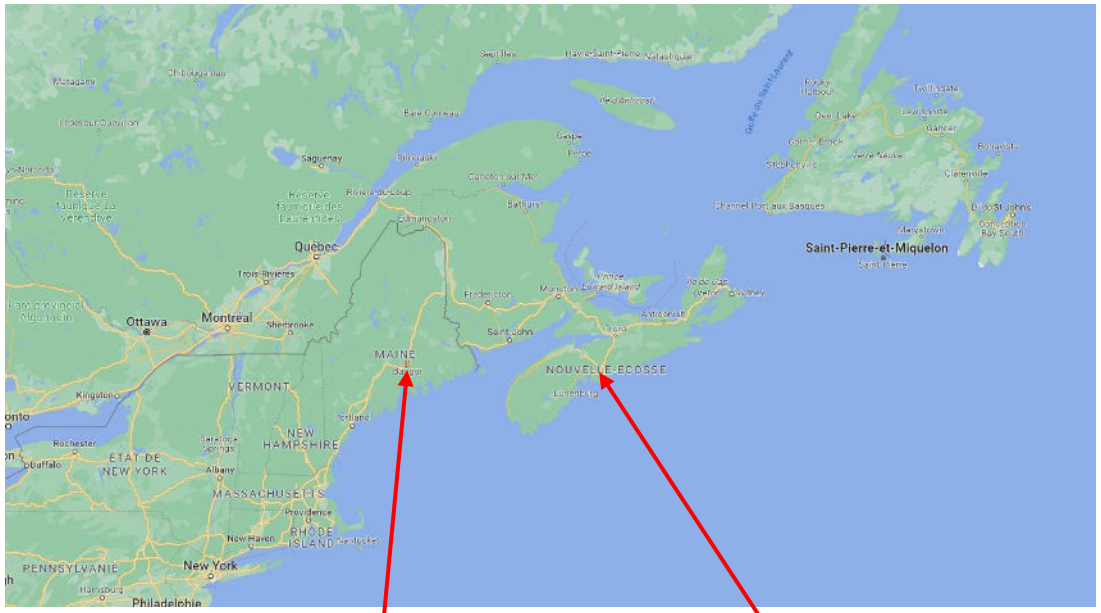
KENTA Technologies & NAUTEL: Shared passion for maritime communications



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Maine, US

Nautel HQ
Halifax, Canada

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KENTA Technology Key Points

- Nautel's European subsidiary since February 2021
  - Part of a 200+ employee, 54 year RF and communications innovator, with outstanding financial stability.
- Founded in 1990 as a Furuno spin off with focus on maritime communications
- GMDSS since 2013
- Software and hardware completely developed internally
- Key competences:
  - IP Technologies
  - Radiocommunications (MF, HF, VHF)
  - Strong field experience for frequencies MF/ HF (less than 30 MHz)
  - Software defined Radio

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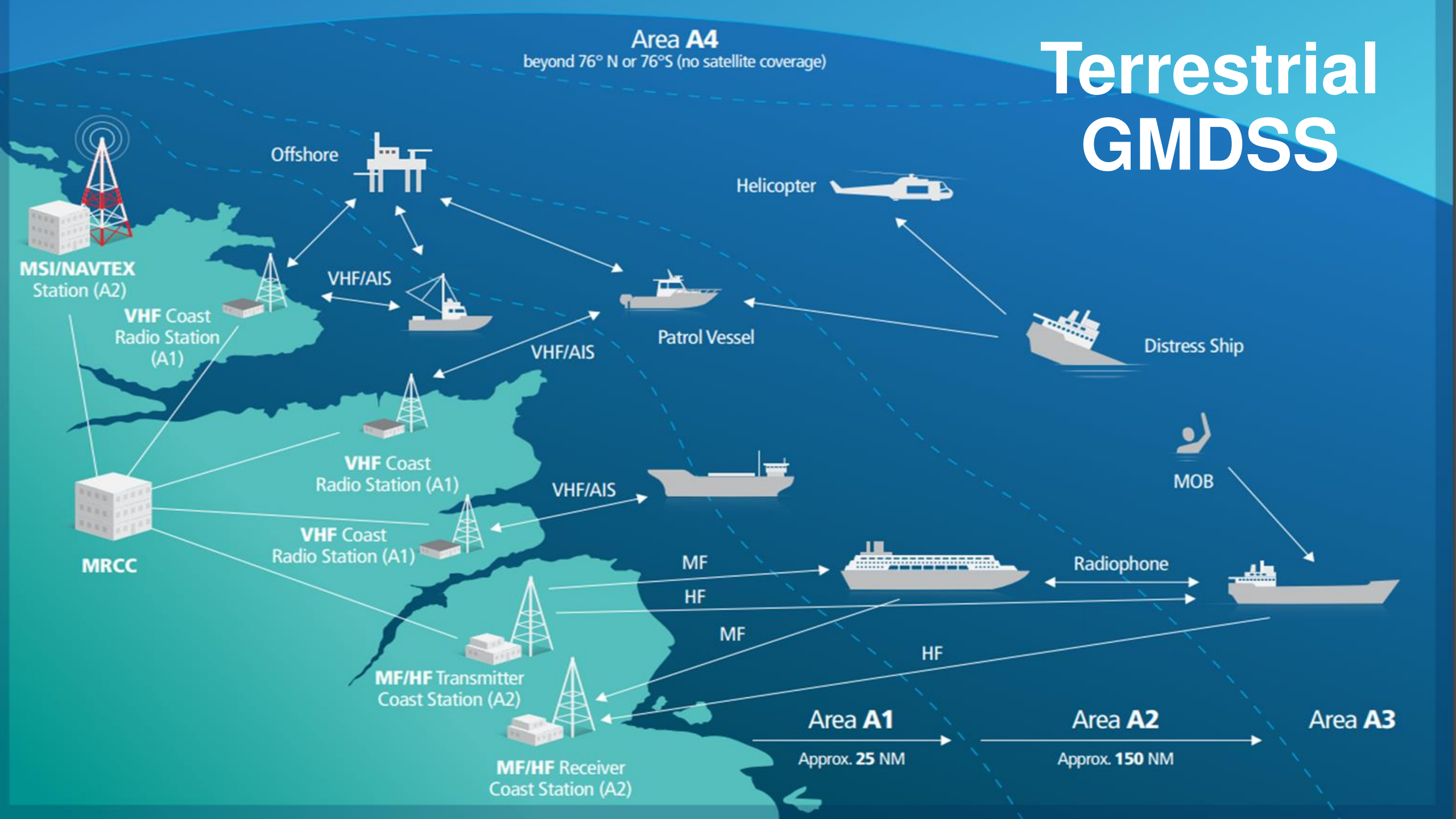
Terrestrial GMDSS



Leveraging Standards: IP Standards

- All industries leveraging IP standards today:
  - Remote control, configuration, update
  - Easy maintenance
  - Easy monitoring
  - Less cables, compact racking
  - Today's IP networks have high bandwidth
  - Ideal for unmanned site and remote operation
  - Standards to be discussed:
    - HTTP, FTP, RTP, SIP, ED137

