DTN Network Management

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Disclaimer: Opinions expressed in this document are of the individuals, and not necessarily of their sponsoring organization.

Network Management Requirements
draft-ivancic-dtnrg-network-management-reqs-00

- **Draft expired**
- **Approached by chairs to split into "scenarios" and "requirements" documents**

1. Introduction
2. DTN Scenarios
3. General Requirement
   - Local Network Management
   - Remote Network Management
   - Security
4. System Characteristics
   1. Bundle Processing
   2. Convergence Layers
   3. Multi-Homing
   4. Others
5. Network Management Utilities
6. Security Considerations
7. IANA Considerations

- **DTN Scenarios (separate doc)**
- **Requirements (separate doc)**
  - General Requirement
    - Local Network Management
    - Remote Network Management
    - Security
  - System Characteristics
    - Bundle Processing
    - Convergence Layers
    - Multi-Homing
    - Others
- **Network Management Utilities (perhaps a future document?)**

Terminology

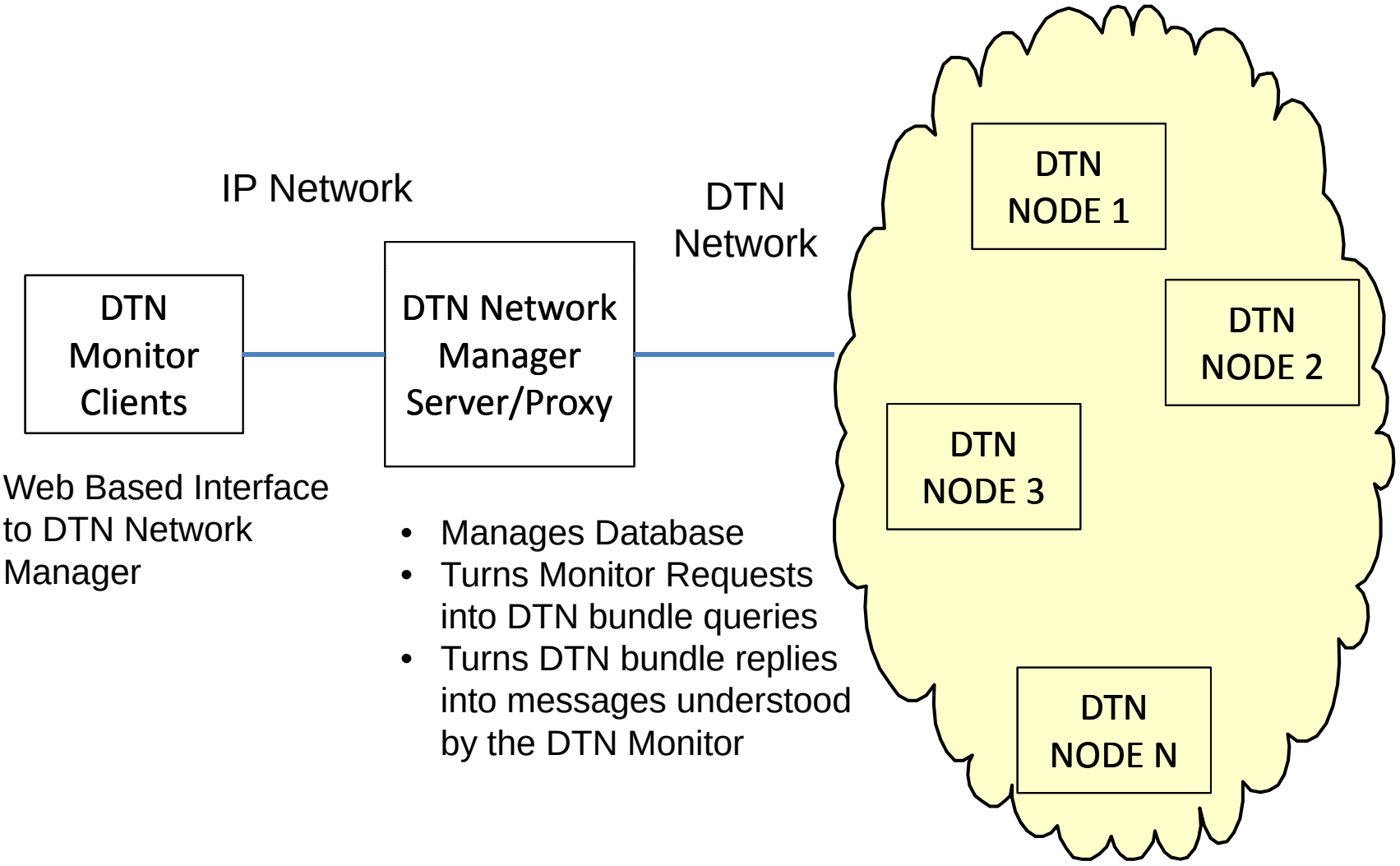
- "Local Management"
  - One can access a the device by being physically at the devices (i.e. console port) or via real-time access such as via a connected IP network.
  - Here we assume high bandwidth, no disruption and insignificant delay
- "Remote Management"
  - Implies managing a DTN node over a DTN network.
  - Assumes that the systems may experience and or all of the following: long propagation delays, long periods of disruption, long periods of disconnection and operate over low bandwidths.

