

Understanding BT's Corporate Networked IT Services Strategy

With increased commoditisation of traditional services, BT is exploiting its core network-centric strengths and targeting increased revenues from corporate networked IT services. Aimed at enterprise-scale customers, these services range from the provision of IP-VPNs to full IT outsourcing, and span the range of infrastructure domains from desktop to data-centre.

BT's networked IT services strategy offers a substantial capability to the business market-place, helping customers reduce costs and complexity, guarantee performance and improve collaboration. Its approach is to help customers identify the right elements, integrating them with the goal of fundamentally transforming the way their business communicates.

Based on BT Global Services' strategy, this article presents a high-level overview of the technological capability that underpins BT's objectives within corporate networked IT services, helping transform the company from a product-oriented organisation to a new breed of services organisation.

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Introduction

For many years the telecommunications and computing industries have talked about the convergence of communications and IT. Now, driven largely by the ubiquitous nature of Internet protocol (IP) technology, it is happening. Faced with declining revenues from legacy services, traditional telecommunications operators are branching into convergent services that can offer substantial benefits to customers. Known as information and communications technologies (ICT), this comprises IT and telecommunications offerings combined, and spans the range of services from the provision of network infrastructure (both fixed and mobile), through to systems integration, outsourcing and business consulting services (Figure 1).

Network Centricity – Creating New Opportunities

With the network now a key channel for IT services delivery, it is no longer enough for telecommunications service providers to simply offer customers high-quality bit or voice transport. Service providers that previously concentrated on selling traditional voice and data networks are now finding that networks are a key channel for engaging in transformational delivery:

- new standards are enabling IT services and applications to be delivered remotely by high-speed networks;
- networks are becoming a key channel for business models for IT services delivery;
- networks are critical in realising end-to-end ICT service quality and assurance to enterprise users, globally;
- convergence, coupled with increasingly distributed business processes, is making IT services more network-centric.

BT's business strategy is to become a world-leading network and IT services company, exploiting its core network-centric strengths and delivering world-class leadership in managed, out-tasked and outsourced agile IP networks. The strategy is underpinned by:

- providing global IP networking with the scale, resilience and security to meet customers' mission-critical, enterprise-wide requirements – at the heart of this is BT's 21st Century Network (21CN) (see panel overleaf);
- reducing the cost and improving the performance of customers' networked IT infrastructure through managed services, out-tasking and outsourcing;
- providing innovative converged communications and collaboration services to improve the efficiency and flexibility of customers' businesses;
- using repeatable components, providing bespoke and industry-specific networked IT services and advice to help customers succeed in the digital networked economy.

BT's 21st Century Network

BT's 21st Century Network (21CN) is a fundamental and radical company-wide programme that set the challenge for the company to evolve from a PSTN provider into a multiservice-centric organisation. 21CN is aimed at developing a truly customer-focused, efficient network that allows communications from any device to any device across an IP-based network¹. As a cross-BT Group programme, 21CN provides a radically improved infrastructure that revolutionises the customer experience, enables rapid deployment of innovative products and services, and transforms the cost base of the company. At the IP layer, customers' separate voice, video and data networks are combined on to a single network. The network architecture specifies the use of IP, Ethernet, MPLS, SDH and WDM technologies in the most cost-effective and efficient way possible to deliver current and future services. The provision of corporate networked IT services – also referred to as ICT services – further broadens the scope of the 21CN to include the need to support:

- end-to-end management of services across multiple ICT components, from desktop to data-centre;
- a wide range of enterprise customer environments and on-site customer infrastructures;
- ICT novated as part of an outsource agreement (infrastructure, people, operations);
- integration with services delivered via BT's partners within a multi-source contract.

Networked IT Services Growth

Comprising IT and telecommunications offerings, networked IT services range from the delivery of IP-VPN products, to communications applications such as conferencing and IP-PBX, to business applications such as procurement, through to fully managed services spanning both IT and network infrastructure across multiple corporate sites. Networked IT services (see panel, right) offer the potential to package and manage voice, mixed media, storage and application-driven service components

into managed bundles. Service may span thousands of locations across the globe, with components including IP-VPNs, access networks, wide area networks, office or branch LAN infrastructure, desktops, data-centres, contact centres, applications, home workers and roaming (see Figure 2).

BT's growth strategy is built around the provision and management of networked IT services to multi-site corporate customers. High-value consulting opportunities are able to concentrate on the performance link between a business or organisation and the operation of the IT infrastructure layer, including partners and third parties. Recent BT examples of multi-site corporate con-

Underpinning BT's networked IT services strategy

BT's networked IT services strategy is built around:

- IP-based services underpinned by a world-class cost base – achieved through the 21CN converged core transformation;
- a virtualised on-demand service that supports BT's move to become a transaction-based company, flexibly responding to the dynamic nature of business – this means real-time, automated processes where the user's request is satisfied there and then;
- exploiting economies of scale by implementing a simple, standard service capability on an industrialised service delivery platform;
- embracing an ecosystem of BT, partner and third-party service capability, presented through a unified client service interface;
- service delivery capability/practices that can flex to meet the needs of clients/contracts – resources 'move' to the work;
- exploiting the potential of emerging ICT technologies through targeted development with partners and suppliers.

tracts include Unilever, NHS, HM Revenue & Customs and the European Central Bank.

Figure 1 ICT comprising IT and telecommunications offerings

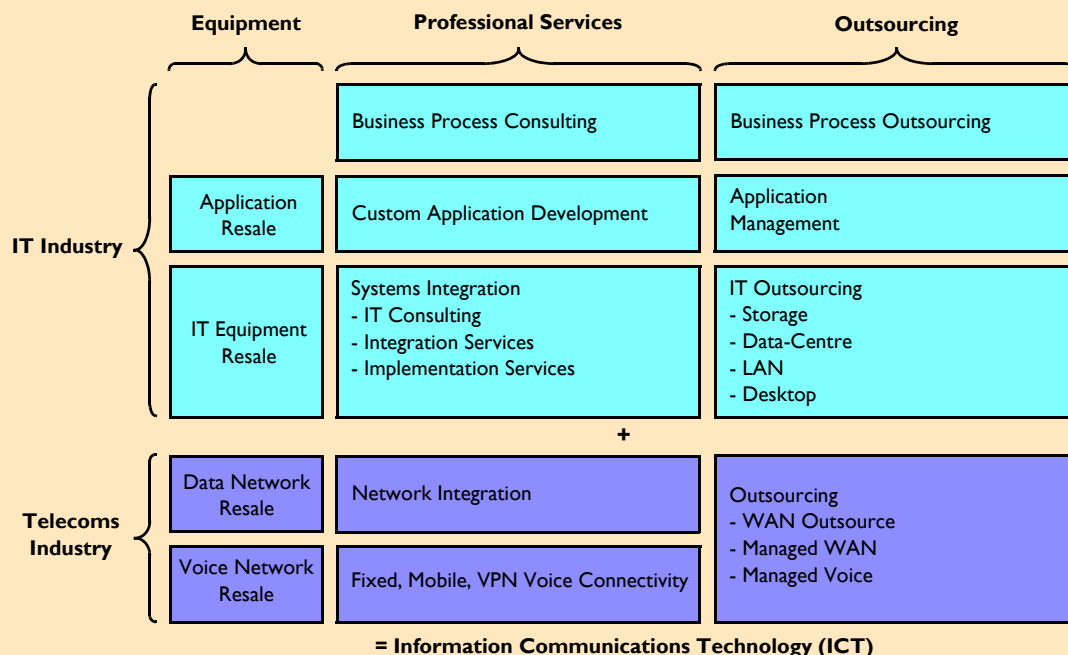
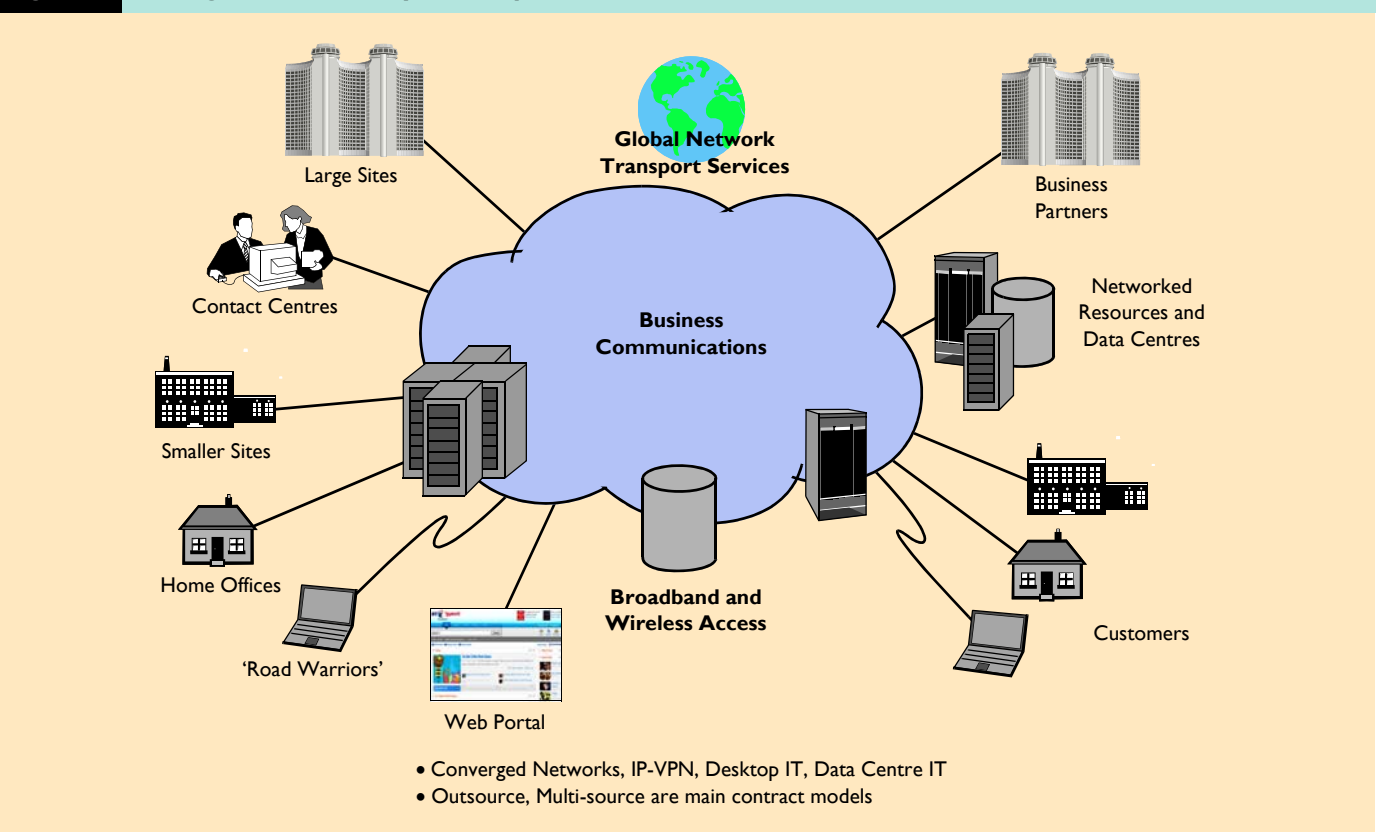


