Low Latency Xhaul (LLX) over DOCSIS® and Other Transports

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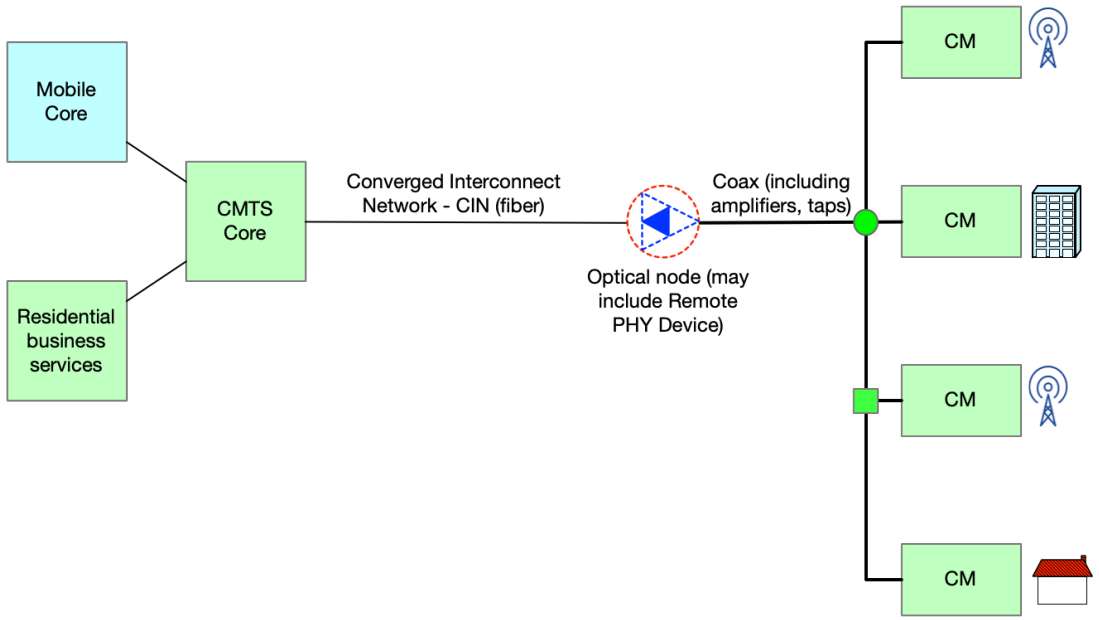
2020.03.24

DOCSIS® Network as a Transport



Downstream

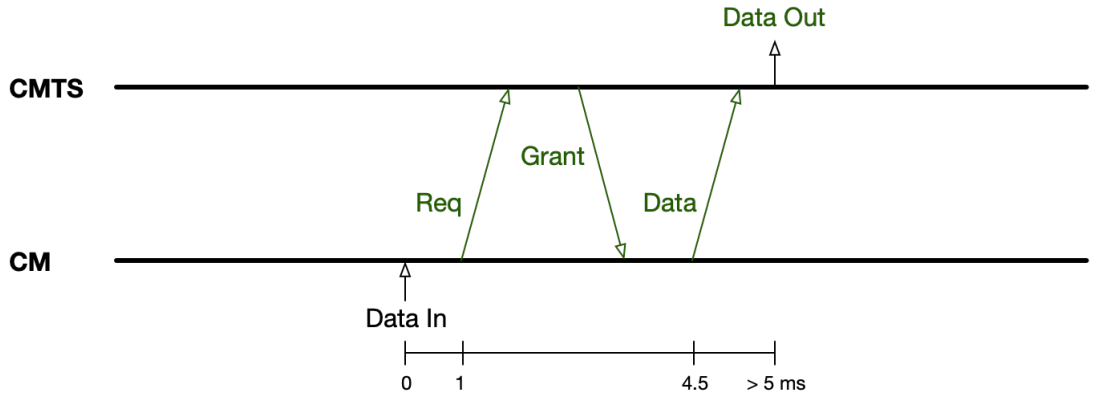
- 1 transmitter: CMTS
- Multiple receivers: CM

