Distributed Operation in the Borealis Stream Processing Engine


High-Availability Techniques

- Passive Standby
  - checkpoin on primary to secondary
  - exploits parallelism
  - logs input tuples
  - shortest recovery time
  - lowest overhead

- Active Standby
  - correlation-based load management

- Distributed Operation in the Borealis Stream Processing Engine

Fault-Tolerance

- Handle fail-stop failures of processing nodes, network failures, and partitions
- Flexible availability/consistency trade-off
- Minimize inconsistency subject to maintaining processing latency below pre-defined bound
- Ensure eventual consistency: correct tuples produced during failures
- Replication-based scheme
- New data model: tentative tuples

System Overview

A distributed stream processing engine
- Dynamic and scalable optimization
  - Load balancing + load shedding
  - Network-aware operator placement + distribution
- High availability
  - Tolerance to node + network failures
  - Dynamic revision of query results
  - Corrections from sources + from failure recovery
  - Dynamic modification of query networks
  - Content-based dissemination of query results
  - Server and sensor network integration

Architecture

1. Submit queries
2. Deploy queries to nodes
3. Reflect queries to regional components
4. Generate inputs and monitor outputs
5. Collect statistics
6. Track box movement