Applying Web-Based Tools for Research, Engineering and Operations

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Problem

How does one get the maximum amount of work done for the dollars allocated?

Collaborate!

How Do People Work TODAY?

- People work globally.
- The world runs 24 hours a day.
- People work across time zones – often, global time zones.
- People are mobile (locally and globally).
- Wireless is the norm.
- Always on connectivity is the norm (at least if one does not intentionally disconnect).
- It is not uncommon to be on a teleconference while sitting in an airport or taxi or car or train.
- People operate in a virtual environment and multitask.
- One does not have to be physically present to participate.
- Technology allows one to time-shift information
- Machines do not care what time it is, people do.

Web Applications and Technologies (1)

- Voice Over Internet Protocol (VOIP) – it is cheap.
- Teleconferencing (See VOIP).
  - Anyone Can Do It.
- Web-based Meetings
  - Anyone Can do it.
- Email and maillist
  - Anyone Can do it – see Google Groups, Yahoo Groups etc
  - What do you think Twitter is?
- Webservers.
  - Anyone Can do it (Apache for Linux, cable modem and No-IP™).
  - What do you think Facebook is?
- Wiki – See Webserver
  - An easy to edit webserver with shared editing authority (if so desired)
- Instant Messaging
  - Real-time Chat (now with file sharing)

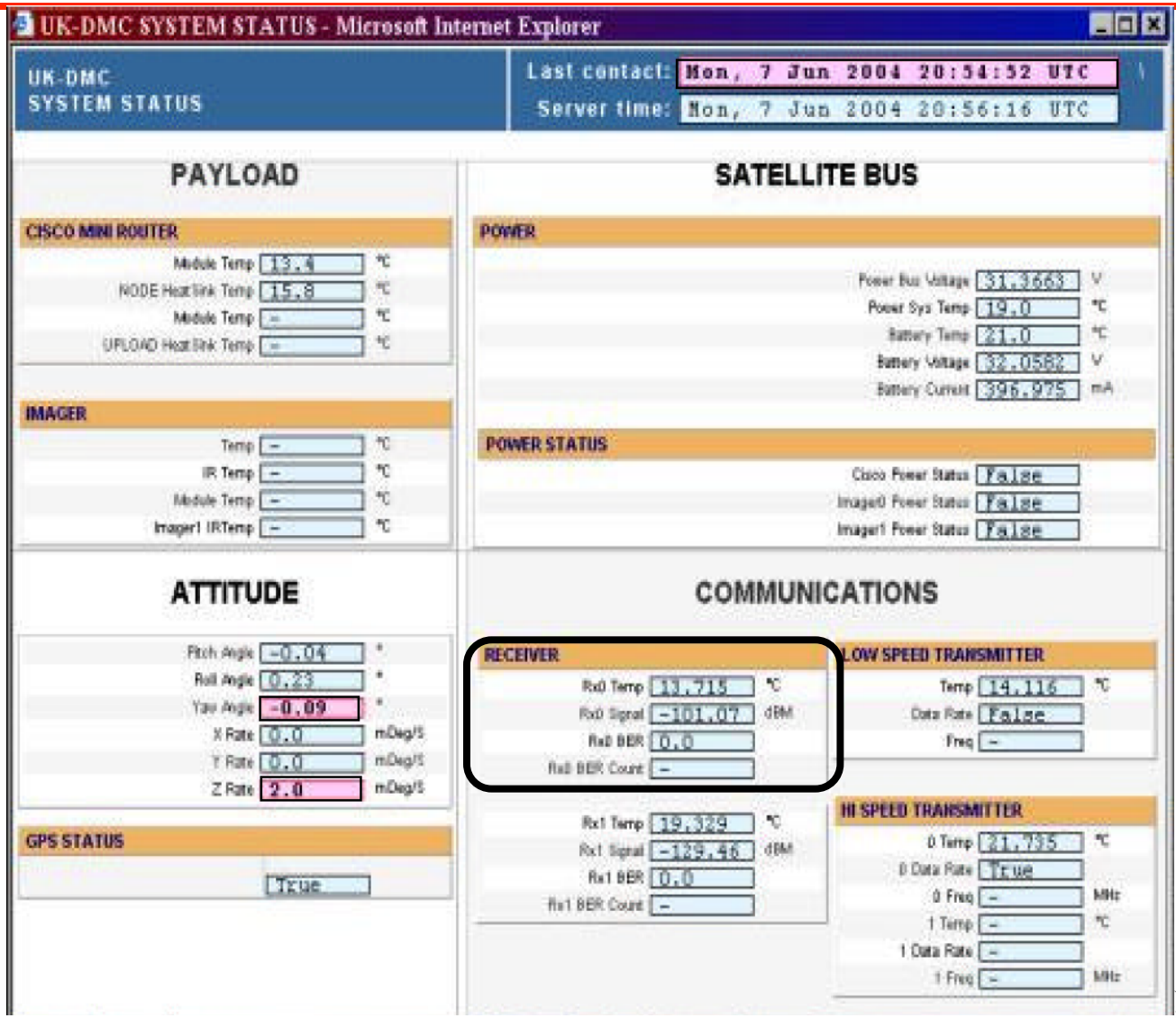
Web Applications and Technologies (2)