Upstream

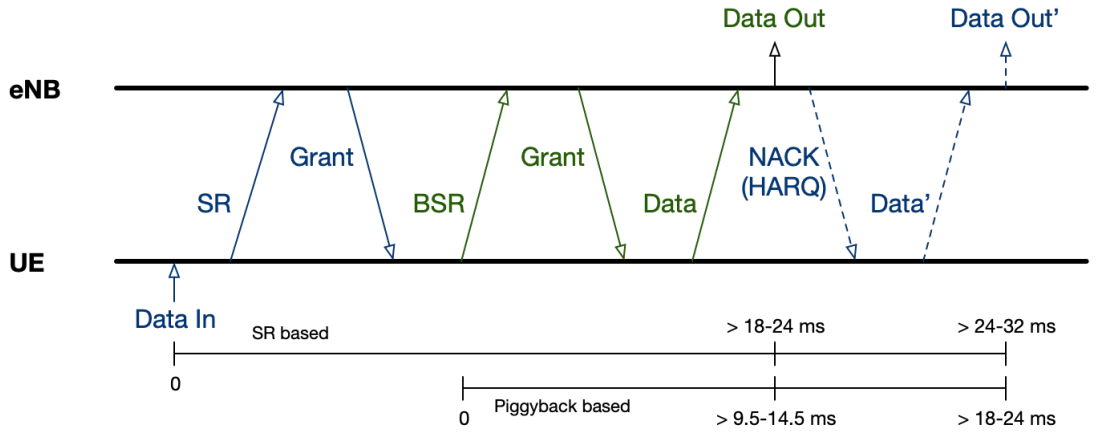
- Scheduling modes
  - Best effort / piggyback
  - UGS (semi-persistent)
  - RTPS (poll-based)
- Typical US latency: 5 – 50 ms
- Load dependent

