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Agenda

- 1) Meeting objective, finding scribes, agenda bashing (co-chairs), 5 min.
- 2) Problem statement (Fred Templin as individual contributor), 15 min.
- 3) Summary of technical topics (Scott Burleigh), 20 min.
- 4) Proposed charter (co-chairs), 10 min.
- 5) Open discussion (all), 30 min.
- 6) Next steps (co-chairs) 10 min.

Draft Charter

Working group name:

Delay/Disruption Tolerant Networking Working Group (DTN WG)

Chair(s):

TBD

Area and Area Director(s):

Transport Area: ADs Spencer Dawkins <spencerdawkins.ietf at gmail.com>, Martin Stiernerling <m.ietf at gmail.com>

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Description of Working Group:

The Delay/Disruption Tolerant Network Working Group (DTN WG) specifies mechanisms for data communications in the presence of long delays and/or intermittent connectivity. The work is motivated by well known limitations of standard Internet protocols that expect end-to-end connectivity between communicating endpoints, sub-second transmission delays and robust packet delivery ratios. In environments where these favorable conditions do not apply, existing mechanisms encounter problems such as reliable transport protocol handshakes timing out and routing protocols failing to converge resulting in communication failures. Furthermore, classical end-to-end security associations cannot be coordinated when communicating endpoints cannot conduct multi-message keying exchanges in a timely fashion. These limitations suggested the

need for a new approach.

Delay-Tolerant Networking (DTN) protocols have been the subject of extensive research and development in the Delay-Tolerant Networking Research Group (DTNRG) of the Internet Research Task Force since 2002. The DTNRG has developed the Delay-Tolerant Networking Architecture (RFC 4838) that the DTN WG uses as the basis for its work. The key components of this architecture are the bundle concept for encapsulating data units, the bundle transmission protocol and the underlying convergence layer architecture.

The experimental DTN Bundle Protocol (RFC 5050) and Licklider Transmission Protocol (RFC 5326) have been shown to address the issues identified above in substantial fielded deployments in the space sector [1]. RFC 5050 in conjunction with TCP- and UDP-based convergence layers has been used successfully in a number of experiments both in communications challenged environments around the edges of the Internet and as an Internet overlay where applications require delay- and/or disruption-tolerance [refs needed].

The success of the BP over convergence layer protocol stack -- the core protocols of the "DTN Architecture" described in RFC 4838 -- may be attributed to the following fundamental design principles:

- There is never any expectation of contemporaneous end-to-end connectivity between any two network nodes.
- Because end-to-end connectivity can never be assumed, each node on the path between source and destination must be prepared to handle incoming "bundles" of data that cannot immediately be forwarded.
- Again because end-to-end connectivity can never be assumed, end-to-end conversational data exchange can never be assumed to complete in a timely manner; protocol features that rely on timely conversational data exchange must be excluded from the architecture.

The DTN WG believes that protocols adhering to these principles offer opportunities for enhancing the functionality of the Internet, including

Draft Charter (2)

- facilitating the extension of the Internet into environments such as the ocean floor and deep space in which the core Internet protocols operate sub-optimally for the reasons discussed earlier;
- extending the Internet into communications challenged terrestrial environments where it is not possible to provide continuous, low delay Internet connections; and
- supporting Internet applications that need DTN capabilities.

We believe that the extensive research, demonstration, and pilot operations performed to date using the DTNRG protocols provides a firm basis for publishing Internet standards derived from that work.

Work items related to Delay/Disruption Tolerant Networking include:

- o A mechanism for the exchange of protocol data units, termed "bundles", that are designed to obviate conversational communications by containing values for all potentially relevant configuration parameters. These protocol data units are typically larger than network-layer packets. We will derive this bundle exchange mechanism from the DTN Bundle Protocol (BP) documented in RFC 5050 by publishing a new document for which [2] is a proposed first draft (where appendix A provides a summary of the proposed changes).
- o A security protocol for ensuring that the network in which bundles are exchanged is secured against unauthorized access and denial of service attacks, and to ensure data integrity and confidentiality in that network where necessary. We will derive this security protocol from a "streamlined" adaptation of the DTN Bundle Security Protocol documented in RFC 6257.
- o A delay-tolerant security key management scheme that can protect the integrity of a DTN network.
- o A simple datagram convergence layer protocol for adaptation of the bundle protocol to underlying internetworks. We expect to derive this convergence layer protocol from the Datagram Convergence protocol documented in RFC 7122.
- o A protocol for remote status monitoring, configuration, and administration of network nodes in the presence of long delays and/or intermittent connectivity.

