



**Poseidon House
Castle Park
Cambridge CB3 0RD
United Kingdom**

TELEPHONE:
INTERNATIONAL:
FAX:
E-MAIL:

**Cambridge (01223) 515010
+44 1223 515010
+44 1223 359779
apm@ansa.co.uk**

Training

ANSAwise - Course Roundup [to Building Applications with Distributed Objects]

Chris Mayers

Abstract

This is the "goodbye speech" to the course "Building Applications with Distributed Objects". As well as a summary of the key points, it gives information for finding out more.

[Since different course presentations offer a choice of modules, this presentation may need to be adjusted to cover different key points.

This session also covers commercial products briefly under 'finding out more'. This should be expanded as we build up experience, possibly into separate modules.]

APM.1356.01

Approved
Briefing Note

28th November 1994

Distribution:

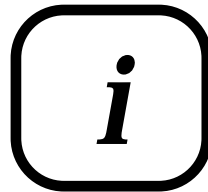
Supersedes:

Superseded by:



Building Applications with Distributed Objects

Course Roundup



...and Learning More...



About this course

- *We have covered a lot of ground*
 - technical topics
 - open standards and products
 - applications
- *Let us step back and see how these fit together*



Distributed Systems Are Different

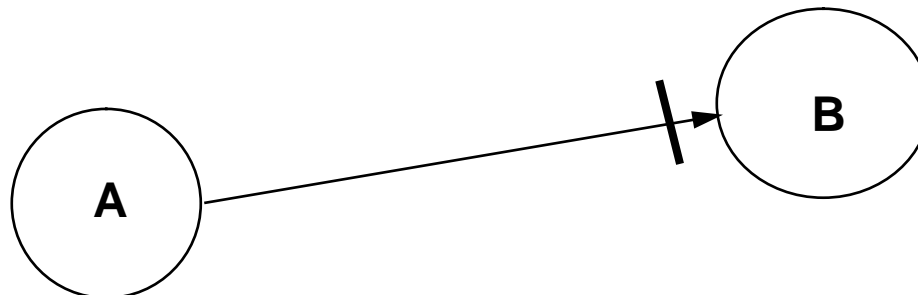
- *Many traditional system design assumptions must be reversed*

<i>Traditional</i>	<i>Reversed</i>
Local	Remote
Sequential	Concurrent
Homogeneous Environment	Diverse Environment
Fixed Location	Mobile
Single Copy	Multiple Copies
Synchronous	Asynchronous
Direct	Indirect
Shared	Separate
Global	Context Relative
Complete Failures	Partial Failures
Early Binding	Late Binding

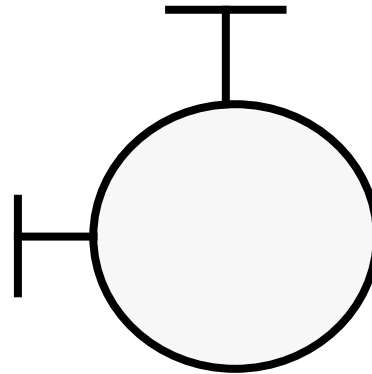
- *A systematic approach is needed to avoid these assumptions*

Distributed objects

- *We cannot assume anything about the location of distributed objects*
- *... objects A and B may be in different countries*