DOCSIS and Mobile Scheduling

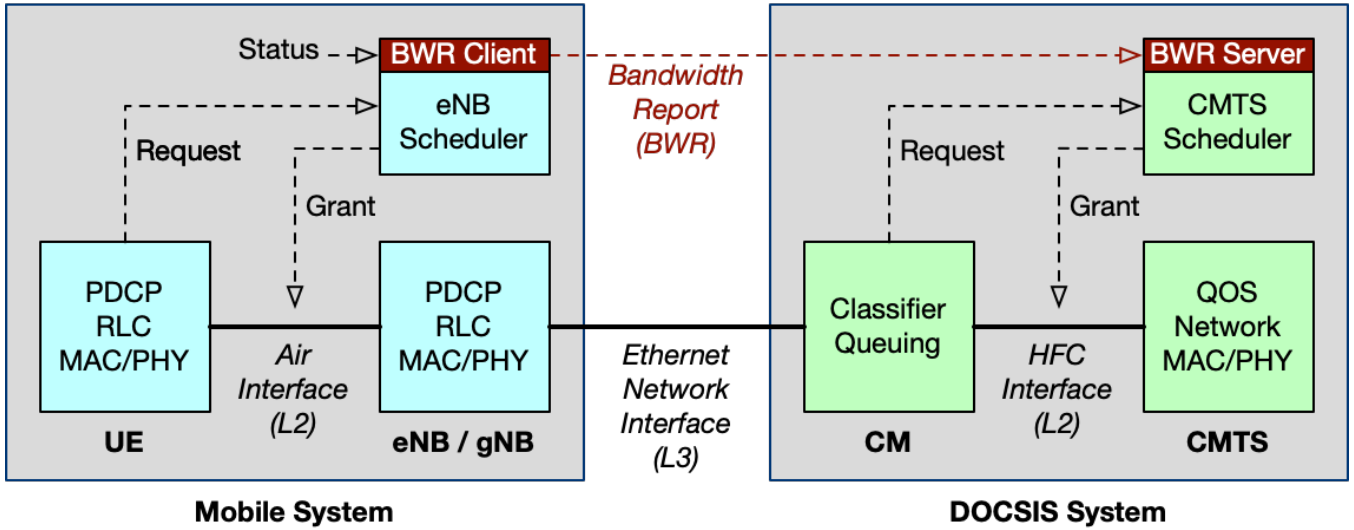
DOCSIS



LTE / 5G

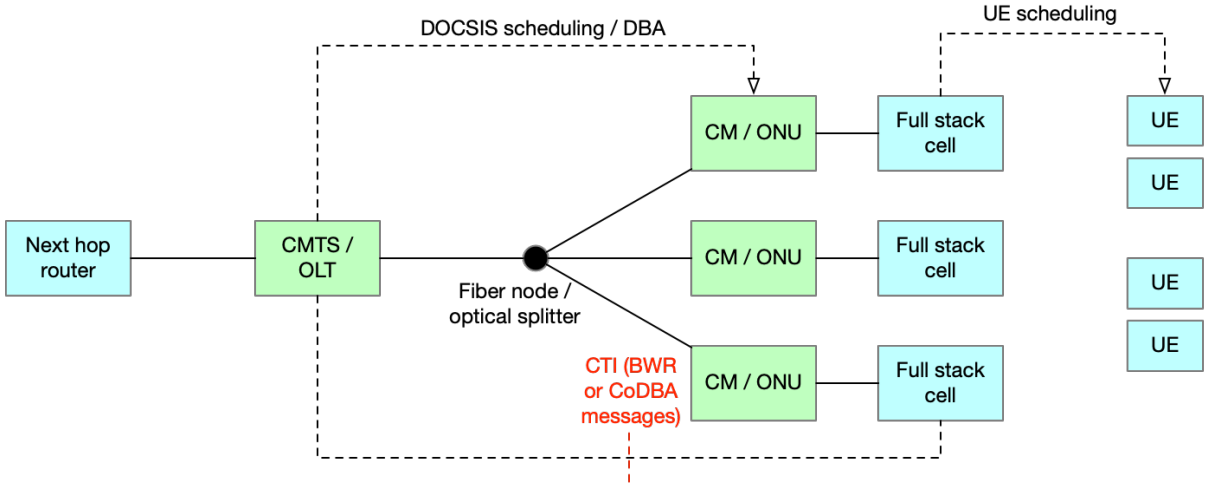


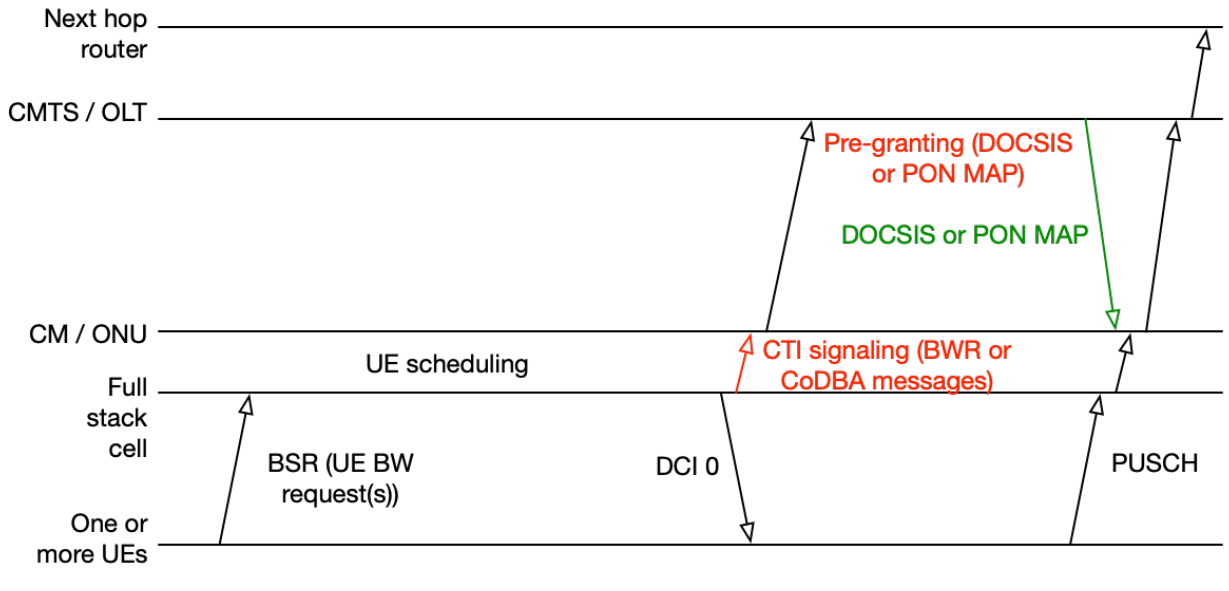
Low Latency Xhaul – LLX



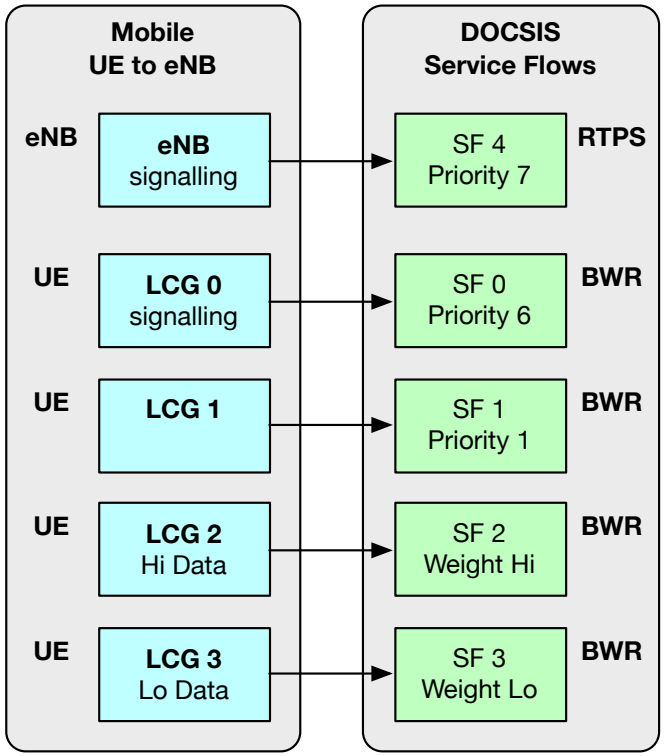
- Mobile and DOCSIS are similar in concept. Both use a scheduled uplink/upstream
- BWR (Bandwidth Report) lets the mobile scheduler to tell the CMTS how many bytes it schedules in the future
- This allows DOCSIS scheduler to preschedule the correct number grants
- BWR connects the mobile scheduler to the DOCSIS scheduler to create a scheduler pipeline that effectively decreases DOCSIS US latency to 1 to 2 ms

LLX with BWR Message for Backhaul





LLX Common QoS Framework



Example DOCSIS priorities/weights are shown

LLX recommends a consistent QoS policy across mobile and DOCSIS

- Align the DOCSIS service flows with the mobile flows (e.g. four BWR flows for four LCGs)
