Traffic-Aware Rule-Cache Assignment in SDN: Security Implications

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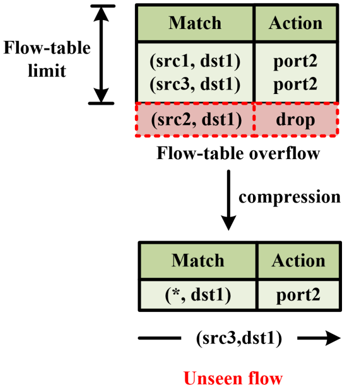
IEEE International Conference on Communications (ICC), 2020

Motivation

- Match-action flow-rules for data-plane forwarding



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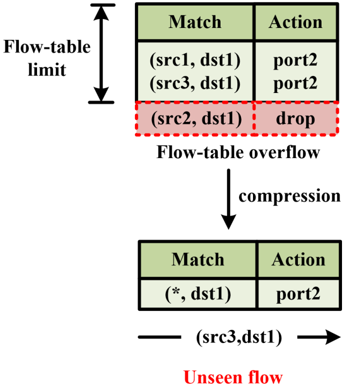

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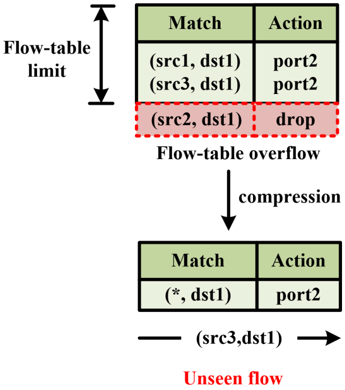

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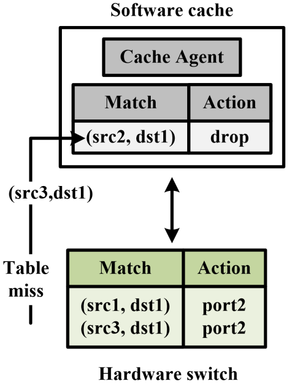

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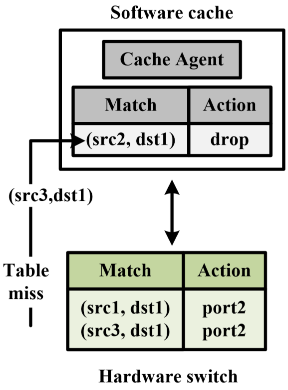

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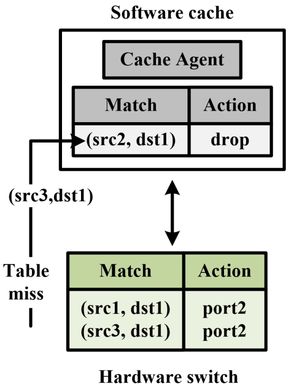
- TCAM hardware augmented with inexpensive software switches[1] [2]
- Distributed software switches $\rightarrow$ scalability and fault tolerance
- Non-uniform latencies between hardware and software cache instances + many-to-many mapping $\rightarrow$ rule-cache assignment problem



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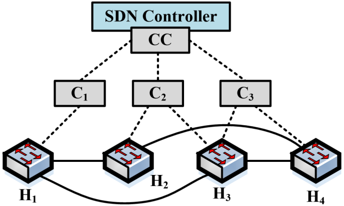

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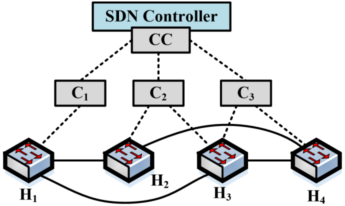

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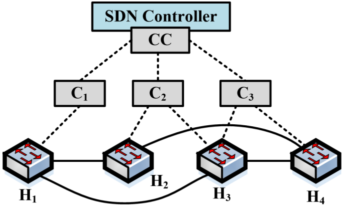

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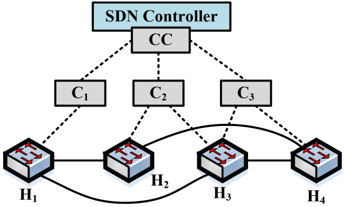

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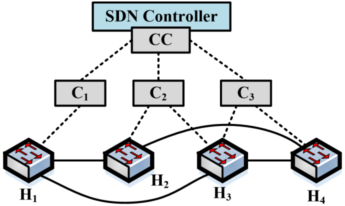

- Minimize software cache instances (static)
- Traffic-aware assignment (dynamic)

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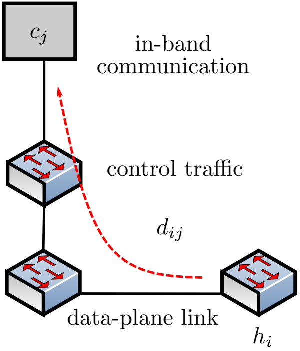

