Multi-flow Regular Expression Matching
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Background
• Regular Expression Matching (REM)
  - scan packet flows during runtime
  - essential function of network routers for cyber-security
• Network traffic
  - 40%-50% bandwidth growth per year
  - security issue: worms, virus, etc.
  - consists of millions of packet flows

Challenges
• Multi-flow REM
  - increasing internet bandwidth
    - require high throughput
  - scalable for concurrent flows
    - efficient context switch
  - high-speed multi-flow REM system
    - use FPGA for on-chip circuit
    - large number of states
    - use off-chip memory for storage

Experiments

Motivation

Context Switch
1. REM
   perform single-flow REM for current packet flow
2. load
   read context of the next flow from off-chip memory into FPGA stages
3. switch
   switch contexts of the next flow and the previous flow
4. save
   write context of the previous flow from FPGA stages back to off-chip memory

Conclusion
• Capable of large-scale design
  - a large set of regular expressions
  - a large number of packet flows
• Maintain high throughput
• Achieve efficient context switch

Future Work
• Apply the same solution to other network applications
  - where large amounts of states are involved
• Run-time reconfigurable REME design
  - configure REME during run-time
  - choose specific regular expression sets

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