

***NDIA/AIAA  
Interoperability & System Integration  
Conference***

***Industry Session  
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**Rick Baily  
The Boeing Company**

# “Start With The End In Mind”

- Shared situational awareness
- Speed and agility of “Battle Command”
- Dynamic “Battle Execution”



# Capability Needs Driven by Changing Environment

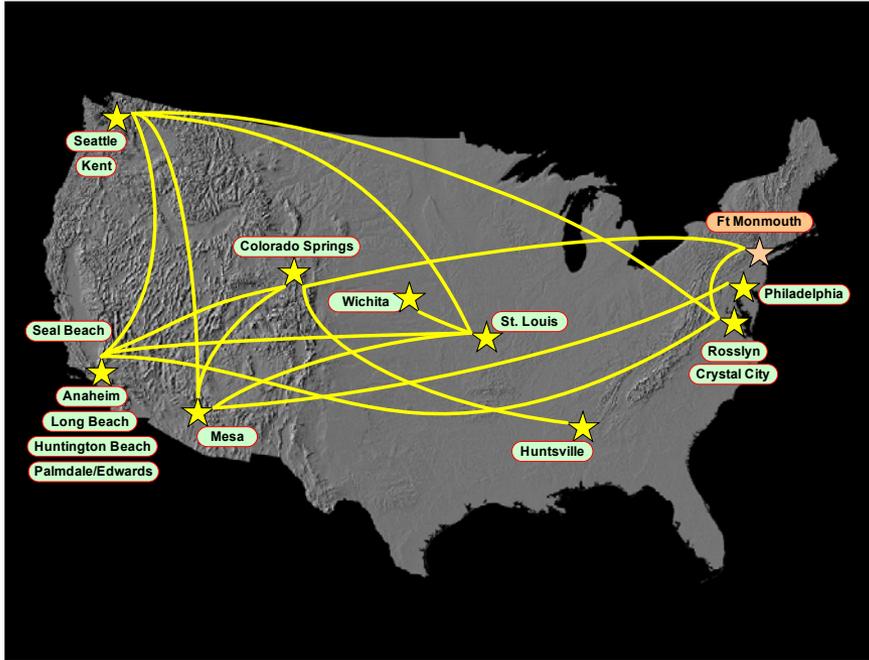
Environment Trends	Capability Need
Complex, dispersed operating environments	Everything part of network
Integrate varied set of capabilities from broad group of “mission partners” (interdependence) IT-savvy adversaries that appreciate “asymmetry” of network attacks	Seamless, secure information flow
Very dynamic employment to respond to rapid changes in environments	Right Quality of Service to “the edge”

**Net-centric capabilities enable transformation to network centric warfare**

# Filling Capability Needs

- **Everything in the network**
  - Communications and avionics block upgrades
  - Data translations services
  - IP designed into all new systems
- **Seamless, secure information flow**
  - Seamless information management
  - Information Assurance: Defense-in-Depth
- **Right QoS to “the edge”**
  - High bandwidth tactical ad-hoc mobile communications
  - Laser communications and high bandwidth RF relays
  - QoS management extended to information management layer

