Market Analysis

Ericsson Rolls Out BT Next-Generation Switching Network

Abstract: The upgrade of BT’s trunking network represents one of the largest next-generation switching deployments. Ericsson’s ENGINE Integral solution was selected to upgrade an existing TDM trunking network.

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Strategic Market Statement

NGN switching will be deployed by carriers not on a broad network basis, but rather by evaluating the functionality and capacity constraints of distinct network elements (0.9 probability).

Critical benchmark requirements in a carrier’s vendor selection for NGN switching is end-to-end customer support and longevity of the vendor’s product portfolio and the vendor itself (0.9 probability).

NGN switching implementation within existing infrastructures will be occurring on the tandem switch level first, as migration from circuit to packet at this level will be less painful than at the local exchange level (0.8 probability).
British Telecom Overview

British Telecom (BT) is rolling out a multiservice packet trunk network that will augment existing traffic capacity of new and existing services by BT and its wholesale customers. BT evaluated that its network and port capacity would not be scalable enough to accommodate the growth in traffic and to add new advanced services to its existing service portfolio. The nationwide trunk network upgrade involves 71 of the 102 Marconi 64 Kbps time division multiplexing (TDM) switches with 2000 E1 connecting out to a plesiochronous digital hierarchy (PDH) transport network. With the transformation of the network by year-end 2002 to voice over asynchronous transfer mode (VoATM), 23 trunk layer switches will carry more than 50 percent of BT’s trunk traffic. Each node, which is comprised of an Ericsson Telephony Server and an AXD 301 media gateway, is handling 30 to 40 million calls per week. As of September 2002, approximately 6 billion calls went over BT’s asynchronous transfer mode (ATM) transport network using VoATM.

Ericsson’s ENGINE Overview

ENGINE Integral Solution is a next-generation open architecture supporting horizontally independent multiservice layers that share one common switching and transport layer. Call connection and control are detached, enabling the deployment, or for existing networks, the migration toward decentralized switching networks in which services and subscribers — and the supporting technology for those — can be added and upgraded on a step-by-step basis. Integral embeds three layers:

- Call control layer, which uses the telephony server (TeS) as a communication and control server, for narrowband voice and other services
- Connectivity layer, which supports Internet Protocol (IP) and ATM packet transport between the backbone and the access network
- Access layer, which establishes the link between the multiservice network and the subscriber.

For the BT network upgrade, Integral is implemented as shown in Figure 1. Figures 2 and 3 show the phases of integration of this network.
Figure 1
Integral Integration Process

Step 1
- AXD301 and Ethernet control links installed and integrated
- STM-1 fibres terminated on AXD301 and "looped back" at ADM

Step 2
- AXE data "dump" passed through a data emulator (SEA) to convert NGS (NB) data build into NGS (H) data build

Step 3
- STM-1 interconnect links between AXD301 and AXE installed
- "Looped back" STM-1 fibres from AXD301 progressively terminated on ADMs

I/O = input/output
Source: Ericsson
Figure 2
Phase 1: Next-Generation Switching Narrowband

Source: Ericsson
Figure 3
Phase 2: Next-Generation Switching Hybrid

Ericsson as a Partner to BT
BT and Ericsson have a business relationship that dates back to 1997, when initial merger talks between BT and MCI took place, and BT was looking for open API’s solution to interconnect both networks. Since then, Ericsson has become BT’s partner for the next-generation switching rollout of its network, with Ericsson winning over 12 other competitors. Ericsson’s ENGINE Integral Solution accommodated BT’s requirement of minimal service disruption while work in the network was done and the transition from old switches to next-generation network (NGN) switches were to occur. In addition, ENGINE met BT’s network reliability and interfacability standards, as BT is connecting not only to other wireline carriers but also to mobile carriers and international gateways.

Phases of Deployment: ENGINE

Phase 1
In the first step, BT upgraded 71 of the total 102 64K port trunk switches with a narrowband AXE switch, doubling their capacity to 128K. Synchronous Digital Hierarchy (SDH) was added to the PDH transport. By integrating ENGINE, STM-1 interfaces were added, with 4000 VC12 ports...
connecting to fiber optic via an add/drop multiplexer. This combination provides large concentration capabilities, and therefore improved utilization between the physical links. This phase has been concluded.

**Phase 2**
The second phase is the upgrade from the next-generation switching (NGS) narrowband AXE switch to ENGINE Integral in a hybrid configuration, which involves another doubling of capacity from 128K to 256K per switch. Each node includes a telephony server as well as a 60 Gbps AXD 301 media gateway, and STM-1 fibers with 8000 VC12 and ATM ports are terminated on the AXD 301. STM-1 also interconnects links between the gateways and the narrowband switch AXE. The transport is a hybrid ATM/SDH/PDH approach. Significant in this phase is the convergence of the AXE to the Telephony Server, which allows BT to leverage deployed and embedded technology for the conversion to a NGN switching topology.

