TRANSWITCH®

Silicon Solutions Integrating Communications Worldwide

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From the President

COBRA Enables Full Potential of ATM

"Plain Old Telephone Service" or POTS remains the core business of local and long distance telephone companies even as they invade each other's markets. Competition among these traditional service providers and from the new entrants like the Competitive Access Providers (CAPs) is driving them in two directions: the RBOCs and other large carriers worldwide must reduce operating expenses; at the same time, both the residential and business customers are demanding new, more sophisticated services and, mostly, they want these services available now.

The carriers understand that they must be leaner and more cost-effective yet be market-driven to remain competitive. They understand that they need new technologies and newer

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Until recently, most discussions about ATM focused on data communications: using the ATM network efficiently for data; making it work transparently for emulating LANs; managing the diverse routing protocols of private data networks and the Internet; etc.

The original motivation for the basic structure of ATM was to allow data, voice, video and image communications to merge seamlessly. This past year voice and video over ATM have received increased attention from the ATM Forum. Two working groups within the Forum have been exclusively dedicated to these issues.

The protocols for data communications over ATM have emphasized ATM Adaptation Layer 5 (AAL5), and either variable bit rate or available bit rate traffic management. Many ATM systems have been developed to provide these features. Their viability has been supported by specialized VLSI devices for efficient segmentation and reassembly functions that convert existing LAN packet formats into ATM and back. TranSwitch has been at the forefront, supplying these needs with its widely used SARA-S and SARA-R products.

In order to make an ATM network solution ubiquitous, not only must it handle data, voice, video, and image, but it must also allow existing transmission systems to be effectively merged onto an ATM connection. The challenge is in some ways similar to that of emulating LANs because the protocols of the existing systems are quite different from those of the ATM network. Yet, the success of ATM as a long distance networking solution relies heavily on its ability to transport these systems transparently just as it must transport LAN traffic transparently.

Until today, devices for efficiently converting voice, video and present day transmission systems to

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From the President-continued

ways of doing business, thus enabling them to lower operation costs as well as to offer newer services beyond the POTS.

Carriers all over the world have recognized that SONET/SDH and ATM are the two technologies with the best potential to meet their needs in transforming their network capabilities so that they can cost-effectively transport not only traditional POTS traffic but also data, messaging and video traffic. Fortunately, equipment vendors all over the world are now responding to the carriers' needs with a new array of product solutions based on SONET/SDH and ATM standards.

TranSwitch's core business is focused on products based on SONET/SDH and ATM technologies. As our customers — the equipment vendors — expand their product offerings based on these technologies, we will be ready with newer, highly-integrated SONET/SDH and ATM solutions ensuring mutual benefits. Our COBRA, featured in this issue, is an example of such a solution.

It is interesting to note that LAN/WAN administrators have also embraced SONET/SDH and ATM technologies to lower their overall communications costs and improve performance, further fueling the growth of SONET/SDH and ATM systems — the largest applications of TranSwitch's VLSI solutions.

Santanu Das

Telecom '95

At Telecom '95, several exhibitors displayed and demonstrated Transmission and ATM Systems solutions designed with TranSwitch transmission and ATM VLSI products.

ATM Potential...continued

ATM have not been available. The system designers have either ignored this segment of potential ATM traffic or designed special circuitry to work around it. Today, the TranSwitch COBRA device has made the Constant Bit Rate conversion much easier and has been used in a number of applications — which in the past were either ignored or forced-fitted into inappropriate structures. These include:

- Merging T1 and E1 lines with ATM links;
- Efficient delivery of packetized video (MPEG-2);
- Add/drop multiplexing of voice, video and T1/E1 links;

Merging T1 and E1 Lines with ATM Links

As ATM grows in supplying backbone connections for corporate data networks, network managers will want to reduce costs and management burdens by combining inter-location PABX connections with other data traffic. Today, this traffic is carried over dedicated T1 lines. In order to use ATM, a transparent conversion is required so that PABXs will not have to be changed. This "unstructured" conversion can be done either as an added card in the PABX or as an input to an ATM switch as shown in the diagram.

Illustrated in the upper path is the case in which T1 is provided between two PABXs through an ATM switch using ATM Adaptation Layer 1 (AAL1) protocol provided by the COBRA. An alternate application shown in the lower path provides fractional T1 service from the PABX to an ATM user through the existing telecom TDM network. Service is provided by an AAL1 function at the point of connection of the TDM network to the ATM switch providing structured service.