# Current Experience Example ..... Fixed and Mobile Networks



**Boeing LABNET – real time collaborative simulations**



**Mobile, ad-hoc network demonstration**

**Harsh mobile tactical warfighting environment  
not like fixed infrastructure – requires different solutions**

## Provocative Statement #1

**In focusing on “enterprise” interoperability, we are not adequately addressing the tactical regime**

**We need seamless, secure information flow from enterprise to tactical levels**

# *Interoperability Isn't.....*

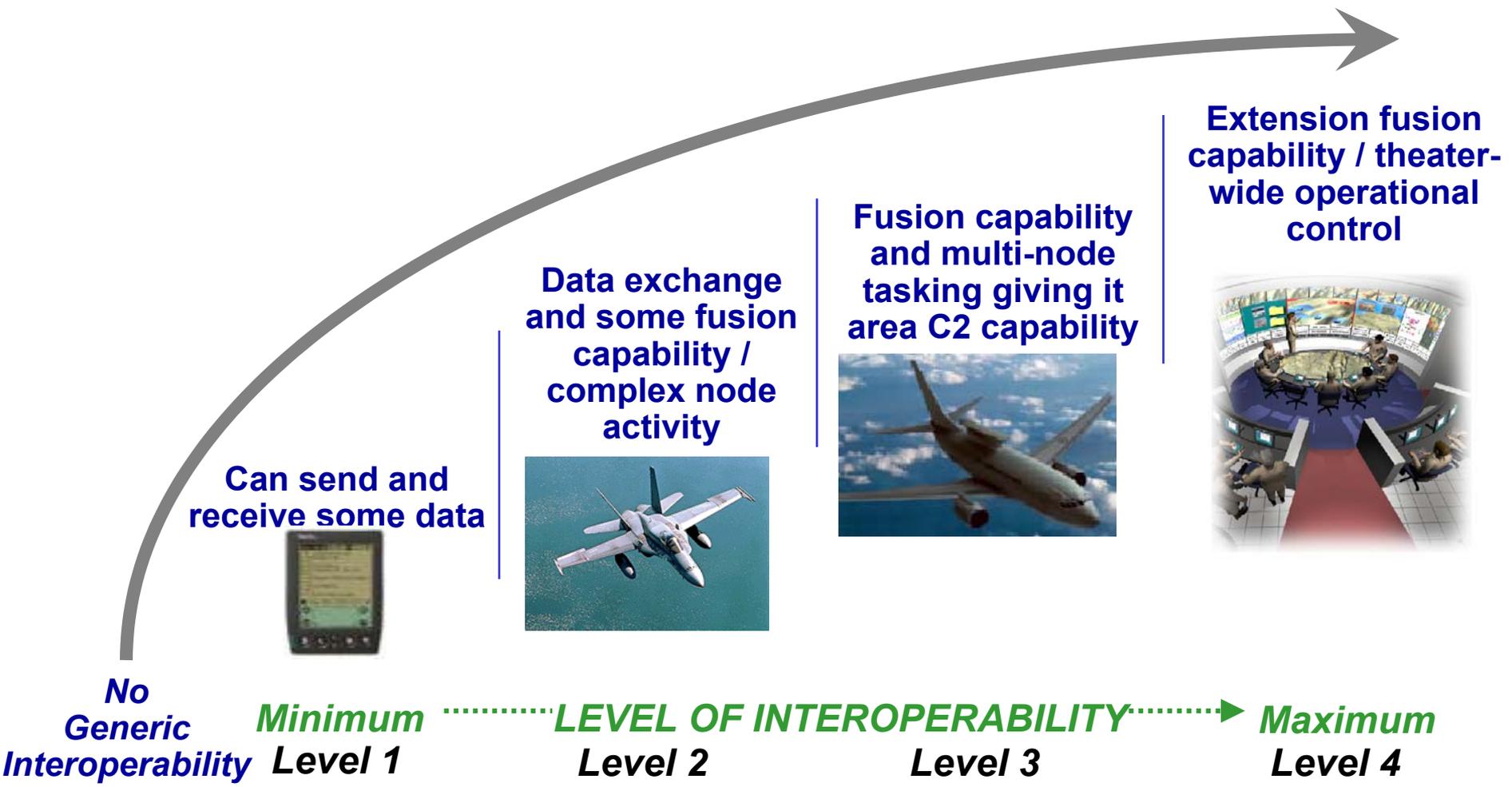


