JOHNS HOPKINS
APPLIED PHYSICS LABORATORY

Lightweight Bundle Protocol Edge Node with Zero-Configuration and Zero-State

IETF 118 DTN WG

Brian Sipos, Sarah Heiner
JHU/APL

Background

- Existing BPA and CLA implementations rely on externally-supplied configuration for - at least - bootstrapping into a BP network
- Configuration represents a burden to **network admins**
  - It must be maintained and distributed; there is currently no standard form
  - It must be **re-distributed** when it changes
- Configuration represents a burden to **edge node users**
  - It must be obtained and translated into the form my BPA needs
  - It must be **synchronized** when it changes
- Burden translates into a **barrier to entry**
  - For an edge node with a single application with one (or a few) endpoint(s) on a non-challenged IP network
  - Even a *perceived* barrier will stop potential users from trying things out
  - Hinders developers of *X*-over-BP applications when they need to prototype, experiment, and/or test interoperations

Use Case and Goals

"I already have IP LAN connectivity, I just want to get on this BP network!"

- ✓ No inventing new protocols or tools
- ✓ No need for general-case CLA discovery
- ✓ No need for router—router discovery
- ✓ No need for complex multi-application nodes

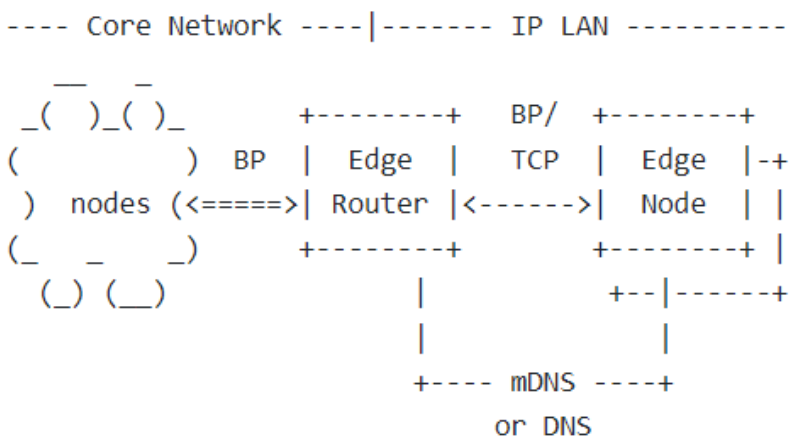

Figure 1: Network Edge Topology

These separate mechanisms already exist

Existing Mechanisms and New Behavior

- Zero-Configuration CLA Discovery
  - Existing protocols and tools for **DNS-Based Service Discovery** (DNS-SD)
    - Can use multicast DNS (mDNS) or traditional unicast DNS
  - Existing **TCP/IP service parameters** in SRV resource record (RR)
  - Existing **IANA service name** “dtn-bundle” for the TCPCL
  - Existing **PKIX certificate profile** to authenticate and authorize a node
- New behavior at a higher-level is for a router to offer and edge node to enumerate/use the TCPCL service
- Zero-State BP Agent
  - Existing logic of what are the necessary functions of a BPA
  - Existing uses of TCPCL for both receiving and sending bundles
- New behavior to narrow to a single-application case which allows zero-state operation
  - This is not necessarily limiting to a single endpoint - just single app

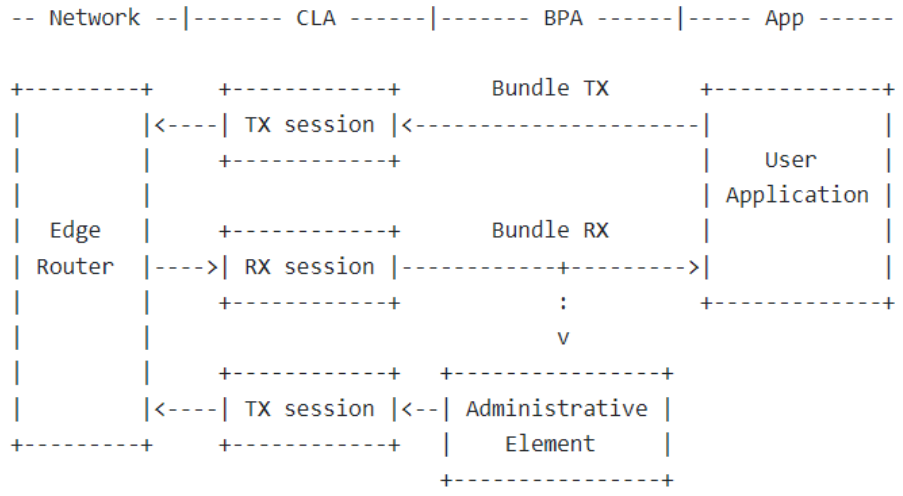

Figure 5: Zero-State BPA Flows

Current State of the Draft

- First revision of a personal draft had editorial feedback
- Second revision of a personal draft: https://www.ietf.org/archive/id/draft-sipos-dtn-edge-zeroconf-01.html
- These mechanisms are not intended to:
  - Be a general purpose BP neighbor discovery
  - Share information about other CLAs on the same node or other peer connectivity
  - Discover other domain's BP routers; just local BP gateway router
  - Operate on the interior of a BP network; just the edge
  - Operate over non-IP networks or non-TCP CL
- These mechanisms can be augmented to relax assumptions
  - Discussed in Section 5

Next Steps

- Document feedback welcome
- Implementation feedback
  - Try it out!
  - These mechanisms should be usable within existing infrastructure right now
- This could be a topic for a hackathon activity
  - Easier: Create a tool to extract DNS-SD state into configuration for ION, HDTN, DTNME, etc.
  - Less easy: Create a minimal BPA in your favorite language (a single-package Python BPA?)
- Do existing BPA implementations “behave well” when ad-hoc edge nodes connect to them via TCPCL?
  - This means routing properly between those edge nodes
- Does this document need more specific requirements on edge router behavior?