

Pervasive (ubiquitous) computing today

Summary: *What is pervasive computing all about? What kind of scenarios can we envisage in the future where pervasive technologies will be put to use? Read more..*

"Things that think want to link", Nicholas Negraponte of MIT Media Labs is quoted as saying. This is the doctrine on which pervasive computing is based!

Talking about pervasive computing raises many questions - Will pervasive computing simulate the super-intelligent HAL in 2001: A Space Odyssey, written by Arthur C. Clarke? HAL seemed an affectionate and intelligent fellow at the outset, but then morphed into a sinister and powerful controlling intelligence with a hidden agenda. Will pervasive computing impinge on our privacy or be a harbinger of 'convenience and convergence'. And will we have to make a choice or can we marry the two in a rational manner?

What Pervasive?

Let's take a look at what pervasive computing means and what it portends for human kind in the next few years. To put it simply it is computation that's freely available everywhere. A scenario where all devices are networked, human-centric, communicate and interact with each other without any hiccups; their primary objective being to bestow quality life to the user. What's so beautiful about pervasive computing is that it is an important part of our lives even now, but in ways that we don't really notice. Earlier, television used to be a source for entertainment while the computer was used for work-related functions only. But, today, their functions don't adhere to any rigid boundaries anymore. What this suggests is that pervasive computing is soon going to be invisible. The way it interfaces with users will also become intuitive. Progress has continued up to a point where the greatest innovations transcend our personal notions of personal computing.

Pervasive speak

The underlying premise of pervasive computing is compelling: simplicity of use, and the user spending time completing the task, not learning the application and how to configure and troubleshoot it. The user experience is the message that the brands of pervasive computing devices will promote.

The "authorized access to anytime-anywhere-any device-any network-any data", the 6As model of pervasive computing propounds a new paradigm in convergence and networking. Apart from making a user's life more easy and convenient, the global nature of these applications, their 7*24 ubiquitous access on a PC or a Palm/PDA or cell phone of email, Internet and other data makes them an imperative requirement that will increase revenues, improve customer service and decrease costs in any application.

Nomadic computing

What pervasive devices do is to connect nomadic users. They can access different locations, URLs that point to specific content through barcodes, electronic tags, optical recognition methods and infrared and radio frequency transceivers available on PDAs (personal digital assistants) and laptops through direct or indirect sensing methods.

Any user can monitor his household utility consumption through reports on how the household generates electricity. Data are analyzed by time, appliance and weather conditions to discover trends and generate suggestions about efficiency levels, etc. Even the refrigerator knows when it's running out of lemonade and sends an alert to a system that can tell the grocer to supply lemonade. When returning home from work, the user can remotely switch on the air-conditioner while in his car and create the desired ambience/temperature even before he reaches home. A web tablet that moves from car to home and office and helps a continuum of devices interact and communicate effectively helps achieve this.

Old age home residents and babies in a day-care center can be tracked through a radio-frequency infrared badge that the residents wear. When the button is pressed, an alert is conveyed and the request is relayed to the concerned people at their respective locations. Even the tossing and turning of a child can be tracked effectively.

Pervasive and embedded software

In its essence, pervasive computing uses web technology, portable devices, wireless communications and nomadic or ubiquitous computing systems. The web and the simple standard HTTP protocol that it is based on, facilitate this kind of ubiquitous access. This can be implemented on a variety of devices - PDAs, laptops, information appliances such as digital cameras and printers. Mobile users get transparent access to resources outside their current environment.

New environments can be accessed without requiring a global wireless connection like a cell phone and even without networking with the immediate surroundings. In other words, the infrastructure needed to interact with local users can be minimized to a great extent. Or even made invisible!

A pervasive system is unobtrusively embedded in the environment. The emerging technologies that will prevail in a pervasive environment of the future are wearable computers, smart homes (that can control temperature gauges, control lighting, program a home theatre system and indulge in other activities of home automation), speech and gesture recognition sensors, optical switching devices and imbedded sensors.

For example, a mobile user should be able to print a document at a nearby printer without necessarily having to contact a global service. All they may need is a local web server that helps them discover these local resources without having to reconfigure their devices as they move from place to place.

Lets talk about a few emerging technologies.