Figure 2 ICT – growth driven by the corporate market



Strategically, growth is being addressed in a number of ways – firstly, by extending existing networked IT services in the UK and Europe, secondly, by leveraging partnerships such as CSC and HP, and thirdly, via new ICT propositions. Acquisition is also a key component of the strategy, with Infonet, Albacom and Radianz all having been acquired (see panel on page 31). Integration and harmonisation of networks, products and systems from these companies are well under way.

In supporting the delivery of managed services and solutions, BT is leveraging its

global experience and resources to provide a broad set of IT-based solutions, managing customers’ networks and extending services into areas previously the preserve of IT companies. Achieving this requires new services that extend the value offered to customers:

- improving leverage from network assets;
- building transformational capability;
- creating a joined-up approach for customers;
- making it easier for customers to do business with BT.

Business Models

Before examining the technical offerings comprising BT’s corporate networked IT services strategy, it is instructive to examine the various business models that can apply. Broadly speaking, the provision of networked IT services can be offered against three distinct business models – ‘products’, ‘managed services’ and ‘professional services’ (Figure 3). Business models, in turn, may be network focused, IT focused or business process focused.

Figure 3 Business models for networked IT services

Utilisation and People Capability Drives Profitability	Professional Services	Consulting, Professional Services and Systems Integration		
Longer Term Payback Requiring Strong Operational and Commercial Management	Managed Services	Managed Network Services	Managed IT Services • Applications • Infrastructure	Business Process Outsourcing
Volume, Repeatability and Efficiency Drives Profitability	Products	Network Products • Retail • Wholesale	IT Products • Software • Hardware	
		Network	IT	Business Process
		Relatively Mature Model Moving Towards Commodity for Basic Telephony Services	Requires Strong IT Skill-set Coupled with Excellent Understanding of Customer Issues	Essential to Have Deep Understanding of Customer’s Business and Sector

- **Products**
Products such as IP-VPN access are typically purchased by the customer from the service provider, complete with varying degrees of support. Where no consultancy has been purchased, the customer integrates the product within their own business environment. Under this model, service provider profitability is driven by volume, repeatability and efficiency of delivery and support.
- **Managed services**
In managed services, the customer outsources the management of their communications and IT infrastructure to the service provider, allowing the customer time to focus on running their core business. The customer transfers their existing estate on the contractual promise of lower costs and performance improvements, underpinned by a strategic roadmap of future enhancements. Such roadmaps may include single points of contact for a wide variety of service components; simple views of end-to-end services through portals, future provisioning of resources on demand, technology future-proofing. Increasingly, customers are demanding an end-to-end managed service offering from service providers, delivering integrated IT and network

services with end-to-end service level guarantees. Such an offering is outlined in detail in Dames et al². In recent years, the current trend in managed services is towards multi-sourcing, where a wide range of IT, network, applications and processes are outsourced to a collaboration of best-of-breed partners working together to serve the client.

- **Professional services**
Professional services are consultancy-based and range from the provision of network consultancy through to full business transformation. Business transformation is achieved through high-value professional services targeted at organisations with a heavy reliance on communications. This requires a high degree of skill in business consulting, business process re-engineering and technical consulting.

to global multiprotocol label switching IP-VPNs for multi-national corporations;

- **layer 2 - applications management and assurance services:** managed network-centric applications such as mail, contact centre and conferencing services with assurance of application traffic end-to-end across the network;
- **layer 3 - ICT outsourcing:** outsourcing of a corporation's network, IT services and non-core business functions to BT and BT's partners.
- **layer 4 - business transformation:** business transformation focused on consultancy and systems integration services.

Global IP infrastructure (layer 1)

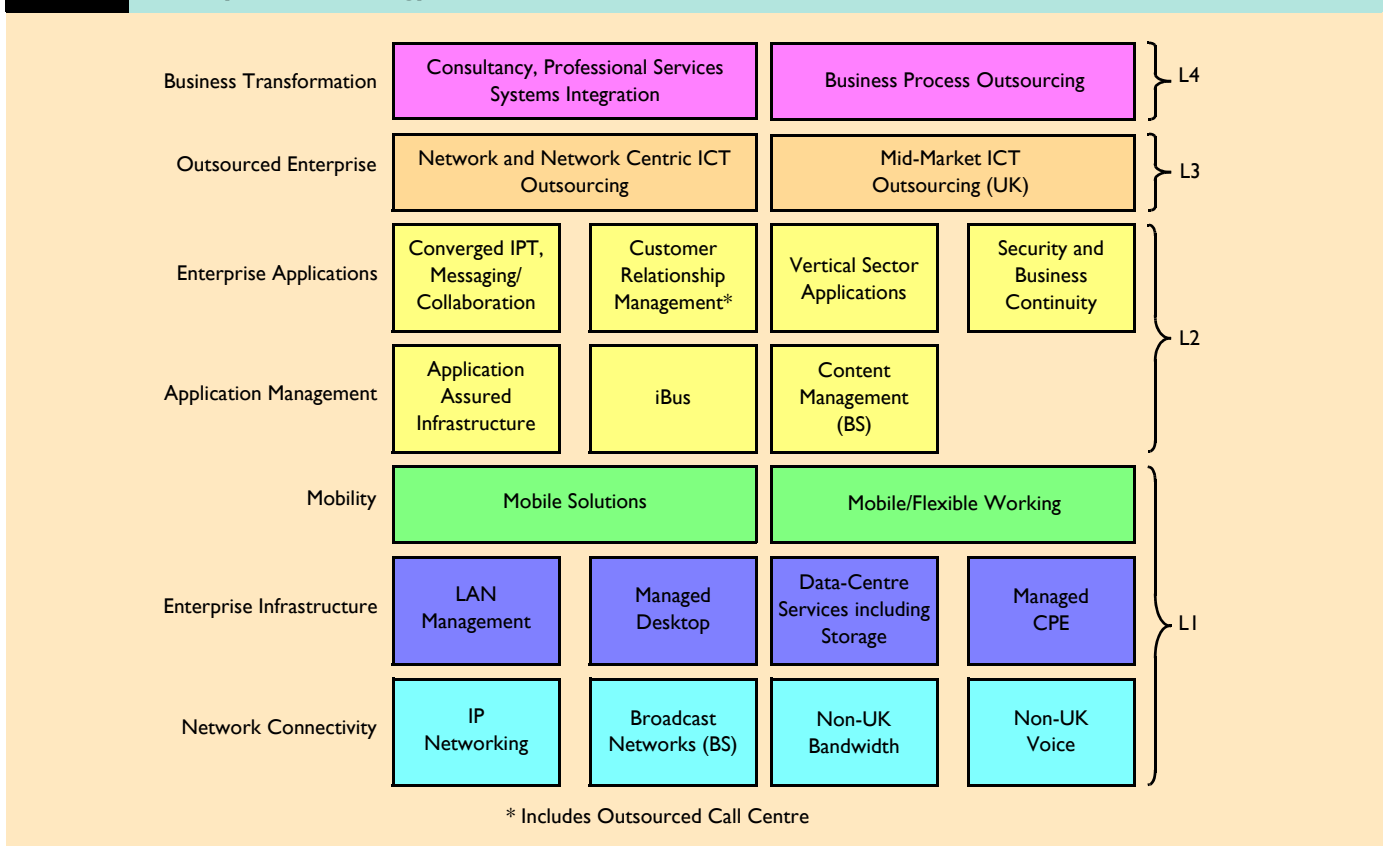
Layer 1 comprises the network-based capabilities needed to support the total communications needs of enterprises across the LAN, WAN and data-centre as well as of a mobile/flexible workforce. It represents the underlying infrastructure that supports networked IT services from the desktop through to the data-centre, including the trunk networks needed to securely carry voice, data and multimedia traffic. Under BT's 21CN, these are implemented as multiprotocol label switching IP-VPNs over an optical architecture. Branching out from the core are the access networks to

