

Industry-Standard Middleware for Distributed Real-time & Embedded (DRE) Computing

What is CORBA/e?

- **A New Family of Specifications:** CORBA/e is the Object Management Group's™ (OMG™) response to the need for a radical new approach to interoperability standards for severely resource-constrained embedded systems. CORBA/e is an umbrella term for a range of new "domain profiles," each designed to dramatically minimize the footprint and overhead of middleware for a specific domain, while retaining the core elements of interoperability that support optimized distributed systems.
- **Lowest possible overhead – no compromise:** CORBA/e profiles are designed from first principles to produce *compact, fast, and predictable* systems with minimum possible overhead. Freed of the dynamic aspects of standard CORBA® and the CORBA Component Model, CORBA/e profiles provide deterministic, real-time execution in footprints that fit easily onto board-based or chip-based systems. CORBA/e is not "CORBA on a diet," it is a new family of specifications designed specifically for severely constrained embedded environments.
- **First profiles available now:** CORBA/e **Compact Profile and CORBA/e Micro Profile** are the first two profiles in what will be a family of CORBA/e specifications.
- **Fully Interoperable:** Despite their minimalist design, CORBA/e systems do not compromise on *full interoperability*: where appropriate they support GIOP and IIOP®.

CORBA/e enables interoperability with systems ranging from the largest ganged server installations to small chip-based sensors.

- **Deployable on individual DSPs and RTOSs:** Designed by the most experienced providers of DRE software, the first two profiles target specific platform functionality: **CORBA/e Compact Profile** supports sophisticated applications such as real-time image and signal processing on board-based systems running a standard Real-Time Operating System (RTOS); **CORBA/e Micro Profile** supports basic functionality on the smallest networked systems, including Digital Signal Processors (DSPs) and the low-powered microprocessors found on typical hand-held devices.
- **COTS product now available:** CORBA/e is not just a family of new specifications on paper. CORBA/e middleware is *available now*. leading vendors of middleware for DRE systems already support CORBA/e specifications and provide products for military, industrial, and consumer DRE applications.

Introduction

When embedded in automobiles, airplanes, hand-held radios and cellular telephones, and almost anything else that either moves or blinks, software must work as reliably as the hardware it brings to life. Today, however, the typical embedded processor environment is networked, forcing its software to deal with communications and interoperability issues without compromising the reliable and timely performance that isolated embedded systems have

delivered in the past. Tailored separately for minimal and single-chip environments, the **Compact Profile** and the **Micro Profile** of OMG's **CORBA/e (CORBA for embedded)** specification bring industry-standard interoperability and real-time predictable behavior to Distributed Real-time and Embedded (DRE) computing.

CORBA/e Summary

Embedded systems are called upon to interoperate in many ways: an automobile, a circuit-board assembly unit, or even a sophisticated office copy machine may contain multiple embedded processors, connected by a network. In an assembly plant or chemical refinery for example, process controllers may interoperate with many small sensor units, and one or a few large servers or mainframes. The combination of interoperability, deterministic execution, and absolute dependability required for these applications can only come from a mature, standard middleware.

Deployed in military, industrial, and consumer applications around the world, CORBA provides these characteristics in an architecture that fits hosts from the largest ganged servers to small, networked digital signal processors (DSPs). To meet these systems' requirements for a small footprint and deterministic execution, the Object Management Group (OMG) has taken the static aspects of industry-standard CORBA and merged them with real-time features into two new profiles under the banner **CORBA/e (CORBA for embedded)**. **CORBA/e Compact Profile** fits easily on a typical 32-bit microprocessor, running a standard real-time operating system (RTOS) – these systems may run such applications as signal or image processing with real-time dependability. **CORBA/e Micro Profile** is even smaller and fits on the kind of low-powered microprocessor or high-end DSP found on mobile or hand-held equipment.

