Why ATM and SONET Are Part of Your Future

BY LEO A. WROBEL

SONET, the underlying technology for virtually all advanced telecommunications applications, is more than just a passing technology; it is the railroad tracks on which everything else we conceive over the next 30 years will ride, and ATM is the electronic equivalent of the trains on the tracks.

THE idea of trying to second-guess technology even five years into the future may seem preposterous to many. Having said this, I will now proceed to do precisely that, and make a few technology projections, not five, but 30 or more years into the future.

The article, "Rewiring Frame Relay: The Promise of ATM" (***Technical Support***, March 1998), examined several emerging technologies, including ATM (Asychronous Transmission Mode) and SONET (Synchronous Optical Network). I demonstrated how these technologies work and why they're better than the "standard telephone company" services being used today. This article will take this discussion a step further. I will prove that the underlying technology for virtually all advanced telecommunications applications — SONET — will be more than just a passing technology; it will be the railroad tracks on which everything else we conceive over the next 30 years will ride.

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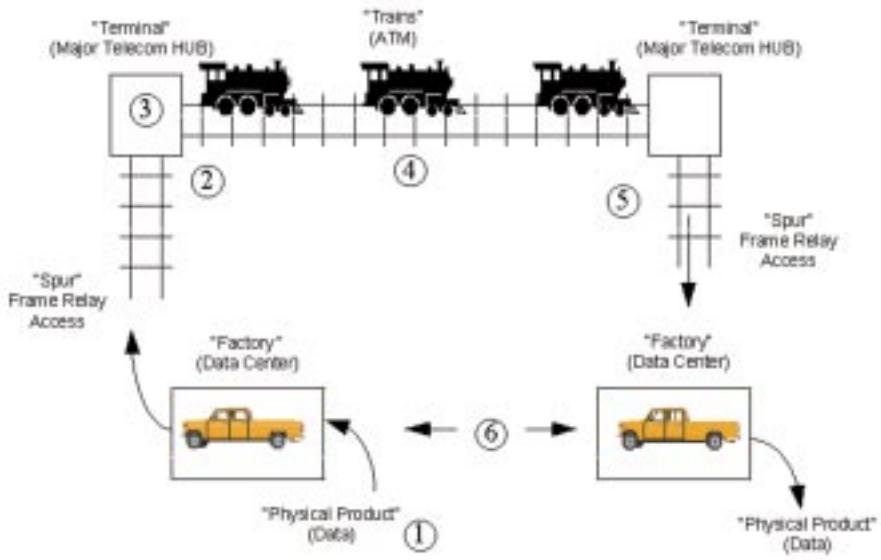
Look into your crystal ball 30 years into the future. It may sound challenging to try to do this, but in a few specific areas such prophesying is not only possible but advisable. Many of today's technologies are doomed to an early death and will be obsolete within two or three years. But what about telecommunication planning? Many telecommunication technologies will also be obsolete within the same period. However, the transport technologies, including SONET, will enjoy a long service life.

As mentioned in last month's article, you can count on SONET to be the technology that will replace T1 and T3 as the backbone transmission medium throughout the United States and Canada. Its companion, SDH (Synchronous Digital Hierarchy), will do the same in Europe and most of the rest of the world.

Is SONET a good idea? The answer depends on your perspective. However, this question is similar to asking if T1 was a good idea back in 1980. Considering that T1 has been the backbone transmission medium for the United States and Canada for the last 40 years, in hindsight this question can be answered with a resounding yes! This is basically because transport technologies have a long life and do not become obsolete quickly. Still skeptical? Forget technology for a moment and consider the following example. Let's return to the year 2038.

Ask yourself this question: Will we still have railroad trains 30 years from now? The answer is probably yes. Ask yourself: Will they run on diesel? Will they run on methanol? Will they run on nuclear fusion? Now the picture gets cloudy. Therefore, although we can be sure the basic technology will still be in use 30 years from now, we are unsure of the

Figure 1: Analogy of a Broadband Distribution System



1. Physical Product Placed Aboard Truck (Frame Relay)
2. Frame Relay Truck Driven to Terminal (Major Telecom HUB)
3. Truck Driven Aboard Train (ATM)
4. Terminals Own Tracks (Sonet) and Can Dispatch Many Trains At Will
5. Customer Owns "Spur" (Sonet) Dedicated to Their Use - Must Be Built as Customer Volume Builds
6. Trucks Deliver Products on Each End, But Some Day Soon Trains Will Run End to End (ATM)

specifics. Will we have trucks 30 years from now? Once again the answer is probably yes. What will they run on? Will electric vehicles proliferate? Will there be a breakthrough in battery technology? Again the details become hazy. But most people will agree that 30 years from now we will still have trucks. So what does all this mean in the world of technology?

In information companies, telecommunications services are the equivalent of railroads and highways. And although the details are as fuzzy in the world of technology as they are in the world of transportation, we can make a few basic assumptions.

In the world of railroads, for example, although we're not sure what types of trains will be running 30 years from now, we can be reasonably certain they will run over the same tracks. And although we're not sure what type of trucks will be running 30 years from now, we can be reasonably sure that the interstate highway system will still be intact and that vehicles will still utilize it. Similarly, in the world of telecommunications we can rationally hypothesize that fiber optics will still be the dominant means of transporting information at the basic level and SONET will still be the backbone transmission medium. After all, we got a 40-year ride out of T1; we should expect a similar useful life out of SONET.

