Load-Sensitive Routing of Long-Lived IP Flows

Anees Shaikh, Jennifer Rexford, and Kang G. Shin
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Florian Kerschbaum
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What’s the goal?

- Dynamic Routing $\Rightarrow$ Load-Balancing of Network Links
What’s the problem?

- Delayed update of link state
- Many short-lived flows
  \[\Rightarrow\text{Route flapping}\]

Dynamic routing on the timescale of packets or connections
What’s the idea?

- Separate traffic into long- and short lived flows (heavy-tail distribution)
- Dynamically route only long-lived flows
- Keep route during flow

⇒ Moves timescale of dynamic routing to lifetime of long-lived flows
Details

- What to do with short-lived flows?
  Route along regular shortest path
  ⇒ Divide bandwidth into regular and dynamic traffic

- Hard or soft limits?
  Hard limit for long-lived flows, soft for short-lived

- How to detect long-lived flows?
  By observation: after x packets/seconds

- How to keep the route (route-pinning)?
  Some (source-initiated) signaling (and reservation) protocol

- How to select the route?
  Source-based weighted shortest path first
Parameters / Trade-offs

- Route update time
  Number of link-state updates messages
  Number of route computations
  Accuracy of link-state information at routers

- Flow trigger (number of packets, aggregation)
  Number of signaling operations
  Bytes routed dynamically

- Provisioning of network links
  Number of rejected flows (for dynamic routing)
  Congestion due to bursts

- Shortest-path exceeding length
  Overall resources
Evaluation Results

- It works! (better than dynamic routing)
- It works over ranges of the parameters (stable)
- It works very well with large link-state update periods
My opinion

What’s good?

• It works (in simulation)
• Simple, but convincing idea
• Very good evaluation
  own simulator
  real traffic patterns
  exhaustive evaluation of parameters
• Scientific approach (one parameter at a time)

What’s bad?

• Little motivation for idea
• Requires signaling protocol