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ANSA Phase III

Introduction to ANSA [ANSAworks '96]

Chris Mayers

Abstract

This presentation was prepared for ANSAworks '96. It is a technical introduction to ANSA, the architecture and the research programme.

It very briefly reviews the basic ideas of the ANSA architecture, then moves on to cover market trends, and the work done in ANSA Phase 3. It notes what has happened since ANSAworks '95 and comments on the predictions made then. I

(Individual ANSA Phase 3 projects are covered in separate ANSAworks '96 presentations. This presentation also does not talk about the future of IT and business since that is the ANSAworks '96 presentation immediately following this.)

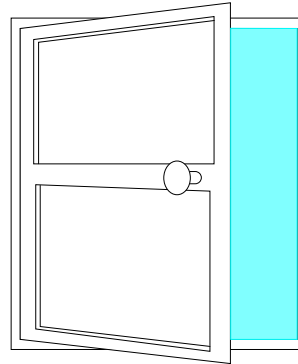
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An Introduction to ANSA



Chris Mayers (cmm@ansa.co.uk)

Speaker Notes

[NB: the ANSA logo on the master page is a temporary hack, and needs to be redrawn properly!]

[Ideally the color and font usage on all these diagrams should be made consistent.] [Needs timings!]

[The first part of this session is intended to be entirely scripted, since it is a conference presentation]

“Welcome again to ANSAworks ‘96. I’m Chris Mayers and work for the APM Business Unit. This is a technical introduction to the ANSA research programme, how our work has been applied and what we see happening next.”



Agenda

[Object Lab is not mentioned here; the focus is firmly on ANSA and associated projects]

[This agenda really needs to be less generic and more punchy.]

“ First, to bring you up to speed with ANSA itself”

- **A view of the IT marketplace**

Business and technology

- **The ANSA vision for exploiting current and future technologies**

Key concepts, including federation, transparency

- **New technical requirements that these pose**

- **How ANSA is tackling these new challenges**

Projects in the ANSA research programme, and associated projects. These are brief overviews to show how the individual projects in ANSA that you'll see covered in ANSAworks presentations fit together.



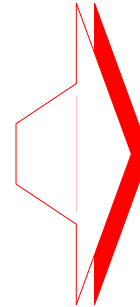
The Hidden Persuader in Open Systems

ANSA

Harvest research

Build on current technology
and open standards

Intercept new requirements



Vision

Architecture

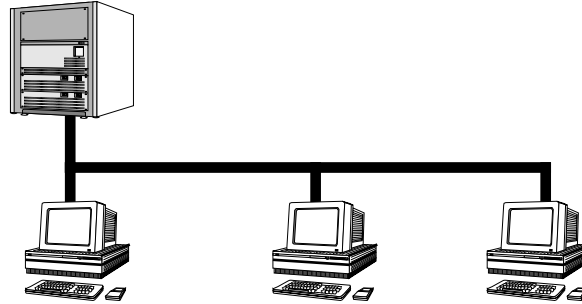
Technology

Standards

“ANSA is a bridge between the end-user, supplier, and the research communities. We deliver our vision of distributed systems in the form of architectural guidance for systems builders, technology demonstrators to prove it works, and contributions to standards so that everyone can use. [[This session isn't structured around the 4 points on the right. We pick up each of these points as we discuss the individual projects.] You might have asked why is ANSA needed? Why don't I choose best-in-class technology? Because large-scale systems are fundamentally different. First, let's look at simple client-server systems]



Issues for Client-Server Systems



- **Scalability**

- **can the system expand as needed?**

Getting the functionality right is just the start. What about evolution? Most large systems start out small. Can it grow to meet to demand?

- **can the system be deployed in small and large configurations?**

For example when deployed at many branch network installations

- **Interoperability**

- **can the system interwork with other systems?**

Growing together, integrating other client/server systems. Interoperability is top of the list for many organizations

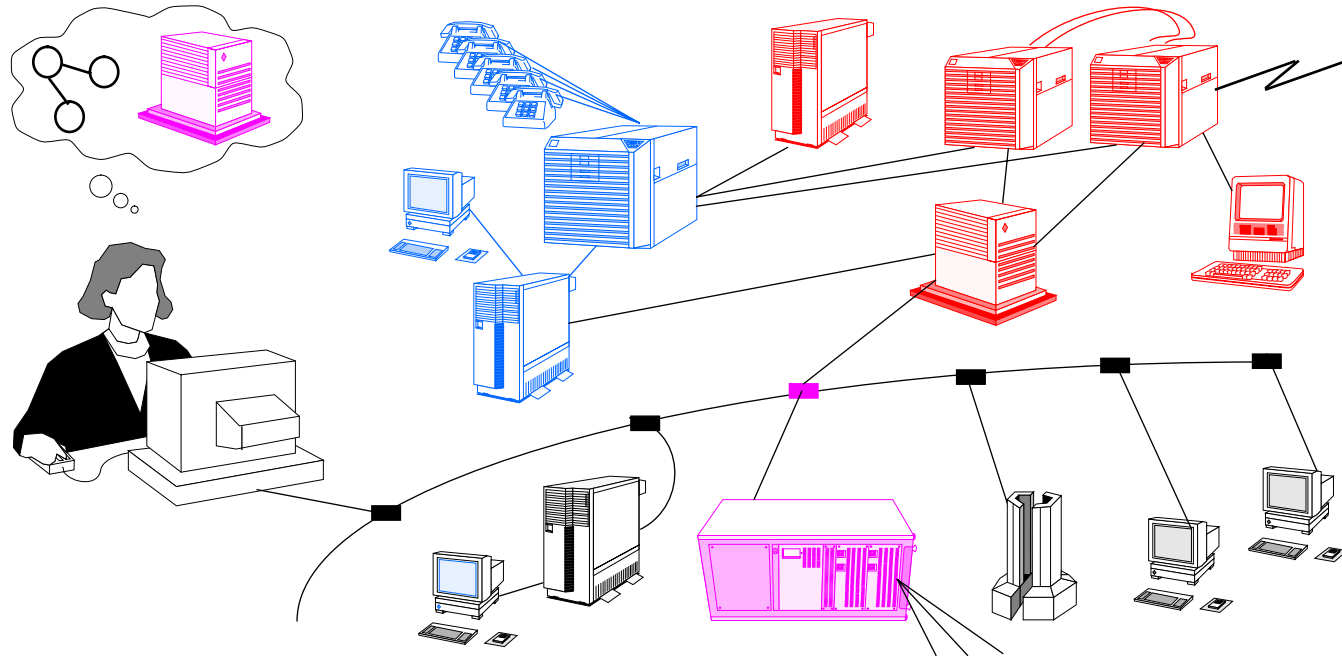
- **Dependability**

- **can the system be made reliable and secure?**

For mission-critical apps. You need to do all these cost-effectively (hence a recent move back to mainframes.)



Distributed Systems in the Real World



Aren't distributed systems just client-server? Yes, they have all the issues of client-server systems, but many more too...

The most obvious point this of this picture is diversity



What's different about distributed systems

Different from simple client-server systems. Here are a few of the general kinds of differences. This isn't a complete list; for the complete list, see AR.0

- **Diversity (heterogeneity)**
 - many types of hardware platforms, networks, operating systems, applications,...

All with different cost/performance trade-offs

- **Legacy**
 - many versions of software

Really another way of looking a diversity. Possibly doing the similar or overlapping functions

- **Decentralization**
 - many points of control in many organizations

plus all the client-server issues on a large scale

To paraphrase that exchange [between F. Scott Fitzgerald and Ernest Hemingway]

- "Distributed systems are different"/ - "Yes, they have more servers" [than simple client-server systems]...The US telephone network will contain:
 - 100,000,000 nodes (each greater than 100 MIPS processing power)(scale)
 - 1000 administrative domains (decentralization)
 - 100 versions of any software component (legacy)



Different policies for different applications

Also, there isn't going to be a single solution that meets the needs of every distributed system, because we are in a world of some very fundamental trade-offs, including.....

- **Availability versus Consistency**

Example: a sales force customer information system. If each sales person has customer details on their own laptop PC, they have the information whenever and wherever they are; but the information on the laptop PC may be out-of-date.

Availability means copies, increases risk of inconsistency

- **Autonomy versus Uniformity**

Example: different departments may select Unix machines from different manufacturers which run different versions of Unix. This makes writing portable (line of business) applications harder; but gives departments greater choice.

Autonomy gives more freedom, but leads to differences which increases complexity

- **Security versus Convenience**

Example: a system that requires a hardware security device (for example, a smartcard) may prevent you from using it if you have mislaid it; greater security than a password system, but can be inconvenient!

Security makes things harder to do

- **... and many other unavoidable trade-offs**



Technical challenges for distributed systems

This all makes the situation sound impossibly complicated for applications developers to deal with. But on the other hand you can't simply ignore the issues and hope they'll go away: in the fairly near future, all systems will be distributed systems. The good news is: ANSA knows how to handle this!

Before explaining the solutions, let's recap...

- **Distributed systems have different properties to centralized systems**

They really are fundamentally different from simple (first-generation) client-server systems

- **Different applications need different solutions**

Allow maximum freedom to vary and show how to cross boundaries where needs mismatch.

