

Resistance is Futile, Computer Telephony will be “XML”-ated!

By

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[It's better to be hated for telling the truth, than to be loved for telling a lie. Really!]

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Last look, this was about 73 pages in length

Begin Notes

“Executives” will probably stop reading after they get to the “Abstract” so...let's have some fun! Pay special attention to the endnotes and the Annotated Biography and Reference sections, because that is where the meat is, and feel free to click on the links throughout the article, just come back to finish reading the report!! ;^)

Oh yeah, many contributors to this report have given legal permission to include their comments. Those who haven't yet will probably appreciate that you read their articles in full through the linking activity. They *need* the exposure and visibility. Besides, you can always email them and let them know how you got there from here!

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Abstract (Executive Summary)

This report focuses attention on the current state of affairs regarding Extensible Markup Languages (XML)¹ that affect telephony today and their impact on future business applications within the constantly changing computer telephony industry. The “prevailing winds” point increasingly towards the Extensible Service Policy Architecture (ESP) and Unified Communications (UC). Appendix A contains an **xML Telephony Family Taxonomy** generated from this [research](#).

Acknowledgements

First and foremost, I wish to publicly express my gratitude to my Heavenly Father for blessing me to be a participant in the “fullness of times” and for giving us technology in these “latter-days” that helps in the progression and betterment of all mankind throughout the world as we prepare ourselves for future “last days” events. Next, my wife, Thelma, for tolerating my excursions into cyberspace and sharing my love for Startrek-like Sci-fi. Then there are a couple of our angel-like daughters, Zontziry and Rocío who have taken time from their busy schedules to proofread this work. I also have to express thanks to the officers of *SCM Consultants, Inc.* for allowing me the privilege of having a website where I can express myself as I explore the technologies that reach out and touch our lives. Also, my appreciation to those intrepid Internet Explorers [alpha order], Robin Cover, Dr. Mark Davydov, Dr. Setrag Khoshafian and Ralph Mackey, who in my estimation, are “enablers” in every sense of the word and have assisted me in “exploring new worlds”. And finally to all those listed in the Bibliography, Resources and End Notes of this work who have invested time and effort in helping mankind communicate more effectively. To each and all, enjoy!

What is the Ultimate Goal here?

Sometimes we can find ourselves sinking deeply into the thick of thin things. Has the wheel already been invented when it comes to Telephony Markup Language (TML) attempts at universal communications, or are we going through *déjà vu*? Just how many divergent ways can we say the same thing? If we keep what I consider to be the ultimate goal of a no-problems-always-on communications system in mind, the rest of this research article will be easier to digest.

Visualize for a moment a communicator device used in Gene Roddenberry’s [Earth: Final Conflict](#),² a glorified Palm Pilot-like pocket device that can slide sideways for a fullscreen view that instantly lights up in color for bidirectional real-time display. It uses an always-in-focus pinhole camera and hidden Mic in the device that always works in all kinds of weather, light and noisy environments without distortion of any kind. It is always “on” and seems to never need recharging. See? No [Virtual Reality](#)³ headsets! It also does other things similar to the old *Star-Trek* Tri-Corders. Want one? Now

picture in your mind an [optical computer](#)⁴ with a [holo-image](#)⁵ pop-up display like [Auger](#)⁶ has in *Earth: Final Conflict*, or [Lili Marquette](#)⁷ when she navigates the flying interspace units by just moving her hands around in virtual reality mode. No headsets, handsets, shoulder cradles, throat Mics, earpieces, dongles⁸, keyboards, mice or other “tethers” and no problems. Now there’s a vision for the future! *Very* nice, even if it is science fiction!

What is keeping everyone from having that kind of technology today? [Sci-Fi](#)⁹ has “shown” us how, and the good folks at the Massachusetts Institute of Technology are leading the way with such technological devices as the “Handy 21”¹⁰ and the other parts of the Oxygen Project. ([Dertouzos](#), 1999, [Guttag](#), 1999) However, we somehow need to make the nuts and bolts of this “gee-whiz” technology “real” without loosing our freedom, health, liberty or privacy. ([Radcliff](#), [Somerson](#), 1999)

Computer Telephony Reality Check

Lewis Trager wrote, “The notion that voice would end up with a bit part in the big scene where a mob of services rides on data networks originally seemed to the telephone industry a quaint delusion of visionaries and sellers of computer networking equipment. This theory that telecom networks and services would converge metamorphosed by 1998 into inconvertible conventional wisdom. The converged future hasn’t arrived, but it’s definitely on the way.” ([Trager](#), 1999) [And so is the [Eveready battery bunny](#)]¹¹ Then there is this comment from Charles Waltner in *Inter@ctive Week*, “...IP-Based PBX technology is bringing all the functionality of the corporate phone system to the remote employee...for roughly two-thirds its previous cost...” ([Waltner](#), 1999, September) Appeals to our “scroogeness”, doesn’t it?

David Newman penned, “Now listen to the voice of reason. VOIP gateways give net architects a whole new set of issues to investigate... But it’s also wise to take soundings on everything from latency and jitter to feature sets and standards support before ripping out the phone services now in place...” ([Newman](#), 1999) (As in, “why fix what ain’t broke”?)

Let’s see, the real issue could be this, “How will packet data-based gateways link up with circuit-switched Private Branch Exchange (PBX) systems? Packet and circuit networks have not yet converged at this key interchange...Early customer interest in packetized desk-set phones has bordered on the fanatical, causing *Cisco* to warn users that some call-feature applications are still in [beta phase](#).” ([Wirbel](#), 1999, September) The answer could be quite simply that we have to continue to build fiber-based carrier-grade or telephony-grade infostructures¹² all the way to the desktop and also in providing intelligence to that optical layer. ([Rich](#), 1999, [Rybczynski](#), 1999 and [Pritchett](#), 1999, October, [McGarvey](#), 1999, October)

“No-Brainer” Gestalt Epiphany of Internet Telephony

Now let's try to cut through all the tele-baloney about consolidating services,¹³ okay? I have found over time that there are usually two foggy-looking clouds shown in most Telephony Design Plans - one for voice systems and one for data systems. Is that really necessary today? The “cloud”¹⁴ is usually the part of the infostructure plan to be “provided by other”. In reality, that “cloud” is usually the part of the telephony infostructure that the engineer doesn't have a complete understanding of, or is too busy to learn about, so a “nebulous” cloud is presented instead of a [cumulus](#) cloud.¹⁵ That cloud can grow into a sizeable storm-front as the various service providers push their services towards the business enterprise. That enterprise can get sucked into long-term contracts for multiple services and can also be convinced that “redundancy” is required to stay “up” in times of difficulty. This is usually more advantageous for the providers than for the businesses they purportedly serve. However, the refreshing scent of newly fallen rain and a small sunbeam begins to peer through those nebulous clouds when “toneheads” and “datapukes”¹⁶ learn to merge and converge telephony services through “IP-ization”.¹⁷ When voice “becomes” data, having those services moving over the same opto-electrical circuits becomes a “no-brainer” gestalt epiphany¹⁸ and a reduced cost economy-of-scale factor can be realized. ([Benson, Woody](#), 1999, [Green](#), 1997, [Pritchett](#), 1998, [Pritchett](#), 1998, September, and [Vizard](#), 1999) See **Figure 1** for a conceptual drawing of what is being done today. The next steps will be to do a component “mind-meld” and continue the one-box-does-it-all “holy grail” as has been done within the integrated circuit industry over the years. I've been involved in "reorgs" where voice and data personnel were merged. In one instance, the process consumed 3 years of effort to complete the transition (and then promptly reversed itself to provide job security for the “survivors”), but as Al Etterman, Director of IT for *Cisco Systems* more or less said, “**the relationship of the future** is that the Telecom, LAN and WAN guys sit next to each other.” ([Terdoslavich](#), 1999, sidebar, Departments, Profiles in Purchasing) Perhaps Telephony Markup Languages can somehow help bring all of the telephony disciplines together into a seamless whole. We shouldn't be all that far away from a commodity communicator device as imagined in *Earth: Final Conflict*.

I attended the Computer & Business Technology Expo²⁴ in Spokane, WA and had the opportunity to spend some time perusing the *Cisco/Selsius* IP Telephony²⁵ solution at the *SJI*²⁶ booth. It seems to be a more robust solution than the SpheriCall product offered by *FORE Systems* presented in an on-line seminar the week previous and sponsored by NWFusion.com.²⁷ The latest computer telephony business-compliant buzzwords have been “instant messaging” (IM) and “unified messaging” (UM), however, *Cisco* is taking it further with all the mergers it’s obtained recently, with “unified communications”(UC, which is noted in **Figure 8**). ([Terdoslavich](#), 1999, sidebar, Departments, Profiles in Purchasing)

Interfacing Conundrums²⁸

Do we really want to perpetuate unintuitive functionality or can we work smarter and provide humanity some [sanity](#) when it comes to computer telephony? There are hard-won “rules” for doing things “right” when it comes to human-computer interface design. We work in a “virtual” world, when it comes to computing today. Perhaps we need to “forget” how things are done in the physical plane? Can we take the blinders off and let our minds expand to fill the universe? David Every has posted links from his article on Interfacing that addresses “correct” human interface studies and more or less said that it is important to use tools tailored for the task, but remember that programmers do their work once, while users are saddled with the results forever. ([Every](#), 1999) It would not be a good thing if we saddled them with a pack mule instead of a thoroughbred. We’ve been conditioned to accept mediocrity, at least in the WinTel world, but it is time we stopped accepting and stopped tolerating more kluges²⁹ or shims³⁰ from the industry. The challenge is to provide product that works “right” for the customer.

Have we established “lessons learned” from past technological misconfigurations? The telephone handset used today is almost as bad a human interface device as the [QWERTY keyboard](#).³¹ For just a couple of many such “phoney” examples;

- 1) The phoneset doesn’t have a backspace function, so if the numbers aren’t dialed or push-buttoned correctly, you have to hang up and try again.
- 2) The reason why the touchtone keypad is “upside down” from a calculator keyboard is because the phonesets had to compensate for the Bell Central Offices early touchtone systems’ inability to “keep up” with how fast numbers were inputted. Carlton Carden, president of *EASE CT Solutions*, declares that “nobody can ‘touch-type’ a conventional telephone tone pad”. ([Carden](#), 1997)

Another example of how not to do things in the computing world can be found at the [Internet Hall of Shame](#)³² with the *QuickTime* interface [the concept is good, the interface just violates good design parameters]. Other examples of poor human interface design can also be found on-line.³³ Will we learn to design better systems by looking seriously at past mistakes?

“Right” Directions

An example of a product that *does* seem to be going in the right direction is the [Palm Pilot](#)³⁴ series and act-a-likes like the Visor from *Handspring*.³⁵ Those nifty little devices make telephony exciting and do applications the original designer never dreamed of accomplishing ([Pritchett](#), 1999, September) such as Digital Voice Recorders. ([Kim](#), 1999) However, *QualComm* may have gone one better with their *pdQ Phone*, which integrates nicely with the Palm Pilot technology.³⁶

Another product that seems to be going in the right direction is the *iMac DV* [Digital Video] unit, which comes with *iMovie* software, but you have to add your own video equipment, etc. When it is combined with speech technology in the OS 9 operating system software and beyond, this will be one excellent tool. Maybe *Apple* will eventually include the *Jabra*³⁷ earpiece for combining both the mic for both listening and speaking and use something like *BingSoftware*³⁸ for the telephony interface. We should be expecting better than this by now in the *Apple* environment. ([Zien](#), 1999) Hopefully they will continue to break new ground and tradition by offering new systems that work right.

In the Web world, there are conferencing services surfacing such as the [InternetPartyLine](#)³⁹ that allow calls to originate from the Internet. There is also a [Talksites Directory](#)⁴⁰ that has links and lists for Internet communications portals and telecom-enabled websites. Most applications are free and are active drivers in helping to get the long-distance providers to finally drop their passive pricing⁴¹ to new lows. (Beringer, 1999) And if free doesn't work in your corporate world, then there are a number of web conferencing packages for sale or that come with web browsers. ([Berst](#), 1999, October)

Standards? What Standards!?!?

Barb Goldworm, a Director at *Enterprise Management Associates*, wrote, “Because standards help developers build products that run across different platforms from different vendors, they help level the playing field. This is great for small developers and for users. For major players, however, a level playing field goes against their competitive advantage. Standards, therefore, become a love/hate passive/aggressive arena. Everyone says they'll implement the standards. But definitions are painfully slow and actual implementations by major vendors are even slower. Given all of that, what happens when standards arise, which overlap or compete? Emotions escalate further and you have a holy war...” ([Goldworm](#), 1999) A love/hate, passive/aggressive holy war among the ever popular standards committees? Say it isn't so! [I have not experienced such shenanigans in said committees, but he only has attended one so far...]

