Research at Intel Day 2009
Technology Zone and Demo Guide

Immersive Connected Experiences Zone

The future of the Internet lies in bringing the richness of visual computing to online experiences that connect people to each other and to the information they seek. This zone will present research in ultra-realistic graphics, natural human-computer interfaces, 3-D Internet, rich social media, and the tera-scale architectural and programming technologies that will enable these computationally intense applications.

Mobility Zone

Life on the go requires anywhere and everywhere access to your digital world. Your mobile device is the vital link between daily experiences. The mobility zone showcases technologies that will help you stay powered and connected for continuous computing as you move about your day. Then, step into the Carry Small, Live Large environments to experience tomorrow's technology - today.

Eco-Innovation Zone

Eco-Innovation begins at home for Intel with responsible product design and extends to the application of technology to tackle the large issues facing us today. In this zone, you will see how Intel's work in energy efficiency could enable significant reductions in power consumed by tomorrow's technology. You will also see an approach to more efficient renewable energy and how technology and social networks can be used to effect positive societal change.

Enterprise Zone

Researchers at Intel Labs are tackling a number of projects aimed at addressing the needs of the Enterprise, from the datacenter to desktop and mobile platforms. In this zone we're highlighting projects aimed at developing a scalable, general purpose Internet infrastructure that can help to preserve privacy and security, while at the same time improving cost and performance.

Immersive Connected Experiences Zone

Real-time Ray Tracing: 3D Water and 3D Display

ICE101 – With the power of upcoming many-core architectures, real-time ray tracing (using the physics of light to realistically render an interactive 3D scene) comes closer and closer to the desktop. In this demo we show the latest innovations from our Real-time Ray Tracing research project, including more realistic 3D water and the ability to render more than 500 animated characters at once. We also show a version rendering multiple camera views on a stereoscopic display, in which viewers can see the 3D depth of the scene without the need for special glasses.

Small Objects, Big Worlds

ICE102 – This project from Intel Labs, China shows how photography can be used to allow amateurs to create rich visual content including 3D objects as well as "mirror worlds," environments that model buildings and other large structures in the real world. One prototype can help users to create a 3D model from real-life images without prior known camera parameters and without any calibration reference. The other can help users to create and navigate a mirror world by using the ever-increasing volume of user-generated and geo-tagged multimedia data.

The Intel Visual Computing Institute: Extending Intel Labs Europe

ICE103 – Last month saw the launch of the Intel Visual Computing Institute, a new hub in Europe to drive innovations such as photo-realistic interactive graphics, 3-D Internet, and data visualization. The Intel VCI is the latest member of Intel Labs Europe, a network consisting of more than 18 labs and more than 800 research professionals. ILE aims to drive even closer collaborations with European researchers on EU initiatives including exploratory research, methods of using information technology to improve the efficiency of industries, and increasing the quality and productivity of information technology overall.

Co-Processor Memory Sharing for Visual Computing

ICE104 – The arrival of Intel's Larrabee co-processor will open new doors for visual computing applications due to its flexibility and programmability. It will also become possible to more tightly couple this co-processor with the main CPU. This research explores memory sharing between the two processors to accelerate the simulation of collisions between "soft" objects in a 3D environment such as a game. The interactive demo uses Sony's open source Bullet physics engine in which the soft-body collisions have be offloaded to a simulated LRB co-processor.

Face-Tracking Enhances Speech Recognition

ICE105 – This demonstration shows an innovative solution to a classic problem: how computer speech recognition can determine whether the user is talking to the computer, or to someone else. Face-tracking software processes video from a camera above the PC screen to determine whether the user is facing the PC or looking away. While facing the PC, audio input and speech recognition is enabled; while looking away, it's muted. This demo highlights the use of two compute-intensive and highly-parallelizable workloads: image processing and speech recognition, and is currently most feasible on multi-core PCs.

ScienceSim.com: Prototyping the 3D Internet

ICE106 – The 3D Internet is a disparate but rapidly converging set of 3D technologies used for visualizing 3D information on the web. This convergence promises to provide a new set of collaborative tools with applications in visualization, education, training and scientific discovery. As part of the Supercomputing Conference this year and working with supporters in the community we have made available a virtual world based on the open source package OpenSim. See the latest visual developments and find out how you can get involved.

