KSC/IT Knowledge Sharing With JAXA/IT

July 29, 2010

Meeting Purpose/Introduction

Kevin Zari/Paul Davis

IT and Comm Services

- IT knowledge sharing with JAXA
- Beneficial to JAXA's creation and introduction of IT systems for Japanese Human mission and launch site operations.

Kennedy Space Center Big Picture

Stacie Turner

IT and Comm Services

- **15,000 Civil Service and contractor employees**
- **Major Programs & Support Contracts**
  - ❖ Space Shuttle – Space Program Operations Contract (SPOC)
  - ❖ International Space Station – Checkout, Assembly, and Payload Processing Services (CAPPS)
  - ❖ Launch Services - ELVIS (Expendable Launch Vehicle Integrated Services)
  - ❖ Constellation
  - ❖ Base Operations – Institutional Support Contract (ISC)
- **How does IT fit into the "Big Picture"**
  - ❖ 2 major contractors—IT, communication services, and desktop support to many of KSC's employees in the major programs and support contracts
    - ➢ Information Management and Communications Support (IMCS)
    - ➢ Outsourcing Desktop Initiative of NASA (ODIN)

IT Services Summary

Chuck Brown

IT and Comm Services

The Information Management and Communications Support (IMCS) contract at the Kennedy Space Center provides:

- Management and Technical Performance Services including system operations, maintenance, sustaining engineering, systems engineering, customer requirements tracking, test team interface, analyses and assessments.
- Services are provided to all Program and Institutional customers.

IMCS Structure

IT and Comm Services

- **3.0 Technical Services**
  - 3.1 Computer Services
    - » 3.1.1 Data Center Operations
    - » 3.1.2 Software Engineering
  - 3.2 Cable Plant Services
  - *3.3 Transmission Services*
  - 3.4 Networks, Telephones, and Network Security Perimeter
    - » 3.4.3 Telephone Services
  - 3.5 Imaging Services
    - » *3.5.1 Surveillance Television*
    - » 3.5.2 Media Production and Distribution
    - » 3.5.3 *Spacecraft Processing, Launch, and Landing Imaging*
    - » 3.5.4 Non-Engineering Imaging
  - 3.6 Graphics Services
  - 3.7 Audio/Visual (A/V) and Presentation Support Services
  - 3.8 *Timing Services*

IMCS Structure
(continued)

IT and Comm Services

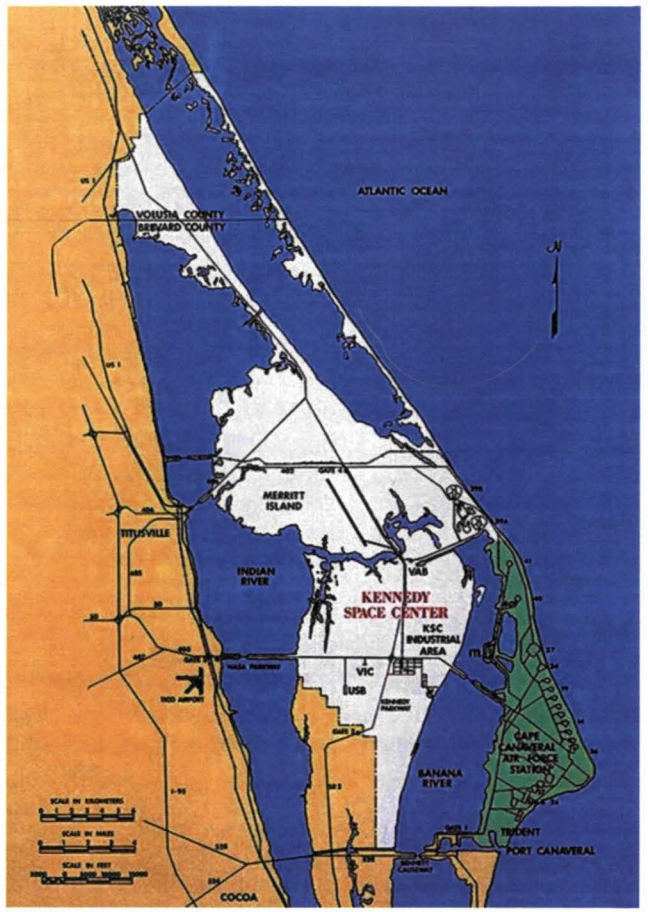
- 3.9 Voice Communications
  - » 3.9.1 Paging and Area Warning
  - » 3.9.2 Radio Services
  - » *3.9.3 Operational Intercommunication System (OIS)*
  - » *3.9.4 Audio Distribution Systems*
  - » *3.9.5 Voice Recording Systems*
  - » *3.9.6 Fixed Audio Systems*
- 3.10 Electromagnetic Measurement and Analysis Services (Option)
- 3.11 Publications Services
- 3.12 Printing, Reproduction, and Micro-imaging Services
  - » *3.12.1 Printing and Reproduction*
- 3.13 Engineering Data Center
- 3.14 Library Services
- 3.15 Maximo Application Support Services
- 3.16 Forms Services
- 3.17 IT Security Services
- 3.18 Center-Managed Outreach Services

