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Esper HA

High-Availability for Complex Event Processing

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Esper HA – Overview

- Provides resiliency for CEP Engine State
- As a foundation for both:
  - The horizontal scale-out architecture that is part of Enterprise Edition (see EE), providing linear horizontal scalability, elastic scaling and balancing of load, fault tolerance
  - The classic “standalone” architecture with high-availability in a cold-standby and hot-standby (aka. active-passive) configuration
- State management features

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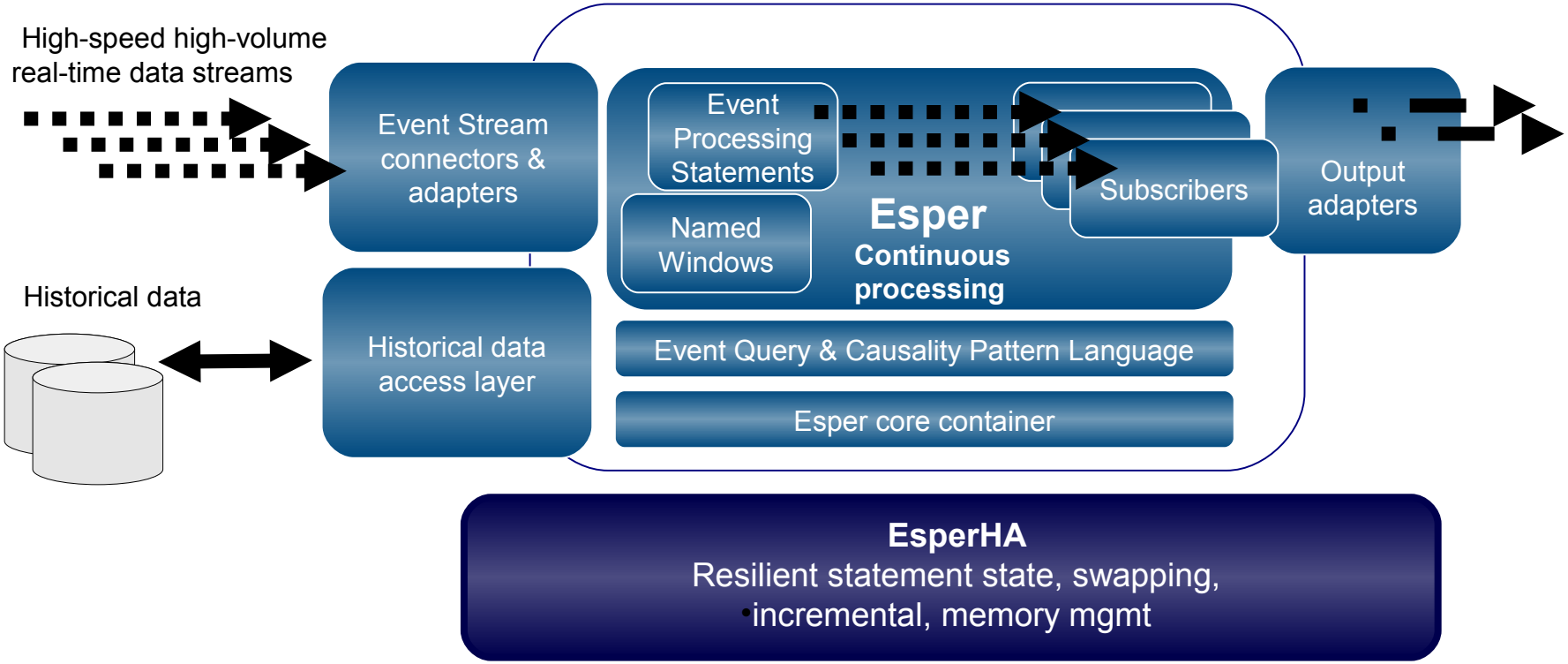
EsperHA as related to Esper



- Resilience for Event Processing Language (EPL) state

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Esper HA – Overview Continued

- EsperHA has two modes of operation:
  - **Selective State Residence (SSR) Mode**
  - **Capture Mode**

- SSR Mode is used by the horizontal scale-out architecture to achieve fault-tolerance, re-balancing, distributed data center support etc.

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Esper HA – SSR Mode Overview (1 of 2)

- Selective State Residence (SSR)
  - The idea of having the state in memory or not in memory as needed
  - Engine state does not need to fit into heap memory
  - All engine state except metadata can be released from memory
  - Reduces or eliminates chance of out-of-memory errors
  - Effectively addresses state hot spots
    - Fast-changing or frequently-accessed state can be in memory
    - Slow-changing or infrequently-accessed state need not all be in memory
  - Allows resource use prioritization of statements
  - Allows fast recovery
  - Engine brings state back into memory when needed (state is not lost)
  - Minimize pause time of checkpoints
  - Organization of state into units (pages) allows IO efficiency and tuning

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Esper HA – SSR Mode Overview (2 of 2)

- SSR supports targets
  - File system
  - Redis
  - JDBC/relational database (MySQL, Oracle, SQLServer)
- Provides detailed statistics

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Esper HA – Capture Mode Overview (1 of 2)

- Capture Mode:
- Statement level QoS configuration (Not an all-or-nothing deal)
- File system persistence
- Incremental and Full Backup for performance and flexibility
- API for selective state extract and load
  - Transferable operator state
  - Replace EPL statement at runtime (with restrictions)
- Detailed IO Statistics

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Esper HA – Capture Mode Overview (2 of 2)

- Capture Mode: File system persistence
  - Optimized for write performance
  - Optimized for fast recovery
- Full-Backup-Only mode
  - Same throughput in events-per-second compared to Esper
  - Same memory and CPU profile compared to Esper
- Incremental-Backup mode
  - Small overhead compared to Esper to track changes
  - Very close throughput in events-per-sec. compared to Esper (estimate -5%)
  - Slightly larger memory and CPU profile (estimate +5%)
- Recovery
  - Algorithms read newest state up to the latest state since last checkpoint
  - Algorithms never replay or read unnecessary state

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Thank you

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info@espertech.com

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