

UNCLASSIFIED//FOUO



AFCEA MILSATCOM Symposium

*The Space Based Group /
Space Local Area Network*

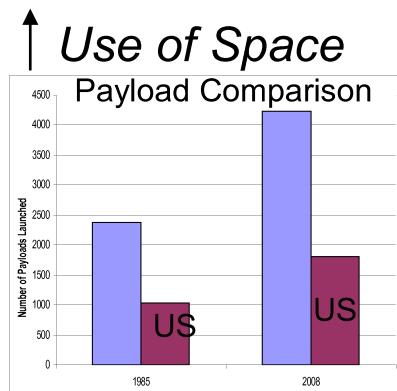
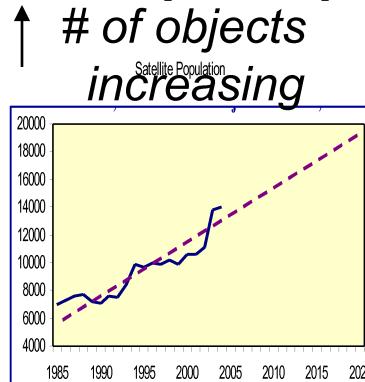
*Maj David Borgeson
SMC/XR*

UNCLASSIFIED//FOUO

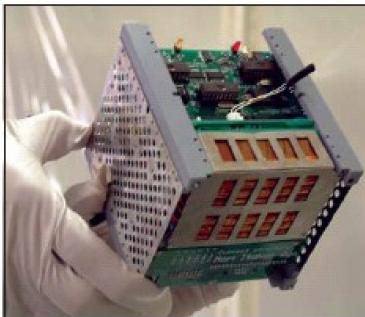


An Ever Changing & Challenging Space Domain

A Complex Space Environment

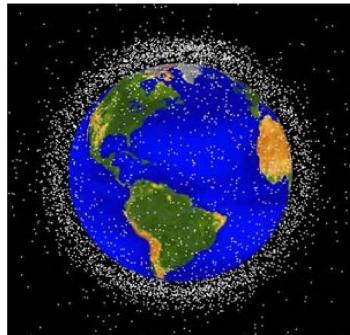


↓ Object Size

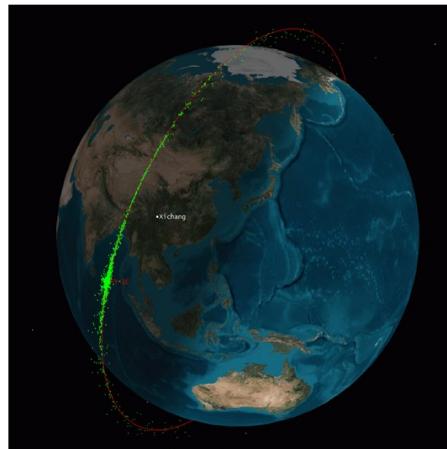


Countries worldwide are utilizing satellites as small as 2.5 lb.

↑ Debris



Evolving Threat Capabilities



→ Emerging
Energy Laser
Recent ASAT



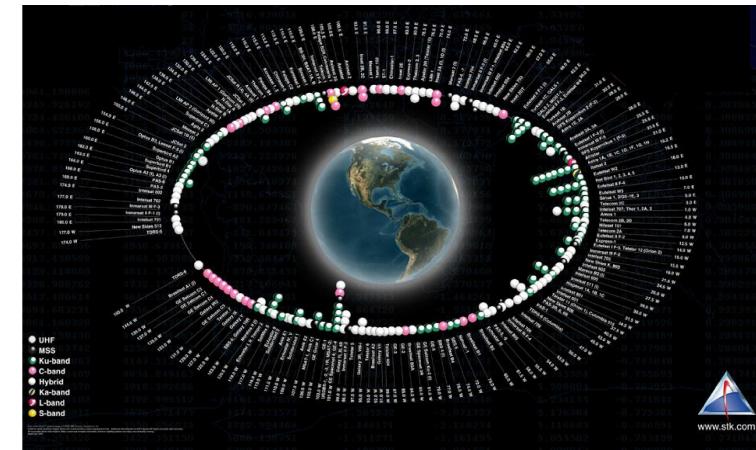
DongFeng-21 Road-Mobile IRBM being prepared for launch