Strategy

- Ohio University => ION, Glenn Research Center => DTN2
- Get something up and useful that will do:
  - Performance measurements
  - Trouble shooting and debugging
  - Remote configuration
- Reuse code if possible
- "Local Management"
  - DTN2 uses local SNMP daemon
  - ION uses ION tools
- "Remote Management"
  - ION exploring Diagnostic Interplanetary Network Gateway protocol (DING)
  - DTN2 using bundle of **JSON** (JavaScript Object Notation) scripts
    - Lightweight data-interchange format. It is easy for humans to read and write. It is easy for machines to parse and generate.

DTN2 Basic Network Configuration

(NASA Glenn Research Center)

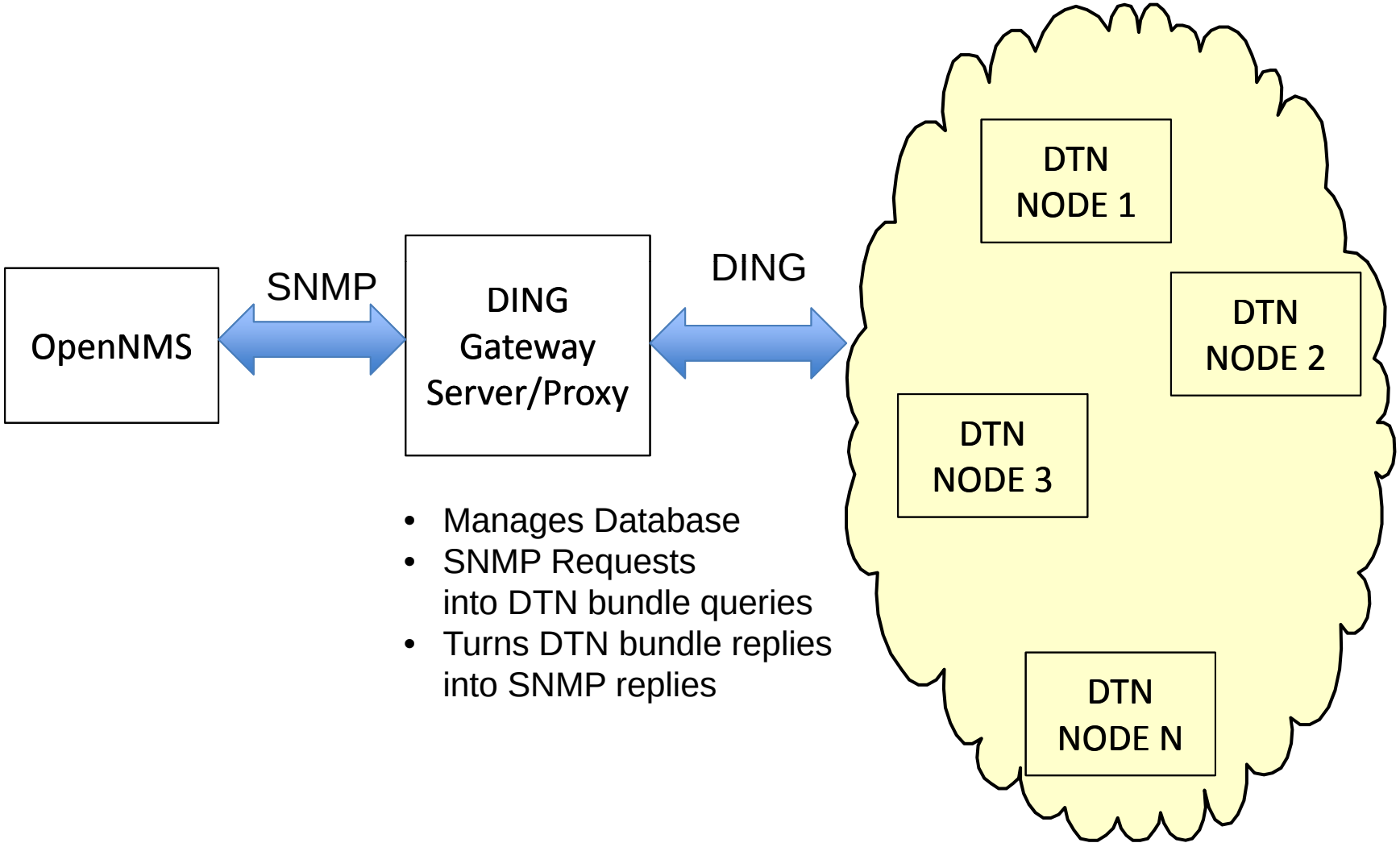


- Web Based Interface to DTN Network Manager

- Manages Database
- Turns Monitor Requests into DTN bundle queries
- Turns DTN bundle replies into messages understood by the DTN Monitor

ION Basic Network Configuration

(Ohio University)



- Manages Database
- SNMP Requests into DTN bundle queries
- Turns DTN bundle replies into SNMP replies

DTN Network Management - Monitoring (Ohio University)

- DING
  - draft-irtf-dtnrg-ding-network-management-02
  - Outlines a suggested monitoring approach
  - Relies on MIB/ASN.1 description of monitored objects
  - Well understood, lots of tools available
  - Allows for easy use of SNMP in local management
  - Remote monitoring over DTN
  - Subscription model similar to telemetry, but more flexible
  - Gateway to SNMP management on the Internet side of DTN
  - Currently revising the ID with feedback received so far
- Research Issues
  - Data compression on the DTN link
  - RMON-style rate computation at the remote end?
  - How to correctly time-stamp data (and get standard monitoring stations to understand such a time stamp)
  - Treatment of SNMP Traps

DTNbone

- Current DTNbone is generally always connected with a meshed or star topology (single hop)
- Need some ***stable, multi-hop*** system with ***disconnection***.
- Mirror-image test networks at OU and GRC (ION/DTN2)
- Link profiles with delay _and_ disconnection (not just errors)
- Enables true store-and-forward testing
- Network management
  - Remote tracking of bundle traffic*
  - Troubleshooting *
  - Remote configuration control (future)*

