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Training

ANSAwise - CORBA in the Real World

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Abstract

Organizations considering purchasing CORBA technology wish to know the state of the market and the practical problems that they may encounter.

CORBA technology is still new; products are incomplete, have serious bugs, and statements by vendors cannot be taken at face value.

This session of the ANSAwise training programme explains the evaluation work carried out by the ANSA Phase 3 project, and the findings so far.

This session is available only to sponsors.

[Note: this module includes material from APM.1194 (Comparison of CORBA-compliant platforms), and should be maintained in line with that document.]

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Briefing Note

Distribution:
Supersedes:
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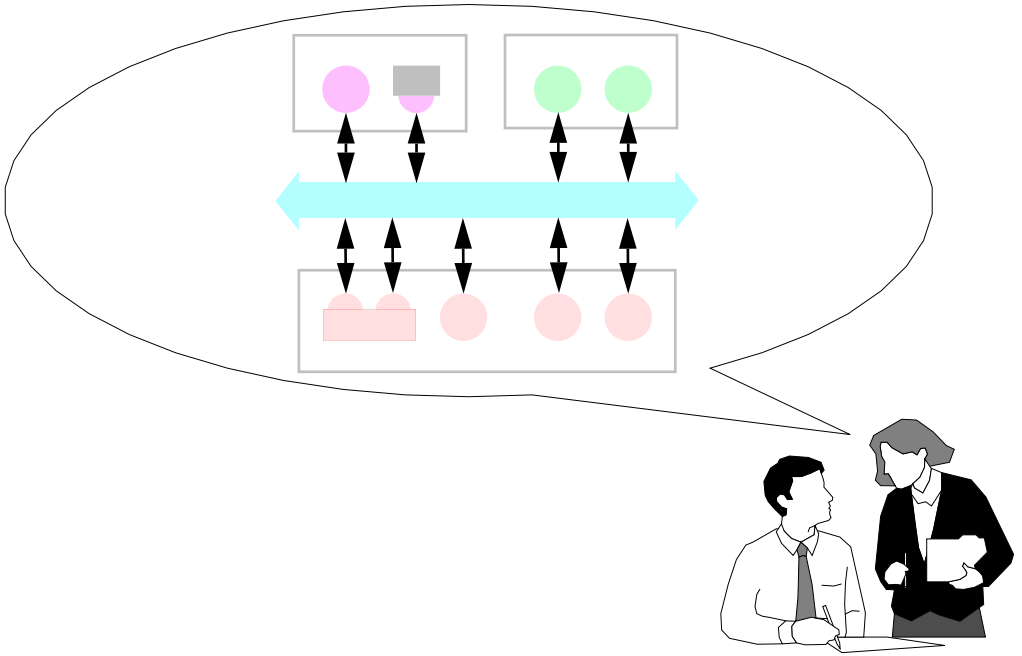
CORBA in the Real World



This presentation is confidential to the ANSA consortium

In this session

- *Review some CORBA products*
  - as evaluated as part of the ANSA Phase 3 project
- *Explain their current limitations*
  - and likely future developments
- *Note other points that arose during the evaluation*

CORBA products evaluated to date

- *Iona's Orbix, version 1.2 (and a beta version 1.3)*
- *DEC's Application Control Architecture Services (ACAS), version 2.1*
  - now known as ObjectBroker
- *Object-Oriented Technologies' DOME*
- *Xerox's ILU (Inter-Language Unification)*
- *Post-Modern Computing Technologies' ORBeline*
- *ICL's DAIS (pre-release 2.1)*