***Your old phone system .....***

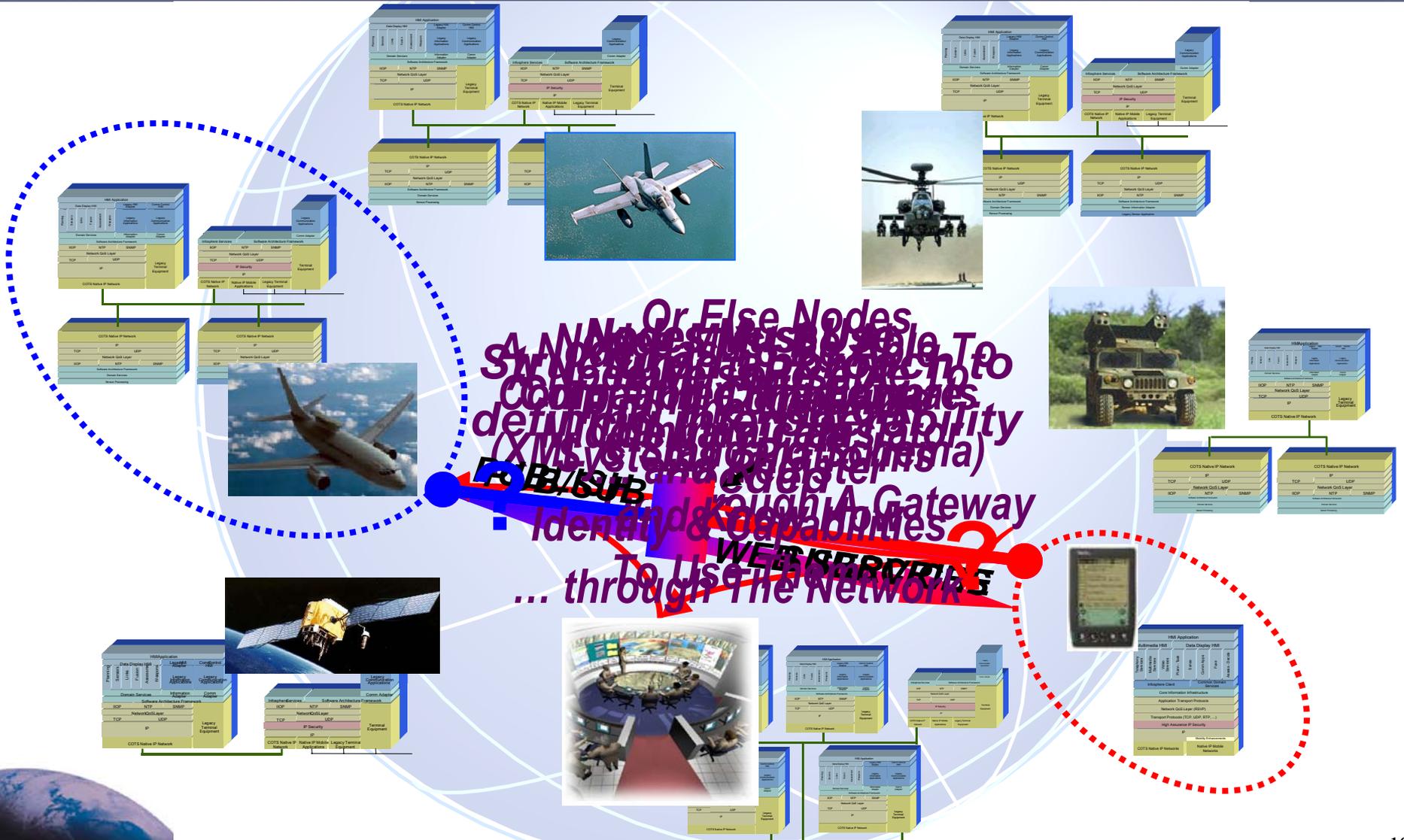
# Systematic Approach to Net-Centric Interoperability

- **Not all systems need same level of interoperability capability**
  - But all must have same basic minimum capability
- **Each system has a desired interoperability capability**
  - Determined by intended missions of the system
- **Metrics indicate system maturity toward the desired level**
  - Most significant indicator for high-level decision makers
  - Metrics and scores for identifying gaps and guiding implementation