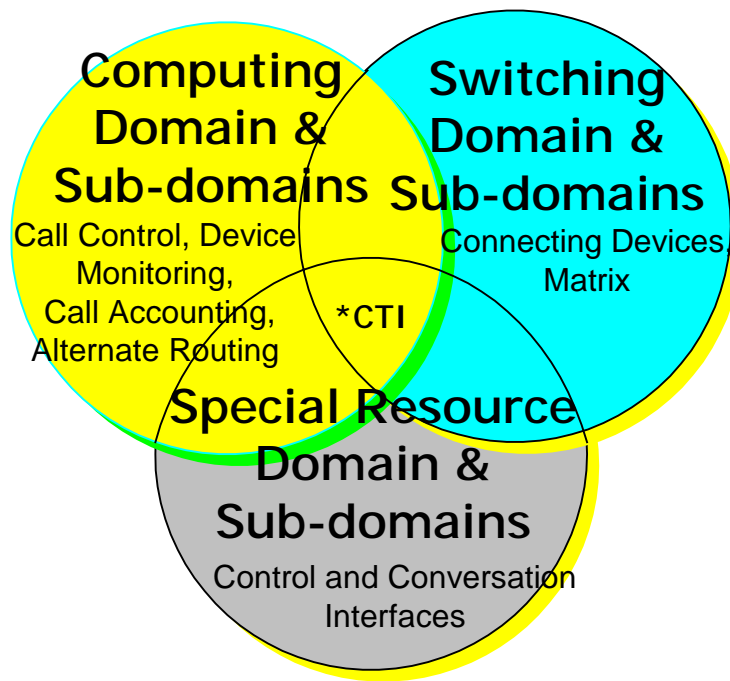
Jesse Berst, *AnchorDesk* Editorial Director, wrote that, “There are *currently* **no standards** for **voice interaction** on the Web. Interoperability remains a challenge as both *Cisco* and *Lucent* have released competing network data convergence technologies for enterprises.” ([Berst](#), 1999, September) *Au contraire, mon ami*. Perhaps part of the problem is that there appears to be *way too many* proposed

and ratified standards, protocols and specifications and the focus just isn't there for us to grasp the vision of what is going on in the computer telephony world? *ComputerTelephony* keeps an eye on the telephony-over-the-Net standards.⁴² [Kevin Cloud](#) is the Director of IP Research at *Gecko Research and Publishing* and manages an excellent website named "iptelephony.org".⁴³ It acts as a "Grand Central Station" where one can get a better flavor of those standards for the computer telephony industry. It has links to Internet telephony vendors, service providers and technology, and the tutorial links in the technology section are very value-added. The Protocol tables related to developing telephony standards and the ITU (International Telecommunications Union) G, H, Q and T series⁴⁴ are not only up-to-date, but each acronym is linked, as well.⁴⁵ This is very helpful inasmuch as the Standards Committee hosting systems like to get paid for the privilege of letting us know what the official/approved standards are.

The *European Computer Manufacturers Association* (ECMA) created the Computer Supported Telephony Application (CSTA) standard back in 1992, which is now (1999) in Phase IV, addressing such issues as VoIP (see "Voice Over" below) and Application Programming Interfaces. Prior work has been on the CSTA model and Protocol Data Units (PDAs). [Don't confuse *this* CSTA with the *Computer Science Teachers Association*⁴⁶ or a bunch of other CSTAs.] **Figure 2** shows the interrelationships of the Computer Telephony Interface functions, C.100, H.100, S.100 specifications⁴⁷ and the different Application Programming Interfaces with what the ECMA calls the CSTA model. Flow diagrams of how the "new and improved" model works can be found at <http://www.ecma.ch/topics/tg11voip/TG11VoIP.htm>. It summarizes the concept/proposal of merging CSTA and the H.323 environments through a "CSTA System Marshal" and "CSTA Deputies" process working with the H.323 terminals and gatekeeping architecture.

The Computing Domain handles Servers, PBX and systems like Signaling System 7. The Switching Domain handles bus architectures and other hardware interfaces. The Special Resource Domain handles Inside and Outside Plant cabling interfaces. These would appear to revolve around the Computer Telephony Integration applications also known as Computer Telephony Interfaces or CTI. With the Switching Domain section, there probably have been some jokes made about a "domainatrix". Maybe there will be Internet police after all!

How can we get through this standardization topic without including the on-going efforts of the Internet Engineering Task Force (IETF)? Henry Schulzrinne of Columbia University and Jonathan Rosenberg of Bell-Labs-Lucent Technologies have been working diligently on Internet Telephony Architectures & Technologies, especially the Gateway Location Protocol (GLP) and have posted tutorials on-line under the IETF. ([Rosenberg & Schulzrinne](#), 1999)



*** Computer Telephony Interfaces:**

Java Telephony Application Interface (JTAPI)
 MacIntosh Telephony Application (MTA)
 Novell Telephony Services Application Telephony Interface (TSAPI)
 Windows Telephony Application Programming Interface (TAPI)
 Call Processing Specification (C.100)
 Hardware Service Provider Interface Specification(H.100)
 Software Application Interface (S.100)

Figure 2 The CSTA Model

“Voice Over” Standards

It would appear that the telephony industry is enamored with “Voice Over” technology. Those standards would be: Voice over ATM, Voice over Ethernet, Voice over Frame Relay and Voice over IP. These are covered nicely in a tutorial at Web ProForums under *Voice Over Packet Tutorial*.⁴⁸ Many of the Voice over IP (VoIP) references can be found on-line.⁴⁹ VoIP should be considered as just another way of transporting voice traffic over non-telephony networks and apparently is a *de facto* standard in the computer telephony industry. (Black, 1999, [Harbison](#), 1999) A chart showing when each of these technologies are to be deployed up through the year 2004 and a Voice over Packet

Comparison Chart between Voice over ATM, Frame Relay and IP (balancing cost, efficiency, reach, reliability, management and security) is located at <http://img.cmpnet.com/nc/1021/graphics/fl.pdf>. (Willis, 1999) Thomas McNamara writes that VoIP needs to be planned into building projects within the next 10 years and especially to keep an eye on technology over the next year to plan properly, voicing his opinion that VoIP is *coming*. It is here *now* and has been for a while. It just is working better than it used to (wink,wink). (McNamara, 1999)

Ellen Muraskin, constant contributor to *Computer Telephony*, can best sum up the always acronym-happy telephony industry now bent on VoIP standards. She wrote, “Welcome to acronym heaven, the alphabet-soup world of IP telephony interoperability standards. You’ll spend the first 2 days just separating the rival protocols – H.323, SGCP, H.GCP, MGCP, SIP, IPDC, to name the majors – from the standards bodies promoting them – IETF, IMTC, ITU-T, (ETSI) Tiphon.⁵⁰ You’ll spend the next few weeks figuring out where major telcos and platform providers have placed their opening bets. And then you’ll watch it change.” Boy, is she ever right! And maybe that is where a taxonomy will come in handy, if it can be kept fluid enough to keep up with this constantly morphing industry that has the goal of having ubiquitous interoperability among those proposed standards. (Muraskin, 1999)

One wonders sometimes that the “standards issue” could possibly be that there seems to be just about as many “standards” as there are players in the computer industry fields. However, I have learned from a Computer Telephony Engineering course⁵¹ that standards are established by industry cartels for the express purpose of creating markets. It doesn’t help when some of those players declare that their particular brand of application is *the* standard, especially when it really is a proprietary one that has to be licensed in order to be legally used. By all means, if the industries in question are paying attention to this paper, keep those home-grown [babies](#) open, so the rest of the [universe](#) can use them!

Speech! Speech! Or is it all “Just Talk”?

Text-to-Speech (TTS)⁵² can be considered a base-line “mature” technology. It’s been around the block for a while, but it is critical to maturing the telephony aspects of computing. Think of it as a simplex-mode voice application. Then there is Speech-to-Text (STT),⁵³ which is another baseline “maturing” technology. Critical to Speech Recognition (SR)⁵⁴ two-way communications, this technology is another simplex-mode application. Speech Recognition applications can be considered as more “maturing” technology. This technology has its base in the two simplex-mode applications mentioned above, and could be considered as a duplex-mode application. Maybe, just maybe, seamless Speech Recognition (SR) and **53x24x7**⁵⁵ telephone system reliability will be the “killer applications” that will push enterprises over the edge to using IP Telephony!

Victor Zue wrote in the *Scientific American* that, “...the first generation of speech-based interfaces is beginning to emerge, including high-performance systems that can recognize tens of thousands of words. In fact, you can now go to various computer stores and buy speech-recognition

software for dictation. Products are offered by [IBM](#), [Dragon Systems](#), [Lernout & Hauspie](#), and other systems can accept extemporaneously generated speech over the telephone. [AT&T Bell Labs](#) pioneered the use of speech-recognition systems for telephone transactions, and now companies such as [Nuance](#), [Philips](#) and [SpeechWorks](#) have also entered the field. The current technology is employed in virtual-assistant services, such as [General Magic's Portico](#) service, which allows users to request news and stock quotes and even listen to e-mail over the telephone..." (Zue, 1999) (Okay, now we're talkin' "killer apps"!)

“PC” – Or NOT

Charles Lindquist wrote that as far as the PC world is concerned, the users shouldn't give up their keyboards just yet. Even though "last year, voice recognition software broke records...people think, "Hey, it's Star Trek time", and that's absolutely not the case...It's not that the technology fails to work--*it does work*. People must be willing to put in a significant amount of effort into training and getting used to dictation mode." (Lindquist, 1999) But by now you should know that the PC World⁵⁶ has been conditioned to the "no pain, no gain" scenario.

And while the PC World may [not be ready](#), Charles Moore reports that the MacIntosh World⁵⁷ has been on the computer generated speech forefront for years. And nearly 60 Million Mac users are eagerly awaiting further developments from [IBM](#), [Dragon Systems](#), and [MacSpeech](#) based on recent announcements. For example, "*MacSpeech* has been working on continuous speech dictation software for the Mac for longer than any other company, and was the only dictation developer that stuck with the Mac platform during the dark days when Apple's future was in doubt. MacSpeech's engineering team has been working in the field of speech recognition since 1993, and developed *Articulate Systems' PowerSecretary* (now being sold by Britain's *OneStop* as *Voice Power Pro* and *Voice Navigator* products)." (Moore, 1999) The MacIntosh computer that Scotty the Warp Engine Engineer spoke to on *Star Trek IV*⁵⁸ would have been quite capable of responding to him, even when he was speaking into the mouse. The Lisa⁵⁹ had that capability back in 1983. Even the Mac OS continues to improve on speech technology applications, the latest release being in OS 9.⁶⁰

However, Jennifer Sullivan, wrote in *Voice Recognition is a 'Dragon'*, that Speech Recognition (SR) software just isn't all that much better than the Newton⁶¹ (an *Apple* product) handwriting software was a few years ago. [Sullivan](#), 1999)

Just how close are we to an IP Telephony "killer app"? Russ Wilcox has posted an impressive current list of Commercial Speech Recognition resources,⁶² while Dave Raggett has been chairing the W3C Voice Browser Workshop covering Internet voice browser applications developments for a while.⁶³ Coming from the other direction, Laura Guevin discussed surfing the web using the phone through audio prompts by way of VoiceXML (or earlier known as VXML).⁶⁴ ([Guevin](#), 1999, [Smith](#), 1999) Marc Robins has tried to take the "voice over" concept further. He said, "What if a link could be standardized to enable voice browsers to make live, Internet telephony calls right from the VXML

page? Sort of a “Hypercall Link”, in which the browser would simply ask, “Would you like to speak to a live representative?” and then transparently connect the phone surfer to a call center or some other location? Such a feature could certainly help Internet Telephony and e-commerce measure up to all the rosy predictions.” ([Robins](#), 1999) Paul Festa wrote that a couple of those rosy predictions would be that “conversational access could broaden Web access from automobiles and telephones and facilitate Web access for the visually impaired” using SpeechML.⁶⁵ ([Festa](#), 1999) Meanwhile, the telco industry as a whole is in the process of morphing cellphone technologies into computing devices according to reports from “Telco ‘99”. ([D’Amico & Ferranti](#), 1999) And it seems that everyone in the telephony industry is now into making Ethernet Phones.⁶⁶

Now Let’s See...

If voice applications don’t push the enterprises into IP Telephony environments, how about videostreaming applications? This is where we get deeper into protocols and more markup languages. Jonathan Angel said that, “TCP’s services aren’t useful in the case of video... For that reason, most video servers jettison HTTP⁶⁷ and TCP,⁶⁸ instead using User Datagram Protocol (UDP) as their base protocol for streaming data packets. Designed to be “fast and dangerous”, UDP doesn’t guarantee packet delivery; it just provides a stream of packets as quickly as it can. This is what puts the ‘streaming’ in streaming video.” He also elaborates on Real-Time Streaming Protocol (RTSP)⁶⁹ Real-Time Transfer Protocol (RTP)⁷⁰ and Real-Time Control Protocol (RTCP)⁷¹ as being necessary for happy streaming. We also learn that RealNetworks pioneered the use of Synchronized Multimedia Integration Language (SMIL).⁷² ([Angel](#), 1999) Figure that audio feeds go with the video and we’re almost into the [George Jetson](#)-like environment!⁷³

What Pipe is the “Bandwidth Bugger” Smokin’?

The “bandwidth bugger” raises it’s ugly head and compression scenarios come into play when the [naysayers](#) line up to take potshots at “doing video” over the ‘Net. Such words as “overload” are sneeringly used. We also hear that IP now goes to every desktop, but is not yet media friendly. (Waring, 1999) Jeffrey Fritz strongly suggests that network architects plan now for keeping video off the backbone, multicasting instead of unicasting, using fewer routers, and installing more Quality of Service⁷⁴ topologies and devices now instead of later. ([Fritz](#), 1999) This kind of activity just justifies the reasons for fattening up the bandwidth pipes around the world. Videoconferencing protocols are still considered to be at the diaper-stage and has quite a ways to go to reach puberty. ([Landry](#), 1999) Meanwhile, Nels Johnson reports that an approach has been taken to address the issue of peaks and valleys and bandwidth utilization by *Burstware*. “Burstware leverages two recent market conditions - faster than real-time video delivery, and widespread affordable storage...Burstware takes advantage of all the unused network bandwidth it can find to get video streams to user’s machines, then stores as much of the stream as possible to those machines for reliable, high-quality playback. Burstware’s primary advantage is that *it manages the flow of video and audio on networks*, which is what other

products and technologies tend to ignore.”⁷⁵ ([Johnson](#), 1999) I was told that they are working on MacIntosh and Linux versions and they don’t do real-time conferencing applications – yet.