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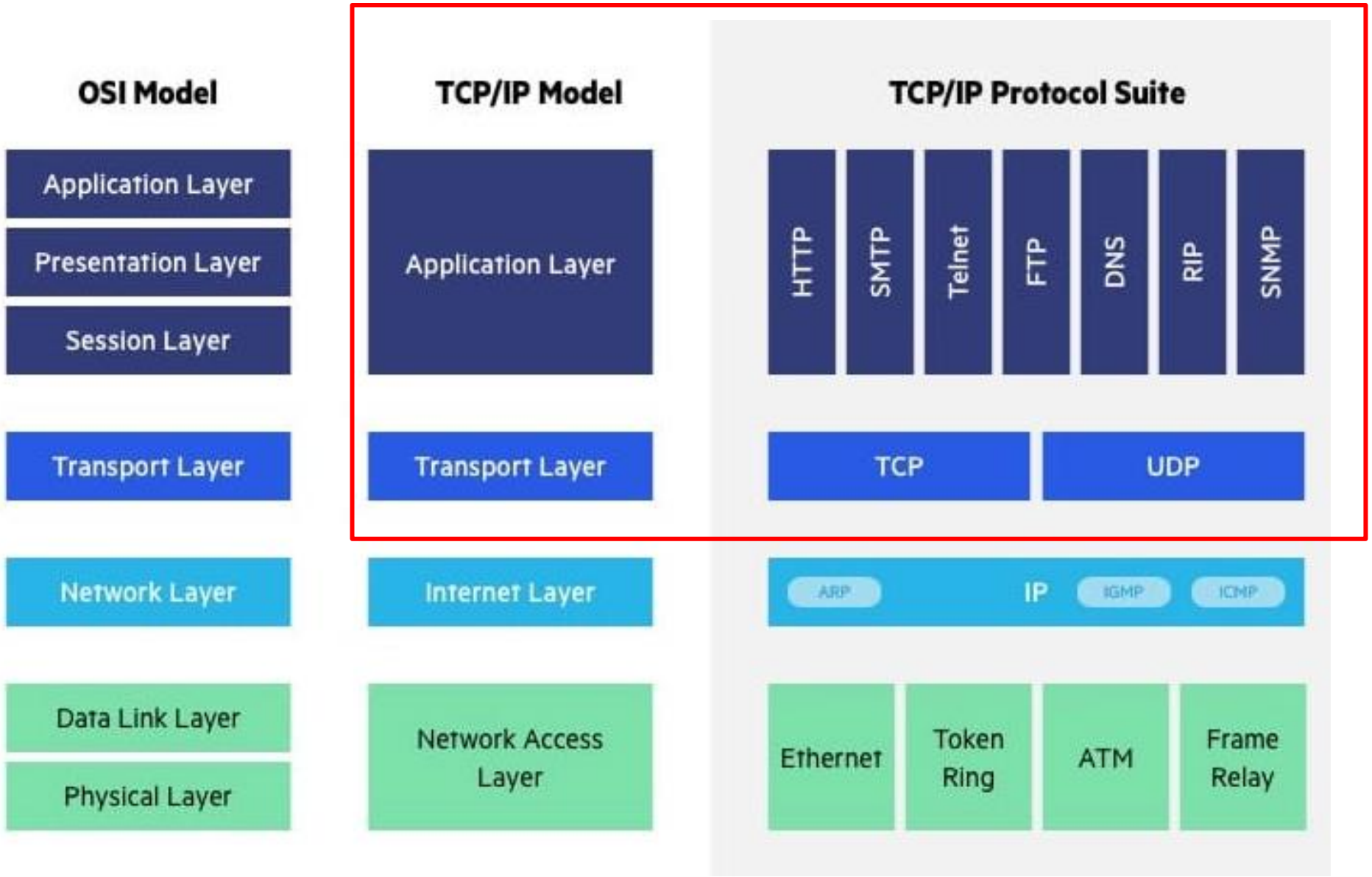
Internet Protocol Layers

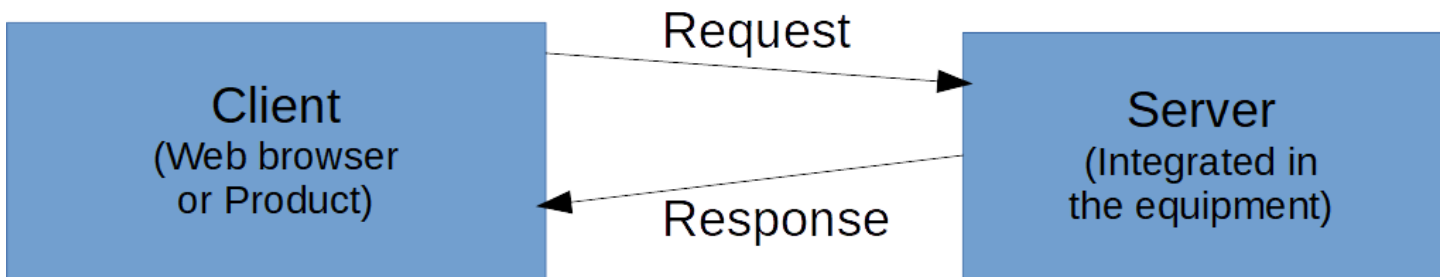


HTTP Protocol

- The Hypertext Transfer Protocol (HTTP)
  - Application layer protocol
  - Enables distributed, collaborative, hypermedia information systems.
  - Foundation of data communication for the World Wide Web
  - Hypertext documents include hyperlinks to other resources that the user can easily access by a mouse click

HTTP Protocol

- Very popular (all web sites!)
  - Well-documented / analyzable with tools like Wireshark
- Client / Server oriented (connected)
  - Request from client expects server response
  - Polling
- Mainly exchanging XML Data format
- Compressible (GZIP)
- Fast (with Keep-Alive support)



HTTP Protocol Example

- **GMDSS utilization:**
  - Monitoring and Control
  - Set/Get Frequency
  - *Get Status/Alarms

Request

```
GET /hello.htm HTTP/1.1
User-Agent: Mozilla/4.0 (compatible; MSIE5.01; Windows NT)
Host: www.tutorialspoint.com
Accept-Language: en-us
Accept-Encoding: gzip, deflate
Connection: Keep-Alive
```

Response

```
HTTP/1.1 200 OK
Date: Mon, 27 Jul 2009 12:28:53 GMT
Server: Apache/2.2.14 (Win32)
Last-Modified: Wed, 22 Jul 2009 19:15:56 GMT
Content-Length: 88
Content-Type: text/html
Connection: Closed
```

```
<html>
<body>
<h1>Hello, World!</h1>
</body>
</html>
```

FTP - Protocol

- File Transfer Protocol (FTP)
  - transfers files from a server to a client on a computer network.
- Built on a client–server model architecture
  - separate client & server, control & data connections.
- Users may authenticate themselves with clear-text sign-in
  - normally in the form of a username and password.

FTP Protocol

- File transfer oriented (file name is also transferred)
- Like HTTP: Client/server, request/response, polling
- Dual communication channel (session & data separately)
- Mainly exchanging XML Data format
- No compression / Not so fast

- **GMDSS utilization:**
  - NAVTEX/DSC Data Exchange
  - Polling of RX messages
  - Push TX messages to be transmitted

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FTP Protocol Example

Simplified Version with FTP client

```
Connected to ftp.nautel.com
220 bruno FTP server (SunOS 4.1) ready.
Name (ftp.nautel.com:yourlogin): anonymous
331 Guest login ok, send ident as password.
Password: ***
230-This server is PURE-FTPd
230 Guest login ok, access restrictions apply.
ftp> cd /pub/HPSC
250 CWD command successful.
ftp> ls
200 PORT command successful.
150 ASCII data connection for /bin/ls (128.138.242.10,3133) (0 bytes).
File1.xml
File2.xml
226 ASCII Transfer complete.
418 bytes received in 0.043 seconds (9.5 Kbytes/s)
ftp> get File1.xml
200 PORT command successful.
150 ASCII data connection for File1.xml (128.138.242.10,3134) (2881 bytes).
226 ASCII Transfer complete.
2939 bytes received in 0.066 seconds (43 Kbytes/s)
ftp> bye
221 Goodbye.
```

Identification with User And Password

Change directory

List

Get the File “File1.xml”

Close.Bye

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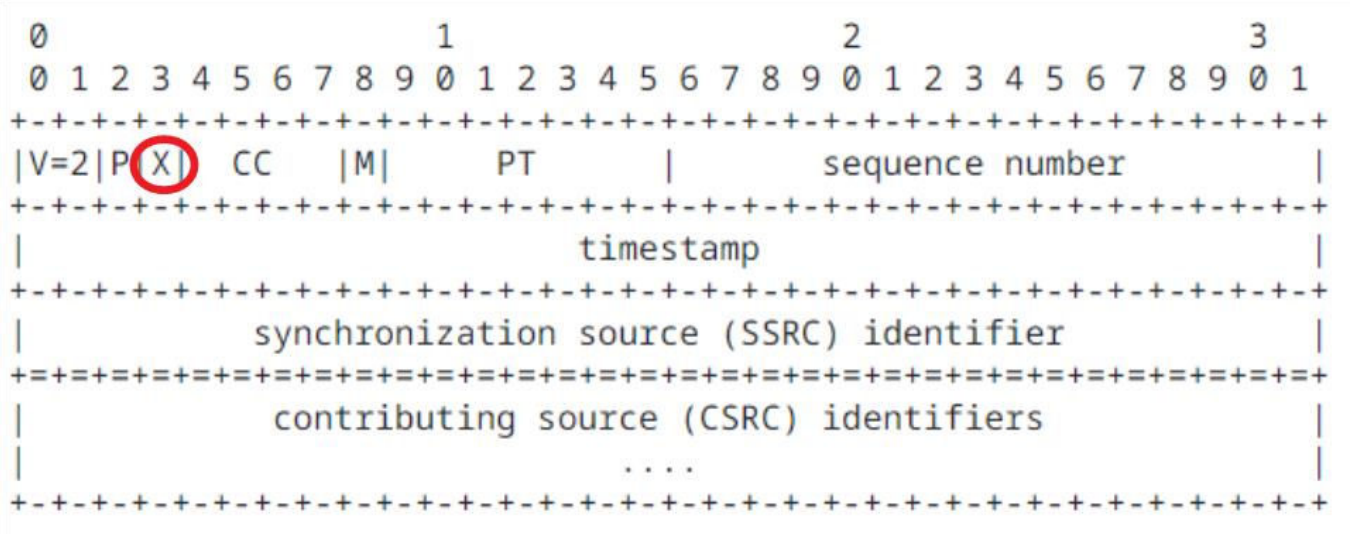
RTP – Real Time Protocol

- Real-time Transport Protocol (RTP)
  - Transport layer protocol
  - Delivers audio and video over IP networks
  - Typically runs over User Datagram Protocol (UDP).