- **Unnecessary complexity should be masked from the applications**

So what are the elements of the solutions. Let's focus on 4; if you have worked in client-server or distributed systems before, but not come across ANSA, they are probably new to you.

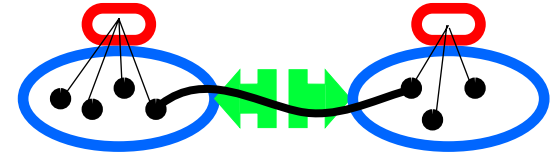
Using transparency mechanisms, and high-level abstractions supported by tools



The ANSA Architecture

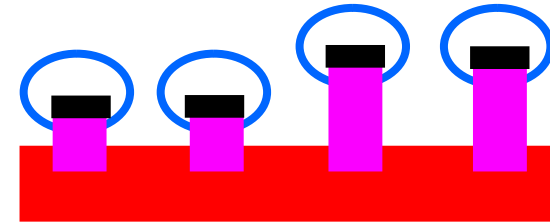
Trading and Federation

Controlled interoperability



Selective Transparency

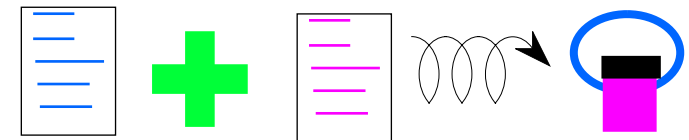
One size does not fit all



Abstract & Automate

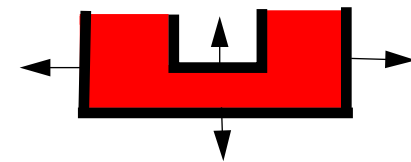
Tools replace APIs

Service Infrastructure



Modular Engineering

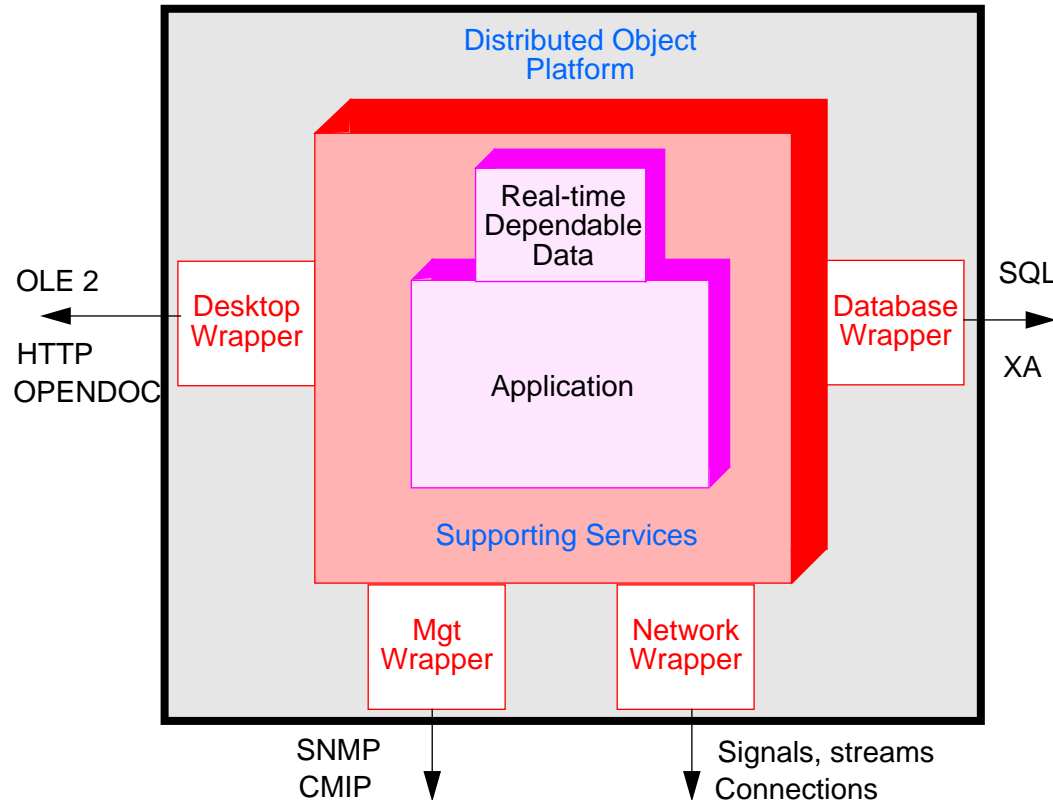
Plug and play infrastructure



Not much yet exists in products? [Trading and Federation; early work in Phase 3, but not now. Selective transparency; nothing. Abstract and Automate; just using CORBA and Java, higher level, not more abstract, APIs not being replaced by tools. Modular Engineering; yes in both ISF and DIMMA; it is this we will focus on.]



Distributed Object Environment for Open Systems

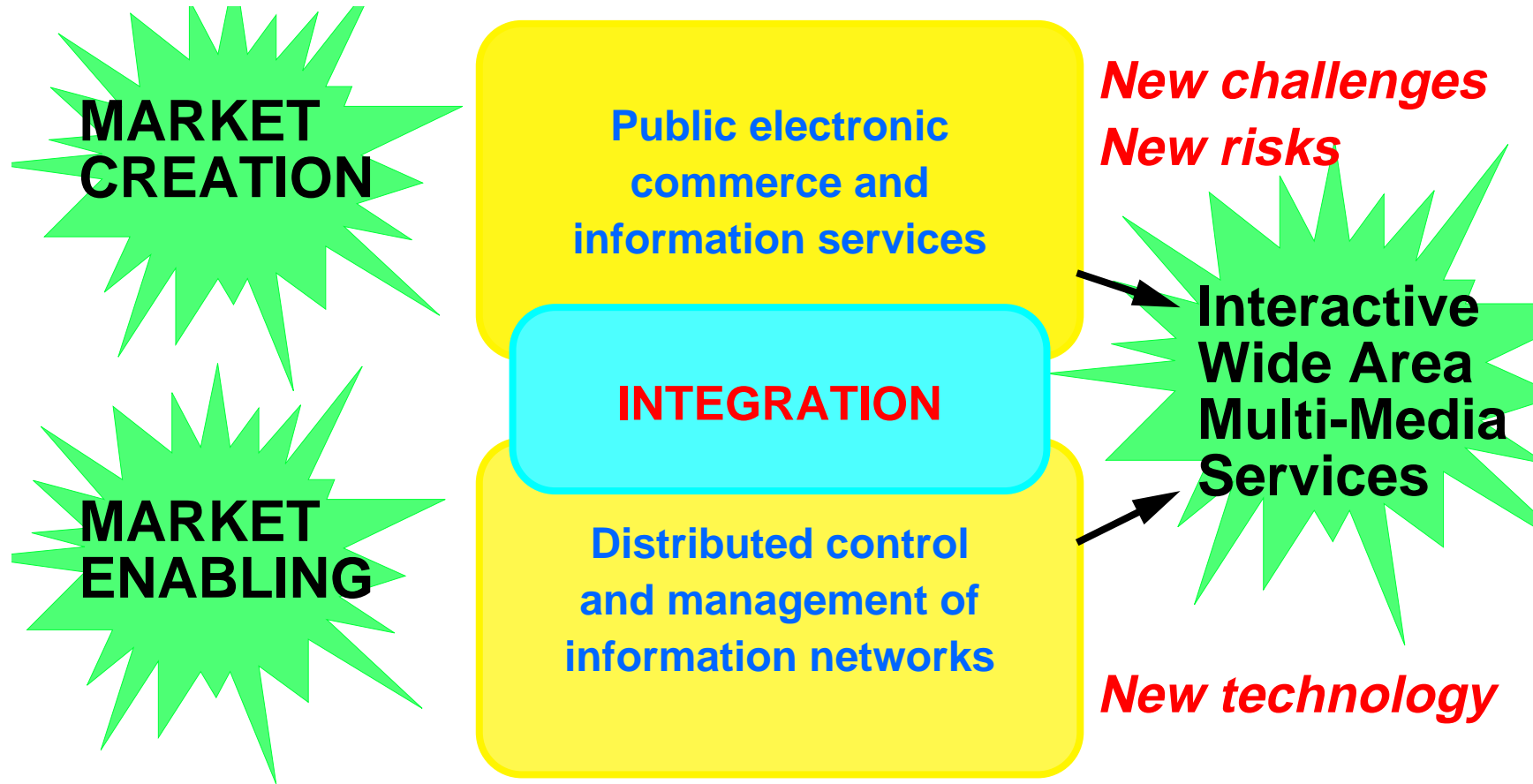


- **Information service system**
- **Business process support system**
- **Systems management system**
- **Interactive multi-media system**

So what we need to do is to be able to link all kinds of computing and telecommunications systems, using the most suitable technology, specifically different kinds of distributed systems technologies [RPC, CORBA, DCE, OLE/COM,...]. This involves many kinds of wrappers. The pressure to do this is coming from the market...