On Developing a Telephony Markup Language Taxonomy

Dr. Setrag Khoshafian, Senior VP of Technology Deployment International, said in August, 1999, “As you know, [TML](#) [Telephony Markup Language]⁷⁶ is very new -- and basically just about to start. We are trying to elucidate and identify its focus. Now one possible - and very good - MSc Thesis will be the taxonomy of these alternatives. What is each trying to achieve, what is common, and what are the differences? Then you can make some remarks and provide some conclusions. One potential thesis could be generation of XML schemata⁷⁷ (DTDs⁷⁸ for the time being) that support the same semantics⁷⁹ in terms of functionality, structures, and interface as JTAPI⁸⁰... For instance, [VoXML](#)⁸¹ is for voice interaction and has support for lists and voice feedback for choices. What do other standards provide? What are different conceptual – ‘semantic’ features of each?” ([Khoshafian](#), 1999) Things move so rapidly in this industry that since this email was sent, VoXML has been absorbed into Voice XML already. Other telephony markup languages and specifications keep appearing, which makes this effort rather challenging. It may be a while before the telephony dust settles and the muddy telephony streams become clear again. And just like the insecticide DDT (C₁₄H₉Cl₅), DTDs are rapidly becoming a thing of the past because of their limitations. ([Angel](#), October 1999 and [Richardson](#), 1999) We must point out that even though XML schemata are designed to replace DTDs, those items will last as long as HTML will in light of XHTML, just like radio has survived the onslaught of TV and personal computing. Empirical evidence of human nature suggests that we reach plateaus where we use resources we’ve learned and struggle mightily against moving out of our ‘comfort zones’. There probably are some Darwinian survivalist undercurrents in there someplace.

Okay, What is a “Taxonomy”?

Well, it’s not intended to be a tax-ona-me or a tax-ona-you, but it coulda-be! However, don’t confuse it with the word, “taxidermy”. Taxidermy is the art of preparing, preserving and mounting skins of animals to make them look “natural” or life-like in appearance. The Merriam-Webster Online Dictionary defines taxonomy as being derived from the French language in 1828, as an orderly classification according to presumed natural relationships, while the word “classification”, from 1790, means a *systematic arrangement in groups or categories* according to established criteria.⁸² The Institute of Electrical and Electronics Engineers, Inc. defines it as, “A scheme that partitions a body of knowledge and defines the relationships among the pieces. It is used for classifying and understanding the body of knowledge” (IEEE Standard 1002). And finally, an evolutionary scientist, Stephen Jay Gould writes that taxonomy is “the most *under-appreciated of all sciences*...the keystone of historical disciplines... Taxonomy, or the *naming of categories*, is a chore even when users speak the same language, since different people use different terminology to describe work practices.” ([Cone](#), 1999) So maybe we can define taxonomy as naming, categorizing and classifying “natural relationships” in such

a way that they appear to take on a life of their own without being mounted on a virtual-reality wall.

Ralph Mackey, a Business/Data Analyst working for Redwolf Business Systems in Australia, mentioned that there are possible disadvantages and advantages to creating a taxonomy. This was posted on-line “once-upon-a-time” in reference to a different context, and is somewhat modified below, but it applies here:

Possible disadvantages of using a taxonomy?

1. It is a lot slower and takes some of the ‘fun’ out of reading this genre of material. [You were expecting this, right?]
2. The discipline to effectively use a taxonomy would be out of the reach of most people who otherwise would be interested in this subject. [Because you are reading this so far, it is within *your* reach, however.]
3. Because of the clarity provided by modeling the taxonomy, some people might get excited and confuse an interpretation with a doctrinal fact. [Luckily, there are no “doctrinal” facts in the World Wide Web Consortium – yet.]
4. The danger of a proliferation of taxonomies with all the inherent perils and the of lack of standards. We might end up in a bigger confusion than we started with. [Perhaps we can focus on what needs to be achieved with on-line telephony applications?]

However, his impressive list of advantages outweighs the disadvantages:

Possible advantages of using a taxonomy?

1. Someone has to throw the gauntlet down. Over time I know with certainty that whatever I come up with can be improved by others more capable than I can. I, in turn, can then benefit from their research. [Isn’t that a great definition of collaboration?]
2. It will provide a method of classifying this body of knowledge. A taxonomy is a filter through which an interpretation can be classified. [We can filter out the [chaff](#) and keep the techno-wheat!]
3. It will increase understanding of this body of knowledge. This is because analyzing results after modeling using a taxonomy produces new insights that just are not readily apparent without it. [Okay, quick quiz; What Specifications go with which [Markup Languages](#) that go with what Application Programming Interfaces by whose Commercial Applications following which Protocols?]
4. It will allow different people who use the same taxonomy to have a common dialogue. For example people using the same taxonomy could research in different areas and converge the results of their research.⁸³
5. Interpretations are allowed for and catered for in a controlled manner - allowing comparative analysis. Currently, studies in this area often reflect the interpretations of

the various authors. It is hard to challenge someone's work if you don't know why he/she arrived at a conclusion. People are forced to be more disciplined and state why they believe a certain interpretation is correct. [Probably in a grey "analog-think", but systems are migrating quickly to a black and white "digital-think".]

6. Anyone unfamiliar with chronology development would not know the rationale that went into its development. This puts the developer at an arrogant advantage that says this is the chronology and you have to accept it – 'take my word for it'. Even the developer by not documenting the rationale behind the chronology development is creating extra work for themselves by having to rethink the rationale every time they re-analyse it. [The Computer Telephony Integration industry is above "arrogance", correct? This probably should have been in the "disadvantages list" above.]

7. If the developer explicitly states their research methodology, others can then agree or disagree. If a chronology stands up to scrutiny and offers a plausible explanation it can be then said to have stabilized. [Stability is good!]

8. Built-in and undocumented assumptions are not explicitly seen, and probably forgotten over time. Because they are not documented, some assumptions may manifest as errors to the author with the hindsight of further research or because of the passage of time. Use a taxonomy, and you can gracefully tinker and correct false assumptions without screwing up the viable assumptions as well and thus bringing the whole house of cards down with it. [Telephony Markup Languages, Telephony Application Programming Interfaces and Telephony Protocols all need to be playing to the [same drummer](#).]

9. The interpretation is then refined and evolved...

10. It will encourage the creation of models to implement taxonomies. Models bring the research back into the realm of understanding for most people, thus disseminating knowledge and encouraging dialogue on the subject." (Mackey, 1999)

Items 8 through 10 are precisely what are needed in the Computer-Telephony Convergence/Divergence efforts right now. Proprietary solutions make a company a quick buck, but this does a dis-service to the industry as a whole [as in "dissing" the industry]. The telephony interface efforts for web-based applications seems to have been working with blinders on and focusing more on how telcos can take in more money from Internet activities than looking at voice as part of a bigger piece of the pie seen in videoconferencing applications. I am a proponent of Open-Source Applications. He believes those who hold their cards too close to their chests are going to lose the game by not sharing their knowledge with the rest of this fast-paced multi-trillion dollar industry. Consortiums⁸⁴ are a positive trend in the "Open-Source" direction, as long as they "act" open and aren't secret. Alliances, on the other hand, seem to be more ex-clusionary than in-clusionary. Either way, there is a price to be paid to participate.

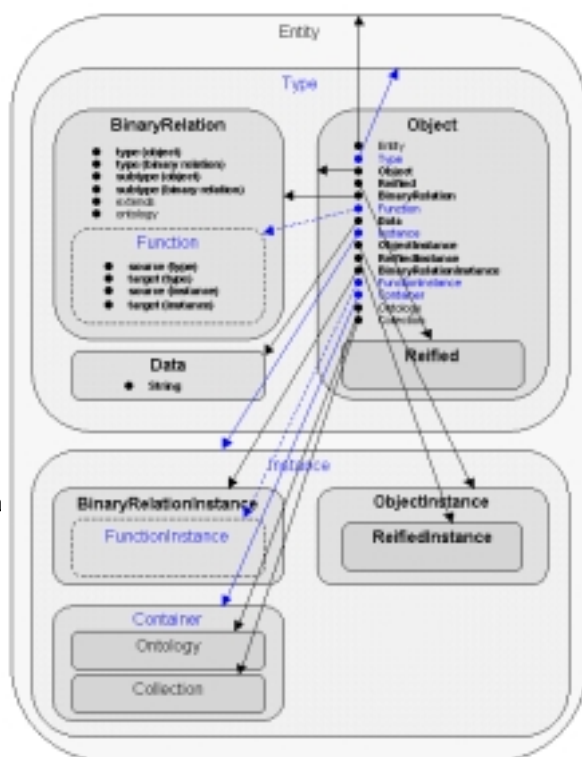
Now, instead of taking the time to labor over the nuts and bolts of "fine-toothing" the telephony markup language trends, we could just buy a copy of [Semio](#) to do the taxonomy

classification job for a measly \$100,000.00 per year or pay \$20,000.00 per month for the privilege, plus maintenance fees, but we won't here. (Gibbs, 1999) Instead, you may now go to **Appendix A** to see a snapshot of what has been accumulated up to this point. If someone wishes to put on the old hip-boots to wade deeper into the topic, they may do so in a PhD thesis, of which this paper obviously is not. For an example of a related one, see Timothy Lethbridge's *Practical Techniques for Organizing and Measuring Knowledge*.⁸⁵ (Lethbridge, 1994) While looking into ontologies, another definition for a taxonomy was discovered, called the Instruction Set Architecture (ISA) Hierarchy.⁸⁶ We're now reaching way down into the depths of "geekdom".

On Donner, On Blitzzen, On-tology!

According to the on-line dictionary definition,⁸⁷ an ontology is simply a systematic account of Existence. Or it has been called "an explicit specification of a conceptualization".⁸⁸ The "college answer" in this context is that it is a subcategorization of the knowledge of essential qualities of "things" in a hierarchical structure. Dr. Setrag Khoshafian would like this to go farther with a presentation somehow showing a consistent semantic mechanism of the schema elements of telephony markup languages and their relationships with each other. This ontology would cover such mechanisms as to understanding what attribute values, implied relationships and terms mean. (Khoshafian, 1999, October) The *Ontology.org* reports, "that the main purpose of an ontology is to enable communication between computer systems in a way that is independent of the individual system technologies, information architectures and application domain."⁸⁹ Apparently, ontologies are synonymous with, but tunnel deeper than, taxonomies and Dr. Khoshafian is perhaps looking for something more along the lines of *Metadata Interoperability: A Conceptual Knowledge Processing Perspective*,⁹⁰ that in this author's view, tends towards nuts&bolts scholarly tastes and less towards business practicality. Examples of such business practicality using ontologies can be found at <http://wave.eecs.wsu.edu/WAVE/Ontologies/ontologies.html>. The whole purpose of this ontological exercise is to somehow reduce the semantic ambiguity so that interoperability between systems can be achieved. (Do you notice a pattern here?)

The diagram in **Figure 3** is an example of the Ontology Markup Language process and has been



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copied from <http://wave.eecs.wsu.edu/CKRMI/OML-Base-Ontology.html>. Someone once said, “the devil’s in the details”. Can you see where the “Ontology” exists inside the “Entity”? It’s hiding in the “Container” inside “Instance”, inside “Object” in this case. Thankfully, there is a tutorial available on this stuff!⁹¹ There also is an on-line *Ontology Editor* guided tour named “Ontolingua” located at <http://www-ksl-svc.stanford.edu:5915/doc/frame-editor/guided-tour/index.html> from the Knowledge System Laboratories at Stanford University. Oh, yes, and like anything else that has become “techie”, Ontology has it’s own “library”⁹² and glossary of terms.⁹³

Figure 3 “Simple” Ontology Markup Language Objects and Relations

There is also an Ontology Exchange Language (XOL)⁹⁴ that is XML-based instead of based on the language format used by Ontolingua. It is designed to identify and handle schema-metadata and will make programming identification much easier for database classification purposes.

Prepare to be “XML-ated”!

Something that has been “marked up” either means that it has been “red-lined” for corrections, or its perceived value has been augmented because the supply/demand ratio has changed for the better to the seller and less for the buyer, right? [Now for a little interlude to help us “[see the light](#)” as far as what can be done with Telephony Markup Languages.]⁹⁵ It must be a “geek-thing” to get us to believe in double entendre⁹⁶ when voicing opinions about Markup Languages. Let’s assume that they are called **Markup** Languages because corrections need to be made to existing databases, web pages and other esoterica, in a less painless manner than is used today. (It *can’t* be because programmers want to make more money!)

Have you experienced HTML⁹⁷-based email? When it works, it works almost as good as an Internet Browser. When it doesn’t though, it looks awful, and you understand why most folks want it turned off when you correspond over the ‘Net with them. Marc Robins wrote, “HTML was only intended to provide a way to easily publish on the Web”, so it is amazing that HTML-based email even exists! (Robins, 1999) But HTML is “old-hat” technology that “only” does text. However, if you wish to do animated graphics, then Neil Balthaser says, “Flash [[Macromedia Flash](#)] is our best weapon. Drop HTML, pick up *Flash*, and really learn it -- then push it. It offers the most robust authoring environment around, and it’s backed by a single company that is focused on creating great tools.” (Oh, another *proprietary* solution.) (Bathaser, 1999 and Cunningham, 1999) Marc Robins continues, “and it [HTML] hasn’t easily satisfied the needs of special industry vocabularies like mathematics, chemistry or finance.” Maybe SMIL⁹⁸ would be a better solution. It uses XML to handle animation applications, multimedia and streaming media, is modular in design for adding future applications, and it’s “open”. (Brown, 1999)

Adherence to a living “Baroque Banquet of Angle Brackets”

So what works if you don't want to do animated graphics, but do want to do interactive databases? Go to my current website and look at an appetizing approach to the topic in the *Web Reporting* article⁹⁹ or sing praises for and **migrate to XML**.¹⁰⁰ ([Pritchett](#), 1999, March) Along the "XML-ated" borg theme noted above, Liz Levy equates XML to being Web DNA (biological cell coding material) stating that it contains code for living documents. ([Levy](#), 1999) Marc Robins wrote, "The way Web development is heading is to build Web applications in a platform independent language (i.e. Java) that can utilize Web protocols without resorting to a browser... XML is a markup language meant to define data in a readable format without presentation constraints.... XML ensures that anyone can read it, as long as they have a valid XML parser¹⁰¹ ([Robins](#), 1999) Justin Benson stated that, "what has been missing up to today has been a **"glue" or universal interchange format** for all of this data. I have seen statistics that state that 40 percent of development resources are currently spent upon extracting, redefining, and updating data. That "glue" is XML. ... It differs [from HTML] in that it is extensible (the "X" in XML). That means that new tags and attribute names can be created and included with a document... XML tags provide *context for content*." ([Benson, Justin](#), 1999) However, Dana Gardner wrote, "With its newest role of middleware patch, Extensible Markup Language (XML) is emerging as a kind of industrial-strength duct tape to fix cracks and fissures throughout an enterprise's application foundation." ([Gardner](#), 1999) Now, can that be improved upon? Yes, it can. According to Judith Davis, "XML can also facilitate data integration in a federated environment by defining a *lingua franca* for exchanging data among heterogeneous DBMSs.¹⁰² With its focus on content, XML paves the way for effective electronic data exchange, Internet publishing, and e-business applications." ([Davis](#), 1999) XML also beats Electronic Data Interchange (EDI) in ease-of-use and flexibility. ([Radding](#), 1999) So now we know XML can be viewed as a sticky living kind of universal interchange industry standard.