In the first case, it is required that the speed of the T1 line be exactly reproduced at the distant end so that no bits are lost or inserted. The COBRA uses two methods to assure accurate handling of this speed control. The Synchronous Residual Time Stamp (SRTS) is part of the control information carried in the ATM cells and tells the COBRA at the distant end the exact difference between the speed of the T1 line and the network synchronous clock. As a broader assurance that information will be delivered properly, the receiving COBRA monitors a 16 cell buffer for underflow or overflow, adjusting the output speed to maintain the proper bit rate. Both of these methods can be used concurrently as a "belt and suspenders" check for controlling the clock frequency of the output COBRA.

Efficient Delivery of Packetized Video (MPEG-2)

One of the keys to the future success of digital video distribution is to use ATM as the routing and multiplexing methodology. However, a general agreement on how the compressed video signal will be converted to ATM still needs to be decided. One method uses the AAL5 adaptation technique used for LAN emulation. This approach was considered because of the wide availability of segmentation and reassembly devices such as the TranSwitch SARA-R and SARA-S VLSI devices.

However, some performance advantages result from using the structured encoding approach of the AAL1 adaptation technique because it helps to get these packets to their destination with minimal delay while using the ATM network efficiently. Using the COBRA device to provide AAL1 conversion means that systems do not require any decoding of the MPEG-2 information since all the information is sent

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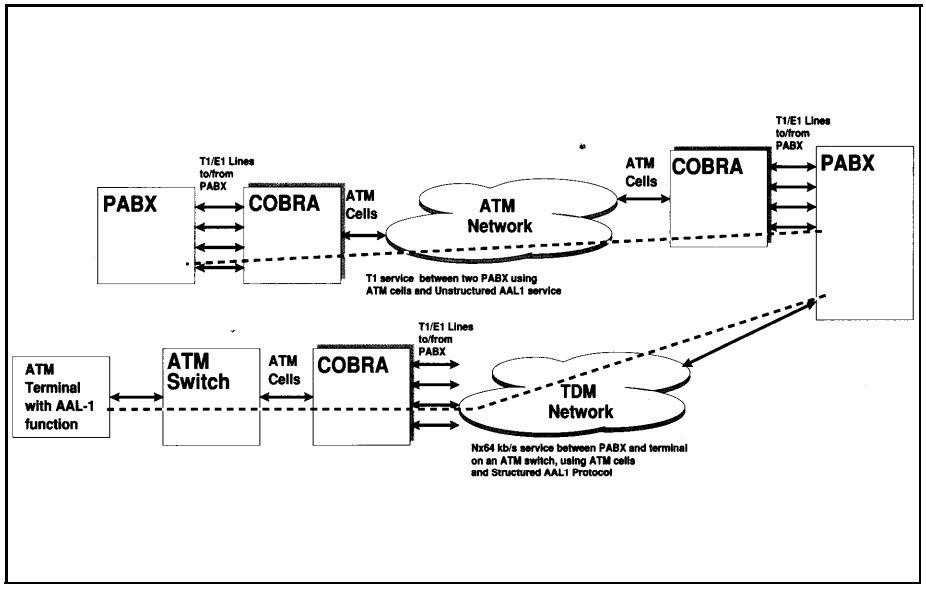
ATM Potential...continued



transparently over the ATM network without delay.

Add/drop Multiplexing of Voice, Video and T1/E1 Links

Many fiber optic distribution networks are configured as rings with two fibers carrying traffic in opposite directions around the ring. The most prevalent method of managing such rings is the SONET/SDH control system providing both overhead control processing and mapping of lower speed transmission links into the SONET/SDH payload. These benefits have been the subject of several articles in *communicator.*

As ATM networks grow, it is likely that higher speed rings will be carrying a mixture of traditional traffic and ATM cells. As a result, it may be preferable in some instances to use the SONET/SDH structure for the overhead control, and use ATM multiplexing for the mapping functions. The key is that the 155 Mbps SONET/SDH link is operating in the STS-3C mode with the entire payload being a continuous stream of ATM cells. At the ATM level, cells destined for a particular node are extracted based on information carried in the cell header. Cells leaving the node are inserted as the capacity allows, with higher priority cells going first. In this case, the equivalent of the mapping function is provided by the unstructured operation of the COBRA device.

COBRA Summary

COBRA provides four independent channels, each capable of performing either structured or unstructured encoding for ATM cells based on AAL1. The maximum rate of each channel is 8.5 Mbps. Each separate channel reconstructs clocking using either or both the SRTS and adaptive mechanism described above.

Although the structured encoding specification presently call for only using the network synchronous clock, COBRA can use both SRTS and adaptive clock recovery for special circumstances.

