AURORA: A Data Stream Management System

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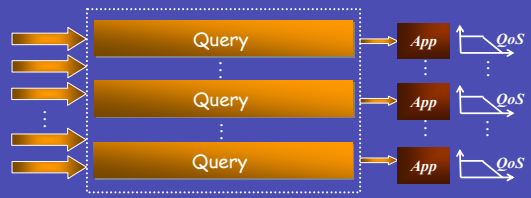
A Brandeis, Brown, MIT Production (http://www.cs.brown.edu/research/aurora)

Stream-based Monitoring Applications

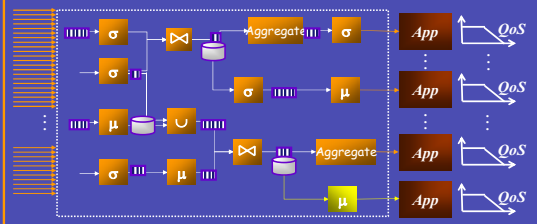
- Monitoring applications:
  - A new class of apps that require timely processing of large volumes of continuous data streams
  - E.g., tracking/monitoring services, financial analysis, sensor networks
  - Traditional DB models are inherently ill suited for these apps
    - Pull- vs. push-based architecture
    - Real-time response requirements
    - Time-series data
    - Approximate answers
- Aurora is a data-stream processing system that is being designed and implemented to support stream-based monitoring applications

Aurora from 30,000 Feet



- Applications provide:
  - Queries over input data streams
  - Quality-of-Service (QoS) specifications (specifies the utility of partial or late results)

Aurora from 100 Feet

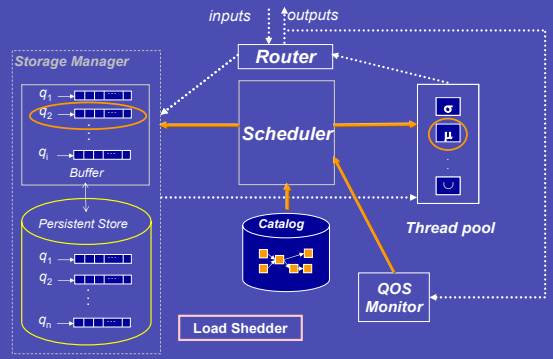


- Boxes → operators
- Arcs → tuple queues
  - can be made persistent via connection points
  - queries can access historical data through connection points

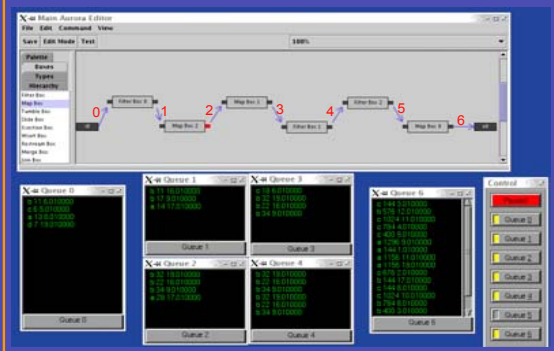
Quality-of-Service

- Per-app QoS specs describe the utility of "imperfect" query results:
  - Delay-based (specify utility of "late" results)
  - Delivery-based (specify utility of "partial" results)
- QoS drives all resource/data management decisions
  - CPU scheduling, storage management, and load shedding, ...

Run-Time Architecture



Graphical User Interface

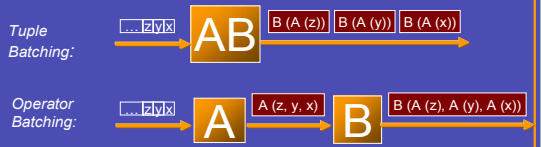


Operator Scheduling

- Goal: "Minimize per-tuple processing overhead"

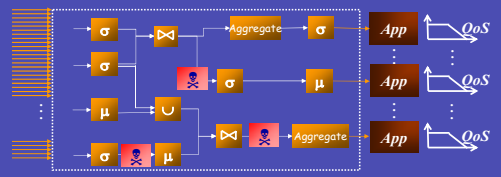
Default Operation: = Context Switch

- Overhead reduction via "batching" (aka trains):

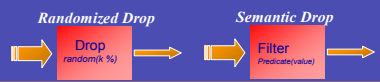


Load Shedding

- Drop access load (i.e., tuples) when the system gets overloaded
- Insert drop operators ( ) such that excess load is shed with minimum drop in the perceived QoS



- Two types of drop operators:



Distributed Processing: Aurora*