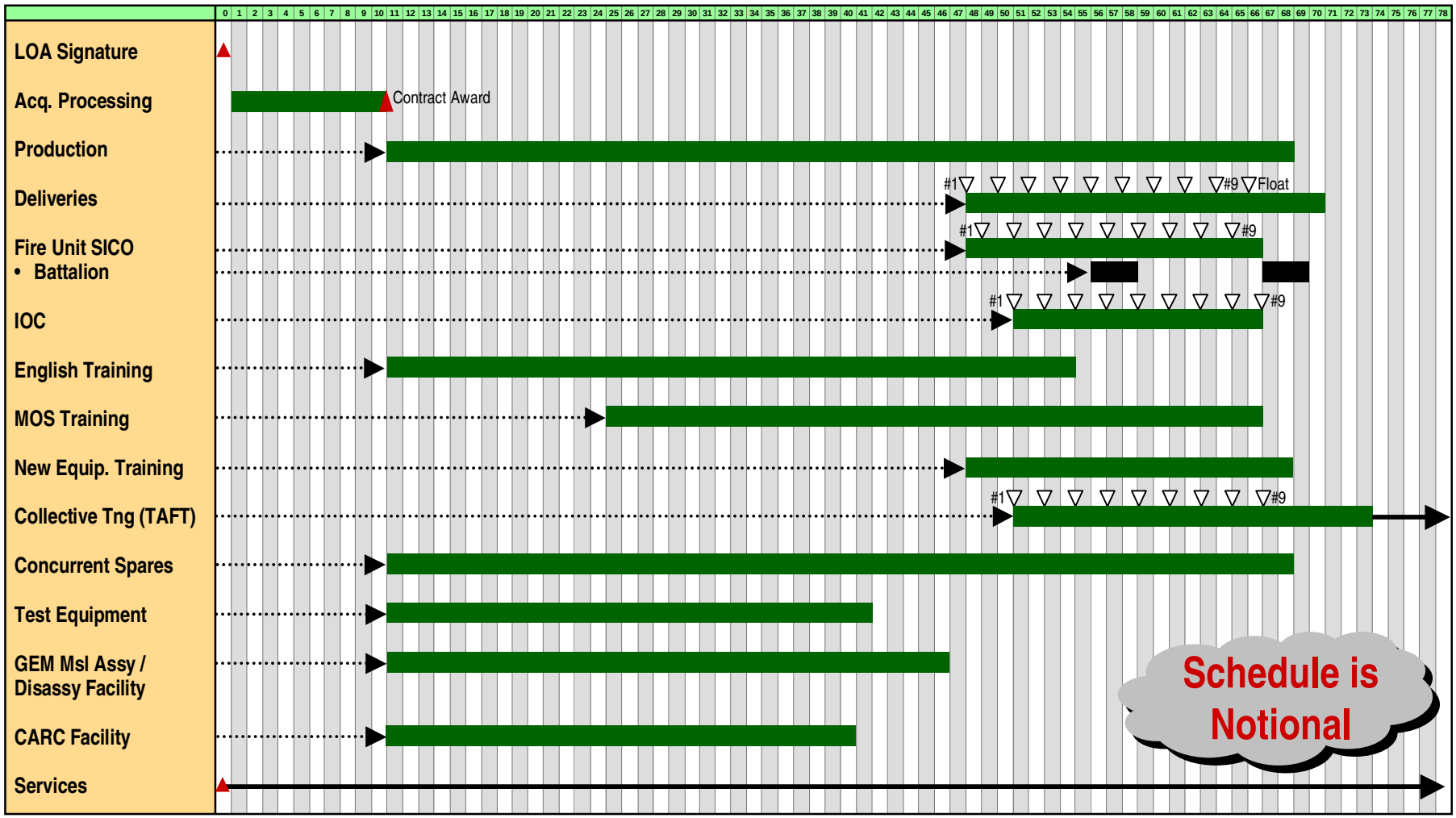
# UNITED ARAB EMIRATES

# FMS CASE AE-B-ZUG




**Schedule to be Definitized after Contract Award**

# PATRIOT Communications For UAE(U) April 2008

**Disclosure of the enclosed data does not imply a commitment on behalf of the U.S. Government to sell or furnish the systems discussed herein until such time a final U.S. Government decision has been made concerning the sale of such systems and information.**

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**Creation Date:** March 24, 2008

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# Purpose (U)

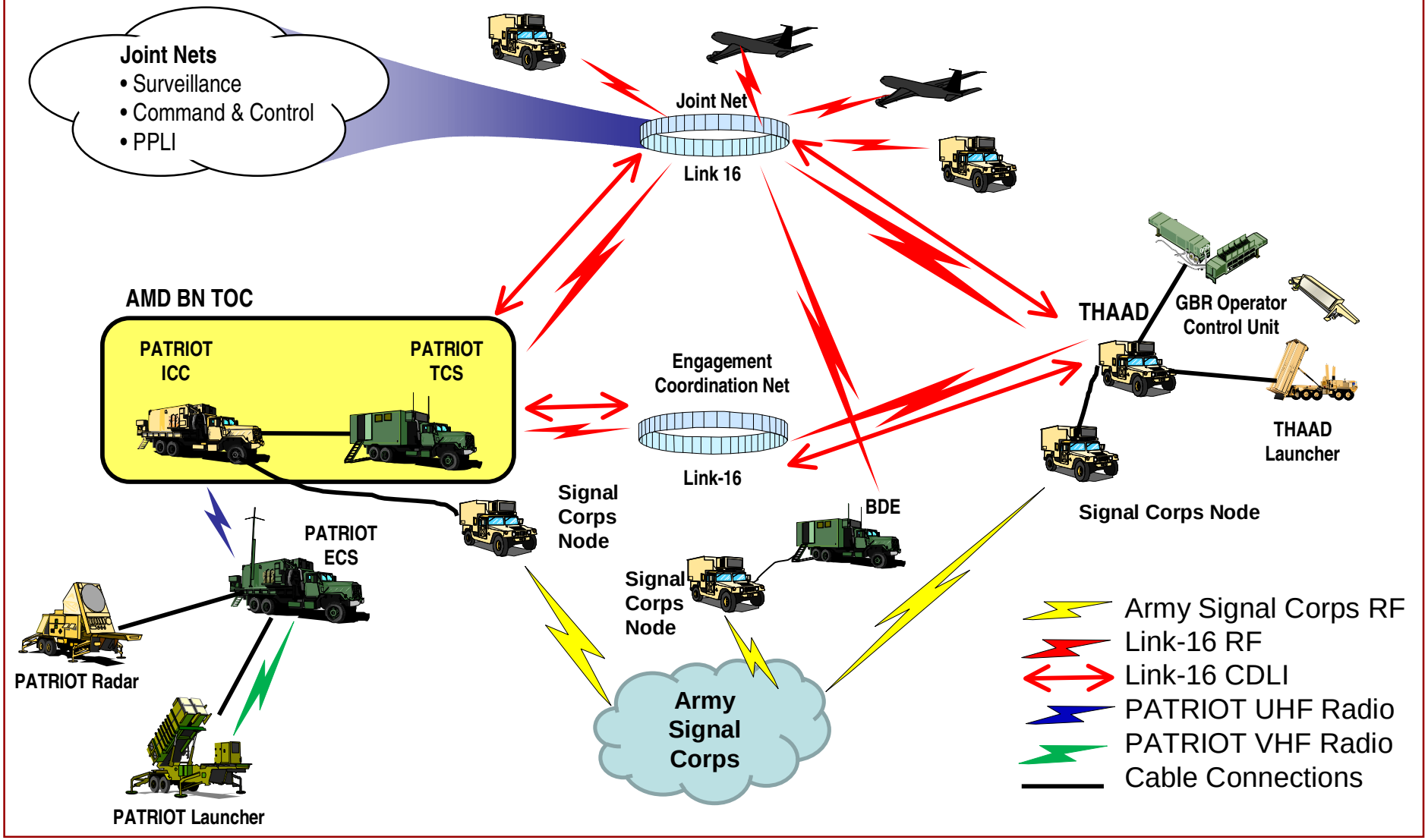
- Provide an overview of the PATRIOT missile system communications architecture
- Provide details on communications components and operations
- Describe the proposed UAE network configuration and components required to support

# Agenda (U)

- PATRIOT Communications Overview and Network Descriptions
- Local Voice Network
- Launcher Data Link
- Intra Battalion Voice and Data
- External Communications
- US/UAE Communications Hardware Comparison
- Summary