Breadth of Current Services

IT and Comm Services

Statistics

- 800 Miles of major cables
- 495,084 Cable Pairs
- 488 Manholes with 54 miles of duct bank
- 270 miles of Fiber Optics
- 3000+ Fiber Optic circuits
- 3000+ OIS units, 1024 channels
- 3000 Radios, 85 nets
- Paging in every building at KSC
- 300+ Countdown and timing displays
- 200+ Video Cameras
- 700+ Video Monitors
- 150 Film Cameras (up to 400 Frames/second)
- 16,000+ Computer Network connections
- 18,500 Telephones



ODIN Services

Jimmy Gonzalez

IT and Comm Services

- Scope of ODIN at KSC
  - Desktop services (e.g., desktop, laptop, and workstation support, Windows, Mac and UNIX platform are available)
    - » Each seat includes the necessary IT support services
      - Hardware and software support e.g., installation, maintenance, and technology refresh
        - Hardware technology refreshment every three (3) years
        - Software tech refresh within one year of latest release from vendor, with concurrence from NASA
      - Administration, relocation, and network access
      - Customer support and training
      - Server services (e.g., file, print, e-mail, and application servers)
        - Exchange 2007, SQL 2003, Cold Fusion, etc.

ODIN Services
(continued)

IT and Comm Services

» Each seat includes the necessary IT support services (cont.)
  - Support HSPD-12 compliance for two factor authentication, SmartCard readers, Privilege Management and Data at Rest (DAR)
  - ODIN Help Desk
    - Single point of contact
    - Tracks problem from initial call through resolution, including support redirected to other service provides

- Mobile computing services (e.g., cell phones, Blackberry's, iPhones and pagers)
- Administrative and back office server support (e.g., file, print, e-mail, application, and internal web servers)
- Additional services include network printers, backup services, web conferencing, file shares, etc.

IP Networking at KSC

Bryan Boatright

IT and Comm Services

- Multiple different IP network environments in operation to support a wide variety of requirements & customers at Kennedy Space Center
  - Multiple wired & wireless networks deployed to support Mission, "Institutional" (onsite NASA/partner personnel), Guest (Visitors or Press) & special purpose functions.
- Connections to external partners/corporations/organizations largely supported through existing NASA WAN Communication Systems
  - Dedicated Lines only used for special circumstances & normally to closed nets
    - » Legacy Mission telemetry and support circuits still largely supported this way
    - » Increasing trend towards IP based services , but still on "closed" nets.
  - IP based traffic sent via either Internet, or NASA Wide Area Networks via direct network tail circuits
    - » Support outbound corporate /partner client access from on-site systems
    - » Very limited support for network-to-network VPN tunnels between KSC and external partners/corporate (special circumstances only)
    - » The KSC Network Security Perimeter (firewall) provides initial IP-based access controls between external and KSC networks

IP Networking at KSC

(continued)