Four-Layer Strategy

BT's networked IT service strategy is built across four layers (Figure 4):

- **layer 1 – global IP infrastructure:** a global converged IP network and IT infrastructure, ranging from broadband connections for small businesses through

Figure 4 Four-layer ICT strategy



customer sites. These span a range of technologies from DSL, frame relay and asynchronous transfer mode to Ethernet or wireless, depending on the site size, application requirements and location.

The infrastructure layer also includes customer sites (typically LAN, desktops, switches, phones, local routers or PBX) and data-centre infrastructure (typically server, firewall and load balancers). Key to this infrastructure is the virtualisation or exposure layer through which applications access network and IT resources 'on demand' using common capabilities such as authentication, bandwidth allocation, directories and session management. Layer 1 includes the following capabilities.

- **IP networking**
IP networking meets customer requirements for the provision of secure data and voice communication between sites. This is combined with an application-centric approach, assuring application performance and enabling application integration.
- **Non-UK voice**
Non-UK voice offers voice connectivity to customers who require a managed voice service. The strategy is based around moving to a portfolio where technology is not the issue and voice is treated as a key business application. BT Global Services' voice portfolio is being developed to combine TDM and IP technologies seamlessly over a single intelligent network and MPLS-based core platform.
- **LAN management**
LAN management is about meeting customer requirements for LAN supply, configuration, installation and management – including both wired and wireless LAN. Combining enterprise and networking portfolios allows the delivery of convergence of IT and communications technologies, managing the customer's CPE, LAN and WAN over a single service surround.
- **Managed CPE**
Managed customer premises equipment (CPE) is about taking away from the customer the cost of CPE acquisition, configuration, installation and management associated with the purchase of networking capability.
- **Mobile solutions**
Mobile solutions is driven by the need to deliver fully managed mobile voice, delivering excellence on service reports and billing, fieldforce solutions and fixed-mobile convergence. Delivered solutions must meet customer needs for working independently of place and device, reduced cost of fixed infrastruc-

typical layer 2 application services include network-based applications such as IP PBX, conferencing, video and enterprise applications, such as procurement, HR and finance

ture, and reduced total cost of ownership of management of fixed and mobile assets.

- **Mobile and flexible working**
Mobile and flexible working is driven by the need to meet customer requirements for workforce location flexibility to reduce costs and increase worker lifestyle. Flexible working is about delivering a LAN-quality experience to roaming customers and a home-based workforce 'any time, any place' through DSL, Wi-Fi, GPRS and 3G access. Solutions must provide seamless handover and application support, whatever the access technology.

Applications management and assurance services (layer 2)

Layer 2 focuses on customer applications and their assurance across the network. The applications layer provides network-centric application services and also provides assurance of application service quality end-to-end over the complex infrastructure. This is termed the 'applications assured infrastructure' (AAI) sub-layer.

Key components of the AAI are combined reporting and fault management across IT and network, assurance of network traffic using MPLS service classes, management of performance, and prioritisation of traffic according to individual customer needs. Typical application services include network-based applications such as IP PBX, conferencing, video and enterprise applications, such as procurement, HR and finance.

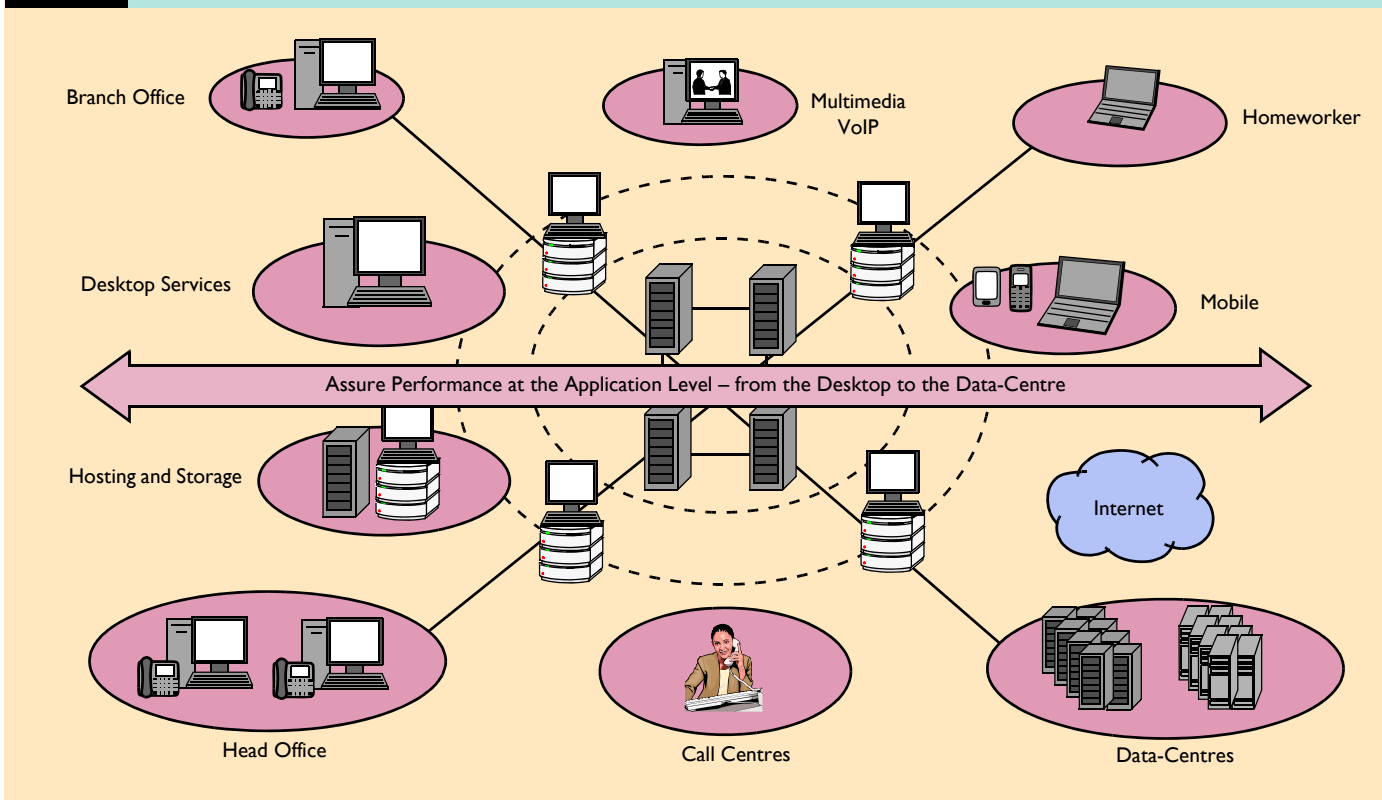
Layer 2 is a critical focus area as it helps BT find unique ways of delivering added value from its network assets. The combination of application support, security and end-to-end management of the customer's LAN, WAN and data-centre is at the heart of the network-centric ICT solutions strategy. Layer 2 includes the following capabilities.

