OMG's First Workshop on Embedded Object-based Systems

January 17-19, 2001
Santa Clara, CA USA

Workshop Program

WEDNESDAY - January 17, 2001

0830 - 1230 ***CORBA Tutorial***
Dr. Jon Siegel, Object Management Group
This tutorial covers OMG's Object Management Architecture including CORBA, the CORBAservices and CORBAfacilities, the Domain CORBAfacilities. Starting with a brief look at requirements and needs in distributed computing and how UML, the MOF, and XMI fit into the rest of the OMG specifications, the tutorial moves on to cover OMG Interface Definition Language and mappings to various programming languages, structure of the Object Request Broker, interoperability and the standard protocols GIOP and IIOP, and integration with Java and COM/DCOM. The next section of the tutorial covers the CORBAservices and facilities, and the Domain CORBAfacilities

1030 - 1100 Coffee Break

1230 - 1330 Lunch

1330 – 1730 ***CORBA for Embedded Systems Tutorial***
David Barnett, Highlander Engineering

MinimumCORBA Tutorial
Shahzad Aslam-Mir, Vertel Corporation

Real-Time Systems and CORBA Tutorial
Victor Giddings, Objective Interface Systems

1500 – 1530 Coffee Break

THURSDAY, January 18, 2001

0845 - 0900 ***Opening Remarks***
Dr. Richard Soley, Object Management Group

0900 - 1030 ***Modeling/Specifications***
Chair: Judy McGoogan, Lucent Technologies

Correct specification of a system provides the foundation for a successful product life cycle. Advanced modeling tools hold the potential to produce correct specifications faster and more accurately. These tools, coupled with advances in automatic code generation have the potential to significantly decrease time-to-market and reduce life-cycle software development costs. This session explores approaches to abstracting components, combining them into systems and subsystems, and analyzing the temporal performance of these systems. It also presents an overview of ITU's Specification and Description Language (SDL-2000), and shows how SDL-UML profiles can be useful in designing CORBA applications.

"Traditional Approaches to Component Abstraction and Combination into Subsystems and Systems"
Mark S. Gerhardt, TimeSys Corporation

The derivation of an architecture that must meet temporal performance requirement alters the order and importance of concerns that must be addressed during the architecture synthesis and refinement process. Traditional Structured and Object Oriented approaches produce layered architectures which are composed into functionally co-operating abstractions. This talk will discuss these traditional approaches to component abstraction and combination into subsystems and systems, and discuss their inadequacies regarding temporal performance prediction. Required changes and augmentation to object oriented analysis and decomposition methods to provide adequate characterization of objects to allow schedulability and temporal performance analysis will be discussed. A skeleton for an object-oriented development method that supports temporal performance analysis throughout the evolution of the architecture and its implementation will be presented.

"Specification and Design of Distributed Embedded Middleware Applications with SDL"
Eckhardt Holz, Humboldt-Universität zu Berlin

This presentation will include an overview of the features of ITU's architectural modeling language - SDL-2000. It will show how an interface specification of an embedded system in CORBA-IDL can not only be reflected by an equivalent SDL specification but also be extended by a formal structural and behavioral SDL description. Because SDL is accompanied by an SDL-UML-Profile the proposed approach integrates well with other technologies used for the specification and design of CORBA applications.

1030 - 1100 Coffee Break

1100 - 1230 ***Use of CORBA in Network Management***
Chair: Shahzad Aslam-Mir, Vertel Corporation

This session explores the use of CORBA as a key part of next generation Network Management infrastructure. Use of GIOP as both a management and configuration, command and control protocol as the core mechanism is discussed. The role of hybrid NMS and EMS architectures which use GIOP, CMIP, SNMP, CMISE and other protocols is a also discussed. Presentations in this session describe the experiences of carriers and communications equipment vendors in their successful use of CORBA in the architecture of next-generation network elements.

“CORBA-based Performance Management System”
Bing Leng, Lucent Technologies

This presentation reports an application of CORBA in Telecom network management where the network elements can be existing or next generation embedded systems. A key network management area is performance management that deals with monitoring and controlling real-time traffic (calls/packets/cells) passing through the elements in order to achieve "agreed-upon" Quality of Service.

“Using CORBA for Network Management of Next Generation Networking Equipment”
Ken Black, Highlander Engineering

This presentation will review the ways in which CORBA is used for network management and show how CORBA-based network management agents are implemented. It will also review CORBA management standards, including standards for native CORBA management and the Joint Inter-Domain Management (JIDM) standard for interoperability with -- and migration from -- SNMP (the traditional protocol used for enterprise network management) and CMIP (traditionally used for carrier-grade management).

