

DetNet Data Plane Protocol and Solution Alternatives draft-dt-detnet-dp-alt-00

Jouni Korhonen, Janos Farkas, Greg Mirsky, Pascal Thubert,
Norm Finn, Olivier Marce and Yan Zhuang

DetNet WG, IETF 95
4/5/2016 v1

Overview

- Design Team
- Current status
- Next steps

Disclaimer

- The I-D is work in progress and subject to undergo multiple changes. Even the list of data plane alternatives is not fixed yet.
- The flow and ordering of topics is not that good yet, specifically when it comes to MPLS-related technologies..

Design team

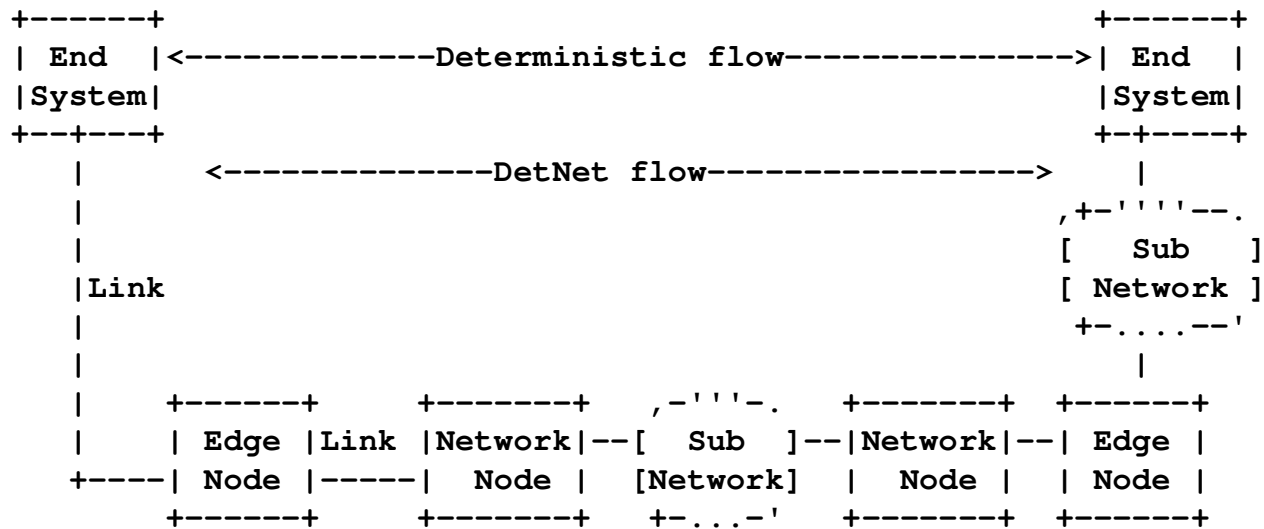
- Regular participants:
 - Jouni Korhonen (DT lead)
 - Norm Finn
 - Pascal Thubert
 - Janos Farkas
 - Greg Misrky
 - Olivier Marce
 - Yan Zhuang
 - Lou Berger
- Work done over email and (bi-)weekly calls

Scoping the work

- Goals:
 - Identify potential *existing* data plane alternatives.
 - Form a criteria for data plane alternative evaluation.
 - Elaborate what it would require to adapt and use a specific protocol as the deterministic networking data plane solution.
- Non-goals:
 - Selection of the data plane protocol.
 - Control plane.
- Focus on topics that potentially impact deterministic networking aware data plane hardware.

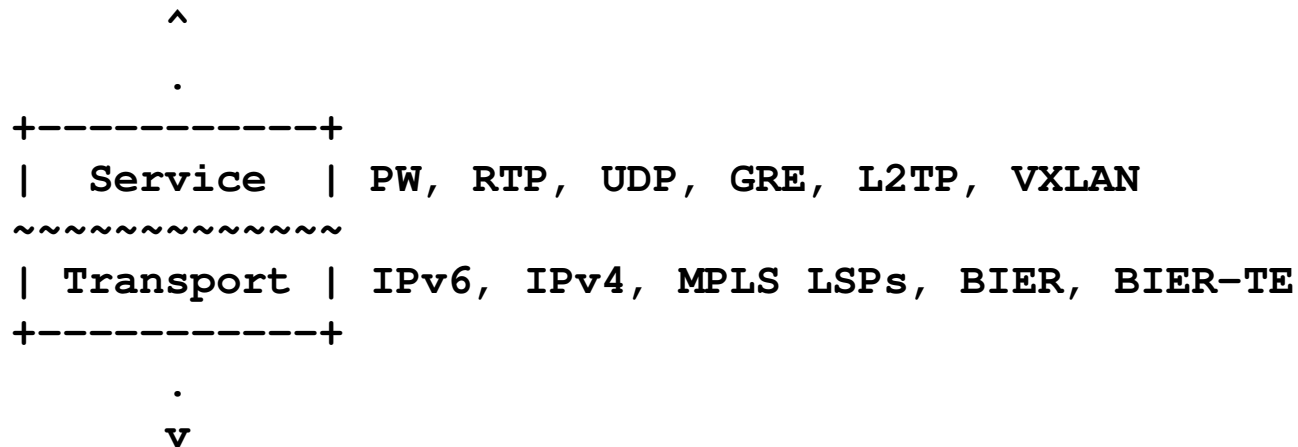
Data plane overview

- A "Deterministic Network" will be composed of DetNet enabled "End Systems", DetNet enabled "Edge Nodes", and DetNet enabled "Network Nodes".
- DetNet enabled nodes will provide a DetNet service to attached DetNet End Systems. DetNet enabled systems and nodes will be interconnected by sub-networks.