- One of the technical foundations of Voice over IP
  - Often used in conjunction with a signaling protocol
  - For example:
    - Used with the Session Initiation Protocol (SIP) which establishes connections across the network

RTP – Real Time Protocol

- Used over UDP (datagrams / no connection)
- Can transport anything
  - such as audio PCM/G711/G729 and ED137 controls for transceivers
- Timestamped
- Additional Forward Error Correction (FEC) possible
  - (Packet Loss prevention)



X = Extension flag.
Used for ED137

RTP Header from normative RFC 3550 (followed by useful data)

Leveraging Standards: ED137

- ED137:
  - Open protocol for air traffic management control centers
  - Easy Integration of equipment from different suppliers
  - Standardized Audio encoding: G711
  - Interoperability



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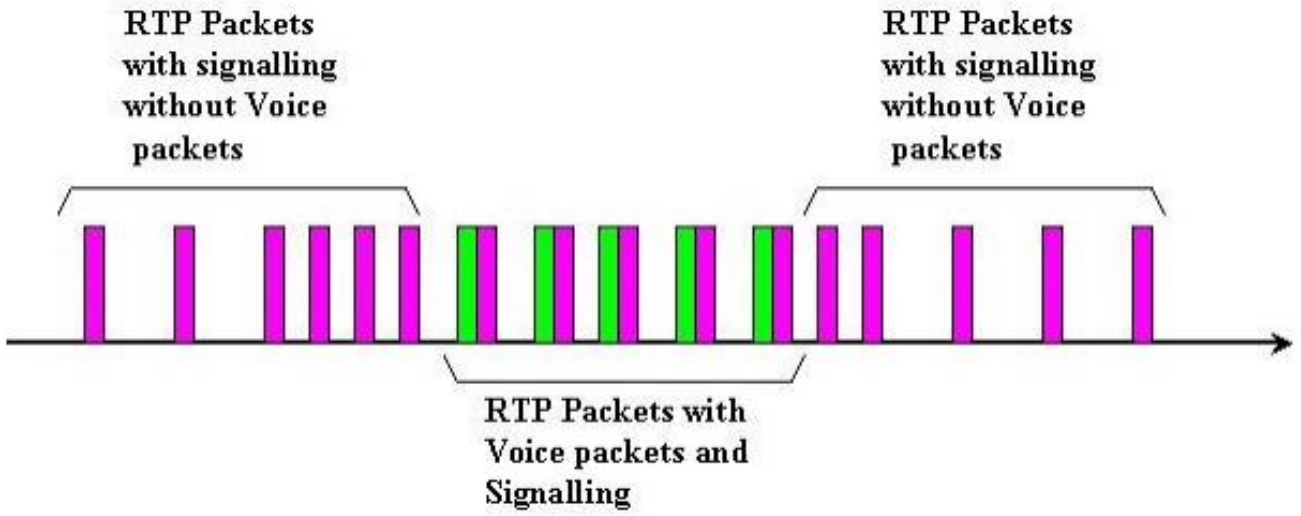
Leveraging Standards: ED137

- Use of SIP for establishing sessions between 2 pieces of equipment
  - SIP Version 2.
- Additional RTP header provides extra real-time information (with each audio packet)
  - PTT for transmitter
  - SQUELCH for receivers
  - No audio transported when there is no communication at all
  - R2S Keep-Alive packets missing in SIP standard (no network link status monitoring)
  - Keep Session Open



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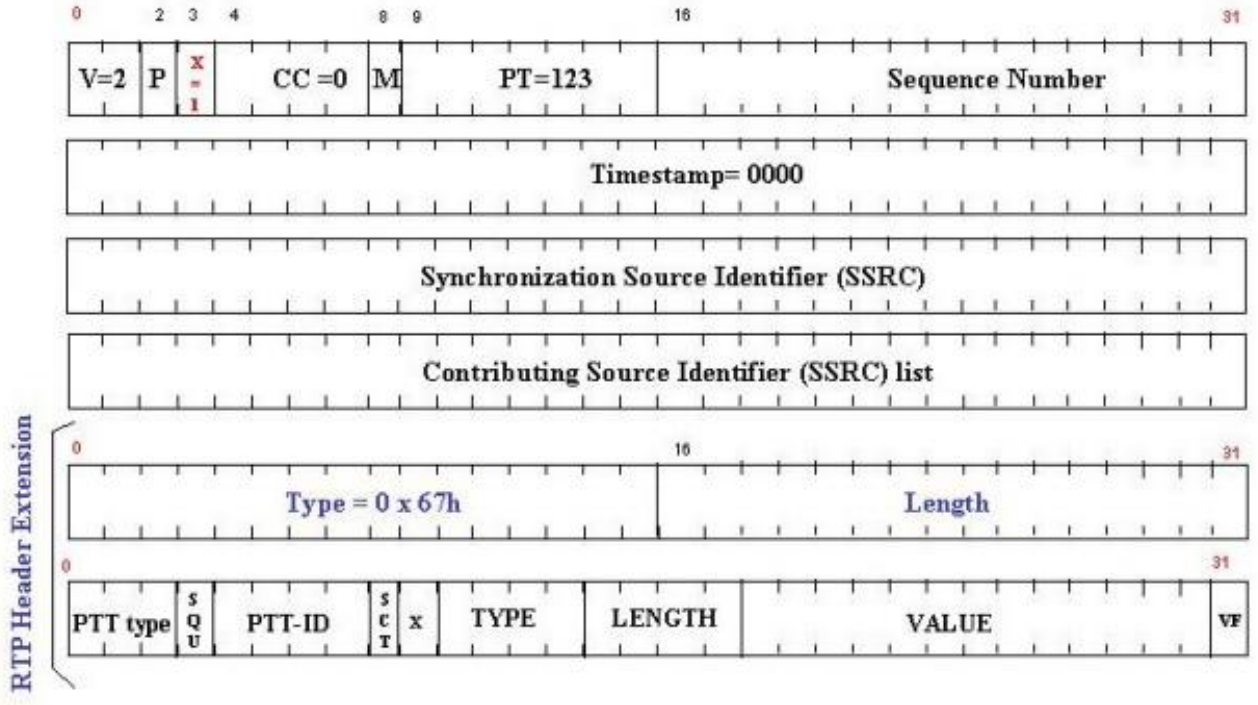
Leveraging Standards: ED137



Modified RTP header with ED137 information

- **GMDSS utilization:**
  - All audio exchanges for transmitting/receiving

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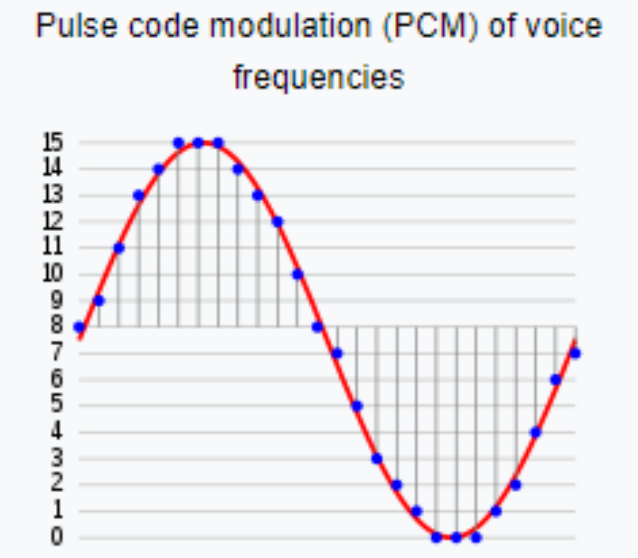
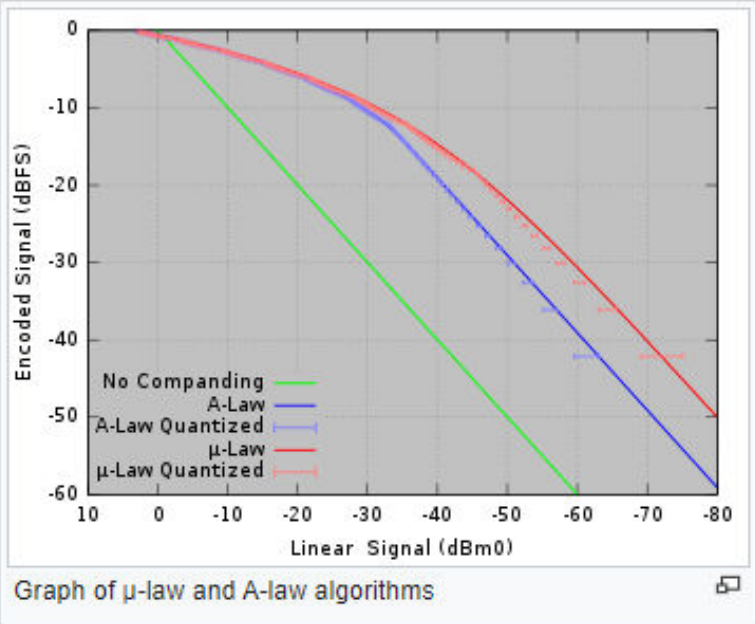
G711 Audio Encoding

