GSI Operating Software – Migration OpenVMS to Linux





Migration OpenVMS to Linux

- Motivation
- Present Situation
- Migration Aims
- Details of Porting
- Conclusions



GSI Accelerator Facilities







GSI Accelerator Facilities + FAIR



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Present Situation

- Hardware: Cluster of DEC-Alphas (Hewlett-Packard)
- OS: OpenVMS 8.3
- Distributed Client-Server Architecture
- User-Interface: X11/Motif-based, Hardware Display and Control Units (Knobs, Key, LED)
- Database: Oracle 10g on Linux-Cluster (migrated from Oracle RDB on OpenVMS)
- Code base: DEC-F77 (F90, F95, 2million lines of code)



GSI Main Control Room

Wigereting Schiwere on VMS/X11



- to enable integration into FAIR controls
- to protect investment (source code)

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VMS based Application Software





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Future Design of FAIR Controls

- Java Software Architecture (JSE, J2EE, Spring)
- New User Interface
- New generic data supply mechanisms (LSA)
- New Device Interfaces (FESA, CMW)



Migration Aims

- Integration to FAIR Controls (Java Environment)
- Native Unix/Linux Run-Time Environment
- Porting of current VMS-Applications with minimal source-modification



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Details of Porting

- DEC-Fortran Extensions
- VMS System API
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- GSI specific APIs
- Connectivity to new Java Applications



DEC Fortran77 Extensions

- Type definitions: STRUCTURE
- built-in-functions: %LOC(), %REF(), %VAL()
- Compiler Directives: cDEC

Covered either by

Intel Fortran Compiler

or

to be replaced by suitable Fortran90 constructs



Details of Porting

DEC-Fortran Extensions



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VMS-System API and -Runtime Library

- Non POSIX
- System API to support event driven architectures
- Fortran Utility Libraries
- Commercial Products: inadequate implementation in detail or lacking support

GSI In-house-library and Tools support

- Events
- Timer
- Global Section
- Message Compiler

"VMS-API" Architecture on Linux



Subset of VMS-API implemented by an emulation library

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X11 / Motif

- Porting Fortran-X11-Programs using VMS-Fortran-X-lib: Wrapper functions to Linux X11 Library
- Porting Fortran-Motif-Programs using VMS-Motif-Library: Same C-API
- But porting software using Motif-XtAppMainLoop()/XtAppAddInput() framework: VMSspecific feature handled in a special GSI-in-house-library



Example: Motif-Program on VMS/X11/DECwindows

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Done with minor code changes

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GSI specific APIs

Example: GSI-API for Inter Process Communication

- Written in Modula-2
- Transfers binary data between programs
- VMS-Events
- VMS-Mailboxes
- Communication Server
- Raw Ethernet Protocol



IPC Architecture (VMS)



Ethernet



IPC by TCP/IP peer-to-peer network



Registration-Service (Broker) to map Process-Name to Host/Port



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IPC by TCP/IP peer-to-peer

- Same API
- Peer-to-peer network through TCP/IP sockets, addressed by host:port
- Registration service (name service, broker) for mapping application-name to TCP/IP host/port information



IPC Registration Service (Broker)

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GSI specific APIs

Another example: device access

Part of our front end renovation project, see "Integration of a Renovated Networking Middleware into a Running Control System Environment" by Udo Krause, PCaPAC 20.10.2008

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Connectivity to Java Applications

Constraints:

- Minimal source code modification for existing Fortran Applications
- Flexible data structures
- Simple and generic interface to avoid API adaptations

Solution: Universal Value Architecture (UV)



UV (Universal Value Architecture)



Example: Browser as UV-Java Client

Generic Browser:

- Java Application
- Value Tree
- Finds application by name service lookup





Example: Browser as UV-Java Client

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- A Java Client can survey and modify any set of values presented by the ported VMS software
- Values can be handled in a single tree
- Tree structure can be changed at run-time



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Conclusions and Outlook

- Proof of concept (minimal source modification, Java integration)
- Libraries and Tools build solid basis for migration
- Further efforts will be made to integrate into FAIR controls





Thank you!



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FINE



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