

Reverse-Path Congestion Notification: Accelerating the Congestion Control Feedback Loop



@ IEEE International Conference on Network Protocols (ICNP) 2021

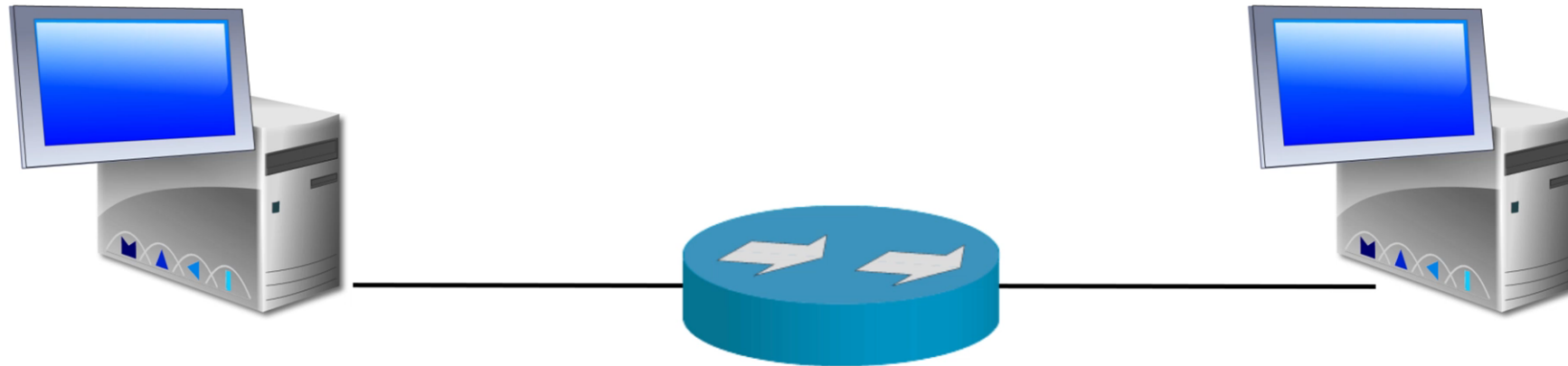
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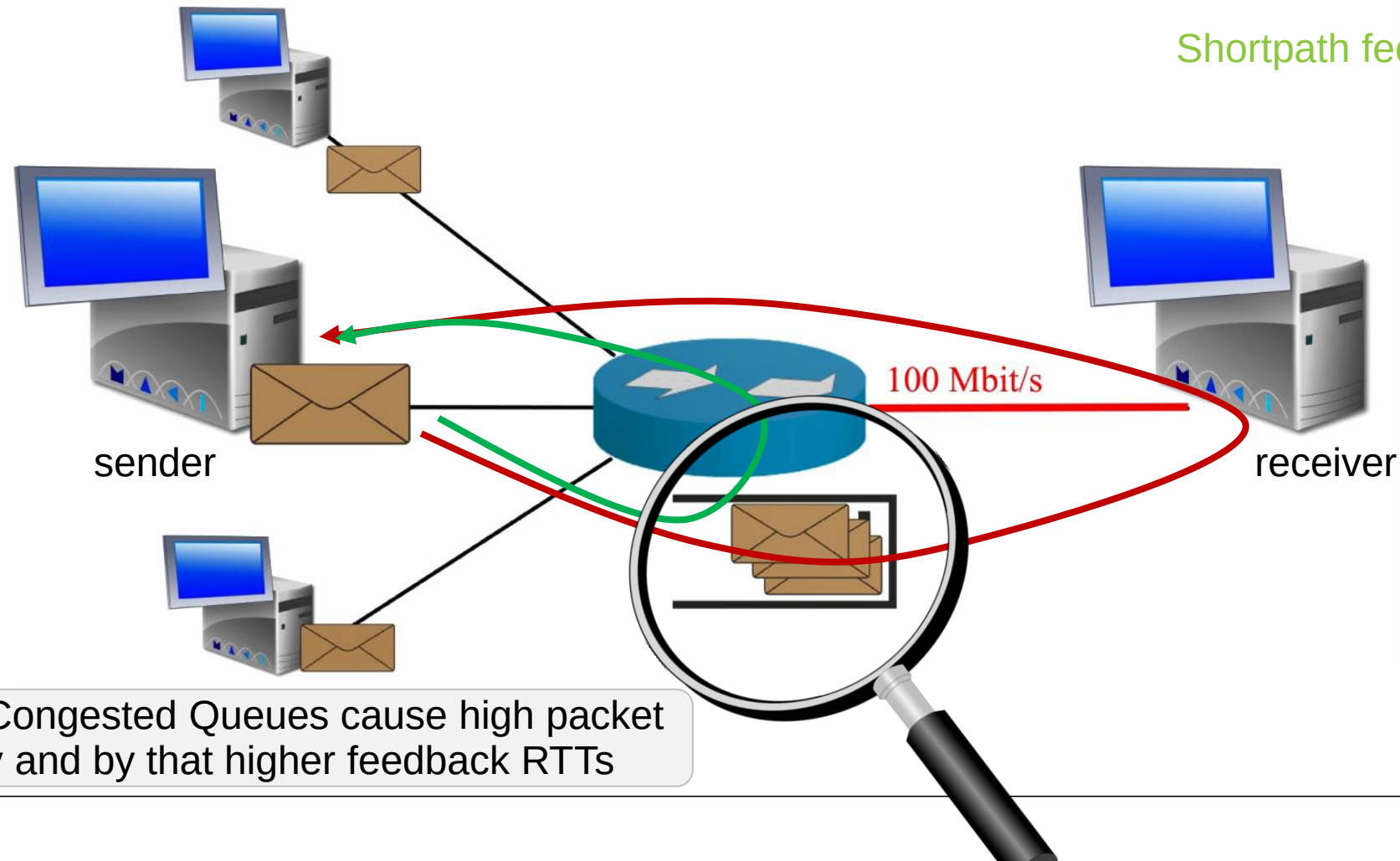
Network Congestion