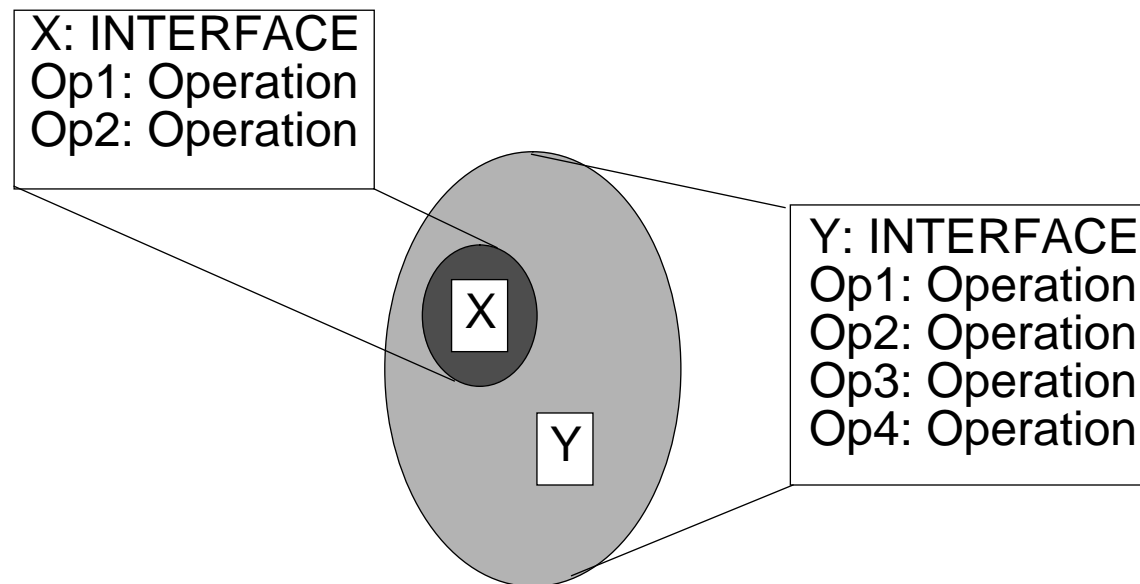
Objects for encapsulation



- ***Objects are encapsulated...***
 - **...all interactions are via defined interfaces**
 - **...all objects interact in the same way**
 - **...all objects can be managed in the same way**

Type conformance

- *Conforming interface types do not have to be identical...*
- *...Interface type Y conforms to interface type X*





IDL

- ***Service interfaces are specified in Interface Definition Languages (IDLs)***
 - CORBA, DCE, and ANSAware IDL have important differences
- ***Pointers cannot be transferred through interfaces***
 - they must be converted to a type that reflects their meaning...
 - ... a sequence, an array, or an object reference, for instance
- ***Check that language mappings and implementations are available for all the systems that you plan to use***
 - but remember you can use different programming languages for client and server if you wish
- ***Take care with some IDL features***
 - for example, modes *inout* and *out*



Distributed Communications Techniques

- *There are three common techniques*
 - RPC (Remote Procedure Call)
 - RDA (Remote Data Access)
 - RQM (Robust Queued Messaging)
- *RQM is not quite what it might appear; it is not necessarily more reliable than RPC*
- *Avoid oneway RPC unless you are sure why you need it*



Dependability

- *Partial failure is a property of distributed systems*
 - a property that must be assumed
- *Applications must be prepared to handle partial failure*
 - via exceptions that are specified for the interfaces that they use
- *Fault avoidance and fault tolerance are complementary*
- *Fault tolerance can be achieved through replication*



Replication

- *Replication can be achieved through group communications*
- *Group communications can be supplied as a separate mechanism, or integrated with the distributed processing environment*
 - group RPC, RDA, and RQM are all possible
- *You need to consider the ordering requirements*
 - probably causal + total order, if you have a choice
- *Efficient application state transfer (when members join) is a difficult design problem*
- *Careful product selection is essential if you plan to use group communications*



Real-time and Performance

- *Real-time is about making systems 'fast enough', not 'as fast as possible'*
 - the performance requirement must be specified
- *End-to-end resource reservation is required for predictable performance*
 - systems supporting this will emerge slowly
- *Programming with priority can be effective for soft real-time systems*
 - but insist on a scheduler that avoids priority inversions...
 - ... and don't expect miracles



Concurrency

- *Concurrency is one technique to improve performance*
- *Concurrency is expensive to design, implement, and test*
 - it requires highly-trained, highly-competent engineers...
 - ... all paying careful attention to detail
- *Invocation concurrency (using multiple implicit threads in servers) is a reasonable first step*
 - use if you have to...
 - ...and, again, don't expect miracles
- *Some systems still don't support concurrency*
 - but standards are emerging



Transparency mechanisms

- *The engineering of a distributed system allows you to make trade-offs*
- *Transparency mechanisms hide many of these trade-offs from the application programmer*
- *But complete transparency may have unacceptable overheads*
 - *it may be necessary to insert application-specific policies for efficient implementations*
 - *...this is called selective transparency*
- *Every distributed system should provide access and location transparency*
 - *check your product carefully*
- *Federation transparency is the most complex; comprehensive implementations are for the future*



CORBA

- ***The Object Management Architecture is stable***
 - interoperability between ORBs will become an important product feature
- ***CORBA clients are straightforward***
 - provided you avoid the Dynamic Invocation Interface (DII)
- ***CORBA object implementations (servers) are rather more complex...***
 - ...the interactions with the Basic Object Adapter (BOA) are more involved
 - ...but are similar for all object implementations



Common Object Services

- *Applications will need to use a common set of object services*
 - supplied as objects in CORBA, and ANSAware
 - supplied as APIs in DCE
- *Object services are emerging, for example*
 - ANSAware has the Trader
 - DCE has Security
 - CORBA has Events
 - all have a naming service
- *You should plan carefully for*
 - standardization of the various service interfaces
 - appearance of compliant products



