Dataplane for SUBSCRIBER GATEWAY

OVERVIEW & CHALLENGES

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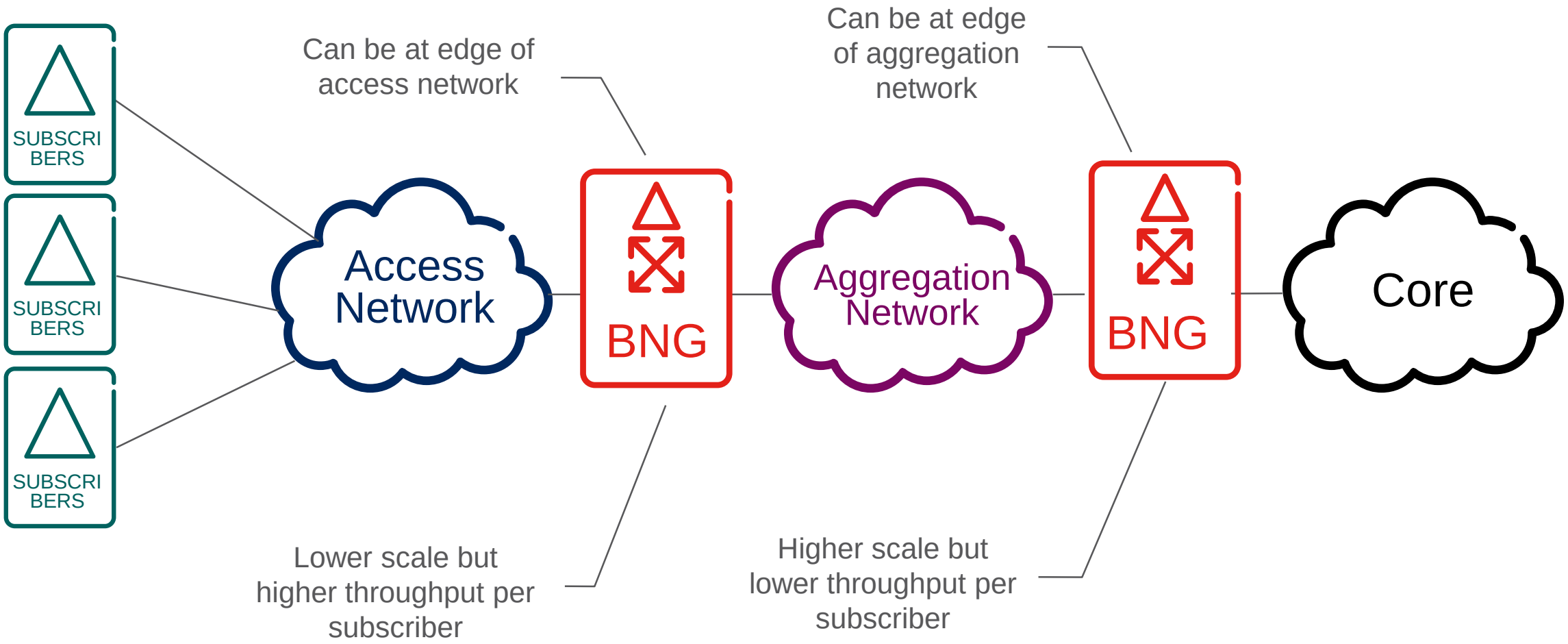
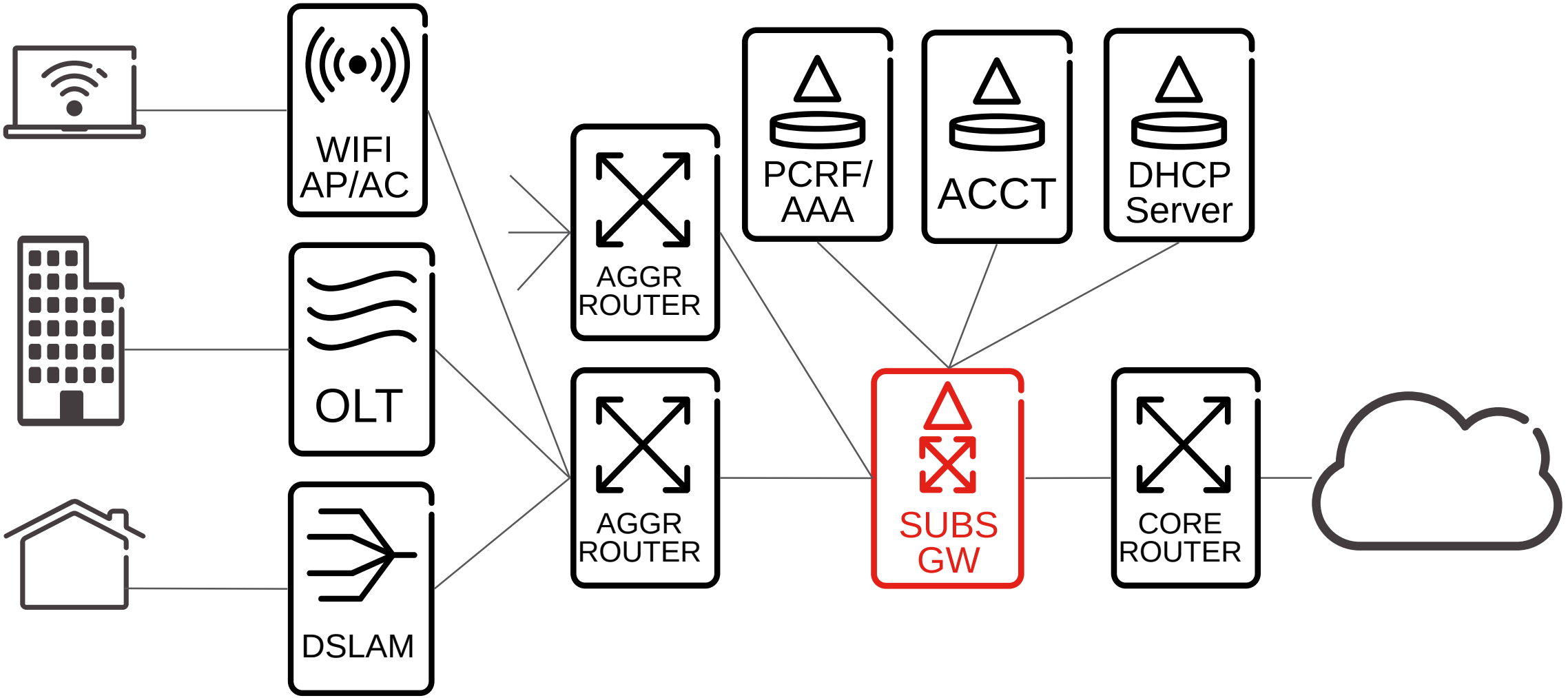
Subscriber Gateway