Confrontational Computing: Socializing Around Arguments on the Web

ICE107 – "The web" is nearly synonymous with "information." While much of this information is useful, a significant amount could be characterized as false, misleading, or biased. Confrontational Computing is a research project from Intel Labs, Berkeley to create a new tool that makes it easier for readers to pick through this minefield. The tool automatically highlights text snippets that disagree with information found elsewhere. Clicking on a highlighted snippet reveals an argument graph showing the best sources on either side of the issue. The links are maintained by a community of users, creating a new venue for rich interaction.

Parallel@Illinois: Human-Centric Vision of Consumer Applications

ICE108 – Last year, Intel and Microsoft funded the establishment of a Universal Parallel Computing Research Center (UPCRC) at the University of Illinois at Urbana-Champaign with the goal of bringing parallel computing applications to the mainstream. We demonstrate such an application that the UPCRC is working to parallelize in which attendees can participate in a tele-immersive 3D environment. Participants in two separate spaces engage and interact in a 3D virtual environment to complete tasks or play games such as Tele-Immersive Saber Fencing or Tele-Immersive Jump Rope.

On-chip Highways: 2D Interconnect for Tera-scale Processors

ICE109 – The ability to integrate 100s of Intel Architecture cores into future microprocessors will help deliver the power of Moore's Law to new user interfaces and visually compelling experiences. A high performance, resilient, core-to-core interconnect will be as important for these tera-scale microprocessors as a well-designed highway grid is to moving goods and services across a country. We demonstrate a next generation 2D interconnect prototype which provides high data bandwidth and low latencies between cores, memory and I/O. The demo also features our "MCEMU" FPGA-based many-core emulation platform (developed in Germany at Intel Labs, Braunschweig) and a 3D visual interface developed with UC Irvine.

Collaborative Visual Analytics in Virtual Worlds

ICE110 – Virtual worlds are powerful tools for connecting groups of people. At the 2007 Intel Developer Forum, Intel and Qwaq, Inc. announced a development partnership on enterprise collaboration combining Intel's Miramar 3D desktop and Qwaq Forums into a new virtual collaboration environment, thus enabling groups of people to connect with groups of documents. Now, Intel and Qwaq are bringing 3D visualizations into the mix, enabling visual analytics usage models within a collaborative work environment. This connects groups of people with large amounts of complex information for collaborative sense-making and understanding.

Parallel Programming Tools: Enhancing Computer Vision

ICE111 – Creating applications that take advantage of multi-core hardware requires new approaches in parallel programming. We show how innovative tools like Intel® Concurrent Collections and Intel's Ct Technology can aid the development of applications such as computer vision. Concurrent Collections for C++ is a new language, available on whatif.intel.com, that helps to create robust parallel applications. Ct was born as an Intel research effort to extend C/C++ for data-parallel programming. Driven by market demand, Ct Technology is now on its way to becoming an Intel product.

Computer Vision Accelerator

ICE112 – As video cameras are integrated into more and more devices from laptops to phones, computer vision capabilities have become increasingly attractive to enable applications such as gesture-based user interfaces and augmented reality. We demonstrate a functional, reconfigurable hardware accelerator to enable advanced vision capabilities on mobile devices. This research from Intel Labs, St. Petersburg explores the automated design of reconfigurable accelerators based on tools-aided application analysis targeting computationally-intensive media workloads such as the SURF object recognition algorithm.

Also see:

Mobility Zone

Wireless Resonant Energy Link: Efficient Wireless Power

MOB201 – In the past few years, we have experienced a dramatic rise in the number of electronic devices—cell phones, digital cameras, laptops, etc.—that we use in our everyday lives. Most of these devices are powered by batteries which need to be recharged very often. The costs, resources and management of multiple, incompatible power cords, bricks, etc. are already a nightmare for the typical user.   WREL, in contrast to surface-based systems ("power pads"), demonstrates wireless power transfer whose efficiency can be nearly independent of orientation, distance, and load over a wide range of operating conditions. This technology could allow people to cut that last cord.

Enriching the Living Room Using CSLL Across Intel platforms

MOB202 – Mobile computing devices and CE equipment, supporting the Carry Small, Live Large (CSLL) vision, can be used together in a living room to deliver an entertainment experience not otherwise possible when these devices are used alone. The living room environment will show how MIDs and notebooks can uniquely be used with a set top box (STB) and HDTV to wirelessly show photos and videos, interact with applications, and play games.

