Future Of Internet Over Wireless Essay, Research Paper

Beken 1

TCP/IP AND THE FUTURE OF THE INTERNET OVER WIRELESS MEDIUM

By Robert Beken

ISM 410

Fifteen Years ago computers were just an expensive typewriter, calculator, and entertainment center thrown together in one box. People transferred their tiny files with floppy disk. The computer itself seldom had a hard drive. It was an amazing feat to dial into a computer bulletin board, and talk to other users of systems. Networking computers was more or less unheard of. The only exception were mainframes that might span several buildings, with terminals, or dial in terminals. The internet, and TCP/IP were developed by the Department of Defense so as to be able to link together several LANs around the country. Each individual system was built sometimes by different vendors, and were sometimes incompatible. For example I can remember my father telling me while he was working at Perkin Elmer that they had to link from San Diego to Cheyenne Mountain in Colorado with two dissimilar systems. TCP/IP was a robust common language that could be used.

In part the same is true today, The Arpanet is no longer the driving factor in the internet, but business. Computers using a myriad of operating systems, from a DEC to a Unix box, to someone running Windows 2000, they all can speak the same language.

Beken 2

I’m going to overview how TCP/IP works into the entire system. Keeping in mind the OSI reference model (Fig. 1). While TCP and/or

UDP are running at the Transport Layer IP is

running at the Session Layer. The IP protocol

handles fragmentation of packets. Fragmentation

is essential, because some networks allow a very

large packet size, and others do not packets

sometimes must be fragmented. The presentation

layer is where the TCP/IP “languages” are used

such as FTP, SMTP, HTTP, and Gopher. Fig. 2

demonstrates the overlapping of the Ethernet Frame,

the IP packet, and TCP packet. (Fig. 1) 7 layers of the OSI Model

The TCP packet information is placed inside the IP Packet which in turn, fits inside the Ethernet frame. The last is the Ethernet frame. Everything else is squeezed into that frame.

The Internet is changing daily, and the future is currently

unforeseeable. The future of the internet is teetering on a variety

of political issues, new and growing technology, and the

Beken 3

economy. The Internet is no longer purely half TCP/IP and half Computer. It’s now a sloppy mix of politics, get rich quick schemes, scandal, and major internet players buying out media giants. The recent controversy over internet taxes shows what a large part of

the world that this medium has become. Gov Gray Davis a California Democrat told CBS Reporters “ In the short term, I do not favor the application of the sales tax for the internet, gecause I certainly don’t want to kill the golden goose that is laying the egg” The president outlined other challenges made by the internet to governments.

“We need to think about how we can reasonably make more new markets or help

to facilitate them, and how we can remove barriers without undermining public interest to the private sector’s development, and how we can make government more user friendly.” Even Online Voting was discussed. The fact that the government is getting it’s fingers deep into the internet shows that the internet must be the next best thing since sliced bread.

It seems that Wireless technology is the next step in communication between computing devices. I will explain several different types of wireless technology, and how it fits into the future of the internet

The buzz at CeBIT this year was wireless everything. Wireless technology promises to bring in the next wave of electronic commerce. The FCC has made available several bands for Wireless networking. The 5.8 GHZ as well as the 2.4 GHZ bands. Radio LAN a world leader in high speed wireless

Beken 4

networking, recently unveiled a new PCI LAN adapter that allows users to stay connected to the network at 10 Mbps of speed while operating in the 5.8 GHZ band which guarantees interference free connections. These systems are priced at around $400 US. This means that Network administrators can use a Windows CE device that is Terminal Served into their workstation, and move about the building doing administrative tasks without being tied down. Microwave WAN configurations are also becoming very popular, due to their cost effectiveness, as well as relative ease of installation. Microwave communication is possible between sites approximately 25 to 30 Km apart. Distance of microwave communication is restricted primarily because of the curvature of the earth. Transmitter and Receiver tower height also affect this equation Obviously the terrain affects the equation as well. Microwave is popular in metropolitan areas and provides an effective means for signal transmission to various locales outside a metro area. There are several problems with Radio type transmission systems. Distortion becomes a very real problem. Signal distortion is not a matter that should be taken lightly. It happens in most transmissions, just like when lines that were originally designed for voice transmission are used for data transmission, some distortion occurs. Humans easily filter out distortion when it occurs by the human ear when it happens between 2 people having a conversation. This happens quite often. We become used to the noise or distortion, unless it is