- 8-bit PCM Based
- Quantization µ-Law (majorly U.S. and Japan) or A-Law
  - (Generic ; also called ‘PCMA’ like we use for phony)
- Used in mono/8kHz for voice
- Bitrate: 8Khz*8bit = 64 kbit/s

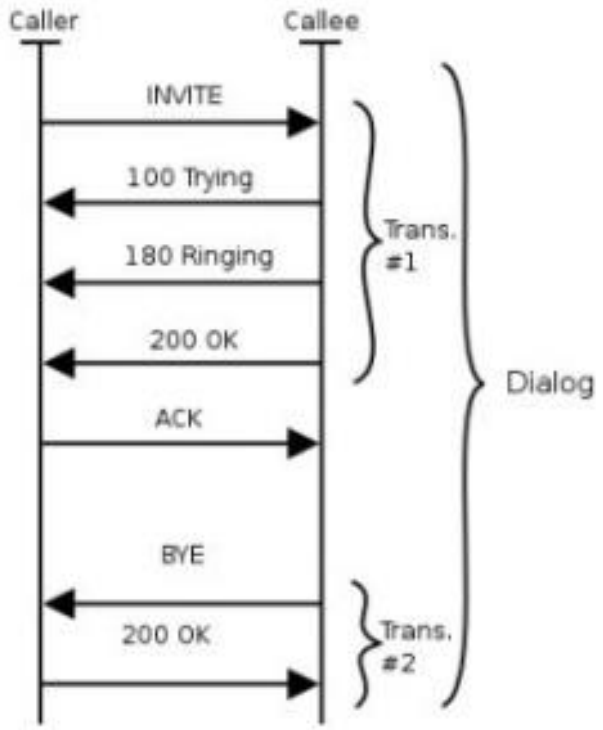




Graph of µ-law and A-law algorithms

Leveraging Standards: SIP - Protocol

- Session Initialization Protocol (SIP)
  - Used in Internet telephony, in private IP telephone systems, mobile phone calling over LTE
  - Signaling protocol for RTP (Application Layer)
  - initiates, maintains, and terminates communication sessions
  - voice, video and messaging applications
- Text based peer to peer protocol,
  - includes elements of HTTP and SMTP
- Describes future RTP/Audio session
  - Session Description Protocol (SDP) carried as payload in SIP messages
  - No further exchanges when RTP stream has started
- Independent of the transport layer:
  - Can be used with TCP and UDP

