Crucial Factors in the Design of Net-Centric Systems

Dr. David Hernandez
Director of Advanced Systems Engineering
Tactronics Holdings, LLC
Creating a Tech/Product Pipeline

PRODUCT DEVELOPMENT – ENGINEERING PERSPECTIVE

• Goal: To create a disciplined engineering framework which supports customer focus, sustained innovation, and quick time-to-market
Divide and Conquer

The Two Components of Success:
- “Doing the right things” and “Doing things right”
- Focus and Execution
NOTE: With proper CONFIGURATION MANAGEMENT and REQUIREMENTS TRACEABILITY, each development program adds to the “capability portfolio” and enhances the execution and predictability (including $) of future jobs.

**SYSTEMS ENGINEERING – Divide and Conquer**

**THE “WHAT?”**

CUSTOMER DESIRES OR PERCEIVED CAPABILITY NEED MARKET OPPORTUNITY

Allocation to Disciplines

Disciplines take ownership and define specifications

**THE “HOW?”**

DID WE MAKE WHAT WE SAID WE WERE GOING TO MAKE?

HOW DO WE DO IT BETTER, FASTER, CHEAPER?

ARE WE GIVING THE CUSTOMER WHAT THEY WANT/NEED?

IS THIS PRODUCT GOOD FOR THE COMPANY?

SYSTEMS ENGINEERS serve as “internal customers”

**SUB-SYSTEM#N FUNCTIONAL REQUIREMENTS**

... SUB-SYSTEM#2 FUNCTIONAL REQUIREMENTS

SUB-SYSTEM#1 FUNCTIONAL REQUIREMENTS

**SYSTEM FUNCTIONAL REQUIREMENTS**

**ELECTRICAL REQUIREMENTS**

**SOFTWARE REQUIREMENTS**

... **MECHANICAL REQUIREMENTS**

**ELECTRICAL SPECIFICATIONS**

**SOFTWARE SPECIFICATIONS**

... **MECHANICAL SPECIFICATIONS**

**DESIGN AND IMPLEMENTATION**

**ELECTRICAL TEST (Unit/Module Testing- Quantitative)**

**SOFTWARE TEST (Module “Desktop” Testing - Quantitative)**

... **MECHANICAL TEST (Unit/Module Testing- Quantitative)**

**SYSTEM FUNCTIONAL TEST**

DISCIPLINE ENGINEERS => Electrical, Software, Mechanical... Engineers

CUSTOMER DESIRES OR PERCEIVED CAPABILITY NEED / MARKET OPPORTUNITY
Commitment to Discipline

- Implementing a Disciplined Engineering Framework will initially make things appear qualitatively “slower”, “harder”, “more bureaucratic”, “less responsive”…
- The “startup costs” associated with this approach can often elicit significant resistance from staff and management, however the cumulative effect is a more efficient organization and quicker speed to market.
What Makes Engineering “Net-Centric” Different?

• Goal of “Net-Centricity”: Get the right information to the right decision-makers at the right time, irrespective of physical/organizational boundaries

• Net-Centric Operations aim to provide:
  – Shared situational awareness across the battlespace, resulting in:
    • Increased ability to self-synchronize & self-task resulting in:
      – Increased agility in executing the mission and carrying out “commander’s intent”
• Systems Engineering entails:
  – Defining desired customer/stakeholder capability
  – Defining specific system requirements
  – Allocating those requirements to specific sub-systems/software modules
• In the case of Net-Centricity, the “sub-systems” we seek to integrate may already exist

• Consider the much-maligned “stovepipes”:
  – Represent investment in developing technologies/platforms to carry out specific tasks effectively, sometimes refined over years of field deployment
  – Represent significant resource expenditure in training personnel to use these tools
  – Net-Centric sub-systems may be separated by great physical distance, but more importantly, “virtual distance”
  – Technologies underlying Net-Centric capabilities – communications/information dissemination – are relatively dynamic compared to other technologies (“internet pace”)
- Leverage existing capabilities
  - Represent investment in developing technologies/platforms to carry out specific tasks effectively, sometimes refined over years of field deployment
  - Represent significant resource expenditure in training personnel to use these tools
- Leverage existing personnel familiarity
- Respect differences — adapt to the mission need
  - Net-Centric sub-systems may be separated by great physical distance, but more importantly, “virtual distance”
  - Technologies underlying Net-Centric capabilities — communications/information dissemination — are relatively dynamic compared to other technologies (“internet pace”)
What Makes Engineering “Net-Centric” Different?

• Approach:
  – Leverage components that have been developed, deployed, and refined through field testing
  – Maximally leverage knowledge and training that is in place to get capabilities into the field quicker
  – Account for differences across user groups, rather than forcing adaptation, by allowing for tailoring to specific use cases
  – Make systems extensible to incorporate new capabilities
This Approach Applies Across Technology Areas

• Tactronics’ Products Areas Where this Approach to Systems Engineering is Being Applied:
  – Fixed Computing/Processing
  – Human-Machine Interfacing and Displays
  – Mobile Computing
  – Navigational/Mapping and Sensor Processing
  – Networking Infrastructure
  – Power Management
  – Radio Management
  – Specialized Data Manipulation/Transport
    • Audio Intercommunications
    • Beyond-Line-of-Sight Communications
    • Data Acquisition/Monitoring (including Platform Telemetry)
    • Radar Processing/Display
    • Video Processing/Manipulation
  – Networked/Fixed Storage Devices
Example: “Off-the-Shelf” Software
Case Study: Data Distribution
Case Study: Radio Management
Case Study: Systems Integration

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Standards-Based Computing
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Operation In Multiple
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Platform Immaterial Common Line Replaceable Units For:
- Man Portable
- Vehicular Platforms
- Maritime Platforms
- Rotary Wing Aircraft
- Fixed Wing Aircraft
- Forward Staging Bases FSB’s
ANY QUESTIONS?

Contact Info: dhernandez@tactronics.com