OASIS Evolution

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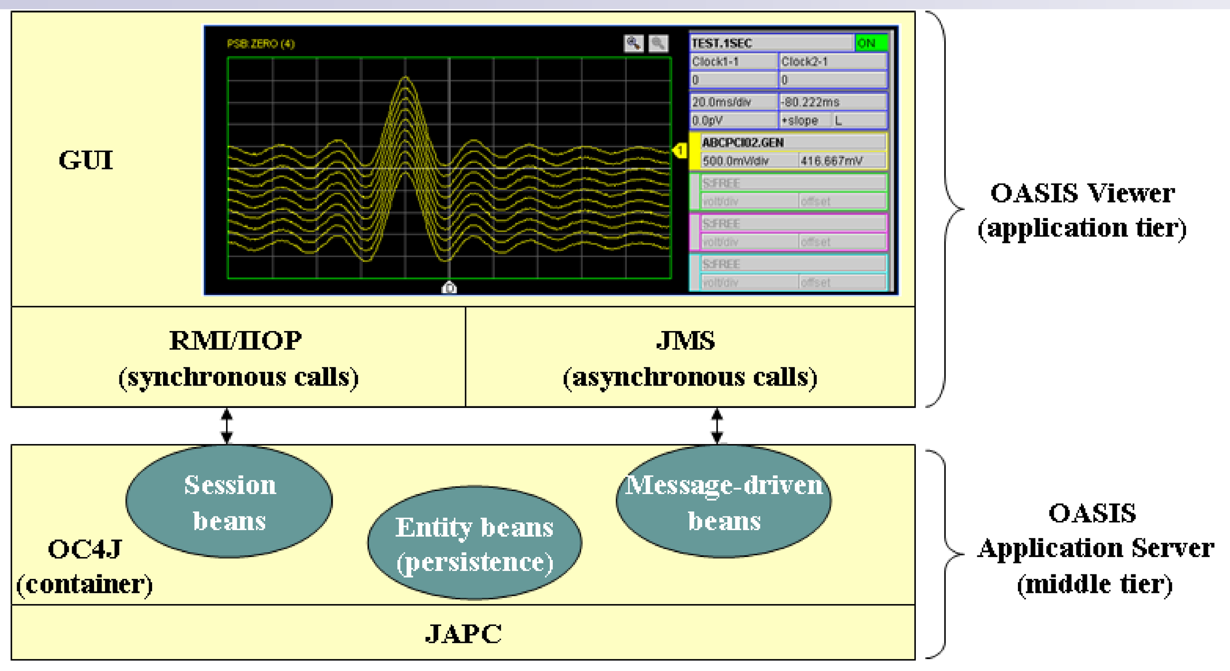
Abstract

OASIS, the Open Analogue Signal Information System, was fully deployed in 2006 and now allows observation of more than 1900 analogue signals in the CERN accelerator complex. Our first operational experience in 2005 indicated that, for performance reasons, a change in the technology used to access the database was needed. Further experience throughout 2006 showed that an even bigger move was required in order to keep the system easy to maintain and improve. Initially based on the J2EE Enterprise Java Beans (EJB) and Java Messaging Service (JMS), the OASIS server was tightly coupled to OC4J, the Oracle's EJB container, and SonicMQ, a JMS broker. The upgrade to the latest version of these products being unnecessary complex and the architectural constrains being major drawbacks of the EJBs, it was decided to move completely away from those. The paper presents the new server architecture based on open-source products – Spring, ActiveMQ & Hibernate. It also presents the improvements done to the user request processing in order to reduce drastically the response time. Finally, the concept of Virtual Signal is introduced along with the new scalability constrain it brings into the system.

