Visualizing Distributed Systems of Dynamically Cooperating Services SEP Presentation

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Outline

- Motivation
- Requirements
- Demo
- Implementation
 - Subsystem Decomposition
 - Graph Layout Tools
 - Debugging
- Future Extensions
- Summary





Motivation

- Finding errors in distributed systems is difficult
- Communication is an additional source of errors
- Necessary information is spread all over the network
 DWARF: Each service manager only knows local services
- It is difficult to find relevant data in diagnostic output
- Therefore we need a visualization tool for DWARF

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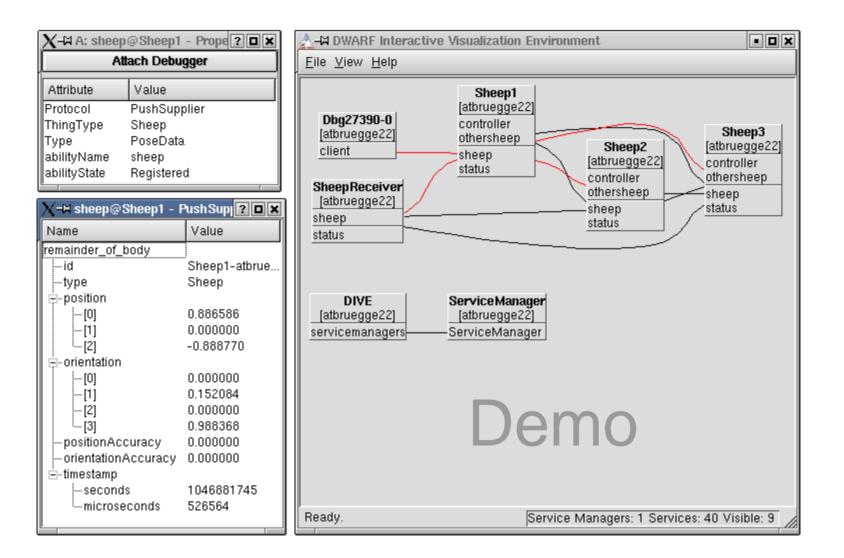
Requirements

- Collect structural information
 - Connect to all service managers
 - Combine their knowledge of the system
- Display structural information
 - Service connections as graph
 - UML class diagram style
 - Automatic graph layout
 - Service attributes
- Debugging
 - View CORBA events





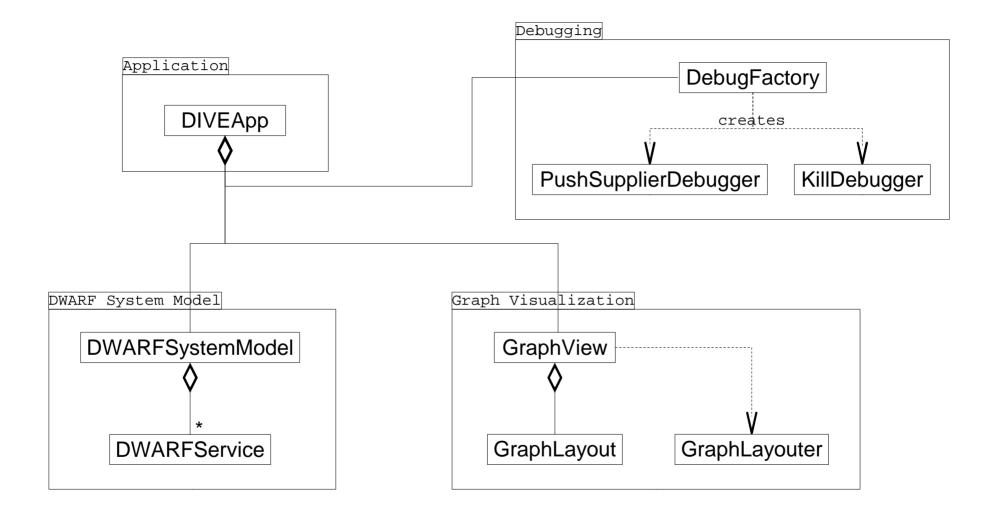
The User Interface of DIVE





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Subsystem Decomposition









Basic Program Flow

- Find all running service managers
 - Create a new DWARF service with a "ServiceManager" need
- Data Aquisition
 - Connect to all known service managers
 - Read their information about services and connections
 - Store this in the DWARF System Model subsystem
- Graph Display
 - Create a graph description from the DWARF System Model
 - Pass it to the Graph Visualization subsystem
 - Call the graph layout tool
 - Display the DWARF system as a graph



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Graph Layout Tools

- Fortunately many existing tools are available
- Requirements
 - Useful layout features
 - Records
 - Clusters/subgraphs
 - Incremental layout
 - Preferably open source
 - Should be under active development
 - Must be usable as a library or stdin/stdout filter
- Evaluated 12 Tools
- Final decision: Use the Dot layouter from the Graphviz collection (AT&T labs), but integrate it using the bridge pattern.



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Debugging Subsystem

- Main design goal: extensibility
 - Abstract factory design pattern
 - Each debugger can provide its own Qt user interface
- Currently implemented debuggers
 - PushSupplierDebugger
 - Receives CORBA structured events from a "PushSupplier" ability
 - Automatically decodes embedded data structures
 - KillDebugger
- Demo



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Future Extensions

- More debuggers
 - CORBA method invocations
 - Image viewer
 - 3D view for PoseData
- Using DIVE for DWARF system design
 - Manipulate service descriptions
 - Remote service configuration
 - Saving DWARF applications
 - Visual programming
- Graph drawing improvements
 - Better performance through dynamic and incremental updates
 - Edge labels





Adding New Debuggers

- Step 1: Implement the debugger
 - Qt user interface, if necessary
 - Can use DebugService to handle connections automatically

- Step 2: Add the debugger to the DebugFactory
 - Derive from DebuggerCreator and implement HaveDebugger and CreateDebugger methods



Summary

DIVE

- works
- helps keeping an overview of dynamic distributed DWARF systems
- has successfully been used to demonstrate the DWARF middleware and applications built on top of it
- makes learning curve for DWARF less steep
- is used by almost all DWARF developers
- can be extended to become even more useful



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Questions?

Thank you for your attention!