Evaluations of new and updated CORBA products continue

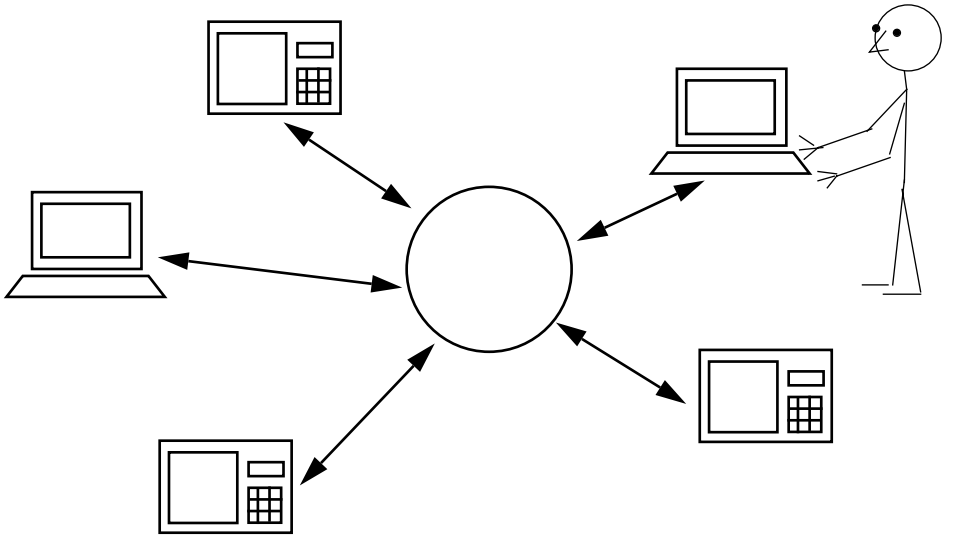
Approach to evaluation

- *Check compliance with the CORBA specification*
- *Port standard example programs*
  - the ANSAware Echo and Simple Bank applications
- *Look beyond the ORB specification*
  - multi-threading
  - trading (or its equivalent)
- *Evaluate the product's ease of use, including documentation*

What conformance and compliance mean

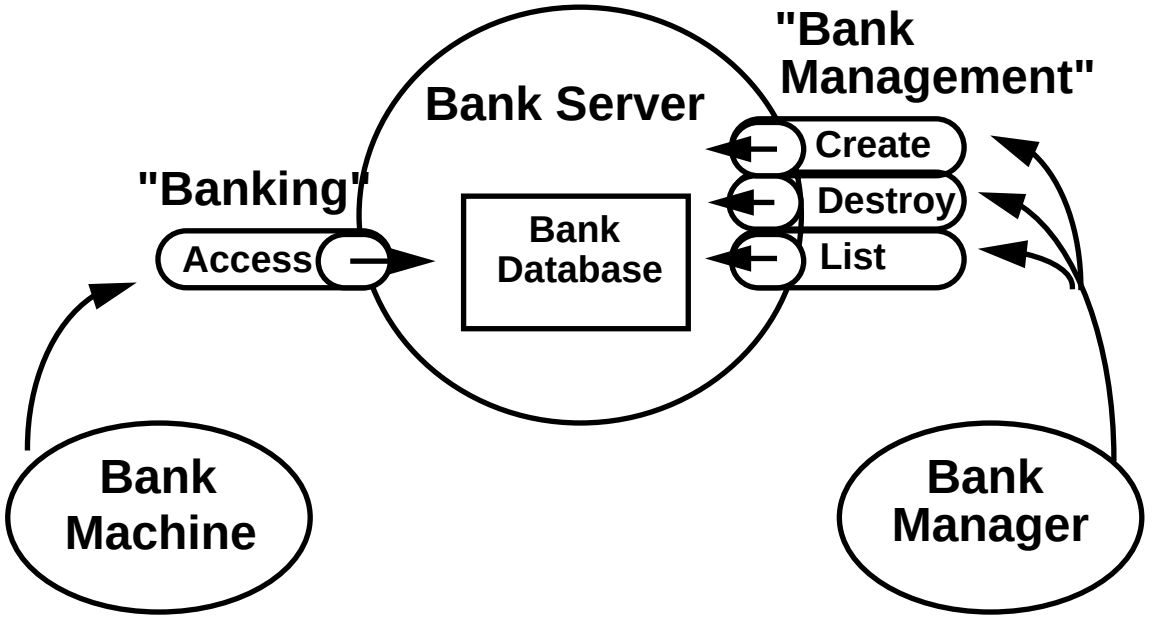
- ***Conformance means that a specification matches another specification...***
  - **as in verification of type conformance between interface specifications**
- ***...Compliance means that an implementation matches a specification***
  - **here we are interested in an ORB implementation complying with the CORBA specification**
- ***In the future, compliance will be formally validated against an international CORBA standard***
  - **probably by X/Open...**
  - **...meanwhile, we must check the vendors' assertions ourselves**

