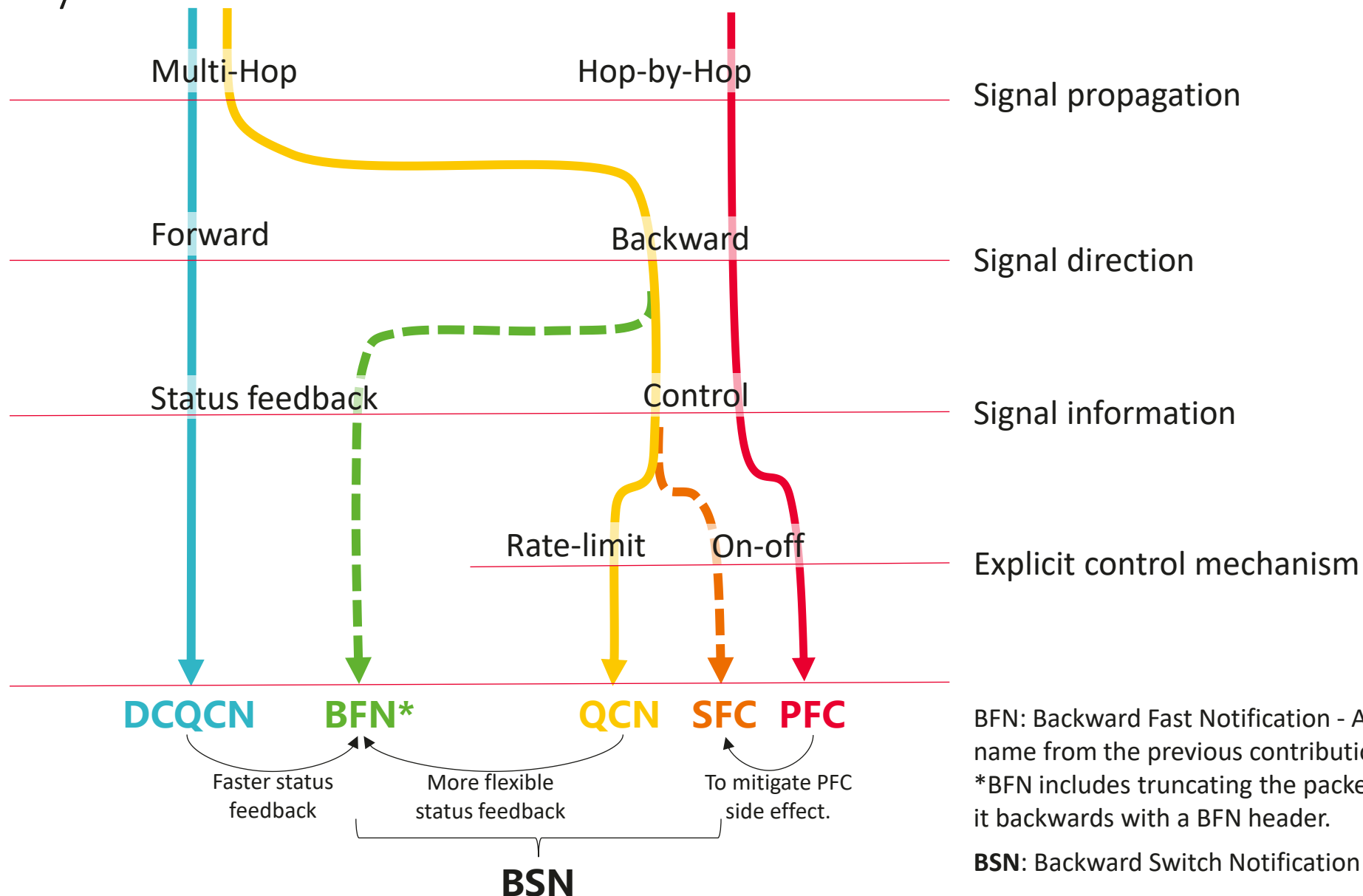


# Backwards Switch Notification signals and scope

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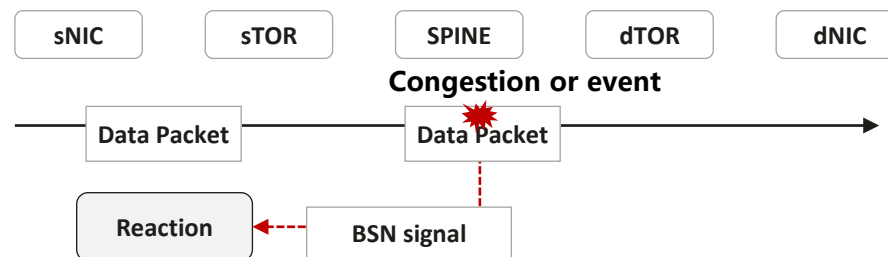
# Taxonomy of discussed solutions



BFN: Backward Fast Notification - A temporary name from the previous contribution.  
 \*BFN includes truncating the packet and sending it backwards with a BFN header.

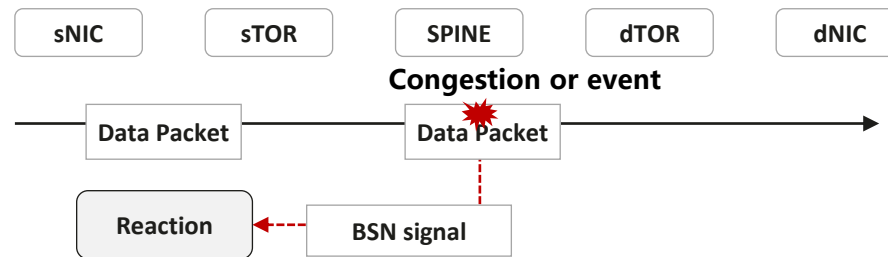
# What do we mean by BSN signals

- Backward Switch Notification (BSN) mechanisms share three properties:
  - > Congestion or critical event is detected by a switch (queue depth, buffer occupancy, drop, trim, link failure, etc.)
  - > A signal propagates upstream (in-band or out-of-band)
  - > The sender changes behavior (rate, window, path/EV, replication, or scheduling)
- The differences are:
  - > How far back the signal goes (one hop vs. to the sender)
  - > Who responds to the signal (upstream switch or end-station)
  - > What form the signal takes (packet, mark, tag, control message)
  - > What caused the signal (congestion drop, congestion experienced, path failure, XYZ threshold crossed)