- Audiocasting and Podcasting
  - Audiocast is streaming, podcast is a file transfer
- Video
  - Becoming the major source of content (even from your cell phone)
  - Videos are created for entertainment, advertising, promotion, publication, tutorials, or documentation.
  - YouTube, Facebook, others
- Version Control Software
  - Most often used by computer programmers to collaborate, maintain and document software changes.
  - Can be readily adapted to non-software documentation.
- Web Collaboration software and servers
  - A combination of File Servers, version control, instant messaging, web meeting, white boarding and teleconferencing all in on package.
  - Usually some integrated security approach

Case Studies (1): Internet Protocols in Space – Testing and Troubleshooting 2004

- Cisco router in Low-Earth Orbit (CLEO)
- Multiple locations and time zones (East, Mountain, and Pacific time, Cleveland, Colorado, California, Alaska, and England)
- Used multiple email lists to keep proper groups informed of progress/ status/needs
- Used secure and unsecure web server sites to distribute information
- Used a Virtual Mission Operations Center (VMOC) as a secure communication portal
  - Authenticated access for multiple users from a variety of organizations (Universal Space Network, NASA, Surrey Satellite Technology Limited, US DOD Organizations.)
  - Publish/Subscribe architecture
  - Real-time telemetry distribution
    - Great for troubleshooting ground stations
  - Integration of Simulation tools such as Satellite Tool Kit.
    - Provided visual of satellite pass times and antenna look angles

