IETF Hackathon

-Performance Evaluation of APN6

IETF 109

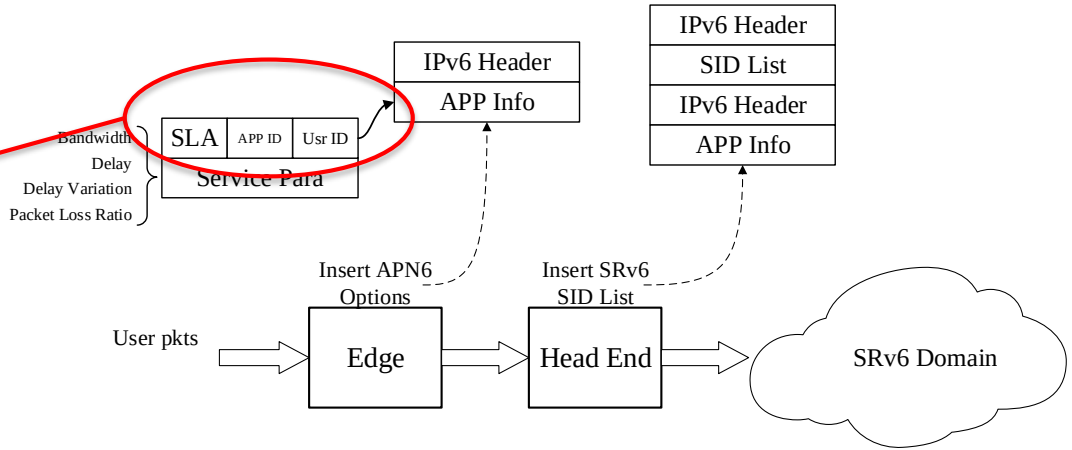
2020-11-13

Online

Hackathon 108 Review

- Briefly introduced IFIT and APN6
- Showed the implementation of the demo of IFIT and APN6 based on P4 and Bmv2
- The review of APN6

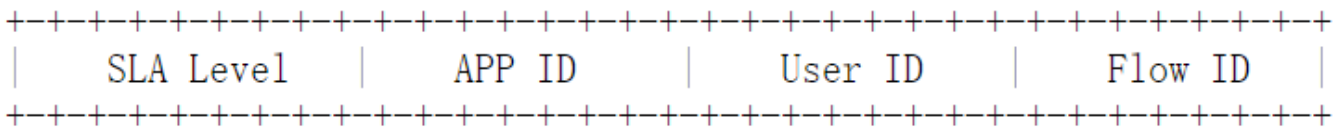
Utilizing the IPv6 Hop by hop option to indicate the APP info. The option is called the Application-aware ID Option.



Related Documents

- APN6 Documents:
  - https://tools.ietf.org/html/draft-li-apn-problem-statement-usecases-00
  - https://tools.ietf.org/html/draft-li-apn-framework-00
  - https://tools.ietf.org/html/draft-li-6man-app-aware-ipv6-network-02
  - https://tools.ietf.org/html/draft-zhang-apn-acceleration-usecase-00
  - https://tools.ietf.org/html/draft-liu-apn-edge-usecase-00

- Fields of the Application-aware ID Option Structure I:



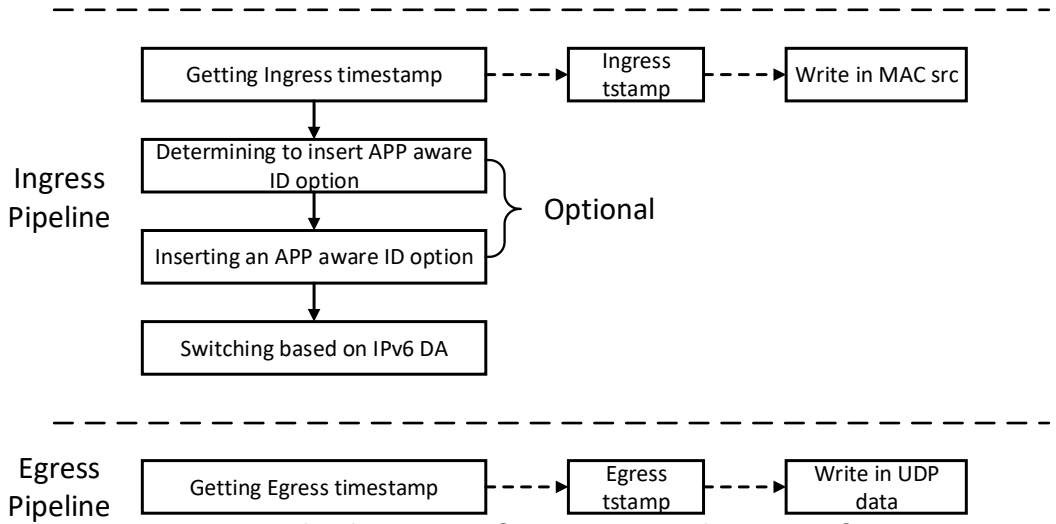
  - SLA Level: The level of SLA requirement of the application
  - APP ID: The identifier of the application
  - User ID: The user of the application
  - Flow ID: The particular flow of the application

