Delay Tolerant Networking (DTN)

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Introduction

• We all use the Internet. Reliable.
• However, some assumptions on the network structure (uptime, physical medium, latency).
• We want to extend this to “challenged networks”
Normal vs. challenged network

The figure on the left shows internet communication and the figure on the right shows satellite communication which is a kind of challenged network.
Network Challenged: When?

• High latency/low data rate
• Disconnection
• Long queuing times
• Interoperability considerations
• Low power requirements
DTN Infrastructure

Application A

Application B

Application C

Persistent Storage

Storage

Application Interface

DTN Forwarder

Routing

Convergence Layers

TCP

UDP

LTP

Non-IP

DOD-Specific Policy/Routing Protocol
DTN : Concepts

1. Operates above transport layer
2. Main Concepts
   → Bundles
   → Store-Carry-and-Forward
DTN : Bundles

Bundle

- The source application's user data
- The control information provided by the source application for the destination application which describes how to process, store, dispose off, and handle the user data
- A bundle header which is inserted by the bundle layer and can be arbitrarily long depending on the volume of the data encapsulated in the bundle layers.

Optional ACKs
DTN: Store-Carry-and-Forward

Store a bundle.
Forward when the next contact is available. Hours or even days until appropriate contact.
Similar to Postal system

How is this different from Internet routers’ store-and-forward?
1) Persistent storage (hard disk, days) vs memory storage (few ms)
2) Wait for next hop to appear vs. wait for table-lookup and available outgoing routing port
DTN : Scenario

[Diagram showing DTN Scenario with User-S, University-U, Company-C, Operator-O, City A, City B, and User-D connected through Internet.]
DTN : Types of nodes

- Host
- Router
  - works within a single DTN region
- Gateway
  - connects neighboring networks
DTN : Node names

- based on URIs
- consist of region and entity ids

Example:

dnt://earth.sol.int/src.someclient.com
DTN : Addressing

- **unicast**
  - `dnt://earth.sol.int/src.someclient.com`

- **anycast**
  - `dnt://earth.sol.int/*.someclient.*`

- **multicast**
  - `dnt://earth.sol.int/*.someclient.*`

- **broadcast**
  - `dnt://earth.sol.int/*`
Summary

• Introduction
• Why DTN?
• Overview of DTN protocol

Resources

http://www.nasa.gov/mission_pages/station/research/experiments/DTN.html