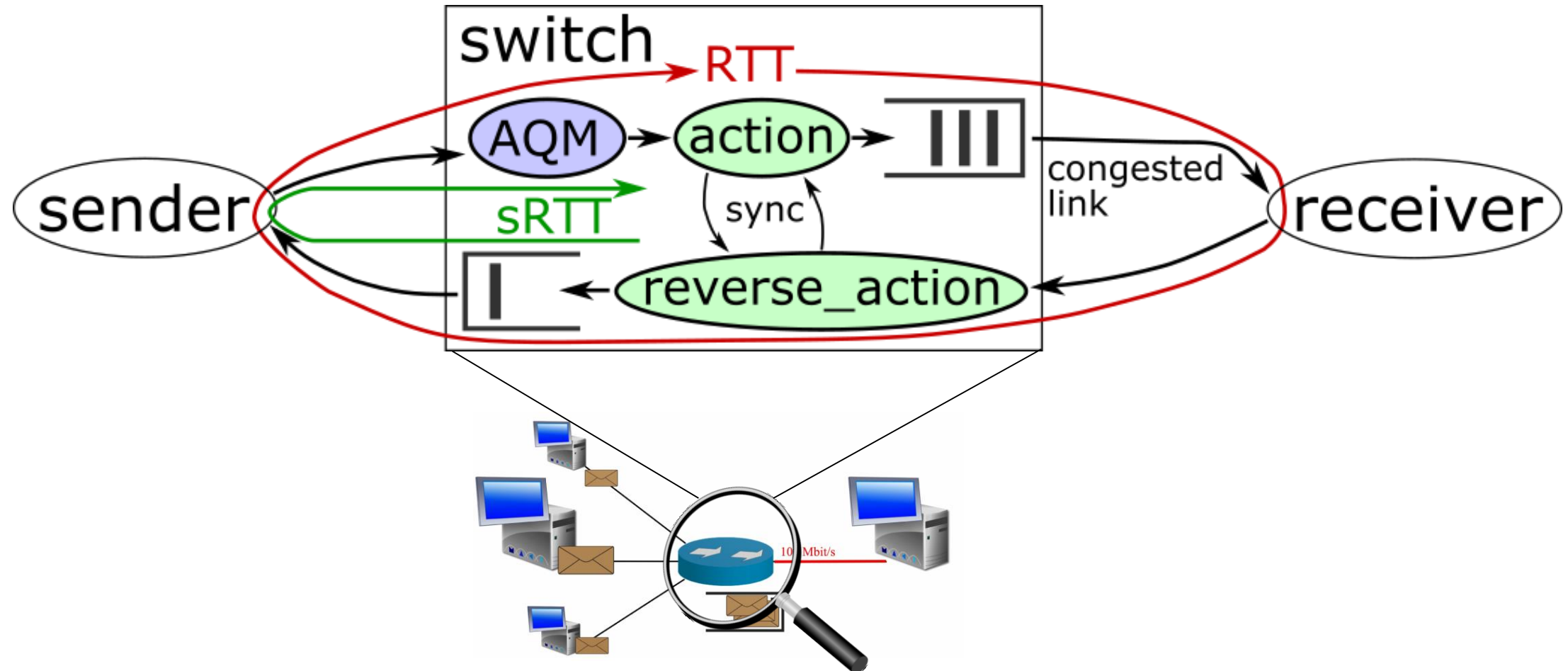
Shorten the Feedback Loop of TCP Congestion Control

Traditional feedback RTT: e.g. 100 ms

Shortpath feedback RTT: e.g. 50 ms



Note: Congested Queues cause high packet latency and by that higher feedback RTTs