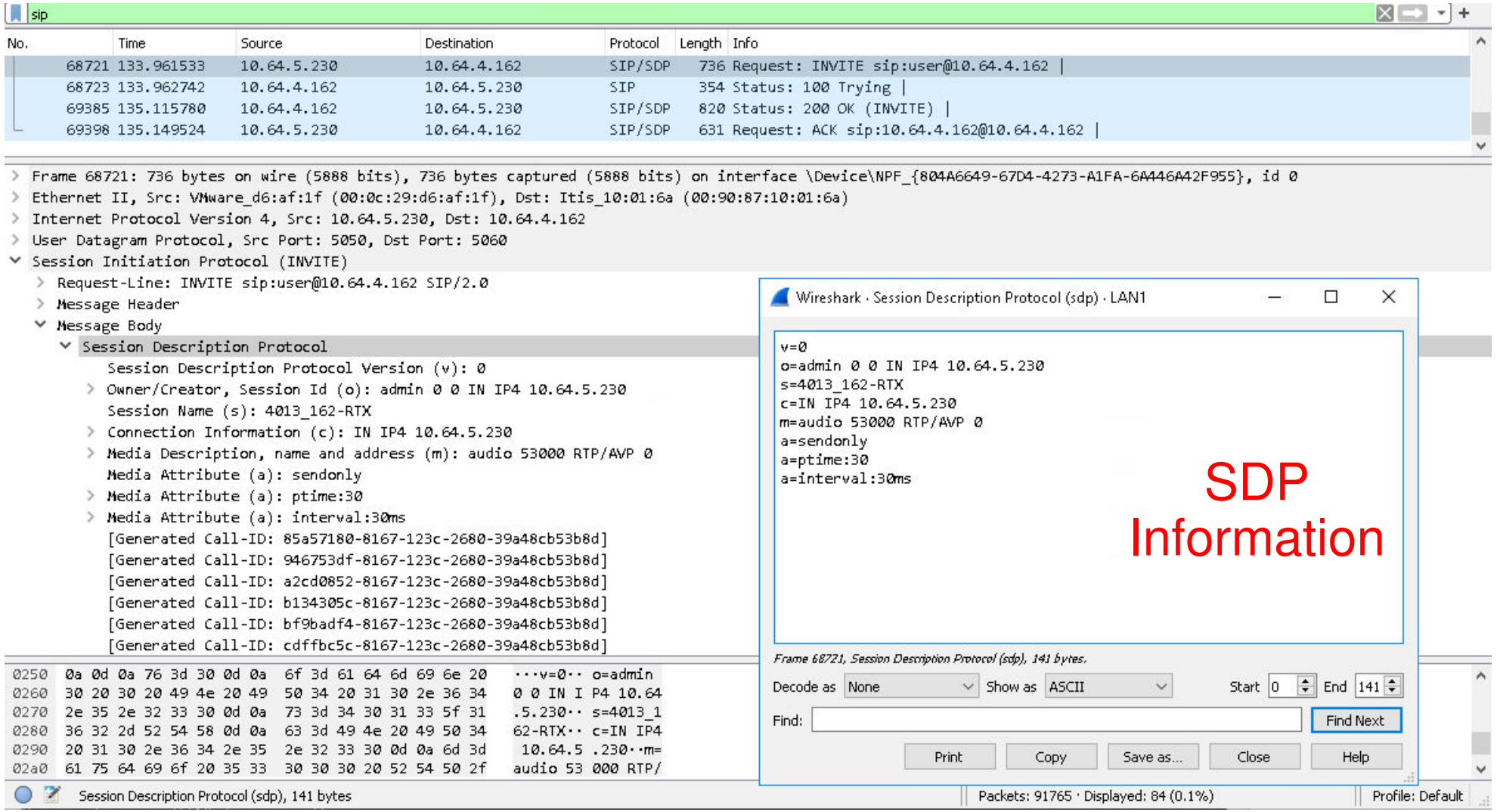


SIP Protocol – Wireshark Capture

IP Source and destination

SIP Message Body

Bit per bit



SDP Information

IP Standards Implementation Example
KENTA Solution Step by Step

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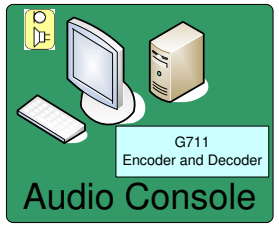
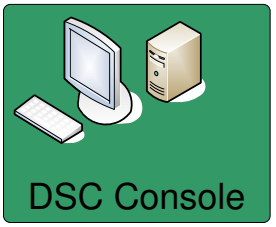
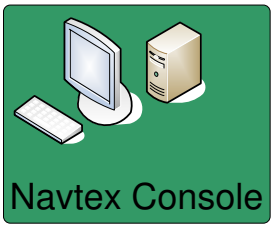
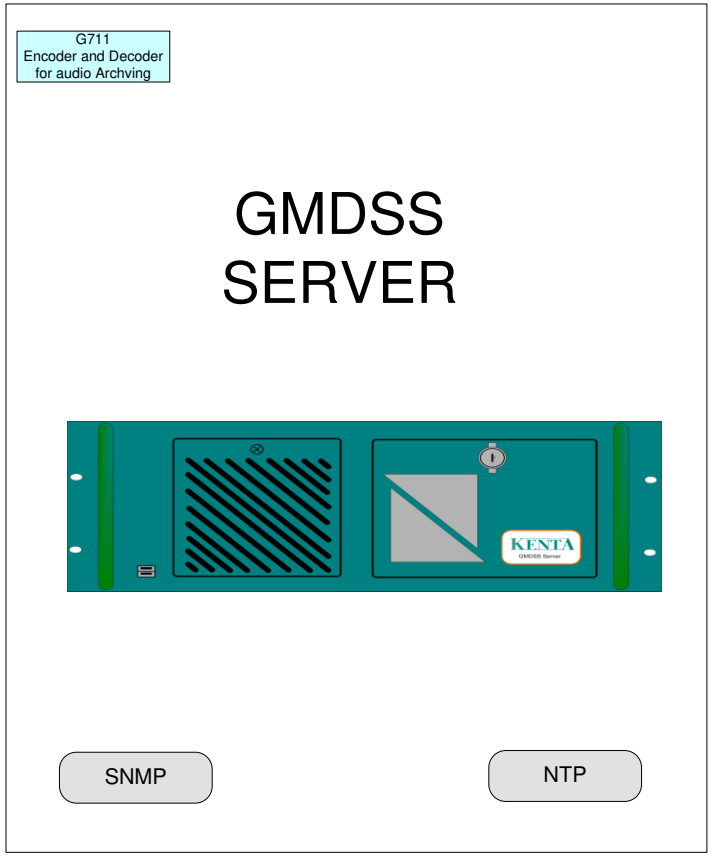
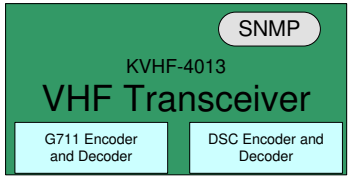
KENTA IP Solution

