

# **Open technical issues @IETF121 HPWAN BoF**

**Daniel Huang, ZTE**

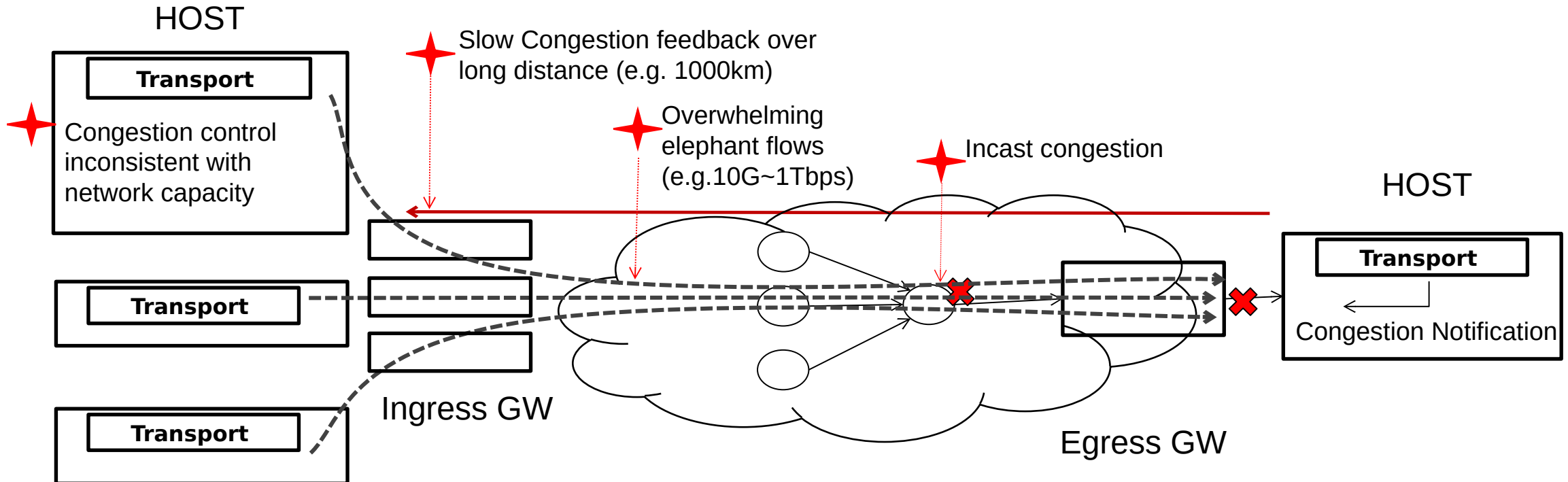
# What could matter for hp-wan ?

## Technical issues worthy being highlighted

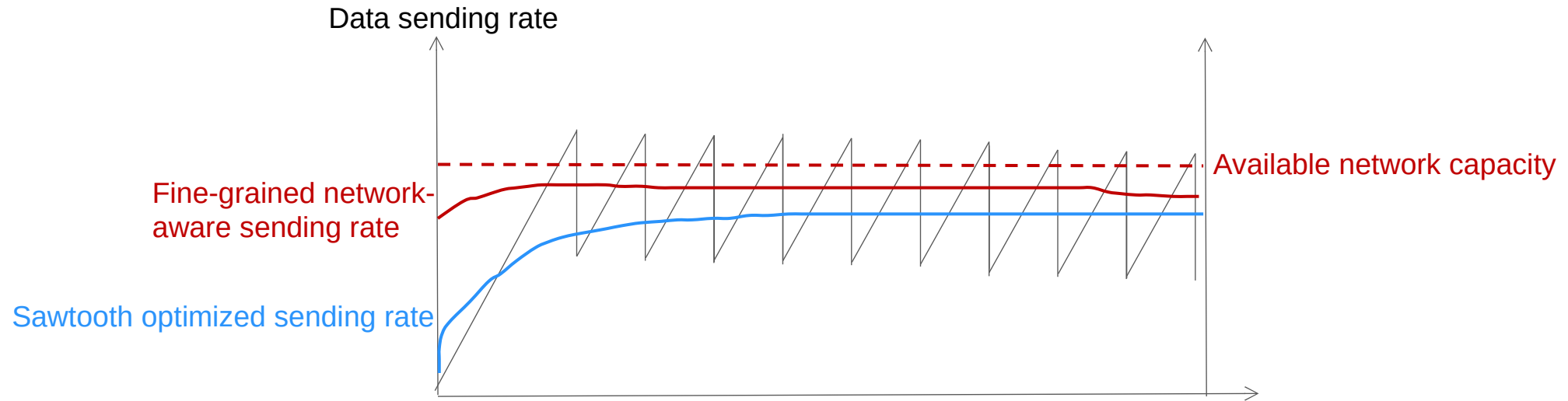
1. Per-flow congestion control **VS** multi-flow coordination.
2. Reactive **VS** Preemptive interventions
3. Qualitative **VS** Quantitative feedback
4. Static **VS** Dynamic services scheduling