Changing Security and Global Environment Necessitates a Shift in How We “Think About” & “Build” our “Space Enterprise”



SpLAN Introduction

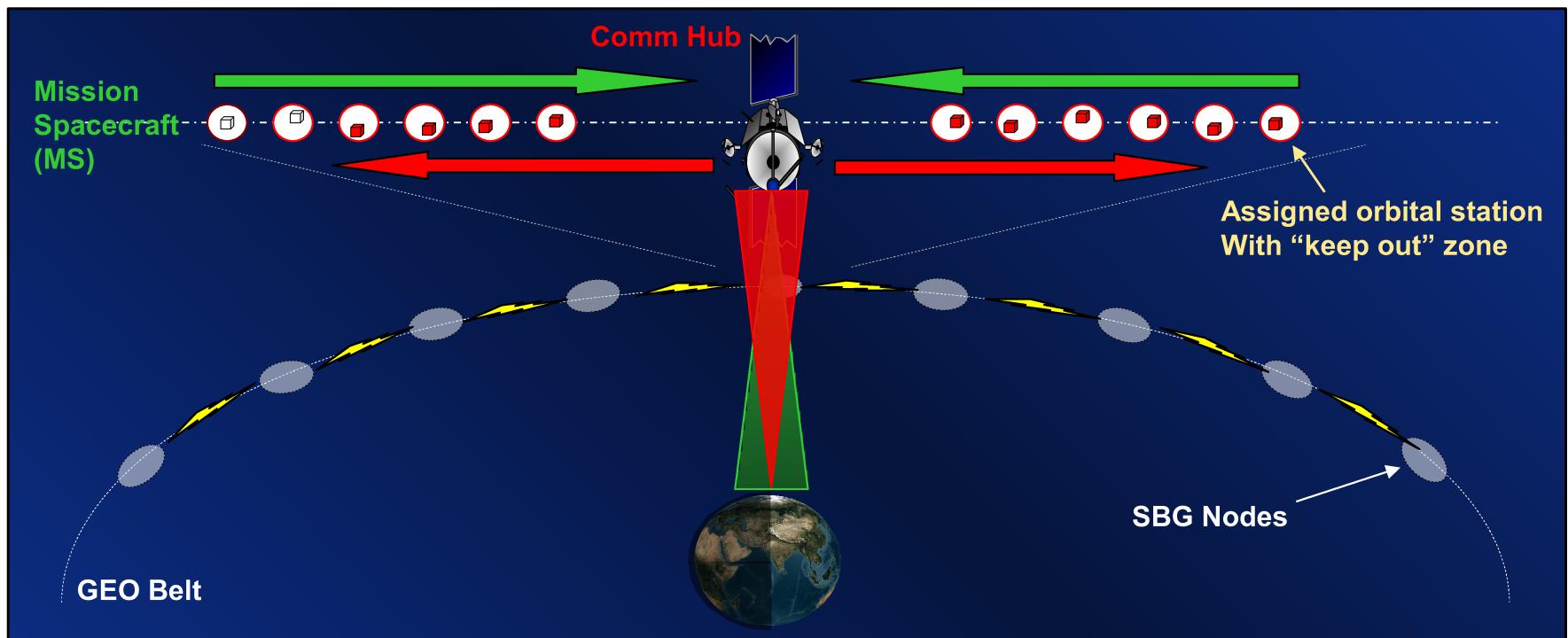
- Communication satellites designed for high bandwidth
 - Physical crowding leveraged for potential network node opportunities
 - Spectral crowding solved by network dynamic freq allocation
- GEO orbit highly valued and assets extremely difficult to protect
 - Lack of ability to detect threats
 - Unable to reconstitute assets quickly following failure
- Internet robust due to distributed network of nodes ad users
- Enable robust, diverse user network like cell phones & blackberries
- Objective: Provide a Space Local Area Network (SpLAN) to enable a common use infrastructure