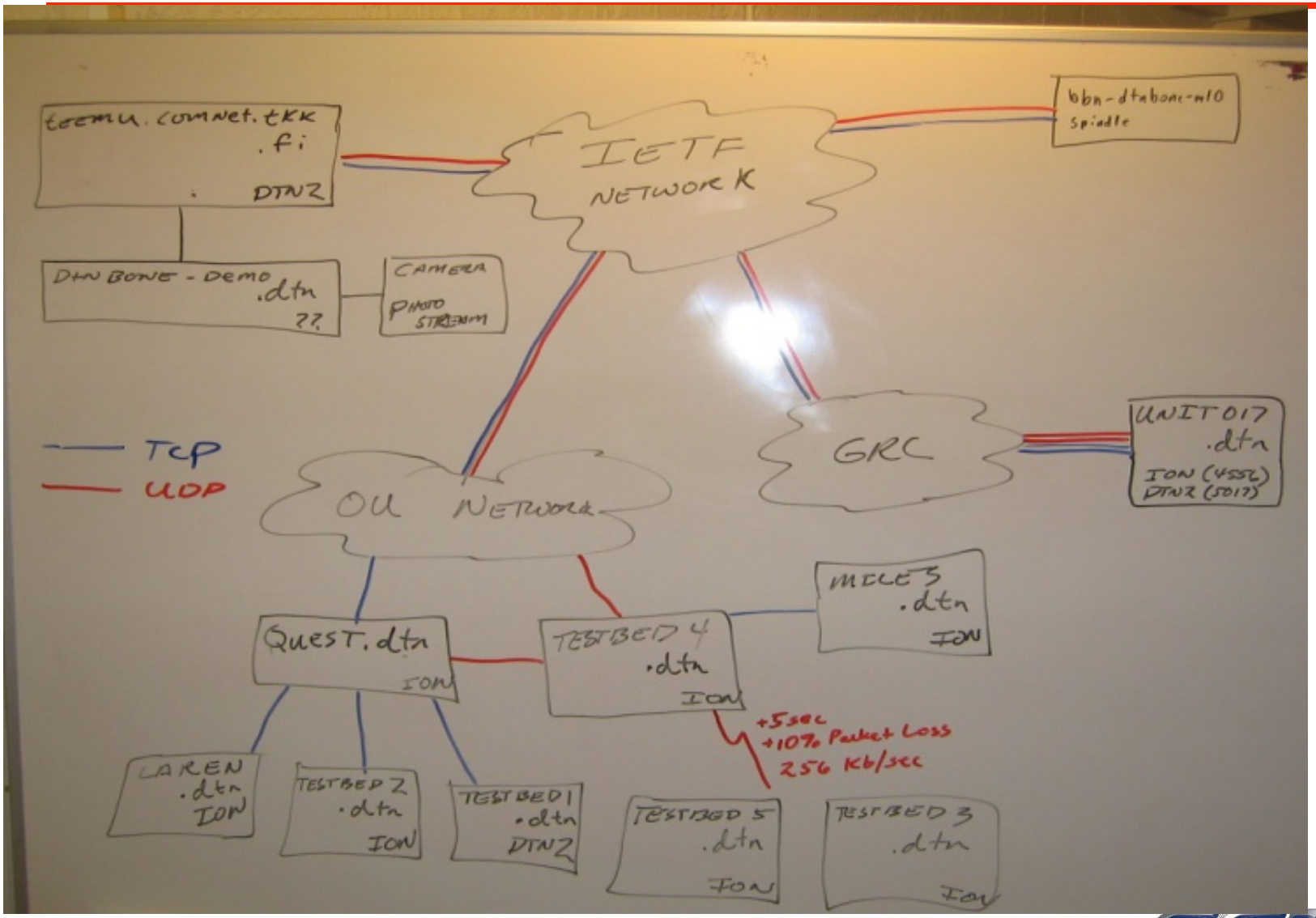
Early Telemetry Page



Case Studies (2): Delay Tolerant Networking (DTN) Disconnectathon

- DTN interoperability event June 29-30, 2009, at the Internet Engineering Task Force (IETF) meetings in Stockholm, Sweden, BBN facilities, Ohio University, NASA Glenn Research Center and Trinity College of Dublin, Ireland
- Web-based collaborative site for file sharing
- Established interoperability email list
- Jabber meeting room for real-time Chat
  - Meeting room provide for group Instant messaging and archiving
- Teleconference number provided by NASA (toll number outside US, so many used Skype to call in, but Chat was generally more effective)
- Used Internet Engineering Task Force (IETF) meeting wireless network as test infrastructure
  - Allowed participants to be in a variety of location and disconnect.
- Dynamic Domain Name Server at Ohio University used to register IP addresses (locations)
- DTN Research Group Wiki and other web servers to distribute test plans, code, etc…
  - http://www.dtnrg.org/wiki/DtnBone/Disconnectathon

