

On the Future of DTN

Scott Burleigh
Jet Propulsion Laboratory,
California Institute of Technology
7 June 2012

Technology (1 of 2)

- Bundle Multicast
 - Multi-source.
 - High end-to-end reliability supported by retransmission.
 - Borrowing concepts from CCSDS Remote Asynchronous Message Service for efficiency in multicast trees.
- Extending Contact Graph Routing
 - New recognition that the CGR contact plan is a general representation of topology in a DTN network.
 - CGR extension block for DTN source routing.

Technology (2 of 2)

- Reliable Opportunistic Forwarding
 - Networks are not opportunistic; forwarding may be opportunistic – real-time discovery of a contact, real-time decision on which bundles to forward over that contact.
- Completely new capabilities
 - Bundle Streaming Service
 - Delay-Tolerant Payload Conditioning
 - Bundle Delivery Time Estimation

Standardization

- Near-term standardization in Consultative Committee for Space Data Systems (CCSDS) is advancing quickly.
 - DTN is seen as important for future space flight programs, “Solar System Internet”.
 - Approved CCSDS standards are also ISO standards.
- Long-term: standards-track RFCs in IETF.
 - Will likely entail some changes to the specifications.
 - IP-over-DTN will clarify relevance of DTN to IETF.

Applications (1 of 3)

- DTN is a natural for space flight communications.
 - Solar System Internet endorsed by Interoperability Advisory Group.
 - Cubesat Research Network.



Photo courtesy of <http://www.cubesat.org/>

Applications (2 of 3)

- Enhancing the Internet
 - As a growing fraction of the Internet becomes wireless, corruption errors and disruptions occur more frequently and DTN is needed.
 - Apps over UDP/IP over DTPC over BP/LTP.
 - TCP-like in-order reliable delivery for asynchronous messages.
 - Aggregation limits transmission overhead.
 - Apps over UDP/IP over BP/LTP.
 - Reliable delivery but possibly out-of-order with duplicates.
 - Apps over native DTPC/BP/LTP or BP/LTP.
 - Shorter stack, reduced transmission overhead.

Applications (3 of 3)

- Delay-Tolerant E-Commerce
 - Markets:
 - Finance (banking, investments, insurance)
 - Retail (shopping, purchases)
 - Services (paying bills, making reservations)
 - Key concept is eliminating user conversational interaction with enterprise central computers.
 - Push information asynchronously to the customer.
 - Send transactions asynchronously to the merchant.
 - Like catalog sales in pre-Internet times, but far more powerful and much faster (subject to connectivity).