# PATRIOT COMMUNICATIONS OVERVIEW AND NETWORK DESCRIPTIONS (U)

# Current PATRIOT Communications (U)

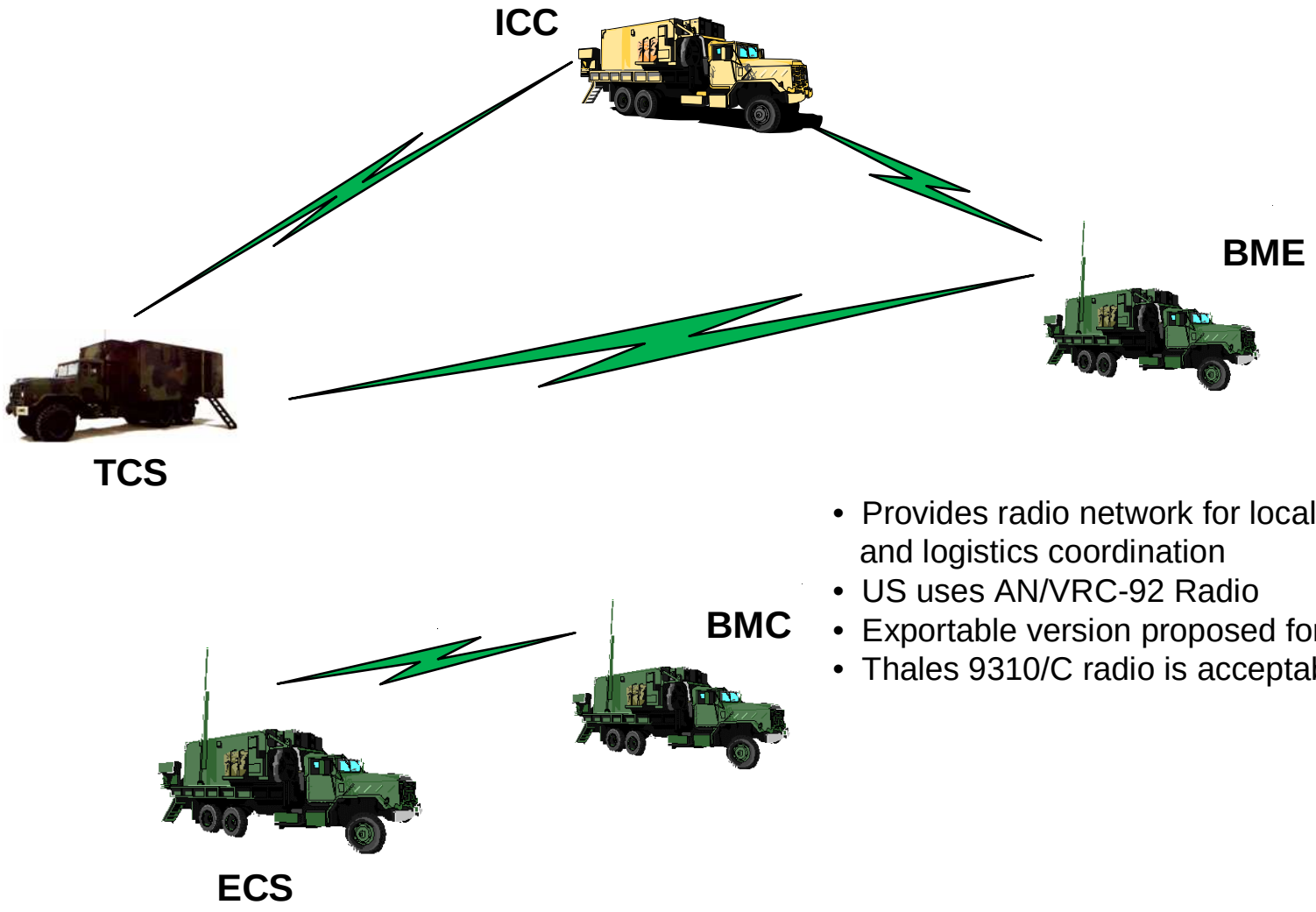


# PATRIOT Communications Networks (U)

- **Local Voice Network (at ICC, at ECS, at CRG)**
  - **Very High Frequency (VHF) radio**
- **Launcher Data Link (ECS to LS)**
  - **VHF radio**
  - **Fiber Optic**
- **Intra Battalion Voice and Data (ICC to ECS)**
  - **Patriot Data Information Link (PADIL)**
    - Multi routed via Ultra High Frequency (UHF) network
  - **Voice**
    - Battle Circuit Party line conference via Integrated Digital Operator Control System (IDOCS) for Engagement Coordination
    - Circuit switched telephone system for other voice circuits
- **External Communications**
  - **Link 16 to higher echelon units and THAAD**
    - Link 16 radio terminal for line-of-sight (LOS) RF
    - Common Data Link Interface (CDLI) for Beyond Line-of-Sight (BLOS)
  - **Voice**
    - Circuit switched telephone system

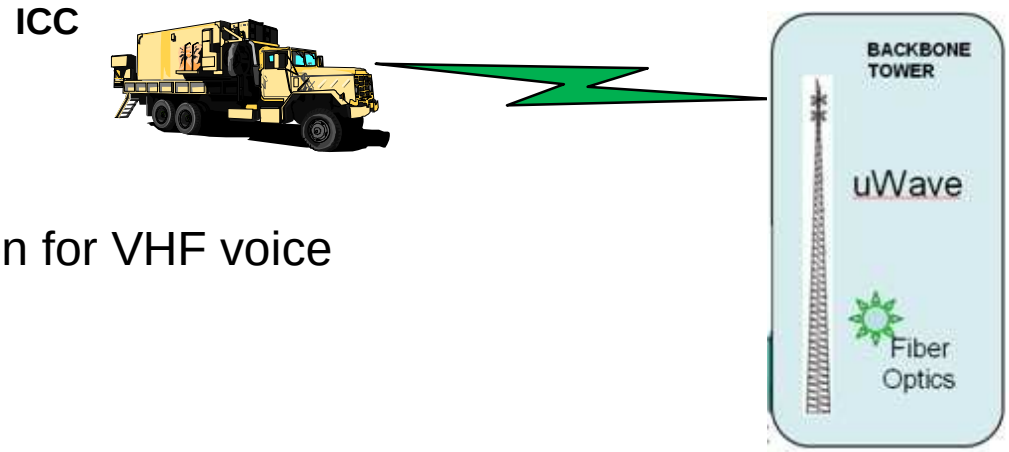
# LOCAL VOICE NETWORK (U)

# Local Voice Network (U)




- Provides radio network for local administration and logistics coordination
- US uses AN/VRC-92 Radio
- Exportable version proposed for UAE
- Thales 9310/C radio is acceptable alternative

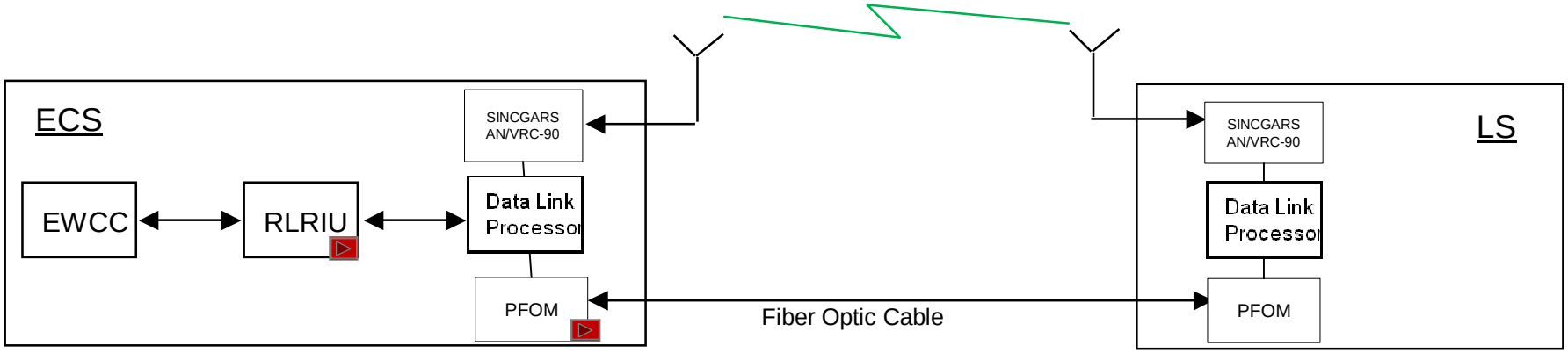
# VHF Radios at UAE Towers (U)




- Provide range extension for VHF voice
- Provide Order Wire to facilitate establishment of UHF and C-Band radio shots

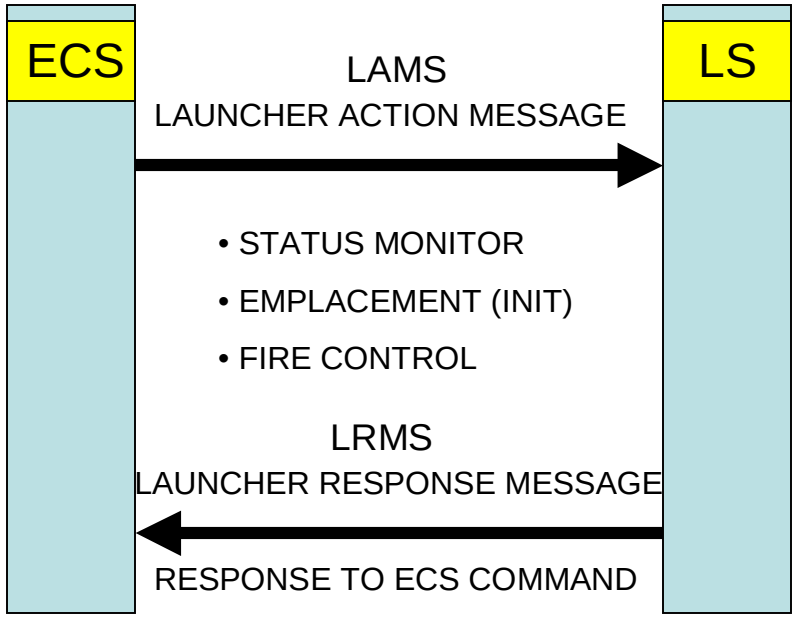
# LAUNCHER DATA LINK (U)

# Launcher Data Link (U)




- **Provides link for emplacement, command, and status information between ECS and launcher**
- **Fiber Optic Cable is the Preferred Method of Communications**
- **Operator can Manually Select Fiber Optic or Radio as Primary with Other as Backup**

EWCC = Enhanced Weapon Control Computer
RLRIU = Routing Logic Radio Interface Unit
PFOM = PATRIOT Fiber Optic Modem



# SINCGARS vs. TRC-9310C (U)

- **SINCGARS radio is standard US VHF radio for voice and data**
  - **Dual radio in each ICC, CRG, ECS, BME, and BMC for voice**
  - **Single radio in each ECS, CRG, and LS for launcher link**
  - **Managed by US Communications-Electronics Command (CECOM)**

