Scalable, Hardware-Accelerated Network Analytics

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Network Monitoring & Analytics

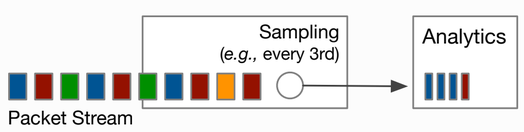
Applications
- Network debugging
- Performance analysis
- Security

Data Collection
- Netflow/IPFIX
- Packet traces
- P4 telemetry systems

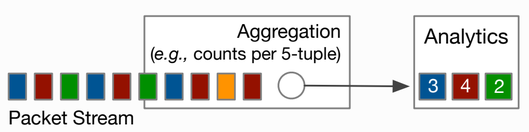
Data Analysis
- Generally post-hoc
- Batch processing, e.g., MapReduce
- Heavyweight deployments

Compromises in Today's Systems

Traffic Filtering



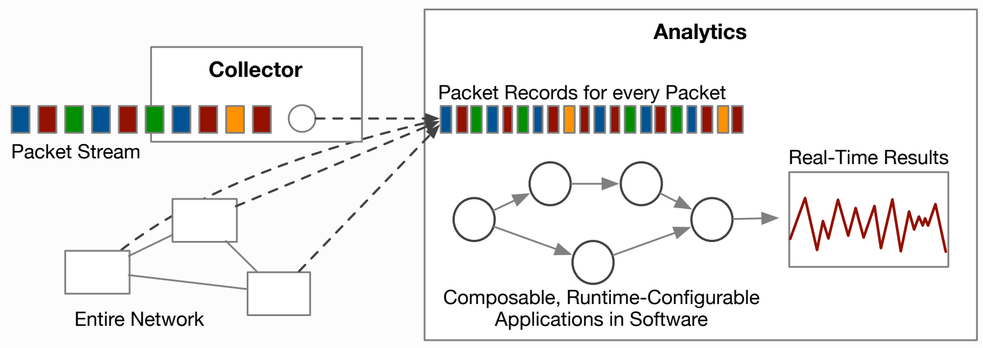
Sampling



Aggregation

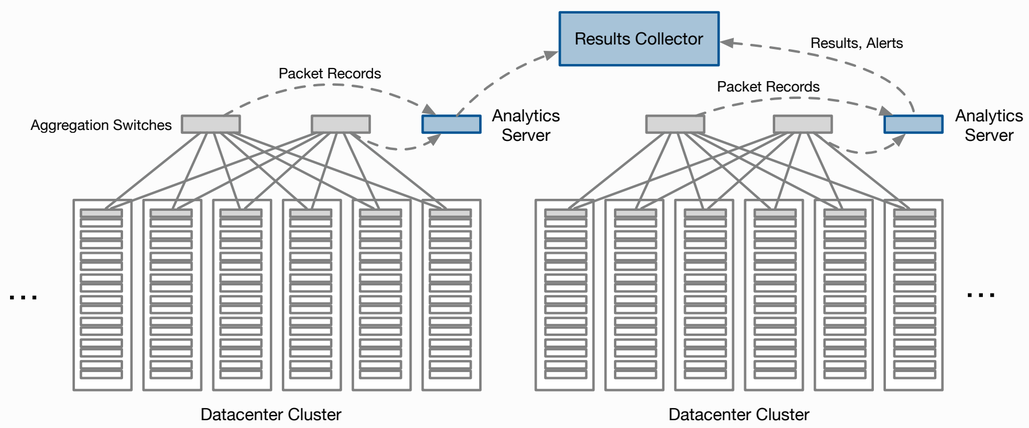
Limited Expressiveness

An Ideal Network Analytics System

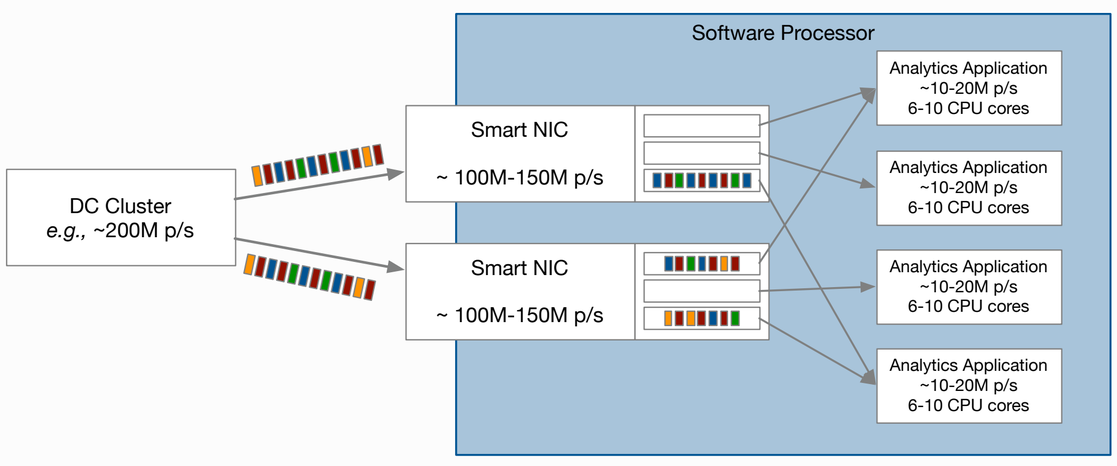


- Every single packet in software (no filtering, no sampling)
- Per packet data (no aggregation)
- In real time (processing as packets traverse the network)
- Composable, flexible analytics applications in software
- Analytics configurable at runtime without downtime