SpLAN Architecture

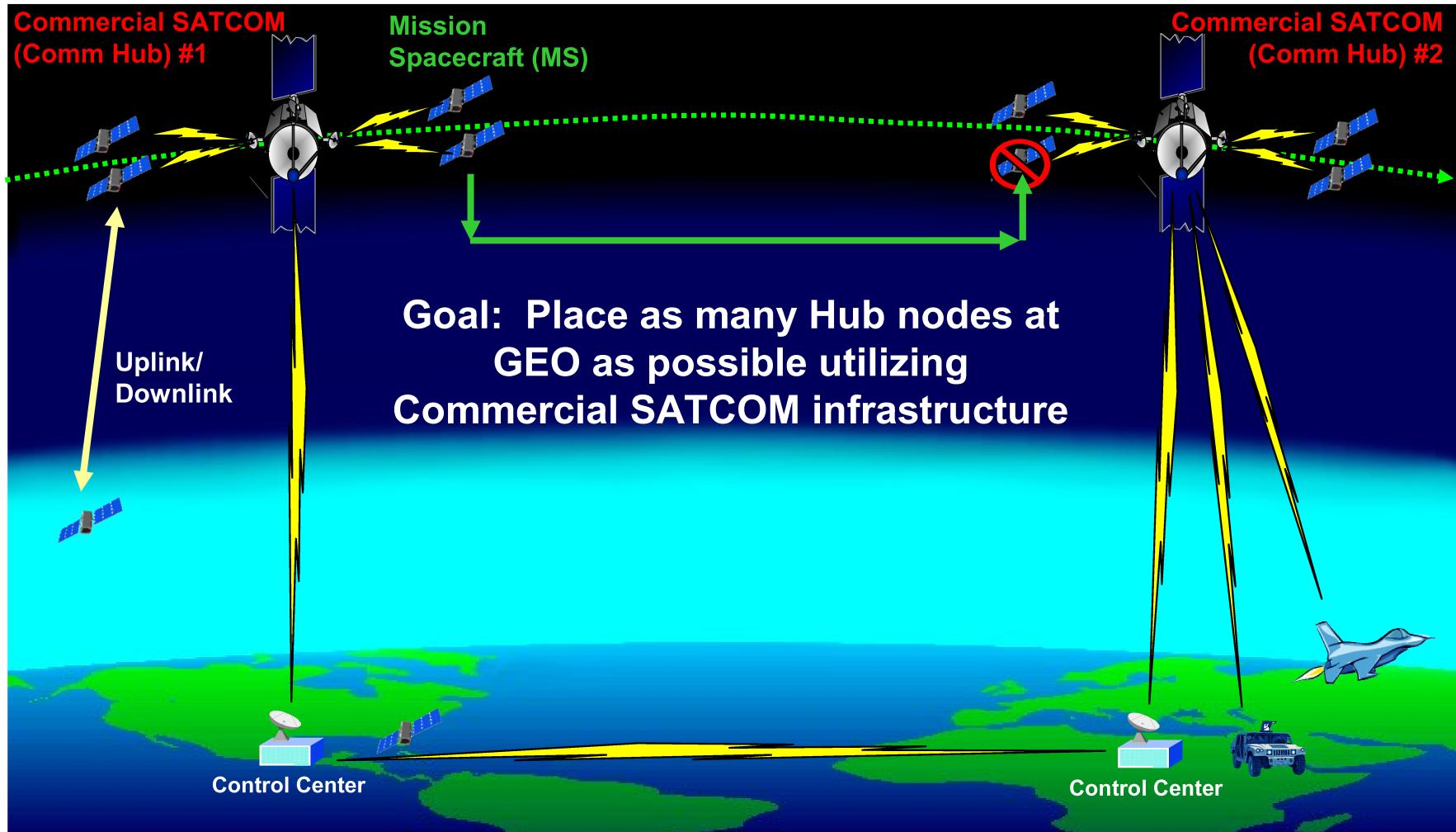
- Utilize Internet Protocol (IP) routing and network standards to provide netcentric connectivity to mission spacecraft (S/C)
- Enables multiple missions – Payload selection becomes insignificant in demo tradespace
- Maximize integration with Commercial Satellites to eliminate architecture issues and need for large communication infrastructure





