

Intel Suggests New Architecture for Next-Generation Internet

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<u>Intel Corporation</u> described the significant changes that need to be made to the Internet's architecture to make it safer, more useful, reliable and accessible.

In a speech at the Intel Developer Forum, Intel Senior Vice President and Chief Technology Officer Pat Gelsinger said that **by adding an overlay network of computational services to the Internet** - made up of computing and storage resources -- the industry could bring greater intelligence into and across the network core. This would transform the Internet from a data transmission pipe into a vast platform for hosting a wide array of services available to the world's six billion inhabitants. Gelsinger referred to this approach as the ability to provide planetaryscale services.

"These new smart services could allow the Internet to detect and warn of worm attacks on its own, dynamically re-route network traffic to avoid delays and improve video web casting," Gelsinger said. "They could also



be used to make accessibility easier for users in regions of the world where power and connectivity are unreliable at best."

Gelsinger called on the industry and potential users of planetary-scale services to help build a smarter Internet by joining the PlanetLab Consortium. PlanetLab is an overlay network of computational services and an open, global test bed for developing new Internet technologies. One hundred fifty of the world's top universities and industrial research labs are already members of PlanetLab including AT&T Labs*, Cambridge University*, France Telecom*, HP*, NEC Labs*, Princeton University*, and UC Berkeley*, along with national research education networks in Brazil, Canada and China, as well as the Internet 2* organization.

"As more and more processes shift from analog to digital and are dependent on being available anytime and anywhere, the importance of the Internet's resiliency can't be emphasized enough," said Shane Robison, executive vice president and chief strategy and technology officer, HP. "PlanetLab provides Intel, HP and our partners and customers with an environment for testing the next generation of distributed applications and services, and after 18 months of successful scientific trials we are confident that we now can begin deploying and testing revolutionary, planetary-scale commercial services that will change the way business is done on the Internet."

The Public Broadcasting Service* (PBS), a leader in the broadcasting industry, can see the benefits of planetary-scale services for distributing high definition digital content to the PBS system of member stations.

"PBS has already been working with Intel on the design of ACE, an integrated digital system for automating and monitoring the broadcast operations of participating PBS member stations using Hewlett Packard computer systems," said André Mendes, chief technology integration



officer of the Public Broadcasting Service. "PlanetLab gives us the opportunity to take our collaboration further by providing a way of testing and developing system-wide applications like HDTV content distribution."

Upgrading the Internet with Overlays

In outlining the challenges to making the Internet more useful, Gelsinger was joined by Vint Cerf, senior vice president of technology strategy at MCI and widely considered "the father of the Internet" for co-designing TCP/IP protocols and Internet architecture. Thirty years ago no one could foresee the kinds of applications, such as graphical web, video, and voice, the volume of traffic, or the huge number of people and devices that now rely on the Internet.

The Internet was originally designed as an "overlay" network running on top of existing phone and other networks. It is based on a small set of software protocols that direct routers inside the network to forward data from source to destination, while applications run on the Internet to rapidly scale into a critical global service. However, this success now makes it difficult to create and test new ways of protecting it from abuses, or from implementing innovative applications and services.

Gelsinger described how the PlanetLab approach uses the Internet to send data but then integrates a new overlay network of its own intelligent routers and servers on top of the Internet to add new capabilities. Applications run on PlanetLab are decentralized, with pieces running on many machines spread across the global Internet. They can also selforganize to form their own networks, and include some form of application processing inside the network (instead of at the edges), adding new intelligence and capabilities to the Internet.

"A planetary-scale overlay of computational services would open the



Internet up to a new era of innovation while complementing other Internet initiatives," Gelsinger added. "It would provide a platform on which Web services can run and a way to connect grid computing sites and utility data centers. It sits above the new physical infrastructure supplied by Internet 2 and above the networking layer where IPv6 functions, adding a new stratum of higher-level functionality to the Internet."

New Uses, New Users

In an example of how pervasive Internet technology will become, Gelsinger described a joint research project occurring this summer between Intel and BP, one of the world's largest petroleum and petrochemicals companies. Using a wireless sensor network, the companies are providing continuous vibration monitoring of the engines on one of BP's crude oil tankers, the Loch Rannoch, off the Shetland Islands in northern Scotland. Wireless sensor networks, radio frequency ID and other smart tags are examples of how companies will use the Internet and millions of new low-cost devices to help run their factories, manage their entire supply-chains, and collaborate globally. This will drive the need for greater capacity and increased reliability as businesses come to rely on this influx of information to manage both day-to-day activities and develop long-term business strategies.

To bring the Internet to billions of new users, industry researchers are proposing a new generation of low-cost, battery-operated devices for use in regions where people cannot afford a traditional computer and lack reliable connectivity and power. Gelsinger described how planetary-scale services could help these users by supporting new kinds of device connectivity and in-network storage that would mitigate disruptions and delays in transactions. Another intelligence service would be transcoding, the capability for the network to dynamically convert content to a form appropriate to various devices.



More information about the PlanetLab Consortium can be found at http: //www.planet-lab.org.

Source: Intel

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