Architectural Considerations for Network Processor Design

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The Study

- Examine Parallel NP Performance as a Function of Variations in the Workload
- Workload is Abstracted
  - NP must Adapt to Future Workloads
  - Parallel Nature Preserved
  - Results Not Tied to One Algorithm

Data Plane Workload

- Packet Forwarding
- Packet Filtering/Firewall
- Security
- Statistics Gathering
- Congestion Management
- Network Address Translation
- Data Transcoding

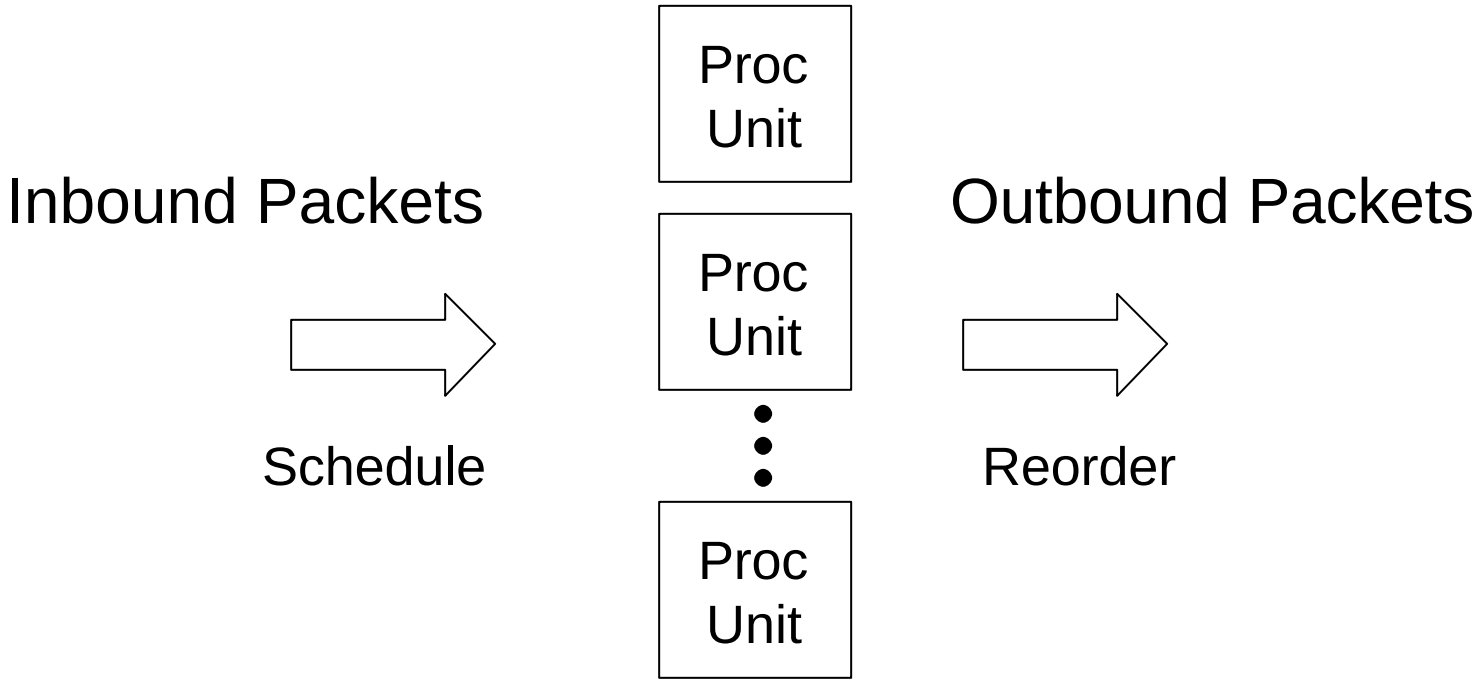
Workload Characteristics

- No Single Application or Traffic Pattern
- Packets Usually Independent
- However, Some Dependencies
  - Network Processor State
  - Stream Cipher Encryption
  - Network Address Translation
- Packets Processed Out of Order
- Workload is Evolving