CSLL and WiMAX Drive Auto Entertainment

MOB203 –Today's personal and in-vehicle entertainment devices are highly incompatible with each other outside of a simple wired connection enabling only rudimentary interactions. In the new mobile world, Mobile Internet Devices (MIDs) supporting the Carry Small, Live Large (CSLL) vision used with Atom-powered, WiMAX™-enabled automobiles, can deliver a personalized, enhanced in-vehicle entertainment experience. Personal preferences contained in MIDs can customize the in-car entertainment experience while WiMAX-based internet services link drivers with the world around them using visual light communications to enable exciting new safety, entertainment and communication experiences for tomorrow's automobiles.

CSLL Composition and the Collaborative Office

MOB204 – Most everybody in business today has been negatively impacted through the inefficiencies of conference room meetings that are hampered by passing projector cables between presenters, if within reach, and initiating conference calls. Using wireless display and mobile device-to-speakerphone dialing enabled by CSLL, users can have more effective meetings by seamlessly switching between presenters and more easily establishing conference calls.

Everyday Sensing and Perception

MOB205 – The ability to perceive user context (e.g., their location, activity and social interaction) is an essential ingredient of future mobile devices. Such devices could remind you to take medications before a meal, step you through jump-starting your car or alert you that you're speaking to your son's coach. However, understanding detailed context accurately over most of a user's day is beyond current systems. The Everyday Sensing and Perception (ESP) system integrates a novel wearable sensor-augmented video camera with state-of the art perception algorithms into one of the first systems that can parse much of daily life at a useful level.

Bringing Mobility to Virtual Worlds

MOB207 – 3D virtual worlds offer great promise as collaborative meeting spaces. However, today's systems are not tuned for mobile devices nor do they let you transfer a session from a mobile device to a larger computer when one becomes available. In this demo, we show how a user can initiate a virtual world session on a mobile device and transfer that session to a more powerful computer and display when available. We also show how virtualization from a MID to a desktop computer can be used to improve the application runtime performance on the mobile device. The capability is secure, convenient and enables mobile activities to move between physical locations.

CSLL and Seamless Transitions in the Classroom

MOB208 – Sustained technology use in classrooms is hampered by difficult moments of transitions, which take time and distract from the core activity of learning. These transitions happen between lessons, individuals, study groups, and classroom-wide activities. Composition and CSLL enables mobile devices such as the Intel Classmate PC to dynamically share their clipboard and storage for collaborative learning, and then seamlessly transition to front-of-the-class presentations using wireless display technology. This demonstration brings together education and composition to enable technology-assisted education in the classroom, primarily focusing on using platform-based context sensing to facilitate fluid device compositions.

VoIP Capacity Improvement for Next-Generation WiMAX Networks

MOB209 – Next-generation mobile networks will significantly improve both data and VoIP capacities over 3G systems. With increased use of data and VoIP services on 4G networks such as WiMAX, VoIP capacity may become a challenge. An Intel-first prototype showcasing the technology, this demo features a Group Scheduling technique adopted in IEEE 802.16m, the next-generation WiMAX standard, and provides up to a 40% increase in VoIP capacity, before considering additional spectral efficiency gains achieved in the 802.16m specification.

Clone Cloud: Augmented Smartphone Applications Through Cloud Execution

MOB210 – Small mobile devices such as smartphones are limited in processing capability as well as battery life. However, users expect them to deliver ever more powerful capabilities to augment an on-the-go lifestyle. Clone Cloud makes it possible to execute applications of resource-starved devices by opportunistically off-loading computation to available cloud resources in nearby datacenters. The idea is simple: clone the entire set of data and applications from the smartphone onto the cloud and selectively execute some operations on the clones, reintegrating the results back into the smartphone. CloneCloud brings the power of the datacenter to your finger tips.

Client Cooperation in Heterogeneous Wireless Networks

MOB211 – With increasing demand for new wireless services and applications, wireless networks are continuously growing in density and becoming more heterogeneous. This demo illustrates innovative system design techniques around a cooperative communication paradigm that leverages network density and heterogeneity as new resources rather than treating them as sources of network congestion resulting in 100-200% spectral efficiency improvement in WiMAX. Recent Intel publications on this research gained significant external recognition in the academic community for their quality and originality resulting in three best-paper awards at IEEE ISSSTA 2008, CROWNCOM 2008 and IEEE GLOBECOM 2007 conferences, and parts of the resulting intellectual property have been adopted by the IEEE 802.16 standard.