In response to the plethora of XML subgroupings, Robert Richardson wrote," The basics of XML are simple, but real word uses gather together style transformations, data-typing specifications, and hierarchical schemata so energetically that they risk rendering XML a baroque banquet of angle brackets." ([Richardson](#), 1999) Alan Richmond has some excellent information and tutorials on the forward migration from HTML and XML to XHTML.¹⁰³ Todd Sunsted has also posted a series of articles on how XML and Java can work together in harmony. ([Sunsted](#), 1999) Probably the neatest thing about XML variants is that as Allan Wyke said, "You develop a schema that defines your data, then you develop a skin (in XSL¹⁰⁴ or CSS¹⁰⁵) that defines your look. Done. Suddenly all of your content is in an easily-validated XML document that references your schema, with a skin for the design. Need to redesign your website? Just change the skin." ([Wyke](#), 1999) (Sounds almost snake-like, doesn't it?) John Makulowich reported that the W3C has a download utility for moving HTML documents into XHTML called *Tidy*.¹⁰⁶ ([Makulowich](#), 1999) That should help eliminate concerns about the "cost" of "upgrading" to HTML 4.01 (which now *is* XHTML!). Also, XML works just fine in Linux and MacIntosh environments. ([Ogbuji](#), 1999 and [Media Design in*Progress](#)) For links to browser compatibility charts for XML and other enhancements such as Rich Site Summary (RSS) the up-to-date information can be found at <http://www.webreview.com>. ([Story](#), 1999) Next, we will see how the compatibility issue between schemas is being addressed.

E-volving “Click&Mortar” XML-based E-Commerce

There are several “click-and-mortar”, e-volving e-commerce self-proclaimed “standards” bodies in motion that will possibly have a greater influence on telephony markup languages, including:

Biztalk (<http://www.biztalk.org/BizTalk/default.asp>),
CommerceNet (<http://www.commercenet.com>),
Open Applications Group (<http://www.openapplications.org>)
OBI (<http://www.openbuy.org>),
RosettaNet (<http://www.rosettanet.org/>),
XML/EDI Group (<http://www.geocities.com/WallStreet/Floor/5815/>), and
XML.ORG (<http://www.xml.org>).

But those guys are more interested in XML-based e-business¹⁰⁷ application DTDs and XML-schematas. Perhaps we can categorize them as XML-schemata banks, while the XML Schema Working Group¹⁰⁸ (now in Phase 3) calls them “repositories”.¹⁰⁹ ([Angel](#), 1999, October, [Shankar](#), 1999 and [Wonnacott & Talley](#), 1999) XML.org keeps a current listing of all the different organizations producing industry-specific specifications.¹¹⁰ According to a whitepaper by the *XML/EDI Group*¹¹¹ there are **over 50** such standards bodies attempting to cut short the ever-exploding overload of conflicting sets of XML semantics knowledge.¹¹²

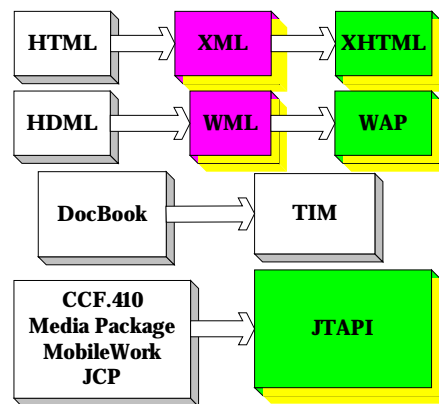
One such “standards” group, *BizTalk*,¹¹³ is acting as a repository for XML schemas that are usable only in a single application. Don Kiely reported, “so while XML provides the structure, *BizTalk* provides the dialects and dictionaries to make sense of the content. It also serves as a framework for consistent XML schemas, and as a means for registering such schemas for wide use...So a major feature of *BizTalk*, and ultimately the most important one, is the repository implemented at <http://www.biztalk.org/BizTalk/default.asp> and scheduled to go live this Fall [1999]. The repository will let developers submit schema to an automated validation process, which posts it as either a public or private schema. Anyone can then go to the site and search for public schemas by author, company, product industry, process and document type.” ([Kiely](#), 1999) *IBM* is calling into question Microsoft’s “openness” of *BizTalk*, since all schemas added to *Biztalk* become the intellectual property of *Microsoft*. So we will be delighted with the throes of scheming schema skirmishes, which only adds some fire to the smoke being generated to life beyond DTDs. ([Lattig & Vizard](#), 1999) Maybe we can all just wash our mouths out with SOAP (Simple Object Access Protocol).¹¹⁴

Gimme some “TML” Skin!

Richard Grigonis wrote, “It suddenly occurred to us that what the world needs is an XML vocabulary for a *Telephony Markup Language* (TML) to handle telephony and unified messaging. Such a standard would let messaging system makers present a single front-end interface that could

drive standard non-XML browsers, but also (via XML tagging) inform XML-aware client apps or netlinked wired or wireless devices.” ([Grigonis & Jainshigg](#), 1999) Well, apparently there *are* a number of telephony related markup languages listed at Robin Cover’s SGML/XML website at *The Organization for the Advancement of Structured Information Standards*¹¹⁵ which continues to grow. See **Figures 4, 5 and 6** for an idea of how Telephony Markup Languages fit into the XML scheme of things. **Appendix A** provides what the acronyms mean as well as a textual history for each Markup Language represented in the next 3 figures.

Figure 4 Who Went Where?



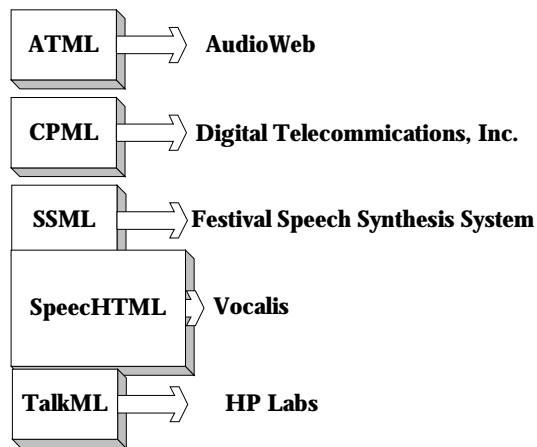
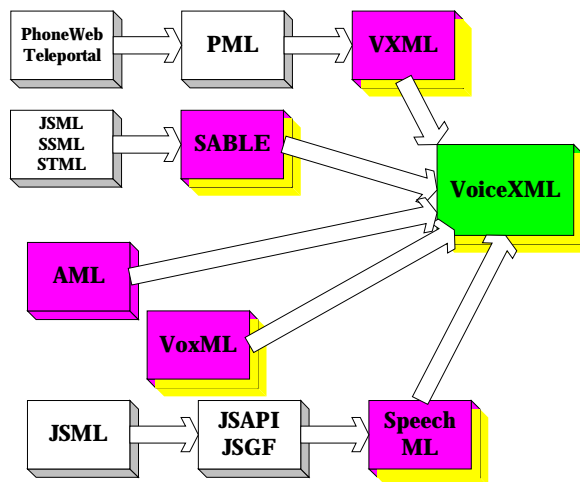


Figure 5 Proprietary Telephony Markup Languages

Figure 5 represents those Mark Languages that have been integrated into proprietary telephony applications and solutions thus far.

Figure 6 VoiceXML Migration



In **Figure 6** we see the transition towards VoiceXML from PML that evolved from PhoneWeb and Teleportal. SABLE evolved from JSML, SSML and STML and has been incorporated into VoiceXML as well. Motorola has also allowed VoxML to merge into VoiceXML, so we see a mixture of morphing and converging taking place as VoiceXML becomes the “favorite” for telephony markup languages.

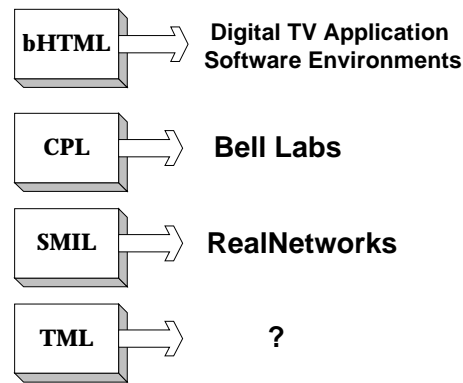


Figure 7 Other Related Languages

Other related Languages are also represented in **Figure 7**. bHTML has to do with Broadband services. Bell Labs may do eventually do something with CPL, but the product's purpose is to describe and control Internet Telephony services using the Session Initiation Protocol (SIP) and H.323 on either user agent or network servers.¹¹⁶ SMIL is being used by RealNetworks.¹¹⁷ ([Sims & Story](#), 1999) And TML, as it currently stands, may fall by the wayside, since so many companies have recently jumped onto the VoiceXML bandwagon.

Along with these language efforts, the Distributed Management Task Force has been busy working on the Web Based Enterprise Management model that uses both XML and the Common Information Model (CIM) as an *Esperanto*¹¹⁸ for linking disparate telecommunications networks together.¹¹⁹ ([Korzenioski](#), 1999)

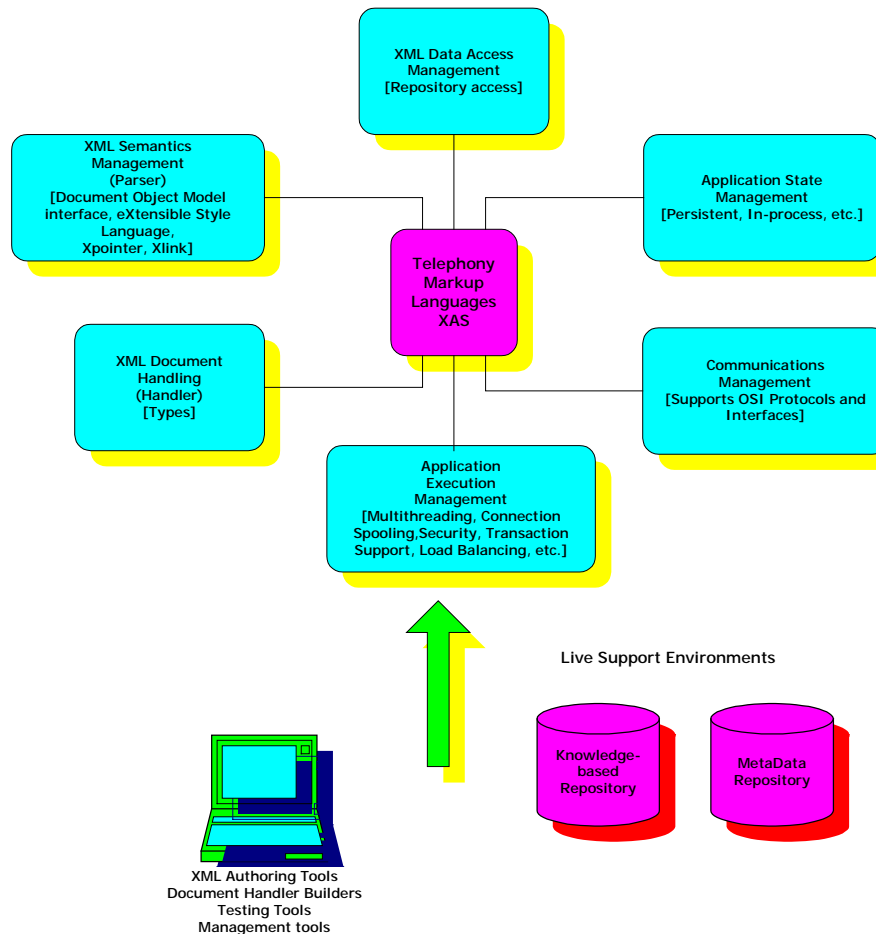


Figure 8 Telephony Markup Languages using an XML Application Server

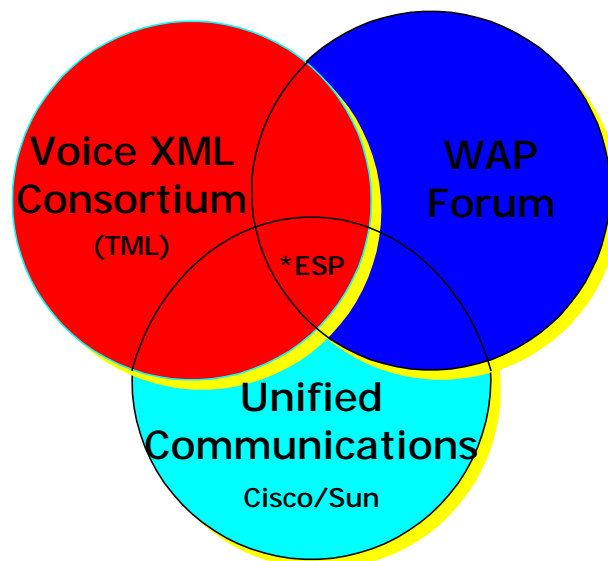
Is XAS Enough for Now?