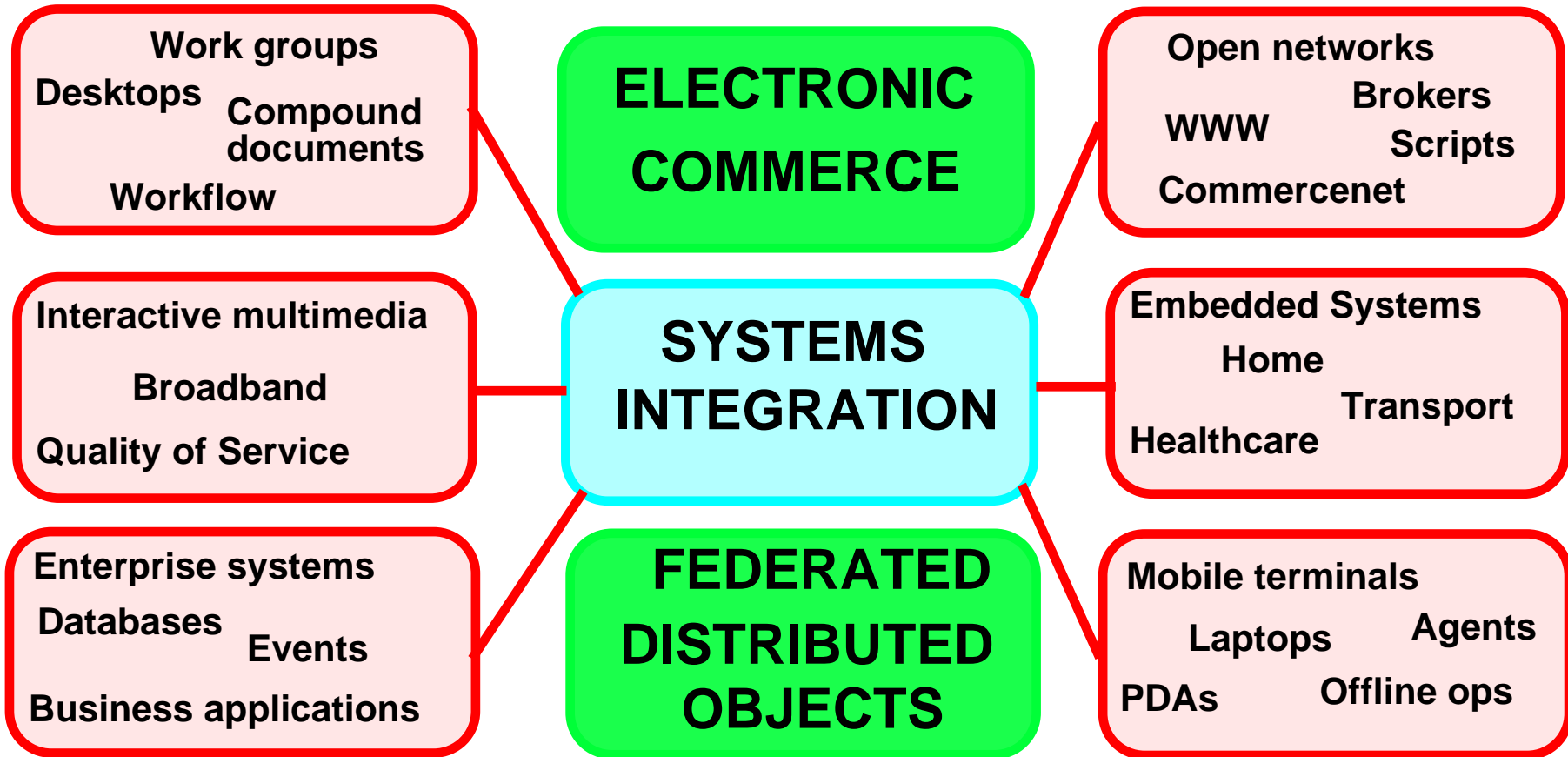
The Market



A market for public electronic commerce and [paid-for] information is being created. We need to enable it with new technology. [The upper and lower boxes correspond to the ANSA project lines ISF and DIMMA]



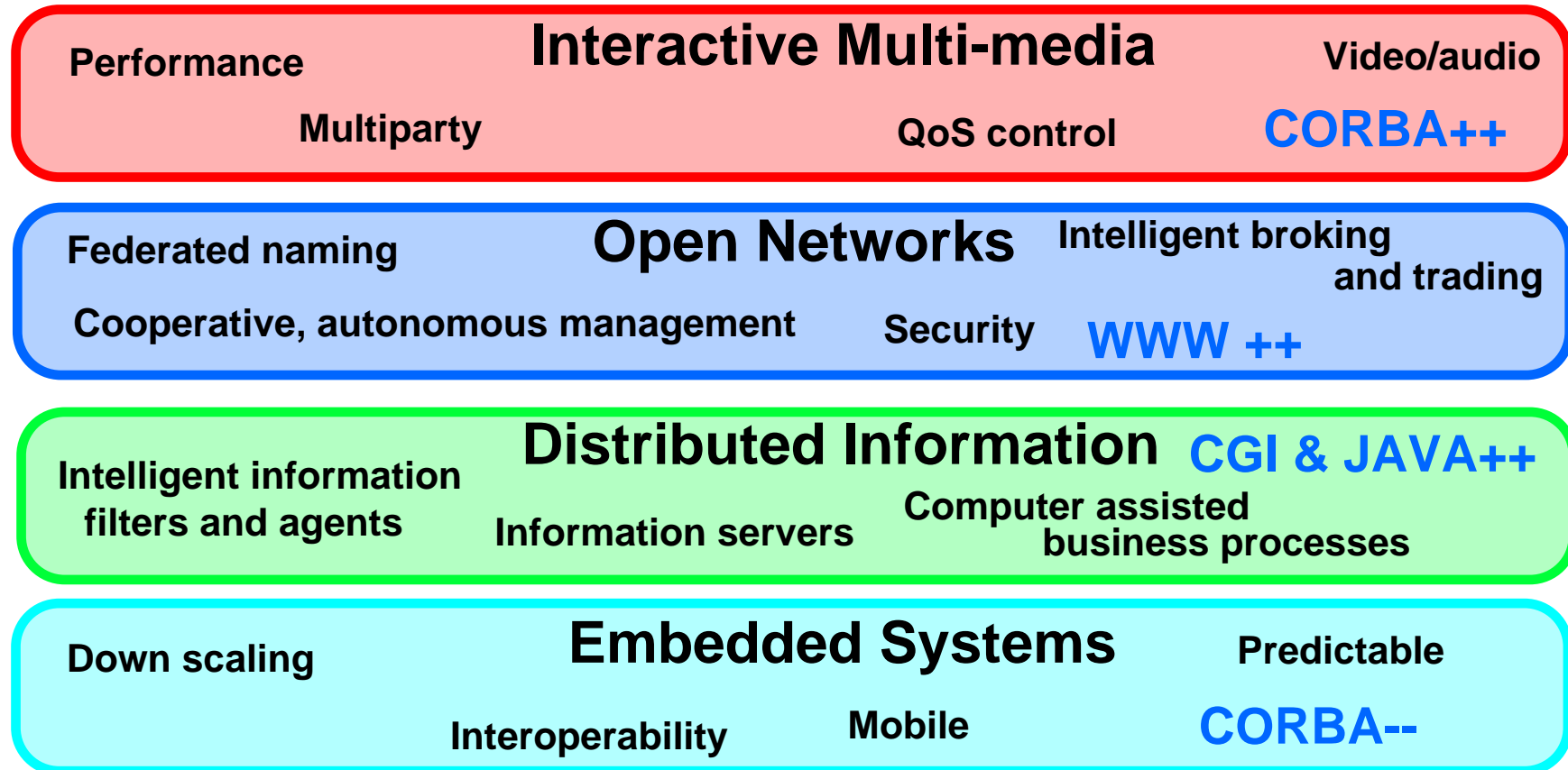
ANSA Vision



Products built using ANSA technology already exist: Workflow (ICL), Healthcare (GESI),... This is not just about shopping over the Internet. We are linking many business processes in many markets. [Distributed control and management of information networks is achieved by using federated distributed objects.]



New Requirements



Performance is about make effective use of hardware and networking. QoS is about paying for what you need, and getting what you pay for.[Distributed Information does not appear as a box heading on the previous slide [CORBA-- is lightweight CORBA; note the tension with CORBA++] (this picture isn't layered.)



Meeting the requirements

[How ANSA delivers]

[Small logos would look good here, as substitutes for bullets]

- **Extend the ANSA architecture with new concepts and mechanisms**

Compared with the state of the architecture at the beginning of Phase 3.

- **Deliver prototypes**

Of the infrastructure and applications, based on a scenario

- **to prove the concepts work**
- **to show how to apply them**
- **to enable application development**

The requirements will only be fully met in commercial products, so we must disseminate the knowledge...