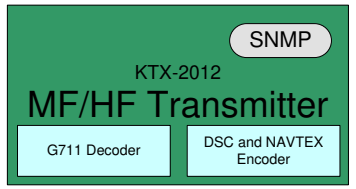


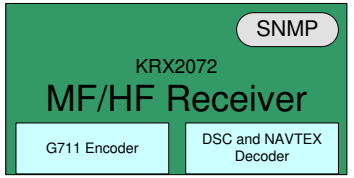


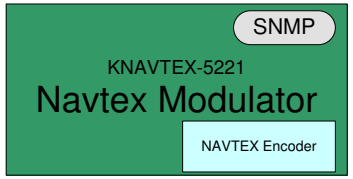




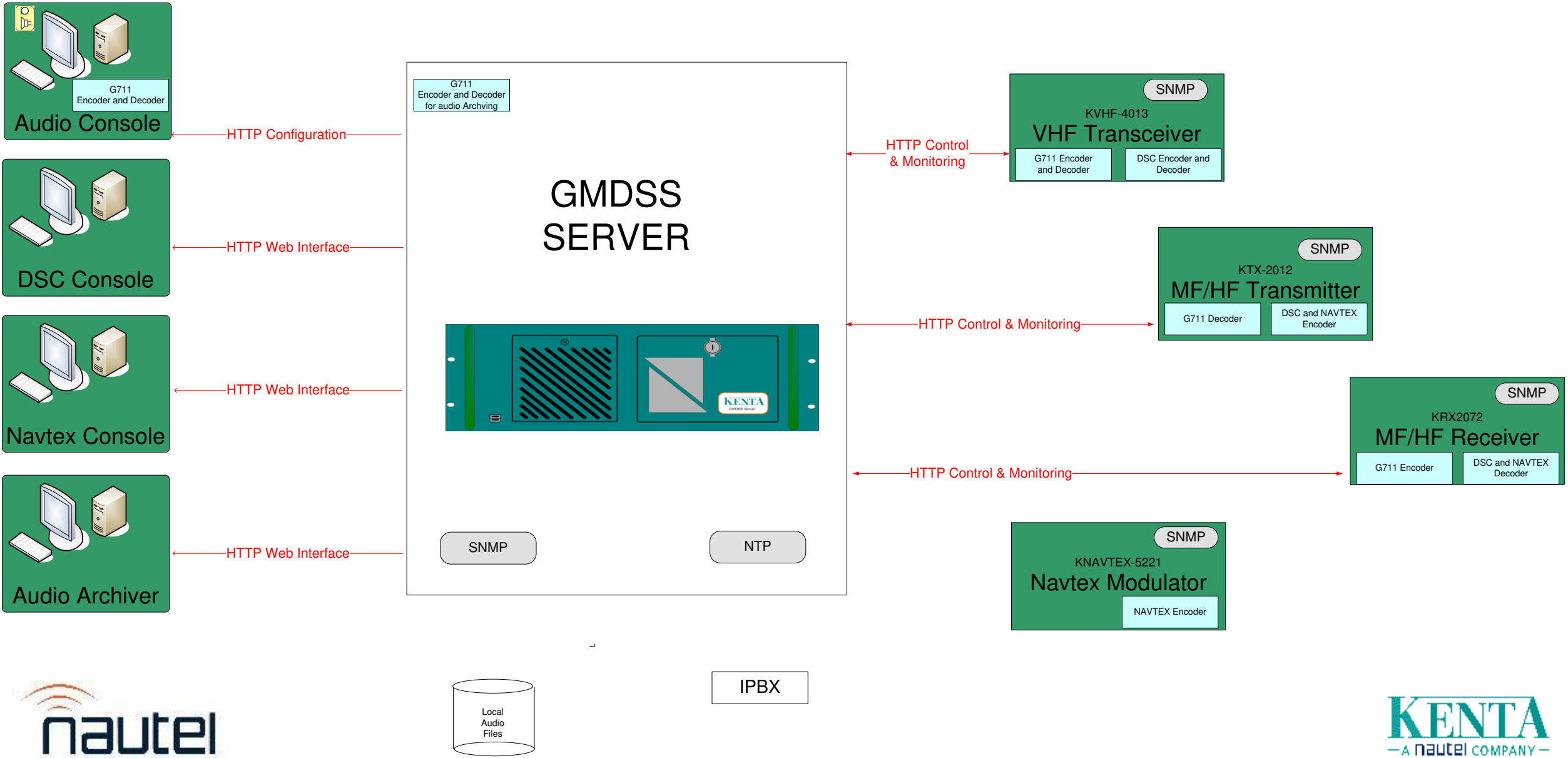




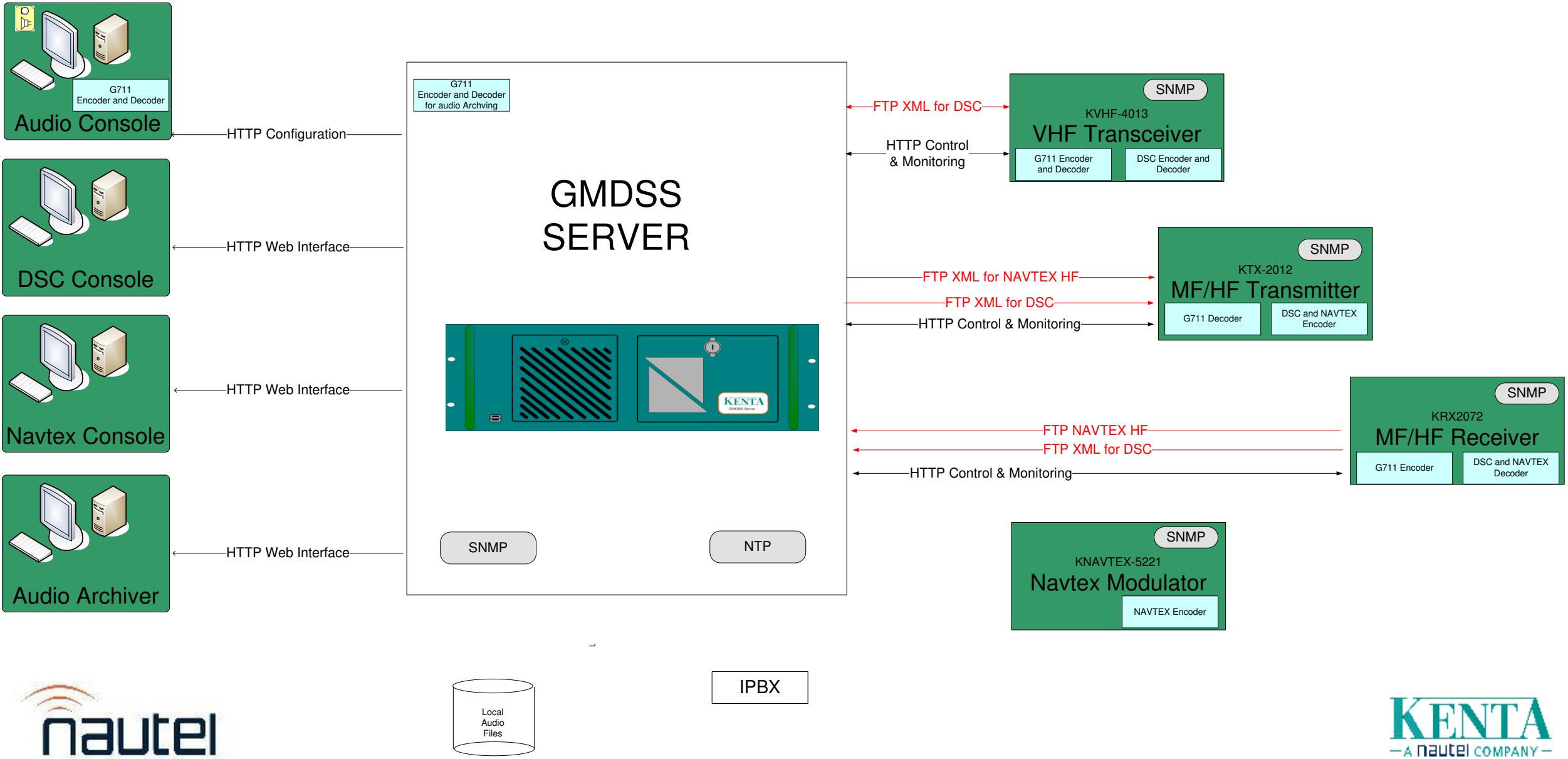




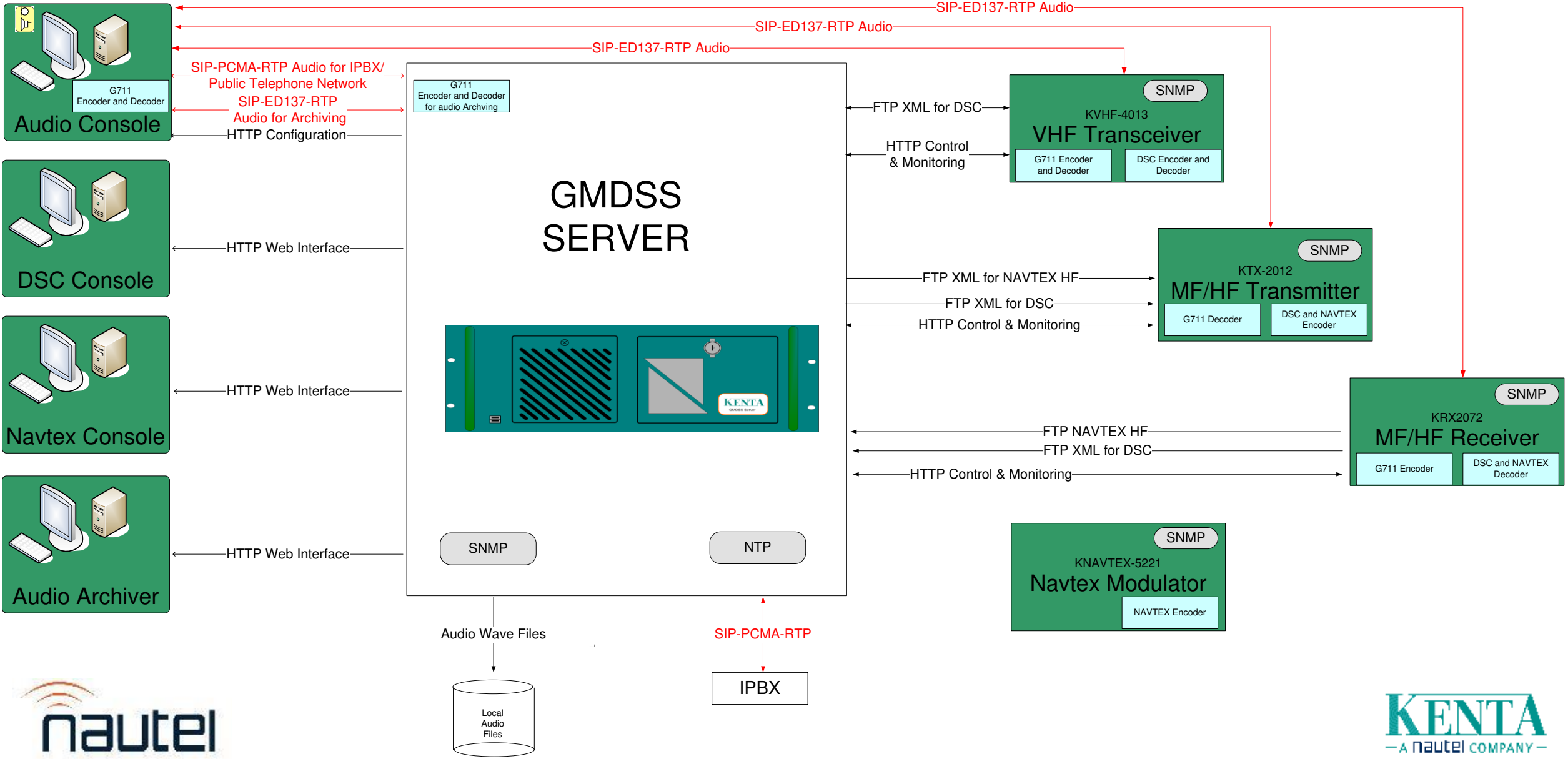
KENTA IP Architecture with HTTP only



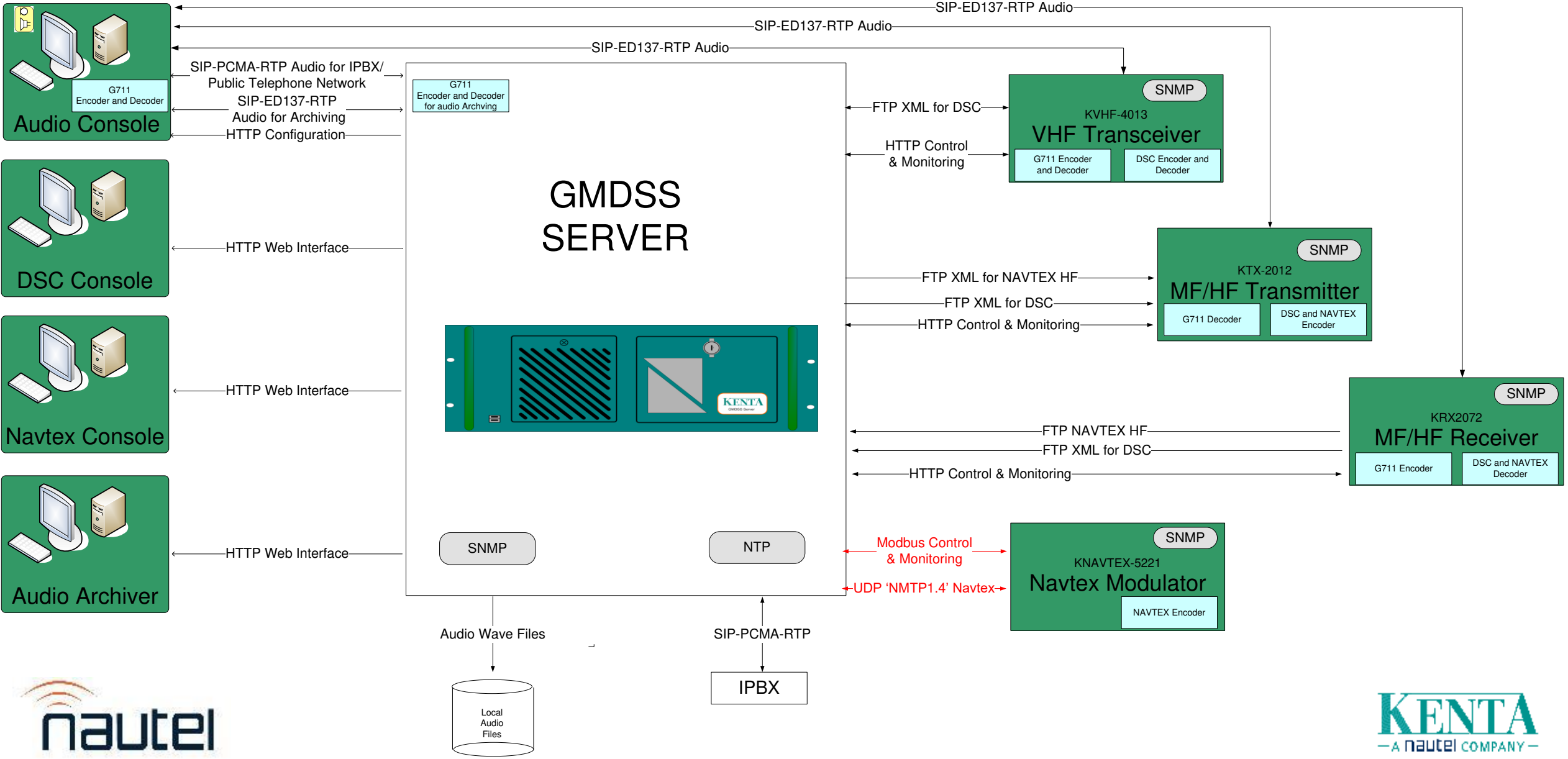
KENTA IP Architecture with HTTP and FTP



KENTA IP Architecture with HTTP, FTP and ED137B



KENTA IP Architecture: Complete IP Implementation



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DEMONSTRATION

Standards and IP in action

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KENTA Nautel GMDSS Equipment

VHF Transceiver

MF/HF and Navtex RX

Navtex Transmitter

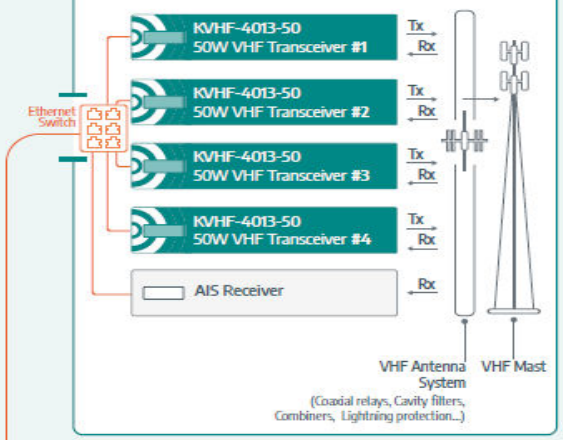
IP Network

GMDSS Server

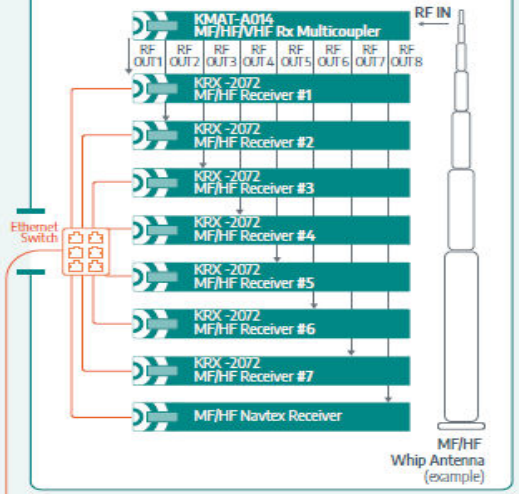
MF/HF TX

Global Overview KENTA Nautel GMDSS Solution