Real Time Network Construction

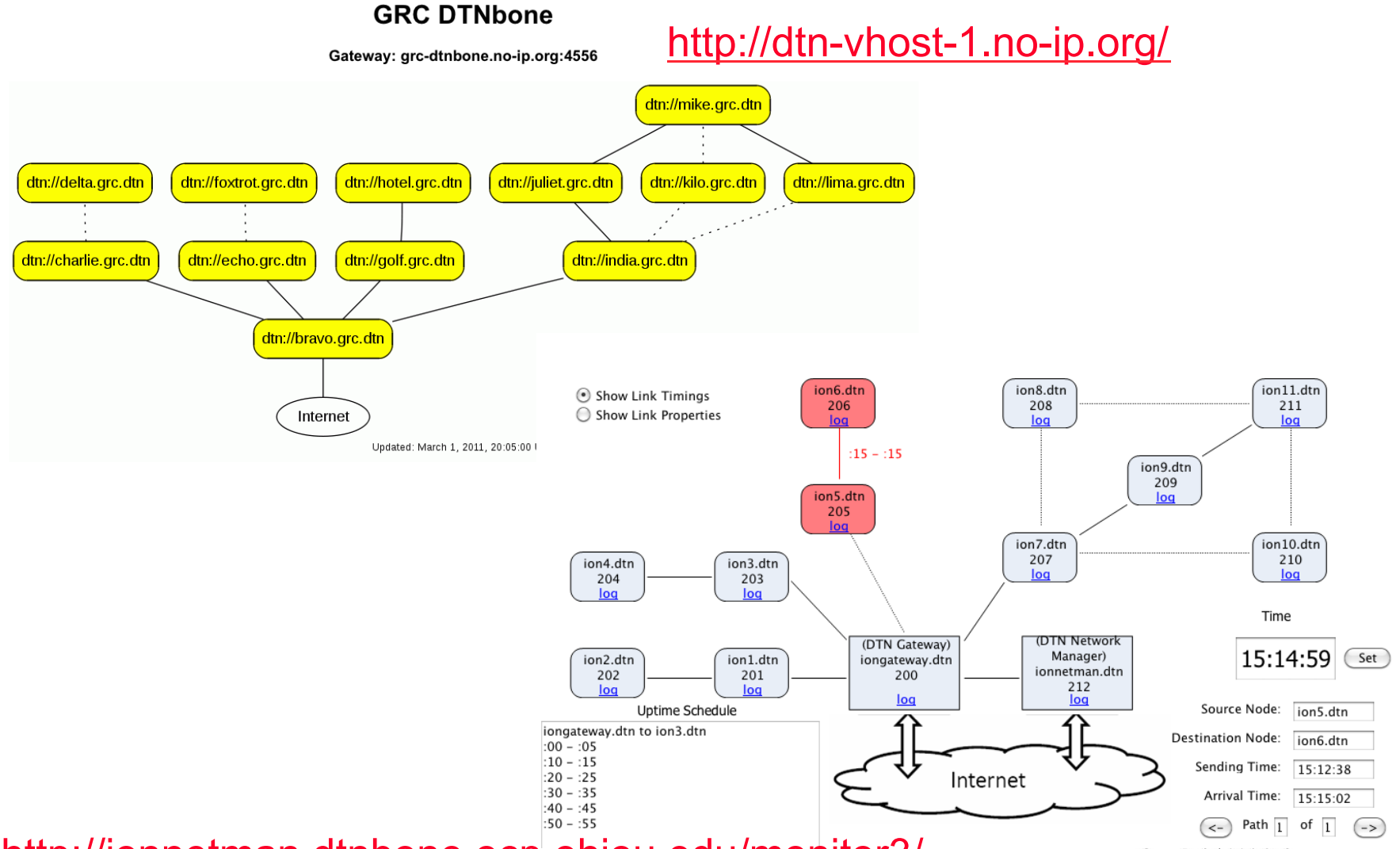


Disconnectation Dynamic DNS

dtnbone.ocp.ohiou.edu name server lin5.its.ohiou.edu. < ---server URL
bbn-dtnbone-m04.dtnbone.ocp.ohiou.edu has address 130.129.20.132
daedalus.dtnbone.ocp.ohiou.edu has address 75.180.14.85
dax.dtnbone.ocp.ohiou.edu has address 132.235.232.105
dtngateway-2-200.dtnbone.ocp.ohiou.edu has address 130.129.51.245
dtnmule-2-10.dtnbone.ocp.ohiou.edu has address 130.129.52.243
dtnmule-2-31.dtnbone.ocp.ohiou.edu has address 130.129.53.239
haruman.dtnbone.ocp.ohiou.edu has address 132.235.3.41
jishac-laptop.dtnbone.ocp.ohiou.edu has address 130.129.37.254
laren.dtnbone.ocp.ohiou.edu has address 132.235.67.81
miles.dtnbone.ocp.ohiou.edu has address 132.235.67.20
sphere.dtnbone.ocp.ohiou.edu has address 130.129.23.175
teemu.dtnbone.ocp.ohiou.edu has address 130.129.21.129

dtnbone.commet.tkk.fi (Camera Application) <---- Reg in other DNS

DTNbone


GRC DTNbone
