Packet Classification with Explicit Coordination

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**Packet Classification** is a fundamental building block of many network services and applications.

- It is resource- and computation-intensive.
- Classifiers often do not have semantic context of what they are classifying.

**APPROACH**

- Introduce packet classification as a fundamental primitive of the network protocol stack.
  - New classification layer – **Clayer**
  - Offload part of classification tasks to the **helpers** (e.g., end hosts, edge routers) that have better semantic context than the classifiers (e.g., middleboxes).

- Create a robust signaling protocol to coordinate between helpers and classifiers that can handle:
  - Non-symmetric paths and path changes
  - State discrepancies and losses (use soft-states)
  - Trust, security, and privacy concerns

- Design and develop a generic **API** to make Clayer functionalities accessible from different network services and applications.

**Clayer PROTOCOL**

- **Clayer** uses a 4-way handshaking protocol analogous to the 3-way TCP handshaking.

- **Flexible header format**
  - Except for the **len** field, a classifier has full control over everything.

- **Bottleneck of the design**

**EVALUATION**

- Prototype implemented using Click modular software router.
  - Minimal changes required to port existing software.
  - Experimental results are collected from a 10-node 2-LAN topology on the DETERlab testbed.

**RESULTS**

- **Firewall Prototype**
  - Regular firewall throughput drops 60-80% as the number of rules increases.
  - **Clayer-enabled firewall shows almost no change**

- **Load Balancer Prototype**
  - Regular load balancer can handle 20% less connection while taking 20% more time per connection.