“CORBA - The Key To Vertical Harmony in the Telecom Domain”
Yuval Levy, Vertel Corporation

The last decade saw huge growth and many changes in the telecommunication infrastructure. New networks were deployed and technology evolved from PDH and other static oriented networks to Sonet/SDH, ATM, xDSL, DWDM, gigabit Switches, and many others. The industry made the transition from simple network elements with static configurations to large, complex network elements that allow dynamic management and configuration. As the industry changed, the introduction of the internet, VOIP, media streaming, VPN, and many other new services brought about the need to provide these services quickly and to update them periodically. This presentation introduces trends in CORBA technology that enable the vertical integration of management systems and services from the front office down to the network elements.

1200 - 1800 ***Demonstration Area***
Highlander Engineering, Objective Interface Systems, Vertel Corporation, Consystant Design Technologies, Inc, Eternal Systems, Tri-Pacific Software

1230 – 1330 Lunch

1330 - 1500 ***Performance of Embedded CORBA***
Chair:Priya Narasimhan, Eternal Systems

This session focuses on the performance and QoS aspects of implementing and deploying embedded systems. The presenters will target the performance requirements of embedded object-based systems, as well as the key factors that influence the performance of such systems. The presenters will also describe their work and/or experiences in dealing with the performance-sensitive aspects of embedded CORBA/Java/object-based systems, with particular focus on strategies for performance improvement.

“Using a Real-time, QOS-based ORB to Intelligently Manage Communications Bandwidth in a Multi-protocol Environment”
Bill Beckwith, Objective Interface Systems, Inc.

The presentation will provide measurements of the affect of using various QoS parameters on a system based on a Real-Time, QoS-based ORB implementation (ORBexpress RT). End-to-end latency of a distributed real-time system is frequently more dependent on the jitter and bandwidth (Quality of Service or QoS) provided by the

available communications infrastructure than by processor contention. Thus, a critical component in distributed real-time systems is the intelligent management of communications QoS.

"Meeting Customer Performance and QoS Requirements with Embedded CORBA"
Joey Garon, Vertel Corporation

After being used for more than 5 years in enterprise systems, CORBA is making its way into the embedded world. Providing solutions for embedded systems impose different set of requirements on the ORBs. The performance and QoS that were good enough in the enterprise world can not satisfy the embedded customer requirements. The embedded world is rich and complex. It is comprised of many variations of operating systems, many different CPUs, different types communication transports, etc. All of this need to be addressed by an embedded ORB. Many of the new CORBA products for embedded environment are faster and smaller than the old enterprise ORBs. This is good but not enough. Providing the RIGHT architectural solution to the customer is the key. It must be provided on top of a fast and small ORB but in many situations there is a need to have more than just a good ORB.
This presentation is based on experience learned from customers who are utilizing CORBA in embedded systems, description of their requirements and how the requirements were met.

"Applying Adaptive & Reflective Middleware to Optimize Distributed Embedded Systems"
Chris Gill, Washington University

Middleware is becoming increasingly important for building embedded systems that reduce software development cycle time and effort. Conventional middleware has historically been too slow, unpredictable, and large to meet the requirements of many types of embedded systems. Historically, these problems have been addressed by developing special-purpose and/or proprietary middleware that must be customized manually for particular applications. While these approaches can ensure that applications incur little or no overhead for capabilities they don't need, experience has shown that such custom solutions are hard to evolve to support new requirements that arise in long-lived, complex embedded systems. This talk will describe how advanced meta-programming techniques, such as reflection and aspect-oriented programming, can be used to auto-generate many components in an ORB in such a way that only a minimal amount of space is used, while still supporting the standard CORBA APIs.

1500 – 1530 Coffee Break

1530 – 1730 ***Implementers' Roundtable***
Chair: Dr. Richard Soley, Object Management Group

This panel of vendors of embedded CORBA implementations will focus on the products and plans of the companies represented. Panelists will briefly introduce their products, product plans, standards conformance plans and suggestions for future standardization in this area. This will be followed by an open discussion with all workshop participants on the topic.

Panelists: Shahzad Aslam-Mir, Principal Software Engineer, Vertel Corporation

Bill Beckwith, CEO/CTO, Object Interface Systems

Ken Black, Founder and CEO, Highlander Engineering

Mark Gerhardt, Chief Architect, TimeSys Corporation

1800 - 2000 ***Workshop Reception***

FRIDAY - January 19, 2001

0830 - 1000 ***Telecommunications and Data Communications Case Studies***
Chair: Bill Beckwith, Objective Interface Systems

This session explores the use of CORBA as the core architecture to embedded telecommunications and data communications equipment. Presentations in this session describe the experiences of communications equipment vendors in their efforts to use CORBA in the software architecture for next-generation network elements.

"Applying Object-oriented Technologies on the SPEED Platform"
Prudence T. Z.Kapauan, Bell Laboratories

"Beyond Network Management, Using Real-time CORBA in Optical Switching Infrastructures"
Chuck Abbott, Objective Interface Systems

1000 – 1530 ***Demonstration Area***
Highlander Engineering, Objective Interface Systems, Vertel Corporation, Consystant Design Technologies, Inc, Eternal Systems, Tri-Pacific Software

1000 - 1030 Coffee Break

1030 – 1200 ***Embedded Controller Case Studies***
Chair:Victor Giddings, Objective Interface Systems

This session describes experiences in the use of CORBA in embedded device controllers. Presentations will describe the advantages of CORBA to enhance the integration, control, and communication of "deeply embedded" devices. Invited presentations cover such diverse devices as controllers for software-controlled radios, high-energy lasers, and air-to-air communications links.

