On-time Forwarding with Push-In First-Out (PIFO) Queue

draft-ryoo-detnet-ontime-forwarding-03

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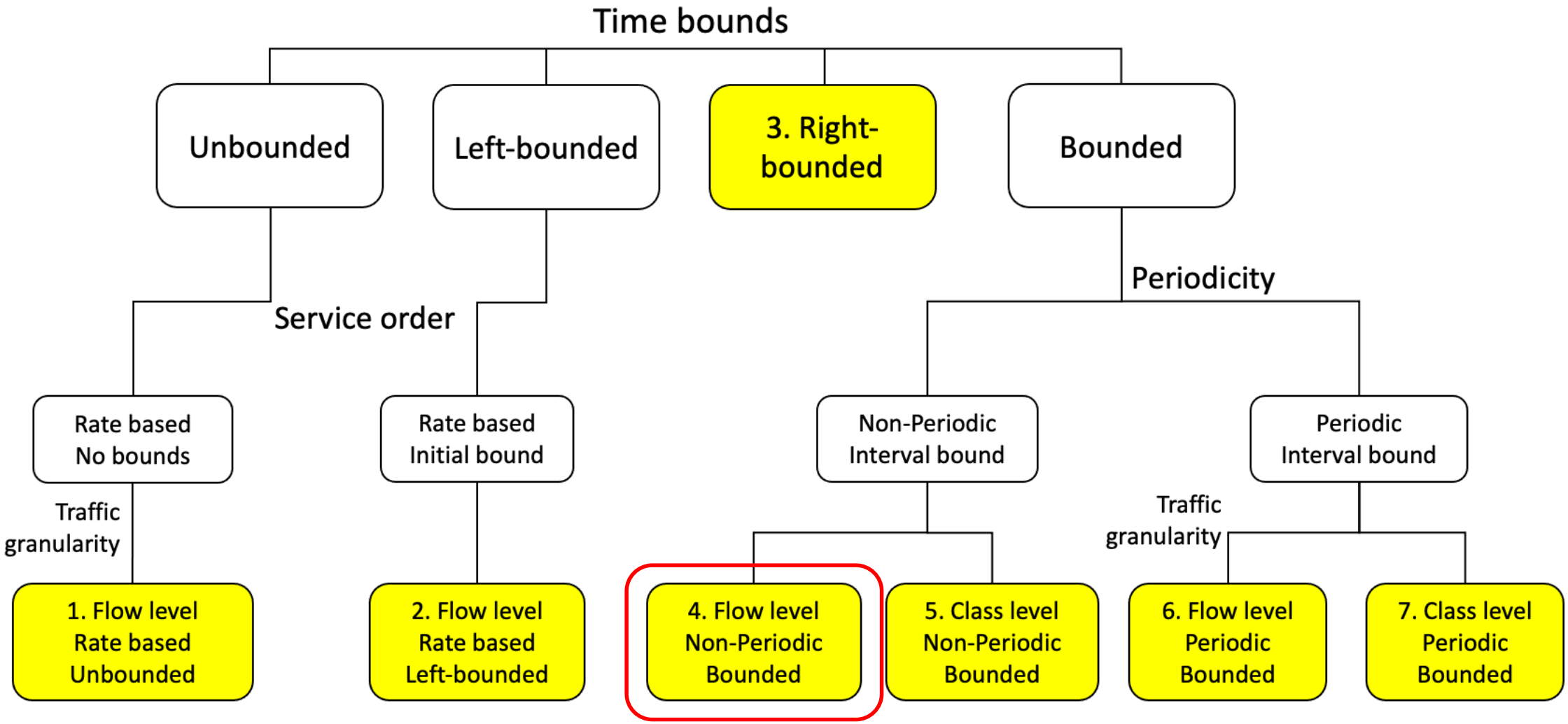
Update of On-time Forwarding

- Identify the appropriate suitable category for On-time Forwarding among those defined in the Taxonomy draft.
- The contents of Chapter 7 have been updated to reflect the revised Taxonomy draft.

> The draft of the taxonomy defines several functional characteristics and suitable categories. The solution described in this document has "Non-periodic, asynchronous, flow level, non-work conserving, on-time, time-based" functional characteristics and belongs to the "Flow level non-periodic bounded category".