- Entity at edge of access-aggregation network / mobile RAN network
- Provides Internet access to subscribers
- Enables ISPs to monitor usage for charging
- Primary Role
  - AAA: Authenticate, Authorize subscribers and Account their traffic (for charging etc.)
  - Provide IP-address to subscribers
  - Provide various services as per SLA
- Example Nodes
  - BNG / BRAS: Fixed broadband
  - P-Gateway: Mobile broadband
- In talk we will take the BNG as a representative of a subscriber gateway

Deployment Points - BNG



Subscriber Gateway and Support Nodes



Desired Characteristics

- Good packet throughput (like any router)
- High session setup / teardown rate (sessions/sec)
- High subscriber scale
  - At each dataplane and at system level
- Rich services, service orchestration
- Session survivability support

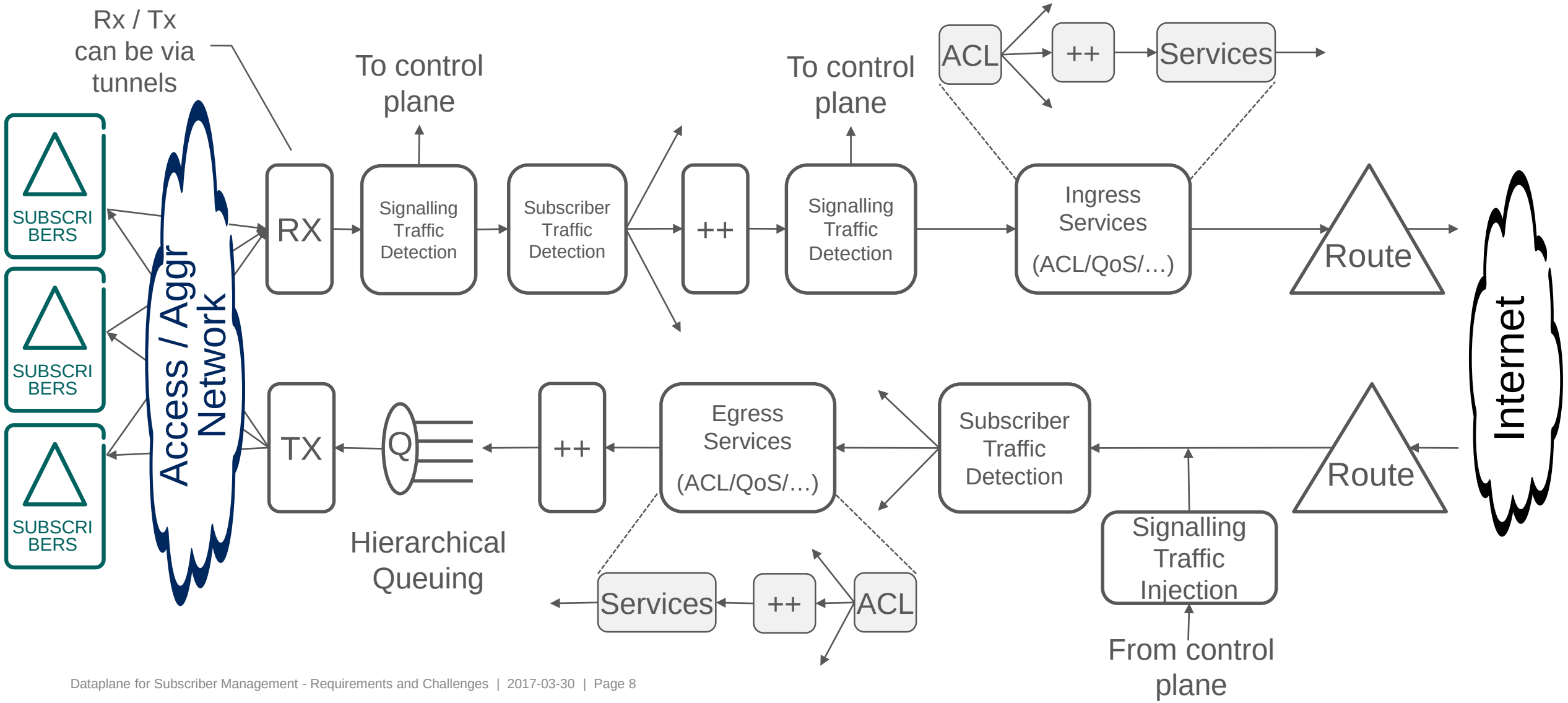
Dataplane - Control Plane Interaction

- Continuous session signaling packet transfer between control plane and dataplane
- Continuous provisioning messages and responses between control plane and dataplane
- Continuous session keep-alives with subscribers
- Continuous push of statistics counters from dataplane to control plane and thence to accounting servers
- Loss of these will be impactful ➔ Poor product perception
  - Low session setup rates, Session flaps, Subscriber dissatisfaction, Revenue loss