- **Thales 9310C is functionally equivalent to SINCGARS AN/VRC-92 for voice. However, not interoperable with SINCGARS in frequency hopping mode.**

- **Launcher data link designed specifically for use with SINCGARS AN/VRC-90. Thales radio can be considered for this link, but significant development effort is required.**

- **Current LOA assumes use of SINCGARS AN/VRC-92E and 90E.**

- **SINCGARS AN/VRC-92E and 90E quantities and support items required for Total Package Approach are contained in Case Lines 181 – 196, 202, 210**

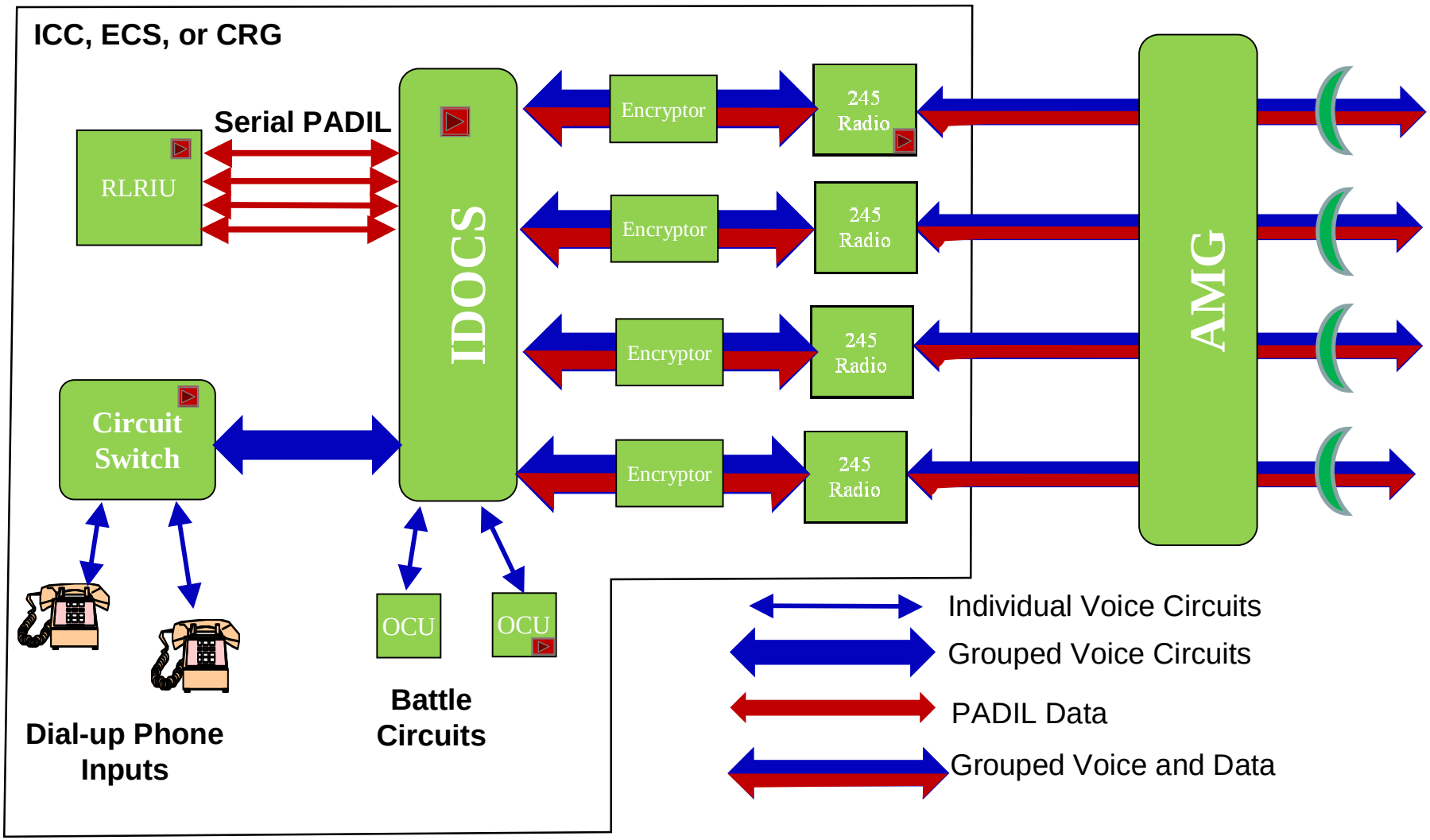
- **Recommend that VHF voice radio selected for PATRIOT also be used for THAAD and SL-AMRAAM.**