System Overview



Hardware Support



- Initial pre-processing in hardware (e.g., Smart NIC, PFE)
  - Different queues per target application
  - Batching of low-priority traffic
- Zero-copy read into user-space (e.g., DPDK)
- Netronome NFP-4000: 148M packet/s throughput

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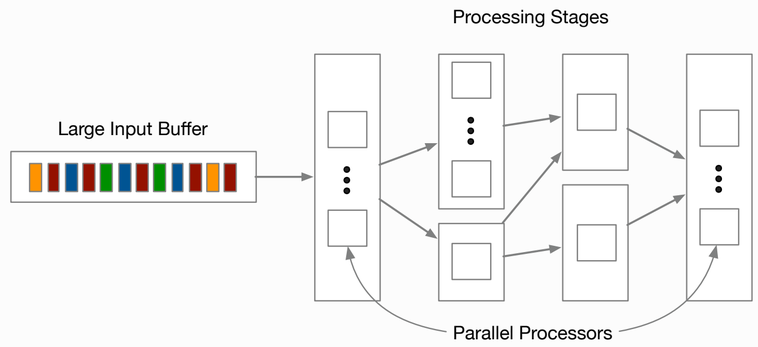
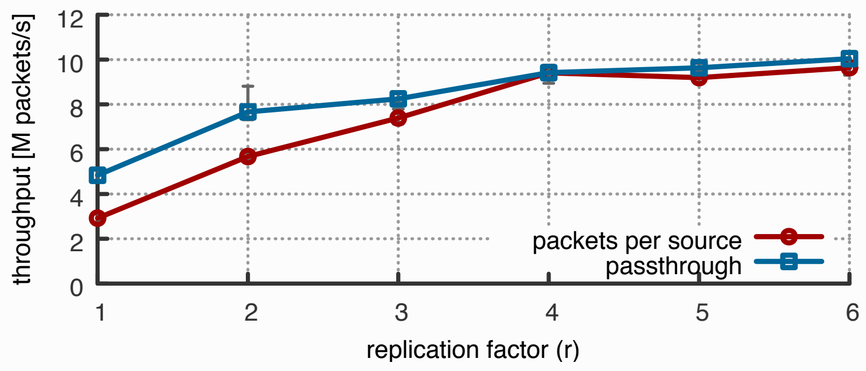
High-Performance Software Analytics



- Processing system based on streaming analytics paradigm
- Processing elements organized in scalable stages
- Run in parallel
- Data is passed between processors through queues
- C++ API with pre-defined elements
- Custom elements easy to implement



API Example:

```
jetstream::app app;
auto source = app.add_stage<source>(1, "eth0");
auto per_src_counter = app.add_stage<pkts_per_src>(3);
auto threshold = app.add_stage<threshold>(1);
app.connect<pkt>(source, per_src_counter);
app.connect<src_count>(per_src_counter, threshold);
app();
```