M E M O R A N D U M

A/To: See Distribution List

De/From: PS/SL Controls Convergence Project Team
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Concerne/Subject: PS/SL Middleware Project

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Introduction

The control of the CERN accelerator complex and the development of machine control application programs has shown the need for highly distributed communication software. Several significant but different investments were made in the PS and SL controls groups to address this issue. The recent joined investment of the PS and SL controls groups in an Object Oriented Accelerator Device Model and Interface (CERN Java API project) gives the opportunity to co-ordinate efforts to provide a common modern communication middleware allowing the deployment of Object Oriented applications.

Purpose

The purpose of the PS/SL Middleware project is:

"To provide a software communication architecture and services allowing inter-objects communications and supporting, as first priority, the CERN Java API technical specification, including the standard Accelerator Device Model."

This software architecture shall provide homogeneous solutions for implementing all communications functions between the equipment and the application programs. It should ultimately replace existing PS and SL heterogeneous protocols and software components.

The "Distributed OO Architecture Supporting the Accelerator Device Model" schema attached to this memorandum provides a logical view of the desired architecture.

Scope

From a technical point of view, this project must provide a middleware solution supporting the complete Accelerator Device I/O model of the CERN Java API technical specification, in particular:

- the synchronous I/O operations on Accelerator device data
- the distribution of Accelerator device data to client programs, based on the publish/subscribe paradigm and supporting the synchronization of application programs with Accelerator timing information
- methods for deploying the Device Abstraction Layer including interfaces, tools and libraries allowing the connection of physical and virtual devices to the middleware
- the access to generic services (e.g. Data logging, Alarms)

From a strategic point of view, the following activities are considered as part of the project:

- the gathering of the requirements and performance figures
- the inventory of the communication software used in the PS and SL controls software in view of their integration or replacement
- the study of relevant standard middleware protocols (e.g. CORBA) including evaluations and prototypes
- the investigation of inter-operability issues with other middlewares and the proposal of an interface for exchanging data with Real Time systems developed in view of the LHC and with industrial control systems (e.g. OPC servers, DCOM, SCADA)
- a decision regarding the architecture and the commercial products to be used
- the implementation of the proposed solution
- a software operation and maintenance plan

Constraints and interfaces

The following technical constraints and interfaces shall be considered:

- the first priority of the project is to support the Accelerator Device Model and Device I/O services defined in the CERN Java API Technical Specification
- The specification and development of protocols must rely as much as possible on available standards
- The interfaces between this project and the LHC String2 will be discussed beginning of 1999

Objectives

The objectives of the project are:

- to have the PS/SL middleware architecture defined, the relevant commercial middleware product(s) selected and an estimation of the budget and resources for **July 1999**
- to verify the technical feasibility through a prototype using the CERN Java API for **October 1999**
- to confirm final technical decision for **December 1999**, including a software operation and maintenance plan
- to deploy this middleware **mid-2000** in order to be used by the application software of the SPS-2001 project

The PS/SL Middleware project team is also invited, as explained in the CERN PS/SL Controls Convergence Project Definition Report, to produce a Project Definition Report including:

- a decomposition of the project into distinct phases mapping the objectives of the present memorandum
- a project milestone plan outlining the intermediate project results to be achieved

This last document will have to be validated by the PS/SL convergence team and will be used as baseline reference for progress reporting.

The composition of the PS/SL Middleware Project team will be decided by end of November 1998.

The PS/SL Controls Convergence Team

DISTRIBUTED OO ARCHITECTURE
supporting the ACCELERATOR DEVICE MODEL

Accelerator Control Layer
Services : beam operation and optimization

Generic Services Layer

Data Logging/ Archiving

Diagnostic Tools

Alarm Service

API to Accelerator Objects Layer

Services : access to Accelerator devices, devices properties and attributes
High level functionalities such as manipulation of collection of devices and synchronization with machine timing parameters

Configuration Services
Services : naming and directory services, interfaces descriptions

Middleware Layer
Services : distributed data exchange paradigms (publish/subscribe, synchronous I/O, ...) , services and protocols

inter-operability

Device abstraction layer
Services : abstraction of physical and virtual devices into software components and supporting the Accelerator Device Model

Physical device layer
Services : RF, Magnet, Powering, ...