- **Propagate the knowledge into high-profile industry groups**

- **W3C, Smartcard Forum,...**

- **Feed the expertise into standards bodies**

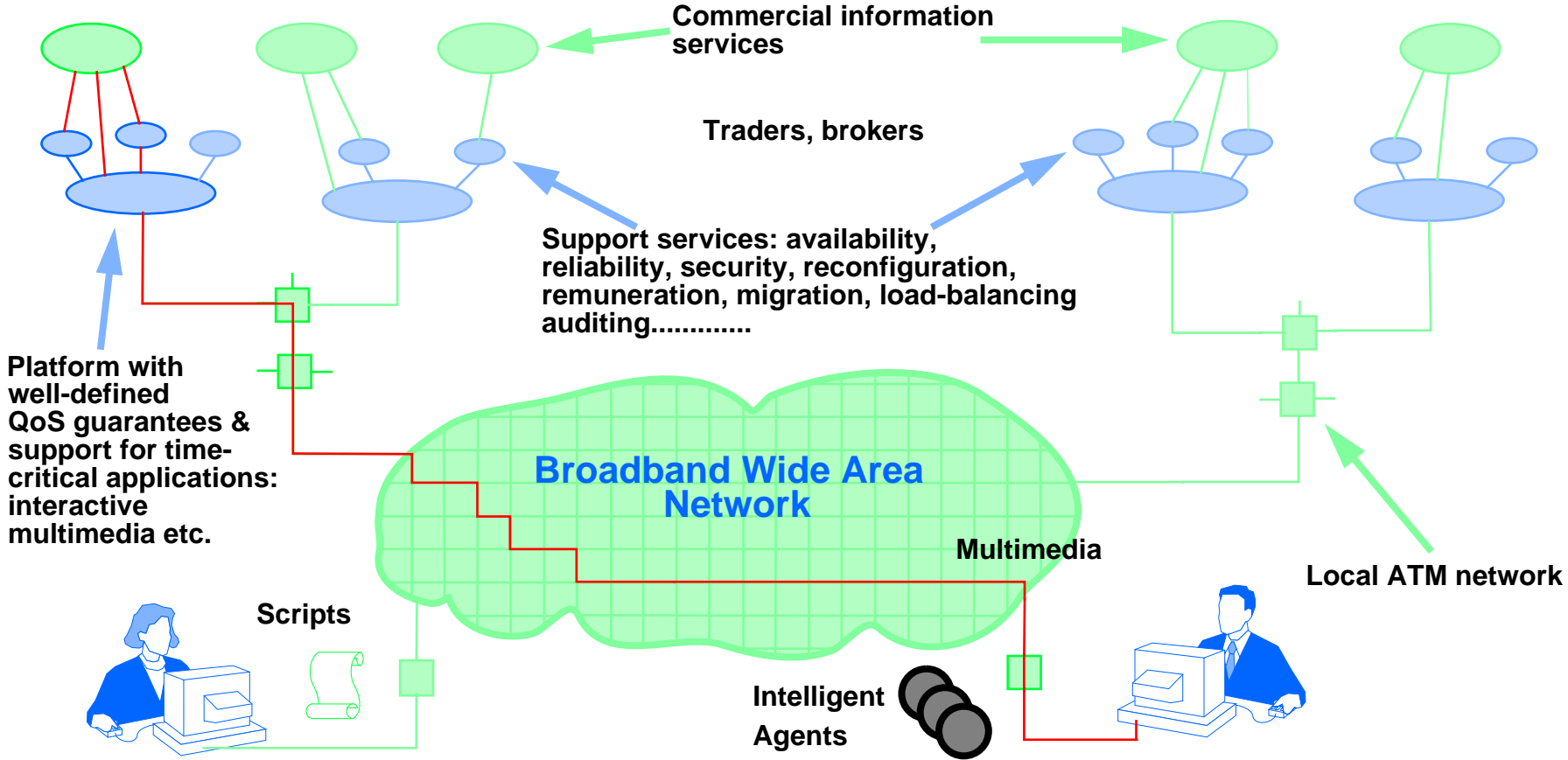
- **OMG, ISO, ITU, OSF**

Object Management Group, ITU/CCITT, Open Software Foundation

Andrew Watson from the OMG talking tomorrow



Scenario



This scenario shows how many elements need to be blended to meet user needs. End to end. You can therefore see a strong emphasis on integration by linking together current and emerging technologies and standards [gateways, wrapping], rather than inventing new ones. We are continuing to apply existing ANSA concepts



ANSA Focus

**Public electronic
commerce and
information services**



**Explore,
demonstrate**



**Distributed control
and management of
information networks**



**Prototype,
extend,
validate**



[cf Market slide earlier] The ANSA Phase 3 programme has demonstrated during 1995 that various of these integration approaches are feasible by delivering prototype software. You'll be finding out more about these throughout ANSAworks, and we'll be demonstrating them live on Wednesday afternoon at APM. We have been focusing our efforts in two project lines for these areas...



Information Services Framework - the need

[Rest of this session isa partial ANSAworks roadmap] [This summary as Vision, Architecture, Technology, Standards?)] So, for each of these two areas, what I'll run briefly through the technical challenges, and the key technologies to be exploited. I'll then show the framework ANSA has adopted, and how our projects in this area fit together. I won't spend a great deal of time on any one of these projects because you can find in much more about each of them later on in ANSAworks; this is big picture [Need to add project logos throughout.]

- **World Wide Web is creating a uniform information space**

As much from existing information as new information. Browser and authoring tools getting better all the time

- **Good presentation and authoring tools**
- **Poor navigation, administration and development tools**

A corporate home page is straightforward. Maintaining it to be useful is expensive because of poor tools

- **Inefficient protocols**

HTTP requires a minimum of 4 message pairs (round trips) to retrieve one page

- **No support for active documents**

It's still basically static text and images

- **Distributed objects can help**

- **using a tool-based approach**
- **applying experience with protocols**
- **applying federation principles**



Information Services Framework - the key technologies

[Small logos for each of these would help]

[Need to explain these briefly]

[Would be good to be able to highlight these on the scenario picture.]

[Now do 3 key technologies from the bottom up.]

At last year's ANSAworks '95, Ninian Edie of ICL in the keynote speech said that no one vendor would dominate the market [Microsoft]. He gave several reasons, closing with "the main reason is that progress messes up the best laid plans". Seeing certain vendors scramble to put together an Internet strategy [Java and the Internet]

- **Internet, the World Wide Web and its protocols**
 - **new capabilities still evolving and being standardized**

IPv6(IPng): the basics are there, but there is still much to do (QoS, etc.)

- **CORBA, and its IIOP interoperability protocol**

1995 also saw the standardization of CORBA 2.0 and the Internet Inter-ORB protocol (IIOP); products now shipping

- **for integrating distributed applications**

- **Java**

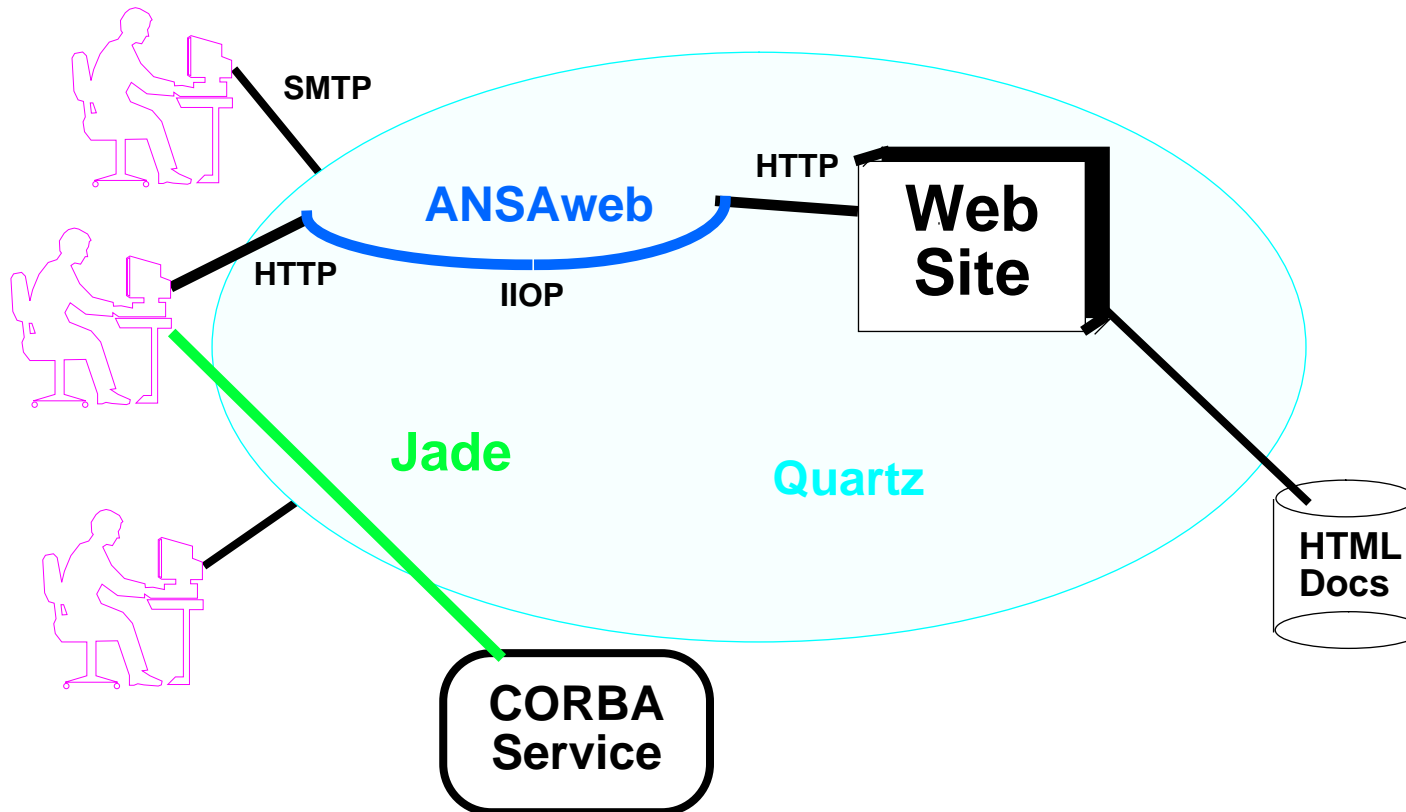
Supporting active WWW documents. Also can be thought of as a starting point for scripts and intelligent agents
The right technology at the right time

- **for programming Internet applications**

How do these key technologies fit together, what are the missing components that ANSA have added, and why?
[Security is a key technology here, but is not part of ISF proper; it is dealt with under E2S.]