Beken 5

extreme enough to create a problem communicating, we just drive on. This isn’t necessarily the case with data transmission. Since data is generally transmitted by electronics, of some kind, they have preprogrammed methods of dealing with distortion.

Latency is a type of distortion. Many times it is called propagation delay. With the global reach of networks latency can, and is a serious problem. TCP/IP and other devices have a problem with latency many times. When a large delay happens, the data will simply die, and not reach it’s destination.

Harmonic Distortion is very specific to radio propagation. Harmonics are defined as a repetitive nonsinusoidal waveform is composed of a fundamental frequency and harmonic frequencies. Out of the fundamental frequency odd harmonics and even harmonics will be produced. For example if a 1Khz digital fundamental waveform is propagated the odd harmonics produced would be signals at 3KHz 5KHz 7KHz and so on. Even Harmonics are similar, if a 2MHz Wave is keyed you would get a 4MHz and 8MHz etc. signals transmitted as well. See Fig. 3.

Beken 6

Figure 3 Harmonic Distortion

Jitter is another type of distortion that commonly occurs is data transmission. Jitter is frequency oriented noise distortion. Jitter poses problems with clocking incoming signals on the receiving station, and Sync control while frequency hopping.

Crosstalk is a type of distortion that occurs with analog, and sometimes digital signals when a voltage is induced on surrounding wires. Since every wire carrying electrical current has a rotating magnetic field. This can be demonstrated by the right hand rule. When holding your right hand in a fist with your thumb sticking up, your thumb shows the current flow and your fingers show the direction of the rotating magnetic field. The action of cutting a wire through lines of magnetic flux, or magnetic fields collapsing and building through another wire will cause a voltage, or current flow induced onto that wire. Since this is an

Beken 7

element of basic electronic theory, and could probably not be covered in this paper alone I won’t go any further.

Fading is another distortion type, when a signal becomes weaker, generally due to atmospheric conditions. In some bands of the radio spectrum Tropospheric propogation is a serious factor in transmission. This result can be seen with your home radio. The sun reduces the elevation of the Ionosphere (a field of excited particles in the atmosphere) during the day, but at night the ionosphere rises again allowing radio waves of large wavelength to go many times further than during the day, because of Tropospheric bounce ( where radio waves are transmitted bounce between the ionosphere, and the ground, allowing long distance communication.) That is why Short wave radio can be heard around the world. This phenomenon is most prevalent around the 14MHZ range. Solar activity will affect most any radio transmission, sunspots, rain, and snow will affect microwave communication especially. Particulate matter will affect microwave more than lower frequency transmissions, because of its narrow wavelength it has closer properties to light waves (line of sight).

Interference is an obvious distortion in signal quality as well. Interference results from other transmissions no matter what transmission medium used.

Antenna systems are also a key element in the microwave system. Omnidirectional Dipole Antennas provide 360? coverage. These types of systems

Beken 8

are typically mounted on a mast. Omni Antennas have a very narrow elevation when dealing with microwave transmissions, both the height and distance separation between the two sites mist be taken into consideration when selecting this type of antenna.

Parabolic Dish antennas provide high gain directional transmissions. Parabolic antennas provide narrow sectorization, and are quite hard to align.

Sector Panel antennas are the best choice when several wide angle coverage sectors are needed (typically seen cell towers) There is normaly a drop in antenna gain at 90?, so the antenna coverage needs to be overlapped.