The COBRA device is presently being sampled to Beta Test customers, with General Sampling scheduled for January 1996. It is available in a 160-pin quad flat pack and the power dissipation is less than one watt.

3rd Quarter Report

TranSwitch Corporation (NASDAQ: TXCC) third quarter results showed a 76 percent increase in revenues over the same period in 1994 and a 44 percent increase for the nine months in 1995 over the comparable period in 1994.

Dr. Santanu Das, president and CEO of TranSwitch, said, "The Company's revenue growth for the quarter was fueled by the continued acceptance of our ATM and SONET/SDH product lines. Recent introduction of products like CUBIT™, COBRA™, and the Level 4 Mapper present exciting growth opportunities for the Company."

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Need a datasheet right away? Don't worry, you're just a few keystrokes away. The TranSwitch Web Site is now on the Internet World Wide Web (www). Data Sheets can be downloaded for local viewing or printing. Press releases, product applications, employment opportunities and names of authorized distributors and representatives can all be accessed on the web. You can reach us at:

http://www.txc.com
or
http://www.transwitch.com

If you would like a CD-ROM of TranSwitch's product information, with company overview, data sheets, application notes and technical manuals, call Mary Lombardo at (203) 929-8810 *or* email: **mary@txc.com.**

List of TranSwitch Products

Product Name	Product Number	Product Description
Asynchronous VLSI Devices		
ART/ARTE	TXC-02020/21	Advanced DS3/STS-1 Line Interface Device
DJB	TXC-03351	Quad DS1 Dejitter Buffer Device
DS3F	TXC-03401	DS3 Framer Device
DS3LIM-SN	TXC-20153	DS3/STS-1 Line Interface Module
E2/E3F	TXC-03701	8- 34-Mbit/s Framer Device
HDLC	TXC-05101	HDLC Controller Device
JT2F	TXC-03702	6-Mbit/s Framer Device
M12	TXC-03375	DS2/DS1 Mux/Demux Device
M13/M13E	TXC-03301/03	DS3/DS1 Mux/Demux Device
MRT	TXC-02050	6-8-34-Mbit/s Line Interface Device
QDS1F	TXC-03102	Quad DS1 Framer Device
QE1E	TXC-03104	Quad E1 Framer Device
XBERT	TXC-06125	Bit Error Rate Generator/Receiver Device
SONET/SDH Synchronous VLSI Devices		
ADMA-E1	TXC-04002	2-Mbit/s to TU-12 Async Mapper-Desync Device
ADMA-T1/T1P	TXC-04001/11	1.544 Mbit/s to VT1.5/TU-11 Async Mapper-Desync Device
CDR	TXC-02624	SONET/SDH Clock and Data Recovery Device
L3M	TXC-03452	SDH/SONET Level 3 Mapper Device
L4M	TXC-03456	SDH/SONET Level 4 Mapper Device
QE1M	TXC-04252	Quad E1 Mapper Device
QT1M	TXC-04251	Quad T1 Mapper Device
SM3	TXC-02201	SONET STS-3/STS-1 Mux/Demux Device
SOT-1/SOT-1E	TXC-03001/11	SONET STS-1 Overhead Terminator Device
SOT-3	TXC-03003	STM-1/STS-3/STS-3c Overhead Terminator Device
STAF	TXC-02623	SONET/SDH Transceiver and Framer Device
SYN155/155C	TXC-02301/02	155-Mbit/s Synchronizer Device
ATM (Asynchronous Transfer Mode) VLSI Devices		
ALI-25C/25T	TXC-07125/225	ATM 25-Mbit/s Line Interface Controller Device/Transceiver Device
CDB	TXC-05150	ATM Cell Delineation Block Device
COBRA	TXC-05427	Constant Bit Rate ATM Adaptation Layer 1 Device
CUBIT	TXC-05801	ATM *CellBus* Switch Device
SARA-R	TXC-05601	ATM/SMDS Reassembly Controller Device
SARA-S	TXC-05501	ATM/SMDS Segmentation Controller Device
Evaluation Boards		
Contact TranSwitch Sales		
Development Support Systems		
SONGEN-51E/155F	TXC-21007	Signal Generator-Analyzer: STS-1 Electrical and STM-1/STS-3/STS-3c Fiber Optic Interfaces
SONGEN-155E/155F	TXC-21107	Signal Generator-Analyzer: STM-1/STS-3/STS-3c Electrical and STM-1/STS-3/STS-3c Fiber Optic Interfaces
SONGEN-PB1	TXC-20047	SONGEN Processor Board: Parity and Pointer Processor

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