Also see:

ICE106	ScienceSim.com: Prototyping the 3D Internet
ICE112	Computer Vision Accelerator
ECO301	Communication Assisted Platform Power Management
ECO302	Common Sense: Mobile Community Sensing of Environmental Data
ECO303	Platform Power Management
ECO306	Ultra-low Voltage Scalable Graphics SIMD Vector Processing
ENT402	Improving Privacy for Wireless Device Users

Eco-Innovation Zone

Communication Assisted Platform Power Management

ECO301 – Intel's energy efficiency research is showing how we're reducing overall platform power demands while maintaining high performance. Our research is taking a holistic approach to power management from the network to the platform for extended battery life. This Comm based technology creates idle durations by aligning Tx, Rx and I/O break events allowing the CPU and platform to get into a low power state faster and stay there longer. This synergistic approach to power management is resulting in up to 30% CPU power savings for various workloads.

Common Sense: Mobile Community Sensing of Environmental Data

ECO302 – The rise of social networking and the ubiquity of mobile devices offer unique opportunities to create new usage models and drive innovative new services. Intel researchers are exploring how mobile devices can be extended to include environmental sensors so that large amounts of data can be collected and shared by everyday users throughout the world. This new data could influence environmental policy and regulations as well as enabling significant new scientific and medical research. This demo showcases our new prototype personal mobile device that everyday users can carry to collect air quality data and a website that allows everyday users to visualize and discuss environmental data.

Platform Power Management

ECO303 – Intel research in platform power management is a new approach to power management that is poised to deliver dramatic reductions in power to future Intel products. While Intel and others have continued to improve the efficiency of various platform subsystems, efforts to achieve significant reductions in total power consumption have been hampered by the inability to broadly modify behavior across the platform. By researching a new framework for power management that coordinates behavior across the platform we have been able to demonstrate dramatic power reductions in a single generation of product which traditionally would have taken multiple generations to achieve.

Organic Photovoltaics for Low-cost Renewable Energy

ECO304 – Future generation organic photovoltaic (OPV) technology holds the promise of ultra low-cost renewable energy because of its potential for high-speed manufacturing in roll-to-roll printing production. OPV's are also light-weight, thin, and flexible for ubiquitous use. However, current capabilities are limited to < 1 cm² sizes due to the critical dependence on nanoscale morphology of the organic material. To solve the manufacturability problem, hard templates are introduced into the OPV device structure to scaffold the organic inks. The templates can be produced in high volumes and work well as a mold for the organic ink solutions.

Energy Efficient Services Using Sleep State Networking

ECO305 – Emerging "anytime" device usages pose a difficult choice for consumers: either having a fully powered ON system which is energy inefficient and costly; or, shutdown their systems to conserve power which prohibits "anytime" services access. Our technology allows devices to enter standby (S3) sleep state while maintaining full network presence, and waking up the system on network service requests, saving 40+ TWhr over 100 million devices. Our demo showcases SIP (Ethernet) and 802.11 wireless low-power proxying, as we lead the industry to develop Ecma energy-efficiency "Network Proxy" standards, poised to intersect impending US Energy Star and EU regulatory environment.

Ultra-low Voltage Scalable Graphics SIMD Vector Processing

ECO306 – Delivering great graphics performance on phones or handheld computers is challenging because of the limitations of integrating high performance components in a small, battery operated device. One technique to get around these limitations is executing multiple computing instructions at once (called SIMD, or Single Instruction, Multiple Data) so that the onscreen graphic images are done faster. Intel researchers have developed an ultra-low voltage SIMD Accelerator that is 10 times more energy efficient than today's techniques, and 80 times more energy-efficient when running at ultra-low voltage modes. This advancement could enable richer multimedia and more immersive visuals, particularly on Mobile Internet Devices and other small devices in the future.

A Network Proxy to Reduce End-System Energy Consumption

ECO307 – Networked end-systems such as desktops and set-top boxes are often left powered-on, but idle, leading to wasted energy consumption. Switching these idle systems into low-power sleep modes is challenging because first, a sleeping device loses its network "presence" which is problematic to users and applications that expect to maintain access to a machine and, second, sleeping can prevent the running of tasks scheduled during times of low utilization (e.g., backups). Intel, with our collaborators at Lawrence Berkeley Labs and U.C. Berkeley, has designed a network proxy that handles network traffic on behalf of a sleeping machine, thus maintaining its network presence while maximizing its sleep time.

