

OpenSpliceDDS Persistence Profile

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Innovation shapes the vision.

Hard work brings it to life.

Determination turns it into success."

— ZettaScale Technology

About ZettaScale

ZettaScale's mission is to bring to every connected human and machine the unconstrained freedom to communicate, compute and store — anywhere, at any scale, efficiently and securely. We strive for excellence as engineers and humans -- we firmly believe that we can't separate "the engineer" from "the human". As such we embrace and promote the Seven Knightly Virtues of Courage, Justice, Mercy, Generosity, Faith, Nobility and Hope.



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OpenSpliceDDS is part of the ZettaScale DDS offering - it is a fully featured DDS implementation targeted for enterprise platforms and devices. It is fully interoperable with Cyclone DDS, Vortex Link and Vortex Insight products. The OpenSpliceDDS product offering is made of the Core offering and a set of commercially available add-ons and extra features. The OpenSpliceDDS Core is a full implementation of the Object Management Group (OMG) Data Distribution Service for Real-time Systems (henceforth DDS) rev1.4 standard (DCPS profiles) and the OMG-DDSI-RTPS v2.3 interoperable wire-protocol.

Overview

The OMG-DDS Persistence profile is an essential element for real-time DDS systems that demand fault tolerance and high availability. Unlike most competing DDS implementations, ZettaScale's OpenSpliceDDS Persistence profile is included as a standard feature in all OpenSpliceDDS editions (OpenSpliceDDS Community & Commercial Editions).

OpenSpliceDDS Persistence Profile provides information management capabilities by assuring high availability of non-volatile information (via fault-tolerant persistence).

In a distributed real-time system, data does not only need to be delivered — it often needs to survive component restarts, network partitions, and even full outages, so that applications can recover state without re-deriving it from scratch. The Persistence Profile addresses this by extending OpenSpliceDDS's Durability QoS policy with a fault-tolerant, distributed durability service, rather than requiring applications to integrate a separate database or replication layer of their own.





Durability QoS Levels

OpenSpliceDDS supports the full range of Durability QoS kinds defined by the OMG DDS specification, giving applications fine-grained control over how much history the middleware retains on behalf of a topic, and for how long:

- **Volatile** — no history is kept for late-joining readers; only samples published while a reader is already matched are received.
- **Transient Local** — the DataWriter itself caches recent samples and delivers them to late-joining readers, for as long as the writer remains alive.
- **Transient** — history is kept by the durability service independently of the writer's lifetime, held in memory so it survives writer or reader restarts, though not a full system power-down.
- **Persistent** — history is stored by the durability service on permanent, non-volatile storage, so it survives even a complete system outage.

The Persistence Profile's built-in durability service manages this non-volatile information in a distributed and fault-tolerant way, and is, uniquely, a distributed implementation of the Transient policy: applications retain state in a fault-tolerant manner, facilitating the creation of highly fault-tolerant systems. The Persistent QoS policy extends this further towards selective information persistence on permanent storage, so that it survives even system outages.

Key Features

The key features of OpenSpliceDDS Persistence Profile include:

- Provision of a built-in 'durability service' that manages non-volatile information in a distributed and fault-tolerant way
- Support for DDS's Transient QoS policy, thus allowing selected information to be maintained outside the scope of individual data writers. The OpenSpliceDDS Persistence Module is, uniquely, a distributed implementation of this policy allowing applications to retain state in a fault-tolerant manner and thus facilitating the creation of highly fault-tolerant systems
- Support for DDS's Persistent QoS policy, that extends fault-tolerant persistence towards selective information persistence on permanent storage, so that it survives even system outages
- Support for configurable 'merge-policies' that facilitate the merging of transient data-sets when communication is (re)established between clusters of processors and related applications



OpenSpliceDDS Persistence profile is differentiated from other DDS persistence profile implementations by its fault-tolerant characteristics (including the merge-policies to recover from traditional 'split-brain' syndromes) implemented by pluggable 'durability-services' that provide configurable and highly granular distributed persistence for fault-tolerant systems.

Recovering from Network Partitions

When a distributed system is partitioned by a network outage, each isolated cluster can continue to operate independently, with its own durability service maintaining state for the applications it can still reach. When connectivity is restored, the affected durability services must reconcile any updates that occurred on either side of the partition — the classic 'split-brain' problem.

OpenSpliceDDS's pluggable merge-policies let system integrators define how these reconciliations happen for each topic — for example, preferring the data-set from a designated master cluster, merging by timestamp, or applying a custom conflict-resolution strategy. This keeps split-brain recovery predictable and configurable, rather than leaving it to ad-hoc application logic.

Benefits

The following are the benefits of OpenSpliceDDS Persistence Profile implementation:

- Transparent and fault-tolerant (replicated) availability of 'non-volatile' data
- Allows easy late-joining of applications without reliance on publisher-presence
- Reduces complexity related to recovery from so-called 'split-brain' syndrome
- Removes the need to integrate and operate a separate database or replication layer purely to preserve application state
- Included as standard in every OpenSpliceDDS edition, so fault-tolerant persistence is available without additional licensing

Support/Maintenance

Zettascale provides world class support, delivering a timely, reliable service to ensure every customer's business success. We offer a wide range of Support and Maintenance Programs which can be tailored to customer's best fit requirements.

OpenSpliceDDS Persistence Profile comes along with the OpenSpliceDDS Core Commercial Edition and the OpenSpliceDDS Community Edition. We offer support through the Community forum for the OpenSpliceDDS Community Edition and full commercial support is available for the OpenSpliceDDS Commercial Edition.



References and For More Information

For further information regarding OpenSpliceDDS, please e-mail: contact@zettascale.tech or visit: www.zettascale.tech



OpenSpliceDDS

DATA-CENTRIC MIDDLEWARE FOR MISSION-CRITICAL SYSTEMS



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