Existing Approaches to Traffic Management

Alissa Cooper

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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

- Uses $\Sigma$ 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