Perhaps the maturity of a particular technology is made apparent when it is treated as “mainstream”. If you look at **Figure 7**, you will see a TML XML Application Server in the center portion of the diagram with the not-so-obvious acronym of “XAS”. This software technology combines the strengths inherent in database access, “middleware”¹²⁰ and XML concepts into unified web applications. This is causing a sea-change shift to multi-tiered network architectures effecting both front and back-end interfaces to enterprise systems. Mark Davydov, Ph. D., specialist in advanced system architectures and data management solutions, wrote, “XML application servers tie different networked software components together to provide information from multiple sources to a set of client-side, Web-based application components, perhaps even running on different devices (desktops, PDAs,¹²¹ and all kinds of consumer electronics devices). Basically, XAS is a tightly coupled conglomeration of several distributed and client/server software systems. Clearly, these networked

components must be tightly integrated with each other as well as with different Internet-based data sources, which is another reason middleware and XML are a powerful combination for the next generation of Web-based systems.” This is possible through a fusion of document handling and various management services from outfits like [BEA Systems](#), [Bluestone Software](#), [IBM](#), [Microsoft](#), [ReachCast](#), [Sequoia Software](#), [TSI](#) and [WebMethods](#). (Davydov, 1999)

The “Other” ESP

Possibly more startling than XAS is the bombshell lobbed by Richard C. Graves, CEO of Digital Telecommunications, Inc (DTI). He is using a Call Policy Markup Language (CPML) in an Extensible Service Policy Architecture (ESP) that provides a common structure to implement and scale applications over *any* transmission or switching media. ESP uses switching elements, agents, portals and logic to interface with telco switch and IP databases. **Figure 8** illustrates how the Extensible Service Policy Architecture might work in an environment where VoiceXML (feeding-frenzy *du jour*) and other TMLs listed in **Figures 4, 5, and 6**, Wireless Application Protocols¹²² (another telco feeding-frenzy) and the proposed Unified Communications (UC) by Cisco and Sun are brought together. ([Graves](#), 1999)



*ESP= Extensible Service Policy Architecture

Figure 9 “Universal” Communications

Conclusion (xML-ated WAP-up)

Robin Cover has done a fantastic job posting and keeping the SGML/XML website up-to-date. That site keeps tabs on all things related to XML, including links to Drafts, DTDs, Specifications and Schemas. ([Cover](#), 1998) Also, after organizing an **xML Telephony Family Taxonomy**,¹²³ located in **Appendix A**, the “winners” in the race for mindshare at the moment in the Telephony Markup Language Department, appears so far to be:

- 1) VoiceXML (formerly VXML) for “landlubbers” and
- 2) The Wireless Application Protocol Forum (WAP) for those who wish to communicate via airwaves.

The [proprietary approaches](#) are going to have a rough time of it competing with the Alliance, Cartel, Forum and Consortium forces. With the way things have been changing so quickly in the last few *months* (not years!) in this field, expect to see a few more exciting converging efforts. Unless some earth-shattering additions can be made for justifying efforts for a separate “TML”, the present combinations of Java-based functionality and the VoiceXML and WAP activities may be the ticket for moving towards the transition into IP Telephony and beyond. Even so, both those technologies may end up being modules in the Extensible Service Policy Architecture or superseded by *Cisco*’s Unified Communications strategy. The W3C will also have to continue to ratify the processes for Telephony Markup Languages in order for them to be considered “standardized” so that Enterprise Infostructures can feel comfortable moving in that direction.

Not too many years ago [1994] Roy Ascott coined the term “cyberception”, allowing us the conceptual/perceptual freedom to access the holomatic media of the cybernet. ([Ascott](#), 1994) If we were supposedly in or at any interface, then we were in the virtual presence of all other interfaces throughout the known networks. Shortly after that the *HotSauce* Meta Content Framework (MCF) *Fly Through* browser¹²⁴ came into being at *Apple*, allowing us to “fly” through the Internet. Today we can visually browse databases either on or off-line with XML-enhanced MCFs in virtual 3D.¹²⁵ Maybe, just maybe we aren’t that far way from the *Earth: Final Conflict* stylistic UC devices after all!

With heaven-sent technological advancements continuing to accelerate as they are today, we can bring the concept of “universal communicators” to reality as envisioned in such sci-fi circles as *Star-Trek* and other programs of that *genre*. We now know that it is quite feasible. Perhaps the TMLs (such as VoiceXML, WAP and others), combined with such technologies as MIT’s Oxygen project, the DMTF’s Web Based Enterprise Management, DTI’s Extensible Service Policy Architecture and even *Cisco*’s UC system will be used by the Computer Telephony industry as catalysts to migrate us toward true Universal Communications in Enterprise, Small Office-Home Office (SOHO) and Public Telephony Networks.

Appendix A: xML Telephony Family Taxonomy

All quotes listed are from the web links shown within the body of each module below. For DTD, Schema or Specification information, click on the web links. Some modules are not “complete” because they have been superseded by other modules, as noted.

Child: Standard Generalized Markup Language (SGML)

Born: 1974

Parent: Charles Goldfarb and then the International Organization for Standardization ISO 8879

Purpose: An on-line system for integrated text processing.

Dictionary: <http://www.bradley.co.uk/DICT.HTM>

More: <http://www.oasis-open.org/cover/sgml-xml.html>

Child: HyperText Markup Language (HTML)

Born: 1990

Current Version 4.0

Parent: World Wide Web Consortium (W3C)

Morphing to XHTML

Purpose: A non-application-specific DTD developed for delivery and presentation of documents over the Web, to be composed using an HTML browser.

More: <http://www.oasis-open.org/cover/sgml-xml.html>

Child: Extensible Markup Language (XML)

Born: 1997

Current Version 1.0

Reborn: 10 February, 1999

Parent: W3C

Purpose: “An extremely simple dialect [or 'subset'] of SGML the goal of which is to enable generic SGML to be served, received, and processed on the Web in the way that is now possible with HTML, for which reason XML has been designed for ease of implementation, and for interoperability with both SGML and HTML.”

DTD: <http://www.w3.org/XML/1998/06/xmlspec-report-v20.htm>

More: <http://www.oasis-open.org/cover/xml.html>

Child: Extensible Hyper Text Markup Language (XHTML)

Born: 22 September 1999

Current Version HTML 4.01

Parent: W3C

Purpose: It provides the basis for a family of document types that will extend and/or subset XHTML, in order to support a wide range of new devices and applications.

DTD: <http://w3c.org/Authoring/Languages/XML/XHTML/dtd.html>

More: <http://w3c.org/Authoring/Languages/XML/XHTML/>

Child: Audio Markup Language

Born: September 1998

Parents: T.V. Raman and David Gries, Cornell University

Licensed Parent: 4Peripherals joined VXML Forum April 1999

More: <http://www.gofourth.com/news/>

Child: AudioText Markup Language (ATML)

Born: August 1997

Parent: Rutgers University

Purpose: “Much as HTML tags direct a Web browser on how to display information on a computer screen and link to other Web pages, ATML commands direct an *audio browser* on how to access, link, and process information from the Web, and read it over the phone.”

Used in AudioWeb

More: <http://audio-app.rutgers.edu/atml/atmlman/>

Child: Broadcast HyperText markup Language (bHTML)

Born: 6 August 1998

Parent: Aninda DasGupta, ATSC T3/S17

Purpose: To be the application programming interface for a Digital Television Application Software Environment (DASE) compliant receiver.

DTD: http://toocan.philabs.research.philips.com/misc/atsc/bhtml/cover.html#s3_0

More: <http://toocan.philabs.research.philips.com/misc/atsc/bhtml/cover.html>

Child: Common Information Model (CIM)

Born: 9 April 1997

Current Version 2.2

Parent: Distributed Management Task Force, Inc.

Purpose: It's an approach to the management of systems and networks that applies the basic structuring and conceptualization techniques of the object-oriented paradigm that supports the cooperative development of an object-oriented schema across multiple organizations.

Specifications: <http://www.dmtf.org/spec/cims.html>

More: <http://www.dmtf.org/index.html>

http://www.dmtf.org/spec/cim_tutorial/

Child: Call Processing Language (CPL)

Born: 26 February 1999

Parent: IP Telephony (IPTEL) working group of the Internet Engineering Task Force (IETF), Jonathan Rosenberg (Bell Labs) and Henning Schulzrinne (Columbia University)

Purpose: The CPL is powerful enough to describe a large number of services and features, but it is limited in power so that it can run safely in Internet telephony servers. The intention is to make it impossible for users to do anything more complex (and dangerous) than describing Internet telephony services. The language is not Turing-complete, and provides no way to write a loop or a function."

DTD: <http://www.oasis-open.org/cover/cplDTD199902.txt>

More: <http://computer.org/internet/telephony/>

<http://www.oasis-open.org/cover/cpl.html>

Child: Call Policy Markup Language (CPML)

Born: 26 July 1999

Parent: Digital Telecommunications, Inc.

Used in Extensible Service Policy Telecommunications Services Portal.

Purpose: "It opens the telecommunications network to basic IP tools that brings order to its complexity and empowers carriers, and ultimately customers, to control, customize, and extend the functionality and usefulness of the telecommunications network. It is an open language used to simply describe call processing."

More: <http://www.dticorp.com>

<http://www.oasis-open.org/cover/cpml.html>

Child: DocBook DTD Document Type Definition

Born: 1991

Current Version 3.1

Parent: HaL Computer Systems, O'Reilly & Associates
handed off to Davenport Group

Current Parent: Oasis DocBook Technical Committee
Used in TIM

Purpose: To provide SGML support for folks who like to write books on-line.

DTD: <http://www.oasis-open.org/docbook/docbook/index.html>

More: <http://www.oasis-open.org/docbook/>

Child: Festival Speech Synthesis System

Born: January 1999

Version 1.3.0

Current Version 1.4.0

Parent: Centre for Speech Technology Research (CSTR)
Uses SSML

Purpose: “It offers a full text to speech system with various APIs, as well an environment for development and research of speech synthesis techniques.”

Programming Information: http://www.cstr.ed.ac.uk/projects/festival/manual/festival_toc.html

More: <http://www.cstr.ed.ac.uk/projects/festival>

Child: Handheld Device Markup Language (HDML)

Born: June 1997

Parent: Unwired Planet [Phone.com]
Morphed into WML

More: <http://whatis.com/hdml.htm>

Child: Java Speech Application Programming Language (JSAPI)

Born: February 1998

Parent: Sun

Uses JSML

Purpose: “The Java™ Speech API allows Java applications to incorporate speech technology into their user interfaces. It defines a cross-platform API to support command and control recognizers, dictation systems and speech synthesizers.”

More: <http://www.javasoft.com/products/java-media/speech/forDevelopers/jsapifaq.html>

Child: Java Speech or Synthesis Markup Language (JSML)

Born: 28 August 1997

Parent: Sun

Used in SpeechML, JSAPI, SABLE and VoiceXML

Purpose: “JSML is a subset of XML (Extensible Markup Language), which is a simple dialect of SGML. By being a subset of XML, JSML gains a standardized, extensible syntax that is not tied to the Java Speech API (JSAPI).”

Specification: <http://java.sun.com/products/java-media/speech/forDevelopers/JSML/>

More: <http://www.oasis-open.org/cover/xml.html#xml-javaSpeech>

Child: Java Telephony Application Programming Interface (JTAPI)

Born: 30 October 1997

Version 1.0

Current Version 2.0

Parent: Intel, Nortel Networks, Novell, Sun Microsystems, Inc.

More Parents: Enterprise Computer Telephony Forum (ECTF), Dialogic, Siemens

Uses ECF S.410 JTAPI Media package, JTAPI mobile work, Java Community Process (JCP)

Purpose: “It is an extensible API designed to scale for use in a range of domains from first party call control in a consumer device to third party call control in large distributed call centers.”

Specifications: <http://www.javasoft.com/products/jtapi/#JTAPI 1.3>

More: <http://www.javasoft.com/products/jtapi/>

Child: Phone Markup Language (PML)

Born: (before the breakup/divorce?)

Formerly PhoneWeb (AT&T) and TelePortal (Lucent)

Parent: AT&T Bell Labs, Lucent

Used in VXML

More: <http://www.oasis-open.org/cover/vxml.html>

Child: SABLE Consortium

Born: March 1998

Version 0.2

Current Version 1.0

Parent: AT&T Bell Labs, British Telecom, Carnegie Mellon, Edinburgh University, Sun

Uses JSML, SSML and STML

Used in VoiceXML

Purpose: The draft SABLE specification is an initiative to establish a standard system for marking up text input to speech synthesizers.

Specification: http://www.cstr.ed.ac.uk/projects/sable_spec2.html

More: <http://www.oasis-open.org/cover/sable.html>

Child: Synchronized Multimedia Integration Language (SMIL)

Born: July 1998

Current Version SMIL Boston

Parent: Synchronized Multimedia Working Group

Used in RealNetworks RealSlideshow Plus

Purpose: “Define a simple XML-based language that allows authors to write interactive multimedia presentations. Allow reusing of SMIL syntax and semantics in other XML-based languages, in particular those who need to represent timing and synchronization.”

Modules: <http://www.w3.org/1999/08/WD-smil-boston-19990803/Modules/smil-modules.html>

More: <http://www.w3.org/1999/08/WD-smil-boston-19990803/>

Child: Speech HyperText Markup Language (SpeechHTML)

Born: 20 October 1998

Parent: Vocalis. Ltd.

Purpose: “The SpeechHTML service allows your customers to call your website over the telephone.”

More: <http://www.speechhtml.com/>

Child: Speech Markup Language (SpeechML)

Born: 12 February 1999

Parent: IBM alphaWorks Laboratory

Uses JSAPI, JSGF, JSML

It has been morphed into VoiceXML.

Purpose: “It is a language for building network-based conversational applications.”

More: <http://www.oasis-open.org/cover/speechML.html>
<http://www.alphaworks.ibm.com/formula/speechml>

Child: Speech Synthesis Markup Language (SSML)

Born: 1992

Parent: Paul Taylor

Version 1.0 Summer 1995

New Parents: Amy Isard, Paul Taylor

Used in Festival Speech Synthesis System and SABLE

Purpose: Converts Text to Speech.

More: <http://www.oasis-open.org/cover/ssml-details.html>

Child: Speech-to-Text or Spoken Text Markup Language (STML)

Born: 1996

Parent: Bell Labs, Edinburgh University

Used in SABLE

Purpose: System independent standard for marking up text for the purposes of synthesis.