- o A functional specification of Contact Graph Routing (CGR) specifying the inputs (global contact schedules, traffic demands, etc.) and outputs (node specific transmission and reception schedules, notifications, etc.). CGR is a centralized, oracle-based bundle transmission and reception scheduling scheme used in space segment DTN deployments.
- o An adjunct to the management protocol that will allow the contact schedules generated by CGR to be distributed to nodes. This may be based on the Contact Plan Update Protocol (CPUP) proposed in
- o An encapsulation protocol for "tunneling" BP traffic within bundles that are secured and/or routed in different way from the encapsulated bundles.
- o A registry for DTN Service Identifiers

The working group will consider extending the current milestones based on new information and knowledge gained while working on the initial charter, as well as to accommodate new work items beyond the scope of the initial phase. For example, we expect that transport protocols such as LTP and the Saratoga protocol are among the candidates for work in this phase.

Draft Charter (3)

Goals and Milestones:

- start+0mos - Accept 'Bundle Protocol Specification (RFC5050bis)' [2] as a working group work item intended for Proposed Standard.
- Start+0mos - Accept 'Streamlined Bundle Security Protocol (SBSP)' [3] as a working group work item intended for Proposed Standard.
- start+3mos - Accept 'Bundle In Bundle Encapsulation (BIBE)' [4] as a working work item intended for Proposed Standard.
- start+6mos - Working group getting consensus on changes to be implemented in RFC 5050(bis).
- start+9mos - Working group getting consensus on merging RFC5050bis, SBSP, BIBE etc. into a combined draft or keep as separate drafts.
- start+12mos - Accept 'CGR Functional Specification' as a working group working group work item intended for Informational.
- start+12mos - Accept 'Delay Tolerant Networking Security Key Management' as a working group work item intended for Proposed Standard.
- start+15mos - Accept 'Contact Plan Update Protocol' as working group work item intended for Proposed Standard.
- start+18mos - Submit RFC5050bis, SBSP, BIBE and Key Mgmt to the IESG either as a combined draft or as separate drafts.
- start+18mos - Submit Network Management [5], Registry [6] and Simple Convergence Layer [7] as working group documents.
- start+20mos - Survey appropriate forums (e.g., DTNRG) for emerging technologies (e.g., convergence layer protocols, dynamic routing protocols, naming and addressing services, etc.) ready for transition into IETF DTN Working Group. Publish draft on survey results as independent submission related to the WG.
- start+24mos - Submit Network Management, Registry and Simple Convergence Layer to IESG
- start+24mos - Recharter to accommodate new work items or close Working Group

- [1] "BP/LTP deployment on EPOXI spacecraft" [2008], http://committees.comsoc.org/tccc/ccw/2010/slides/DINET_CCW.pdf
- [2] "Proposed Revised Bundle Protocol" [2014], <https://datatracker.ietf.org/doc/draft-burleigh-bpv7/>
- [3] "Streamlined Bundle Security Protocol Specification" [2014], <https://datatracker.ietf.org/doc/draft-irtf-dtnrg-sbsp/>
- [4] "Bundle-in-Bundle Encapsulation" [2013], <http://tools.ietf.org/id/draft-irtf-burleigh-bibe>
- [5] "Delay Tolerant Network Management Protocol" [2013], <http://tools.ietf.org/id/draft-irtf-dtnrg-dtnmp>
- [6] "Delay-Tolerant Networking Bundle Protocol IANA Registries" [2011], <https://datatracker.ietf.org/doc/rfc6255/>
- [7] "Datagram Convergence Layers ..." [2014], <https://datatracker.ietf.org/doc/rfc7122/>
- [8] "Towards Flexibility and Accuracy in Space DTN Communications", Bezirgiandia et al, CHANTS 2012, <http://dl.acm.org/citation.cfm?id=2505499> [2012]

Questions

- Do people think this work should be carried in IETF?
- Is there support to form a WG with the discussed charter?
- Who is willing to work on documents, either as editor or reviewer?