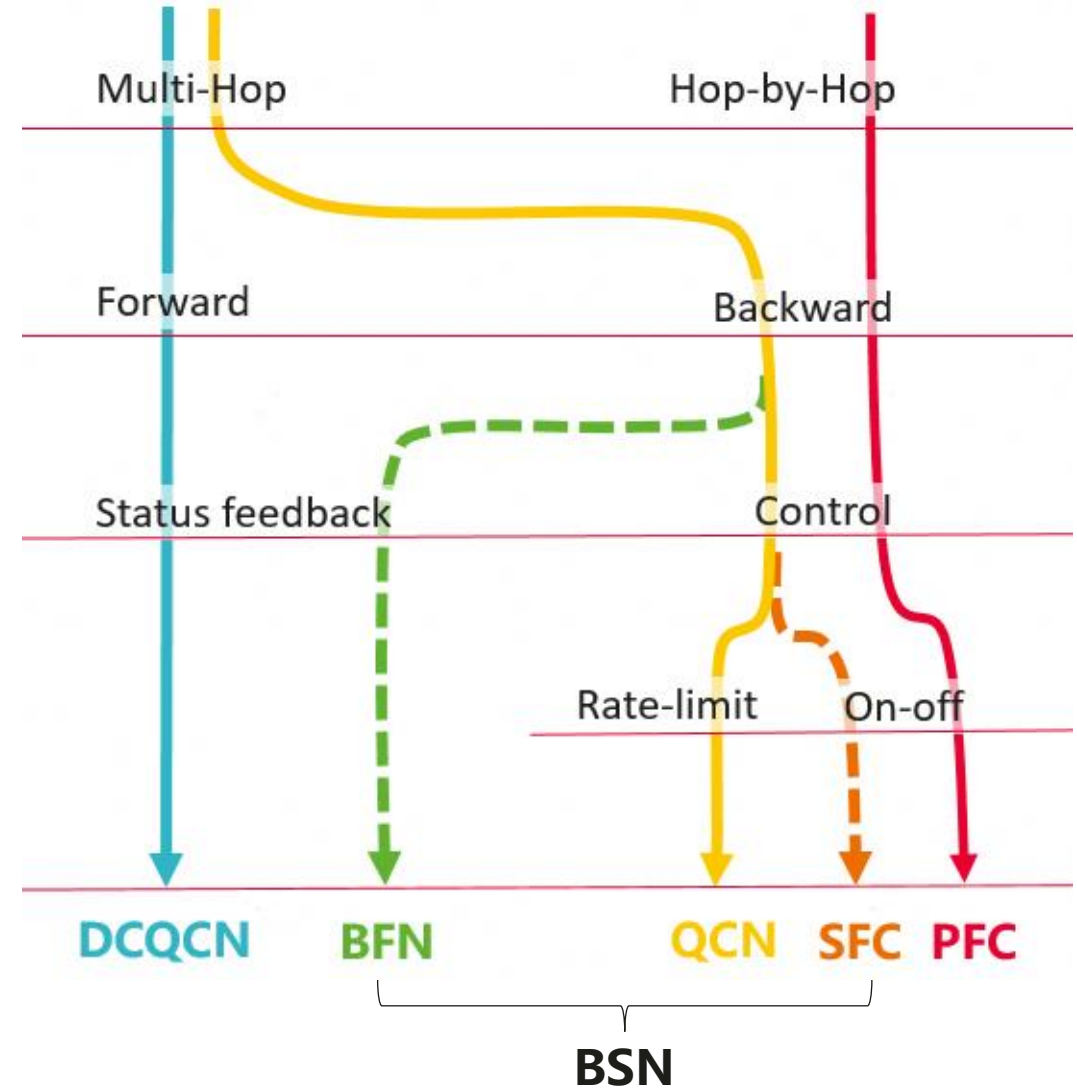
# What are BSNs good at?

- Shorter congestion control loop – faster feedback
- Rapid error detection and reporting
- Push urgent network conditions backward to alter subsequent paths (e.g., remote link failures rather than waiting on RTO)
- Feedback is not subject to delays from coalesced ACKs or receiver ACK timing
- Feedback can be explicit and not subject to sender having to choose which signal to monitor (e.g. CSIG)

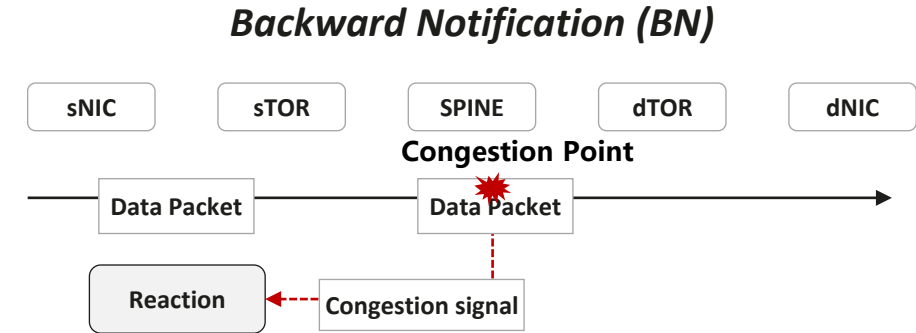
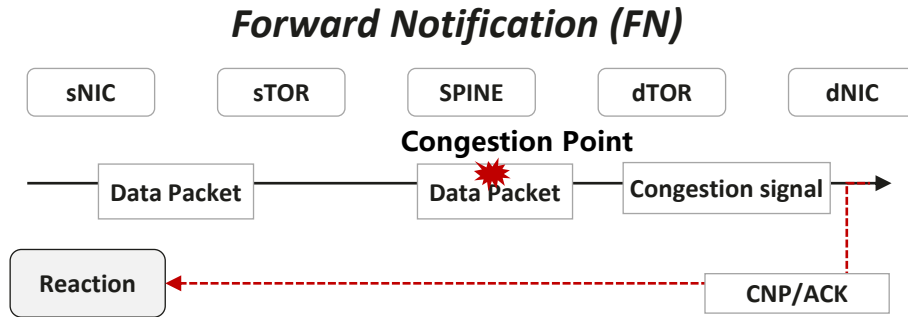


