Existing Approaches to Traffic Management

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IETF 77

General reasons for doing traffic management

- Cheaper than expanding capacity
- Allows operators to build out on their own schedules, avoiding emergency upgrades
- Allows fine-grained control over level of service
 - Market segmentation

Just throwing capacity at it

- Benefits:
  - Straightforward
  - Meets growing demand
- Drawbacks:
  - Expensive
  - Cannot increase other networks' capacity
  - Not amenable to market segmentation
  - Costs spread across all customers, including those who are not heavy users

Current approaches to traffic management

- Volume-based

- Rate-based

- Application-based

- Combinations of the above, addressing two design decisions:

  – What metric is basis for decision?

  – What action is taken?

Volume-based

bit-rate / time
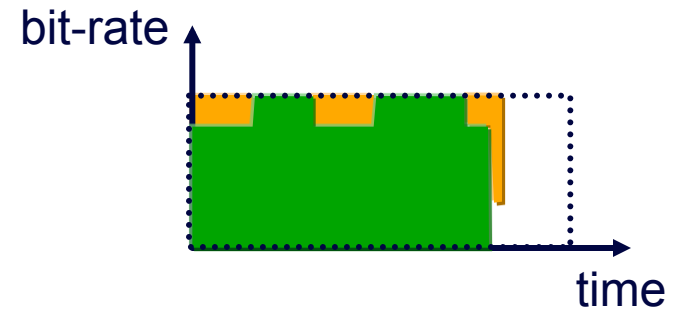
- Uses Σ bytes over some time frame
- Benefits:
  - Simple to calculate
  - Diversity of uses: volume caps, volume-based penalties
- Drawbacks:
  - Too restrictive in times of little traffic
  - Not restrictive enough in times of much traffic

Rate-based

- Limits transmission rate per user
- Benefits:
  - Simple to implement
- Drawbacks:
  - Overconstrains rates during low usage periods
  - Underconstrains rates during high usage periods
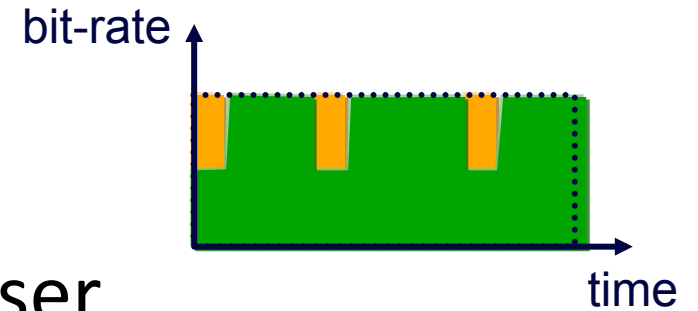
Application-based
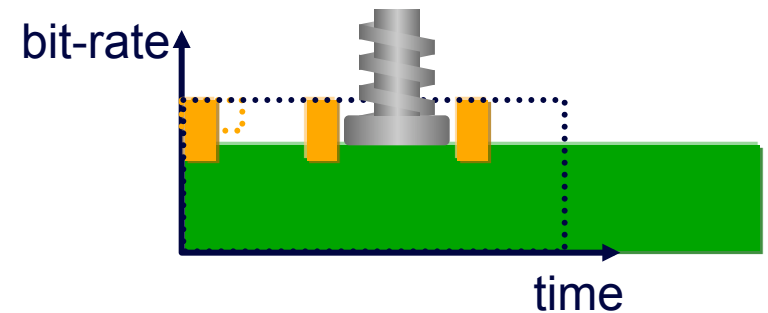
- Limiting throughput of specific applications
- Benefits:
  - Sensitive to application and user characteristics
  - Same tools (DPI) may already be in use for other purposes
- Drawbacks:
  - Cat-and-mouse game with applications developers
  - Expensive
  - Requires continuous software updates and management
  - Public policy issues: privacy, liability, user backlash

Combinations

- Single solution can combine approaches
  - E.g., measure volume to identify heavy users, then throttle their use of particular applications
  - E.g., measure volume to determine what "peak hours" are, then reduce rates during those hours
- Typically combined with capacity increases

Benefits of congestion exposure

- Incentivizes reduced-congestion protocols like LEDBAT

- Exposes congestion end-to-end, across network borders

- Provides transparency at every network node
  – Also good for capacity planning

- Avoids cat-and-mouse with apps developers, other drawbacks of application-based approaches

- Any-to-any traffic: enables Internet-wide solutions

bit-rate

time