} More sophisticated CC upon more ACTIVE network coordination

## Bottlenecks in terms of IETF technologies

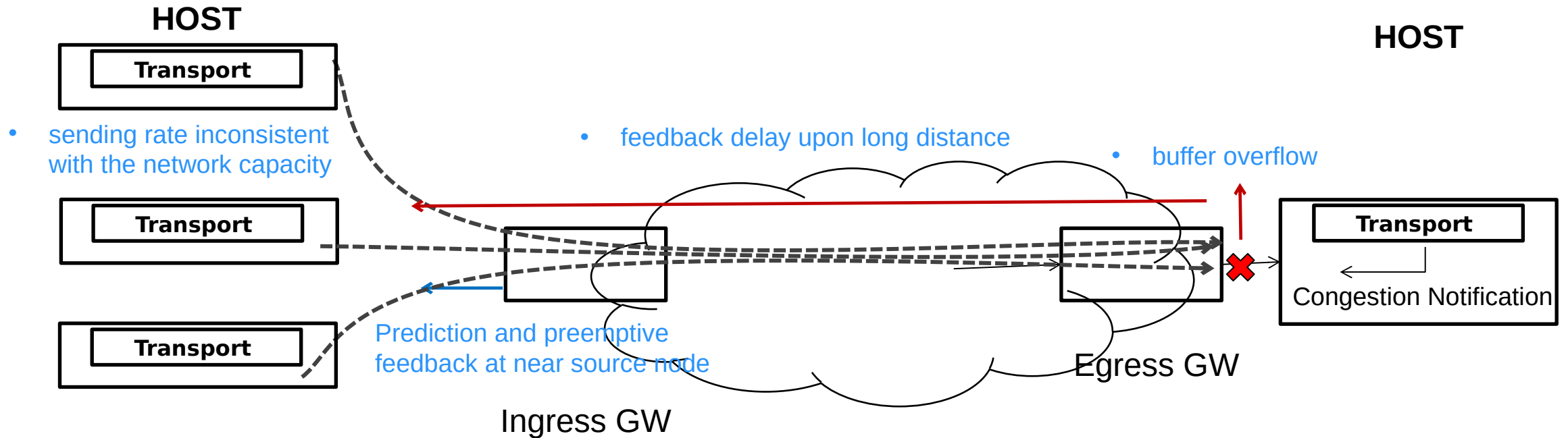


# Transmission capacity gaps could be further exploited



- **Where we are in terms of WAN bandwidth utilization with the existing technologies ? 10-30%**
  - Larger than **50%** is expected to satisfy HP-WAN effective high-throughput requirements with massive data transmission.
- **Rationale**
  - Significant transmission capacity gaps between the sending rate and the available network capacity exist as the data is transmitted, and it's worthy being exploited further to increase the bandwidth utilization.