"Software Radio Architecture (SRA) 2.0 Technical Overview"
Jerry Bickle, Raytheon and Kent Bruner, ITT

"Distributed Control System for the National Ignition Facility"
Chris Estes and John Woodruff, Lawrence Livermore National Laboratory

The National Ignition Facility (NIF) is a high-energy laser being constructed under the auspices of the US Department of Energy at the Lawrence Livermore Laboratory, for investigation of the physics of inertial confinement fusion. The laser comprises 192 parallel beams that amplify 25-nanosecond-long pulses of light to a total of 1.8 Mega-Joules and focuses all the beams on a 2-milllimeter-diameter target, heating the deuterium fuel to conditions like those in the sun.

The integrated computer control system (ICCS) will automate the control of 60,000 devices using some 500 computers located throughout the 600-foot-long facility. The distributed software system uses CORBA to communicate among control processes written in object-oriented Ada and user interfaces written in Java.

Some 20% of the anticipated 1.2 million source lines of software have been deployed into a laser laboratory where low energy pulses are generated and diagnosed. Experiences in deploying and testing initial increments of the ICCS give confidence that the completed control system will succeed.

"A Plug-in Transport with Dissimilar ORBs and a Connectionless Network"
Nathan Scandella, The Boeing Company

CORBA provides application developers standardized network communication and related facilities that reduce development time and promote interoperability. Traditionally, CORBA implementations have focused on the Internet (more specifically, TCP/IP) as a network. The aforementioned benefits, however, would also be desirable for programs which historically have used alternative networks, processing for which is often highly specialized and tightly coupled with the application. For example, military aircraft use secure tactical RF datalinks to connect software running on multiple aircraft. This presentation describes how CORBA is being used as distributed middleware on such an application. The plug-in transport feature of the ORBexpress and TAO real-time ORBs is used to bridge the inter-aircraft divide. Mapping of the datalink into the ORBs is described, and suggestions are made regarding the standardization of this important real-time feature. Preliminary results are presented on how this solution can bring network abstraction and interoperability to applications on heterogeneous platforms and non-traditional networks.

1200 - 1300 Lunch

1300 – 1430 ***Manufacturing Case Studies***
Chair: Fred Waskiewicz, Object Management Group

This session explores the use of CORBA to integrate and enhance communications between the automation devices on the factory floor and the IT systems running higher level manufacturing applications.

"Using CORBA to Integrate Automation and Information Applications"
Annick Fron, AFC Europe

This presentation describes the use of Realtime CORBA to provide communications between Advanced Process Control (APC) applications and distributed factory floor devices via an Embedded Logic Server running on PLCs. Two successful deployments, one in container fabrication and the other in semiconductor manufacturing, are discussed.

"Real Time CORBA-MMS for Embbeded Systems"
Eric Gressier-Soudan, CNAM-CEDRIC

This presentation describes a research project in which the ISO MMS standard has been enhanced through adapting it to CORBA. The intent is to improve the use of MMS in real-time messaging in embedded and real-time applications. A case study involving a Java-based prototype remotely controlling a Numerical Control Machine is described.

1430 – 1500 Coffee Break

1500 – 1700 ***Users' Roundtable***
Chair: Dr. Richard Soley, Object Management Group

This panel will feature end-users of the embedded CORBA specifications who have built (or are building) embedded applications using CORBA today. The panel will provide end users who are considering the use of CORBA a chance to hear first hand about the experiences of projects which have deployed high performance, fault-tolerant embedded and real-time CORBA standards. Panelists will discuss their projects, how they used embedded CORBA standards, and what they would like to see from the standards in the future.

Panelists: Ammar Attoui, Professor in Computation Science, University of Savoie

Bing Leng, Member of Technical Staff, Lucent Technologies

Workshop Program Committee

Dock Allen, MITRE
Shahzad Aslam-Mir, Vertel
Bill Beckwith, Objective Interface Systems
David Barnett, Highlander Engineering
Ken Black, Highlander Engineering
Victor Giddings, Objective Interface Systems
Chris Gill, Washington University
Janice Gilman, Object Management Group
Susan Jancourtz, Vertel
E. Douglas Jensen, MITRE
Carl Koebler, Object Management Group
Kevin Loughry, Object Management Group
Judy McGoogan, Lucent Technologies
Priya Narasimhan, Eternal Systems
Irfan Pyarali, Washington University
Bran Selic, Rational Software
Richard Soley, Object Management Group
Rob Van Blommestein, Highlander Engineering