**AN/VRC-92**
Vehicular 50W dual long-range (retransmit) – plus 2nd power amp and retrans cable

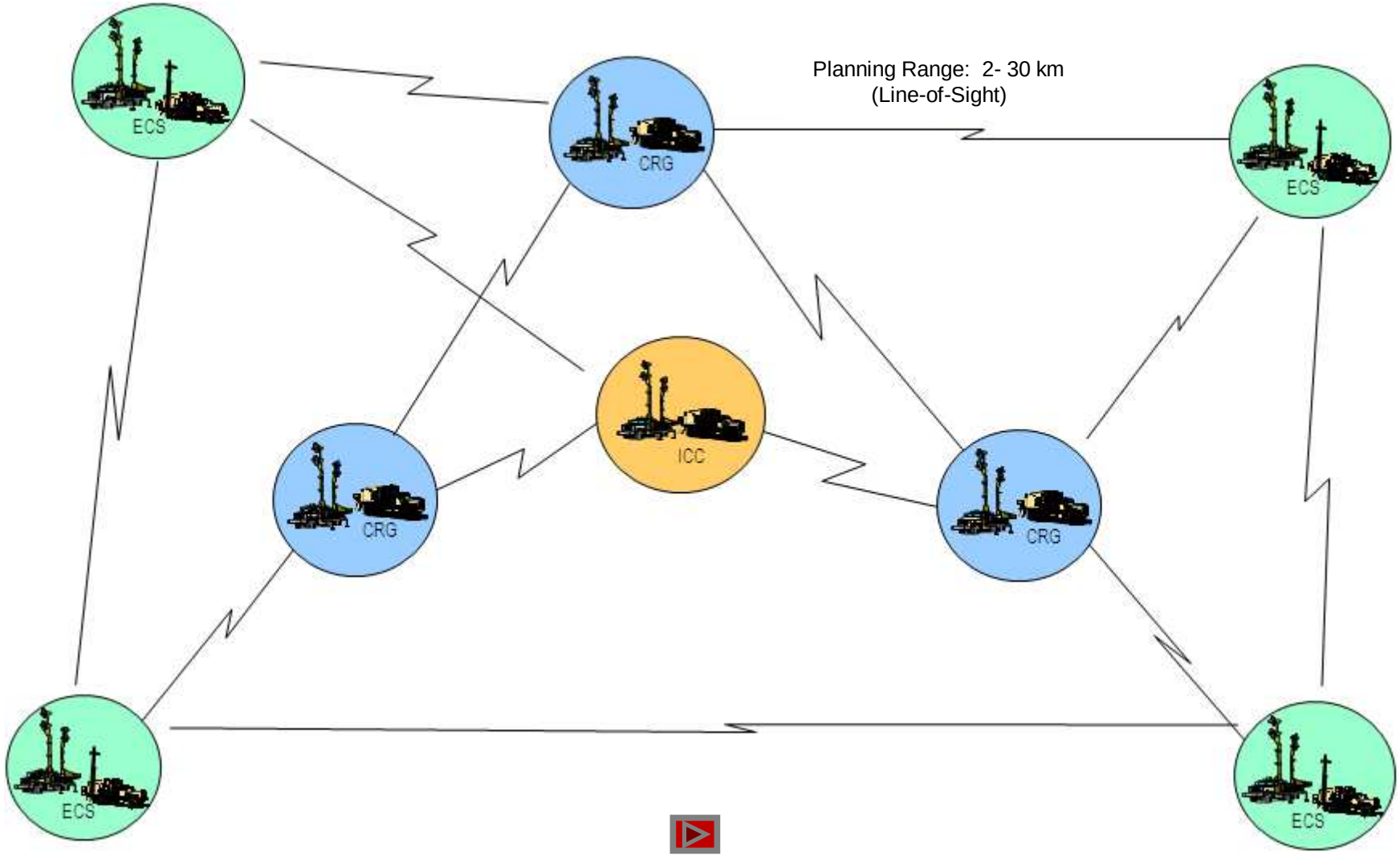
**Thales TRC-9310C VHF Radio**

# INTRA BATTALION VOICE AND DATA (U)

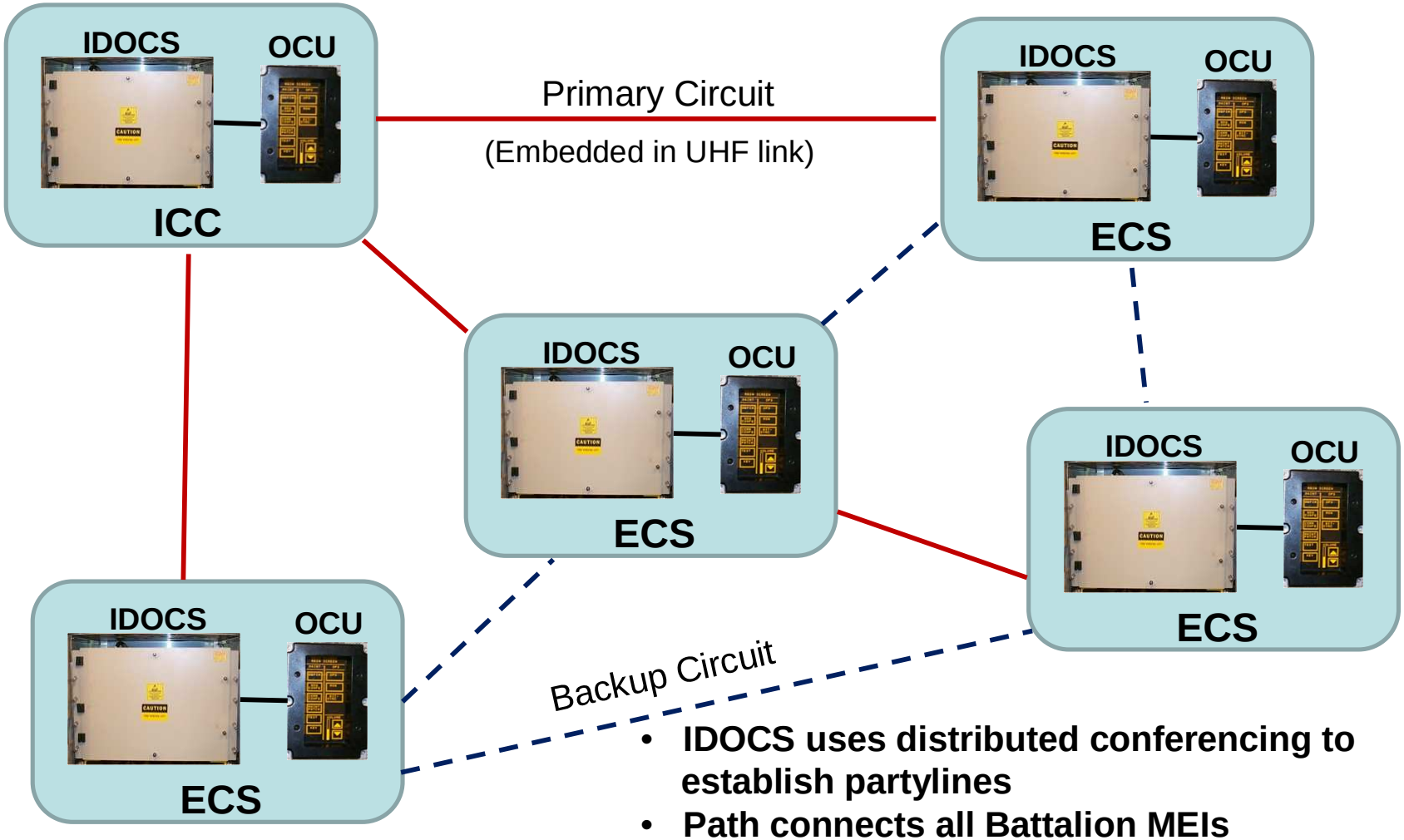
# US and UAE Intra Battalion Voice and Data Circuits (U)



# UHF Network (U)



# Battle Circuit Party Lines (U)



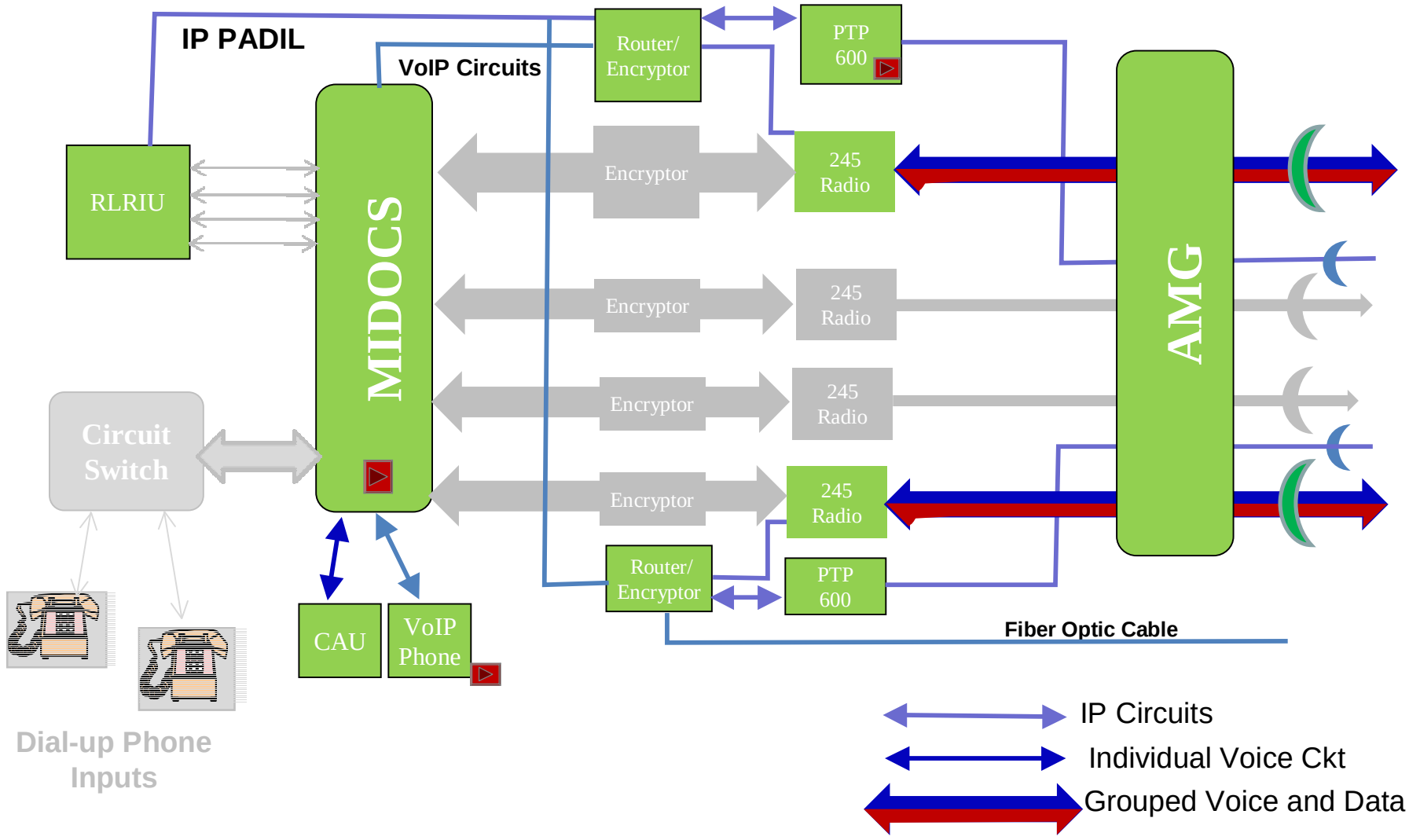

- **IDOCS uses distributed conferencing to establish partylines**
- **Path connects all Battalion MEIs**
- **Link failure results in default to another path**

# UAE Unique Requirements for Voice and Data (U)

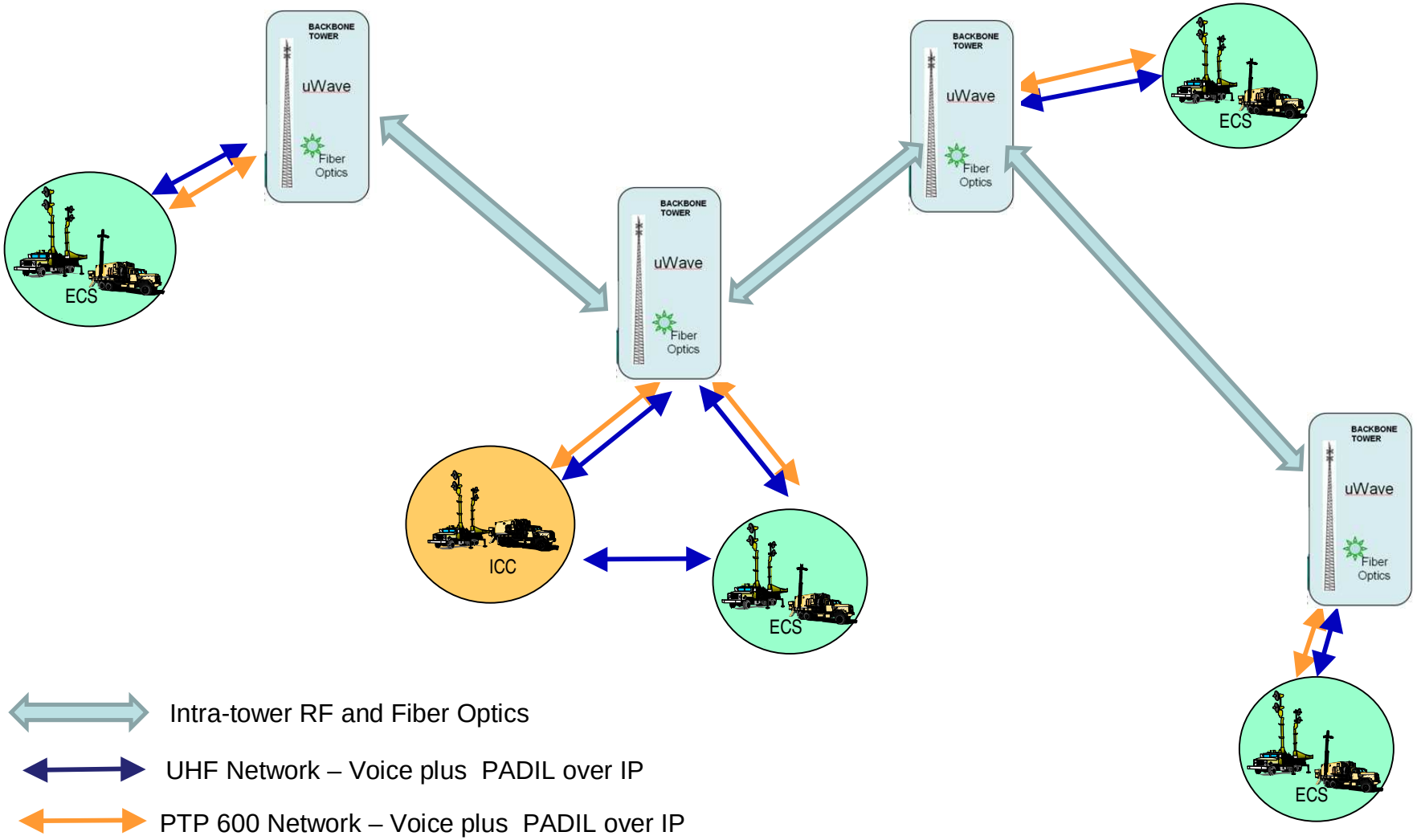
- Existing IP network in UAE is comprised of microwave and fiber optic assets
- UAE PATRIOT will utilize this network for internal and external communications*
- Requires translation of voice and data circuits into IP format
  - Adds IP equipment not currently in US system such as routers and Voice over Internet Protocol (VoIP) phones
- "Hub and spoke" rather than multirouted architecture for PADIL data
  - Second radio operating in different frequency band provides frequency diversity to compensate for lack of spatial diversity

