What's After ATM?

Tachyon

Transmission Mode

The Information Airline

Disclaimer & Copyright

◆ Caveat Lector*

   – The problems discussed herein are real. The solutions are not guaranteed -- to say the least.
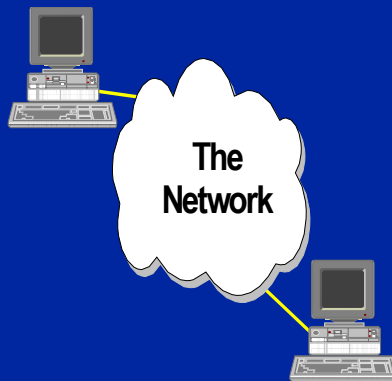
Tachyon Transmission Mode

◆ Defining the Problem
  – Why the "Information Highway" is just a dirt road, fraught with mud and potholes...

ATM and Protocols

◆ ATM relies on upper layer protocols for accurate transmission

◆ Protocols are in the "end" devices - the DTE

◆ Often ignored in throughput calculations

The Network

Protocols and Windows

◆ All protocols have "windows" of frames that are outstanding
◆ Essential for network throughput
◆ "Window out" once all outstanding frames are transmitted

Modulo-8 Window

```
        5      6
     4              7
     3              0
        2      1
```

Protocol Issues

� All data must have some form of protocol, but it will usually be in the DTE or beyond

– The protocol ensures accurate delivery of the data
– Not literally within the scope of Frame Relay or ATM, but can have a profound effect

Protocol Issues

◆ All data must have some form of protocol, but it will usually be in the DTE or beyond

➡ Protocol factors affecting throughput

– Modulo (number of outstanding frames)
– Maximum frame size
– Memory in protocol device
– Selective vs. "Go Back N" ARQ

Protocol Issues

◆ All data must have some form of protocol, but it will usually be in the DTE or beyond

◆ Protocol issues, including selective ARQ, also affect net congestion.

➡ *If Frame Relay or ATM doesn't offer the throughput you expect, it may have nothing to do with the transport protocol.*

Protocols and Network Delay

◆ Memory Effects: "Bits in the Pipe" must be buffered at some place in the network

– "Bits in the Pipe" = Delay X Speed

– At T1: 1.544 Mbps X 30 msec. = 45,000 bits = 5,600 bytes; OK for Modulo-8 & medium-sized frames

– At T3: 45 Mbps X 30 msec. = 1,350,000 bits = 160,000 bytes; Almost all protocols will "window out" for a single transmission

Network Delay

◆ In tomorrow's world, the "Memory Effects" remain; "Bits in the Pipe" still must be buffered

– "Bits in the Pipe" = Delay X Speed

» At OC-12: 600 Mbps X 30 msec. = 18,000,000 bits = 2.25 Mbytes in the communications buffers!

» At OC-48: 2.4 Gbps X 30 msec. = 72,000,000 bits = 9 Mbytes in the communications buffer!

– DUE TO THE SPEED OF LIGHT IN A VACUUM - THERE ARE MANY MORE DELAYS!

» Glass (Fiber Optic) has about 1.5 to 1.7 index of refraction

Tachyon Transmission Mode

◆ Defining the Problem

➔ Introducing Tachyon Transmission Mode

What is a Tachyon?

◆ Elementary particle that moves faster than the speed of light; similar to "anti-matter"

◆ Detected in linear accelerator experiments

◆ Field Propagation is an example of how tachyons "work" in the real world
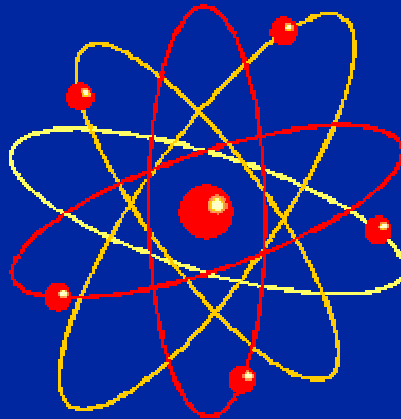
What is Tachyon Transmission Mode?

- ◆ Intrinsic photonic relay using electromagnetic fields of photons
- ◆ Based on *Bilateral Ultra Low Luminescence Coupled Resonance Attenuated Phase Technology*
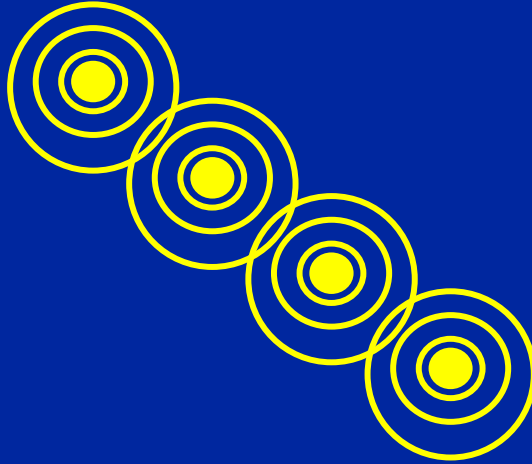
What is BULLCRAP?

- ◆ Each photon detects minor changes in the electromagnetic field of adjacent photons
- ◆ Similar to cars radioing ahead (or flashing lights) to propagate signal as they travel down the highway
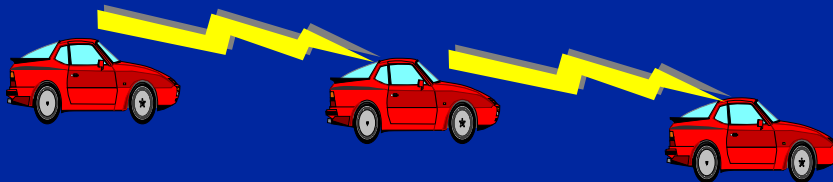
Tachyon Transmission Mode

◆ Defining the Problem
◆ Introducing Tachyon Transmission Mode
➡ Challenges
  – Higher speeds
  – Technology
  – Regulatory
  – "Moral"

TTM Challenges

◆ Higher Speeds
  – Current experiments to Warp 3; Warp 8 needed for production

TTM Challenges

◆ Technology
  – Existence of tachyons hasn't been proven
  – No way to detect particles in excess of speed of light
  – Minor problem that should have essentially no impact
  – Industry has no history of encumbrance by mere reality

TTM Challenges

◆ Regulatory
  – If the FCC doesn't regulate it, it's because they don't know about its existence
  – PUCs will also get involved

TTM Challenges

- "Moral"
  - Redefines meaning of simultaneous
  - Particularly a problem for anything on which wagers can be made
  - If the uncertainty principle really holds, will it be useful only for information that is not used? Remember Schroedinger's cat?