Enterprise Zone

Identifying Insecure Applications That Leak Private Data

ENT401 – Users expect networked applications (such as on-line shopping sites) to treat their private data responsibly and to protect it, but the truth is that many applications actually have "leaks" that allow private data to escape. To address this concern, and give end-users some control, Intel researchers are developing a tool that detects "leaky" systems and warns the user before they actually submit their private information. We call the tool Privacy Scope. Come see the demo of how Privacy Scope runs along with a browser and can help keep users' private information private.

Improving Privacy for Wireless Device Users

ENT402 – Wireless devices are becoming pervasive and personal (e.g. cell phones, GPS systems, health monitors) and, with this, users are becoming increasingly concerned about maintaining their privacy and security. Unfortunately, even today's best security practices don't adequately preserve privacy and leave users vulnerable to tracking, profiling and inventorying attacks. This demo presents an 802.11-like protocol that protects users' privacy by concealing all identifying bits. Intel is working with the IEEE 802.11 community to standardize this technology.

Defending Enterprises Against "Data Poisoning" Attacks

ENT403 – Enterprise security solutions are beginning to rely heavily on the use of data mining techniques to help defend against malicious Internet threats. However, in response, Internet attackers have begun utilizing a new technique called data poisoning, whereby they purposefully inject erroneous data into the system during the data mining, collection, and profile-building phases in an attempt to thwart such defenses. Now Intel researchers are responding by developing new threat mitigation techniques. Come to this demo and see how we are countering the data poisoning threat by leveraging techniques from the field of Robust Statistics.

Automated Classification of Malware Threats

ENT404 – The rate at which new types of malware are being developed and deployed is staggering. Some are variations of existing threats for which there are existing solutions (aka signatures), and some are new threats for which there are no signatures. At present, most of the capture, analysis, and characterization of this malware is being done manually, which takes a long time and delays signature updates to Antivirus clients, allowing the malware more time to spread. In this demo we present a method for using behavioral analysis to automatically classify malware threats thereby enabling faster generation of signatures and threat mitigation.

Distributed Applications With Adaptable Security

ENT405 – Today, application developers have to choose at design time the cryptographic tools and protocols they need to achieve end-to-end security. This hard-coding is inflexible and prevents applications from adapting securely to the computers and networks they run on: different choices make sense on wireless MIDs versus wired servers. The Middleware for Optimized Messaging in Insecure Environments research project addresses this inflexibility by picking at runtime the optimal cryptographic tools based on specified security guarantees, policy, and available computing/communications hardware. As a result, hardware and software innovations are readily absorbed by existing applications, while end users get secure, high-performance software.

End-to-End Internet Security

ENT406 – Currently, performing cryptographic operations in order to secure internet traffic is very expensive in terms of both cost and performance impact, so many networks aren't even doing it. This means that the data traffic on these unencrypted networks is exposed to hackers and other folks that would use it in malicious ways. This research project is addressing this issue by developing a uniquely affordable method for doing end-to-end internet data integrity and encryption that doesn't impact performance. The result will be more networks with end-to-end security running at full speed and giving end users increased peace of mind.

Getting the Most out of Solid State Drives in the Data Center

ENT407 – IDC predicts that Solid-State Drives (SSDs) will experience a combined annual growth rate of 227%, from 2007-2012, and will be mixed with hard disk drives in the data center. Unfortunately, without a new storage interface, such hybrid storage pools cannot take maximum advantage of the performance of SSDs. Come to this demo to see how Intel and LSI are addressing this issue by collaborating on a project called Differentiated Storage Services (DSS) which defines new file system management capabilities that in some cases could enable substantial performance gains for hybrid storage pools.

Router Bricks: Enabling General-Purpose Network Infrastructure

ENT408 – The inflexibility of the Internet's infrastructure is a growing concern within the computer science community. Simply put – the Internet's original designers never anticipated its astounding success. Consequently, traditional network design built networks using specialized equipment (routers) with "hard coded" support for a pre-defined set of capabilities. This approach can no longer keep pace with the rapidly-evolving demands of new applications. Router Bricks proposes a simple but radical solution – that networks be built from general-purpose computers rather than specialized equipment. The project is building high-speed routers from clusters of servers running open-source software. Ordinary programmers can thus cheaply and rapidly (re)program networks using the platform they are most familiar with—the general-purpose computer.