# Types of BSN messages and industry efforts

- Priority-based Flow Control (PFC)
- Source Flow Control (SFC) / remote PFC
  - > <https://support.huawei.com/enterprise/en/doc/EDOC1100518851/a390b2b1/understanding-rpfc>
- For congestion control: L3 version QCN / FastCNP (BSN version of DCQCN)
  - > <https://docs.broadcom.com/doc/BCM78919-PB>
  - > <https://cloudswit.ch/whitepapers/fast-cnp-congestion-notification-technology/>
  - > UEC related works (see next page)
- BSN Telemetry / Global Load Balancing (GLB) congestion status heartbeats
  - > <https://www.broadcom.com/blog/cognitive-routing-in-the-tomahawk-5-data-center-switch>
  - > <https://blogs.juniper.net/en-us/industry-solutions-and-trends/avoiding-ai-ml-traffic-congestion-with-global-load-balancing>
- BSN Trimming (BTS trimming)
  - > <https://blogs.cisco.com/datacenter/ultra-ethernet-for-scalable-ai-network-deployment#:~:text=Smarter%20congestion%20recovery,congestion%20and%20improving%20tail%20latency.>
- Hybrids



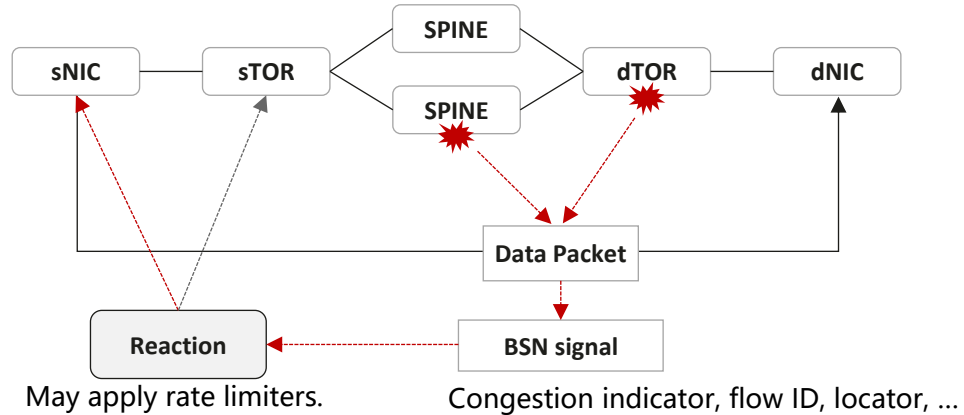
# UEC related works



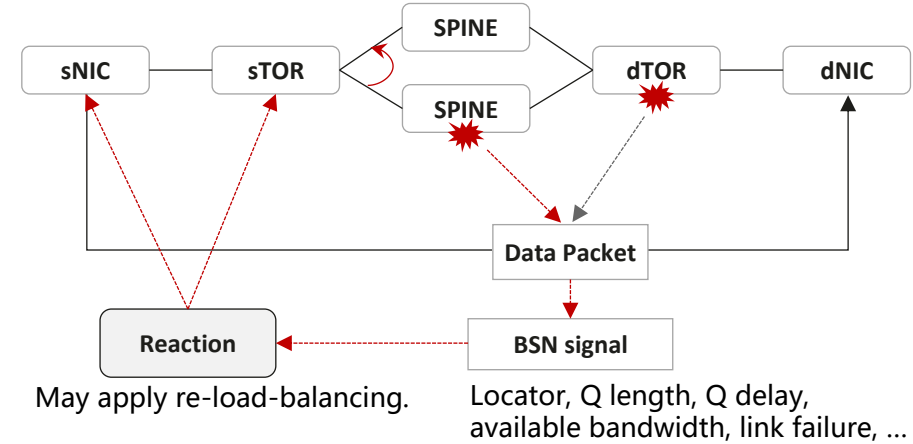
- UEC is standardizing Programmable Congestion Management (PCM), enabling anyone to implement new congestion control algorithms to address changing workloads using a standard language.
  - > <https://ultraethernet.org/accelerating-ai-with-open-standards-uecs-expanding-vision/>
- Important updates for the next iteration of the UEC spec include flexible congestion management mechanisms.
  - > <https://ultraethernet.org/uec-2025-in-review-preparing-for-what-comes-next-a-letter-from-uecs-chair/>
- UEC's PCM can be a consumer of BSN signals.