Gateway: grc-dtnbone.no-ip.org:4556
http://dtn-vhost-1.no-ip.org/
dtn://mike.grc.dtn
dtn://delta.grc.dtn
dtn://foxtrot.grc.dtn
dtn://hotel.grc.dtn
dtn://juliet.grc.dtn
dtn://kilo.grc.dtn
dtn://lima.grc.dtn
dtn://charlie.grc.dtn
dtn://echo.grc.dtn
dtn://golf.grc.dtn
dtn://india.grc.dtn
dtn://bravo.grc.dtn
Internet
Updated: March 1, 2011, 20:05:00
Show Link Timings
Show Link Properties
ion6.dtn 206 log
:15 - :15
ion5.dtn 205 log
ion8.dtn 208 log
ion11.dtn 211 log
ion9.dtn 209 log
ion7.dtn 207 log
ion10.dtn 210 log
ion4.dtn 204 log
ion3.dtn 203 log
ion2.dtn 202 log
ion1.dtn 201 log
(DTN Gateway) iongateway.dtn 200 log
(DTN Network Manager) ionnetman.dtn 212 log
Uptime Schedule
iongateway.dtn to ion3.dtn
:00 - :05
:10 - :15
:20 - :25
:30 - :35
:40 - :45
:50 - :55
Internet
Time
15:14:59
Set
Source Node: ion5.dtn
Destination Node: ion6.dtn
Sending Time: 15:12:38
Arrival Time: 15:15:02
<- Path 1 of 1 ->
http://ionnetman.dtnbone.ocp.ohiou.edu/monitor3/

