Control System Migration Challenge

Contributors: Matthias Clausen (DESY), Bob Hall, Ron MacKenzie, Judy Rock, Robert Sass, Hamid Shoae, Greg White, Leeann Yasukawa
What are the Problems?

We really have two, three letter problems:

**VMS**

Very Magnificent System

**NLC**

Need Lotta Chutzpah (to build it)
Building and Installing TAO

The following table summarizes platforms on which TAO runs:

**Fully supported, i.e., continually tested and used daily** Solaris 2.5, 2.6, and 7, Windows NT/2000 (MSVC 5.0 and 6.0), Linux/Intel, Linux/Alpha, VxWorks, LynxOS, Digital UNIX 4.0 and 5.0, IRIX 6.x, and QNX Neutrino 2.0

**Nearly fully supported, i.e., periodically tested** Windows 9x/ME, HP/UX 10.x and 11.x, AIX 4.x

**Partially supported, i.e., infrequently tested** FreeBSD, NetBSD, SunOS 4.x, Chorus

**Planned support, i.e., pending** pSoS, MVS, Windows CE, Tandem, SCO, UnixWare

You’ll notice that the three magic little letters (shhh! VMS) are missing.
VMS for the next 5 years

- Near-term support seems assured.
  - It runs Intel’s chip fab lines!
- Development of VMS on Alphas at least through 2006
- Compaq says OpenVMS development on Itanium to go on indefinitely but....
- The port will be hard. Much more work than porting UNIX.
- VMS may be great as a server but not so good an environment on which to develop a distributed Control System for the next 20 years.
- Very little third-party software is available but....
- Compaq is supporting a Java SDK 1.3 and a good optimizing JIT compiler! This will be important later.
Next Linear Collider
Simplified SLC Control System Overview
Migrating from VMS: Key Concepts

- **Oracle database**
  - Configuration
  - Archive data
  - Soft Real-time data from SLC?

- **Distributed Control System**
  - IOCs & Industrial PCs replace our Multibus micros
  - Advanced Display Management/Application Interface
  - Uniform Data Access from Anywhere
  - Standardized Messaging
  - Distributed Application Development Environment
  - OO Capable
What’s Under Development

1. Oracle – Configuration Database
2. Oracle – Archive Data
3. Aida – CORBA-based Accelerator Integrated Data Access
4. CORBA Message Service
5. JoiMint – Java Operator Interface
Configuration Database

Alpha

SCP

SLC DB

Dbex

dbGen

EPICS PCAS

Oracle Config Database

Oracle Admin Databases

SLCnet

Micro

Micro

IOC

XSLT

XML

XSLT

XML

Message Service

TCP/IP

TCP/IP

IOCs

Databases
Archive into Oracle; What’s New?

- Oracle 8i
- Oracle Call Interface (OCI)
  - Low-level interface.
  - Completely revised for Oracle 8
  - Is interface for Oracle’s own products
- Partitioning
  - 64K table segments
  - Each independently managed
  - Can be merged
  - (Almost) unlimited data size 512 Petabytes - $10^{15}$
Oracle Archive Test Results

- Simple SQL Insert: 200 rows/second
- UNIX Pipe and SQL Loader: 400 Rows/second
- OCI with 7 fields 185 bytes: 10000 rows/second
- OCI with only numeric store: 150000 rows/second!
Archive into Oracle

- MCC
  - SLCCAS
    - SLC Database
- ORACLE
  - Archive Engine
  - PEPII IOCs
  - TARF IOCs

SLC Micros
Aida Supporting Ideas

- Name and schema mapping
- Data location discovered at runtime.
- CORBA middleware & services
- Server resilience (auto reconfigure on server down)
- API and OPI
- Language and OS independent
- Collections, Aliases, Range Names
Differences from CDEV

- NT and VMS as well as Unix
- CORBA network layer, not proprietary
- Multilanguage, Java, C++, C, based on IDL
- Dynamic name mapping, based on Oracle not files
- History data, including history playback
- Structured data access
- Data Services
- Monitors based on push_consumer, not just callback
Each name.attribute{.attribute}$_{0+}$ maps to a database query
Aida Logical Architecture

Support get/set/monitor any data from/to any source

[Diagram showing data flow between Application, Data Services, and Data Sources with various connectors to databases like SLC db, Oracle db, CA db, etc.]
Class QUAD {
    private AIDA d;
    QUAD( string name ) { d = new AIDA(name); }

    float get( string attribute ) { return d.get('B_desired'); }
    float[2][6] getTwiss() {
        org.omg.CORBA.Any t = d.getAny('Model.Twiss');
        ...
    }
}

QUAD fred('quad:pr04144');
float bfieldwanted = fred.get('B_desired');
float twiss[2][6] = fred.getTwiss();
Where We’re At

- Have a complete set of requirements.
- Have a development environment using CVS.
- Accessed EPICS, Oracle & old SLC data via Corba.
- Java Corba -> JDBC -> Oracle
- Sample Name & attribute databases with query mapping to get data. 2 million rows.
- Have a Java Orb on VMS
- Complete prototyping at end of year.
- Start detailed design and robust implementation early next year.
What we have now for Aida

Oracle Database

Oracle Name Database

Java Channel Access

CORBA

Monitors

Get/Set/Monitor Request

Interface Definition Language

Event/Notify CORBA Service

CORBA

Services

JDBC

CORBA

CORBA

CORBA

CORBA

Any VMS Shareable

OCI

Java/Corba Interface to the known Universe

JNI-VMS Interface Shareable
CORBA Messaging

- We need a message service to complement Aida.
- Now part of the CORBA 2.5 specification
  - Quality of Service
  - Synchronous or Asynchronous
- It’s on our list once we get to it and find an implementation!
Java Operator Interface
and
Management Integration Tool

Another Suggestion has been to call it.....
MADAM
Mother Of All Display Managers
Main Objectives

Provide services for:

- **Updating displays**
- ‘Emulate’ SCP 8*8 Panels
  - Sending commands to (graphical) objects (by name)
  - Dynamically configure (correlation) plot displays
- **Command record and replay**
- **Save and reload configuration files (XML)**
- **Connection to multiple data sources**
- **Local Message Window**
  - Information from local processes
- **System Message Window**
  - Information forwarded to JoiMint from other applications
Command Record and Playback

- Record all operator commands
  - Allow command editing
- Implementation of sequencing features:
  - Loops
  - If – then – else structures
    (based on live data from the underlying control system)
- Store commands as XML file
- Load command-set from XML file
- Replay commands
Display features

- Dynamically insert (graphical) objects
  - No (special) edit mode necessary
  - Connect object’s properties to one (or more) I/O sources
  - Store Configuration in XML files format
  - Restore configuration from XML file
  - Support multiple summary displays
  - ‘Save Content’ command will save graphic image and the current data stored in the individual objects
Listen to Matthias for the Latest

THCT005 An XML Driven Graphical User Interface and Application Management Toolkit