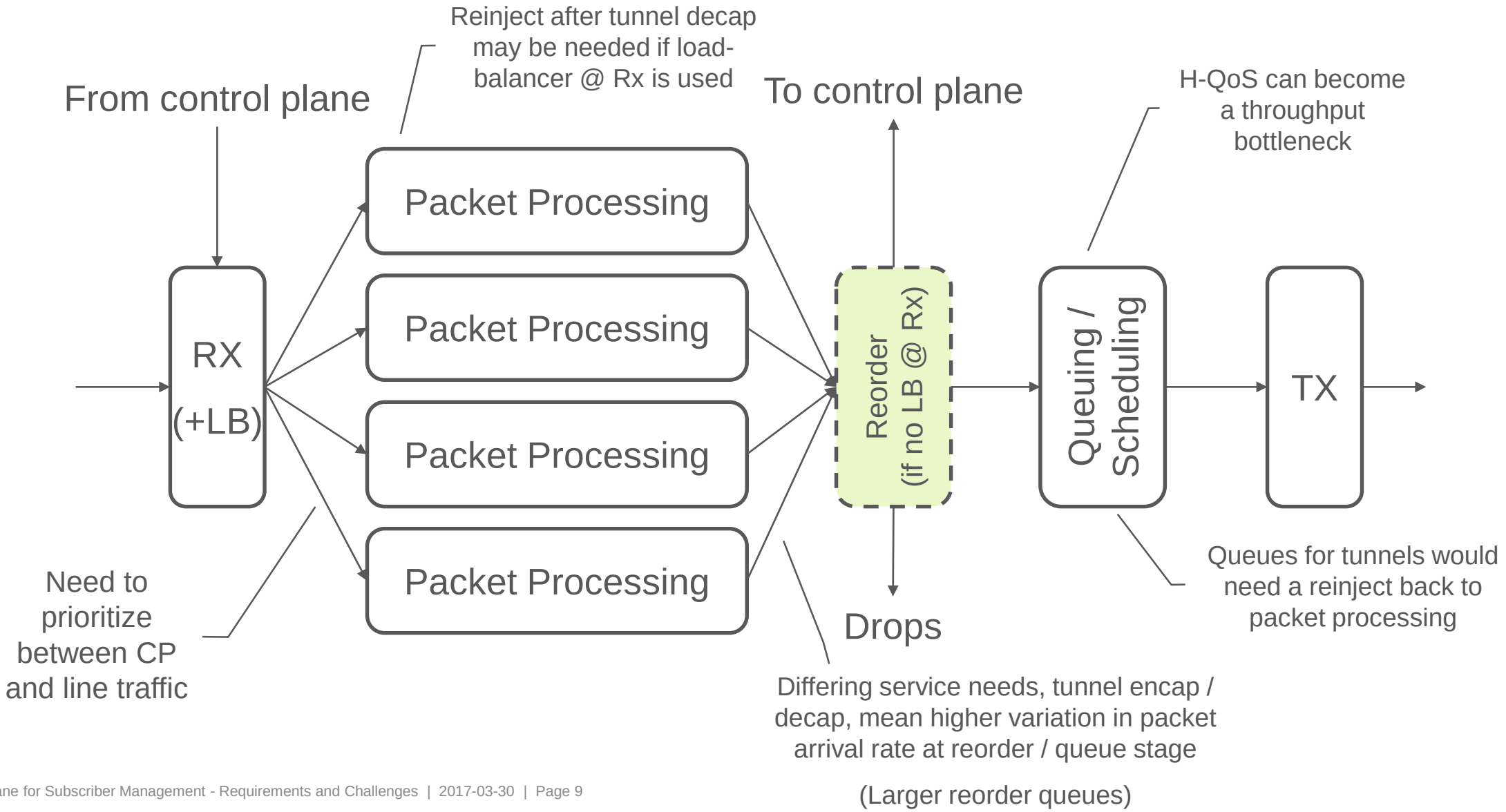
Service Provisioning

- Services made available to a subscriber can change at any time
  - Pre-paid model: Once limit is reached, service needs to be deactivated
  - Value-added services: Subscribers can purchase at anytime and expect instant activation
  - Time-based services: Increase in bandwidth or usage during peak / off-peak hours
- Service changes are communicated to subscriber gateway via policy control nodes
- Results in reprovisioning of an active packet processing chain for subscriber
  - Will such reprovisioning result in temporary traffic impact?
  - Can services be added / removed with minimal to nil hit?

Conceptual Dataplane



Typical Dataplane Design



Scale - Memory Implications

- Large number of statistics – both to be collected and pushed periodically
  - Session level counters
  - Counters for each service
- Large number of /32 (v4) [or /128 (v6)] routes
  - 1 per subscriber: IPv4 (/32 routes)
  - 2 or 3 per subscriber: IPv6 (Covers link-local, IA-PD and IA-NA routes)
    - Link-local and IA-NA would be /128 routes
- Large number of QoS policers / meters
  - Each session (and each service as well) would need to be rate-limited as per SLA
    - Thus, multiple policers / meters per subscriber

Scale – Timer Implications

- Session timers include
  - Protocol (keep-alive) timers
  - Idleness detection timers
  - Session lifetime timers
- Higher scale can result in many timers firing simultaneously
- Offloading of protocol timers to dataplane can increase responsiveness
  - Lowers burden on control plane