# Interoperability Requirements Reflect Varying Types of NCO Activities

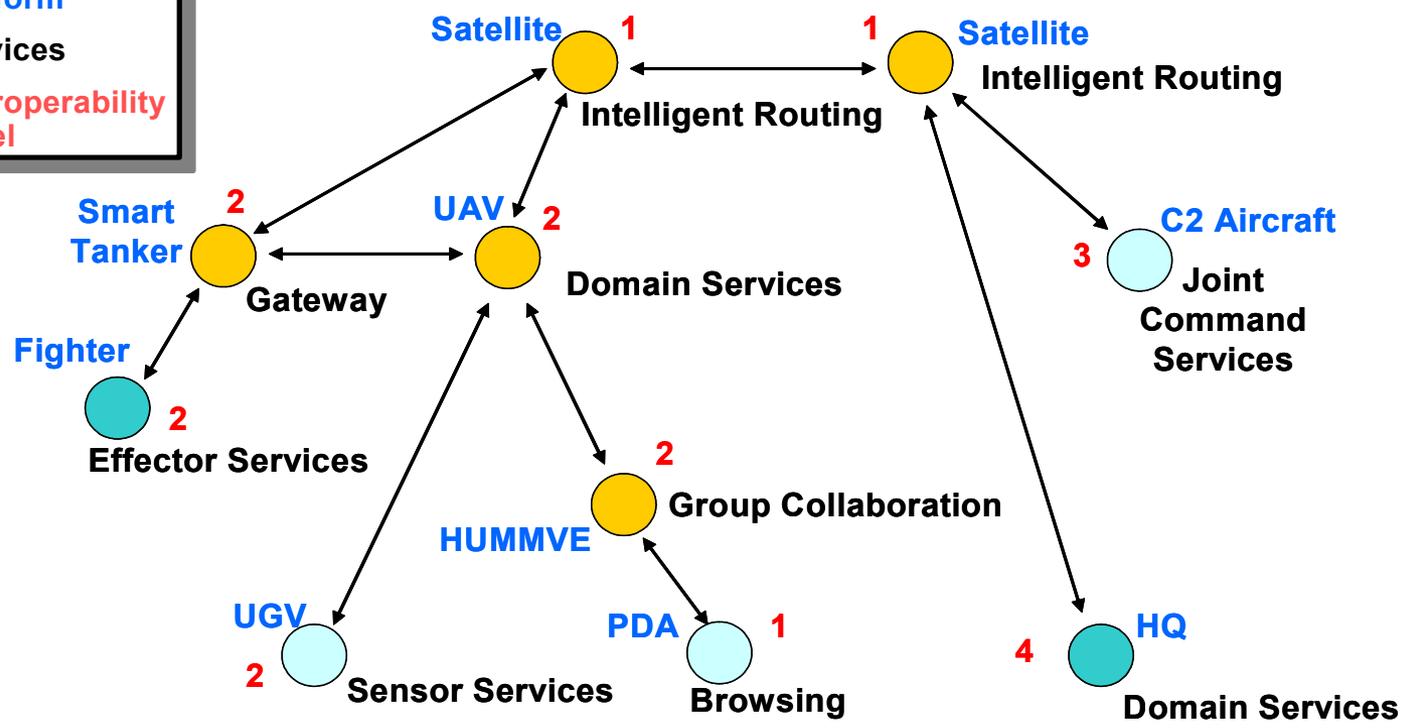


# Dissimilar Nodes Interoperating



# Interoperability Levels Based On Mission Needs

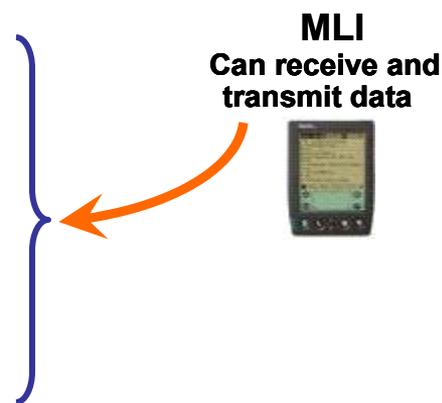
**BLUE:** Platform  
**Black:** Services  
**RED:** Interoperability Level



# Minimum Level of Interoperability

- **MLI requirements are simple and implementable in most information systems**
  - Discover communications network
  - Connect to an IP network
  - Register and discover services (in a mobile ad hoc environment)
  - Can transmit and receive data
- **MLI requirements flow down to each attribute**

Attribute	Requirements
Service Oriented	Use of community registry for service discovery
Data Semantics	Use of community XML Schemas in data exchanged
Info Assurance	Adherence to Common Criteria EAL
End-to-end QoS	Support for Service Level Agreements
Info Management	WS-I Basic Profile Standard compliant
Transport	Link to an IP network



# Reference Model Provides Structure For Analysis

- Requirements based on mission needs
- Model breaks down needs into defined capabilities and technical functionality
- Boeing reference model called “Levels of Information Interoperability for NCO” (LIINCO)
- Consistent with USAF maturity model being developed (SISSU/LISI-based)

Level	Interoperability Capability		
5	Representation	a	Agent
		c	Planning / Tasking
		b	Workflow
4	Coordination	a	Resource Mgmt
		b	Utility Computing
		c	Web Services
3	Contribution	a	Dissemination
		b	Distributed Processing
		c	Web-based Apps
2	Interaction	a	Video/Video over IP
		b	Instant Messaging
		c	E-mail
		d	File Transfer
		e	Hypermedia (HTTP)
1	Transfer	a	Hypermedia (HTTP)
		b	File Transfer
		c	E-mail
		d	Instant Messaging
		e	Video/Video over IP

Cognitive

Effector

Sensor/Data Sources

## Provocative Statement #2

**We can't rely on "web-services" for solving all interoperability capability needs**

**We need interoperability and performance met at enterprise to tactical levels – we'll need a blend of solutions**



# Interoperability Recommendations

- Let's work solutions that seamlessly and securely create information flow across all levels – let's not leave out tactical/mobile environment
- Let's work together to adopt a “target value” interoperability model focused on mission needs - not “more is better”
- Let's assure our solutions meet interoperability and performance – augment web-services where required