Simple Bank Example



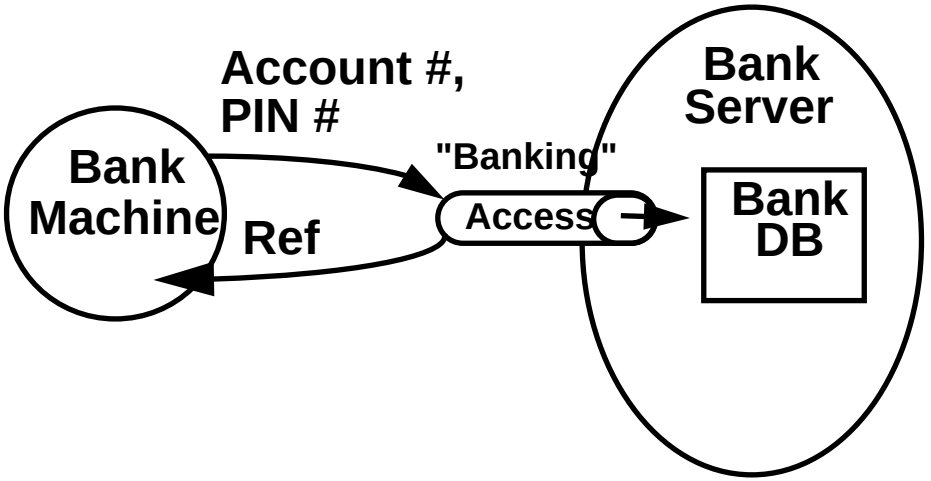
- *A Bank Machine (Automatic Teller Machine) system*
  - Users accessing their accounts
  - Bank managers administering these accounts

Bank Server - Interfaces

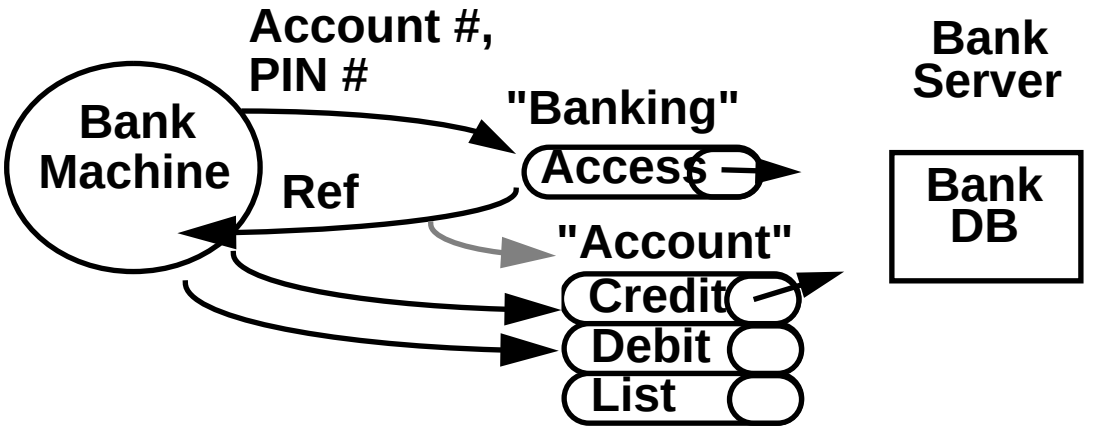


Banking Interface

- *User should only be able to interact with account if PIN is valid*
- *Do not want Accounts to be public*
  - customers should only access their own accounts
- *If "Access" succeeds, "Account" is created and its object reference returned*