*Pending complete network analysis and verification of operational compatibility

# UAE Intra Battalion Voice and Data Circuits over IP (U)

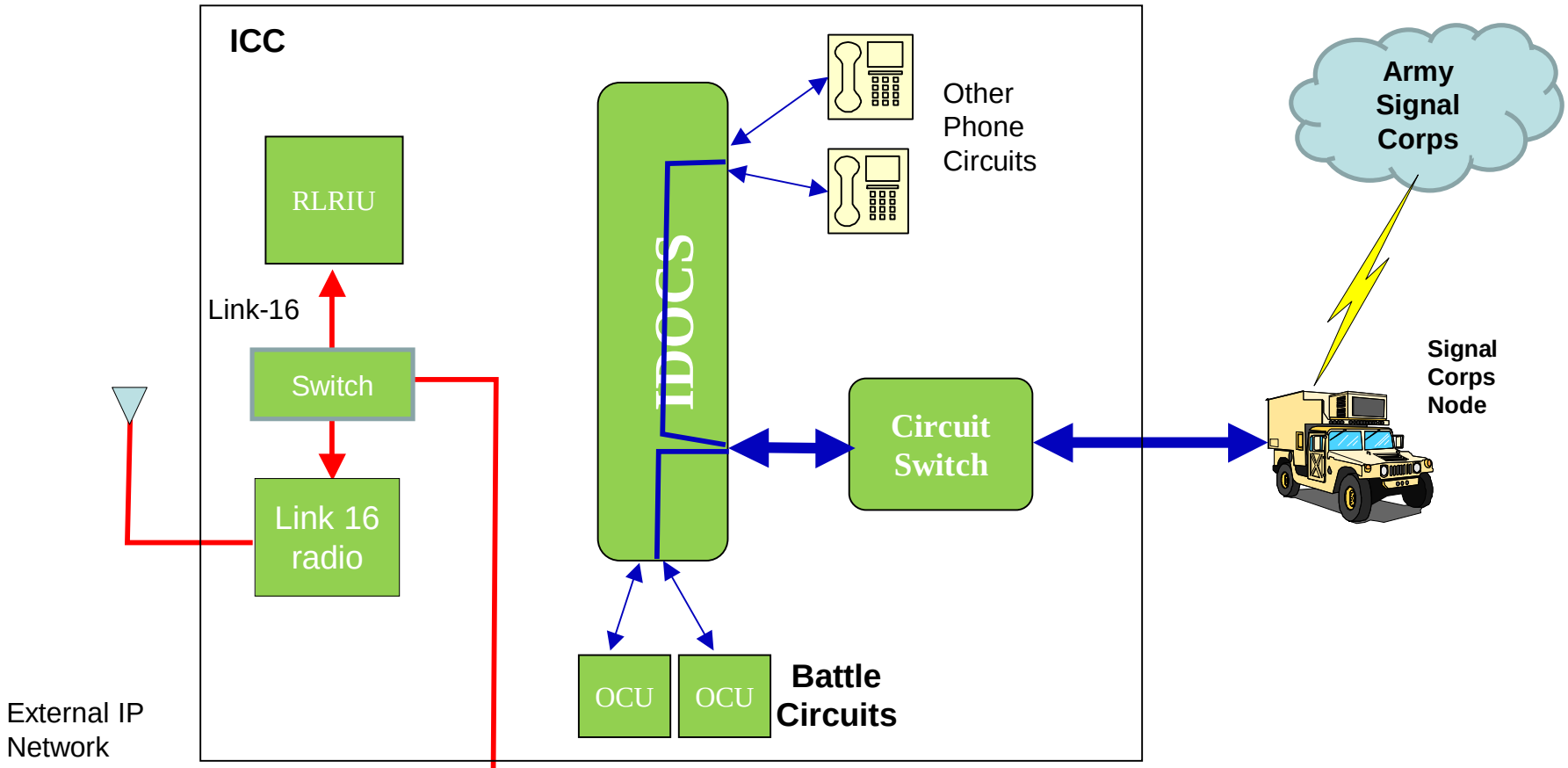


# UAE Intra Battalion Network (U)

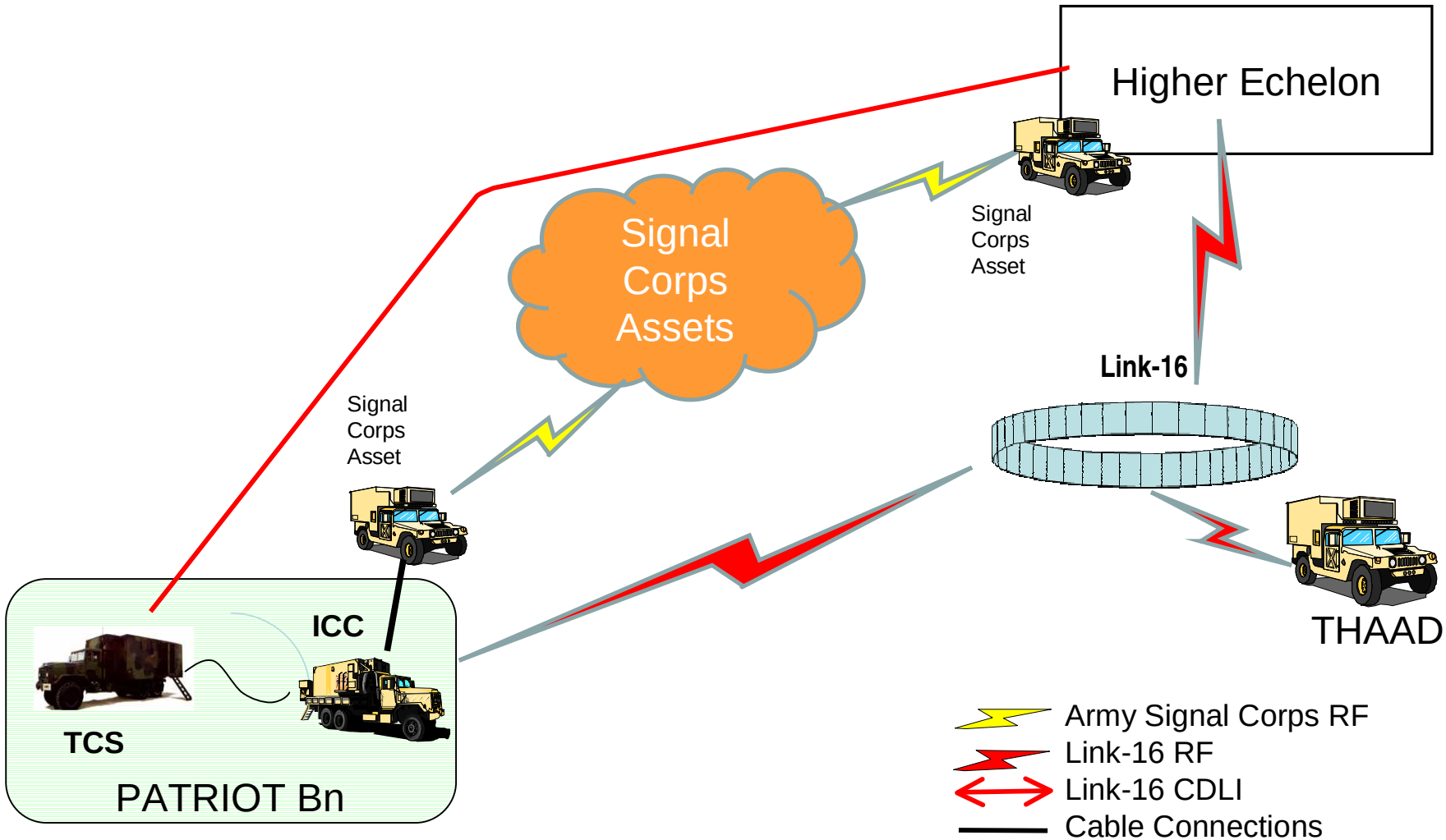


# EXTERNAL COMMUNICATIONS (U)

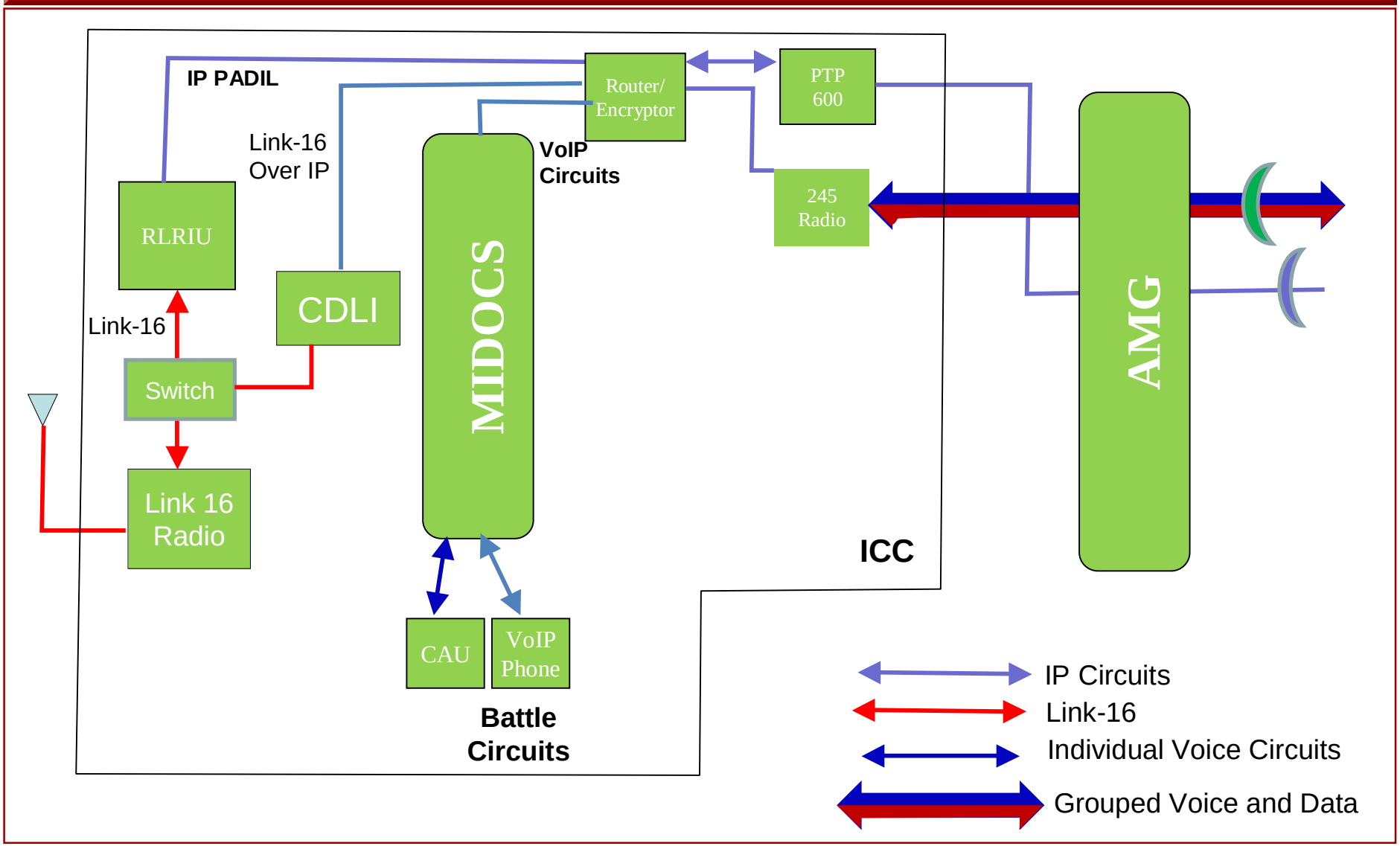
# External Voice and Data Circuits (U)



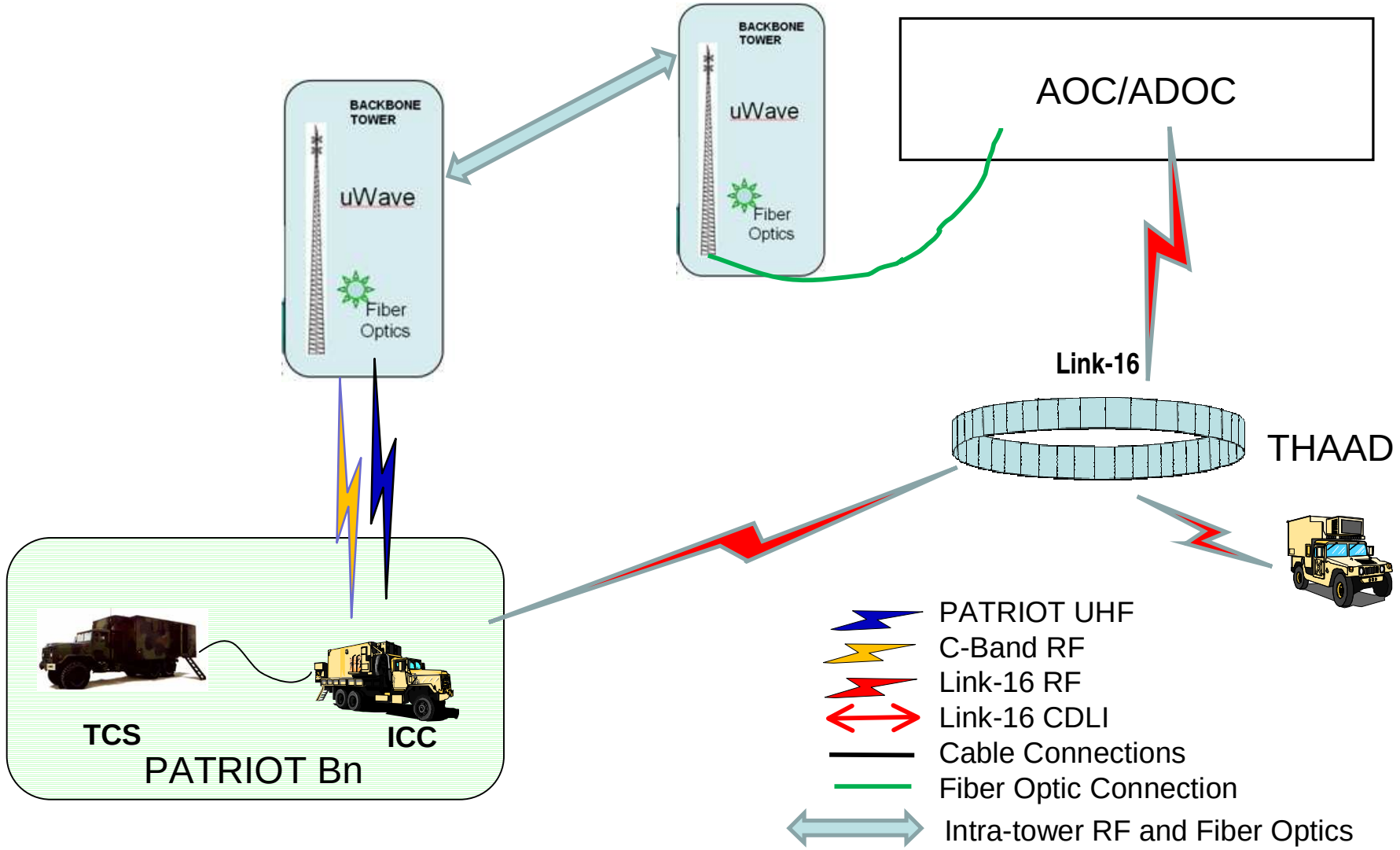
# External Communications (U)



# Link-16/CDLI for UAE (U)



# UAE External Communications (U)



# US/UAE COMMUNICATIONS HARDWARE COMPARISON (U)

# Communications Hardware (U)

| Function | US | UAE | Comments |
|---|---|---|---|
| UHF Radio | AN/GRC-245(V)4 | AN/GRC-245(V)6 | (V)6 has built-in Combiner for IP Capability |
| VHF Radio (Voice) | AN/VRC-92F | AN/VRC-92E | Exportable version of SINCGARS. Thales 9310 C also acceptable |
| VHF radio (Data) | AN/VRC-90F | AN/VRC-90E | Exportable version of SINCGARS. |
| Circuit Switch | SMU-96 | CPX300 | Kongsberg switch meets UAE criteria |
| Bulk Encryptor | US Encryptor | Exportable DTG Encryptor | |
| IP Encryptor | None | Exportable IP encryptor | |
| Frequency Diversity Radio | None | Motorola PTP600 Series or equivalent | Recommended capability for network |
| Internal Voice and Data Network Control | MIDOCS | MIDOCS | |

# SUMMARY (U)

# Conclusions (U)

- Proposed UAE PATRIOT communications system is functionally equivalent to current US PATRIOT comms system
- In addition, UAE PATRIOT system contains equipment required to pass voice and data through existing UAE IP network

# REFERENCE SLIDES (U)

# Integrated Digital Operator Control System (IDOCS) (U)

–Installed in all shelters (ECS, CRG, ICC).

–The heart of the PATRIOT communication network.

- Drives up to four Operator Control Units (OCUs).
- Provides Voice Intercom capability between two or all OCUs within a shelter.
- Provides Party-Line circuits for battalion-wide voice between all OCUs.
- Provides all Mux / DeMux processing for voice and data communications.
- Acts as an electronic patch panel.


*IDOCS shown installed in a CRG*

# Operator Control Unit (OCU)

–The Human Interface into the communications network

- Consists of a 3x6 inch touch-screen display.

–Operator uses a series of touch-screen buttons and menus to initialize, control, and monitor the communications network.

