

# Radio World

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## The Case for T1 STLs

Like Meat and Potatoes: Here's Why T1 Circuits Aren't Going Away

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First, congratulations for reading this far.

With all of the "I'm IP, are you?" and recent introductions of radio-based studio-to-transmitter links, you'd think venerable T1-based STLs have gone the way of typewriters and 8-track.

So, in the spirit of full disclosure and to make sure all of the facts are out on the table, here's why T1 circuits — like meat and potatoes — aren't going away.



### 1. YOU CAN'T GET THERE FROM HERE.

Maybe this is too obvious, but there are applications that aren't suitable for radio or IP STLs. In the case of radio links, it could be the airways are full. Or it could be terrain, distance or up-front costs. IP requires a high-speed link — often DSL — which can be found in more and more neighborhoods and business parks but perhaps not so much at remote broadcast towers.

T1 has the benefit of ubiquity (with a "u", actually). Telcos, and their competitors, have mastered T1 delivery so you can get one just about everywhere.

### 2. WE'RE GOING TO SAVE SO MUCH MONEY.

OK, even though T1s have dropped into the \$400-per-month price range (based upon distance), it's true DSL circuits can be leased very cheaply. And the savings add up. It's a common way to cost-justify the price of new equipment. So, time for item #3.

### 3. WHY'S IT SOUND FUNNY?

Any engineer worth her/his salt knows all about this. For IP audio, you need high Quality of Service or QoS to "guarantee" that audio content is not delayed and thereby distorted by other traffic within the massive Ethernet arteries that stretch across the globe. For sure, if you have a private link — such as a radio-based STL or IP carried over a T1 — you have full control to avoid transmission delays. But the public network for IP transport can look like a Los Angeles freeway during afternoon rush hour(s) when even "express lanes" may not be express enough.

Tried-and-true T1s, of course, are immune from delays. In fact, if it's off-the-air monitoring you're after, the ability of some T1-based systems to limit delays to a

few milliseconds can eliminate echo and howl during real-time listening and slash the aspirin budget.

### 4. OH MY GOSH. OUR LINK IS DOWN.

When asking telco types for an IP link, check to see what kind of support is available when it fails. T1s get full telco attention because they are business-class circuits. There are lots of classes of IP service; the price goes up and savings may peter out for IPs with service assurances comparable to T1s.

### 5. OH MY GOSH. OUR LINK IS DOWN.

Ethernet is known for lightning-fast speeds, not lightning resistance. That's because Ethernet speeds are relatively high (10 Mb to 100 Mb or even gigabit Ethernet)

when compared with T1 (1.5 Mb). The physics of the whole deal is that lightning protection components work very well with T1s, but stray capacitance and inductance start to wreak havoc with Ethernet-rate speeds, essentially loading down (stray capacitance in this case) the signal to the point it's unusable. I'm here to tell you that broadcast towers excel at attracting lightning, so an IP hand-off from a telco can be iffy if you plan to operate during the spring, summer or fall. One of the world's two largest telecom carriers recommends that Ethernet hand-offs be extended optically to within



inches of cell tower radios before an electrical hand-off.

#### **6. OH MY GOSH. OUR LINK IS DOWN.**

You may have read about a recent STL failure caused by tower storm damage. It's a rare event. Heavy snow, heavy rain, fog and the like are more common, and can impact microwave — even with redundant links (that need to plow their way through the same crummy conditions). The thing is, folks often depend upon your station when emergencies occur, so susceptibility to Mother Nature deserves some consideration.

#### **7. OH MY GOSH. THAT'S NOT OUR SIGNAL!**

*“Thousands of confidential files on the U.S. military's most technologically advanced fighter aircraft have been compromised by unknown computer hackers over the past two years” (CNN, 4/21/09).* Hackers may not be after your aerospace technology, but with growing talk of subscription-based services, some consideration should be given to protecting valuable program content and avoiding unexpected broadcasts of new “personalities” and content throughout your tri-county area. Even a private microwave link isn't immune, as demonstrated when a Long Island station's microwave STL was overpowered in 2006.

On the other hand, T1s over copper or fiber are immune, from hacking and pirating unless the attacker has physical access to the

copper or fiber pairs. As they say in the phone companies, a T1 circuit is a “nailed-up private line.”

#### **8. SO, I'M JUST GOING TO HOOK OUR OLD PBX AND OTHER T1-BASED EQUIPMENT TO OUR IP LINK.**

Good luck with that. So-called “pseudowire” (transporting T1s over Ethernet) is a gift from above if you just need to surf the Web or link office routers for e-mail and file transfers together. But the big telcos know that even when they're providing Ethernet to cell towers (to support all the new cell phone features) they also need to provide a T1 for synchronization. And many have learned that using pseudowire for cell phone calls (voice calls, not data) is subject to the congestion and quality issues already discussed. Cell phones aren't exactly broadcast quality, either.

These days, when cash is short, it can be a tough argument to replace working T1 equipment with something that may not work as well.

#### **9. IT'S ALL ABOUT QUALITY.**

On the one hand we have the new all-digital TV network, HDTV, 10+ megapixel cameras, HD Radio, Home Theater, countless consumer magazines and Web sites that rate which car or toaster or movie is better. On the other hand, there's documented listener fatigue and audio artifacts that can be part of IP processing. IP offers a lot of oper-

ational advantages, but public perception seems to be tied more and more closely to quality. Watching the recent grainy replays of the Apollo 11 moon landing was reliving a thrilling bit of history and a mighty fine reminder of how much quality we now take for granted.

There are lots of articles on the digital radio transition (a.k.a., Web, podcasting etc.). Content is king, how the content gets delivered is secondary. So, if content is (are?) the Crown Jewels, preserving the Jewels deserves consideration as Job 1. Of today's technologies, T1 is the bank vault of transport.

#### **10. IP SOUNDS FINE TO ME.**

It probably really does to many. But with ratings so close, there's something to be said for nailing the fundamentals to assure a pristine signal. Some will care. Some pay a premium for better quality Sirius stations on their PCs. Some will gravitate to the highest quality and most dependable signal they can get.

We've all seen the arguments for IP and microwave. They remain good choices and have many well-documented benefits. But in the final analysis, there are other factors worthy of consideration when putting together a comprehensive STL cost-benefit analysis.

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