MIDS/Link 16 Overview

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History

- Where did MIDS/Link 16 come from?
  - The system was originally known as Joint Tactical Information Distribution System (JTIDS) and was developed by the US during the 1970s

- Why?
  - The US had major problems with tactical communications during the Vietnam war and wanted a faster digital system with higher data capacity and more resistance to electronic countermeasures i.e. jamming
  - They also needed to replace the older Link 11 TDL because it was slow and restrictive in its information exchange capability and capacity
Basic Capabilities

- What does MIDS/Link 16 offer the User?
  - Security
    - Built-in encryption features
  - Survivability
    - Nodeless system, capable of gracefully degraded operation under stress conditions
  - Flexibility
    - Can be tailored to exchange many types of information
  - Resistance to electronic jamming
    - Employs specialised techniques
  - High Capacity
    - Capable of data exchange up to 256kbps
  - Near Real Time information exchange
    - SA Information updated every 12 seconds
Basic Operational Functionality

- MIDS/Link 16 is primarily used to support military functions/tasks such as:
  - Air Defence
  - Anti-Air Warfare
  - Anti-Surface Warfare
  - Anti-Submarine Warfare
  - Reconnaissance and Intelligence gathering
  - Electronic Warfare (EW)
  - Air to Air and Air to Ground Targeting
Basic Operational Applications

- MIDS/Link 16 is primarily used to exchange tactical and operational information such as:
  - Precise Participant Location and Identification (PPLI)
  - Status (Platform and Airfield)
  - Surveillance (Tracks, Reference Points and Management)
  - Command and Control (Mission Management, Coordination and Weapons Control)
  - Electronic Warfare
  - Intelligence
  - Navigation
  - Voice
Basic Technical Characteristics

- MIDS/Link 16 operates in the Aeronautical Radio Navigation frequency band
  - Uses a UHF frequency range of 969 – 1206 MHz
- Uses a Time Division Multiple Access (TDMA) architecture
  - Allows multiple users to share information in a variety of ways
- Provides users with the capability to exchange many different types of information
  - Predominantly tactical and operational data
JTIDS/MIDS Frequency Band

- JTIDS/MIDS uses 51 frequencies across this range.

- JTIDS/MIDS also shares much of this band with Tactical Air Navigation (TACAN) and civilian Distance Measuring Equipment (DME) systems.

- Frequency Clearance Agreements impose peacetime restrictions which must be complied with.
TDMA Architecture (1)

- JTIDS/MIDS uses a nodeless TDMA architecture i.e. no one unit is critical to operation of the network
- Users are allocated specific timeslots in which to transmit and receive data as follows:
TDMA Architecture (2)

1 Day = 112.5 Epochs
12.8 Minutes Each

Epoch = 64 Frames
12 Seconds Each

Frame = 1536 Timeslots
128 Timeslots / Second

Timeslot = 7.8125 mSec

Set A

Set B

Set C

Frame = 3 Sets
512 Timeslots / Frame

Sets are Interleaved
JTIDS/MIDS uses Frequency Hopping techniques

- Pulses pseudo-randomly hop across the 51 frequencies, making the system extremely difficult to jam.
 JTIDS/MIDS can operate using more than one network

- Up to 127 single nets can be “stacked” on top of each other, with their time slot boundaries aligned
- Specific types of information can then be exchanged on certain nets e.g. Net 2 – EW, Net 1 - Control
- However, the nets are mutually exclusive i.e. a unit can only transmit or receive on any one net at a time
J Series Labels

- J0 – System Information Exchange and NM
- J1 – System Information Exchange and NM
- J2 - PPLI
- J3 - Surveillance
- J5 – Anti Submarine Warfare
- J6 - Intelligence
- J7 – Information Management
- J8 – Information Management
- J9 - Weapons Coordination and Management
- J10 – Weapons Coordination and Management
- J12 - Control
- J13 – Platform and System Status
- J14 – EW Control and Coord
- J15 – Threat Warning
- J17 – Miscellaneous
- J28 – National Use
- J29 - National Use
- J30 - National Use
- J31 - Miscellaneous
Sub Labels