SpLAN Concept

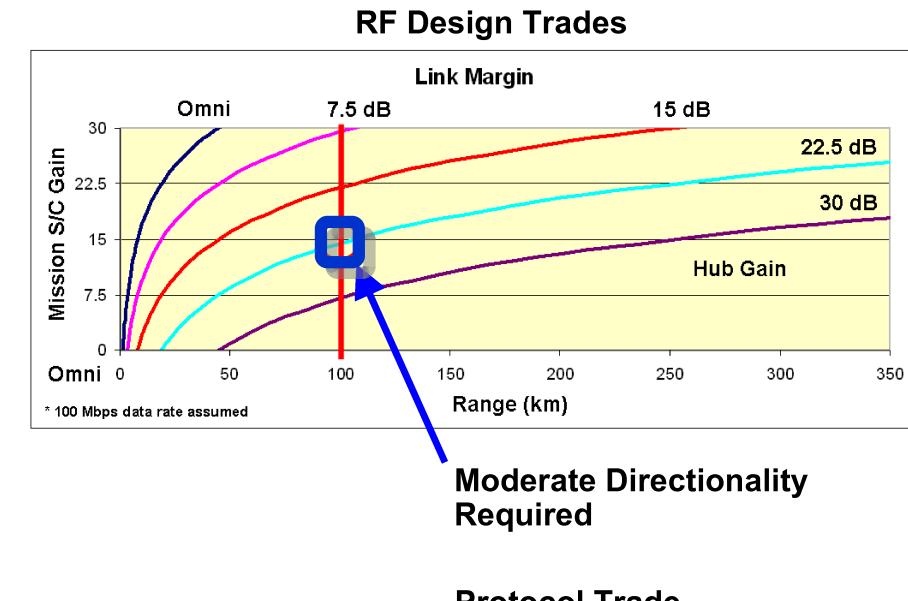
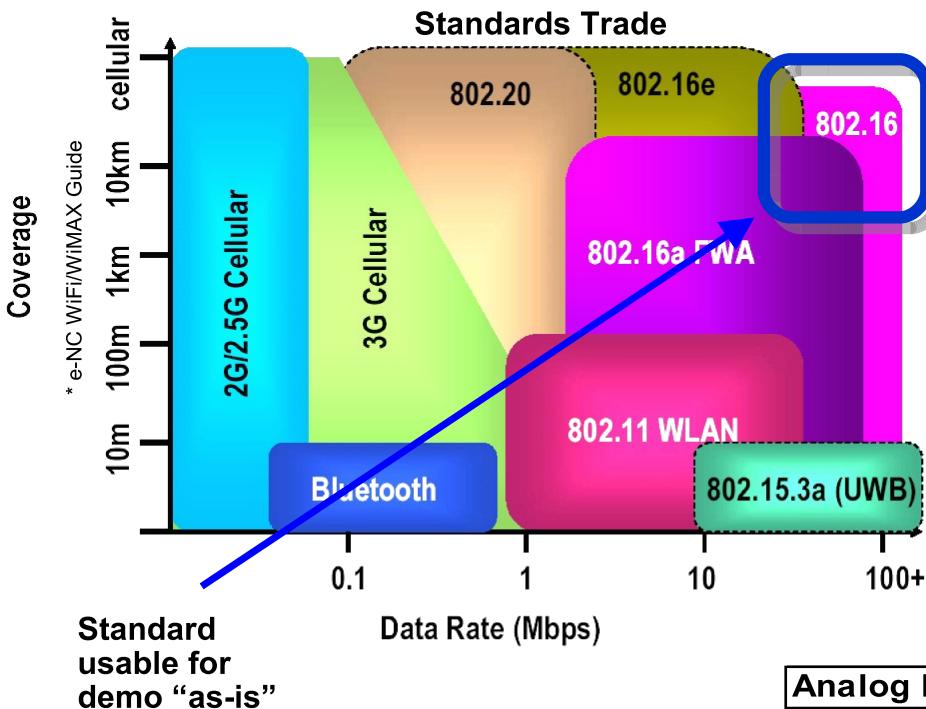
- Protection as a function of Reliability, Responsiveness, Flexibility, Augmentation, and Autonomy