Hackathon Plan

- Transplanted the demo of APN6 to a P4 switch, specifically TradeDX S9180 32X, whose ASIC is the Barefoot Tofino BFN-T10-032D
- Performed performance testing and evaluation for the encapsulating (inserting) of Application-aware ID Option Structure I

Implemented Functions

- Switching based on IPv6 DA
- Determining whether to insert an Application-aware ID
- Inserting an Application-aware ID Option Structure I
- Getting the time delta of the processing pipeline



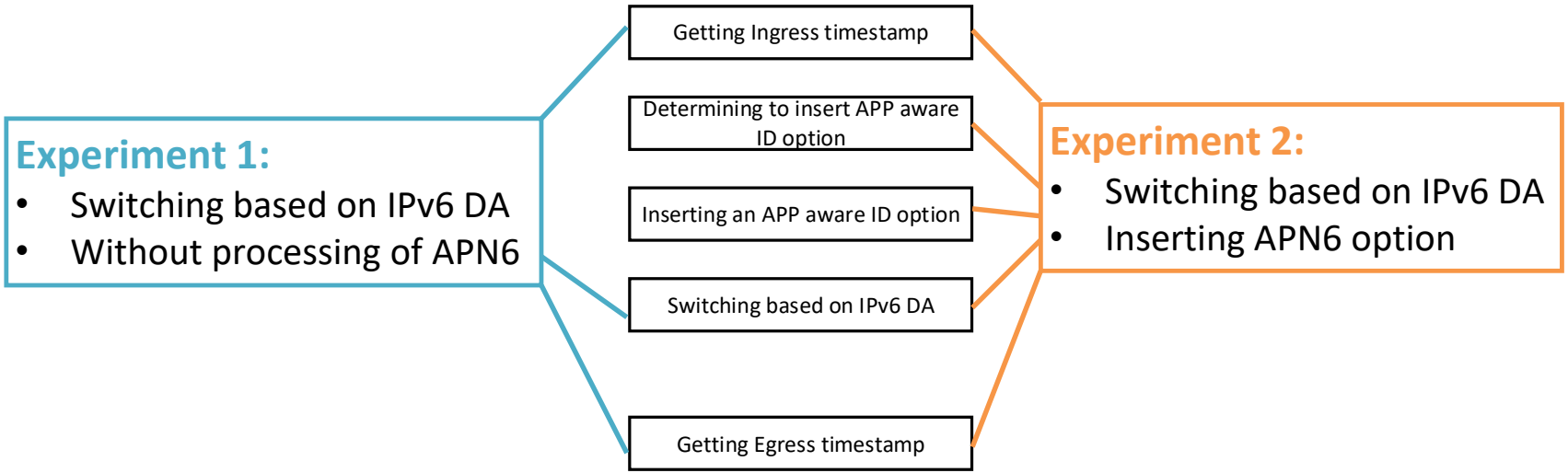
Performance Evaluation

- **MAU Resource Occupation**
  - The maximum number of flow entries of *Switching based on IPv6 DA* and *Inserting an APN6 option* is set to 1024
  - The calculation of MAU resource occupation is based on 1 pipeline (There are 2 pipelines in total in the switch)

MAU Resource	*Description*	*Determining to insert*	*Inserting Option*	*Total*
Crossbar	Select Data from PHV	1.17%	0.07%	1.24%
SRAMs	Exact match tables, action data	0.83%	0.10%	0.94%
Hash bits	Hash generators	0.80%	0.00%	0.80%
Action Data Bus	Stages data for PHV ALUs	0.07%	1.30%	1.37%

Performance Evaluation

- **Processing Latency**



Performance Evaluation

- **Result**
  - Send 50,000 packets in each experiment.
  - The interval between 2 packets is 1ms.
  - All results are in nanoseconds

Experiment	*Mean*	*STDEV*	*MAX*	*MIN*	*Range*
1 (IPv6)	364.07436	0.56514087	366	363	3
2 (IPv6 & APN6)	370.63256	0.611774343	373	369	4
DIFF	6.5582	0.046633473	7	6	

Performance Evaluation

- **Analysis**
  - The KS-test proved that the results of Experiment 1&2 are in accordance with the normal distribution.
  - Using Z-test to calculate some probability of some events
  - Define *K = (L – Latency_IPv6) / Latency_IPv6 * 100%*

L = average latency of 10,000 packets

K ≤	*Value (ns)*	*Probability*
1.80%	370.62769848	21.34%
1.81%	370.664105916	99.999987%
1.82%	370.700513352	100%
1.83%	370.736920788	100%

L = latency of 1 packet

K ≤	*Value (ns)*	*Probability*
1.80%	370.62769848	49.68%
2.00%	371.3558472	88.15%
2.20%	372.08399592	99.11%
2.40%	372.81214464	99.98%

Future Plan

- Complete the test for other ID options and Sub-TLVs of APN6.
- Deploy the simulation on *CENI*

- CENI: China Environment for Network Innovations, an experiment infrastructure, including 40 cities and 100Gbps links

  Characteristics:
  - For the next-generation networks, Cyberspace security, and Space Terrestrial Integrated Network
  - Contain OTN, SDN, and Programmable network
  - The NOS that support 400 cities, 1100 nodes

Wrap Up

Team members:

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