Data plane layering in DetNet

- The evaluation is divided into two parts:
 - DetNet service layer alternatives
 - DetNet transport layer alternatives
- The criteria is also divided into two sets.



DetNet layers

- The **DetNet Service layer** provides adaptation of DetNet services.
 - Composed of a shim layer to carry DetNet flow specific attributes, which are needed during forwarding.
 - End systems originate and terminate the DetNet Service layer and are peers at the DetNet Service layer.
- The **DetNet Transport layer** is supported by all DetNet aware systems and nodes.
 - Operates below the DetNet Service layer.
 - The DetNet Transport layer is used to relay traffic end to end across a DetNet domain.

The criteria for the DetNet data plane

Transport layer

- #1 Encapsulation and overhead
- #2 Flow identification
- ~~#3 Packet sequencing~~
- #4 Explicit routes
- #5 Packet replication and deletion
- #6 Operations, Administration and Maintenance
- #7 Time synchronization.. or rather OAM part of it
- #8 Class and quality of service capabilities
- #9 Packet traceability
- #10 Technical maturity
- #? DetNet Service Interface (under discussion)

Service layer

- #1 Encapsulation and overhead
- #2 Flow identification
- #3 Packet sequencing
- ~~#4 Explicit routes~~
- #5 Packet replication and deletion
- #6 Operations, Administration and Maintenance
- #7 Time synchronization.. or rather timestamping
- #8 Class and quality of service capabilities
- ~~#9 Packet traceability~~
- #10 Technical maturity
- #? DetNet Service Interface (under discussion)

Current data plane alternatives

Transport layer

- Native IPv6 transport
- Native IPv4 transport
- MPLS
- BIER
 - “Base” BIER
 - BIER-TE

Service layer

- GRE
- L2TP – any interest?
- VXLAN – any interest?
- MPLS-based services
- Pseudo Wire E2E Emulation
 - Both IP and MPLS PSNs
- MPLS-based Ethernet VPN
- Higher layer headers
 - TCP
 - RTP

Why?

- Transport alternatives:
 - IPv[46] natural transport choices.. even IPv4 due its “maturity” and popularity.
 - MPLS due its maturity and popularity in transport.
 - BIER for e.g., its packet replication and elimination properties.
- Service alternatives:
 - GRE has keys, sequencing and transports L2..
 - MPLS* has a lot of work put into it.. that seems to fit the bucket.
 - PWs have sequencing, duplicate detection, control word, L2 transport, ...
 - Higher layers like RTP has sequencing, timestamps and prior deployments on the similar field of applications..

Immediate observations

- The design team has spent considerable amount of time figuring out “seamless redundancy” properties of DetNet data plane alternatives:
 - How and where to realize the flow split/merge.
 - How and where to realize the packet duplication and duplicate elimination.

Transport layer summaries

- IPv6 & IPv4
 - TBD.
- MPLS
 - “MPLS is a mature technology that has been widely deployed. Numerous vendor products and multiple generations of MPLS hardware have been built and deployed. MPLS LSPs support a significant portion of the identified DetNet data plane criteria today. Aspects of the DetNet data plane that are not fully supported can be incrementally added.”
- BIER
 - TBD.

Service layer summaries 1/2

- GRE, L2TP, VXLAN
 - TBD.
- MPLS-based services
 - “This is the same as MPLS at the DetNet transport layer. MPLS is a mature technology that has been widely deployed. Numerous vendor products and multiple generations of MPLS hardware have been built and deployed. MPLS LSPs support a significant portion of the identified DetNet data plane criteria today. Aspects of the DetNet data plane that are not fully supported can be incrementally added.”
- Pseudo Wires
 - “PseudoWires appear to be a strong candidate as the deterministic networking data plane solution alternative for the DetNet Service layer. The strong points are the technical maturity and the extensive control plane for OAM. This holds specifically for MPLS-based PSN. Extensions are required to realize the packet replication and duplicate detection features of the deterministic networking data plane.”

Service layer summaries 2/2

- MPLS EVPN
 - “EVPN is the emerging successor to VPLS. EVPN is standardized, implemented and deployed. It makes use of the mature MPLS data plane. While offering a mature and very comprehensive set of features, certain DetNet required features are not fully/directly supported and additional standardization in these areas are needed. Examples include: mapping CoS and QoS; use of labels per DetNet flow, and hitless 1+1 protection.”
- Higher layer headers
 - TBD.

Next steps

- Quickly produce -01 within the Design Team
 - The document has to be “complete” before taking next steps or progressing the data plane selection process..
 - Add / remove alternatives.
- WG adoption call after posting -01.

Discussion & questions