Banking and Account interfaces



- *If "Access" succeeds, "Account" is created, and its object reference returned*
- *"Account" interface provides operations on one particular account*
- *Only that client knows the "Account" object reference*

Simple Bank Interfaces

- ***Banking (SBank)***
  - **for access with PIN by customer via Bank Machine, with PIN**
- ***Account (Account)***
  - **for credit/debit/list by customer via Bank Machine**
- ***Bank Management (SBankMgmt)***
  - **for create/destroy/list by manager**

Simple Bank - general definitions

```
typedef unsigned long AccountNumber;

typedef unsigned long PersonalIdentificationNumber;


exception NoSuchAccount {};

exception InvalidPin {};

exception InsufficientFunds {};

exception ResourcesExhausted {};

exception StaleAccountReference {};
```

Account Interface

- *Account - credit/debit/list account*
- *An Account object is created (via the SBank interface's Access operation) for each account being accessed*
- *So there is no need to pass account numbers as arguments to the operations in the Account interface*

Simple Bank - interface Account

```
interface Account
{
   struct AccountRecord {
      string owner;
      float balance;
      string lastaccess;
   };
   void Credit(in float Amount) raises(StaleAccountReference);
   void Debit(in float Amount)
       raises (InsufficientFunds, StaleAccountReference);
   void List(out AccountRecord List_R1)
       raises(StaleAccountReference);
};
```

Banking (SBank) Interface

- ***SBank - PIN based access to Account interfaces***

- ***Returns an Account interface for the account identified by an account number and corresponding PIN***

- ***Equivalent to the user interface offered by a real bank machine to a human user***

Simple Bank - interface SBank

```
interface SBank

{

      Account Access(in AccountNumber acct,
                     in PersonalIdentificationNumber pin)
        raises(NoSuchAccount, InvalidPin, ResourcesExhausted);

};
```

Bank Management (SBankMgmt) Interface

- ***SBankMgmt - management operations for:***
  - **creating an account**
  - **destroying an account**
  - **listing an account**
  - **listing all accounts**
- ***Note the use of an IDL sequence to return a variable amount of data when listing all accounts***

Simple Bank - interface SBankMgmt: types

```
interface SBankMgmt
{
    struct CreateRecord {
        AccountNumber acct;
        PersonalIdentificationNumber pin;
    };
    struct FullRecord {
        AccountNumber acct;
        PersonalIdentificationNumber pin;
        string owner;
        float balance;
        string lastaccess;
    };
    typedef sequence<FullRecord> ListAllResult;
```

Simple Bank - interface SBankMgmt: operations

```
   void Create(in string owner,
               in float balance, out CreateRecord Create_R1)
      raises(ResourcesExhausted);

   void Destroy(in AccountNumber acct) raises(NoSuchAccount);

   void ListOne(in AccountNumber acct, out FullRecord ListOne_R1)
      raises(NoSuchAccount);

   void ListAll(out ListAllResult ListAll_R1);

};
```

ORBIX - Iona Technologies

- *Implements all of the ORB*
  - all IDL, the Dynamic Invocation Interface, and exceptions
- *Clients and servers are written in C++*
- *No direct support for multi-threading*
  - but Orbix examples show how to use an operating system threads package

Other ORBIX findings

- ***The Interface Repository is simply a directory containing the IDL source files***
  - **eminently straightforward...**
  - **... but the Interface Repository server must reparse all the IDL source files when it starts up**
- ***Executable binaries are small; they use shared libraries***