DTD: <http://www.bell-labs.com/project/tts/stml.dtd>

More: <http://www.bell-labs.com/project/tts/stml.html>

Child: Talk Markup Language (TalkML)

Born: 29 June 1999

Parent: HP Labs

Purpose: Experimental language for Voice Browsers.

More: <http://www.w3.org/Voice/TalkML/>

Child: Telecommunications Interchange Markup (TIM) or Technical Information Markup (DTD)

Born: 1996

Parent: Telecommunications Industry Forum (TCIF)

Uses DocBook

Purpose: “It’s a specification for describing the structure of telecommunications and other technical documents. TIM extends DocBook by describing additional structural constructs that are often found in technical documentation. It may now be the best general-purpose (or “interchange”) DTD for technical documents in many industries.”

More: http://www.atis.org/atis/tcif/ipi/dl_tim.htm
<http://www.oasis-open.org/cover/swankSGML97IPI.html>

Child: Telephony Markup Language (TML)

Born: August 1999

Parent: Richard “Zippy” Grigonis & John Jainschigg

Purpose: “By atomizing call and messaging functions in an effort to start formulating a list of possible telephony and messaging tags. There's also the organizational structure of the language that must be considered, the base types and the enumeration types that need to be listed. Those assist in defining constraints -- such as the default values assumed by attributes when those are unspecified in a particular document.”

More: <http://www.oasis-open.org/cover/tml.html>

Child: VoxML

Born: 30 September 1998

Parent: Motorola

Morphed into VXML

Purpose: VoxMLTM allows a developer to create a script of the conversation a user can have with an application program run by a Web server.

More: <http://www.whatis.com/> Then search on VoxML

Child: Voice Extensible Markup Language Forum or now VoiceXML (VXML)

Born: 02 March 1999

Parent: AT&T Bell Labs, 4P, Lucent, Motorola (joined now by many other companies)

Uses AML, JSML, PML, SABLE, SpeechML, VoxML

Purpose: “The VXML Forum has four main objectives: (1) to develop an open VXML specification and then submit it for standardization; (2) to educate the industry about the need for a standard voice markup language; (3) to attract industry support and participation in the VXML Forum; (4) to promote industry-wide use of the resulting standard to create innovative content and service applications.”

Specification: <http://www.voicexml.org/specs/VoiceXML-0.9-19990817.pdf>

More: <http://www.oasis-open.org/cover/vxml.html>
<http://www.vxmlforum.org/pr19990825-1.html>

Child: Wireless Application Protocol Forum (WAP)

Born: 9 August 1999

Parent: Ericson, Motorola, Nokia, Unwired Planet [renamed Phone.com] (and now, many others)

Uses HDML, WML

Purpose: Wireless Application Protocol (WAP) is a result of continuous work to define an industry wide standard for developing applications over wireless communication networks.

Specifications: <http://www.wapforum.org/what/technical.htm>

More: <http://www.oasis-open.org/cover/wap-wml.html>

Child: Wireless Markup Language (WML)

Born: 3 February 1998

Parent: Unwired Planet [Phone.com], WAP Forum

Was HDML

Used in WAP

Purpose: “WML was formed to create the global wireless protocol specification that works across differing wireless network technology types, for adoption by appropriate industry standards bodies.” (see links in WAP above) “It is a language that allows the text portions of Web pages to be presented on cellular phones and personal digital assistants (PDAs) via wireless access. The Wireless Application Protocol works on top of standard data link protocols, such as [GSM](#), [CDMA](#), and TDMA, and provides a complete set of network communication programs comparable to and supportive of the Internet set of protocols.”

More: <http://www.whatis.com/wml.htm>

Appendix B: Facetious Taxonomy of Y2K Respondents

by Gerry Kolisch gerry@qadas.com

edited by Robert L. Pritchett 01/11/1999

Ants

Ants, 1st Class: Primarily Christians, these people have stockpiled by mid 1998. Food, gold and silver, weapons and ammunition, generators are still plentiful. Presently, they are considered fools and paranoids.

Length of self-sufficiency: 6 months to indefinite

Percentage of population: Infinitesimal

Ants, 2nd Class: Stockpiled by December 1998. Critical goods still widely available.

Length of self-sufficiency: 3 to 18 months

Percentage of population: Less than 1%

Ants, 3rd Class: Stockpiled before April 1999, just before the public really starts to worry.

Length of self-sufficiency: 3 - 12 months

Percentage of population: 1%

Squirrels

Squirrel, 1st Class: Stockpiled before fall 1999 when Y2K becomes a national issue.

Length of self-sufficiency: 1 - 6 months

Percentage of population: 2%

Squirrel, 2nd Class: Will wait until December 1999 and then try to stockpile during the Christmas shopping rush.

Length of self-sufficiency: 1 - 3 months

Percentage of population: 5%

Squirrel, 3rd Class: Will wait until after Christmas and start to shop for stockpiling bargains.

Length of self-sufficiency: 1 - 4 weeks

Percentage of population: 10%

Grasshoppers

Grasshopper, 1st Class: Will wait for December 31 and start shopping as the news reports crashes in earlier time zones.

Length of self-sufficiency: 1 - 3 weeks

Percentage of population: 20%

Grasshopper, 2nd Class: Will get serious on January 1, 2000 when the lights go out.

Length of self-sufficiency: 1 - 2 weeks

Percentage of population: 50+%

Grasshopper, 3rd Class: Has not so much as bought a can of beans or extra batteries. He thinks Y2K is not a problem and the government will take care of things.

Length of self-sufficiency: several days

Percentage of population: 10%

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Good article that discusses speech-based interfaces. Includes mentions and links to [IBM](#), [Dragon Systems](#), [Lernout & Hauspie](#), and [Philips](#), [AT&T Bell Labs](#), [Nuance](#), [Philips](#) and [SpeechWorks](#) and [General Magic's Portico service](#).

<http://www.sciam.com/1999/0899issue/0899zue.html>

Resources

Some IP Telephony Resources

Alternate Telephony

http://www.alternatetelephony.com/news/1998/12/buzz_981211.shtml

Apcentia *Computer Telephony White Paper*

<http://www.c3ltd.co.uk/insight/apwp1296.htm>

Artisoft *Visual Voice Pro*

<http://www.artisoft.com/products/ct/vv/index.htm>

AT&T *IP Telephony*

<http://www.ipservices.att.com/index.html>

<http://www.ipservices.att.com/backbone/index.html>

<http://ipnetwork.bgtmo.ip.att.net/>

Cisco *Architecture for Voice, Video and Integrated Data (AVVID)*

<http://www.telecomlibrary.com/content/news/avvid.html>

http://www.cisco.com/warp/public/cc/cisco/mkt/iptel/prodlit/avvid_wp.htm

<http://www.cisco.com/warp/public/779/largeent/issues/dvvi/>

<http://www.cisco.com/warp/public/779/largeent/learn/technologies/dvvi/>

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Columbia University *IP Telephony Resources*

<http://www.cs.columbia.edu/~hgs/internet/internet-telephony.html>

Computer Telephony Portal: *Standards: IP Telephony Standards*

http://www.computertelephony.org/links/Standards/IP_Telephony_Standards/index.html

ConnectTel's *Favorite Computer Telephony Standards*

<http://ieee.ece.utexas.edu/~current/AprilIssue/henryPerez.html>

Excellent graphics!

DataBeam *T.120 and H.323 Primers*

<http://www.databeam.com>

Dialogic *IP Telephony Basics*

<http://www.dialogic.com/solution/internet/4070web.htm>

eG3 *Master Index on telephony papers on-line*

<http://www.eewindow.com/dspv/dsptele.htm>

General Packet Radio Service (GPRS) *Applications Alliance*

<http://www.gprsworld.com/>

Links to the telephone/mobile/wireless industry. Ericsson sponsors the site.

IBM Home Page Reader *The Voice of the World Wide Web*,

<http://www.austin.ibm.com/sns/hpr.html>

IETF Internet Telephony Architecture and Protocols tutorial,

<http://computer.org/internet/telephony/w3schrosen.htm>

Internet Computing *IP Telephony Online Resources*

<http://computer.org/internet/telephony/index.htm>

Internet Product Watch *Internet Telephones*

http://ipw.internet.com/communication/internet_telephone/index.html

IP *Telephony News*

<http://www.theipsite.com/newsip.cfm>

IP Xstream *IP Telephony* grand-central

<http://www.iptelephony.org>

Internet Telephony *Definitions*

http://www.webopedia.com/TERM/I/Internet_telephony.html

IpVerse *ControlSwitch*

<http://www.ipverse.com>

Lucent *Internet Telephony & Elemedia, Softswitch and Zingo*

<http://public1.lucent.com/netsys/telephony.html>

<http://www.elemedia.com/> H.323 Gatekeeper Platform

<http://www.lucent.com/IN/softswitch.html>

<http://www.zingo.com/>

Checkout the H.323 Center at their website. Neat whitepapers!

MicroLegend *What Is IP Telephony?* and *What is SS7?* Tutorials

<http://www.microlegend.com/>

<http://www.microlegend.com/whatss7.htm>

Nokia *IP Telephony White Paper*,

<http://www.viennasys.com/public/architecture.html>

Great Telephony History and graphics!

Open Packet Telephony

<http://www.lsiinc.com/>

Protocols.com

<http://www.protocols.com/voip.htm>

Shunra *The Cloud and Storm*

<http://shunra.com/home.htm>

Soundingboard

<http://www.soundingboardmag.com/>

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PipeBeach speechWeb

<http://www.pipebeach.com/>

Qualcomm PureVoice and SmartRate CDMA cellular technology standards

<http://eudora.qualcomm.com/purevoice/>

Siemens DICE (Delivering Information in a Cellular Environment),

http://www.scr.siemens.com/p_mstrframeset.htm

3Com *The Architectural Impact of IP Telephony on Packet Network Infrastructures*

http://www.3com.com/technology/tech_net/white_papers/503045.html

TimesTen *Performance Software – In-Memory Database*

<http://www.timesten.com/>

Web ProForums *Internet Telephony Tutorial*
http://www.webforum.com/int_tele/

Some Voice Application Resources

Applescript over IP

<http://bbs.applescript.net/>

<http://www.apple.com/macOS/start/wnlNg.htm>

ASRNews *Commercial Links in the Speech Recognition/Text-to-Speech Industry*,

<http://www.asrnews.com/hotlinks.htm>

Audio Web

<http://audio-app.rutgers.edu/atml/atmlman/>

<http://www.cs.rutgers.edu/~imielins/ClearingHouse/>

Conversa *Voice Browser*

<http://www.conversa.com>

Dragon Systems *NaturallySpeaking Preferred & NaturalText*

<http://www.dragonsys.com/>

4th Peripheral (4P) Technologies, Inc., *Voice f/x 4Web, 4eXtenxa Server*

<http://www.fourthperipheral.com/>

General Magic *myTalk and Portico*

<http://www.GeneralMagic.com/>

IBM *Via Voice*

<http://www-4.ibm.com/software/speech/>

Image Generators *WebTalk*

<http://www.imagegenerators.com/webtalk.htm>

Interactive *Voice Response* solutions

<http://www.hursley.ibm.com/callpath/solcat/busapps.html>

Lernout & Hauspie *Voice Xpress Professional & RealSpeak*

<http://www.lhs.com/>

MacSpeech *iListen*

<http://www.macspeech.com/>

also

ASRNews (1999, July) "Market, Investment and Technical News of the emerging Speech recognition Industry", *ASRNews* Volume 10 No. 7

<http://www.asrnews.com/current.htm> The July issue focuses on products for the Apple environment

MIT *Spoken Language Systems Group*,

<http://www.sls.lcs.mit.edu/sls/>

MIT Speech Technology

<http://www.sls.lcs.mit.edu/sls/publications/index.html>

Nuance *Natural Language Voice Recognition and Speaker Verification*

<http://www.nuance.com/>

Philips *FreeSpeech*

<http://www.speech.be.philips.com/>

PhoneBrowser

http://www.planetit.com/techcenters/docs/internet_&_intranet/news/PIT19990506S0018

Phone.com, Inc. *MyPhone*

<http://www.phone.com/home.html>

Productivity Works *pwWebSpeak*, *pwSpeech*, *pwTelephone*

<http://www.prodworks.com/index.htm>

Rutgers University *AudioWeb*

<http://audio-app.rutgers.edu/atml/atmlman/>

Sequoia Software Corp. *XDEX - Powerful XML Indexing Made Easy*

http://www.xmlindex.com/product_xdex_fact.html

SpeechLinks *Speech Technology*

<http://www.speech.cs.cmu.edu/comp.speech/SpeechLinks.html> last updated 03-Oct-1997

<http://www.speech.cs.cmu.edu/comp.speech/FAQ.Packages.html> last updated 02-Oct-1997

<http://www.speech.cs.cmu.edu/comp.speech/Update.Times.html> last updated 06-Oct-1997

Speech Technology Magazine

<http://www.speechtechmag.com/index.htm>

Speech Therapist

<http://www.webbtoys.com/speechtherapy/>

SpeechWorks *Portal*

<http://www.speechworks.com/>

<http://www.speechworks.com/news/PR092799spportal.htm>

VideoGate.Com *Videogateway*

<http://www.videogate.com>

Voice Browsers

<http://www.w3.org/TR/NOTE-voice>

Some XML Resources

Audio Markup Language improves the utility of synthesized speech.

<http://www.fourthperipheral.com/>

Audio Text Markup Language (ATML)

<http://audio-app.rutgers.edu/atml/atmlman/>

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Tutorial on XML-Java with good graphics and resource links.

<http://www.javaworld.com/javaworld/jw-09-1999/jw-09-xmlmessage.html?IDG.net>

Bluestone Software has made it possible to transmit an address book to a 3Com PalmPilot with the first eXtensible Markup Language (XML) application for the handheld device.