- **AAI**
BT's applications assured infrastructure³ provides service-level assurance and service-level guarantees at the application level, end-to-end over complex IT and network infrastructures. AAI meets customers' requirements for guaranteed application performance in support of key business processes. It achieves this by auditing performance, optimising network/application perfor-

mance and assuring end-to-end, from desktop to data-centre. It supports combined reporting and fault management across both IT and network infrastructure, assurance of network traffic using MPLS service classes, management of performance, and prioritisation of traffic according to customer need (Figure 5).

- **iBus**
BT has the opportunity to deliver fully functional application integration capabilities over the network with performance and reliability guarantees. BT's iBus enables enterprise application integration to be achieved with a high level of automation using a remotely configurable network-based appliance (Figure 6). iBus hardware and software can be deployed on a customer's site or built into the network, supporting integration, automation and assurance of applications without the need for a high level of professional services. Taken together, AAI and iBus allow BT to integrate and assure customers' business applications, and ultimately their business processes.
- **Content management**
Content management delivers the ability to store, manage and deliver media content. With the industry move to digital media and tapeless environments, combined with the growth of internal media services, this is seen as a strategically important area.
- **Messaging and collaboration**
Convergence is not just about voice and data or fixed to mobile. It is about the combination of network infrastructure, communication and collaboration tools and mobility – and how they are coming together and changing the communications landscape. Messaging and collaboration meets customers' need to exchange and share information within enterprises and between enterprises to speed up business processes and exploit the benefits of sharing knowledge. BT's iComms is built around the convergence of productivity and collaboration tools with IP voice (Figure 7). Bringing mobile/flexible working, IP telephony and messaging and collaboration capabilities together into a single, integrated voice and data solution, it tackles the challenge of delivering person-to-person communications and collaboration. As a solution, iComms embraces many different

Figure 5 Applications assured infrastructure



devices and networks, a high level of user mobility, and a wide choice of communications media. iComms requires the use of presence services, user profiles and directory services to control the communications service according to a user's real-time availability and presence, both inside the enterprise and externally.

- Customer relationship management CRM optimises the ways in which customers do business. Combining

technologies such as voice, instant messaging, e-mail and Web content, the customer interface can be optimised to ensure customers have the most appropriate mode of access and fulfilment.

- Managed security services This is about meeting customer requirements to protect the resilience and manage the risks of doing business in a networked world. This includes

protection against external threats and managing internal risks through business policy data access and protection.

ICT outsourcing (layer 3)

Outsourcing is characterised by high contract values, typically up to £2bn over 10 years. Multi-sourcing – where the outsourcer uses a combination of best-of-breed partners tackling ICT breadth, scale and region – is a growing trend. BT, or BT and partners, manages the entire ICT infrastructure for a corporate customer. For new contracts, this typically begins with a phased outsource involving transfer of existing customer ICT infrastructure, people and operations to BT and its partners. Depending on the contract, there is then a migration to a BT operational model and a migration to the convergence portfolio. BT delivers cost savings through convergence, consolidation, automation and performance improvements all underpinned by a robust technology roadmap. Unilever is a prime example of a global outsource contract (120 countries). Abbey bank is a recent example of transfer from separate voice and data networks to a combined VoIP infrastructure (covering 750 branches).

Business transformation (layer 4)

This layer represents the highest value services aimed at transforming customer business through new ICT services, improved business process design, and the integration of the IT systems that underpin these processes. Best-in-class business transformation is achieved through high-

Figure 6 iBus

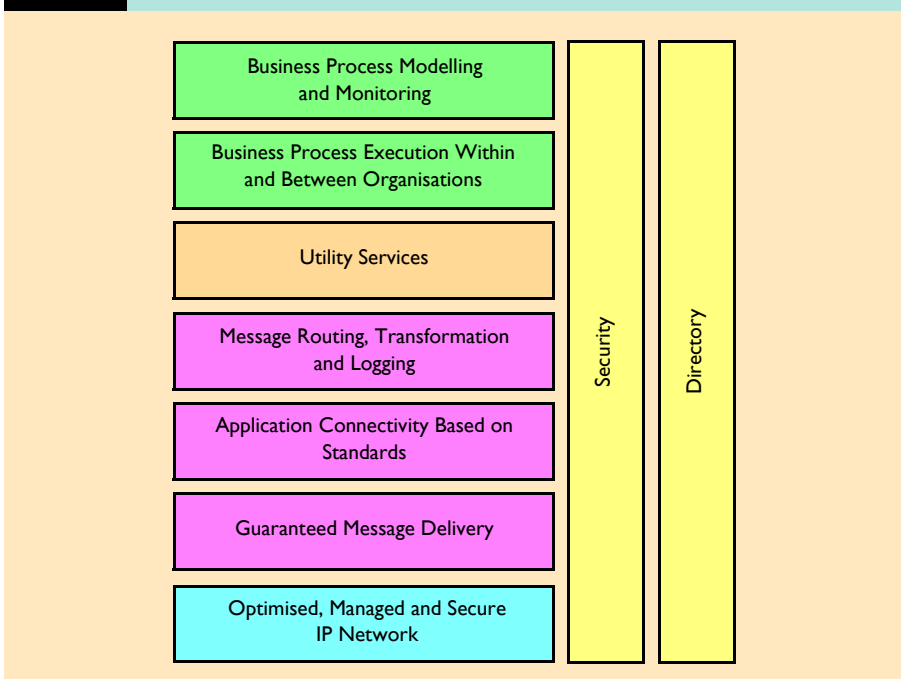
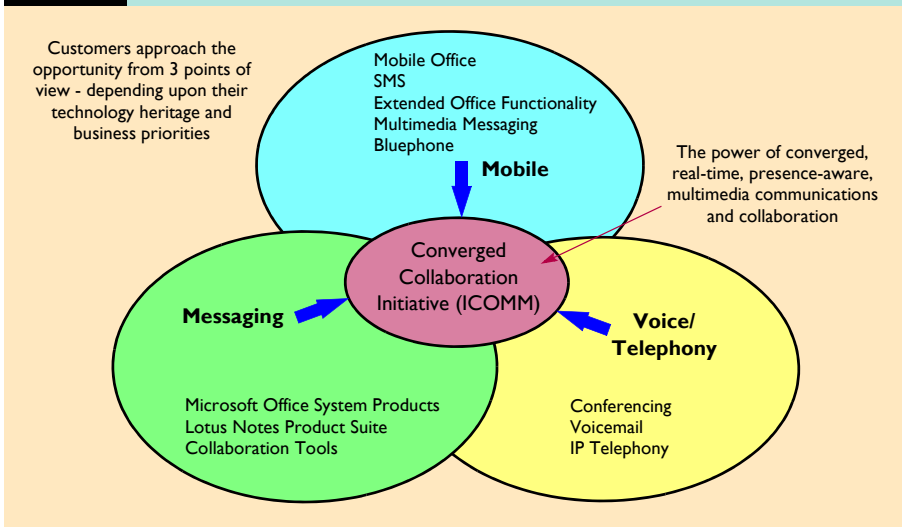


Figure 7 iComms – convergence of productivity/collaboration tools with IP voice



value professional services targeted on areas that have a heavy reliance on networked communications. This allows BT to address clients' business needs in relation to key performance indicators and understand underlying value drivers. Transformation can be facilitated by business process outsourcing, an increasing trend where the whole business function, not just the ICT, is outsourced either to the outsourcing company or to a joint venture between the outsourcing company and the client. The transformation process – and the risk – is then managed with the outsourcing entity. Contracts such as Liverpool City Council, the Department for Work and Pensions and the NHS are good examples.

Architectural Vision

The architecture for delivering BT's networked IT services vision is built around a highly flexible, converged capability enabling the rapid creation and operation of the range of products and solutions on a world-class cost base. There are three major parts to the vision.

- **Systems vision**

This supports world-class, integrated ICT services and operations, spanning the range of capabilities. The systems vision includes key concepts such as real-time delivery via policy management⁴ and converged operations spanning BT, partner and outsourced network and IT capabilities. The challenge is to enable maximum reuse of systems within the product layer, while supporting end-to-end ICT services without constructing entirely different systems stacks.

- **Networks vision**

This comprises a convergent, global communications network providing

virtualised network and IT capabilities – the framework for network-centric applications and on-demand resourcing.