Infrastructure changes

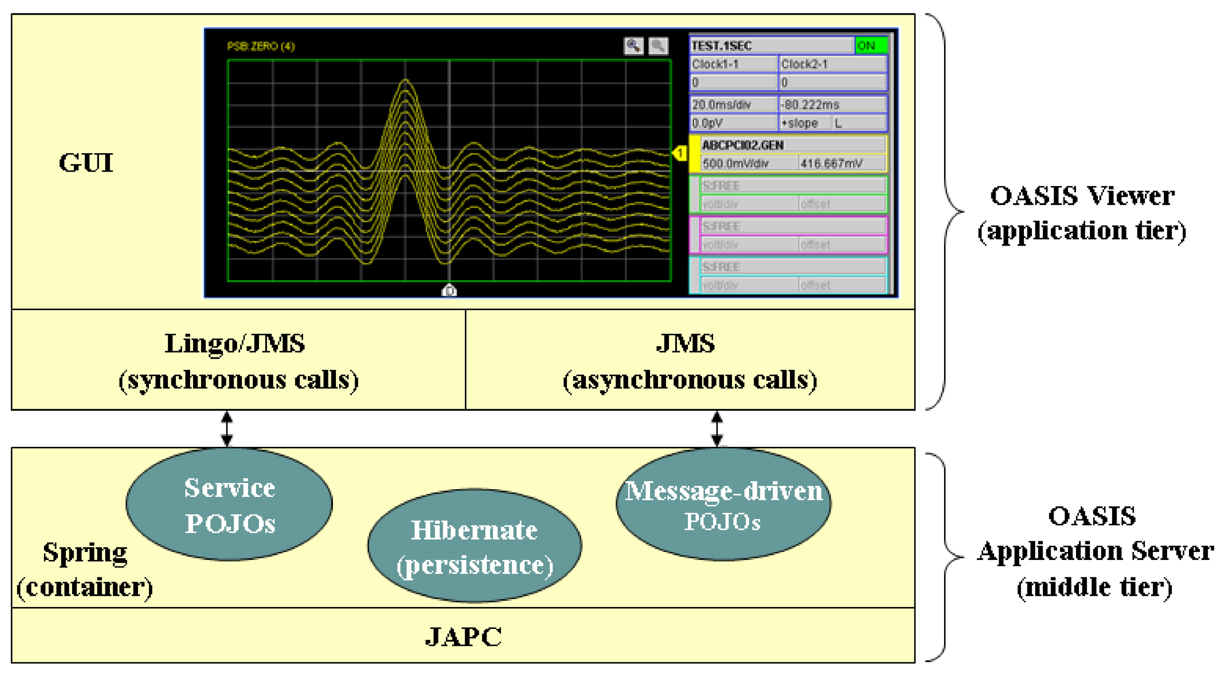
- Entity beans are slow and complex to use.
- Configuration of Oracle J2EE container is complex
- EJBs & J2EE container impose strong architectural constrains. E.g. no user thread
- SonicMQ JMS broker expensive & complex

- ✓ Performance improved
- ✓ Architectural constrains relaxed
- ✓ Developments simplified
- ✓ Configuration & deployment eased
- ✓ License cost reduced



Persistence
Entity Bean ➔ Hibernate with annotation & Spring integration
Configuration
J2EE EJB & Oracle descriptors ➔ Spring Contexts

Client-Server Communication
Session & Message Driver Beans ➔ POJOs with Spring Remoting & Lingo
Stand-alone SonicMQ JMS Broker ➔ Embedded ActiveMQ JMS Broker
Deployment
Oracle J2EE container ➔ Stand-alone JVM