<http://www.bluestone.com/xml/XML-Contact/>

Call Policy Markup Language (CPML)

<http://www.oasis-open.org/cover/cpml.html>

Call Processing Language (CPL)

<http://www.oasis-open.org/cover/cpl.html>

Clark, James (1998), *XML Resources*, XML parsers and testing tools,
A link to good XML links.

<http://www.jclark.com/>

Extensible Markup Language (XML)

<http://www.teamscience.com/>

eXtensible Markup Language (XML) W3C Activity

<http://www.w3.org/XML/Activity.html>

Extensibility *Authority*

<http://www.extensibility.com>

Emilé an XML Editor for Mac ships

<http://www.maccentral.com/news/9904/06.xml.shtml>

From Media Design in*Progress

<http://www.in-progress.com/>

HTML Design Tools

<http://204.251.24.24/MacFanatic.html>

HTTP-mediated interactive voice response services. Requirements for a markup language.

http://www.research.att.com/~klarlund/external/from_my_server/articles/W3C-requirements-markup-language-http-med-IVR.html

HTML Training Resources

http://www.intraware.com/research/training/1999/oct/wbt_webdev.html

<http://www.davesite.com/webstation/html/>

Intraware's JAVA Speech Application Programming Interface (JSAPI)

<http://www.javasoft.com/products/java-media/speech/forDevelopers/jsapifaq.html>

JAVA Telephony API (JTAPI)

<http://www.javasoft.com/products/jtapi/>

Lee's XML Resources

<http://www.homestead.com/xml1/>

Meta Content Framework Resources

<http://www.textuality.com/mcf/MCF-tutorial.html>

<http://developer.netscape.com/tech/metadata/submit.html>

<http://www.w3.org/TR/Note-XMLsubmit.html>

Motorola

<http://www.vxmlforum.com/>

<http://www.voxml.com/voxml.html> This was the predecessor to VXML

Rist, Oliver (1999, August 16) "XML Comes of Age", pp.31-36, *InternetWeek*, CMP Media, Inc., Table of XML Development Suites.

<http://www.internetwk.com/links/xml.html>

SABLE: A Standard for Text-to-Speech Synthesis Markup

<http://www.oasis-open.org/cover/sable.html>

<http://www.bell-labs.com/project/tts/sable.html>

SpeechML

<http://www.alphaWorks.ibm.com/formula/speechml>

<http://www.oasis-open.org/cover/speechML.html>

Synchronized Multimedia Integration Language (SMIL)

<http://www.w3.org/AudioVideo/Activity-new.html>

The Telecommunication Interchange Markup (TIM) language

http://www.atis.org/atis/tcif/ipi/dl_tim.htm

Telephony Markup Language TML

<http://www.oasis-open.org/cover/tml.html>

Textuality *Lark* XML processor

<http://www.textuality.com/xml/>

Tidy The HTML-to-XML Conversion tool,

<http://www.w3.org/People/Raggett/tidy/>

for the Mac

<http://1.digital.cnet.com/cgi-bin1/flo?x=dEuAmYuKmwAKumuo>

Vocalis SpeechHTML

<http://www.speechtml.com/>

VoiceXML, VXML Forum (Voice Extensible Markup Language Forum)

<http://www.oasis-open.org/cover/vxml.html>

Vtopia Structured Information Source,

<http://www.vtopia.com/resources/XML/telecom.html>

WAP FORUM

<http://www.wapforum.org/>

Web Developers Virtual Library

<http://www.stars.com/>

Wireless Markup Language (WML)

<http://www.oasis-open.org/cover/wap-wml.html>

Web Proforums Speech-Enabled Interactive Voice Response Systems Tutorial,

http://www.webforum.com/speech_enabled/index.html

Web Reference Tutorials - XML - THE resource site!!

<http://webreference.com/authoring/languages/xml/>

XHTML

<http://www.builder.com/Authoring/Xhtml/ss01.html>

<http://www.w3.org/TR/xhtml1/>

<http://wdvl.com/Authoring/Languages/XML/XHTML/>

<http://www.w3.org/TR/xhtml-modularization/>

Actually HTML 4.01 “XML of the Future” or recasting of HTML in XML

XML Acronyms

<http://www.eccnet.com/acronyms/>

XML Definitions & Links

<http://www.webopedia.com/TERM/X/XML.html>

XML

<http://www.xml.com>

XML FAQ

<http://www.netlingo.com/more/xmlfaq.htm>

Ultimate Resource for everything XML

<http://www.everythingxml.com/xml/index.html>

Visual Browsers

<http://www.public.iastate.edu/~CYBERSTACKS/BigPic.htm>

Other Related Resources

Apple iMovie

The movie software enabler for use with the iMac DV platform.
<http://www.apple.com/imovie/>

Alliance For Telecommunications Industry Solutions

<http://www.atis.org/>

Breyer, Robert and Riley, Sean (1999) "Switched, Fast, And Gigabit Ethernet, 3rd Edition", pp. 313-314 *Voice over IP*, Macmillan Technical Publishing

Corkern Carla (1998) "From Architectures to Authoring DTDs - A Fairy Tale", *Isogen Technical Papers*, Isogen International Corp.,

A paper on how to migrate enterprises to SGML using appropriate software engines.
<http://www.isogen.com/papers.htm>

Detert, Ryan (1999, October 15) "Metaflash: A New Take on 3D", *Webreview.Com*, Songline Studios Inc., Miller-Freeman, Inc.,

A technology to convert 2D photos to 3D photos viewable in browsers.
http://webreview.com/pub/1999/10/15/feature/index2.html?wwwrrr_19991015.txt

Drexler, Michael (1999, September 24) "See who's on the Cell Phone", *PC World*, IDG News Service, PC World Communications, Inc.,

Announcement of video phone technology for cell phones.
<http://www.idg.net/go.cgi?id=164448>

Encyclopedia Cybernetica

A guide to the World Wide Web for human and cyborg brain-minds:
<http://www.geocities.com/Athens/Agora/7256/webcyc.html#proglangs>

ECMAScript

<http://www.ecma.ch/stand/ECMA-262.htm>

EDI Acronyms

<http://www.eccnet.com/acronyms/>

Gecko Research

<http://www.gecko.com/>

Holly, Krisztina & Brookins, Chris (1996) *Visual Basic Telephony*, Flatiron Publishing, Inc.

Book based on Telephony applications in Visual Basic called *Visual Voice*. Apparently taken over by Artisoft from Stylus Innovation, Inc.

<http://www.artisoft.com/products/ct/vv/index.htm>

Lewis, James Wm (1999, January, 19) *The Other Markup Languages*,

A list with links to various Markup Languages.

<http://cyberlewis.com/markup>

Morris, Charlie (1999, January 4) "Streaming Audio Tutorial", *Web Developer's Virtual Library*, internet.com Corporation,

Exactly what it says it is, with lots of links.

<http://wdvl.com/Multimedia/Sound/Audio/streaming.html>

Newton, Harry (1993) *Newton's Telecom Dictionary*, 6th Edition, Telecom Library, Inc.,

This has been updated many times since this edition. It is hard to keep current on the changes, but Harry Newton seems to keep up!

The 15th Edition can be found at <http://businesssavvy.com/101297n.html>

Oakes, Chris (1999, August 10) "HDML, Take Two", *WiredNews*, Wired Digital, Inc.,

Wireless Application Protocol (WAP) absorbs handheld Device Markup Language (HDML)

<http://www.wired.com/news/news/story/12173.html>

Ontology.org

<http://www.ontology.org/>

Science Daily (1999, October 1) "Novel Neural Net Recognizes Spoken Words Better than Human Listeners", ScienceDaily,

The Neural Network Speaker Independent Speech Recognition System was created at the University of Southern California using computer chip neurons made by Theodore Berger and Jim-Shih Liaw. The University has applied for patents.

<http://www.sciencedaily.com/releases/1999/10/991001064257.htm>

Seifert, Rich (1998) *Gigabit Ethernet Technology and Applications for High-Speed LANs*, Addison Wesley Longman, Inc.,

A pretty good book on Gigabit Ethernet.

<http://www.awl.com/cseng/titles/0-201-18553-9/>

Telecom Information Resources On the Internet

<http://china.si.umich.edu/telecom/internet-telephony.html>

TMCNet Newsletter and web page

<http://www.tmcnet.com/>

Wallace, Bob (1999, October 25) "International Voice Over The Internet", p. 115, Issue 758, *InformationWeek*, CMP Media, Inc.,

Press release on the Broadmedia package. The sidebar is more interesting at the website.

<http://www.informationweek.com/758/phone.htm>

W3C in The Press in 1999

<http://w3.org/Press/Articles.html>

The Yankee Group

<http://www.yankeegroup.com>

.mid and .wav Files Used Facetiously Throughout the Text

<http://www.dailywav.com/0999--/seethelite.mid>

[http://www.dailywav.com/0399\(/master.wav](http://www.dailywav.com/0399(/master.wav)

<http://www.dailywav.com/089988/parental.wav>

<http://www.dailywav.com/0199-/nodial.wav>

<http://www.dailywav.com/0699bn/dratcomp.wav>

<http://www.dailywav.com/0999--/jetcar.wav>

<http://www.dailywav.com/1198~/hatethat.wav>

[http://www.dailywav.com/0399\(/birthin.wav](http://www.dailywav.com/0399(/birthin.wav)

<http://www.dailywav.com/049922/et.wav>

<http://www.dailywav.com/0599-1/dialect.wav>

<http://www.dailywav.com/0199-/937msgs.wav>

<http://www.dailywav.com/0299q/techmumbojumbo.wav>

<http://www.dailywav.com/0299q/knowbetr.wav>

[http://www.dailywav.com/0399\(/notknow.wav](http://www.dailywav.com/0399(/notknow.wav)

End Notes

- ¹ See <http://www.sgi.com/grafica/future/futnotes.html> for what “Extensible” *really* means!
- ² See <http://www.earth.finalconflict.com/>.
- ³ See <http://www.link-o-mania.com/comvirtu.htm>.
- ⁴ See <http://www.ee.ic.ac.uk/eee2proj/11197/Mainpage.htm>.
- ⁵ See <http://hololight.virtualave.net/>.
- ⁶ See <http://www.augury.com/>.
- ⁷ See <http://www.earth.finalconflict.com/lili.htm>.
- ⁸ Basically, dongles are security devices that plug into any computer and are designed to protect the proprietary software manufacturer from piracy attempts. See <http://www.itsecurity.com/thedongle.htm>
- ⁹ See <http://www.scifi.com/>.
- ¹⁰ See <http://www.sciam.com/1999/0899issue/0899gutttagbox1.html>.
- ¹¹ See <http://www.energizer.com/>.
- ¹² Ability for a building or system to communicate over *any* media.
- ¹³ Notice that the “convergence” buzzword was not used here!
- ¹⁴ See <http://shunra.com/home.htm> for “Storm” and “The Cloud” software to emulate VoIP environments.
- ¹⁵ *Cumulus* in that the engineer actually had *accumulated* enough knowledge to put that info into the plans.
- ¹⁶ Toneheads – Telco engineers versed in dialtone technology. Datapukes – mildly “derogatory” term by toneheads for those who are certified in data system architectures.
- ¹⁷ IP-ization – morphing all things connected via Internet Protocols - coined by Woody Benson, President of MCK (<http://www.mck.com>).
- ¹⁸ Integrated structure as to constitute a functional unit and an intuitive simple grasp of reality.
- ¹⁹ See <http://www.microlegend.com/what-it.htm>.
- ²⁰ See <http://www.microlegend.com/wahtss7.htm>.
- ²¹ Single physical connection over which all services are delivered, including billing, service ordering and provisioning, “agnostic”[doesn’t-matter-media] about “last-mile” technology, using statistical multiplexing instead of Time Division Multiplexing (TDM).
- ²² See <http://www.oasis-open.org/cover/cpml.html> and <http://www.dticorp.com>.
- ²³ See <http://www.ipverse.com/>.
- ²⁴ See <http://www.abadanevents.com/>.
- ²⁵ See <http://www.cisco.com/warp/public/779/largeent/learn/technologies/dvvi/>.
- ²⁶ See <http://www.sji.com/new/>.
- ²⁷ See <http://www.nwfusion.com/virtual/foresystems/archive/fore.pdf>.
- ²⁸ *Originally* meant as a riddle whose answer is or involves a pun, and *now* meaning an intricate and difficult problem.
- ²⁹ See <http://www.netmeg.net/jargon/terms/k/kluge.html>.
- ³⁰ See <http://www.netmeg.net/jargon/terms/s/shim.html> not to be confused with the shim sham, <http://golgi.ana.ed.ac.uk/swing/ShimSham.html>.
- ³¹ *Originally* designed to SLOW DOWN the typist so as not to jam the typebars when they hit the platen in the manual typewriter! See http://www.cs.utk.edu/~shuford/terminal/dvorak_advice.html for a history on alternatives that work better in a more enlightened and technologically apt world.
- ³² See <http://www.iarchitect.com/qtime.htm>.
- ³³ See <http://www.baddesigns.com/examples.html>.
- ³⁴ See <http://palmtops.about.com/compute/hardware/palmtops/?pid=2764&cob=home>.
- ³⁵ See <http://www.handspring.com/>.
- ³⁶ See http://www.qualcomm.com/phones/products/pdq_phone/.
- ³⁷ See <http://www.jabra.com/>.
- ³⁸ See <http://www.bingsoftware.com/>.
- ³⁹ See <http://www.internetpartyline.com/>.

⁴⁰ See <http://www.talksites.com/>.
⁴¹ Their pricing is “passed” on to you and me when we use their services.
⁴² See http://www.computertelephony.org/links/Standards/IP_Telephony_Standards/index.html.
⁴³ See <http://www.iptelephony.org>.
⁴⁴ International Telecommunication Union Series:

G is for Audio and Speech Codecs.

H is for Audiovisual & Multimedia services codecs and protocols.

Q is for Call Signal protocols

T is for Terminals for Telematic services (facsimile & compression techniques).

