TYMES OF TYMSHARE

People chuckle at some of life's coincidences. There is, for example, a fellow named La Roy Tymes working at Tymshare. It turns out Tymshare was not named after Tymes, although he was one of the service company's early employees. It also turns out that Tymes is the designer of the company's communications network, Tymnet. And, at the danger of heaping improbabilities upon coincidences, there is nothing in his background to indicate that at the age of 26, in 1968, he would sit down and conceive Tymnet and then go on to plan and implement the industry's first operational virtual circuit, packet transmission network — and today the nation's largest public packet network.

Tymes joined the company when it had three SDS 940 computers. "They occasionally kept one on the air for several hours at a time," he now says wryly, noting that they had yet to have one run an entire day without some sort of calamity.

A college dropout, in 1963 Tymes left Michigan and became a computer operator at the Lawrence Radiation Labs in Livermore, Calif. While there, he received his bachelor's degree in math from California State Univ. in Hayward, and became a programmer of numerically controlled machines. He went on to receive his masters in math and joined two-year-old Tymshare Inc., now based in Cupertino, Calif.

"Back then, Tymnet existed only in my head," he says. "And I started the network project under a slim budget and stringent deadlines." Tymes comprised the company's communications R&D department, wrote all the network's original code, and almost singlehandedly created the first virtual circuit data network.

"I want, first of all, to correct a common error in terminology," he says. "While Tymnet is a packet transmission network, it is not a packet switched network." With packet switching technology, he explains, packets are of a fixed length and contain data from a single customer; space within that packet length cannot be shared by another message originator, and that can mean more overhead.

LA ROY TYMES—"To me, it all looks very much the same."

By contrast, Tymnet's packets are of a variable length and can contain data from numerous users. Further, logical records associated with each user may also vary in length. "This approach was chosen because of the emphasis on low-speed interactive terminals and because we felt that computer costs were more likely to decline than line costs. Looking back, it's clear this was a good decision."

At first, of course, Tymshare had no network, only SDS 940s with direct dial-up. It got into remote access by doing time division multiplexing on the old Data Machines 620/i minicomputer. This extended its customer base into areas where there was no nearby computer center.

"I wanted to eliminate the need for the 940's attendant customer terminal equipment (CTE) gear, which was then needed to serialize and deserialize characters," explains Tymes. "So one day my colleague Norm Hardy and I devised a scheme on the blackboard in which the 620/i's were to act as concentrators, first for serializing and deserializing characters, and then to pack characters into records so the data could be written directly into the memory of the SDS 940."

He convinced Tymshare cofounder and president Tom O'Rourke of the scheme's feasibility, and the company ordered three more 940s, but without the CTE gear. "This was my first taste of not only implementing a concept and making it work, but to work under the gun and produce on schedule," says Tymes. "We were operating on a financial shoestring in 1969, and if my scheme didn't work, the 940s without the CTE gear would be worthless." Of course, it did work.

In time the 620/i's were made to recognize terminal characteristics, such as baud rates, when a user first accessed the network. This allowed Tymshare to serve terminals running at 110 baud through 300 on the same telephone rotary. "I'm not sure, but I think we were the first to do that," he says. "I think General Electric had tried to do that earlier but declared it impossible."

In 1970 Tymshare created the first network in which particular ports on each 620/i were mapped to particular ports on corresponding 940s. The network supervisor, running on the 940s, was developed. And the nodes, or communications processors, evolved from the Varian 620/i to the V72 and V77 through Interdata 732s to something now called Tymnet Engines, designed and built in-house. Tymshare's common carrier subsidiary, Tymnet Inc., began offering carrier services in April 1977.

Tymnet Engines, nodes in the network now called Tymnet II, are installed at the rate of three a week. More than 500 nodes are expected to be in by the end of this year.

For a young man from a rural community in Michigan, Tymes has come a long way. "Before I came to Tymshare I was primarily a FORTRAN programmer," he says. "I went from there to systems programming and to microcode and from there to hardware. Now I'm designing my own integrated circuits." And it is this freewheeling spirit, combined with an intellectual curiosity, that helps explain his rapid progression across disciplines. He notes that the computer industry is rigidly divided between people who write programs and those who design hardware. He calls this an "invisible bridge" that neither side crosses.

But Tymes sees the hardware side as nothing more than some silicon and copper and a few other materials that must somehow be organized to perform a

function. "And whether an algorithm is expressed in FORTRAN or machine language or microcode or gates or whatever, it's a matter of what's available to work with and what your skills happen to be. Designing an algorithm in TTL is every bit programming as is designing it in FORTRAN."

Tymes, whose interests range from growing orchids to hang gliding to somehow growing large synthetic diamonds, the latter a "someday" thing, says burning programs into PROM's is only a step removed from programming in machine language, but it's a step most programmers don't take. "And that's what I have some difficulty understanding—that there should be such a well defined barrier between hardware and software. To me, it all looks very much the same. It's a spectrum. And I don't really see any discontinuities in that spectrum."