There are many vendors that provide Microwave networking systems. I have had significant experience with several systems in the military specifically several of Lucent Technologies microwave systems. Many systems offered are Point-to-Multipoint wireless access systems capable of supporting hundreds of remote sites (with a single computer) The system I have worked with in the military employed frequency hopping, spread spectrum technology and was stackable providing up to 600 terminals per antenna location with up to a 3.2Mbps speed on each node.

Imagine being able to listen to a radio station in Germany while you are in your car in Nebraska, Cellular phones that can interact with PCs running Windows CE. This may well be the reality in just a couple of years. Semens and

Beken 9

Proxim have partnered to provide seamless networking in the home, while Qualcomm is developing a more usable wireless CE device that links to the internet, anywhere in the US, Oh did I mention it’s a phone too. CBS MarketWatch claims that the partnership between Siemens and Proxim will initiate more rapid adoption of integrated voice and data solutions resulting in greater flexiblility and convenience for home network users. Standardized solutions might bring a new age of simplified communications and location independence for people in the home, or office.

Qualcomm has partnered with Microsoft and Lucent Technologies recently to develop more usable web browsing phones. Qualcomm is developing a third generation system of CDMA or Code Division Multiple Access multiplexing. This new system has been optimized for high-speed data throughput on standard IP protocol. Qualcomm specifies peak rate at 2.4Mbps data transfer with a 1.25MHz channel Bandwidth for fixed, portable, and mobile applications. This system already supports web browsing, e-commerce, e-mail, mobile e-commerce, while offering users always on access that can be taken anywhere.

Qualcomm is also working with Microsoft to develop the devices themselves, with a foundation of the new CDMA HDR (high data rate) standards.

The companies are currently working on developing advanced multimedia

Beken 10

capable devices, on Microsoft’s Mobile Explorer? Wireless communication platform and wireless pocket PCs. “As Bandwidth increases, the wireless CDMA industry will be incorporating multimedia and internet services in its offerings on an ever-increasing basis,” said Johan Lodenius, Senior Vice President of marketing and project management. Qualcomm is currently in development of multiple classes of multimedia and internet capable devices combining telephony, full internet protocol stacks and drivers, and handheld computing functions into feature-rich wireless handsets with larger screens, more memory, and more data processing capability.

Microsoft Mobile Explorer is a modular wireless application and services platform for phones that allows industry partners to pick the solution which best fits their needs using components selected from a suite which includes: Dual-mode micro browser, a smart phone based on the Windows CE operating system, additional applications, and server-side components. This Operating System is designed to deliver wireless data services such as secure corporate data access, email, the internet, location-based services and electronic commerce.

Microwave systems will play an amazing role in computing in the next few years. The internet will be accessible from anywhere, in your car, on your refrigerator, and in your cellular phone. The ability to browse the internet

Beken 11

anywhere anytime will have a very large impact on western society, Wireless Technology will bring people who were in rural areas, or in countries where there

is no Telecom infrastructure onto the net at blazing speed. The technology is here.

Beken 12

Annex C Reference: Advanced Radio Frequency Theory. Fort Gordon United States Army Ordnance Missile and Munitions Center and School, Ordnance Electronic Maintenance Training Department

Harley Hahn The Unix Companion Berkley: McGraw-Hill, 1995

Thomas L. Floyd Electronics Fundamentals, Circuits Devices and Applications Upper Saddle River: Prentice Hall 1998

Qualcomm and Microsoft Evolve Corporate Alliance. Qualcomm Corp.

http://www.qualcomm.com/cda/pr/view/0,15655, 245,00.html

Siemens and Proxim Partner to develop Wireless Home Networking Solutions CBS Marketwatch Feb 25 2000

http://live.altavista.com/scripts /editorial.dll?ei=1538109&ern=y

Ed Taylor The Network Troubleshooting Handbook New York:

Mcgraw-Hill 1999