

San Antonio: A Trip Report

“We like to do things ourselves, rely on no one else.”

Patrick Irwin

Director, Transportation Operations

Time: 2/28/96 10:30 am 2:30 pm

Place: TransGuide, San Antonio, Texas

Attendees: Pat Irwin, Director, Transportation Operations, and Pat McGowan, Traffic Management Engineer

Given that we had some background on TransGuide already, we jumped into the discussion at the point where it is moving from a local traffic management center with a network of 26 miles (covering downtown) to regional center with coverage of 45,000 square mile and 640 miles of fiber net. (It was pointed out that this is roughly the size of Pennsylvania.) There will be redundancy in the urban areas once the basic loop is established. Special infrared cameras just coming out of the research phase will be deployed every five miles, and they expect to detect incidents (such as a car pulling off the road) in 7 seconds. The network will be OC-48 to Laredo, and later OC-96 or wave-division multiplexed. Fiber will be located 10-feet off the centerline in a v-ditch (with 3” expanding to 4”). They maintain 2 standards. They would never allow a contractor to clamp fiber to bridges, for example, but they do this all the time to keep costs down. Others must bore. Hence, they achieve a cost of \$5 per foot at the low end, plowed in (Conduit, meanwhile costs \$82,000 per mile in an urban area, for 4-duct conduit, banked and encased in concrete.) The local network is growing from 26 miles to 191 miles in the final phase.

In terms of their design goals and philosophy, they originally had a plan developed to go with T-1 lines. They were not at all happy with the spec. The equipment was not temperature hardened. The low-bid procedure meant that office equipment was being offered as field equipment, and the temperature differences would have led to increased bit-rate errors not mentioned in the specs at all. They analogize their system needs to those of the Bell carriers not campus-wide systems, and aren't happy with mil-spec, either, since they do not always abide by open standards. Openness was a recurring theme in the discussions; and, they clearly think it is worth paying more up front to have the flexibility down the line that open standards provide. They will get support from Alcatel and AT&T, and expect that these companies will be around for the next 20 years (their design life) to provide that support. They are happy with SONET in terms of performance and the interchangeability among suppliers that it provides, By way of reference to the terms under which the telco reform bill will move towards standards setting, Pat McGowan allowed that “7 years is just around the corner to me.” Upward compatibility is also important. Looking towards the end of the design life, 20-22% up-time was not deemed sufficient, and different networks all running different systems would involve additional management complexity. They designed all video, voice and data into one network, and pointed out that they could manage a 200-mile network, but probably not 600 miles (on 3 networks). Also, this way redundant equipment is available and sparing is easier. Lasers are backed up, for example, but if the trunk is out, say, the features of the Bell-like network are useful, “We want to do incident management, not network management.” They achieved a high level of reliability (99.9%) with materials already in wide use.

They view other systems as making mistakes that they don't have to worry about, and posed an interface equipment issue: since the signal out of a DS-1 is KS-232, pulling it into a DS-0 requires a DSU. In a couple of years they will have 5000 pieces of field equipment, and ask rhetorically where they would put 5000 DSUs. (A connection from a DS-1 to RS-232 does not require a DSU.) The same sort of issue exists in terms of modulating cameras. With 1000 cameras, would there be room for 1000 demodulators? If you

decode at the monitor, and you have maybe 40 monitors, you are better off and, again, the spare parts problem would overwhelm you. This led to re-emphasis of the role of video. There is a strong emphasis on incident management in TransGuide and police manage the scene. Video is thus designed to be efficient and reliable. The network management system can tell what pieces of equipment failed down to a component on a board, and the maintenance worker takes a board out of stock and replaces it. The component reconfigures itself. There are a total of 3 in-house maintenance personnel; and, transfer of responsibilities has begun to take place, from Allied Signal, the prime, who is moving out this month, over to the in-house staff. A contract for preventative maintenance is in the works. The current budget for operation end maintenance is \$1.7 million (this includes spare parts). Of this, \$800k is for maintenance. Next year the maintenance budget component will grow to \$1.1 million, where it is expected to stabilize. The goal is self-sufficiency in maintenance ("We'll be self-sufficient if we can afford to be"). At \$30k for fusion and mechanical splicers, this is a real commitment, though maintenance so far "has been virtually nothing." They spent about \$175k per mile, including "everything," which includes 36 strands of fiber. And, so far, in a year and a half, they have had one cut in the network, due to utility activity. They went out with a quick mechanical splice the next day and 2 days later got a fusion splice. With 200 cabinets in San Antonio, they don't want to keep going out to fix them, so reliability is designed in. They run coax from back of camera to cabinet. Therefore, the cabinet cannot be more than 300 feet from the camera. The expectation is that after attitudes towards ROW relax, there will be more hits. (Public utilities are allowed in the ROW but not common carriers, because they aren't serving the public good.) Currently the estimated maintenance budget is based on 3-5% of the investment cost, with the 5% figure coming later in the design lift. When there are power failures, the cameras take some hits, but not the network. Uninterruptible power supplies (UPS) are installed in the field, to power both the cameras and the communications network, (these cost \$2.7k per unit.) in fact, the entire building has its own back up and UPS, which allows them to remain on-line for 45 minutes with emergency power. At \$110k for a changeable message sign, these do not get spaced very close together. This means that lane control signs are now a key design element. These get spaced every mile, 1/4 mile near intersections, and they get attention from the motorists. (TTI is in the midst of preparing an evaluation study, due out this summer. It uses video collected from the cameras prior to the entire system coming on-line, as well as recurring survey of 3000 drivers.) Lane control signals are designed to give a warning of an incident 3 miles ahead, so there aren't back-ups as people change lanes. Compliance is good, estimated at about 60% for diversions, although drivers still slow as they pass an accident. There are no back-ups during off-peak periods, however. Compliance is summarized as follows: 80% of the travels will follow instructions, 60% of the travels will divert. As for recurrent congestion, the indications are that back-ups are reduced by up to a mile in specific locations. They performed an experiment, and held off displaying messages for 1 1/2 weeks, and saw the same previous pattern of congestion occurring. This will be part of the data analyzed by TTI.