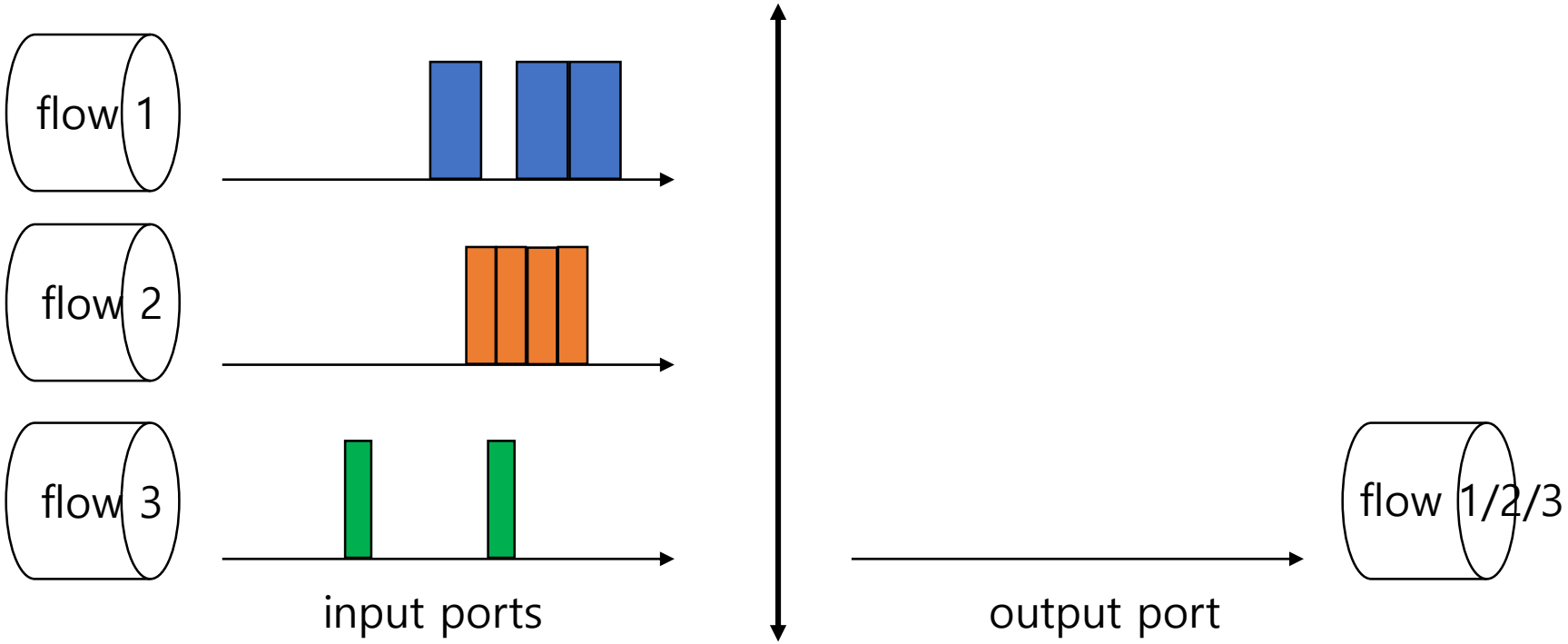
Category of On-time Forwarding



On-time forwarding with PIFO queue

Operation of On-time Forwarding

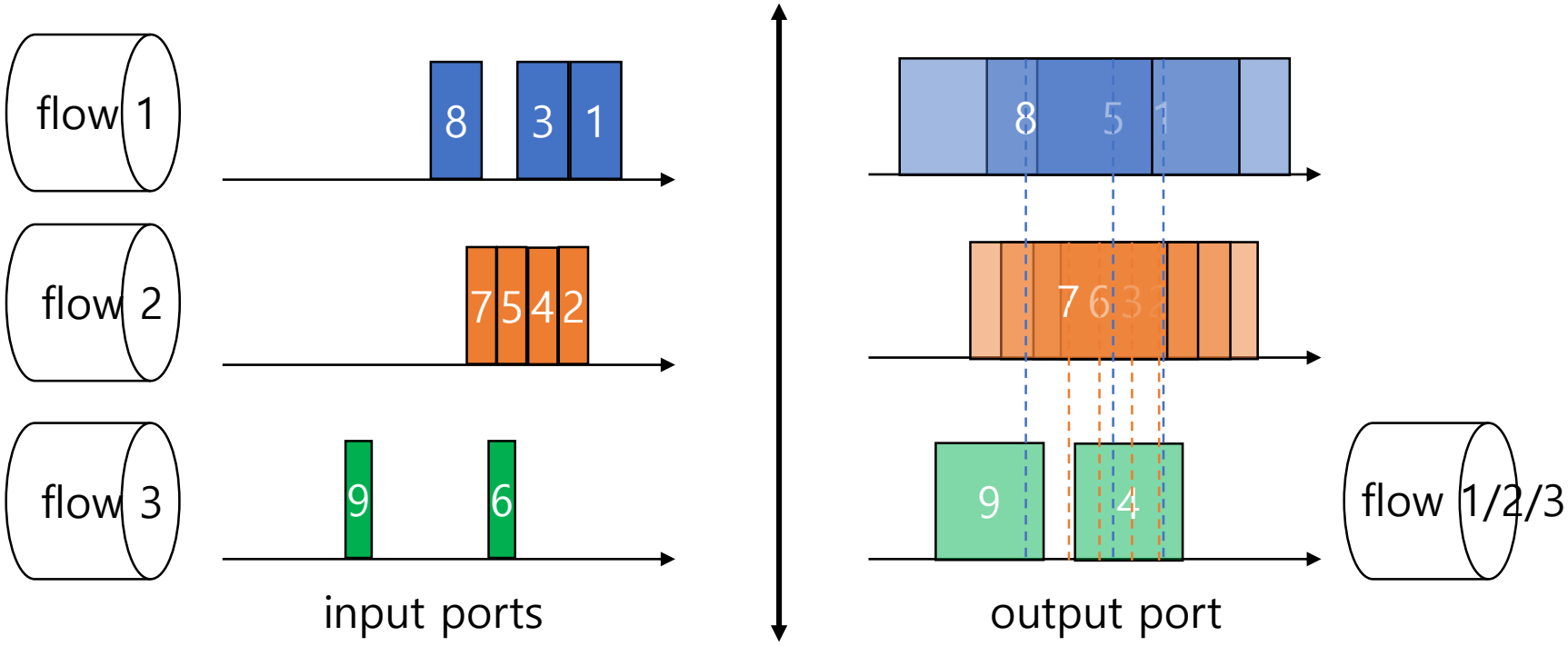
- Different flows arrive from input ports.