*OCU shown installed in a CRG*

# Modular IDOCS (MIDOCS) (U)

- Functional replacement for IDOCS
- Communications Interface Unit (CIU) is replaced by TOCNet and TOCNet-IDOCS Expander (TIE) unit
  - Performs same functions and has same interfaces as IDOCS
  - Adds VoIP interface
- TOCNet and TIE are housed in same chassis as IDOCS
- Crew Access Unit (CAU) replaces OCU

TOCNet


CAU

# SMU vs. CPX300 (U)

- MMU is the standard US Circuit Switch
  - 1 in each ICC, ECS, CRG
  - Provides interface to Army Signal Corps
  - Used as circuit switch for internal battalion telephone communications
  - Managed by US Army CECOM
- UAE architecture calls for circuit switch to provide telephone service within the PATRIOT battalion
- No requirement for direct interface to US Army Signal Corps assets
- No requirement for switch to switch communications between UAE PATRIOT and US PATRIOT
- Kongsberg CPX300 is a multipurpose tactical switch that has been used in other PATRIOT FMS systems. It provides similar functionality to the SMU, is easier to program and use, and is provided at a lower cost.
- The current LOA assumes use of the CPX300. The case line references are lines 201 and 208.

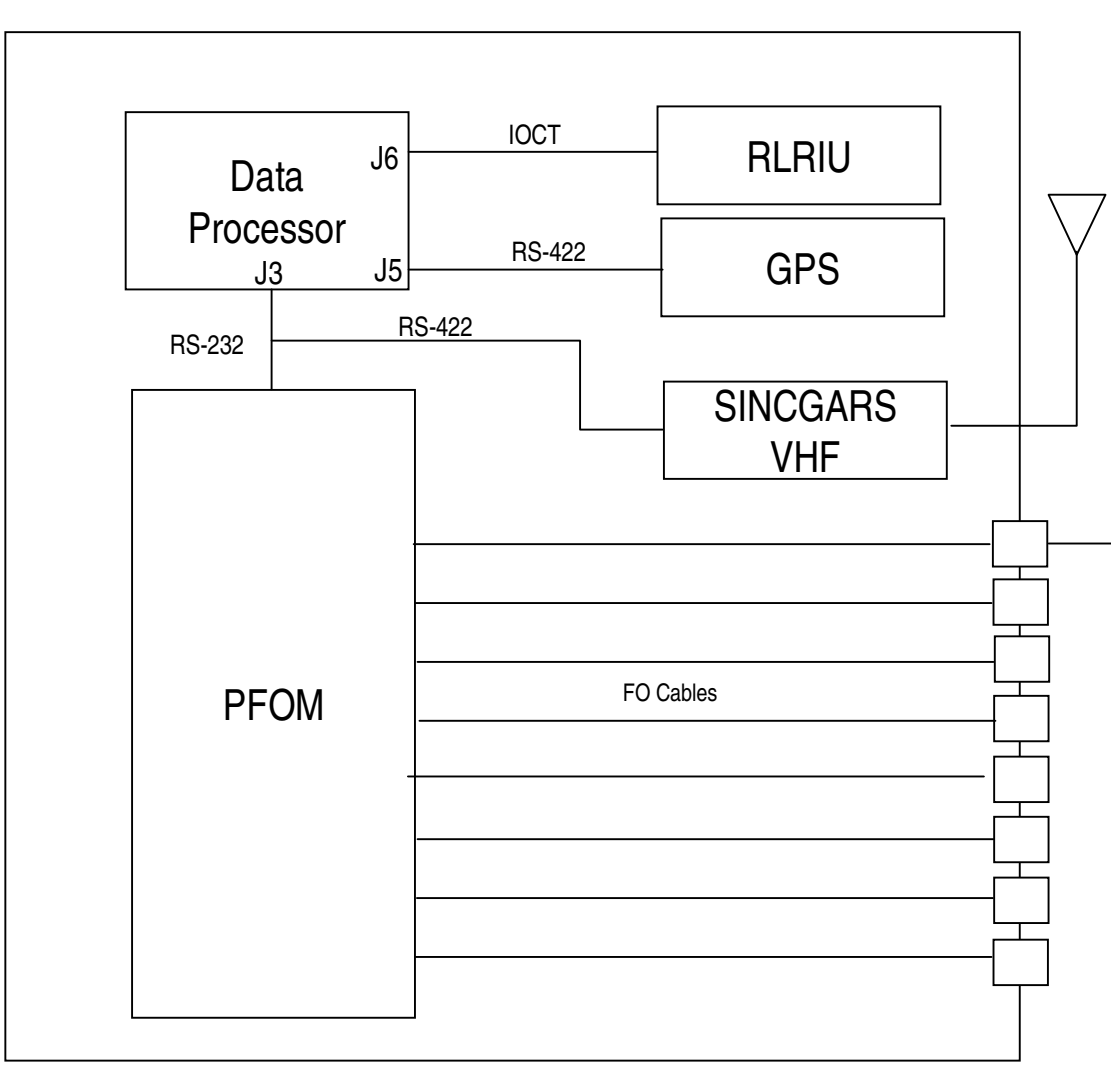
SMU-96

CPX300

# Routing Logic Radio Interface Unit (RLRIU) (U)

- Primary communications interface for PATRIOT
- Provides Link 16 Interface for ICC.
- Performs message packing, routing, error checking, and synchronization for all traffic within a PATRIOT battalion and between battalion and extra-battalion units.
- Provides the interface between the Weapons Computer and the radio stacks.
- Installed in each ICC, ECS, and CRG

# PATRIOT Fiber Optic Modem (PFOM) (U)




PFOM ECS

PFOM LS

# PTP 600 Radio (U)

## PTP 58600 & PTP 54600

Motorola 5.8 and 5.4 GHz Point-to-Point Bridges


- **Commercial Ethernet Radio**
- **Mast mounted units**
- **5.47 – 5.85 GHz Frequency**
- **30 MHz Channel Size**
- **Up to 200 Km Max Range**
- **IEEE 802.3 Protocol**
- **Up to 300 Mbps throughput**

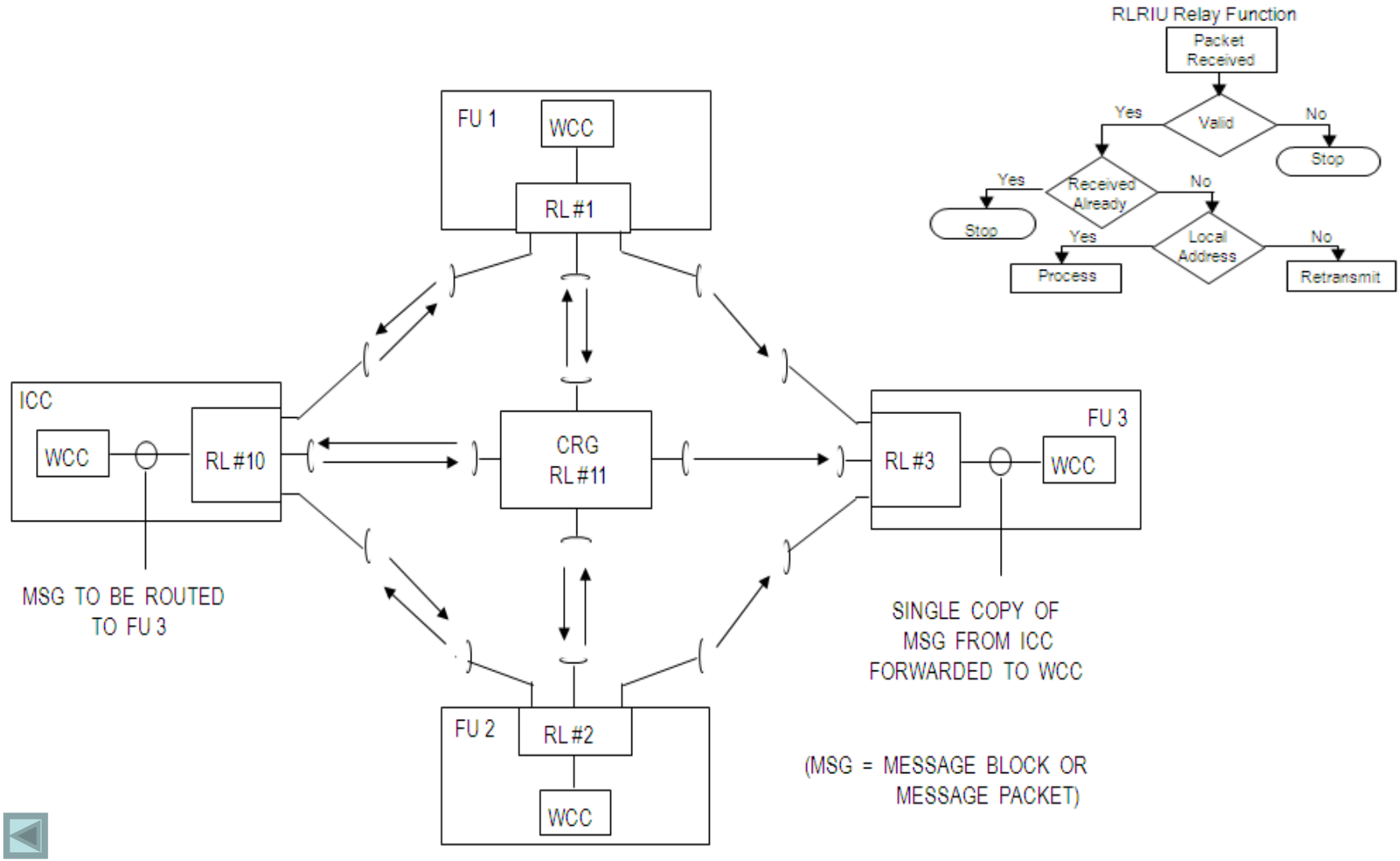
PTP 600 series is proposed as a frequency diversity radio for UAE. Selection of a final radio will be based on operational capabilities and system requirements.