- Align the DOCSIS scheduling policy with the mobile scheduling policy (priority & weight)

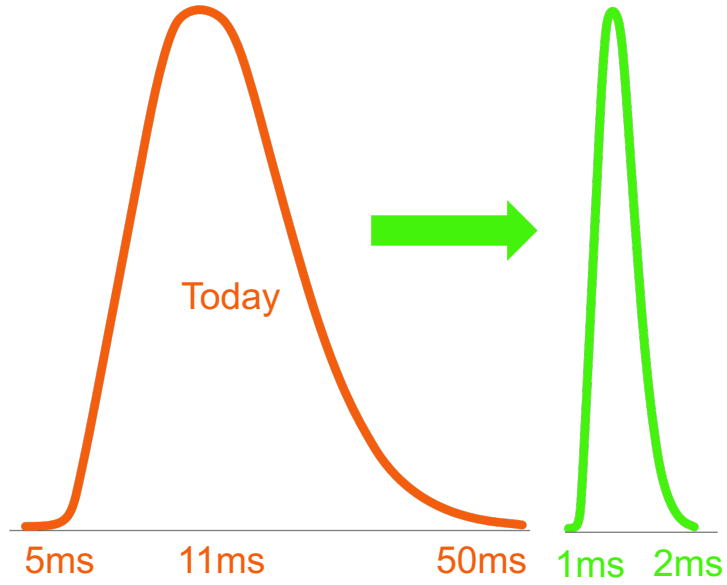
High priority traffic always gets through with the least latency

Prototype to Deployment

CableLabs

Deployable today

- LLX* spec was issued in June 2019
- LLX I02 is expected April 2020
- Implementations on CMTS and RAN equipment
- Lab testing and trials completed



One technology, multiple deployments

- BWR works with backhaul, midhaul, & fronthaul
- BWR concept works on DOCSIS and PON
- BWR works for LTE today and will scale with 5G

Mobile industry-wide adoption

- ORAN working on CTI, based on LLX, and will further incorporate PON-specific needs
- CableLabs, MNOs and vendors driving CTI spec. Phase 1 spec publicly available shortly

LLX spec link: https://specification-search.cablelabs.com/CM-SP-LLX

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