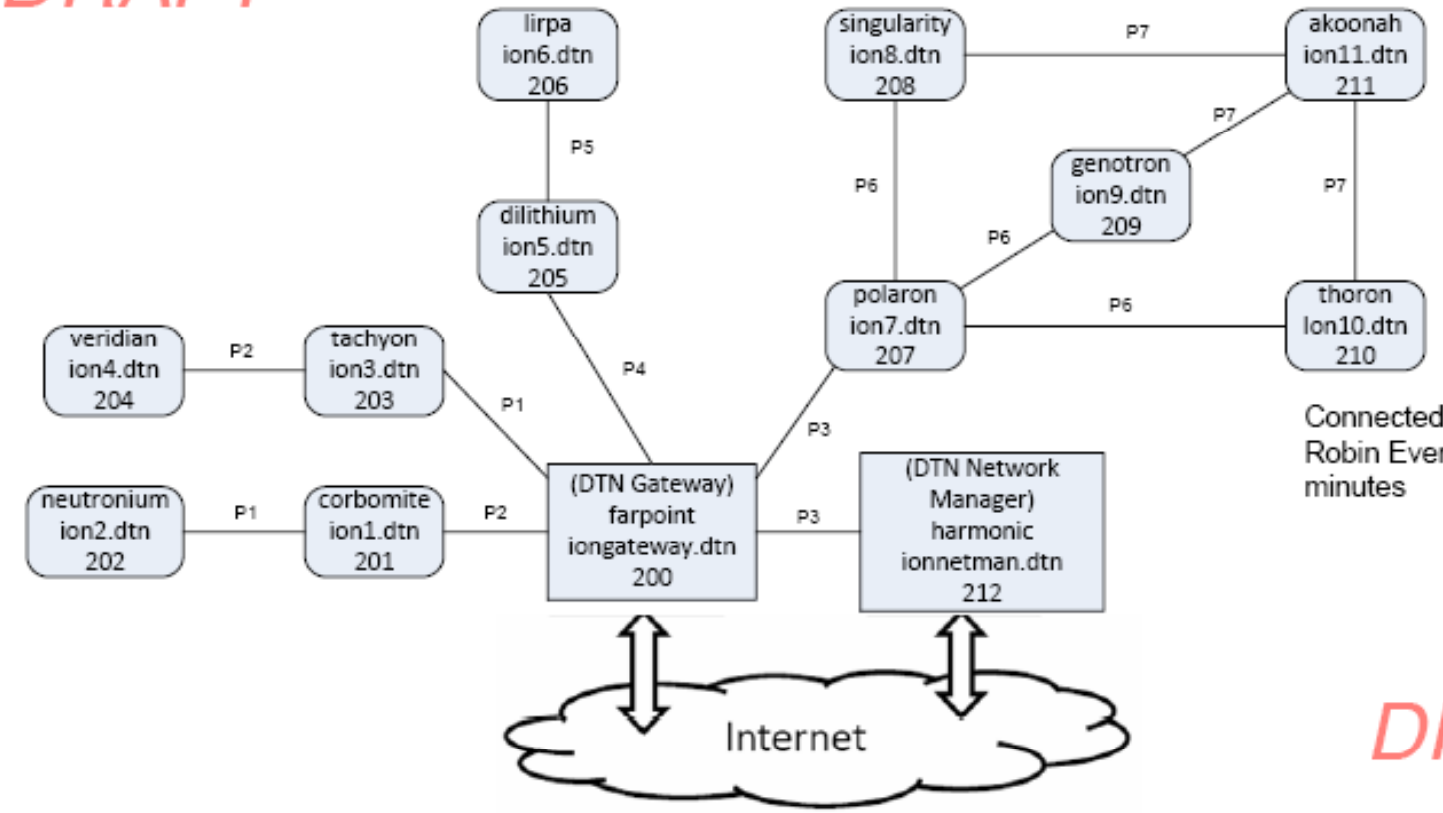
* Should be extremely useful for NASA multi-center interoperability tests

ION DTNbone Always Available Disconnected Network
NASA Glenn Research Center, Ohio University

3/7/2010

KEY:
<Computer Name>
<DTN Name>
<IPN>

DRAFT



DRAFT

P1 – Connected order of minutes, Disconnected order of minutes

P2 – Connected 10 s of minutes, Disconnected 10s of minutes

P3 – Always Connected

P4 – Connected Route Robin Every 10s of minutes for order of minutes, or contact times consistent with Earth to Mars Relay

P5 – Connected Round Robin Every few minutes for a range of minutes, or contact times consistent with Mars Relay to Rover

P6 – Connected Round Robin Every 10s of minutes for order of minutes, or contact times consistent with Earth to Lunar Relay

P7 – Connected Round Robin Every few minutes for range of minute, or contact times consistent with Earth to Lunar Relay to Rover

GRC Network Management Software

- SNMP Agent and associated software (local management)implemented in DTN2 and ready for distribution
  - Fixed / Cleaned up MIBs
  - Distribution likely a ***separate branch*** in SourceForge
    - ??? Suggestions ???
- Network Manager Server/Proxy and Remote Monitor Client via Browser not yet ready for release.

Other Items

IPN Naming in DTN2

DTN Implementation Capabilities Database

IPN Naming in DTN2

- NASA GRC personnel have implemented and are in final testing of IPN naming (and CBHE) for DTN2
  - ION assumes Compressed Bundle Header Encoding (CBHE) when IPN naming is used
  - Therefore, DTN2 implementation assumes the same.
  - As of 24 March 2010, GRC's DTN Bone node is running code which supports CBHE/IPN naming
    - We would like to see the node used to pass bundles (as a sort of stepping stone)
    - We would like to see the node used with normal dtn:// naming to show it's still stable
    - IPN id is 17 and GRC DTNbone machine is 192.55.90.165
    - Contact Joseph Ishac [jishac@nasa.gov] to add routes
- Distribution via ??? Suggestions???
  - SourceForge (Branch)

DTN Implementation Capabilities Database

- ION, DTN2, Spindle, etc... are all designed with a particular operation environment in mind.
- Each has design limitations known (or unknown) by the implementers, but not necessarily the users.
  - (e.g. ION BAB is currently limited to 64 KB bundles, some implementations are not necessarily designed to mover extremely large bundles)
- It would be nice to have a summary of the design criteria and capability matrix (on the wiki) for each implementation in order to aid in interoperability testing