Information Services Framework



Unmodified browsers on the left, unmodified HTML documents and WWW servers on the right
[Note that Topaz has been removed from the right-hand side of this diagram since this is an ANSA Phase 3 proposed project, and is confidential.] [It would be useful to show the evolution path between the projects in this diagram.] [ISF is a framework, DIMMA is an architecture - is this significant?]



Information Services Framework - ANSA in action

- **ISF links distributed objects and the World Wide Web**
- **ISF focuses on security**

[In the medium term, exploiting Java and Internet security mechanisms.] But at the moment, security is in...

- **particularly in the associated E2S (End to End Security) EU project**

Two sessions on security tomorrow. More about E2S in a moment...

- **ISF contributes to World Wide Web standards**
 - **via IETF (Internet Engineering Task Force)**

Mark Madsen chairs the URN (Uniform Resource Naming) Working Group. [He's not at ANSAworks]

- **via participation in World Wide Web initiatives (W3C, and WWW conferences)**

We are (long- standing) members of the World Wide Web Consortium, run by MIT and INRIA in collaboration with CERN. We are also active in presenting our work at the WWW conferences

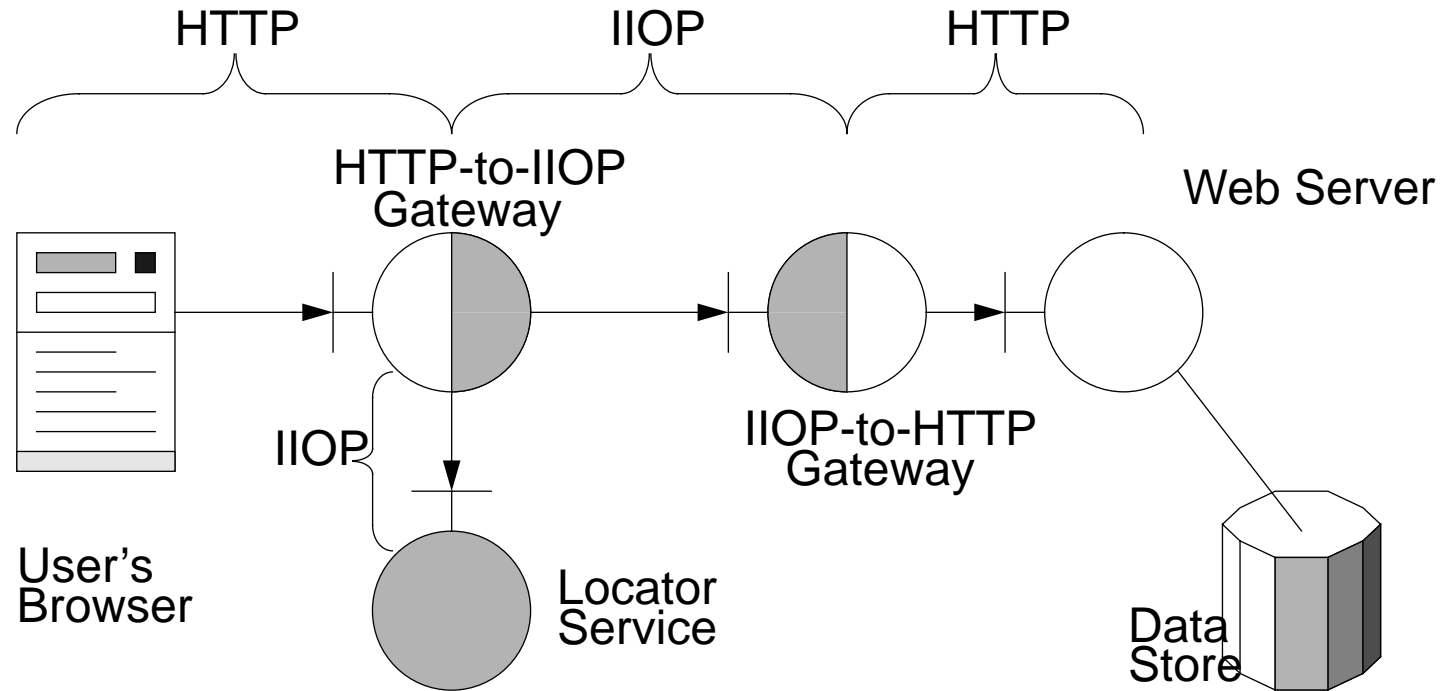
[W3UserNet still in limbo, so don't mention this here] No further coverage of ISF standards here.

(Now a one-slide overview of each ISF project, plus associated projects.)



ANSAweb

Opening Gateways between CORBA and the Web

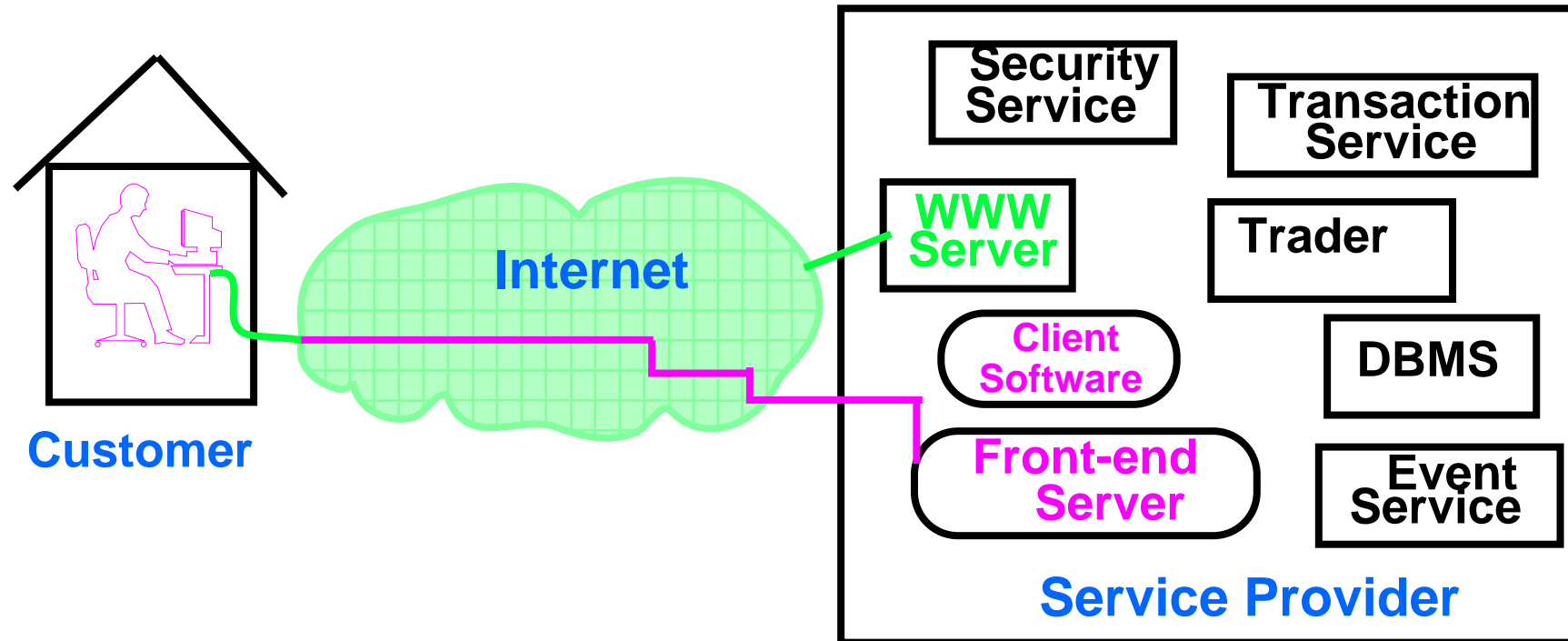


[Need to decide how to talk about ANSAweb, since this work is now in abeyance.] The theme of ANSAweb is that of linking the CORBA and World Wide Web by developing protocol gateways. This picture shows gateways in both directions: from WWW HTTP to CORBA's IIOP (left) and vice-versa. This approach would allow you to isolate your Web servers from direct access, to exploit CORBA security and transaction services, for example. The output from an earlier stage of ANSAweb has already been picked up by the World Wide Web Consortium (W3C) [They haven't updated it to use the latest CGI libraries, though.]



