Dynamic network resource management

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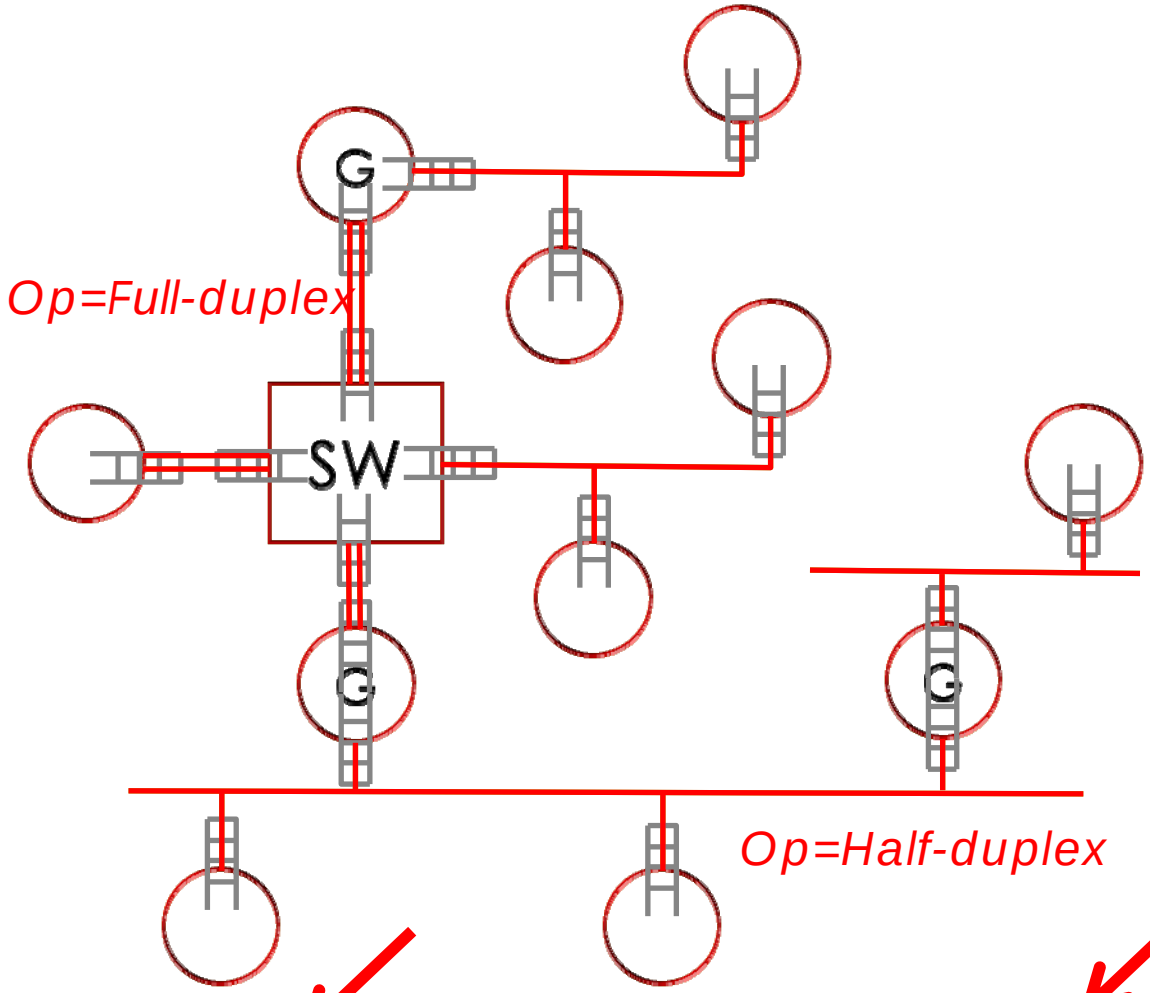
Generic Network Topology



- Segments (Links)
- Network elements
  - Switches
  - Gateways
  - End-points (NICs)

$$R \equiv \left\{ L_i : L_i\left(C_i^L, MAC_i, Op_i\right) \right\} \cup \left\{ E_j : E_j\left(\left\{ L_i^k, QP^k \right\}, k \in \{1,\ldots,N_j\}\right) \right\}$$

Stream model

- Load
  - Bandwidth + release jitter
  - Usage time + period + release jitter
  - Average rate + burstiness (jitter incl.)
- Source end-point
- Destination end-point(s)
- Intermediate points (routing)

$$S \equiv \left\{ St_m : St_m \left(Load_m, Src_m, \left\{ Dst_m^1, \cdots, Dst_m^k \right\}, \left\{ Int_m^1, \cdots, Int_m^k \right\} \right) \right\}$$

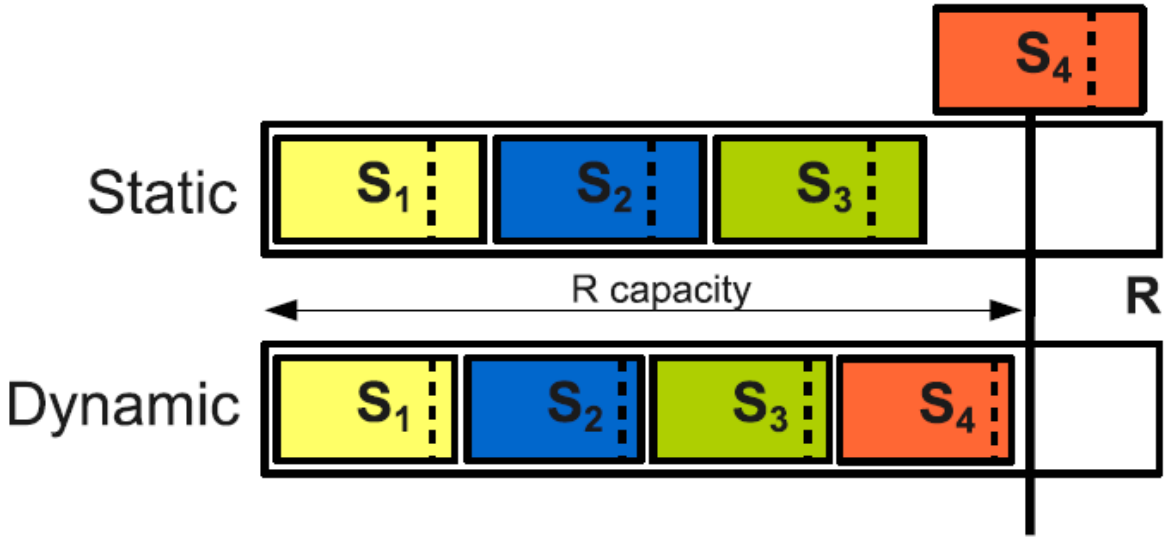
Network - dynamic management

- Resource allocation to streams
  - Involving each segment in the route.
- Centralized / Distributed

- Each segment executes a scheduling policy
- Admission control – Schedulability tests
  - Rate-based
  - Response-time-based
  - Utilization-based

Pursuing Utilization-based analysis

- On-line management => Fast sched. tests
- A utilization limit defines the resource capacity
- Any BW-based QoS distribution scheme applies
  - Particularly bandwidth additive schemes.



However, U-based analysis...

- Exist only for very specific scheduling policies
- Are typically pessimistic
  - the higher the inherited jitter across gateways/switches, the higher the pessimism

- We need ways to reduce the jitter accumulation across Gw/Sw...