"In Between" Phase: Hot Swap
A critical piece in the BT's conversion from phase to phase is the cut over to the next switching technology, because a gradual transfer of traffic from the legacy equipment to the new technology would not have been cost-effective. Therefore, live transfers must be made with minimal service downturn. The cut over is enabled when STM links are built out from the node to the NGS narrowband switch, with add-drop multiplexers (ADMs) taking the path of the PDH transport. BT's lead time for the process is around 39 weeks, with an enormous effort going into the physical re-termination of the existing 4000 2-Mbps Marconi cables. The final hot swap to the NGS nodes takes place in three to five hours, resulting in the traffic running solely over the ENGINE Solution.

**Phase 3 and Outlook**
In Phase 3, BT is able to select and change the network toward emerging technology and standards that will further enable the carrier to offer quality of service (QOS) business services by deploying multiprotocol label switching (MPLS) or a full IP network. Other strategies that could be pursued include the packetization of the local exchange and access network to ATM and later IP.

**Converged Network: Operational Experience**
With the upgrade to a VoATM network, BT will be able to scale its network in terms of capacity and services, enabling the seamless integration of IP and MPLS.

The initial trunk switch configuration was eight times larger than the ENGINE build out, and with the NGS network, BT is able to either reuse the footprint in any other way or obtain savings on the real estate value. Also, the power consumption of the ENGINE solution is significantly less in comparison with the previous set up.

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Ericsson’s ENGINE solution has provided BT with a stepping-stone approach of converging switching centers into an ATM-based switching instead of disruptive forklift upgrade or investment. The ability to interface and grow the capacity of the existing network simultaneously while packetizing nodes allows BT to continue to offer QOS and service-level agreements (SLAs) during the construction time without losing service to its customers. This is especially significant, as BT’s wholesale customers include mobile operators, other wireline operators or international gateways.

BT requires land-to-mobile and land-to-land QOS of 95 percent within 135ms and 100 percent within 150ms. ENGINE can support those QoS comfortably. Echo cancellation on AAL1 packets is included in the AXD 301, which is received on every port made possible through the integration of a custom chip. As ATM and NGS technology become more predominant throughout BT’s network as well as the ones of its wholesale customers, echo cancellation is expected to be included directly in these technologies, therefore abolishing the need to have it on each network interface. Interfacing networks will become more cost efficient this way.

Another roadmap milestone that allows for cost savings and improved service quality is the opportunity to migrate/integrate AAL2 and AAL5, offering voice compression adaptation finally to IPs, leveraging the existing base of AAL1 technology and echo cancellation.

Challenges

The integration of packet-based technologies in a structured and embedded TDM network architecture is challenging in terms of actual implementation process. In the case of BT, the network is more than 20 years old. It requires a long-term planning process from the start of network integration design to the actual deployment, especially engineering, manpower, timing, integration with operations support systems (OSS), telecommunications management (TMN) and operations and maintenance cost (OMC). BT and Ericsson are working in partnership to streamline the physical convergence process and to overcome any potential challenges.

Gartner Dataquest Perspective

The Ericsson ENGINE deployment in the BT network is a significant example of how a carrier can benefit from the transformation of an existing TDM network to a NGN switching architecture. It is interesting that a network with a high traffic volume made the decision to embrace the packetization of its network. BT considered the ENGINE solution as an optimal evolution approach: It allowed for a step-by-step upgrade rather than a forklift upgrade, slowly cutting traffic over the newly constructed network nodes. Gartner Dataquest asserts that BT is one of the early adopters of the idea of deploying ATM in its network. The company has held a relationship with Ericsson on its network upgrade since 1999. Although latency and QOS were issues that could inhibit the rollout of
packetized switching by an incumbent carrier that has a lot of voice network traffic at stake, BT decided to go forward with its plan. It regarded the migration toward ATM a cost-effective and future-proof approach to grow a network. Ericsson provided the guidance and the technology for this strategy, meeting the high QOS and low latency demanded by BT. In 2002, some other vendors announced that they can provide similar network rollouts; but despite those, the BT-Ericsson partnership continues.

In addition to BT, Ericsson announced another large network convergence deal with Skanova Networks, an alternative wireline operator in Sweden, encompassing ENGINE Integral. This network will have an almost equal amount of Telephony Servers and AXD 301 deployed in its network. Those announcements clearly indicate that despite capital expenditure constrains by many carriers, the deployment of NGS solutions can provide a valid answer to network exhaust and capacity limitations. It is contradicting the general industry notion that the value and net gain derived from the deployment of next-generation switching equipment is smaller than capital expenditure and operating expenditure savings of those gear combined.

The BT NGN switching rollout shows the following benefits to a carrier:

- Reduction in operational network costs because of fewer network layers, as well as less traditional equipment and more scalable solutions.
- Less floor space and fewer power requirements
- As the network grows, equipment can be re-used in different locations.
- Future-proof network design with standards-based interfaces can be moved to implementations of MPLS, IP and VoIP.
- Savings on transmission costs because of the integration of transport and switching technologies compared with the traditional TDM switch networks
- Greater efficiency in interfacing networks to other carriers and mobile operators

**Key Issues**

What factors are driving the evolution from circuit-based to packet-based infrastructures?

Which carriers are deploying next-generation technology?
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