- Some of them are bursty.
- How these flows from different ports will mix?



Operation of On-time Forwarding:

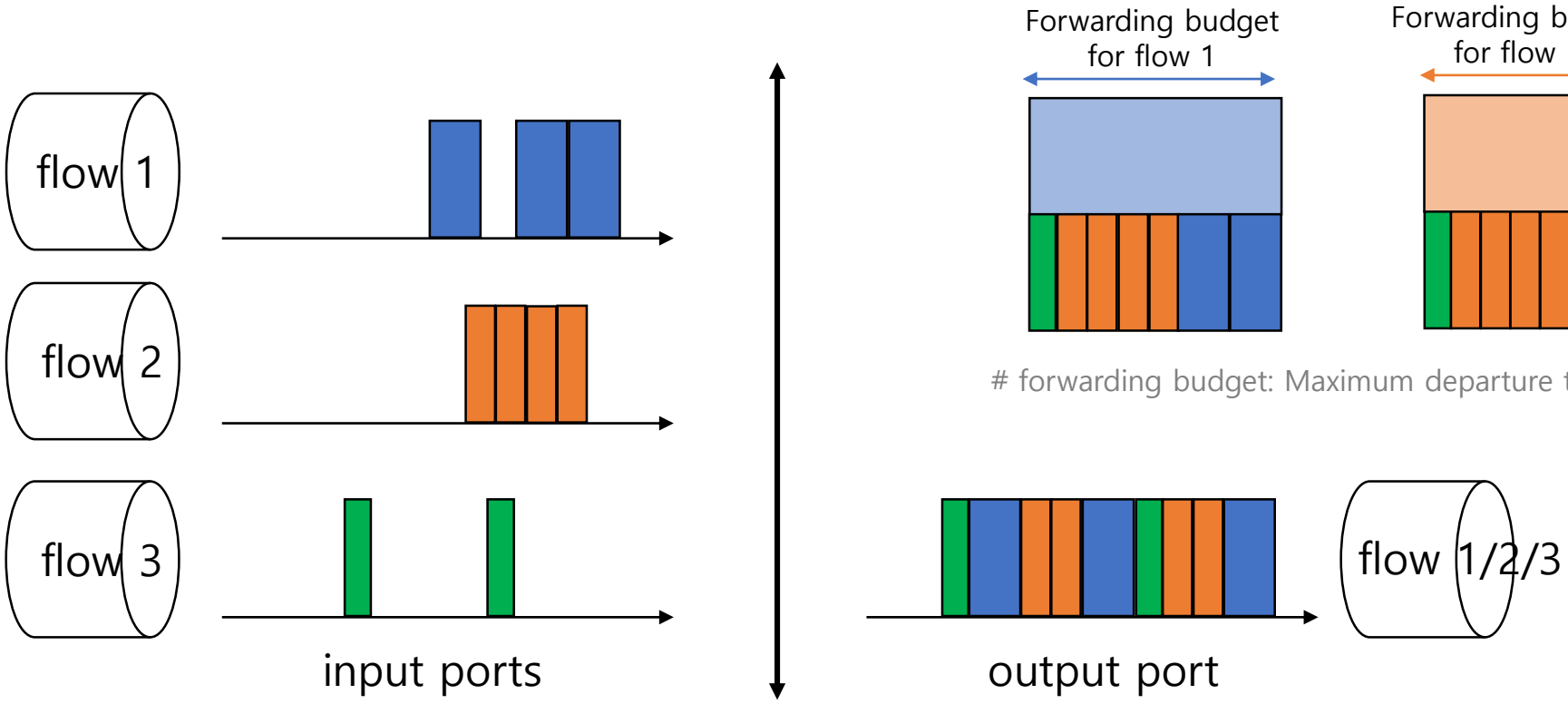
Determination of the minimum and maximum departure time