- **Service creation vision**

This shows how new ICT products and services are created rapidly from reusable capabilities (see panel, right) and incorporated into customer solutions. Reusable common capabilities (e.g. authentication, bandwidth allocation, directories and session management) enable rapid build and operation of new ICT services on a converged IP infrastructure. This reduces the time to market for new services and helps eliminate duplication of development and infrastructure inside the business.

BT's strategy is being realised through a number of activities, programmes and focus areas.

- **Remaking our portfolio**

This initiated a major review of BT's portfolio with the intention of rationalising and simplifying the product set and identifying the impact of BT's 21CN.

- **Partnerships and acquisitions**

This includes partnerships with IT service providers HP and CSC and the acquisitions of Infonet and Radianz, giving increased geographical and market reach (see panel, right).

- **ICT propositions/products**

This includes BT Transform (see panel overleaf), AAI and MPLS IP-VPNs.

- **Focus areas of iComms, iBus and CRM**

These provide strategic proposition development for people-to-people and B2B communications, along with customer relationship handling, respectively.

- **21CN common capabilities**

A wide range of reusable capabilities enables the rapid build and operation of new services based on a converged IP

21CN common capabilities

One of the aims of BT's 21CN is to rebuild the services portfolio based on reusable service capabilities. As such, BT is developing the 21CN common capabilities, enabling the rapid build and operation of new services on a converged IP infrastructure to support both corporate and residential customers. Ready-to-use, off-the-shelf, the common capabilities are an integral part of the product development and launch processes, reducing the time-to-market for new services and helping eliminate duplication of development and infrastructure. Economies of scale mean that the common capabilities will enable products and services to pay-as-they-go, rather than committing development budget and capex costs. Examples of common capabilities include storage, directory and profile, authentication, content processing, messaging, voice as an application, session management and control, net-centricity, user interaction.

Acquisitions and partnerships

BT's acquisitions over the past three years include physical networks, systems, people and ICT contracts. Networks and systems are being integrated with BT.

- **Radianz** – originally announced in October 2004 and finalised in March 2005, BT signed a £1.6bn outsourcing deal with Reuters to supply network services for the next eight years. In April 2005 BT was granted regulatory approval to acquire Reuters' Radianz financial services data provider for £90m. The deal includes MPLS network and people plus highly demanding network availability requirements. Radianz products are part of the harmonisation programme for IP and MPLS.
- **Infonet** – BT's acquisition of the Californian group Infonet, providing local services in 70 countries, was announced in November 2004 and approved by the European Union in January 2005. Infonet's network is being integrated with BT's. The Infonet MobileExpress product has shaped rationalisation of the BT Global Services' remote access portfolio.
- **Albacom** – on 4 February 2006 BT took full control of Albacom, the number two telecoms operator in Italy. The acquisition, initially announced in December 2004, involved BT raising its shareholding from 26 per cent to 100 per cent, buying out partners BNI, Mediaset and ENI.
- **CW Business Solutions SLU (Spain)** – on 8 April 2006 BT announced acquisition of this Spanish Cable & Wireless company for £4m. The company, which provides managed WAN /LAN, hosting, disaster recovery and business continuity, will be integrated into BT Spain.
- **Atlanet (Italy)** – in December 2005 BT announced that it would acquire Atlanet from Fiat as part of a five-year £303m network management deal. The Turin-headquartered company controls a national network with 24 points of presence (PoPs) for voice services and 42 PoPs for data services – interconnected by a fibre-optic backbone and equipped to offer 11 000 IP access points across the country. Atlanet also owns metropolitan area networks in Rome, Milan and Turin.
- **HP alliance** – BT's partnership with HP was announced in May 2004 and this go-to-market alliance will address growth opportunities in the ICT market-place. BT and HP have signed managed services agreements worth approximately \$1.5bn over seven years.

BT Transform

To provide highly flexible ICT delivery, BT has been developing a solution known as Transform, which delivers a flexible, scalable, cost-effective and highly automated IP-VPN-based communications platform⁵. It is a first step towards supporting real-time ICT service delivery. Transform represents a radical operational support system that delivers highly flexible configuration of major clients' networks using real-time, policy-based management. The impact of Transform has been to automate operations across a corporate infrastructure, such as bandwidth changes, which previously required intensive manual effort. Transform is designed to remove the acquisition and management of complex technology from the critical path, leaving senior personnel free to concentrate on taking their organisation forward.

An early customer of Transform was Abbey. Historically, Abbey had been using a number of discrete and interoperable solutions across nine separate networks, from ISDN back-up circuits and ADSL circuits, which were both complex and costly to use. Abbey's main goals were to:

- converge the network – one network for one bank, across which Abbey could introduce a range of additional and enhanced services,
- implement a core IP network as an end-to-end transport for the whole company,
- implement a third-party managed service and introduce core IP voice transport and IP telephony capabilities across the branch network,
- provide upwards and downwards bandwidth capacity on demand to meet the short and long-term requirements of the business,
- demonstrate that the IT division was reducing costs in line with business targets set,
- provide business enablers for future requirements for long-term benefits.

BT Transform was selected to provide the solution, enabling the convergence of Abbey's networks into one network.

ICT vision

The ICT vision is to:

- deliver adaptive ICT services that enable customers to transform their businesses;
- provide an ICT infrastructure that adapts resources automatically according to fluctuations in business demand – not subject to lengthy orders or change controls;
- provide on-demand availability of network, IT and applications resources together;
- provide tuning of network, IT and applications resources to individual needs;
- provide service level agreements (SLAs) end-to-end across network, IT and applications components;
- provide reporting of ICT performance against impact on the customer's own business goals, not just against ICT products.

infrastructure. Ready-to-use, off-the-shelf, the common capabilities are an integral part of the product development and launch processes and should reduce the time-to-market for new services and help eliminate duplication of development and infrastructure.

- **Engineering capabilities**

The OSS and BSS operational functions help BT to manage services in conjunction with partners. These include billing, assurance and mediation. This approach prevents stove-pipe support services being created for each new ICT product and enables end-to-end service views and SLAs to be provided across the wide range of capabilities.

- **Research and venturing**

This addresses futures that are not covered above, yet which could have a significant impact on the business, including adaptive, flexible enterprises utilising high levels of automation (see 'ICT vision' panel, left).

None of the new ICT services imply the introduction of new connectivity products; however, they do imply the need for enhanced service and system surround capability. The network needs to support convergence of LAN and WAN, of voice and data, and of fixed and mobile. The systems need to deliver a unified and consistent service surround in a converged world, from desktop to desktop, device to device and person to person for all customers' business applications.

Service creation

Prior to BT's 21CN programme, product and service capabilities have been tightly coupled to the network components. This has resulted in:

- proprietary interfaces;
- slow time-to-market owing to lack of dynamic re-configuration;
- stove-pipe platforms and service wraps.

Under 21CN, there is a move to a 3-tier architectural model whereby products and services are no longer built directly out of the network infrastructure; instead, a new middle layer allows services to be created, executed and managed without the need for overlay networks or physical changes to network elements. Here the architecture exposes network capabilities with programming interfaces and reusable components. A radical level of reuse and virtualisation eliminates a significant portion of the costs and time associated with building, activating and operating new services.

This can be represented by a 3-layer model (Figure 8):

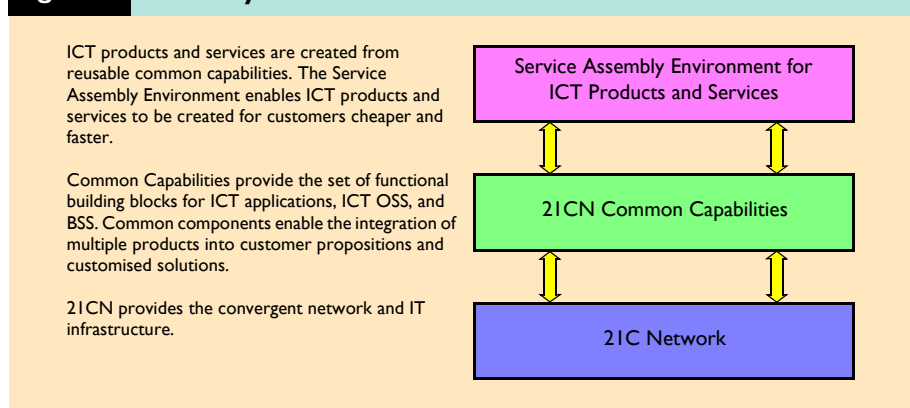
- 21CN (bottom layer) is the set of converged networks and IT infrastructure supporting products and services, including ICT;
- the 21CN common capabilities (middle layer) provide the means to virtualise access to BT (and partner) networks and data-centre resources – they also provide reusable functionality common to any networked application, such as session control and storage;
- to create new products and services, 21CN provides a service assembly environment (top layer) for rapid application development, which enables the inclusion of custom functionality, but with extensive reuse from the common capabilities.

