• **Research and Development Space and Missile Operations (RDSMO) Program Element:** … develop and rapidly field new capabilities, standardize SATOPS, and exploit core competencies/strengths in support of MMSOC and other DoD activities

• **Mission:** ADG operates and sustains an affordable Ground System Enterprise (GSE) for R&D and demo missions; develops innovative solutions to reduce O&M costs; provides a test bed to prove out emerging concepts; and remains a viable choice for all new ground C2 programs
MMSOC will be the foundation Enterprise Ground Services (EGS) builds upon.
Common Telemetry, Tracking, & Control (TT&C) “Core” With Mission Unique Software

Continued to add missions and gather lessons learned

Timeline

- Learned customers want options in TT&C and other services
- Identified the potential Virtualization offers

Envisioning and Shaping the Future of Space
Integrated a Service Bus with Goddard Mission Services Evolution Center (GMSEC) APIs

- Define Interfaces
- Provide Ground Resource Management and Scheduler services
- Offer another TT&C

Collaboration with NRL to configure Neptune Common Ground Architecture (CGA) for common ground services

Timeline:
- Released MMSOC V1.2
- MUS Core Separation
- Virtualization
- MMSOC 2.0 Initial Release
- MMSOC 2.1 Release

Incremental Development

• **Constraints**
  - Limited personnel
  - Small budget
  - Backward compatibility for missions

• **Constraints limit R&D**

• **Employ an Incremental Development Approach**
  - MMSOC 1.8 => Operates with Virtual Machines
  - MMSOC 2.0 => Integrated a Service Bus with GMSEC messaging
  - MMSOC 2.1 => Introduces Service Applications
Future MMSOC

- Improve the Infrastructure:
  - Interoperable across multiple locations
  - A common Network & Security Configuration
  - Standardized Servers
  - Defined Interfaces
  - Virtualization
- Common set of ground services
  - Mission Planning
  - Orbital Analysis
  - Telemetry, Tracking & Commanding (TT&C)
  - Virtual Data Storage
- Reliable/Maintainable set of components
- Service Oriented Architecture (SOA)
- Built in redundancy
**Emphasis 1. Scalable Infrastructure**  
HW, Servers, Network

**Emphasis 2. Elasticity with Virtualization**
- Data Layers
- Virtual LANs
- Standardized VMs
- Virtual Data Storage

<table>
<thead>
<tr>
<th>Common User Interfaces</th>
<th>Common Services</th>
<th>Interface Standards</th>
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*Envisioning and Shaping the Future of Space*
Summary

• MMSOC is an R&D and Operational system
• Incremental system development has allowed innovative solutions
• Constraints limit evolution, but making progress
• Vision is to deliver a scalable and elastic system for future Enterprise Ground Service (EGS) capabilities