CORBA/e Overview

The first two **CORBA/e** profiles – **Compact** and **Micro** – package the static features of CORBA middleware and real-time capabilities into a small footprint.

CORBA/e Compact Profile merges the key features of standard CORBA and Real-time CORBA into a powerful

yet compact middleware package that interoperates with other CORBA clients and servers of every scale, executes with the deterministic characteristics required of a true real-time platform, and leverages the knowledge and skills of your development team through its mature industry-standard architecture.

Shedding the dynamic aspects of CORBA and support for the CORBA Component Model, with their unpredictable response times and unlimited potential memory usage, CORBA/e retains full IIOP interoperability. It also preserves many Portable Object Adapter (POA) options, and most of the functionality of Valuetypes and Any (excepting Dynamic Any).

To the system architect, CORBA/e levels the interoperability playing field, allowing board-based DRE systems to interoperate not only with each other, but also with all existing systems using the industry standards CORBA and IIOP. At the same time, it allows the developer to use his or her existing CORBA skills to code at full speed from the start and allows projects to hire from the industry skill-pool.

The **CORBA/e Micro Profile** shrinks the footprint even more, small enough to fit low-powered microprocessors or DSPs. This profile further eliminates the Valuetype, the Any type, most of the POA options preserved in the Compact Profile, and all of the Real-time functions excepting only the Mutex interface. In exchange for these limitations, the profile defines a CORBA executable that vendors have fit into only tens of kilobytes – small enough to fit onto a high-end DSP or microprocessor on a hand-held device.

Even at this small size, **CORBA/e Micro Profile** retains full IIOP interoperability, so the advantages to the system architect and developer carry through: to the system architect, CORBA/e levels the interoperability playing-field, allowing micro DRE systems to interoperate not only with each other, but with all existing systems using the industry standards CORBA and IIOP. At the same time, it allows the developer to use his or her existing CORBA skills to code at full speed from the start and allows projects to hire from the industry skill-pool.

CORBA/e Technical Features

CORBA/e Compact Profile

- Compact yet powerful: Fits resource-constrained systems (32-bit processor running a RTOS), but supports sophisticated applications such as signal or image processing in Real-time.
- Interoperable:
 - Compiles all OMG IDL (although dynamic aspects of CORBA – IFR, DII, DSi, recursive Valuetypes, dynamic Any – do not execute).
 - Integrates with applications running full CORBA, CORBA/i, CORBA/eCompact Profile, and CORBA/e Micro Profile.
 - Supports native IIOP (all versions through the current GIOP 1.4 and IIOP 1.4).
- Deterministic:
 - Supports Real-time CORBA with Static Scheduling;
 - Propagates Real-time CORBA priorities over the wire.
 - Disallows dynamic aspects of CORBA – IFR, DII, DSi, dynamic Any, recursive Valuetypes.
- Server-side: POA Supporting Transient or Persistent objects; Retained servants (disallows Implicit Activation); Prioritized multi-threading under ORB control.
- Complete: Includes Naming, Events, and Lightweight Logging Services.

CORBA/e Micro Profile

- Truly Micro: Fits on a mobile or similar device with a low-power microprocessor, or high-end DSP.
- Interoperable:
 - Compiles all OMG IDL (Dynamic aspects of CORBA – IFR, DII, DSi, Any, Valuetypes, transient Servants – do not execute).
 - Integrates with applications running full CORBA, CORBA/i, CORBA/e Compact Profile, and CORBA/e Micro Profile.
 - Supports native IIOP (all versions through the current GIOP 1.4 and IIOP 1.4).
- Deterministic:
 - Supports only statically defined Interfaces, Interactions, and Scheduling.
 - Supports Real-time CORBA MUTEX interfaces.
- Server-side: For compactness and deterministic behavior, supports exactly one POA; allows only transient, retained servants with unique, system-assigned IDs; and multi-threading under ORB control.

For more information about CORBA/e, visit the OMG online at <http://www.omg.org>.