- The sub-label amplifies the main label
- **The sub-label decodes for each main label vary**
- Here is an example of a sub-label decode:
  - J3 message sub-labels:
    - .0 = Reference Point
    - .1 = Emergency Point
    - .2 = Air
    - .3 = Maritime
    - .4 = Sub-surface
    - .5 = Land (Ground)
    - .6 = Space
Network Participation Groups

- There are such a variety of message types and not all platforms will be required to transmit all messages.
- Messages are therefore logically grouped together into Network Participation Groups (NPGs).
- Platforms will be given timeslots in the NPGs that apply to their messages to allow for efficient design and management.

-Initial Entry
  - PPLI & Status
  - Voice

-Initial Entry
  - PPLI & Status
  - Target Sorting
  - Voice

- Initial Entry
  - PPLI & Status
  - Network Management
  - Surveillance
  - Mission Management
    - Control
      - EW
    - Voice
    - Free Text
Common List of NPGs

1 Initial Entry
2 RTT-A
3 RTT-B
4 Network Management
5 PPLI and Status Group A
6 PPLI and Status Group B
7 Surveillance
8 Mission Management/Weapons Co-ord
9 Control
10 EW
11 Imagery (planned)
12 Voice Group A
13 Voice Group B
18 Mission Management (US)
19 Non-C2 to Non-C2
20 2\textsuperscript{nd} Non-C2 to Non-C2
21 BMD Engagement Co-ord
22 Composite A
23 Composite B
27 Joint Net PPLI
28 Distributed Net Management
29 Residual
30 IJMS Position and Status
31 Other IJMS data
32-511 Needlines
Navigation Features

- All platforms report Own Unit Position and Position Quality (PQ)
  - PQ is a measure of the accuracy of a platform’s position report
- Terminals use Reported Position, PQ and Time of Arrival (TOA) data to navigate
- Primary use of navigation data is for coordination of track data
- Two types of MIDS Navigation are available
  - Geodetic Navigation (Geo Grid)
  - Relative Rectilinear Planar Grid (Rel Grid)

52° 07' N 02°18'W
Secure Voice

- MIDS/Link 16 is also equipped with a Secure Voice (known as J-Voice or ECM Resistant Voice (ERV)) capability
  - 2 data rates are available
    - 2.4kbps (Voice Group A)
    - 16kbps (Voice Group B)
  - Both are ECM resistant
    - 2.4kbps can have interpretation problems whereas 16kbps is crystal clear
- Very useful for command and control, network management and link co-ordination activities
- Major disadvantage of 16kbps voice is the quantity of timeslots required when designing a network
  - Can be an issue in a busy network with many units
Cryptographic Features

- MIDS also has built-in cryptographic security features
  - 2 types of Cryptographic Variables (CVs)
    - Transmission Security (TSEC)
    - Message Security (MSEC)
  - In addition there are 2 further cryptographic modes
    - Common Variable Mode where TSEC = MSEC
    - Partitioned Variable Mode where TSEC ≠ MSEC
  - TSEC is the encryption of the waveform (Jitter, Pseudo-random Noise and Frequency Hopping Pattern)
  - MSEC is the encryption of the message data
MIDS/Link 16 Terminals

- JTIDS Class I
  - IJMS only
- JTIDS Class II
  - Bilingual
    - IJMS
    - Link 16 J-Series messages
- UK AN/URC 138 (also known as the ‘SHAR’ terminal)
- MIDS LVT
- MIDS JTRS
Typical Integrations

- MIDS terminals can be supplied in many different physical form factors for integration into a wide variety of platforms
  - Relatively simple installations through to highly complex fully integrated capabilities

Increasing Time, Complexity and Cost

Austere  Highly Integrated
Further Information

For more information about MIDS Link 16, Procurement Advice and Training Requirements

We would be delighted to see you at the 3SDL stand ‘BRONZE 8’
Any Questions?