Applying ANSA Principles to Broadband Telecommunications Systems

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1 Background

This paper discusses the use of ANS/ODP and TINA-C concepts in the development of components for use in future broadband telecoms systems. There is a revolution coming in telecoms that enables a new look at the operational problems of delivering telecoms services to be taken.

The paper discusses the use of ODP concepts:

- separation of concerns,
- open systems,
- viewpoints,
- interfaces & objects;

and the TINA-C concepts of

- separation between services, call and connection,
- building blocks.

These concepts are used to address some of the major problems in the current provision of telecoms.

2 Come the Revolution

There is a revolution coming over the horizon in the telecoms business. The revolution arises from the confluence of two important, but independent, influences:

- Deregulation of the industry by governments whose philosophy is to promote the use of market forces, this has the consequence of introducing competition.
- New technology in the form of high-speed broadband communications.

The consequences of these influences are enormous, there are many assumptions, and dearly held beliefs, that are no longer valid. For instance we can see that the telecommunications market-place can be segmented both vertically and horizontally. Finer segmentation allows new players into the market who do not have to be large companies; though many large companies will want a piece of the action as well. There will be niche markets, niche players, big markets and big players.

The existing operators, and their traditional suppliers, will have to re-engineer their businesses; or lose their business to more agile new-comers. For instance:

operators will want to develop their own services as these will be their competitive advantage; they will not rely on suppliers for these new services. Suppliers will find their customers keener on price-performance and wanting to drive the equipment market into commodities as fast as possible to achieve this goal.

This new environment will not arrive overnight, but will probably arrive earlier than many are expecting. Already the process is accelerating in the US where RBOCs and cable companies are getting together for the purposes of competing, or being first to market. The public is being warmed-up to expect the fruits of broadband networking by articles in the general press.

In this atmosphere we have been examining the influences and working out some broad principles which will guide the development of the telecoms market and its requirements for systems. The principles of the ANSA/ODP and TINA-C projects appear to be particularly relevant and are further explored in this paper.

3 Open Systems is the way ahead

The revolution presents many new problems for the telecoms industry, but there is almost universal agreement (at least amongst the operators) that the existing problems need to tackled as well. Consequently, there is a realisation that the Open Systems philosophy should be adopted in the development of the new telecoms infrastructure for broadband. It is in this belief that the TINA-C project has been established, and supported, by the industry as a whole.

Open systems is the antithesis of the proprietary solution, or the introduction of regional differences. The intention is to create a market of components (essentially commodities) that can be bought from several vendors which when combined work together as a whole system solving a whole problem. In particular Open Systems should enable:

- Interworking between systems: regional, national, international; and between competitors.
- Cost-performance attributes that will enable competition between suppliers and operators on a level playing field.
- Evolutionary development and improvement of systems to meet competitive demands.

To achieve these benefits there is a need for an industry consensus on an open architecture of telecoms systems to identify the components and their interfaces. This architecture has to meet the business needs of the industry, it cannot be just technically elegant. The TINA-C project are attempting to define such an architecture based on the ANSA/ODP principles and work in IN, TMN, and Bellcore's INA.

In our project we are using an analysis of the future of the telecoms industry and working with the TINA-C and ANSA projects to develop concepts for components within the architecture and prototype potential products for use in broadband networks. We have concentrated on the development of a product concept for the management of switching resources. We have tried to determine a business need for such a system and used this to influence the development. The remainder of this paper examines the context of the business need and the subsequent separation of concerns that using the ANSA/ODP viewpoints can produce.

4 Views on the development of broadband systems

This section uses the 5 viewpoints of the ANSA/ODP architecture to examine the consequences of the revolution on the development of systems for broadband communication.

4.1 Enterprise view

Most of the consequences from the enterprise view have been captured in the previous section. The main points are:

- The industry is moving towards open systems as a solution to some of the current problems, the TINA-C initiative is evidence of this.
- An open architecture is required if the fragmentation of the market and suppliers is to be supported in a competitive environment; yet the industry must be able to provide global ubiquitous communication to end-customers.

4.2 Information view

The widespread availability of high bandwidth, especially over wide area networks, will enable a large number of new applications. The way these applications will be built is based on the current way distributed applications are built on local area networks. That means the application components will expect to exchange data (via packets) in a transparent and fast way; just like they can on a LAN network. This means there must be a generic data transport mechanism that supports world-wide exchanges of short data traffic between arbitrary applications. Having applications communicate directly, without the active participation of the network, enables new applications to be developed and deployed independently of the network provision. This is essential the rapid growth of applications which will be driving the commercial development of broadband networks. Once the applications have agreed on a communication setup they can ask the network to provide the appropriate connections. Separation between services, calls and connections is essential to delivering this new model of application and network interaction.

Information is the key to the development of applications using broadband networks. It is also the key to the management of the networks. Current network operational systems are designed to generate and keep information. The management system then spies on the network to try and deduce what the operational system is doing. If the control systems are open then they can share their information with the management system leading to much more efficient management and subsequent reduced costs.

4.3 Computation view

In the telecoms system the principal component of deployment is a building block. This is a component which is represented in the architecture and probably the unit of purchase, or development, by the software supplier. Consequently, building blocks tend to be quite large and deliver a particular telecoms function. Our group has been working on a component to deliver connection management (separate from call management).

Outline design of a component can identify the non-operational characteristics required of particular objects in the component. For instance, not all components will require full reliability, availability of sufficient numbers of the same type may

be more appropriate. Similarly, only objects interfacing with objects in other components may require full security, internal objects may utilise some greater degree of trust.

During the computation analysis the performance requirements on particular objects can be deduced; particularly those which might have real-time constraints on their operation — for instance those dealing directly with real telecoms equipment.

4.4 Engineering view

The functional aspects of telecoms components are relatively easy to understand and define. The non-functional aspects are not so easy to pin down. However, it is the non-functional requirements that distinguish a telecoms application from a more generic application. We are exploring the non-functional requirements for security, availability, reliability, and performance. Whilst it is obvious that the new approach does mean that many of the traditional telephony requirements do not apply, it is not obvious what the replacements are. The security requirements are more difficult to meet in an open distributed systems environment.

The segmentation of the market means that many more telecoms systems will be talking to each other to deliver a single service to an end user. Service availability and reliability will have to be higher than that available on current cable networks, but probably lower than that currently espoused by the traditional telecoms operators. It may be possible to separate emergency service provision from, say, home shopping for this purpose.

Performance is an issue in such a potentially large scale telecoms system. We are carrying out experiments to examine the scaling issues. Some people in the industry believe that real-time systems will deliver the performance they require because *UNIX is too slow*. We have anecdotal evidence that some UNIX systems out-perform some real-time systems on the same hardware.

4.5 Technology view

Our target systems technology is CORBA on DCE, utilising both UNIX and real-time operating systems (HP-UX and HP-RT respectively). Currently the available DCE and CORBA implementations do not have the required performance and flexibility we need. We are experimenting with different underlying technologies, whilst keeping all our interfaces defined in CORBA IDL. We hope that only re-compilation separates our experimental system from the base technologies.