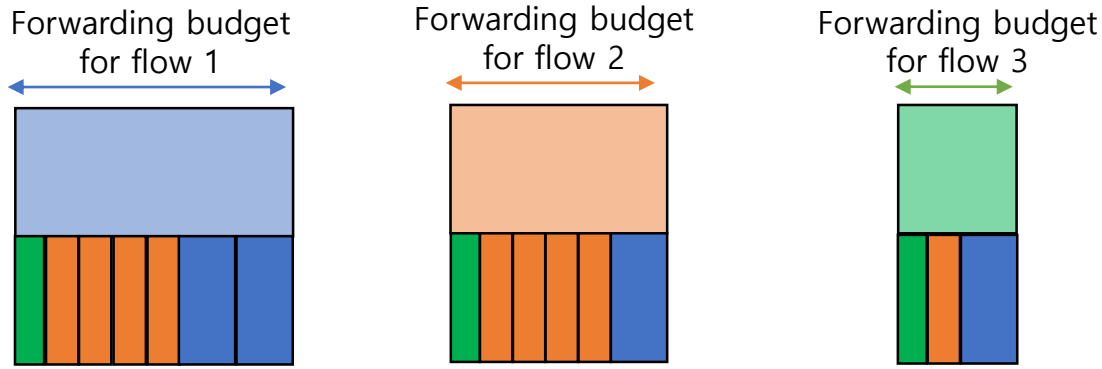
- The minimum and maximum departure times are determined based on the node delay upper bound (N_U) and lower bound (N_L) assigned to each flow.
- Packets are transmitted after their minimum departure time and before their maximum departure time, in ascending order of their nominal departure times (NDT).



Operation of On-time Forwarding: NDT as the service order

- Admission control is required to determine whether the forwarding budget is sufficient, based on the priority of each flow.

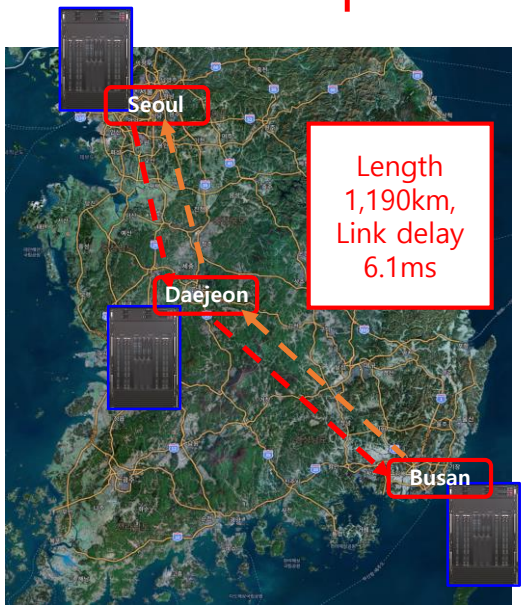




forwarding budget: Maximum departure time – minimum departure time

V03 Main Work

- **On-time service testing on the real system using PIFO queues**
  - We performed an on-time service performance test of the PIFO queue across seven nodes in the actual KOREN network over a 1,190km section between Seoul, Daejeon and Busan (64~1518byte random size test packets)