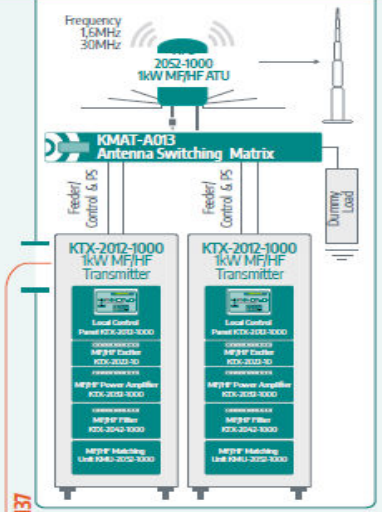
VHF Coastal Station



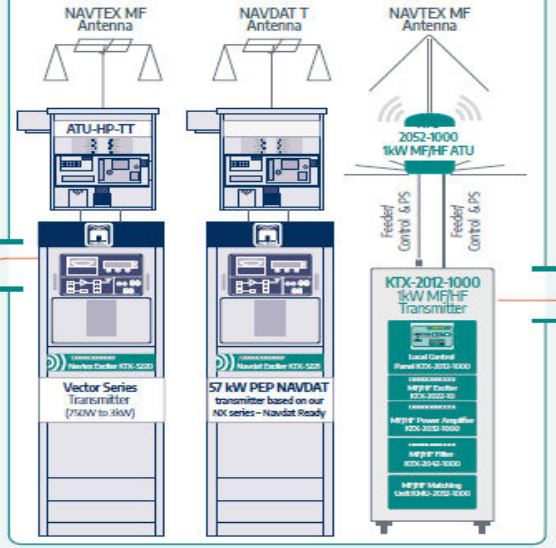
MF/HF Rx Coastal Station



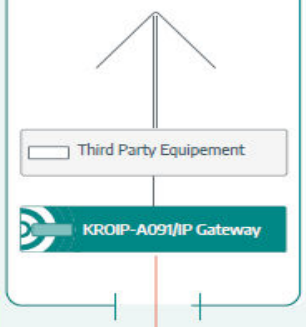
MF/HF Tx Coastal Station



NAVTEX/NAVDAT Coastal Station



THIRD PARTY TX RX Coastal Station



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ED 137

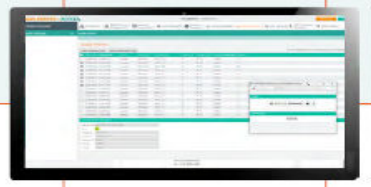
IP DISTRIBUTION NETWORK

IP DISTRIBUTION NETWORK

LAN ETHERNET IP

ED 137

MRCC



VoIP Operator Console # 1 (VHF, MF & HF)

VoIP Operator Console # N (VHF, MF & HF)

DSC Operator Console # 1 (VHF, MF & HF)

DSC Operator Console # N (VHF, MF & HF)

NAVTEX Operator Console

ARCHIVER Voice, Navtex, DSC, AIS

Phone Line (Optional)

Main

GMDSS SERVER

Redundant

Headphones Set

Foot Switch / PTT

Headphones Set

Foot Switch / PTT

Printer (Optional)

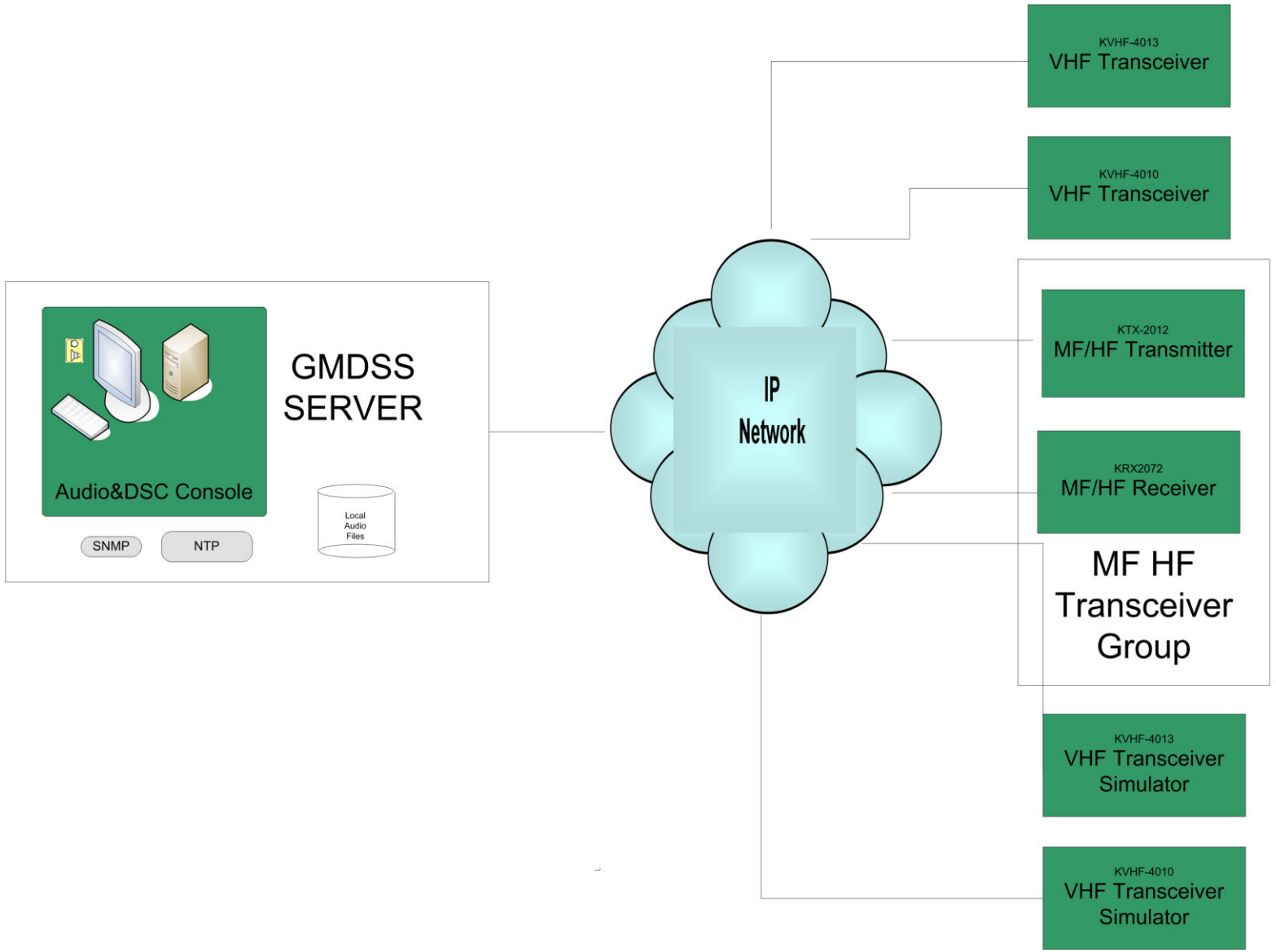
Printer (Optional)