# BSN protocol and use case examples

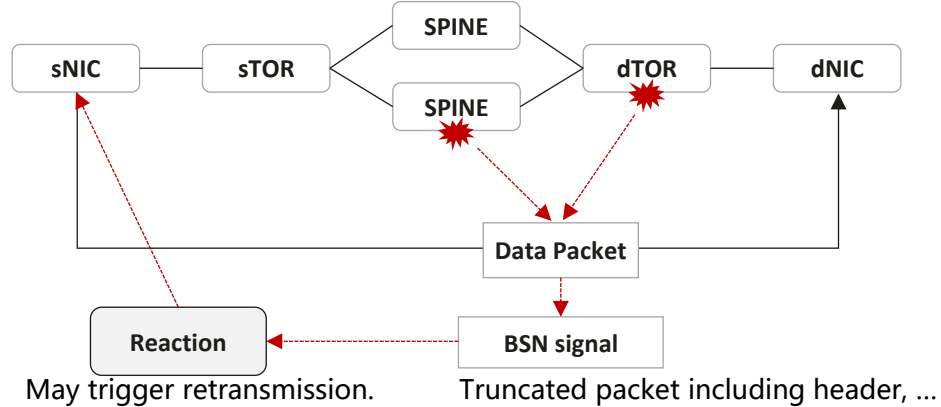
## Use case: Congestion Notification



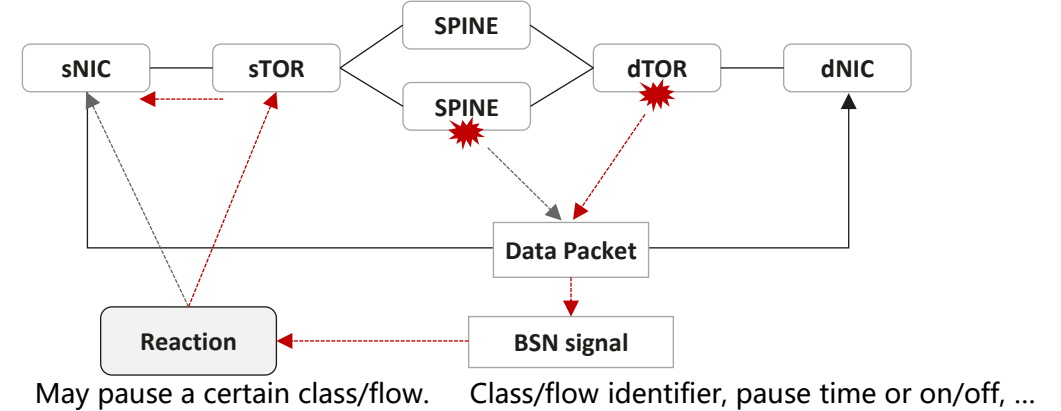
## Use case: network state information



## Use case: packet-related information



## Use case: source flow control



# Proposed Scope of Work

- Inspired by industry activities and the commonality of BSN, we propose to expand Qdw scope to develop a BSN protocol, in order to support broader use cases.
- Specifying BSN protocol includes,
  - > Architecture.
  - > Operational Model: BSN lifecycle overview (trigger -> construct -> send -> relay -> receive -> \*act), state machine, flow identification mechanism.
  - > Congestion point BSN procedures: Initialization, trigger mechanism, message construction, message sending, relay behavior, local processing.
  - > Reaction point BSN procedures: BSN recognition and parsing, capability advertisement and execution of pause/rate-reduction (optional).
  - > BSN message format.
  - > Variables and management.
  - > Security considerations.



# Motion

- 802.1 authorizes the TSN TG to generate PAR and CSD for the backward notification for congestion signaling at the May 2026 interim session for pre-circulation to the LMSC.

Discuss