IT and Comm Services

- Center access to global Internet via NASA provided Wide Area Networks
  - NASA Integrated Services Networks(NISN) – redundant high speed backbones with multiple Internet peering points & direct connections to the major NASA partners/contractors
- Network environment is multivendor, with single vendor concentrations along subsystem/functional lines to minimize integration /interoperability issues
  - Trying to return to open standards based architectures after a long period of unsuccessfully deploying vendor-proprietary solutions.
  - Emphasis on unique network services delivery sometimes dictates a solution best provided by another vendor rather than using those from by existing vendor.
- Communications Systems that directly support Flight/Life Critical Human Spaceflight functions undergo multiple additional Validation & Verification processes (such as System Assurance Analysis)

Remote Access

IT and Comm Services

- Externally Accessible internal IT systems
  - Systems designed to be externally accessed done so via direct firewall openings.
  - Remainder via some for of VPN or "Extranet" solution
  - Access via VPN usually comparable to onsite levels of access
    - » Some special purpose VPN variants limit access to only a few IT systems
  - Mail & other services provided via Agency level systems external to KSC
- Multiple forms of remote access are provided to meet different requirements
  - Client based Virtual Private Networks – both IPSEC & SSL clients
    - » Preconfigured IPSEC Clients avails for Windows. Mac OS, Linux/Unix, some Mobile OSes
    - » SSL VPN Browser support for the standard Agency Web Browsers (IE, Firefox & Safari)
    - » Limited Restrictions beyond that today – evaluating Network Access Control (NAC) options
  - Legacy Dial-in Modem lines (local & toll-free) still available – limited use
  - All forms of remote access use Two Factor Authentication (SecurID tokens)

Remote Access
(continued)

IT and Comm Services

- User support/assistance
  - Majority of user support provided 0700-2200 hours Mon-Fri
  - Authenticated "web portal" resources available 7x24x365 (user configuration/help guides, client software downloads, etc.)
  - Support email address normally monitored off –hours by remote technical team – best effort support outside of support windows
  - Extended support available for specific events if requested (& funded)
  - Likely to move to Agency provided service in the coming 1-2 years, with increased support hours but fewer "custom" solutions

Operations of Information Systems

IT and Comm Services

- Multiple Outsource contracts in use today
  - Firm Fixed Price (Desktop Services) or Cost Plus (remainder)
  - Mission Support Contractors have own IT support services for "program unique" IT services
    - » Increasingly less delivery of infrastructure services & focusing on more mission or contract specific services
- Local Area Networks still managed by Center Communications Contractor
- Wide Area Networks support by the Agency Unified NASA Information Technology Services (UNITeS)
  - Future trend is to roll all services in an Agency-wide suite of IT contracts
    - » NASA Information Technology Infrastructure Integration Program (I3P)

Operations of Information Systems

(continued)

IT and Comm Services

- Chargeback Methodology
  - "Common" network infrastructure services used by all programs/projects are Agency funded baseline
  - Communications services required or used only by a specific program/project are funded by that program/project - Some direct consumption based charges
- IT Resource Management
  - KSC IP address pools are managed at the top level by the Information Management and Communications Support (IMCS) contractor
    - » Now using an Agency required commercial IP Address Management application for documentation, DNS & DHCP services
    - » Some pools of addresses are sub-allocated to the program/project level
  - Desktops are managed by the KSC Outsourcing Desktop Initiative of NASA (ODIN) contractor
  - Increasing use of automation for system management, monitoring & reporting
    - » Multiple Agency required solutions being deployed

Operations of Information Systems
(continued)

IT and Comm Services

- Contractor IT Systems
  - Contractor IT Systems must comply with NASA IT Requirements/Governance
    - » This approach sometimes creates issues between the major NASA Organizations
  - Many "incentives" (positive and negative) for the Contractors to use NASA provided or required Information Technology Resources being utilized
  - Non-utilization (where permitted) of these "Agency standard IT resources" may have a higher cost to the contractors to remain "independent".
- IT Security Requirements
  - Security starts with the Contract Language
    - » NASA is playing "catch-up" trying to make sure the standard security clauses are included in all contracts (NASA FAR 1852.204-76 , Security Requirements for Unclassified Information Technology Resources.).
  - The Federal Government has many laws (ex. FISMA) in place that require all Federal and contractor support systems meet minimum security requirements, regardless of the location of the systems
    - » Frequent changes to U.S. Government policy and law makes this a challenge
  - Performance metrics, audits, and monitoring tools are the most commonly used approaches to ensure contractors continue to meet minimum IT security requirements.