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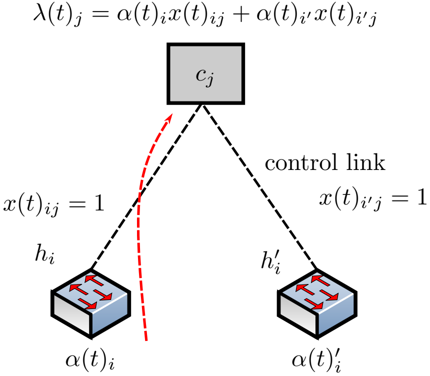

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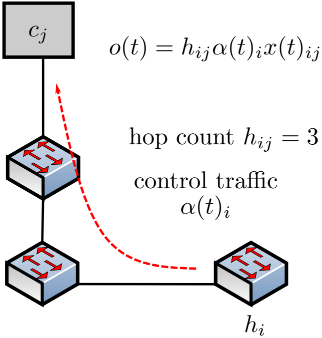

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- Efficient solution needed for dynamic system

Our Approach

- Based on matching theory concepts[1]

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- Third stage: two sided matching

1: Each $j \in \mathcal{C}$ sends association request to its preferred subset $C_i(\mathcal{H})$.
2: Each $i \in \mathcal{H}$ refuses all expect the preferred q_i^{ft} cache instances.
3: **repeat**
4: Each $j \in \mathcal{C}$ sends association request to its preferred subset $C_i(\mathcal{H})$, including those already sent to who have not refused it yet.
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6: **until** convergence to a pairwise-stable outcome

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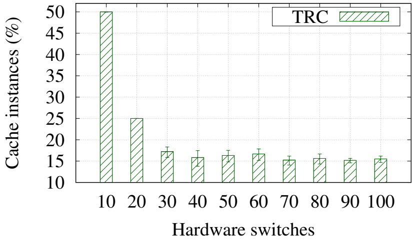

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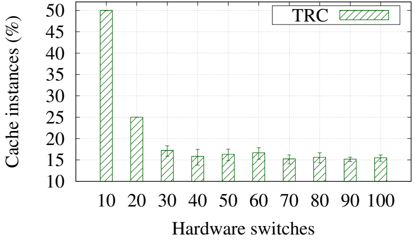

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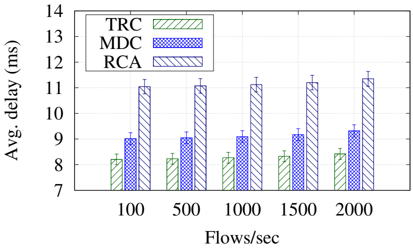

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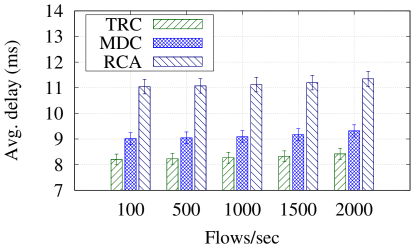

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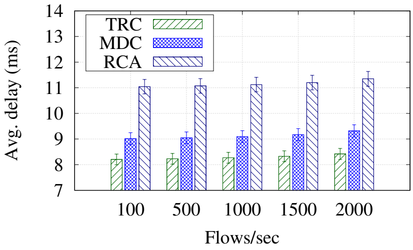

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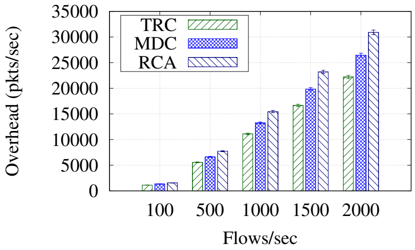

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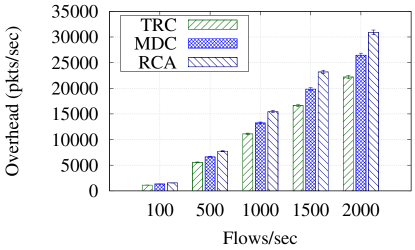

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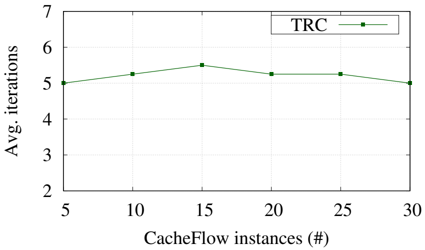

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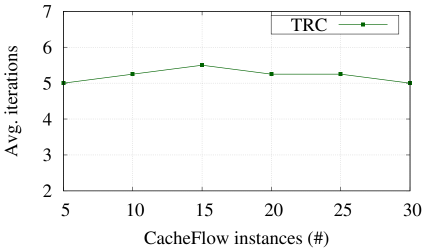

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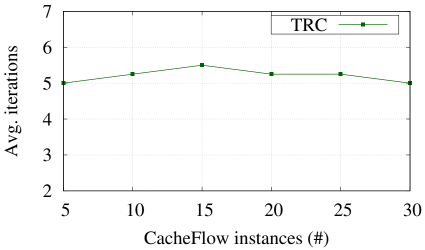
- Efficient for dynamic re-assignment with varying traffic conditions



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