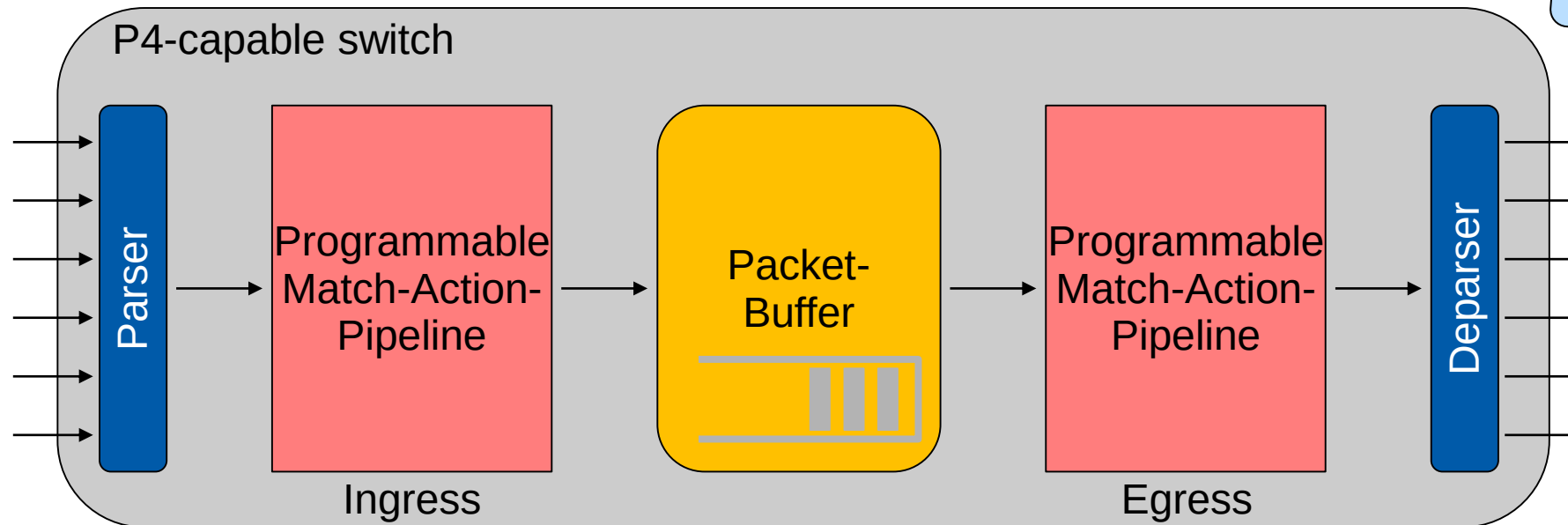
Implementation

P4 Reference Pipeline

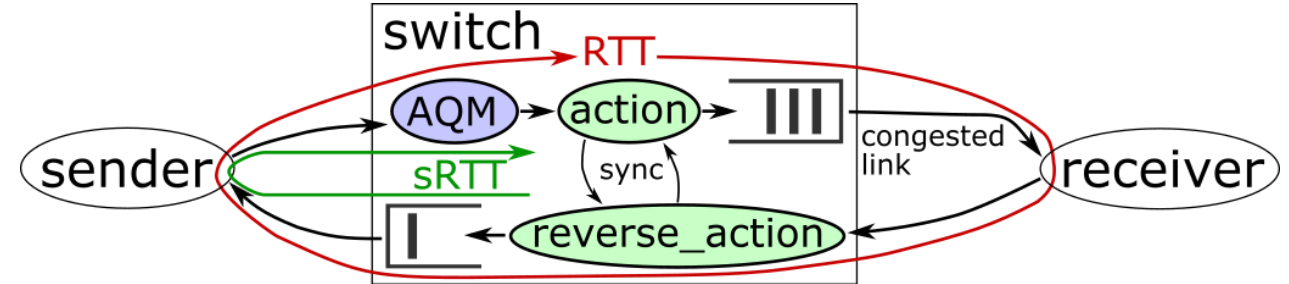
- Parser & Deparser
- Ingress and Egress Pipeline
 - Used for packet processing
 - P4 programmable
- Packet-Buffer



Part of future work



How to Implement it



```
1 Packet p; AQM aqm; StatefulRegister reversePath;
2 //forward direction
3 if (aqm.notifyCongestion()):
4     if (p.isECNEnabled()):
5         if (!reversePath.hasTimeout(p.flowHash)):
6             reversePath.installECNrule(p.flowHash)
7         else:
8             p.markECN() //fallback #1
9     else:
10        p.drop() //fallback #2
11 //reverse direction
12 if (reversePath.hasECNrule(p.flowHash)):
13     p.markECN()
14     reversePath.resetECNrule(p.flowHash)
```

Future Work

Hardware Realization Investigation

- Intel Tofino
- FPGAs?
- Residential Gateways

Algorithmic Implications

- How big are the benefits?
- Are there any drawbacks?
- Fairness?
- Sufficient fallback mechanism?

Questions & Contact



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