# Congestion Control(1): FAST congestion feedback



- **Warning**

- Sending host reacting upon an entire RTT slot over long distance could be a disaster for the congested links!
- Reaction against the overwhelming burst from elephant flow is not enough, it should be handled in a preemptive way.

- **Potential ways out**

- 1. In-network prediction of incast, bandwidth quotas etc. and feedback accordingly
- 2. Candidate technologies: PFC (Priority Flow Control) per flow mechanism, fast

# Congestion control(2): Quantitative congestion feedback

- **How it's possible**

- Predictability of hp-wan service flow volume, rate and sending time.

- **Fine-grained coordination between the host and network**

- Controller involved initial sending rate negotiation between the host and network.

- Fine-grained available capacity feedback from network.

- 1)Host friendly: explicit sending rate information from network.

- 2)Host un-friendly: raw metadata or feedback with new or updated CCAs.

# ACTIVE network

## coordination(1): load balance

### for elephant flows

- **Warning**

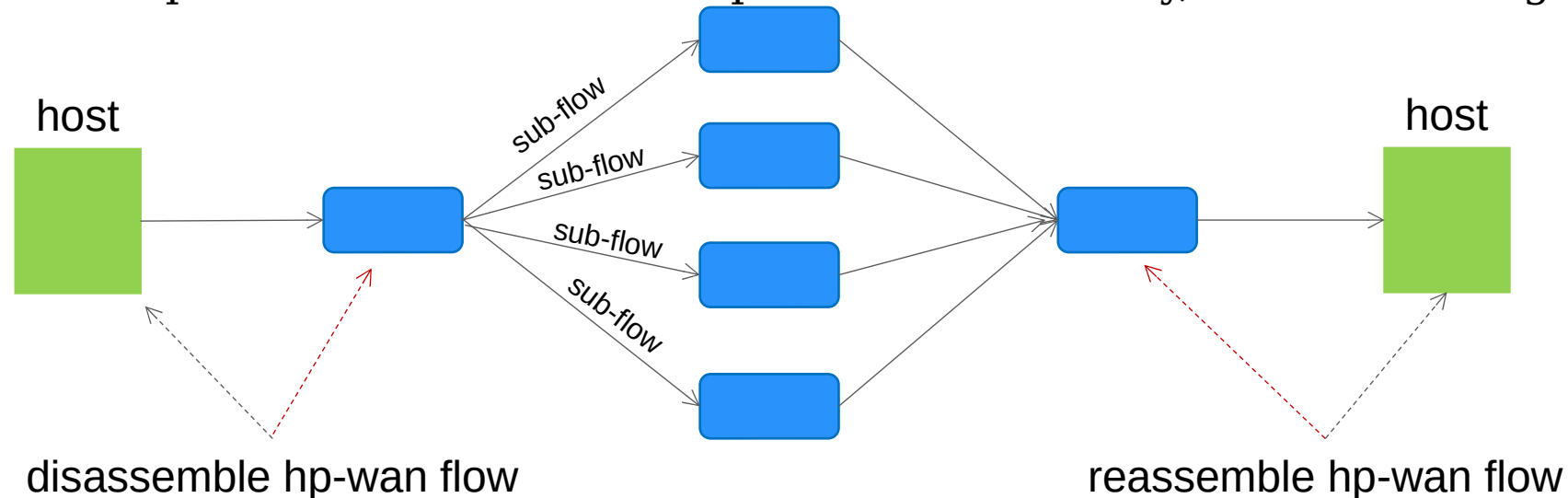
- An hp-wan elephant flow could overwhelm the network link and incur disastrous packet loss and congestions!

- **Guaranteed multi-path load balancing**

1) Host splitting elephant flows: cross sub-flow QoS consistency guarantee, bottleneck effects could ruin the overall performance.

