Postellation:
A DTN Implementation for Fast Applications Deployment

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Plan

- Background
- Key Design Considerations
- Features
- HTTP over DTN
- DTN News Service
- Virtual DTN Cloud and demo
Delay-Tolerant Networks

- Requirements:
  - Delay-tolerant
  - Disruption-tolerant
  - Network
    - instead of point to point links
  - Reliability

- Basic atomic element is a bundle (RFC5050)

- Carried over a convergence layer:
  - Terrestrial: TCP, UDP
  - Space: Licklider Transport Protocol (RFC5326)
    - over CCSDS links

- Store and Forward
Example of DTN

- A Rover Control Center which manages the overall robotic operations
- A Mission Control Center which manages the space mission by transmitting Telemetry/Command messages via the Ground Stations
- A Manned Orbiter (or Surface Habitat) from which crew teleoperate the surface robotic elements
- A Relay Satellite which interconnects:
  - the Rovers with the Manned Orbiter/Surface Habitat, other surface Rovers, and; with the Ground

From: Multipurpose End-To-End Robotic Operations Network (METERON), ESA/NASA

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Current Issues with DTN Software

• Some implementations are big, heavy, complicated
  – Many not ready for flying

• Applications to use DTN need to be written from scratch
  – No standardized API. Even standardized, new network API.
  – New logic
  – Application need to be deeply aware of DTN network layer
  – Consequence: long long development time. No reuse.

• Complicated usage for end-users
  – No current usage in terrestrial world.
  – Codepaths are not exercised.
Postellation

- Name comes from:
  - `<post>`ellation:
    - Postal service is store and forward “network”
    - Has optional “custody”
  - post<ellation>:
    - Constellation => network

- Project:
  - Implementation of DTN
  - DTN simulation cloud
Key Design Considerations

- **Lean** Bundle protocol implementation
  - → good for embedded systems

- **Smart** HTTP proxy
  - → enabling Web/SOA application developers to use DTN “transparently”

- **Easy** deployment of DTN networks
  - → enabling a much larger number of end-users to use DTN, develop a community, applications, ...
Features

● written in lean and “vanilla” C → for embedded systems

● Portable code: compiles/runs/tested on:
  - Linux (kernel 2.6+)
  - *BSD, MacOSX (Leopard, Snow Leopard)
  - Windows (from XP to W7)
  - RTEMS (4.10+)

● Bundle Protocol (RFC5050)

● Convergence Layers:
  - UDP, TCP and TCP-TLS

● Transport: IPv4 and IPv6
Features (cont.)

- Included applications:
  - dtnping/dtnpong
  - dtnsend/dtnrecv
  - HTTP/HTTPS Proxy
  - RSS news service delivery, such as NASA news over DTN!

- Packagers for Windows, MacOSX and Linux

- Automated registration of nodes to our DTN node:
  - No configuration to do.
  - And you are connected to the DTN network
HTTP Proxy

- **Support:**
  - http
  - https
  - or any http tunnels

- **Smarts to facilitate transparency of Web applications over DTN**

- **Implemented as a local proxy**
  - For bundling HTTP requests into Bundles

- **With a remote proxy**
  - For unbundling HTTP requests and sending them over IP
Interoperability

- Tested with the various DTN implementation in the middle of the Postellation DTN Cloud:
  - DTN2
  - IBR
  - ION
- Interop test plan from RFC5050 was created and applied against the implementations.
Meteron

From: Multipurpose End-To-End Robotic Operations Network (METERON), ESA/NASA

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Available to Try and Use

• Implementation:
  – has been tested in production work for weeks
  – connected automatically to the DTN node and HTTP proxy

• If you would like to test it out, go to:
  – http://postellation.viagenie.ca (via IPv4, IPv6 or DTN)
  – After downloading, uncompress, then run the “start” program. This will start Bundle Protocol, HTTP proxy and registers the node to the DTN network.
  – After running it, you can also subscribe to our RSS News Service Delivery over DTN, to receive your NASA news over DTN!
Conclusion

- **Lean** BP implementation → good for embedded systems
- Ported to most OS
- **Smart** http/https proxy for easy application deployment
- **Easy** deployment by automating registration and configuration
- Available to use: http://postellation.viagenie.ca
Questions?

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This presentation: http://www.viagenie.ca/publications/

References

- http://postellation.viagenie.ca

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