In fact, this appears to be true. No one is envisioning a replacement for SONET at this time. By the time SONET is replaced, all of us will be wandering around shopping malls, searching for the perfect frozen yogurt, and asking ourselves why the kids won't call. In other words, SONET affords us a 30-year planning window — and how often do we get something like that in our business? This means it's probably rational to begin planning your backbone net-work now and that the network should encompass SONET technology. OK then, given this perspective, where does ATM fit in?

As I mentioned last month, ATM promises to be as revolutionary in the world of telecommunications as fiber optics was 10 years ago. ATM is the electronic equivalent of the trains on the tracks. Let me reiterate: The railroad tracks represent SONET technology and ATM represents the trains. If you own the railroad, you only run trains when there's a product to be delivered, right? Similarly when you own a SONET carrier, you will only run ATM cells when there is information to be delivered.

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How often can a railroad run a train? In the case of a railroad, the information carrying capacity of the tracks is far greater than what they utilize. If trains run every hour on the hour, one can assume a given number of physical products, measured in tons, could be delivered. What if trains ran every half-hour? Then, conceivably, twice the number of physical products could be delivered over the same tracks. What if trains ran every 15 minutes? Then, of course, four times the physical product could be delivered. What if they ran every 10 minutes? Every five minutes? Every minute? What if a train could run every few milliseconds?

This becomes a ridiculous example when talking about railroads. However, ATM mapped over a SONET carrier can dispatch the electronic equivalent of a railroad train every few milliseconds. Are you starting to understand the correlation here? In this regard the information carrying content of the underlining tracks — i.e., the SONET carrier — becomes enormous since all users technically share the bandwidth and run ATM "trains" only

when information needs to be moved. This is beginning to happen already today. See Figure 1.

AT&T, for example, uses an ATM backbone for its frame relay network. To reiterate what I discussed last month, frame relay is a modified fast packet switching technology and is the hottest telecommunication technology available today. But what is it really? Once again let's go back to our example of railroads and trains. In this context frame relay would represent an 18-wheel truck.

Can someone drive a truck cross-country to deliver products? Sure, it happens all the time. However, we also see a lot of trucks riding flatbed cars on trains. This is because economically it's more justifiable to transport this material by train rather than paying for diesel fuel and drivers.

Imagine a truck that drives to a railroad depot in Washington D.C. It drives up onto the flatbed car of a train, is transported to Los Angeles, then drives off and finishes the trip to its destination under its own power. A similar course of events takes place in the frame relay world.

Many customers utilize frame relay in Washington D.C. They install access lines to the AT&T POP (point of presence). From there, although it's not visible to the customer, AT&T actually puts this traffic on a transcontinental ATM link to Los Angeles. In Los Angeles, AT&T then strips the frame relay frames back out of the ATM cells and delivers the information in frame relay format to the user in Los Angeles. All the user ever sees however, is the truck.

Since AT&T has the economies of scale afforded by many frame relay customers, ATM quickly becomes cost justifiable as the medium of choice, especially for service providers, just as trains quickly become cost justifiable in the medium of choice when moving physical product. So to summarize:

- SONET is represented by railroad tracks that are there all the time, are a large fixed physical investment, and have a carrying capacity that can be measured by how many trains move over them in a given interval of time.
- ATM represents the trains; and the more trains that run, the greater the number of physical products that can be carried down the line.
- Frame relay is the electronic equivalent of a truck driving onto the ATM backbone when justified due to cost or volume.

So what's the bottom line? We don't know exactly what trucks will look like 30 years from now, and we're not entirely sure what trains will run on 30 years from now. However, we can be reasonably sure that there will be highways and railroad tracks. With this in mind it's never too early to begin building the tracks.

Many companies today are taking this exact approach. The advent of telecommunication reform legislation allows us for the first time to put high volume fiber optic SONET service directly into customers' sites, sometimes known as "reverse co-location." This is a prudent move since companies can be reasonably sure that the SONET backbone will be useful to them far into the future. What about ATM? ATM is still a relatively new technology and the operative question whenever anybody says ATM today is "whose ATM?" When we start talking about ATM and even frame relay, things get a little hazy. So the most rational course of action until standards solidify is to concentrate on what we can be pretty sure will be around for a while, mainly, the backbone SONET network.

A BRAVE NEW WORLD

To summarize, planning activities for large users should concern how the user can install huge pipes for data, voice and multimedia traffic, and how the user can derive the competitive and strategic advantages such a network will afford. The plan should also describe a new regulatory and procurement process for securing these services and build strategic advantages that are difficult to duplicate by competitors and will increase the company's competitive posture in the long term. The plan should also deal with other opportunities afforded by telecommunications reform including the SOHO (Small Office Home Office) environment and convergence of entertainment (cable) with telephone companies, as well as offer concrete solutions and examples of how to exploit each. That's a big scope to be sure, but the opportunities are mind-boggling.

It's a brave new world. Hopefully this article has fostered the ideas you will need to exploit this new environment to its fullest. Good luck in your pursuits! ts

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