Another design element was expandability. They employ DS-3 based video and regard full-motion as an asset. They run point-to-point, since it's cheaper, and will swap OC-3 for OC-12 when they need to, wave division multiplexing is employed.

Their flexibility and standards-based design is allowing them to expand the system's capabilities. Mobile Ethernet will be the basis of a new service, planned to be implemented over the next 12-18 months, to bring video from the scene of an accident to a doctor in a trauma center. It is planned that 2 of the 3 trauma centers serving San Antonio will be closed at a savings of \$3 million per year, and permit en-route treatment of the injured. Current practice is to stabilize a patient and move them to a trauma center.

Some services will be leased, based on cost and priorities. They will lease 170 DS-0 lines to get speed data in (and they view AutoScope as less reliable and still rather expensive). They like loops, having had to replace only 5 out of 900 to date. This is a very local decision. Laredo for example, can't keep its loops in the ground, The pavement gets to 160 degrees, and they fail, (As a point of comparison, you lay asphalt at 270 degrees.)

In terms of process they feel that typical operational tests put the cart before the horse, or the solution before the problem. By specifying a vendor up front you get a solution, not a problem definition. They would

rather go first with standards (they are POSIX compliant). As for the ability to do a capital lease, they feel they have the ability to do that, and look at Houston's leasing of a video signal at \$1800 per month as evidence of that. TxDOT has retained ROW restrictions, however. They are also running up against state statutes with respect to public-private partnerships. A Cooperative Industry Partnership Agreement was recently put in place to assist in bringing increased parties to the table.

As far as state communications plans are concerned there is an agency, the State Division of Information resources, whose original mandate was to scrutinize the requirements for PCs on desktops. They have moved on to larger issues, but do not have a comprehensive plan in place. The state accepts a low-bid supplier of services for all its telecomm needs, now SouthWestern Bell (it was AT&T previously). The state will reimburse FHWA if the system comes to be used for non-transportation purposes. They expect that "other agencies will want to get in on our network." The general arrangement would be for the General Services Commission to shop out the capacity sell it back. As for the consequences of not having their own network, "If we have to lease everything, then ITS is done. Its over." They asked the locals about leasing and were told that the capacity did not exist. Neither was there the willingness to add 5 miles to the existing network. Meanwhile, to get to Laredo there will be a public-private partnership. They have 20-25 seriously interested parties, since this gets access to Mexico by just hopping across the border. There will be 154 miles of DS-3 with DS-1 every 5 miles, in places now that do not have phone lines. AT&T is one of the bidders. (Bids will be coming in next week.)

The state of local competition in the fiber marketplace was exemplified by FiberCom's network in downtown San Antonio, which ties together local businesses and television stations. The feeling is that they are stuck with a second-rate network, and the prices keep going up. As an example of the unease with which the view local providers, the leasing of a DS-1 line from TransGuide to the Medical center was given. At first it was quoted at \$1200 per month; then the state tariff of \$800 was applied; finally, an educational use was invoked to get it to \$600 per month. Rather than view this as an opportunity to deal with the telcos and what kind of good deals can be had, this pricing without an apparent cost structure leads instead to suspicion from prospective buyers. A rule of thumb was held out that, if the lease cost met the 10-year build cost, then they'd lease. (Now, go look at the quote at the beginning of the report.)