⁴⁵ See <http://www.iptelephony.org/GIP/protocols/index.html>.
⁴⁶ See <http://cs.georgefox.edu/CSTA/>.
⁴⁷ See <http://www.ectf.org/ectf/tech/download.htm#C100>
⁴⁸ See http://www.webproforum.com/voice_packet/index.html.
⁴⁹ See http://www.netlab.ohio-state.edu/~jain/refs/ref_voip.htm.
⁵⁰ Oh, to heck with acronyms! But here are some more, spelled out and all;

CRTP: Compression for Real-Time Protocol, which is also known as "RTP Header Compression" and not to be confused with the Colorado Rural Technology Project or the Consortium for Research on Telecommunications Policy. See <http://www.cisco.com/warp/public/732/Tech/real/>. Compression for Real-Time Protocol is a compression technology designed to squeeze header information to a 10th its original size.

H.323: See http://webopedia.internet.com/TERM/H/H_323.html. A standard approved by the International Telecommunication Union (ITU) that defines how audiovisual conferencing data is transmitted across networks. *In theory*, H.323 should enable users to participate in the same conference even though they are using different videoconferencing applications.

H.GCP: Gateway Control Protocol. Another name for IDPC. See <http://www.itu.int/> then use the search engine for H.GCP, then scroll down to “ITU Information Note 10 June 1999. H.GCP allows control of gateway devices that pass voice, video, facsimile & data traffic between conventional telephony networks and packet-based networks such as the Internet.

IDPC: IP Device Control. It became H.GCP, perhaps so as not to be confused with UNESCO's International Programme for the Development of Communication or a bunch of other organizations that use the same acronym. See <http://www.ietf.org/internet-drafts/draft-rosen-megaco-structures-and-encoding-00.txt>. IDPC is a protocol suite with components that can be used individually or together to perform connection control, signaling transport and other fine stuff.

MEGACO: Media Gateway Protocol. See <http://www.ietf.org/internet-drafts/draft-ietf-megaco-reqs-07.txt>. Media Gateway Protocol is intended to support mediation/adaptation of flows between different types of transport.

MGCP: Media Gateway Control Protocol. A blend of IDPC and SGCP. See <http://www.ietf.org/internet-drafts/draft-huitema-mgcp-test1-00.txt>. Media Gateway Control Protocol is used for controlling telephony gateways from external call control elements called media gateway controllers or call agents. A telephony gateway is a network element that provides conversion between the audio signals carried on telephone circuits and data packets carried over the Internet or over other packet networks.

MPLS: Multi-Protocol Label Switching. See <http://www.ietf.org/html.charters/mpls-charter.html>. Multi-Protocol Label Switching provides connection-oriented (label-based) switching based on IP routing and control protocols. It is expected to improve price/performance of network layer routing, scalability and flexibility of routing services.

SGCP: Simple Gateway Control Protocol (or Super Genius Computer Programmers). See <http://www.argreenhouse.com/SGCP/>. Simple Gateway Control Protocol is used to control telephony gateways from external call control elements. A telephony gateway is a network element that provides conversion between the audio signals carried on telephone circuits and data packets carried over the Internet or over other packet networks.

SIP: Session Initiation Protocol. See <http://www.cs.columbia.edu/~hgs/sip/sip.html>. SIP, the Session Initiation Protocol, is a simple signaling protocol for Internet conferencing and telephony. SIP was developed within the [IETF MMUSIC \(Multiparty Multimedia Session Control\) working group](#).

IETF: Internet Engineering Task Force. See <http://www.ietf.org/>. The Internet Engineering Task Force is a large open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet.

IMTC: International Multimedia Teleconferencing Consortium. See <http://www.imtc.org>. The International Multimedia Teleconferencing Consortium is a non-profit corporation comprising of over 150 companies. It is designed to facilitate design efforts of interoperable multimedia teleconferencing efforts based on open international standards.

ITU-T: The International Telecommunication Union- Telecommunications Standardization Sector. See <http://www.itu.int/>. The International Telecommunication Union, headquartered in Geneva, Switzerland is an international organization within which governments and the private sector coordinate global telecom networks and services.

(ETSI)Tiphon: European Telecommunications Standards Institute Telecommunications and Internet Protocol Harmonization Over Networks. See <http://www.etsi.org/tiphon/>. Telecommunications and Internet Protocol Harmonization Over Networks is designed to ensure IP-based networks can communicate with switched circuit networks (SCN) such as Public Switched Telephone Networks (PSTN), Integrated Services Digital Networks (ISDN), and Global System for Mobile Communications (GSM).

⁵¹ See <http://www.ctinstitute.com>.

⁵² See <http://www.eloq.com/intro.html>.

⁵³ See <http://www.apple.com/macOS/speech/>.

⁵⁴ See <http://www.asrnews.com/>.

⁵⁵ That's 53 weeks, by 24 hours by 7 days a week.

⁵⁶ Think of the PC as being like an all-terrain vehicle. [Humvees](#) come to mind (<http://www.cablelan.net/geoffw/index.html>) that uses stick-shifts to operate.

⁵⁷ Think of the Mac as being like a [sports car](#) (<http://macworld.zdnet.com/expo/photogallery/thursday/ibeetle.html>) with an automatic transmission, cruise control and luxury package.

⁵⁸ See <http://deepspacefranchise.net/lol/sttos/voyagehome.html>.

⁵⁹ See <http://galena.tjs.org/tom/>.

⁶⁰ See <http://www.apple.com/macOS/start/wnlng.htm>.

⁶¹ See <http://www.panix.com/~clay/newton/>.

⁶² See <http://www.tiac.net/users/rwilcox/speech.html>.

⁶³ See <http://www.w3.org/Voice/1998/Workshop/papers.html>.

⁶⁴ **Voice** eXtensible Markup Language See <http://www.oasis-open.org/cover/vxml.html>.

⁶⁵ See <http://www.alphaWorks.ibm.com/formula.speechml.ml>.

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- ⁶⁶ See http://ipw.internet.com/communication/internet_telephony/index.html
- ⁶⁷ **HyperText Transfer Protocol** The way Web pages are transferred over the 'Net.
- ⁶⁸ **Transmission Control Protocol** Usually tied to /IP [**I**nternet **P**rotocol] as the way networks communicate with each other over the 'Net.
- ⁶⁹ Application-level control protocol defined in RFC 2326 provides standard mechanisms for time-based "seeks" into media clips and control delivery of media via multicasting. Also seriously look at <http://computer.org/internet/telephony/w3schrosen3.htm#r6>.
- ⁷⁰ IETF proposed standard RFC 1889 and ITU Standard H.225.0 provides time-stamping, sequence-numbering and other mechanisms to ensure incoming data packets are placed in the right order.
- ⁷¹ Provides feedback on the quality of data delivery.
- ⁷² **SMIL** allows authors to create a text file with metadata that controls the presentation of multiple streaming media types, including video, audio, text, still images, browser flips, and more. See <http://www.w3.org/1999/08/WD-smil-boston-19990803/>.
- ⁷³ See <http://www.mp3.cybercomm.nl/~ivo/sounds.html>.
- ⁷⁴ See <http://whatis.com/qos.htm>.
- ⁷⁵ See <http://www.dv.com>. Go to Magazine, Back Issue, July, Tutorials, Video on the Web.
- ⁷⁶ See <http://www.oasis-open.org/cover/tml.html>.
- ⁷⁷ "According to schema theories, all knowledge is packaged into units. These units are the schemata. Embedded in these packages of knowledge is, in addition to the knowledge itself, information about how this knowledge is to be used. A schema, then, is a data structure for representing the generic concepts stored in memory." (<http://www.richmond.edu/~terry/schemata.htm>) Schemas are rapidly replacing DTDs. See also <http://www.w3.org/TR/xmlschema-1/>. (Okay, so what sche-mata wid you?)
- ⁷⁸ "Document Type Definition, a type of file associated with [SGML](#) and [XML](#) documents that defines how the [markup tags](#) should be interpreted by the application presenting the document. The [HTML](#) specification that defines how [Web pages](#) should be displayed by [Web browsers](#) is one example of a DTD. XML promises to expand the formatting capabilities of Web documents by supporting additional DTDs." (<http://webopedia.internet.com/>) DTDs are being "obsoleted" by schemas. See the endnote above.
- ⁷⁹ "In [computer science](#), the term is frequently used to differentiate the meaning of an [instruction](#) from its [format](#). The format, which covers the spelling of [language](#) components and the rules controlling how components are combined, is called the language's [syntax](#). For example, if you misspell a [command](#), it is a syntax error. If, on the other hand, you enter a legal command that does not make any sense in the current context, it is a semantic error." (<http://webopedia.internet.com/>) (So now you understand when someone says, "It's just semantics", right?) See also <http://www.iso.ch/BSR/> where the Basic Semantic Register can be found.
- ⁸⁰ See <http://www.javasoft.com/products/jtapi/>.
- ⁸¹ See <http://www.whatis.com/voxml.htm>.
- ⁸² See <http://www.m-w.com>.
- ⁸³ See Robin Covers' [on-line efforts](#).
- ⁸⁴ One dictionary definition of "consortium" means that those who participate may be in a "family" way, as in – pregnant.
- ⁸⁵ See http://www.site.uottawa.ca/~tcl/thesis_html/thesis_ToC.html.
- ⁸⁶ See <http://www.cse.buffalo.edu/~bina/cs506/lec2/index.htm>.
- ⁸⁷ "1. A systematic account of Existence.
2. (From philosophy) An explicit formal specification of how to represent the objects, concepts and other entities that are assumed to exist in some area of interest and the relationships that hold among them.
For [AI](#) systems, what "exists" is that which can be represented. When the [knowledge](#) about a [domain](#) is represented in a [declarative language](#), the set of objects that can be represented is called the [universe of discourse](#). We can describe the ontology of a program by defining a set of representational terms. Definitions associate the names of entities in the universe of discourse (e.g. classes, relations, functions or other objects) with human-readable text describing what the names mean,

and formal [axioms](#) that constrain the interpretation and well-formed use of these terms. Formally, an ontology is the statement of a [logical theory](#).

A set of [agents](#) that share the same ontology will be able to communicate about a domain of discourse without necessarily operating on a globally shared theory. We say that an agent commits to an ontology if its observable actions are consistent with the definitions in the ontology. The idea of ontological commitment is based on the [Knowledge-Level](#) perspective.

3. The hierarchical structuring of knowledge about things by subcategorising them according to their essential (or at least relevant and/or cognitive) qualities. See [subject index](#). This is an extension of the previous senses of "ontology" (above) which has become common in discussions about the difficulty of maintaining [subject indices](#)." See

<http://www.dictionary.com/cgi-bin/dict.pl?term=ontology>.

88 See <http://www-ksl.stanford.edu/kst/what-is-an-ontology.html>.

89 See <http://www.ontology.org/main/papers/faq.html>.

90 See <http://wave.eecs.wsu.edu/WAVE/Ontologies/CKML/Whitepapers/MetaInterop/MetaInterop.html>.

91 See <http://wave.eecs.wsu.edu/CKRMI/OntolinguaTutorial.pdf>.

92 See <http://www-ksl.stanford.edu/knowledge-sharing/ontologies/html/index.html>.

93 See <http://www-ksl-svc.stanford.edu:5915/doc/frame-editor/glossary-of-terms.html>.

94 See <http://www.oasis-open.org/cover/xol.html>.

95 See <http://dailywav.com/>.

96 Ambiguity of meaning arising from language that lends itself to more than one interpretation (<http://www.m-w.com>)

97 HyperText Markup Language, the authoring language used to create documents on the World Wide Web. But you knew that by now, right?

98 See <http://www.w3.org/AudioVideo/Activity-new.html>.

99 See <http://www.scm-ae.com/robertscorner/webr99.htm>.

100 eXtensible Markup Language. Extensibility is not just the capability of being *editable*, but also *additable*.

101 "An [algorithm](#) or program to determine the syntactic structure of a sentence or string of symbols in some language. A parser normally takes as input a sequence of [tokens](#) output by a [lexical analyser](#). It may produce some kind of [abstract syntax tree](#) as output. One of the best known [parser generators](#) is [yacc](#)." (<http://www.nightflight.com/foldoc/>)

102 "A collection of [programs](#) that enables you to store, modify, and extract information from a [database](#)."

(<http://www.webopedia.internet.com>)

103 eXtensible HyperText Markup Language, XHTML 1.0, a reformulation of HTML 4.0 as an XML 1.0 application See <http://w3.org/Authoring/Languages/XHTML/why.html>.

104 eXtensible Stylesheet Language See <http://www.w3.org/Authoring/Languages/XSL/>.

105 Cascading Style Sheets See <http://www.w3.org/Authoring/Style/Sheets/index.html>.

106 See <http://www.w3.org/People/Raggett/tidy/>.

107 The business of doing business electronically.

108 See <http://www.w3.org/XML/Activity>.

109 See <http://www.xml-ei.com/repository/wprep99.pdf>.

110 See http://www.xml.org/xmlorg_catalog.htm.

111 See <http://www.xml-ei.com/>. See also <http://www.sgml.u-net.com/xml-ei/edi-dtds.htm>.

112 See <http://www.undef.com/> for one such proposed solution called the "Universal Data Element Framework using a Dewey Decimal-like indexing system. Great PowerPoint presentation!

113 See <http://www.biztalk.org>.

114 See <http://msdn.microsoft.com/workshop/xml/general/soaptemplate.asp>.

115 See <http://www.oasis-open.org/>.

116 See <http://www.oasis-open.org/cover/cplDTD199902.txt>.

117 See <http://webreview.com/wr/pub/1999/10/08/feature/index.html>.

118 See <http://www.dictionary.com/cgi-bin/dict.pl?term=esperanto>.

119 See <http://www.dmtf.org/wbem/index.html>.

120 Separate products that serve as glue between two applications. Sometimes called "plumbing".

121 **Personal Digital Assistant Like the Palm Pilots.** See <http://nav.webring.org/cgi-bin/navcgi?ring=geoff:list>.
122 See <http://www.itu.int/newsroom/press/releases/1999/99-18.html>.
123 See **Appendix A**.
124 See <http://www.xspace.net/hotsauce/>.
125 See <http://www.public.iastate.edu/~CYBERSTACKS/BigPic.htm>.