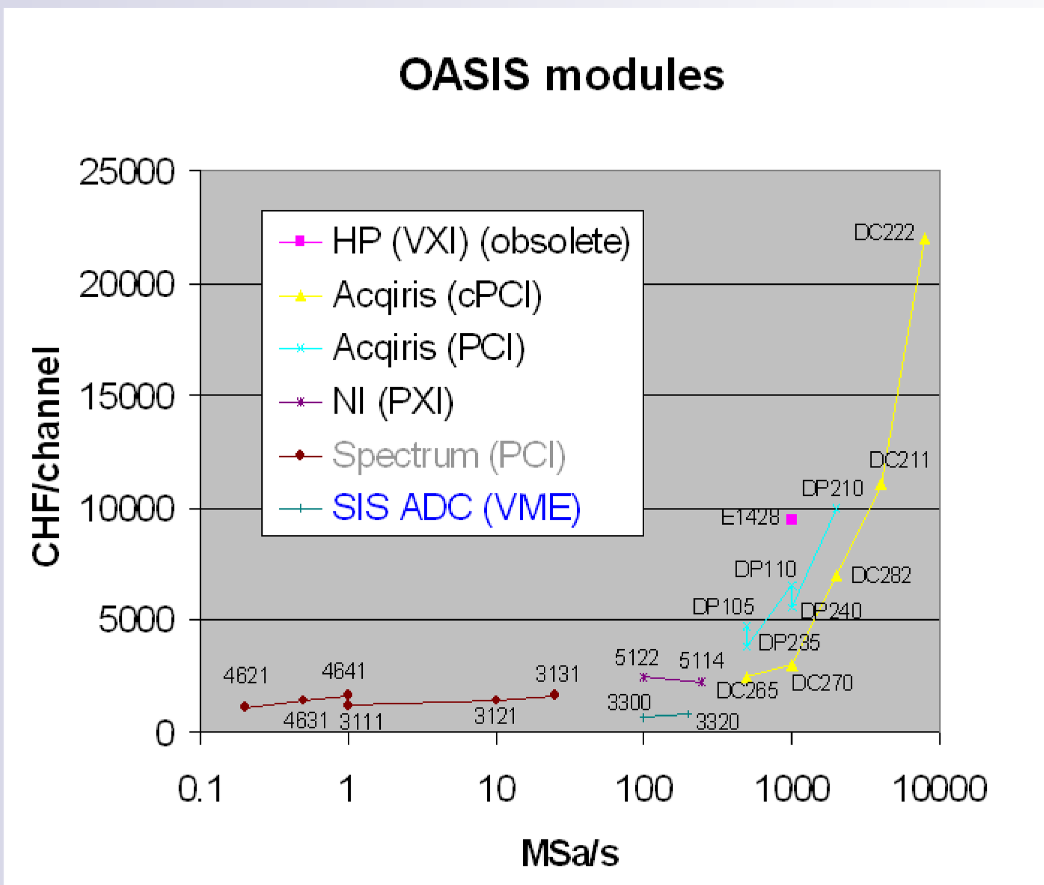


Ongoing developments

ADC & Cost effective hardware integration

The first phase of the project was to provide an open system for fast analogue signal observation.
In order to reduce the cost per signal, the integration of modules with fewer oscilloscope-like features (no sensibility, no offset…) has started.
The chart below shows the digitiser families supported, under integration (in blue) and that will be integrated later (in grey).

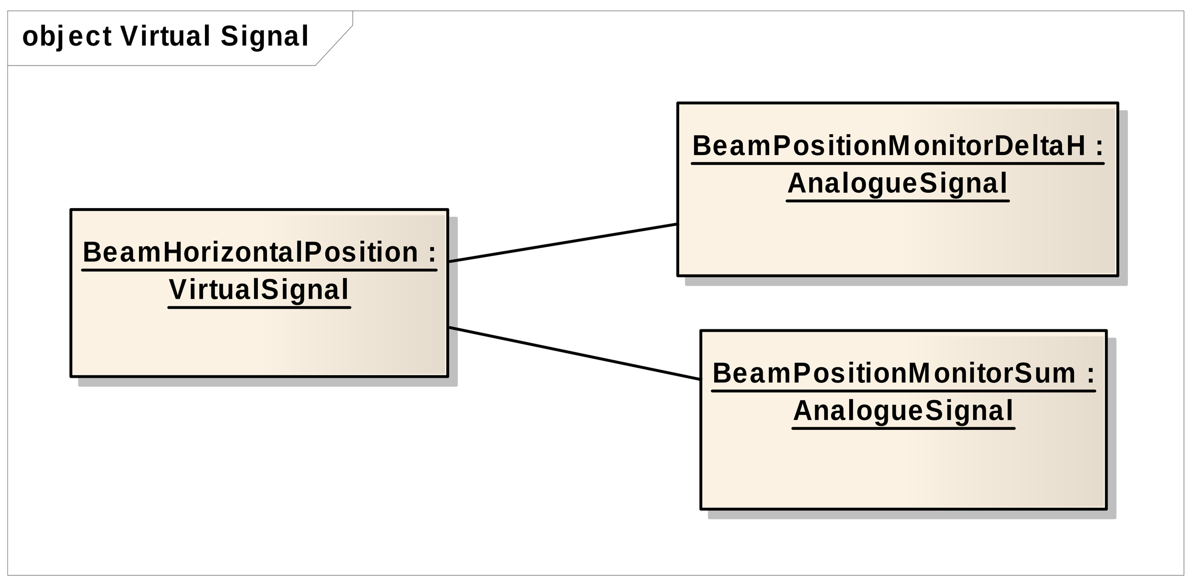
In parallel, the integration of dedicated acquisition systems is also going on with, for example, the LEIR low-level RF digital system and the BPM acquisition system built for the CLIC Test Facility 3 (CTF3) by a LAPP/CERN collaboration [9].



Virtual Signal concept

A Virtual Signal is signal generated by a computation on several real analogue signal acquisitions.

In the example shown below, the Virtual Signal *BeamHorizontalPosition* is the result of the division of the analogue signal *BeamPositionMonitorDeltaH* by the analogue signal *BeamPositionMonitorSum.*



Since the computation on the waveforms is CPU intensive, a scalable schema is required in order to support tens or even hundreds of virtual signals. The front-end tier being the less loaded part of the system, we are developing a virtual signal front-end component to perform the computation. This component is a class developed with the CERN Front-End Software Architecture (FESA) [10].

Conclusions

After a first year of operation, we learnt a lot on the system we did the necessary modifications to have the required system availability. The revised architecture has been running for a year without major problems and with about 40000 connection requests per year, the system is heavily used. A second phase of the project has started with the aim of reducing signal cost and providing the possibilities to the operation to observe high level machine signals.

References

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