New services can be constructed rapidly from the reusable components in the application, IT and network layers. These lower layers form part of an efficient on-demand infrastructure with high grades of efficiency and internal resilience.

One BT Architecture

The technical target for achieving delivery of networked IT services is formalised in the

Figure 8 Three-layer model



'One BT Architecture'. This combines two initiatives – 21CN architecture and the Matrix architecture.

A high-level view is depicted in Figure 9. This decomposes the architecture into the three main domains of 21CN and IT resources (in yellow), service execution (in red), and systems (shown as the four management areas in blue).

The One BT Architecture does not specify the ICT product portfolio – instead it enables the portfolio by providing an environment to rapidly create, test and launch new ICT products and services. The architecture will ensure that services that BT offers are consistent in terms of the way in which service is provided and managed.

The primary benefits offered by the architecture may be summarised as follows.

- Reduced infrastructure and operations costs
This is achieved by migrating to converged networks via the realisation of the One BT Architecture. The full range of business network requirements are addressed using a common core, common metro nodes[†] and common aggregation points.

[†] Metro nodes provide entry to the core, and include features such as broadband access servers and networked storage. At the IP layer, the customers' separate voice, video and data networks are combined on to a single network.

- Faster time-to-market and reduced development costs for new ICT products and services

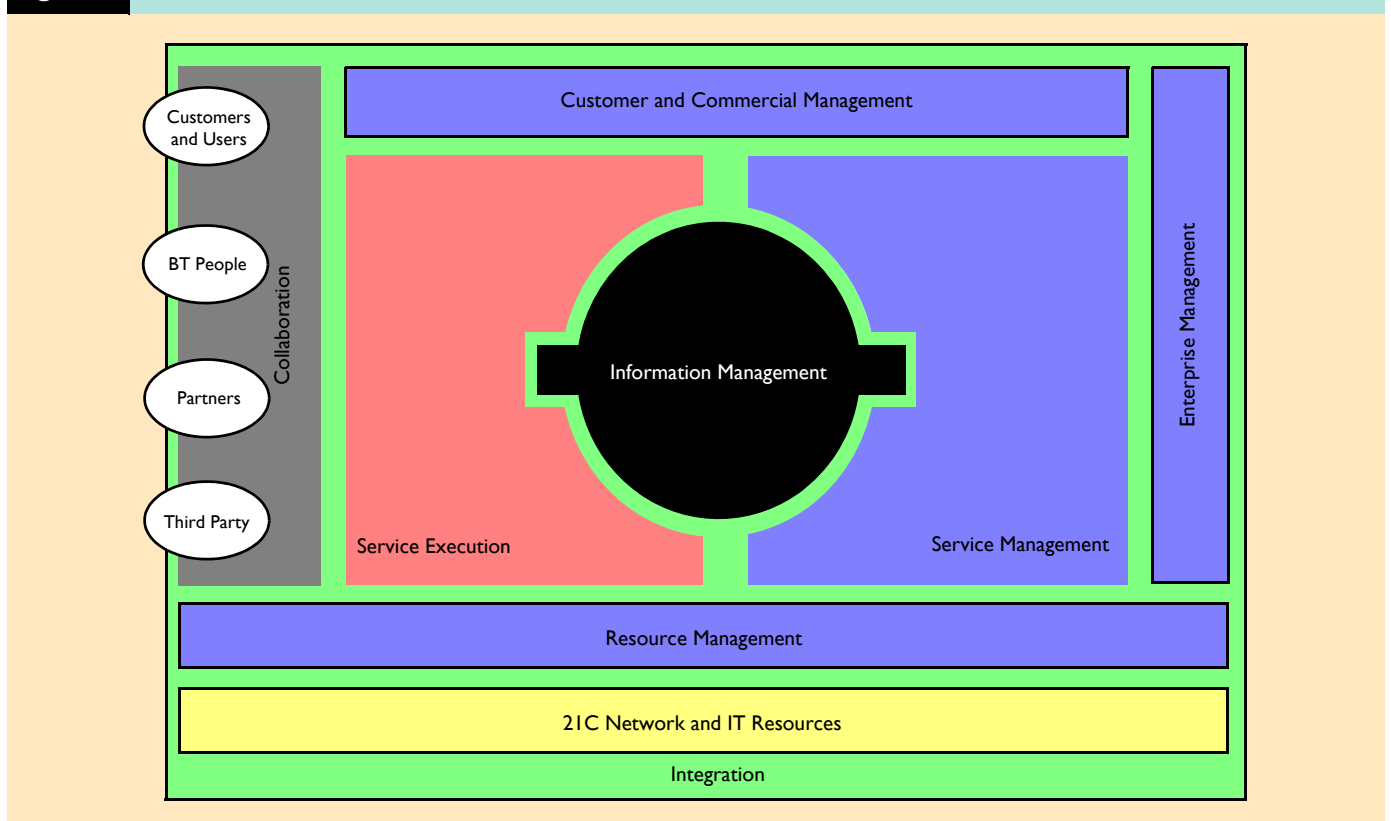
This is achieved using the 21CN common capabilities and the application environment, which target a reduction in cost by capability reuse. The product management vision is that 80% of new products (by cost) will be built using common capabilities. The reduction in development time should be from months to days.

- Enablement of new ICT propositions
Programmes such as iComms (integrated communications), iBus (network appliance-based enterprise application integration) and CRM enable this. State-of-the-art value-added functionality is embedded within the service execution framework. This can offer functionality at a lower cost base and within a highly flexible environment. The nine logical function areas are:

- authentication – identify, authenticate and authorise people, devices or applications;
- user profile – the master store of persistent user and service information;
- presence and location – which knows where the user is and what their preferences are;

- application architecture – this includes application capability exposure via the application environment;
 - content architecture – hosting, manipulation and distribution of content.
 - messaging – e-mail, SMS, instant messaging and voice mail;
 - session control – controls telephony, multimedia and media streams between users;
 - connectivity resources – these condition the network session to the needs of the user and the user's application;
 - media resources – these choose the content encoding for the device and access link.
- Improved end-user experience
With radically improved application performance, self-service and fixed/mobile roaming, applications can be configured and personalised for individual users. Although it has been possible to customise application functionality for some time (for example, through personalised portals), it has not been possible to tune the underlying network to prevailing user circumstances and preferences. The One BT Architecture provides this ability via the profile, session control, location, presence and connectivity resources architectures.

Figure 9 The 'One BT Architecture' framework



- **On-demand delivery**
Network and IT resources are provided to support the needs of user applications. Temporary and on-demand changes to network and IT resources – which are currently subject to lengthy order work-flows of days or weeks – are now enabled via comprehensive network and IT virtualisation through the service execution framework.
- **Improved service management and reduced operational costs**
Integrated fulfilment, assurance and billing across 21CN functionality enables integrated fault handling, reporting and billing instead of stove-pipe operations for each product – all achieved using the engineering capabilities defined in the systems domain of the One BT Architecture.
- **Comprehensive service level guarantees**
SLGs can operate for specific products or end-to-end across the IT and network infrastructure. Key quality indicators can be configured and enforced for each business contract for each type of user within the client's business, or even for each individual business user. This includes end-to-end network, server and application considerations.
- **Simpler integration and management of partner or supplier ICT services**
This is achieved using the convergent operations platform, which supports comprehensive, combined ICT propositions with partners.
- **Enhanced security**
Vulnerabilities and attacks are discovered and contained before reaching the application. This is achieved through value-added applications and services enabled by the 21CN architecture and the service execution framework.

The BT Group Matrix – Providing Coherence across Communications and Computing

In the past, BT had multiple disparate architectures layered upon each other, each covering a different aspect of the ICT story, and in part reflecting the internal business structure of the organisation. Now, customers are demanding that they deal with BT in a coherent way in delivering solutions. Achieving this means that every aspect of BT's systems architecture must be oriented towards the convergence of communications and computing. The

method of handling orders needs to be coherent across the spectrum from the mass-market, highly automated provision of standard, customised services, through to novel combinations of services aimed at large, bespoke and outsourcing contracts.

The Matrix architecture is BT Group's platform-based enterprise architecture (Figure 10) – a single, service-oriented architecture (SOA) for BT's systems. The Matrix is the target towards which BT will migrate existing services and which will act as a template for all new services. It supports BT's overall ICT strategy in the market-place and presents a unified, rationalised and transformed target architecture to meet the needs of the strategy.