Packet Group Statistic View - 09

	B	C	T	AK	BB	BS	BT	CK	DT					
1	PGID	Total # Frames Rec.	Latency Min (탎)	Latency Max (탎)	Latency Max-Min (탎)	Latency Avg (탎)	Bit Rate (/sec)	Byte Count	Small Error					EV timestamp
2							Chassis: 129.254.73.170, Card: 01, Port: 01							
3														
24														
25							Chassis: 129.254.73.170, Card: 01, Port: 02							
26														
32	6	22,636,053,769	6,134.275	6,152.102	17.827	6,146.373	70,793,278,640	17,022,308,408,202	0	1	0	1	00:00:00.0000000	00:32:21.6703043
37	11	943,169,740	6,500.395	6,514.487	14.092	6,507.139	2,951,515,086	709,260,186,769	0	0	0	0	00:00:00.0000000	00:32:21.6721155
38	12	943,169,323	7,500.437	7,514.130	13.693	7,507.278	2,952,347,903	709,301,602,862	0	0	0	0	00:00:00.0000000	00:32:21.6712585
39	13	943,168,901	8,500.505	8,513.867	13.362	8,507.213	2,952,295,275	709,278,104,951	0	0	0	0	00:00:00.0000000	00:32:21.6703908
40	14	943,168,486	9,500.350	9,514.062	13.712	9,507.230	2,952,417,491	709,260,082,698	0	0	0	0	00:00:00.0000000	00:32:21.6695354
41	15	943,166,610	13,499.845	13,514.027	14.182	13,507.199	2,953,370,491	709,278,061,124	0	0	0	0	00:00:00.0000000	00:32:21.6656729
48														
49							Chassis: 129.254.73.170, Card: 02, Port: 01							
50														
72														
73							Chassis: 129.254.73.170, Card: 02, Port: 02							
74														
78	4	1,576,747,029	2,485.740	2,646.172	160.432	2,545.186	8,250,688,631	2,018,236,197,120	3,626,588	284,693,714	0	288,320,302	00:00:00.0000000	00:32:21.6802501

In-time

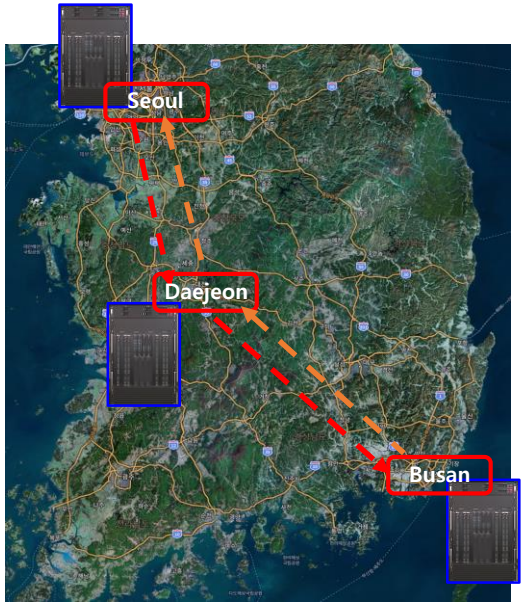
BE

On-time

In-time traffic(PGID:6, 72Gbps)
On-time traffic(PGID:11, 3Gbps)
On-time traffic(PGID:12, 3Gbps)
On-time traffic(PGID:13, 3Gbps)
On-time traffic(PGID:14, 3Gbps)
On-time traffic(PGID:15, 3Gbps)
BE traffic(PGID:4, 95Gbps)

Future Plan

- We plan to multi-path on-time test of the on-time forwarding based on PIFO queue in the actual KOREN network over a 1,190km(flow 1), 500km(flow 2), 690km(flow 3), and 250km(flow 4) section connecting Seoul, Daejeon, and Busan



flow 1: Daejeon -> Busan -> Daejeon -> Seoul -> Daejeon
flow 2: Daejeon -> Seoul -> Daejeon -> Seoul -> Daejeon
flow 3: Daejeon -> Busan -> Daejeon
flow 4: Daejeon -> Seoul -> Daejeon

Verify that four flows, each with different paths and lengths, satisfy the same maximum and minimum delay requirements.

Thank you