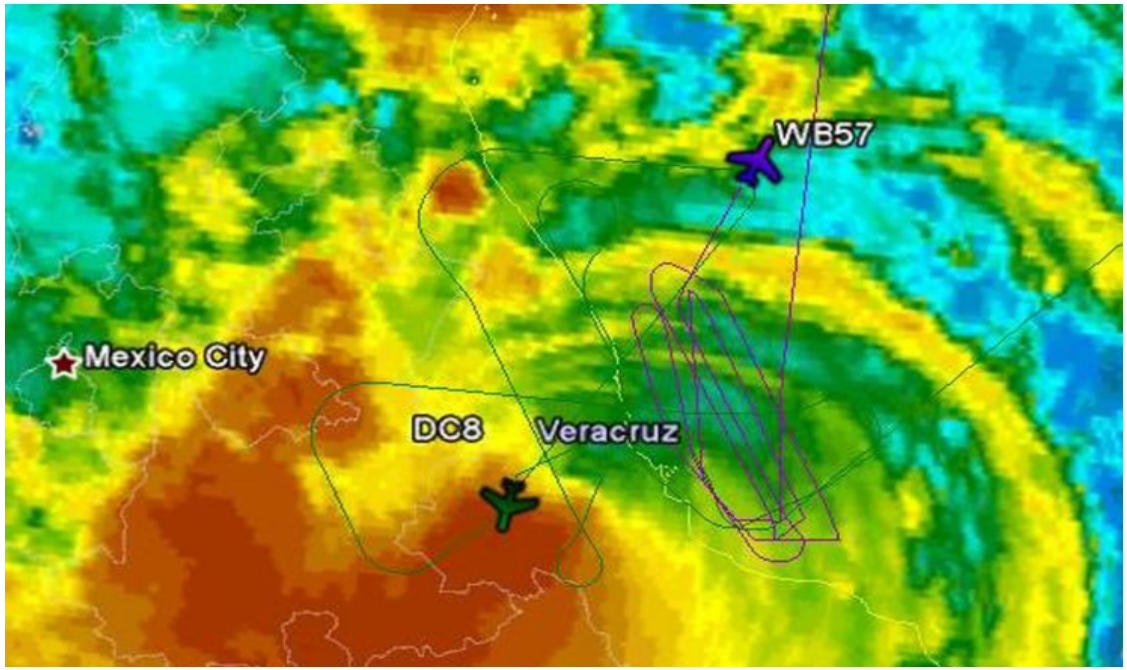
Case Studies (3): Multi-Terminal Delay Tolerant Networking Experiments

- Multi-terminal DTN experiments
  - Japan's National Institute of Information and Communication (NICT), the Japan Manned Space Systems Corporation (JAMSS), Surrey Satellite Technology Limited, NASA Glenn Research Center, Universal Space Networks (Australia)
  - Abandoned USN Australia due to scheduling conflicts and look angle issued on single pass with Koganei to follow.
  - Never set foot on Koganei site or held any face-to-face meetings with the technical personnel.
    - All communication via email or phone (often cell phone due to time differences)
- Virtual Network Control (VCN) software use for full transparency
  - Free Open Source
  - NASA controlled NICT's ground station in Koganei, Japan remotely
    - SSH tunnels to "terminal" windows and VNC
    - VNC can be very slow over long links.
  - VNC allowed NICT and JAMSS personnel to watch script commands on their machine while NASA executed the operations.

Case Studies (4): NASA Real Time Mission Monitor (RTMM)

- Web-based situational awareness tool.
- Uses a service-oriented architecture based on community standards and protocols.
- Currently integrates satellite, airborne and surface data sets; weather information; model and forecast outputs; and vehicle state data

http://rtmm.nsstc.nasa.gov/



Genesis and Rapid Intensification Processes (GRIP)

Issues

- Information Control
  - Web Collaboration software written for business enterprises provides security features that help control information flow. However, anything One can do with an integrated system controlled by the Business Enterprise, One can do with open source free software and open systems often with greater flexibility and usability.
  - Note, individuals do not always follow policy and may take whatever steps are necessary to get the job done.
  - Most corporations block inbound traffic, not outbound, thus access to Facebook, Twitter, Flicker, etc are readily available and once information is on the Web, it is not coming back.
- Abuse
  - Distribution of restricted information (see – wikileaks)
  - Restricting Access to “as advertised” open discussion groups
    - Gives impression of consensus by restricting participates to only those that consent.
    - The Internet Engineering Task Force (IETF) has clear policy on such behavior.

Conclusions

- A Internet technologies help enable a free flow of information and collaboration.
  - Much of this technology is free, openly available.
  - It takes very little time to become a reasonably proficient user.
- Open collaboration tools have been critical to enabling mission success
  - Enable free flow of communication, real-time communication, improved situational awareness, and remote operations and testing.
    - Indirect benefits include: reduced travel costs, information and communication archiving, and better utilization of remote experts for operations and training.
- Enterprise level collaborative software enables corporations and institutions to place security and controls on the information within these systems.
  - That does not ensure that individuals or groups will only collaborate within such closed systems.
  - Employee training is vital to ensuring sensitive information does not reach unintended audiences.