Example application - Multimedia

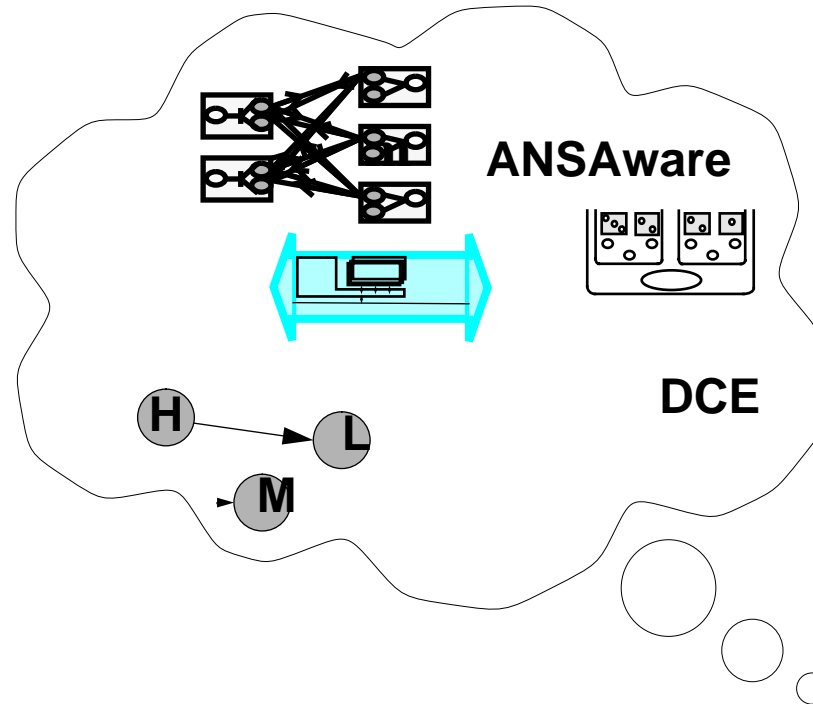
- *Distributed multimedia applications have specific demands that we have shown how to satisfy*
 - continuous media support
 - real-time support
 - replication support
- *Distributed multimedia applications will exploit other object services too*
 - for example, security



Current advice

- *All the distributed systems described are successful*
 - but you need to understand their limitations, which are different
- *Porting applications between distributed systems is not a easy job...*
 - for example, DCE to CORBA
- *Installation and configuration remains complex*
 - future tools will help

New Ideas





More about distributed systems?

- *If you want one introductory book on both technical issues and products:*
 - *Distributed Computing: A Practical Synthesis, by Amjad Umar (Prentice Hall)*
- *If you want one introductory book on the technical issues only:*
 - *Distributed Systems Concepts and Design, by Coulouris, Dollimore, and Kindberg (Addison-Wesley)*
- *If you prefer a more theoretical approach:*
 - *Distributed Systems, edited by Sape Mullender (Addison-Wesley)*



More about client-server systems?

- *If you want one introductory book on both business and technical issues...*
 - *Client/Server Strategies, by David Vaskevitch (IDG Books)*
- *... or see the magazines below*



More on published specifications?

- *For CORBA*
 - *Common Object Request Broker Architecture and Specification (OMG and X/Open)*

- *For DCE*
 - *OSF DCE - Introduction to DCE (OSF)*

- *For ANSA*
 - *An Overview of ANSA (AR.0)*
 - *An Overview of ANSAware 4.1 (RM.099)*



Conferences and exhibitions?

- ***Object World UK: 20-23 June 1995***
 - organized by the Object Management Group
- ***ANSAworks: 3-5 April 1995***
 - the annual ANSA conference, organized by APM
- ***The Millenium: 23-25 May 1995***
 - organized by TMA
- ***ICODP: 20-24 February 1995***
 - International Conference on ODP, Australia



Latest state of play?

- **Magazines**
 - **First Class** from the Object Management Group (OMG)
 - **Software Futures** from APT Data Services
 - **OSN (Open Systems Networking and Computing)** from Technology Appraisals
 - **OII Spectrum (Open Information Interchange Report)** from Technology Appraisals
 - ...and the general computer press
- **Internet newsgroups**
 - **comp.client-server**
 - **comp.object**
 - **comp.unix.osf.misc**



Latest distributed systems research?

- ***Journals***
 - **Distributed Systems Engineering (Institute of Physics Publishing)**
 - **Internetworking Research and Experience (Wiley)**
 - **IEEE Network**
 - **IEEE Computer**
 - **IEEE Communications**
 - **ACM Communications**
 - **IEEE/ACM Transactions on Networking**
 - **ACM Transactions on Computer Systems**
 - **Distributed Computing (Springer-Verlag)**
 - **IEEE Parallel and Distributed Systems**



How we can help

- ***ANSAweb***
 - consultancy and advice

- ***ANSAware***
 - technical support

- ***ANSAworks***
 - the annual ANSA conference

- ***ANSAwise***
 - training in distributed systems



Contacting APM

- *We are online on the World Wide Web!*
 - our URL is <http://www.ansa.co.uk/>
 - ... note the final /
- *E-mail address is apm@ansa.co.uk*

Stay in touch with APM