Jade

World Wide Web access to CORBA Services



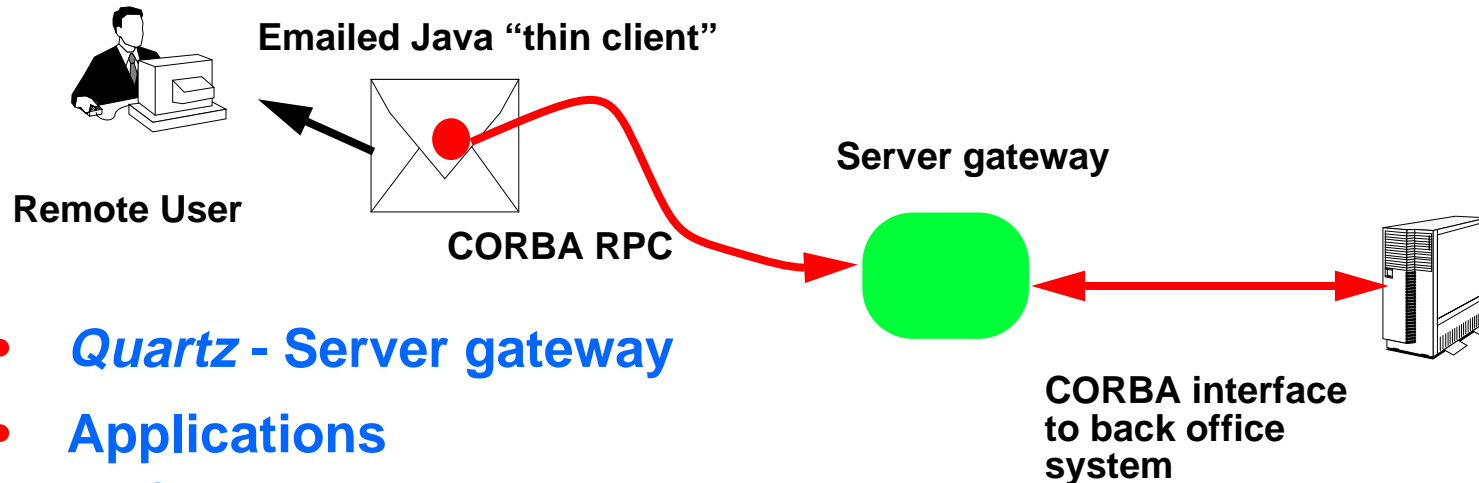
Jade uses Java technology to download the CORBA IIOP, protocols and applications built on the, from a WWW server into a (Java-enabled) WWW browser. This exploits the platform-independent nature of the UI from Java, but also allows access to the full range of CORBA services.



Quartz

Making CORBA objects easier to reach

Also known as ObjectMail (trailed as such in the ANSAworks brochure)

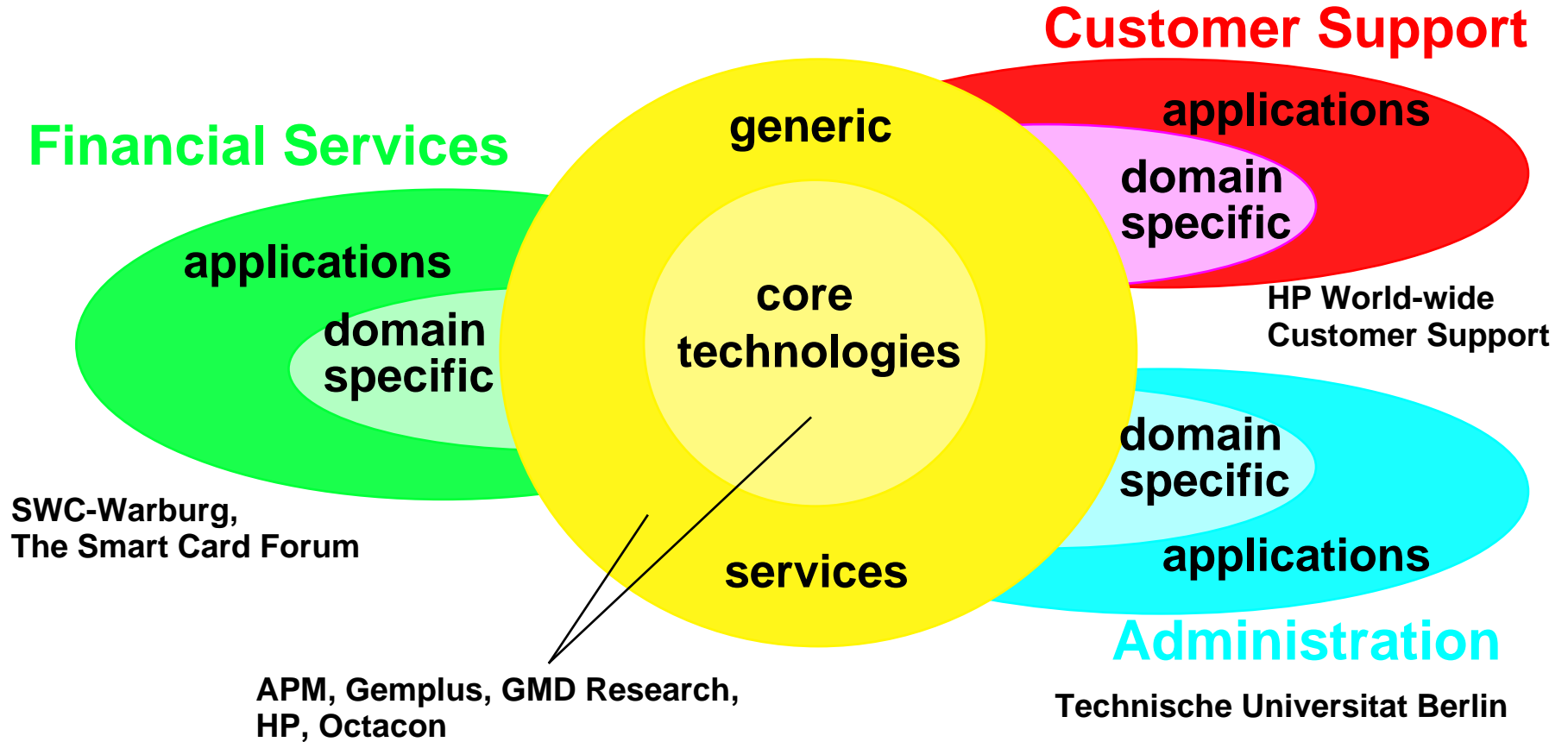


- **Quartz - Server gateway**
- **Applications**
 - **Software distribution**
 - **Data collection - active forms**
 - **Custom client applications**

Quartz combines e-mail and WWW. It uses Jade for delivering access to services. Quartz exploits the e-mail capabilities for confirmation and forwarding to control and monitor workflows. The aim is to build a reusable workflow toolkit that can be customized for particular workflow applications. [Next slide] E2S is about end-to-end inter-organization business processes that must be secured; 3 domains, sharing common services (security services, payment services).



E2S End-to-End Internet Security via the Internet



E2S is funded under the EU Framework 4 programme (not part of ANSA proper, but ties into our ISF work)
[Get Mark to check that this is still accurate, given forthcoming changes to the E2S Technical Annex.]



Distributed Multimedia Architecture - the need

[That was the ISF project line.] Now, on to DIMMA. [This acronym is deprecated, so I've used Distributed Multimedia Architecture throughout.]

[This summary has the same overall structure as the one for ISF]

- **Extend CORBA to handle multimedia streams, peer-to-peer communication, and quality-of-service negotiation and control**
- **Add real-time capabilities to the ANSA/ODP architecture**
 - **without compromise to federation, diversity, and scalability**
- **Provide interoperability between real-time and non-real-time objects**

Applications that don't need real-time must not have to pay the price

- **predictable islands in an unpredictable sea**
- **Provide real-time guarantees in an asynchronous distributed system**

Cost-effective performance

- **for high-performance distributed systems**
- **for predictable distributed systems**



Distributed Multimedia Architecture - the key technologies

[Again, small logos, and being able to highlight them on the scenario picture would be good.]