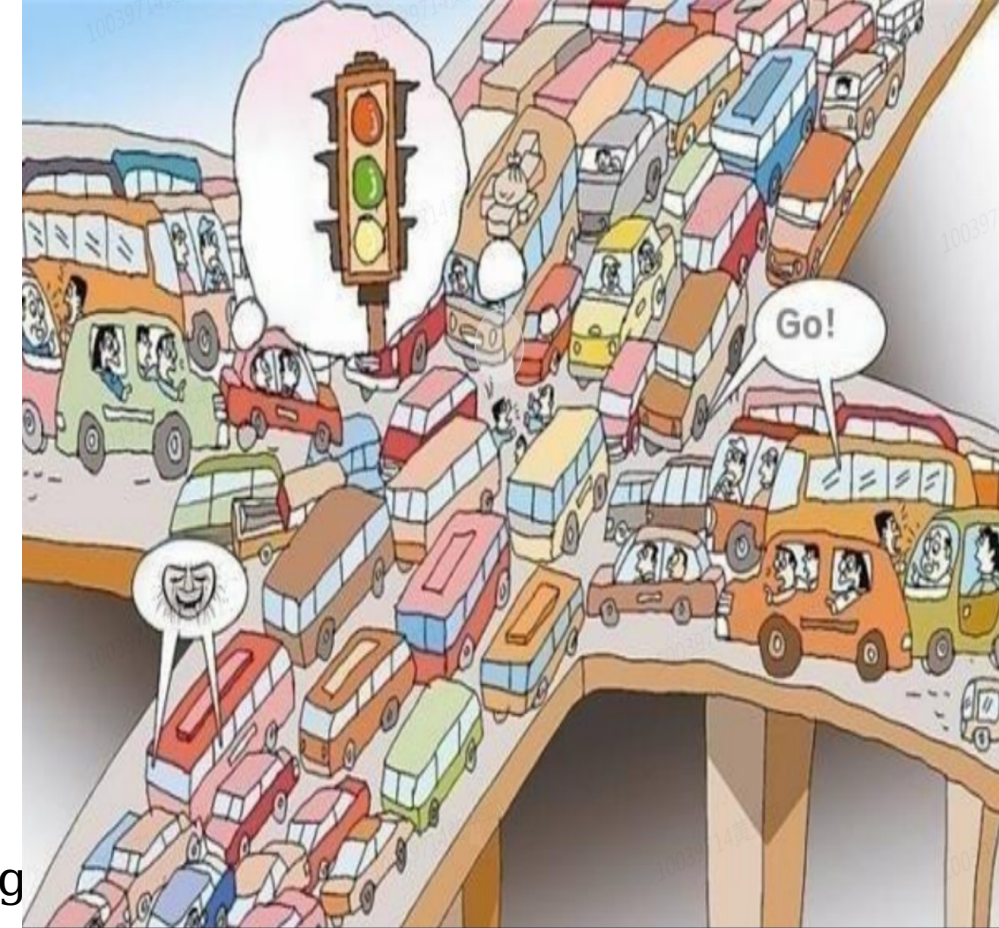
2) Network splitting: on top of 1), reordering would be needed, which seems scary for WAN though.

3) Some elephant flow could not be splitted in either way, and has to be guaranteed as it is.



# ACTIVE network coordination(2): incast regulation and packet loss control

- **Warning:** Unregulated incast traffic is the mastermind of congestions. particularly hp-wan incast traffic.
- **What hp-wan flow faces in WAN: Complex, Volatile, Greedy against Greedy...**
- **It's possible and worthy to regulate the hp-wan incast traffic**
- **Is coordination needed with the underlay?**
  - In the event of high-volume data transmission:
    - 1) path "timing" (scheduling) may be needed
    - 2) awareness of the bottleneck links with fine-grained scheduling
    - 3) coordination between host, ingress and egress
  - This could be a Routing Area discussion, we have side meeting time later in week



**Thanks !**

- **Comments and suggestions are welcome.**