SpLAN Key Factors

- Standardize parameters to establish interoperability
- Design antenna's for broad coverage but ensure link closes



Protocol Trade

Utilization	Flexibility	Capacity
Analog Bent-pipe		
Digital Bent-Pipe		
Digital Packet (IP)		
Digital Circuit		

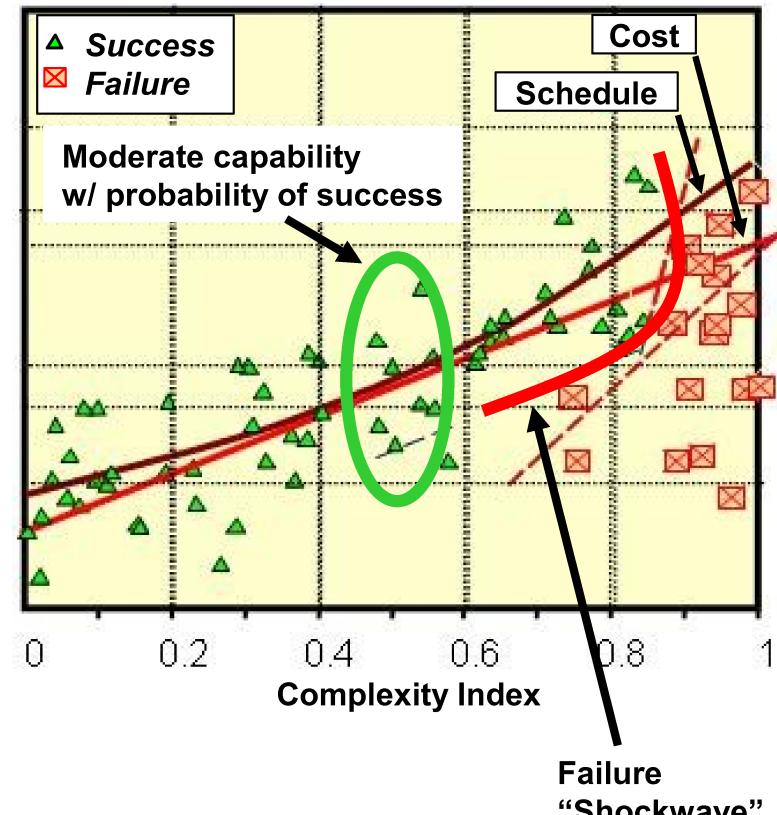
Wi-MAX standard provides functionality in data rate, range, frequency, and assured access.



Enabling Mission Capability

- Decreased S/C complexity decreases
 - Individual S/C cost
 - Schedule
 - Probability of failure
- Complex S/C replaced by multiple less complex S/C
 - More mass on orbit = more cost
 - Complexity may be in mission P/L and not subject to significant decrease
- Network enables additional robustness in
 - Protection
 - Enhances C2 Mobility Support
 - Eliminates spectrum allocation need
 - Decreased dependence on government ground sites
 - Supports Autonomy, Reliability, Availability and Responsiveness

Based on NASA "Faster, Better, Cheaper" (FBC) approach to missions 2000 study by Aerospace



Near-term SBG value likely in Robustness vs. Cost



SpLAN Architecture Goals

- **SpLAN has the potential to positively impact our future space business and space enterprise**
- **Make communications a commodity.... plug & play Space based LAN tied to terrestrial networks**
 - Wireless LAN gateway
 - Simple, lightweight client hardware, standard interfaces
 - Consolidates common mission communication requirements for survivable, tactical and civilian downlinks
- **Enables a new paradigm for orbital operations**
- **Enable new missions with minimal incremental infrastructure – R&D, initial ops**
- **Enable responsive space operations**