It should be noted that the term 'Matrix' is used in its mathematical sense where a matrix, such as an eigenvector, brings about the transformation desired.

The Matrix architecture has at its foundation a set of IT platforms. These platforms deliver the capabilities required by BT to run its business in collaboration with its partners. They also deliver the cost reduction in relation to BT's own internal IT estate and provide the framework on which to build cost-effective, reusable ICT solutions for BT's customers (see panel, right).

As an enabler for transformation and systems rationalisation, the Matrix takes us from a complex world of line of business separation, product-specific stove-pipes, legacy systems estate and costly operation, to a 'One BT' approach, delivering a multi-service systems estate and an efficient operational regime. The architecture must meet the needs of the service provider in delivering maximum reuse as well as supporting holistic operations across a myriad of products and managed services, while also supporting the move to convergence.

Utilising commercial off-the-shelf solutions integrated into a coherent platform using Web service technology, the Matrix delivers capability reuse and follows international standards, where appropriate. The Matrix has architecture policies that guide architects and systems designers to create roadmaps and end-to-end solution designs that make full and proper use of the platforms and capabilities. As part of ongoing governance, product and service designs are tested for compliance against these same architecture policies.

Key Matrix principles

The key principles underpinning the Matrix are⁶:

ICT view of the Matrix

An 'ICT view' on the Matrix is described fully in Wittgreffe et al⁶, highlighting the key platforms and their exposure as capabilities to service operations. From these capabilities, the different operational support systems are created to support the specific operational models. The operational model is, in turn, dependent on the business model. For example, the service may comprise an access and a WAN product from BT only, in which case the OSS could be constructed entirely from BT capability. In an outsourcing model, however, a WAN product from BT could be complemented by several other in-country access service providers and a separate IT service provider. These third parties have their own helpdesks and their own internal OSS. In this case a different OSS is constructed to suit a federated service model, making use of both BT and supplier OSS components, integrating service operations through the convergent operations platform and integrating physically via the collaboration platform. Although each resultant OSS is tuned to the appropriate operational model, the reuse of functionality is maximised through the capability approach, and licence costs and vendor relations are minimised through the platform approach.

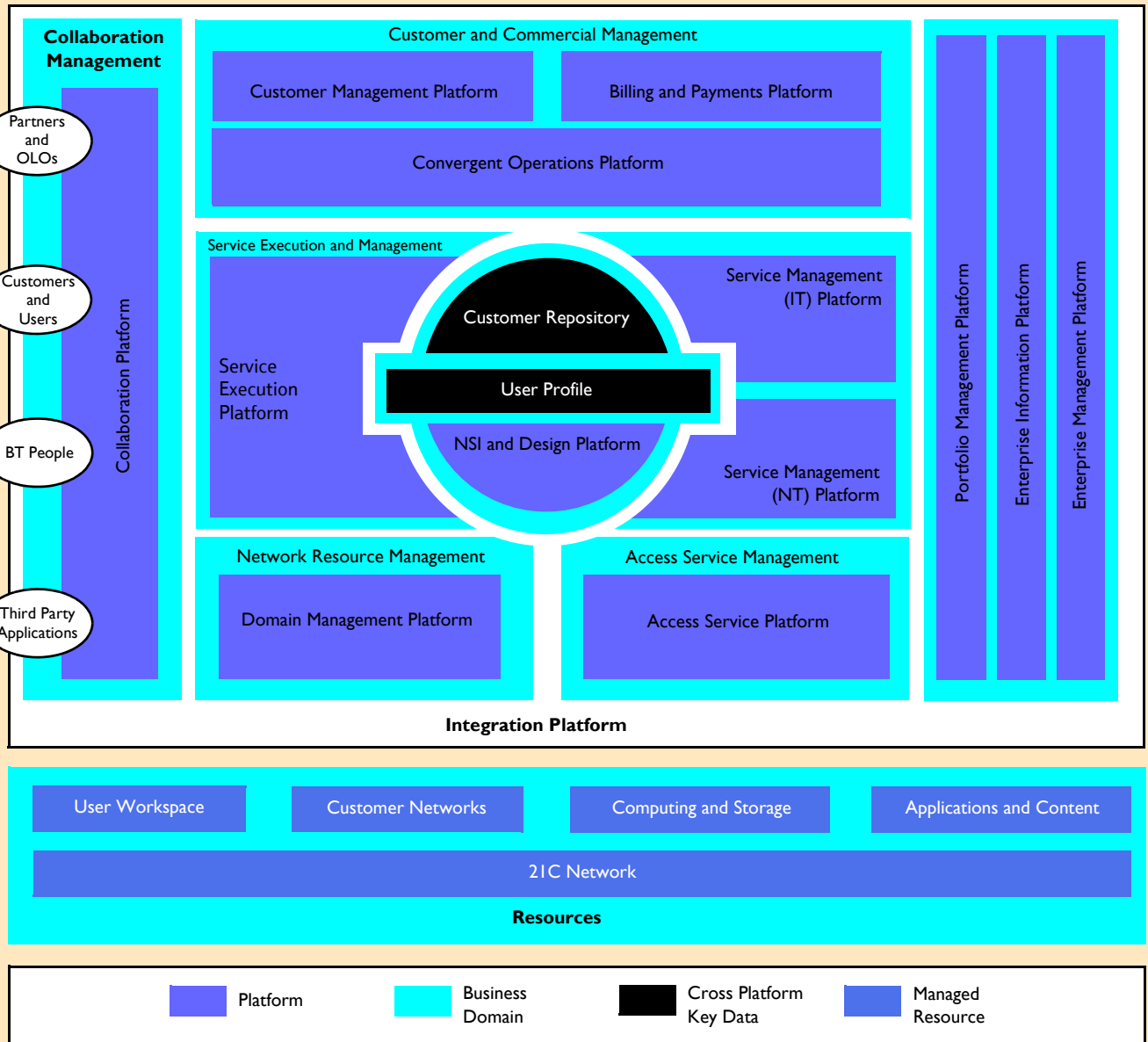
- a single BT-wide portfolio of OSS/BSS components (see panel overleaf);
- multiservice platforms providing re-usable systems capabilities based on the products of best-of-breed OSS vendors;
- plug-and-play OSS/BSS capabilities that expose services for the range of products and solutions;
- a common corporate data model;
- common infrastructure services;
- the use of international standards.

Support for ICT solutions is facilitated by a number of Matrix architecture platforms. Each platform is a set of systems managed as a coherent unit to deliver a set of capabilities which support business transactions – platforms include the following.

- **Collaboration platform**

The collaboration platform provides the interfaces by which customers interact or transact with BT and its partners. It supports new ways of doing business collaboratively using a multi-entity architecture that allows electronic bonding at more touch points and at a depth not previously attempted. BT's largest customers are seeking to move away from having to manage multiple suppliers. In the telecommunications arena, they want either a carrier-of-carrier approach or

Figure 10 The Matrix architecture for BT Group



Operational support systems

The operational support system is vital to achieving and delivering high customer satisfaction, flexibility and cost reduction. It needs to address a wide range of components and deliver a high grade of flexibility, while spanning the multiple operational domains from IT and network partnerships. It must extend managed services capability from data and legacy voice networks to VoIP, IT, desktop and mobile without costs spiralling and while delivering a competitive edge in the marketplace. The requirement for service providers is not just to deliver support for a portfolio of ICT products; for managed services, the primary OSS driver is to be holistic – to deliver services that can be managed end-to-end across the constituent components, for example:

- operates convergent services end-to-end across multiple ICT domains – from desktop to data-centre;
- delivers to a wide range of enterprise customer environments – roaming, branch, head office and data-centre;
- enables an ecosystem of multiple-operator services to work together to deliver far-reaching ICT contracts – ICT domains to be delivered by partners not just BT in multi-source arrangements (e.g. server, application, international);
- interworks with ICT components that are outsourced from the customer – not just BT portfolio;
- provides reporting of ICT performance against the impact on the customer's own business goals, not just against ICT products – switching the focus to ICT for the customer's business, not BT internal;
- meets high customer expectations, including rapid service delivery and end-to-end SLAs;
- delivers adaptive ICT services that enable customers to transform their business, providing a flexible on-demand network and IT infrastructure – an ICT infrastructure that adapts resources automatically according to fluctuations in business demand, not subject to lengthy orders or change controls;
- meets the needs of the service provider in delivering maximum reuse and holistic operations across a myriad of products and managed services, supporting the move to convergence.

their selected carrier to bond together offering seamless services to them. In the ICT outsourcing arena, they want to deal with a single, virtual entity who will manage the overall end-to-end service level their business requires. The collaboration platform facilitates a rich set of eBonding points with partners and customers, including product and service catalogues, document and design sharing, real-time service configuration and execution and change management.