Just to pick up the key features of these technologies

- **ATM (Asynchronous Transfer Mode) and broadband networking**
 - **for multimedia streams with quality-of-service guarantees**

(Which you found out about at last year's ANSAworks.) Guaranteed bandwidth, maximum error rate, and so on
With corresponding lightweight RPC and communications protocols

- **Lightweight operating systems with multithreaded real-time support**

For handling multiple streams. Desktop operating systems now offer multithreading (Windows 95, Windows NT), but these are too heavyweight and don't offer real-time

- **for high-performance, low-cost platforms**

- **Distributed Processing Environments (CORBA and others)**

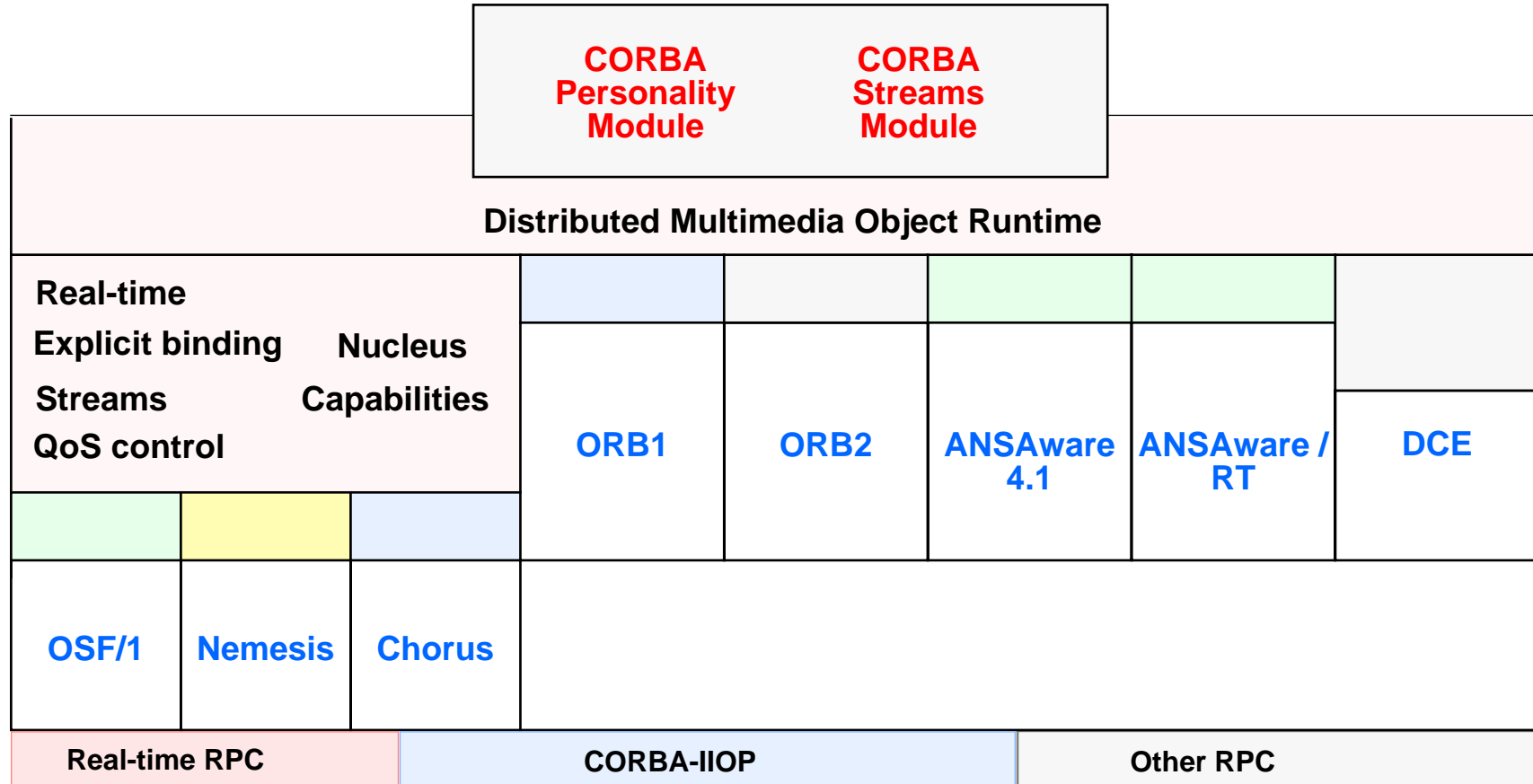
- **for distributed applications**

CORBA and others

[The next picture shows mappings over various distributed processing environments, not just CORBA.]



Distributed Multimedia Architecture



[This only shows the infrastructure, not the applications, unlike the corresponding ISF picture.]
 [It has been changed to show our current project plans; plus some options that are definitely possible.]
 Read this layered picture from the bottom up. Note the modular engineering of this architecture



Distributed Multimedia Architecture - ANSA in action

- **Real-time mechanisms are already proven in ANSAware/RT**

there were other distributed processing environments; we have our own, ANSAware. /RT as shown at ANSAworks '95, and now available on Windows NT. [Not CORBA, though. Don't mention the Solaris port yet.]

- **ANSA infrastructure adds CORBA compatibility**

Jet, Jetstream [Avoid saying we are building an ORB here] Don't mention the synchronous programming work.]

- **and prototypes CORBA extensions for multimedia**

- **ANSA multimedia demonstrations exploit CORBA extensions**

- **Amber**

- **Associated projects add broadband capability**

The convergence of computing and telecommunications - with a vengeance!

- **ReTINA**
- **DCAN**

- **ANSA contributes to multimedia and real-time standards**

- **via OMG Telecom SIG**

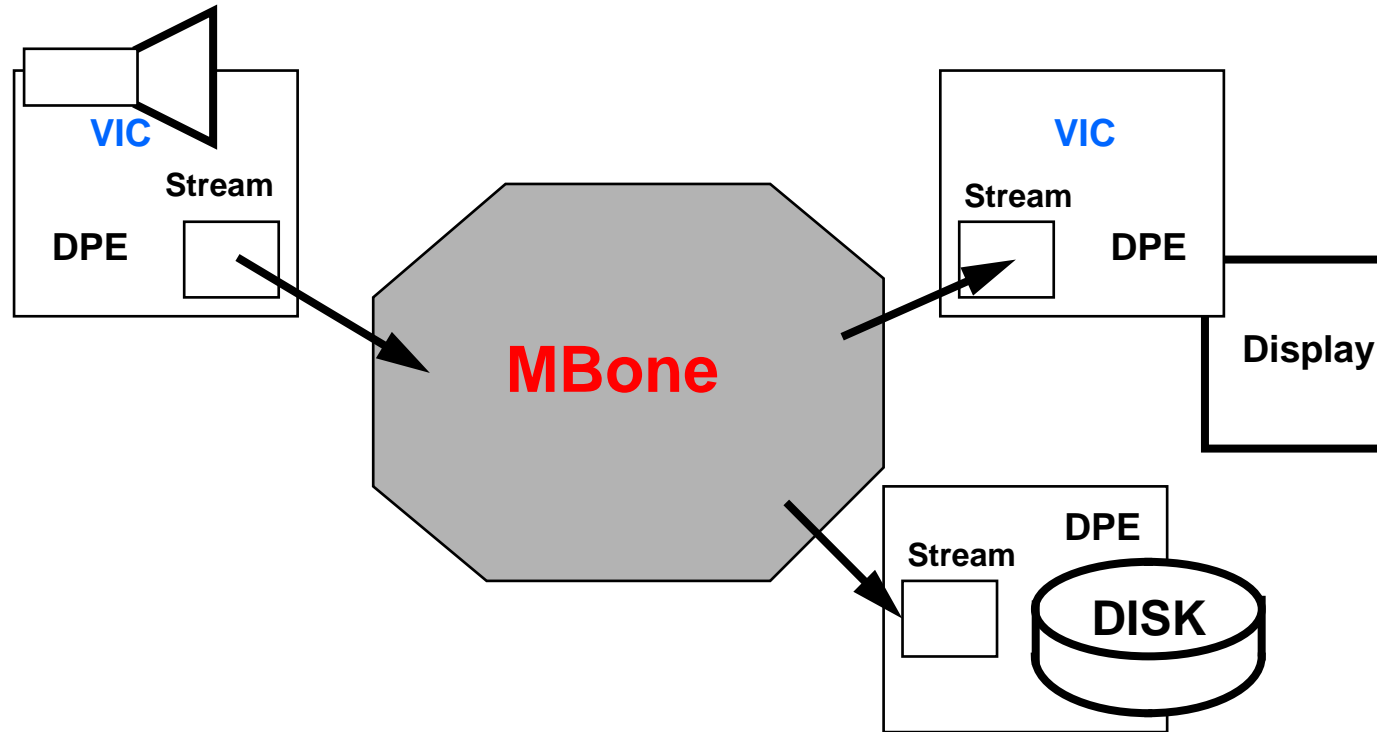
For the CORBA extensions mentioned above (next bullet: ODP extensions)

- **via ReTINA into ISO/ITU-T Open Distributed Processing (ODP) and TINA-C**



Amber

Delivering Real-Time Streams via the Internet



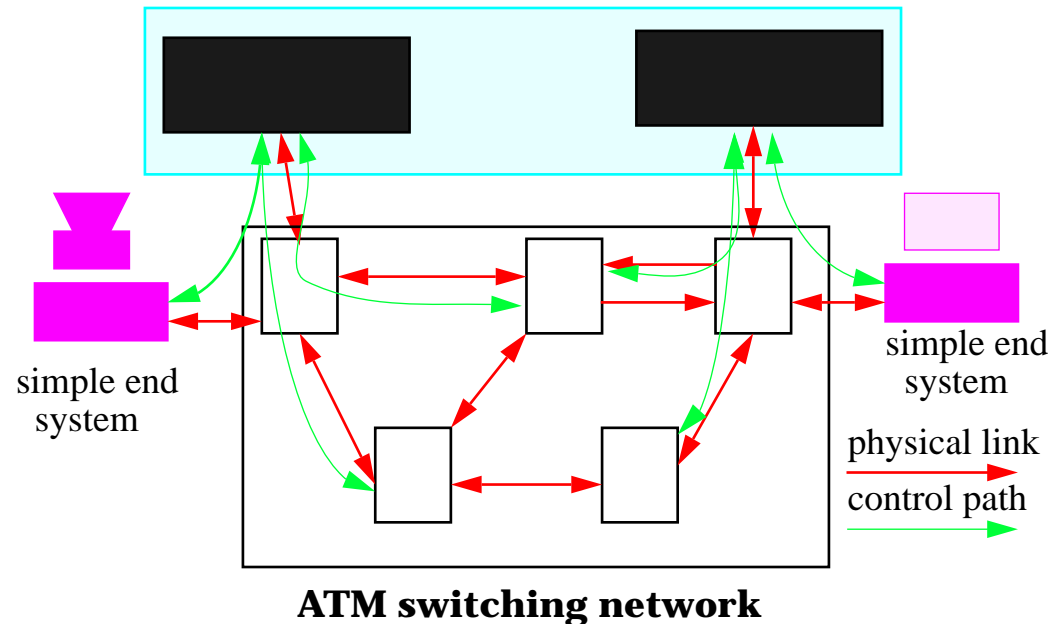
[VIC is a class framework for video streams, built on RTP, using the MBone. victool is the UI; it provides 1-many video multicast, usable for basic videoconferencing. True videoconferencing applications need floor control, meeting management, ... requiring application coordination between sites; a DPE like CORBA is ideal, Amber enables this by linking the vic streams to the real-time DPE. The DPE can also be used for binding the streams, as in RETINA. vic doesn't support audio; there's an equivalent framework (vat) for that.] Now broadband...