Printer (Optional)

NAS Server (Optional)

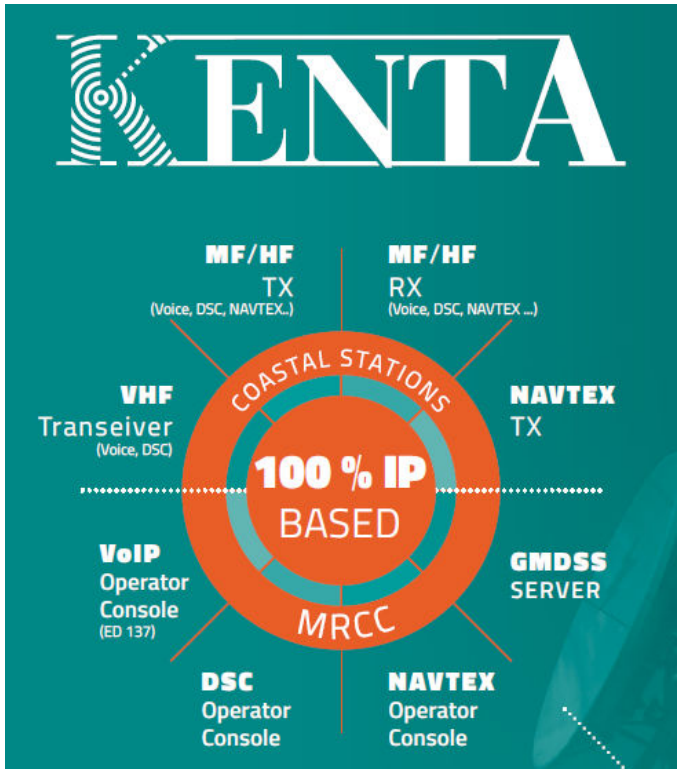
Phone Line #N (Optional)

Demonstration System:



Summary:

- IP networks are ideal for GMDSS Systems
  - Increased bandwidth, easy configuration, analysis tools
- Modern IP based GMDSS Systems:
  - Redundant, Reliable, Scalable, Flexible
  - Easy to maintain and supervise remotely
- ED137 standardization offers:
  - Open & Interoperable
  - Used by main Control Software suppliers such as Frequentis and Prescom
  - Air Traffic Systems security standards compliant
  - Easy integration of 3rd party transmitters and receivers
  - Future proof



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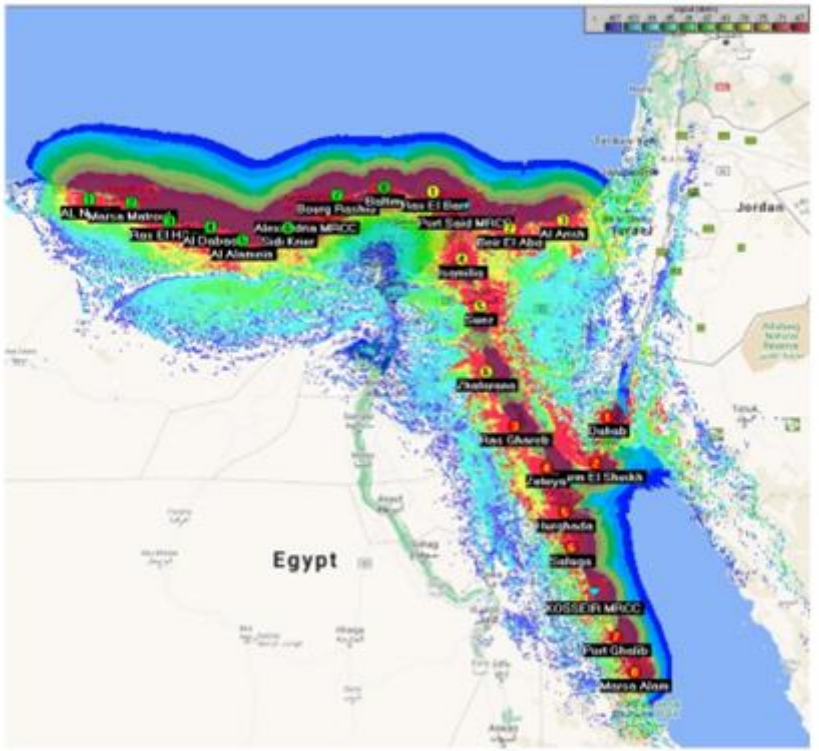
Next steps:

- Contact Kenta for advice on upcoming projects
- Email to request Egypt deployment case study
- Future webinars
  - Please share topic suggestions
    - In chat
    - In the webinar survey



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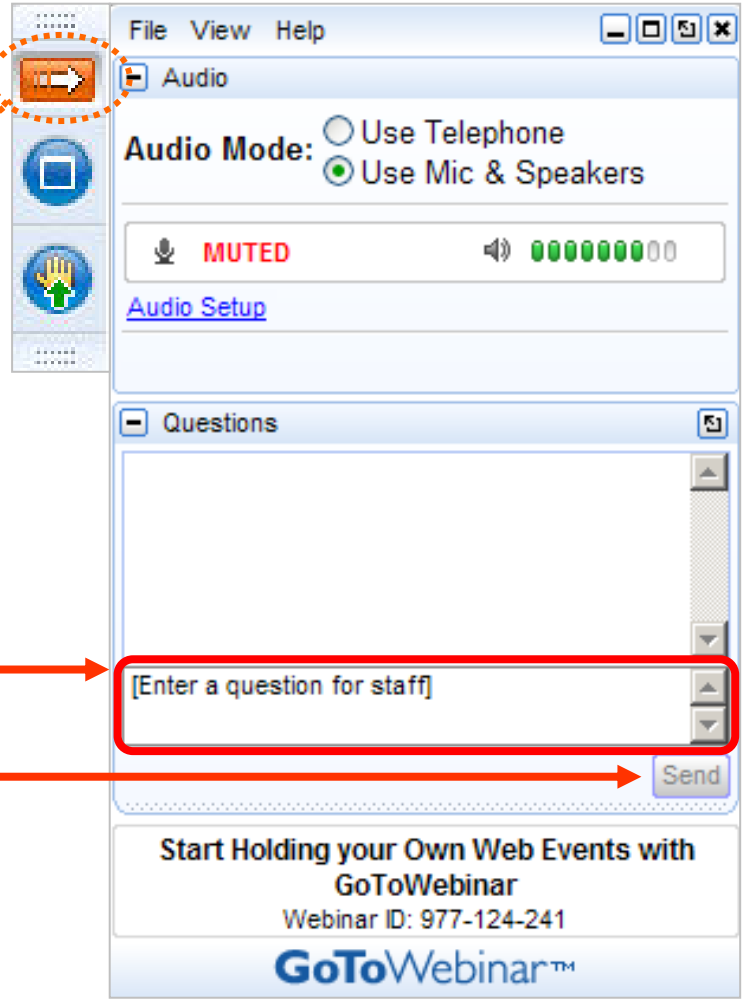
Questions

Click on  *to open/close webinar panel*



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Thank You!

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