# UAE IP Voice Circuits (U)

- VoIP used for both Battle Circuits and other phone circuits
  - Battle circuit partylines will be terminated with MIDOCS CAU or a VoIP telephone.
  - Other voice circuits will be terminated with VoIP phones.
- VoIP phones will be used for both internal PATRIOT communications and for external comms to AOC, THAAD, SL-AMRAMM, etc.

Cisco CP-7940G
VoIP Telephone
(Example of VoIP Phones
Currently available)

# Multirouting (U)



# Common Data Link Interface (U)

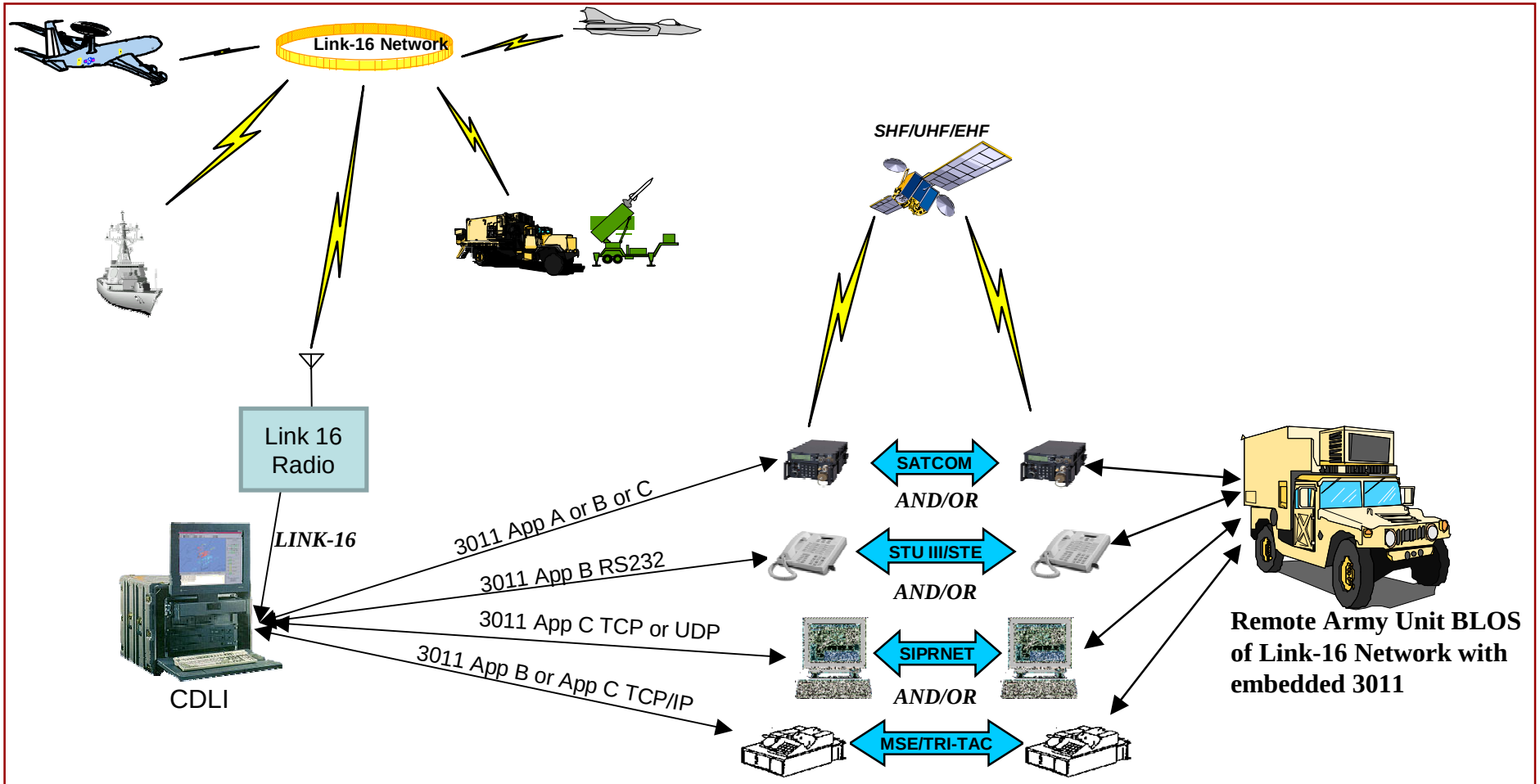
# What is CDLI? (U)

CDLI is a system that utilizes a data router to move Link 16 messages over military and commercial satellites, tactical and commercial phone lines, and secure IP networks

CDLI provides multipoint, interoperable, beyond line of sight (BLOS) Link 16 connectivity between non-adjacent Link-16 networks and/or service C2 platforms

CDLI uses the MIL-STD-3011 Transport Protocol for Link-16 message exchange.

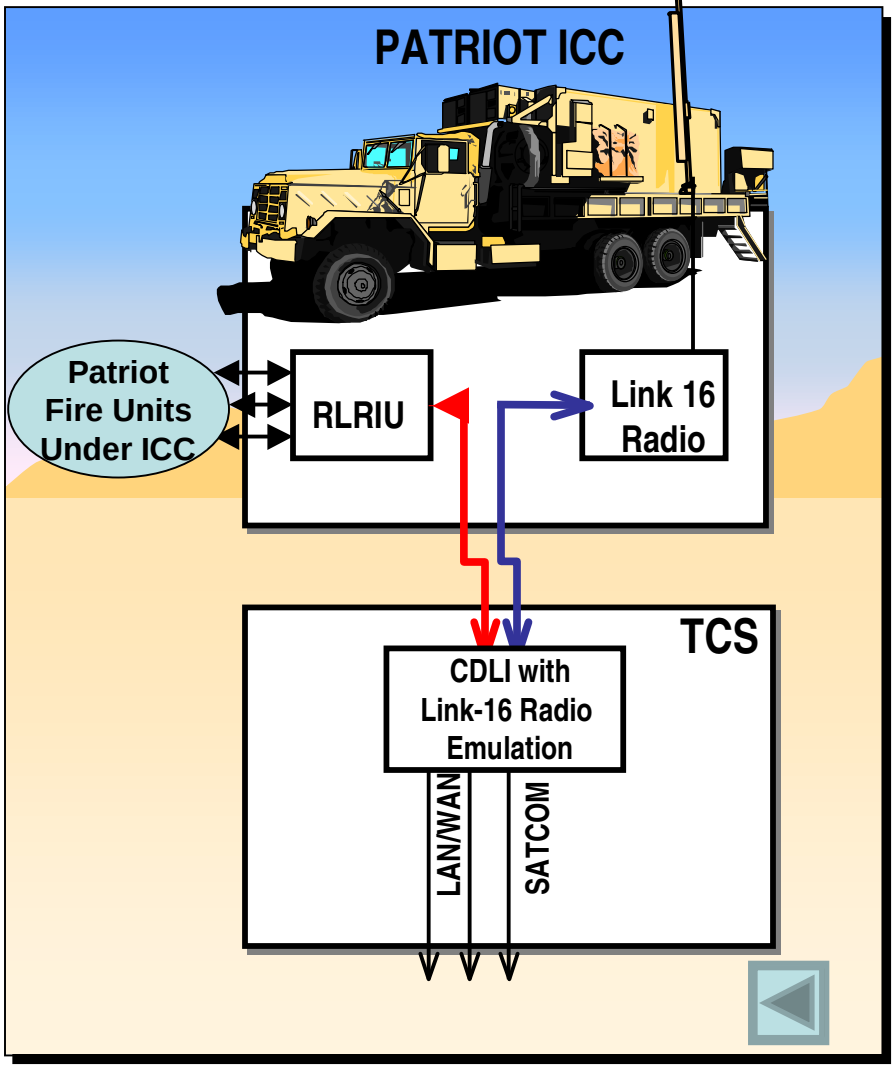
# Connecting Remote Systems (U)




**Utilize whatever media is available to exchange Air and Space Track data Via MIL STD 3011 Protocols**

# CDLI Application for PATRIOT (U)

- Provides Solution For BLOS Link-16 Capability In Patriot
  - CDLI System is comprised of hardware and Common Data Link Interface Module (CDLIM) software.
  - System is Collocated In The TCS and Acts As A UHF Radio Emulator To The Patriot Host Computer
  - Allows Patriot To Exchange Link-16 Track Messages Via Secure LAN Or Commercial Telephone Lines with or without Link-16 Radio Connectivity



# CDLIM Software (U)

- CDLIM software was developed by the US Government at considerable expense
- FMS customers are required to pay a “buy-in” as well as an annual maintenance cost
  - Buy-in compensates US for development costs
  - Maintenance cost provides for continuing support of existing software and provides for new capabilities

# AN/GRC-245 Radio (U)

- Multiband, digital UHF radio
  - US version is the AN/GRC-245(V)4
    - 8 Mbps maximum data rate
    - Serial interface for grouped voice and data
  - UAE will use AN/GRC-245(V)6
    - 16 Mbps maximum data rate
    - Built-in Ethernet interface as well as serial interface
- Separable Baseband Unit (BBU) and Radio Frequency Unit (RFU)
- Primary Specifications:

  Frequency Bands: 1350-2690 MHz
  Channel Spacing: 125 kHz
  Oper. Temp: -40ºC to +55ºC
  Storage Temp: -54ºC to +71ºC
  Data Interface: RS-422, Ethernet [(V)6]

AN/GRC-245

# US AN/GRC-245 Implementation (U)

- Replaces obsolete GRC 103 radios
- H/W modifications required to AMG, ECS, ICC, and CRG
- Provides UHF backbone network for PATRIOT internal voice and data
- MEI can operate stand-alone (using short shot mode) or with AMG