<table>
<thead>
<tr>
<th></th>
<th>DIFI PlugFest</th>
<th>DOD SATCOM Gateways</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High Speed Switching</strong></td>
<td>“No swapping cables”</td>
<td>Digital IF needs to be deployed into a preexisting network architecture.</td>
</tr>
<tr>
<td><strong>Infrastructure</strong></td>
<td></td>
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<tr>
<td><strong>M&amp;C Automation</strong></td>
<td>Abstract user interface;</td>
<td>Digital IF needs to be deployed into preexisting M&amp;C automation.</td>
</tr>
<tr>
<td></td>
<td>Easy multicasting; No command line switch mgmt</td>
<td></td>
</tr>
<tr>
<td><strong>Both</strong></td>
<td>“Couldn’t have finished that week without them”</td>
<td>Both are prerequisites for Digital IF. Digital IF does not happen otherwise.</td>
</tr>
</tbody>
</table>
DOD SATCOM Gateway – Digital IF Networking and M&C Automation
Networking Approach: Single Switch as a Starting Point

Present Architecture Limits:
• Growth
• Reliability
• Upgrades without ASIs

*Digital IF equipment functions are notional as indicated

Present architecture does not yet support growth or reliability
Digital IF Networking and M&C Automation

Networking Approach: Hierarchical Architecture to Grow With

Simple Hierarchical Architecture:
• Supports Larger Networks

Simple hierarchical architecture supports growth, but not reliability

*Digital IF equipment functions are notional as indicated
Spine-Leaf Architecture Supports:
- Larger Networks
- Reliability
- Horizontal Growth
- Network upgrades without ASIs

Spine-leaf architecture can support growth, reliability, and cybersecurity

*Digital IF equipment functions are notional as indicated
Isolation of M&C, Data Traffic, & Digital IF Networks for Cybersecurity; Each Spine-Leaf for Capacity and Reliability
DOD SATCOM Gateway – Digital IF Networking and M&C Automation

DOD SATCOM Gateway Networking Concept

Advantages:
- Reliability
- Horizontal Growth
- Network upgrades without ASIs
- Simplified cabling over cable trays to racks

Army SATCOM Gateway Target Digital IF Architecture

Key
- Digital IF Switch
- Digital IF Connection
- Data Traffic Switch
- Data Traffic Connection
- M&C Switch
- M&C Connection
DOD SATCOM Gateway – Digital IF Networking and M&C Automation
Representative Modem Rack Concept
DOD SATCOM Gateway – Digital IF Networking and M&C Automation
Migration from L-Band to Digital IF Infrastructures

EQUIPMENT BUILDING

L-Band Infrastructure

L-Band Modems → LMS → IFL → IFL → IFL → BUC/BDC

Digital IF Infrastructure

Digital IF Modems → IFC → IFL → IFL → BUC/BDC

ANTENNA PEDESTALS

L-Band Coaxial Cable Paradigm

High Speed Data Center Paradigm

→ Power, cooling, timing, floor space, staffing, networking, cybersecurity, automation
DOD SATCOM Gateway – Digital IF Networking and M&C Automation
Stairstep Approach to Management Automation

* Developed with guidance and assistance of the staff at Northwest SATCOM Gateway

- **Enterprise Management**
  - Enterprise Management via NMS & Operator Interfaces (OIs)
  - Centralized management of multiple SATCOM gateways & satellites

- **Site Management**
  - Site Network Management System (NMS) a.k.a. Site Network Management Software, and OIs
  - 1. Comprehensive M&C tool for site operators
  - 2. Aggregation tool for Enterprise NMS

- **Equipment Management**
  - Equipment Management System (EQMS) & OIs
  - By equipment suite or manufacturer:
    - Modems, switches, Digital IF combiner/dividers, IF converters at the L-Band edge

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DOD SATCOM automation, one step at a time
DOD SATCOM Gateway – Digital IF Networking and M&C Automation
Site Level M&C

Hierarchical architecture for comprehensive site management

Shift Supervisors

Equipment Specialists

Site Level OI

Site Level Management Automation (WESS M&C)
(Resource Accounting, Orchestration, Configuration, NMS, Data Analytics)

Facilities

Baseband

Terminals

Manufacturer-specific Equipment Management Software Sets*

Digital IF equipment

*backups not shown

NOTES:
• Management nodes are intended to run on servers
• All are “virtualization ready” for virtual modems, switches & combiner/dividers

*EQMS = Equipment Management System / SW
i.e. SW management nodes

Northbound to the Enterprise
Enterprise OI

End-to-End Link Planning, Resilience Measures, Site & WSOC Assignments, Network Management, Data Analytics

Site Level OI

Resource Accounting, Orchestration, Configuration, NMS, Data Analytics

Enterprise Management Concept

Site level management to enable enterprise management and SATCOM as a service

EMMS = EDIM Modem Mgmt System/SW
EQMS = EQuipment Management System/SW

Correctly engineered site-level management
High Speed Digital IF Networking
- Hierarchical for capacity and to simplify installation
- Spine-leaf for reliability
- Network separation for cybersecurity
- Sized for growth

Site Management Automation
- Single application, single sign-on, single “pane of glass”
- Resource management, mission scheduling & orchestration, configuration, mission management, data analytics, Northbound enterprise interface

Both
- Lead Digital IF introduction

Facilities → Data Center Paradigm
- Power, cooling, timing, floor space, staffing, networking, cybersecurity, automation
DOD SATCOM Gateway – Digital IF Networking and M&C Automation
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