Simulator

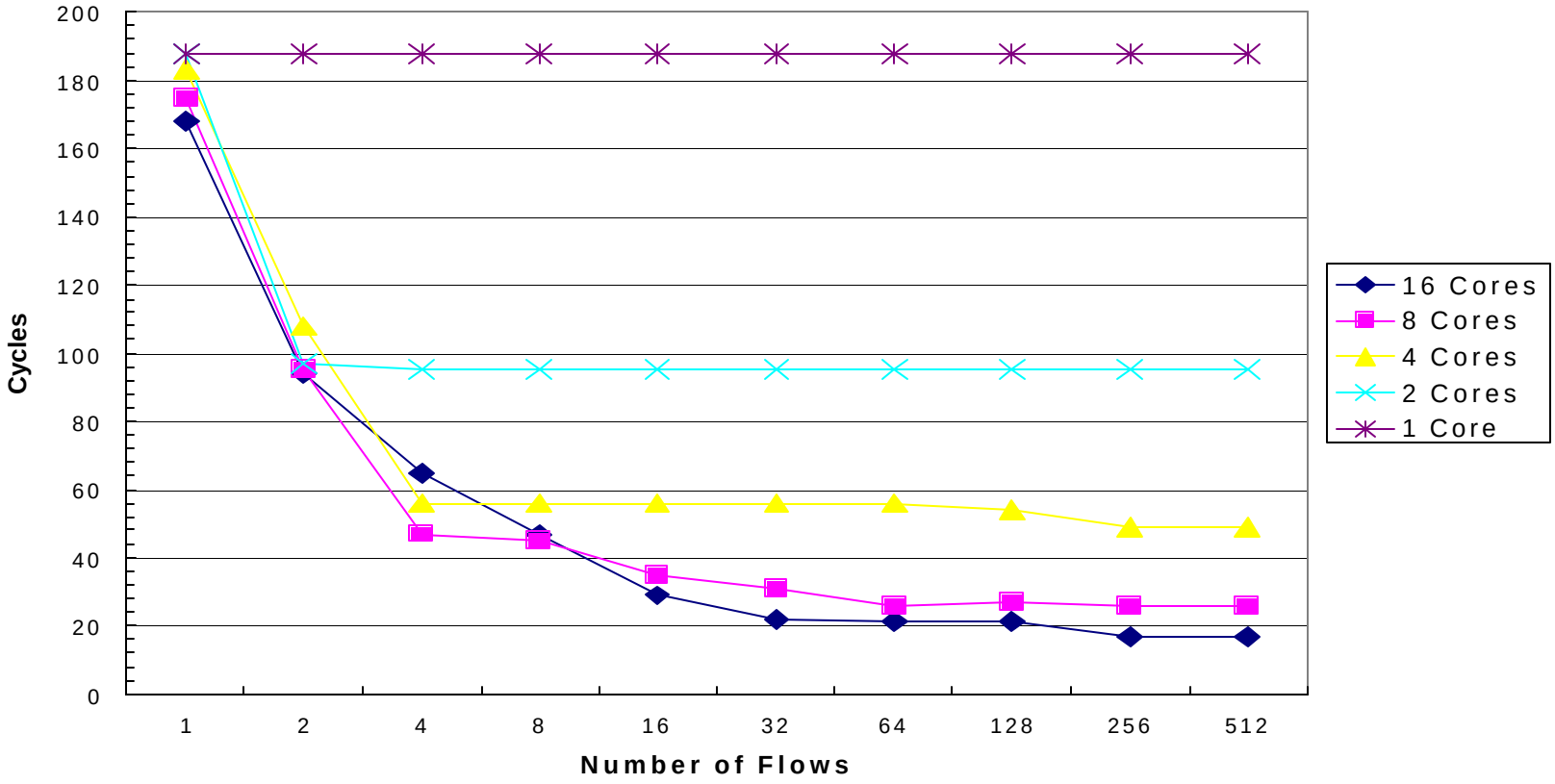
- Analytic Model of a Network Processor
  - Parallel Architectures
  - Packet Dependencies
  - Number of Processing Cores
- Discrete Event Simulator

Chip Multi-Processor



Number of Processing Units Varies

Run Time vs. Dependencies



Summary

- Trend Towards Network Processors
- Workload is Evolving but Exhibits Parallelism
- Evaluate Architectures Based on Abstract Workload to Accommodate Changing Workload
- Parallel Architecture Does Yields Better Performance with Diminishing Returns
- Many Open Issues for Future Work