  - Lowers traffic between dataplane & control plane
  - BUT: Impacts dataplane throughput traffic!

QoS Aspects

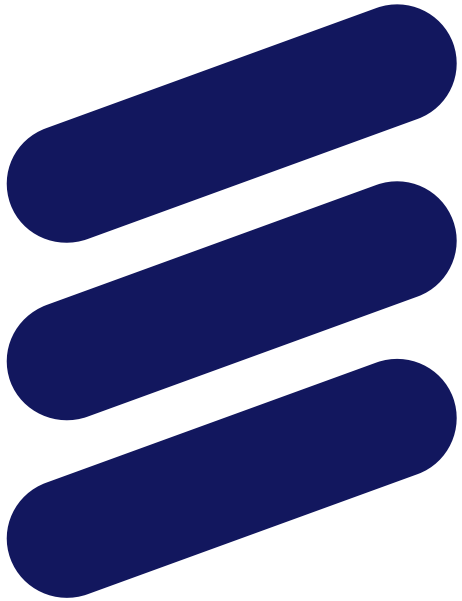
- Since we create / remove subscriber sessions continuously, the H-QoS scheduler cone is dynamic and changes constantly
- Bandwidth oversubscription is required
  - Cannot ensure no oversubscription via configuration
- Memory requirement can be huge
  - But can result in packet buffers sitting in queues and starving the pipeline

NFV IMplications

- Backplane (chassis terminology)
  - Path between dataplane and control plane
  - As mentioned earlier, design of this path is critical for effective functionality
    - We saw that certain kinds of traffic cannot be lost
  - Backplane QoS is an essential characteristic of subscriber gateway dataplane
- Fabric (chassis terminology)
  - Path between dataplane and service plane
  - In chassis systems, designed to be high throughput and near lossless
  - Subscriber gateway requires the essential properties of chassis fabric to be mimic-ed
    - Loss of fabric traffic also results in poor SLA adherence

NFV Implications

- Subscriber traffic likely to be carried over L2-over-L3 tunnels
  - Optimizing dataplane for tunnels may become the common case!
- Service plane via separate service VMs
  - Packet processing at subscriber gateway can become simpler – hence faster
  - Service chain support in the dataplane
    - Subscriber gateway can just add service chain tags in its dataplane or interact with SDN controller to setup service chain paths



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