Why CORBA for Embedded Systems

- Common Object Request Broker Architecture – CORBA
  - Open standard maintained by Object Management Group consortium
  - High performance, low footprint implementations
- Why middleware?
  - Standalone systems are a thing of the past
  - Platform flexibility is essential
  - Software is becoming larger part of embedded systems
- Why CORBA?
  - Distribution – integrate into “system of systems” and enterprise management environment
  - Portability – migrate across processors, operating systems, communications infrastructures
  - Interoperability – interoperate with older models and new enterprise systems
Embedded systems are constrained
  - SWaP – size, weight and power
  - Higher unit counts – different economics

Different processing infrastructures
  - Processors
  - Peripherals
  - Communications

CORBA/e – “CORBA for embedded”
  - Standalone specification
  - Proven performance and utility in the embedded market
  - Retains interoperability
CORBA/e Overview

- **Purpose** – to reduce
  - Resource usage – to extend CORBA’s applicability to systems constrained by
    - Footprint
    - CPU
  - Complexity of implementation – higher assurance
  - Complexity of specification – fewer choices
- **Result** - two profiles containing “static” parts of CORBA
  - Compact profile – embedded 32-bit μ processors
  - Micro profile – smaller μ processors, high-end DSPs
CORBA/e Profiles Overview

- **CORBA/e Compact Profile**
  - Replaces “minimum CORBA” profile
  - Includes
    - “Static” parts of CORBA
    - Essential parts of Real-time CORBA
    - Basic services – Naming, Events, Logging

- **CORBA/e Micro Profile**
  - Restricts types
  - Further simplifies servers
  - Real-time predictability
1. CORBA Overview
2. Object Model
3. OMG IDL Syntax and Semantics
   - Full grammar must be accepted (parsed)
   - Can ignore
     - context clauses
     - abstract interfaces
     - value boxes
     - custom valuetypes
     - value “supports” interface
     - import

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4. Repository IDs – OMG IDL formats only
5. ORB Interface
   - No dynamic TypeCode creation
   - No domain managers
   - Added back: shutdown, destroy
6. Object Interfaces
   - Object - added back: is_a, nonexistent
   - ValueType Semantics
     - Lightweight valuertype
     - No “polylithic” valuertype instances
- Syntactically eliminates
  - Value boxes
  - Abstract interfaces
  - Derivation from interfaces
- Semantically eliminate “polyolithic” valuetypes containing
  - Other valuetypes
  - Type Any – which could contain other value type
  - Any other components (structs, unions, etc.) transitively containing
    - Other valuetypes
    - Type Any
- Eliminates need for garbage collection (complexity, unpredictability)
7. Policies
   - Policy objects
   - Effectiveness
   - Messaging QoS Policies
     - Rebind support
     - SyncScope support
     - RoundTrip Timeout support
8. The Portable Object Adapter
   - “Static parts” of POA specification
     - *A la* MinCORBA
     - No servant managers
     - No default servants
     - No POA policies to support above
9. Real-time Features
   - “Hard real-time” parts of RTCORBA
     - Priorities
       - Definition
       - Mapping
       - Client propagated model
     - Mutexes
     - Binding
     - Banding
     - Invocation timeout
Services

10. Naming Service
11. Event Services – Untyped only
12. Lightweight Log Service
Interoperability

13. General Inter-ORB Protocol (GIOP)
14. CDR Transfer Syntax
15. GIOP Messages
16. Internet Interoperability Protocol (IIOP)

Annexes

A. OMG IDL Tags and Exception
B. Legal Information
1. CORBA Overview
2. Object Model
3. OMG IDL Syntax and Semantics
   - Full grammar must be accepted (parsed)
   - Can ignore
     - context clauses (in errata)
     - abstract interfaces
     - value types
     - type Any
     - import (in errata)
4. Repository IDs – OMG IDL formats only
5. ORB Interface
   - All sub-clauses required
   - No dynamic TypeCode creation
   - No domain managers
   - Added back shutdown, destroy
6. Object Interfaces
   - Object - added back: is_a, nonexistent
   - No ValueType Semantics
7. Policies

- All sub-clauses required
- Policy objects
- Effectiveness
- Messaging QoS Policies
  - Rebind support
  - SyncScope support
  - RoundTrip Timeout support
8. The Portable Object Adapter
   - Single root POA – default policies
   - “Static parts” of POA specification
     - Ala MinCORBA
     - No servant managers
     - No default servants
     - No POA policies to support above

9. Real-time
   - Mutexes only
   - Services – not required
- Interoperability (common with CORBA/i) - all sub-clauses
  13. General Inter-ORB Protocol (GIOP)
  14. CDR Transfer Syntax
  15. GIOP Messages
  16. Internet Interoperability Protocol (IIOP)

- Annexes
  A. OMG IDL Tags and Exception
  B. Legal Information
  C. Acknowledgement
Summary

- CORBA/e Compact Profile
  - Compact, yet powerful – targeted to resource-constrained 32-bit µp
  - Deterministic
    - Combines static core of CORBA with core of Real-time CORBA
    - Priority propagation, priority banding
  - Server options – transient or persistent retained servants
  - CORBA Services – Naming, Events, Logging
  - Interoperable – native IIOP

- CORBA/e Micro Profile
  - Truly micro – mobile or low-power µp, high-end DSP
  - Deterministic core – real-time internals
  - Compact server-side
  - Interoperable – native IIOP
- CORBA/e Specification
- PIDL & IDL for profiles