Video Distribution

POC: Chuck Brown

IT and Comm Services

- **Video distribution at KSC**
  - Broadband Communications Distribution System (BCDS)-
    - » Broadband cable television system. Provides cable television programming and individual camera views of selected operational areas over a hybrid fiber and coax delivery architecture
  - Operational Television (OTV)-
    - » Point to point individual baseband NTSC and ATSC video surveillance camera links to X-Y router for individual video distribution capability to authorized customers.
  - IP network cameras
  - Public Affairs Office (PAO)
    - » High Definition mass general release video

Video Distribution
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IT and Comm Services

- **Inter-center communication**
  - NASA Integrated Services Network(NISN)-
    - » High speed digital data delivery network between centers for both PAO and Engineering video
  - Multi-Channel Digital Television (MCDTV) service between Centers- Provides multiple Standard Definition and a High Definition programming to mass market
    - » Programming originates from KSC (during Launch and Landing) and sent via NISN to NASA HQ for broad distribution
  - Engineering Analysis Video –High resolution (wavelet compressed) digital video sent between mirrored servers at KS, JSC and MSFC over NISN

Video Distribution
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IT and Comm Services

- **Storing of the video data**
  - Video Tapes
    - » DigiBeta
  - Digital Video Disks (DVD)
  - Blu-Ray Video Disks
  - Backed –up Computer editing and server systems
  - Engineering Imaging Analysis
    - » Mirrored Server and Archive System

Video Distribution
(continued)

IT and Comm Services

- **Video Formats**
  - NTSC (scheduled for retirement)
  - ATSC
    - » Standard Definition
    - » High Definition
      - 720P, 1080P
  - Compressed Digital Video
    - » MPEG 2
    - » MPEG 4
    - » DV
    - » IP
  - QuVis (Wavelet Compression)

Ground Processing/Launch Systems

Bryan Boatright

IT and Comm Services

- Individual Mission Contractors/Subcontractors each have a number of unique IT systems/applications for the wide spectrum of functions they support
  - Computer Aided Design/Drawing (CAD)
  - Work Control /Resource Management
  - Documentation /Logistics/ Parts Control
  - Risk Management/Problem Reporting & Corrective Action
- Increased use of workflow technologies & automation for the processing/launch functions
  - Multiple Legacy paper-based processes that are being automated
  - Normally still have a paper based system that can be the fall-back in the event of IT system failure
- NASA has a very mature set of requirements that the systems must ultimately support
- Many integration challenges have emerged over the years where technologies outpaced the governing standards & frameworks

Ground Processing/Launch Systems
(continued)

IT and Comm Services

- Remote Ground Launch Systems Monitoring accomplished via "purpose built" telemetry systems developed & refined over many years
  - Primarily via dedicated "hardwire" types of systems initially, but slowly migrating to multiplexed and IP based networking solutions
  - Additional care has to be taken when moving to some of the more modern technologies (such as packet based systems vs. legacy hard wire systems) - different behaviors sometimes resulted unexpected results during testing
  - Performance requirements often exceed those of Commercial Off The Shelf (COTS) based solutions, which then require additional modification to use.

- All Systems that directly support Flight/Life Critical Human Spaceflight functions undergo multiple additional Validation & Verification processes (such as System Assurance Analysis) and are managed with more stringent configuration control & testing processes

Summary

Bryan Boatright

IT and Comm Services

- The mission of NASA IT [organizations throughout the Agency] is to increase the productivity of scientists, engineers, and mission support personnel by responsively and efficiently delivering reliable, innovative and secure IT services. (http://insidenasa.nasa.gov/ocio/about/index.html, July 2010)

- IT at NASA/KSC serves to enable KSC's mission (Human Space Flight) in a customer-focused manner by offering a breadth of IT services to support the current and advanced information technology and communications needs of KSC institutional and NASA/KSC program customers.