• Customer management platform

The customer management platform provides the capabilities that enable BT to establish and maintain an ongoing relationship with its customer base through the entire life cycle of the relationship. It supports sales leads, customer identification, order capture, fault reporting, issue handling, billing enquiries and self-service over the Web. The customer management platform is ICT-oriented by:

- providing an integrated, bespoke bid management function;
- allowing order capture for complex ICT propositions;
- allowing development of customer-specific catalogues;
- managing contract renewals;
- joining customer and user inventory together (union of sales, contract, billing and service views, including outsource inventory).

• Billing platform

The billing and payments platform enables BT to calculate, request and collect revenues from its customer base. It also supports commercial risk assessment, fraud detection and prevention, and debt management. Key features of the billing and payments platform include:

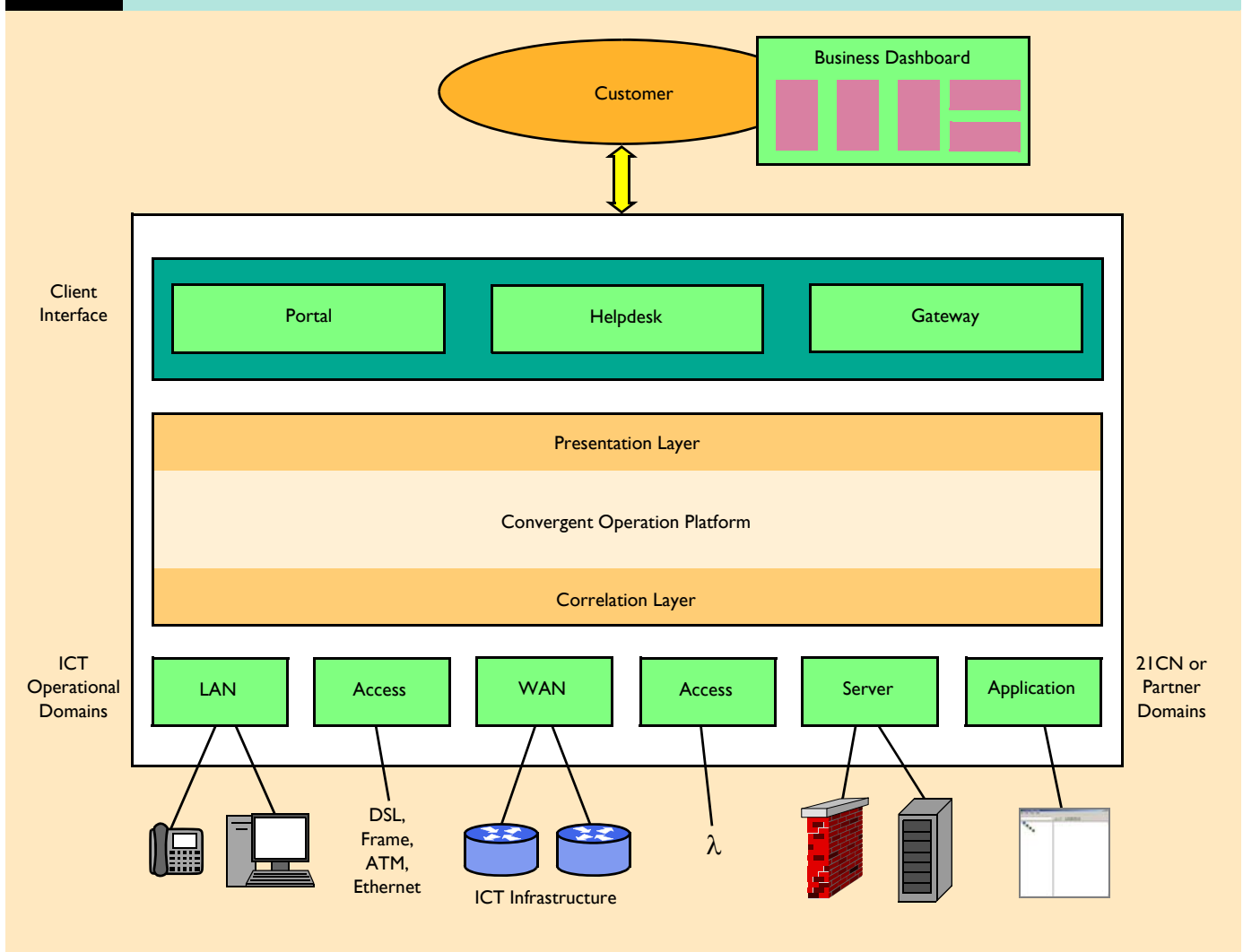
- common billing engine COTS application;
- tool-kit for complex, bespoke billing (including inventory-based billing);

- standardised usage mediation;
- common bill formatting and e-Billing presentation for all customers;
- provision of in-country bill printing where legally required, localised bill formatting and tax where required and a standardised payments infrastructure across the globe.

• Convergent Operations Platform

The One BT Architecture supports solutions and outsourcing in the form of the convergent operations platform (Figure 11)⁷. The COP brings together the operations of many different service providers into a single, integrated operational environment, bringing together the operations of the IT infrastructure with the network into an integrated operations centre. The COP allows capabilities from different domains – computing, applications and external partners as well as BT networks – to be combined into convergent products and solutions. By abstracting

Figure 11 The convergent operations platform



services into a form that can easily be understood by the end customer, the convergent operations platform provides the customer with end-to-end service coherence and continuity, insulating the customer from the underlying complexity. As the various elements of ICT – the management of the desktop, the IP infrastructure, the applications and the basic computing – are all separate operational domains, it is important to be able to get an end-to-end view of service and service-level agreement management all the way from the user's screen through to the application being accessed. The convergent operations platform is able to do this by bringing together the operations of the IT infrastructure with the network into an integrated operations centre. The responsibilities of the COP may be summarised as:

- service-view correlation – correlates across the different ICT domains for all service functions for fulfilment, assurance and billing;
- converged service operations functionality – events/diagnosis, reporting, fault handling, order/change and billing across the ICT domains (desktop, LAN, WAN, server, application);
- presentation – abstracts services into a form the client can easily understand, with simple views of reporting and billing.

Summary and Conclusions

The convergence of communications and IT has created new opportunities for telecommunications service providers, allowing them to extend their reach from the provision of commodity networks towards the provision of services previously offered by IT players. BT's flagship 21CN programme set the challenge for the company to evolve from a PSTN provider into a true multiservice-centric organisation. This provides a radically improved infrastructure that will revolutionise the customer experience, enable rapid deployment of innovative products and services, and transform the cost base of the company.

This article has presented a high-level overview of the technological capability that underpins BT's corporate networked IT services strategy, helping transform it from a product-based company to a service-based organisation. With managed services and

outsourcing forming the bulk of the revenue from enterprise customers and with services spanning multiple ICT products/partners, it is imperative that the systems capability as defined within the Matrix architecture differentiates BT from the competition and capitalises on its strengths. The challenge is to be holistic – to deliver services that can be managed end-to-end across the constituent components. This may span different networks, different IT and, increasingly, both network and IT together.

While selling the benefits of convergence, service providers have substantially raised the stakes in terms of customer's expectations, promising lower costs, better services and radically improved flexibility. Customers are demanding that support processes respond more quickly and are fully tuned to their business needs. Ultimately, in fulfilling the network-centric ICT vision, the goal is to be able to provide 'on demand' allocation of resources to enterprise customers according to their business policies. The capability and flexibility of the operational support systems will increasingly become the determining factor in providing the edge in delivery of end-to-end ICT service management.

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Biography



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Mark Dames is responsible for networked IT services architecture and implementation strategy within CS&NO, BT Global Services. He graduated in 1988 with a BSc(Hons) in Electronics and Physics from Edinburgh University. He joined BT's research laboratories in the same year. Working in the Optical Physics division, he was part of a world-class team carrying out research into novel optical switching technologies for application in future-generation telecommunications networks. After a sabbatical studying at Emmanuel College, Cambridge, in 1997 he was awarded a PhD by Cambridge University for his doctoral thesis on the development of a high-capacity, high-performance optical ATM switching architecture. This work received international critical acclaim and resulted in a number of major published papers and international conference presentations. After a two-year period as a management consultant with Accenture, specialising in communications technology, in 1999 he rejoined BT as a senior consultant specialising in the design of operational support systems. He is a Chartered Engineer and a Chartered Physicist. He was appointed by the BBC Board of Governors to the Broadcasting Council for Scotland in 2002. He is currently on secondment to the Scottish Executive as an adviser to the Innovation Policy Unit.

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