Nor is the chief architect of Tymnet conventional in his thinking about the nation's telephone company. Far from being critical of the Bell System, Tymes says, "I think the phone company has done an absolutely incredible job of tying the world together." Does that mean he also likes Ma Bell's newly proposed Advanced Communications Service? "I think ACS is absurd," he replies, saying it would be obsolete before it becomes operational. "I don't see it doing anything that Tymnet isn't already doing." He says if he had dictatorial powers over the nation's phone system, he would have AT&T concentrate on building an all-digital network. "Because I think that's the best way to increase its value to the human race."

HE LIKES SMALL BUSINESS

In the late '60s, IBM introduced a computer for scientific and engineering applications which required FORTRAN as a programming language. It gained widespread acceptance in the business community but most business programmers were not familiar with FORTRAN.

For a young firm in Atlanta, whose major partners and staff were engineers, the development spelled opportunity. Waverly Graham formed Technical Analysis Corp. in 1965 while he was working for a PhD in nuclear engineering at Georgia Institute of Technology. Set to join the faculty at Georgia, he knew that he'd have to neglect a primary interest, applying scientific methods to business problems, unless he could find an outlet in consulting activities.

"There's a lot more business programming to be done than engineering and scientific programming," says Graham. "For us, that IBM development was a serendipitous thing. We used some of my graduate students as staff on a part time basis. Our programming contracts allowed us to build a revenue base for the company."

Graham himself worked part time for five years to build TAC before taking over as president. For the last five years, TAC's sales volume has been growing at the rate of at least 50% annually. At the end of the last fiscal year sales were $4.1 million.

Graham read about time-sharing that Dartmouth and General Electric promoted in partnership, and went to the Dartmouth campus to learn more about it and its possible benefits to his customers. At that time, the closest time-sharing computer was in New York City. TAC bought wholesale time blocks and retailed them in Georgia. As the systems moved closer to Atlanta, to Bethesda, Md., and Raleigh, N.C., TAC bought blocks in those cities.

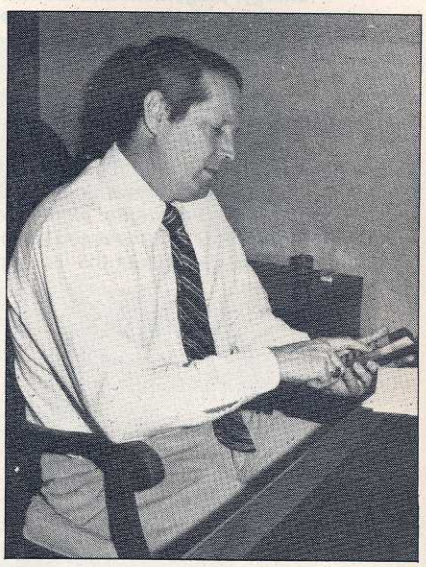
"Finally we developed enough of a base that our supplier in Raleigh put a system in here," said Graham. "It was the first local Atlanta time-sharing offering and we were the franchised marketing organization."

TAC lacked the capital to be competitive, so it returned to its consulting activity. Shortly thereafter, TAC began working with a minicomputer, a logical outgrowth of time-sharing.

"Without the economies of scale available to a large business, we have to live by our wits in terms of our advanced technical capabilities," Graham explained. "That frequently puts us into new areas, sometimes in development, although we don't have a large development budget. Usually there is some company sufficiently interested in applying new technology so we can get some trade-off and be able to have some portion of the new development underwritten by a customer."

TAC's largest single development and production project has been for Olan Mills, a portrait studio company. The long association began when TAC replaced an IBM System/7. The application involved quality control instrumentation which measures color balance in films. Since that beginning project, TAC has put the 160 printers in the company's four production plans under microcomputer control. The five-year project to fully automate the color portrait printers has resulted in a doubling in throughput for a single machine and a reduction in the reprint ratio.

TAC serves a base of industries including a wholesale furniture company, oil companies, several printing companies and a number of bottling companies. The firm has also targeted the paper and textile industries as potential markets.



WAVERLY GRAHAM—"You've got to have interesting projects or you won't keep good people."

"Most 70-man firms would probably be more concentrated in a single industry than we are," said Graham. "We have the breadth and capability that allows us to be a complete turnkey vendor and still be a small business."

Graham believes a project best demonstrating that capability is a paper mill in Tennessee. "We used dual redundant systems, Hewlett-Packard minicomputers, for production and inventory control systems at the dry end of a paper mill to control inventory, shipping and accounting information for rolls of paper. Because data collection terminals of the correct characteristics were not available, we had to design and build a special label printer to print large sized labels and then integrate this into a single system that is expected to operate 24 hours per day, seven days a week."

Another system the firm prepared was for production control of nuclear fuel rods at a fuel fabrication facility in South Carolina. This one-year project involved dual processors and multiple data input stations.

"Our goal is to keep a substantial amount of the interesting first-time development work and to increase the proportion of the more profitable repeat business," Graham said. "You've got to have interesting projects or you won't keep good people. ✲