DCAN

Distributed Control of ATM Networks

Control and management using a distributed processing platform

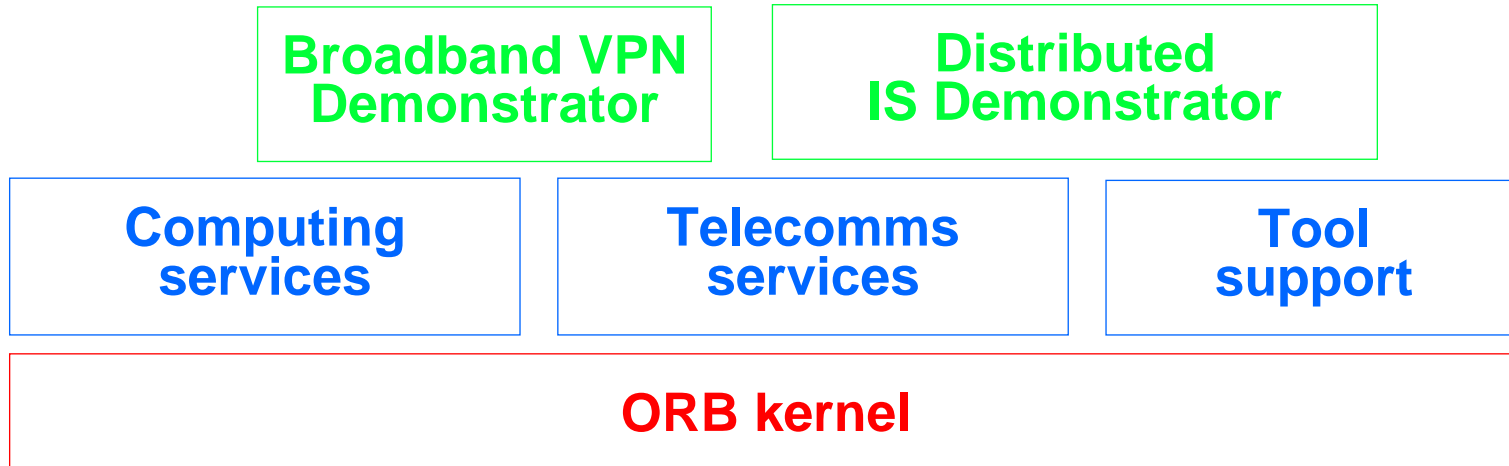


DCAN also brings together streams and DPE, but for management DCAN is funded under the UK DTI HPIP (High Performance Interfaces and Protocols) programme. The partners are APM (distributed processing environment) Nemesys Research (ATM networking), and the Cambridge University Computer Lab (operating system). The aim is to use standard distributed processing environment technology (DPE). There is a session on this later today presented by Ian Leslie of CUCL



ReTINA

An Object Request Broker for Telecommunications



ReTINA is a collaborative project funded under the EU ACTS (Advanced Communications Technology and Services) programme. Participating companies are from throughout Europe.

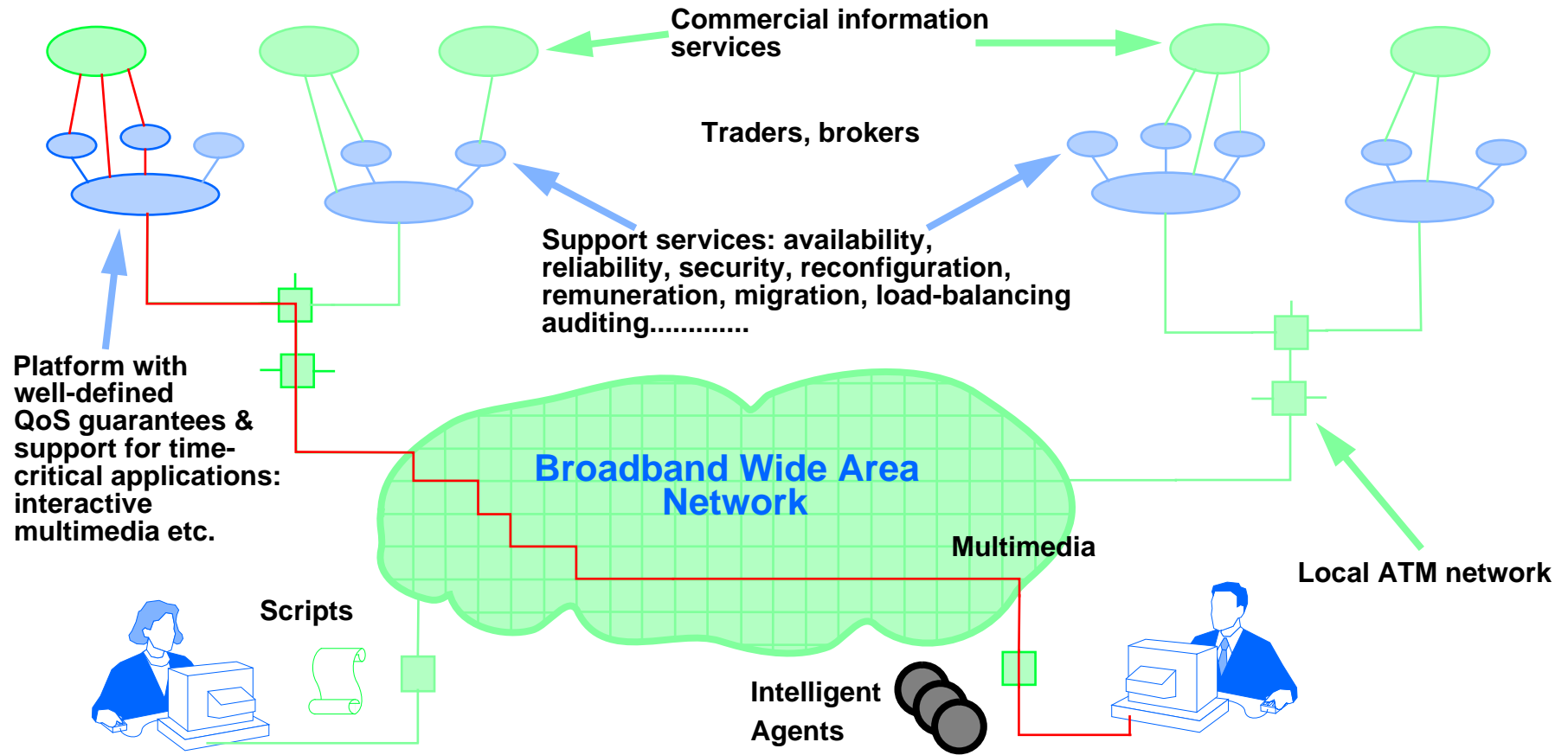
ReTINA is also a TINA-C ((Telecommunications Information Networking Architecture Consortium) Auxiliary project (TINA is based on ODP and CORBA concepts, but is not tasked with developing the software to support this, in particular the CORBA extensions that are necessary.)

The goal is develop an industrial-quality distributed processing environment for telecommunications applications, to meet the performance and availability demands of public telecomms

ReTINA aims to exploit CORBA ORB technology in two ways: for operations, administration and maintenance (needing transaction and database support); and for the delivery of interactive services (needing a small, fast, real-time ORB using microkernel operating system). Both will exploit CORBA and CORBA services, with extensions for multimedia streams, connection management and quality of service.



Scenario Revisited



Summary

[Ask for questions at this point. Don't be afraid to hand them off to Andrew or Rob.]

[Need to link back to the scenario and introduction here, tying together DIMMA and ISF.]

- **ANSA is a firm foundation**
 - **being extended through ISF and Distributed Multimedia projects**

[Punchier here.]

- **To find out more**
 - **see <http://www.ansa.co.uk...>**
 - **... and the rest of ANSAworks!**

I've briefly described some of the projects to be presented at ANSAworks; there are plenty of other sessions on [end-user] applications to enjoy.

“This session has concentrated on technical near-term future. To further broaden your horizons, we continue with the Futures Presentation - after the coffee break!”