Emerging Pervasive (ubiquitous) Technologies

1. Peer-to-Peer (P2P) networking

Napster popularized the application of P2P (peer-to-peer networking) products and now the same technology has begun to sing a business melody. The basic idea behind it being the sharing of files and programs and communicating directly with people over the Internet, without having to rely on a centralized server. What it does is to create private workspaces for sharing files, exchanging information, creating databases and communication instantly.

Companies can now participate in B2B marketplaces, cut out intermediaries and instead collaborate directly with suppliers. Peers on desktop PCs can share files directly over a network. Renting computing power can solve resource problems in smaller companies, thus improving the power of web applications.

2. Nano technology

We've seen science fiction flicks where miniature machines get into the human body and track cell patterns and behavior like those of cancer cells and exterminate them. Molecule sized computers can be manufactured to create new materials that can replace steel in all its properties and even withstand temperatures of 6,500 degree Fahrenheit. It is predicted that these materials will soon be used to build automobiles and office buildings. 'A la' - an invisible infrastructure!

3. Chips and the Net

Net-ready chips are a low cost method of getting on to the Internet. They follow all the necessary Internet Protocols and can be embedded in home appliances that can then be easily connected to the Internet. They function as tags that possess comprehensive information about the object that it is tagged on to and include details like the date and place it was manufactured.

4. Wireless technology

Wireless Internet connection helps access the Net through cellular phones, Personal Digital Assistants (PDAs) and Wireless laptops and this technology proposes enormous business opportunities. The sales force can avail real-time access to inventory records; price lists, order and customer account status and can book a sale almost instantaneously. Constant communication with wireless gadgets (that cost many degrees lesser than a laptop) can ensure that there is a constant feedback loop thus ensuring a new way of reaching customers.

5. The tapestry of distributed computing

Distributed computing is the processing power of thousands of PCs aggregated to create a super computer. A centralized server subsidizes a large computing task in to smaller bits. It then assigns those bits to thousands of desktop computers, each of which does a small task and returns the results to the server. Specialists in content delivery, pharmaceuticals, biotechnology and financial services will see the use of distributed computing capabilities soon. A classic example of how it is being used today is in the SETI@home project. This project is about searching for extraterrestrial using radar arrays that look for intelligent patterns of radio waves among the background radiation. Thousands of volunteers have downloaded the SETI@home screen saver and when their machines are sitting idle, they get data from the project and do some data crunching and send it back for analysis.

6. Voice computing: Tell your computer to switch on!

Voice recognition software will soon allow users to switch on their computers by just talking to them. Even documents can be edited through voice commands. We'll finally be reaching out to the frontier where man will be able to talk to all his machines and command them to do as he wishes.

In effect, we are talking about an e-web or the embedded web where the Internet's role as content provider and shopping assistant morphs into that of companion and advisor. The embedded web with its swarm of sensors and appliances (an insect colony with worker bees) places machines at our beck and call and will take us to the ultimate end in convenience or render all our lives to become a real-life version of The Truman Show.

IBM's pervasive computing lab:

This is a futuristic playground where IBM tests and shows off technology that connects devices in a seamless computing environment. The entire lab and all its rooms are a prime example of a web site. The digital images on display in the picture frames on the living room wall can be controlled remotely. Intelligent countertops in the kitchen recognize bar code labeled stuff and react accordingly.

E-web:

Embedded devices in cars, refrigerators, shop floors, hospital rooms extend the Internet's role beyond content providers and shopping assistants to companion and advisors. The Next-Gen web will be more interactive with a swarm of specialized devices like sensors, and other appliances, all with Internet access and the ability to communicate.

Pervasive computing illustrates a world that we are moving towards, quite rapidly. The promise of 'convenience' implies that islands of technologies will soon converge and simplify life even further. We will finally be witness to the long promised shift to convergence. Computing will no longer be a monopolizing activity that shackles us to our desktops. Basically easier computing that's available everywhere as needed, devices that are going to be easy to use, as simple as calculators and telephones or ATMs. With an extensive range like mobile commerce to home automation, and from the well-connected car to the convenience of small devices, pervasive computing exemplifies a vision beyond the PC. Agreed that some of the technologies behind these devices are in their infancy or evolutionary stages, so it may just be a question of time before all that is promised is achieved.

If what you've read matches with your requirements, please visit us at www.gstiusa.com and share your ideas.