ACAS - DEC

- *Incomplete ORB implementation*
  - no IDL support (no stubs), Dynamic Invocation Interface only
  - no constructed values (e.g. sequences)
- *Clients and servers are written in C*
- *No direct support for multi-threading*
  - and no obvious way of achieving it

ACAS - other findings

- ***Servers can be implemented using shell scripts***
  - **flexible and useful for prototyping**
- ***There is a DDE (Dynamic Data Interchange) interface for Microsoft Windows clients***
- ***Executable binaries are small; they use shared libraries***

DOME - Object-Oriented Technologies

- ***Incomplete ORB implementation***
  - **limited IDL support**
  - **no typedefs**
  - **no constructed values (e.g. sequences)**
  - **no CORBA interfaces (proprietary only)**
- ***Clients and servers written in C++***
- ***No direct support for multi-threading***
  - **it may be possible to achieve this with C++ implementation classes**

DOME - other findings

- *No Interface or Implementation Repository*
- *Installation was difficult*
  - and there were several serious bugs
- *Executable binaries are large; no support for shared libraries*

ILU - Xerox

- *Incomplete ORB implementation*
  - a few IDL features missing (*Object* and *any* types)
  - no DII support
- *Clients and servers are written in C, C++, Common Lisp, and also Modula-3*
- *Supplied as C source*
  - implementation is free!
- *No direct support for multi-threading*

ILU - other findings

- *No Interface or Implementation Repository*

- *Executable binaries are large; no shared library support*

  - not surprising for a product supplied in source form

ORBeline - Post-Modern Computing Technologies

- *Implements all of the ORB*
- *Clients and servers are written in C++*
  - but do not quite comply with the anticipated C++ Language Mapping
- *Multi-threading is supported*
  - in a separately-packaged version

ORBeline - other findings

- ***Both Interface Repository and Implementation Repository supported***
- ***Supports event handling, object migration, and object replication***
- ***Executable binaries are small; they use shared libraries***

DAIS - ICL

- *Implements almost all of the ORB*
  - no Dll support
- *Clients and servers are written in C*
- *Multi-threading is supported*

DAIS - other findings

- *No Interface Repository or Implementation Repository*
- *Support for object relocation and migration*
- *Executable binaries are large; no shared library support*
- *Extended with additional services*
  - database integration, transactions, and security

General summary - compliance

- *Not all vendors fully support IDL*
  - although they aim to in future
- *For language mappings*
  - C++ is generally supported, but not always C

General summary - engineering

- ***Lack of shared libraries support for C++ leads to large executable binaries***
  - **typically 1 Mbyte without shared libraries, 150 Kbyte with them**
  - **a general problem for C++, not confined to CORBA...**
  - **... shared libraries require support from the C++ compiler/linker *and* the operating system *and* the ORB vendor**

Aspects not evaluated

- *Evaluation is not a formal test of compliance*
- *Evaluation is not carried out with a particular application in mind*
- *Evaluation does not test many important non-functional characteristics (e.g. compilation speed, scalability, performance)*
- *Only the ORB was evaluated*
  - not Object Services
- *Interoperability was not evaluated*

Other technical considerations

- ***Leapfrogging ORB product versions and compatibility***
  - **when you are using multiple operating systems or compilers**
- ***Bundled administration tools***
- ***Integration with other tools, for example***
  - **make/configuration control**
  - **CASE tools**
  - **GUI toolkits**

Other commercial considerations

- *Licensing conditions*
  - development and run-time licenses
- *Vendor qualification*
- *...*

Summary

- *There are complete CORBA implementations available now*
  - they will need minor upgrades for ORB 2.0
- *Most implementations support C++*
  - but check for compliance with the CORBA C++ Language Mapping
- *New and updated implementations are continuing to arrive*
  - and we are evaluating them
- *No implementations yet support real-time applications*
  - but ANSA Phase 3 is working on this
- *For more on this topic*
  - see *Comparison of CORBA-compliant platforms* (APM.1194)