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Cool Vendors in Emerging Trends and Technologies, 2005

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Vendors are working on technologies that tame complexity. Emerging sensor networks will need location sensing to succeed. New software architectures will require sophisticated new debugging tools. The life sciences field remains a fertile area for IT.

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Management Summary

This research does not constitute an exhaustive list of vendors in any given technology area but rather is designed to highlight interesting, new and innovative vendors, products and services. Gartner disclaims all warranties, express or implied, with respect to this research, including any warranties of merchantability or fitness for a particular purpose.

Three of the companies we examine — Exavera Technologies, Dust Networks and Impinj — have technologies important to the development of sensor networks and location technologies. Sensor networks will drive the number of network-connected devices up by several orders of magnitude during the next decade. Knowing where these devices are will be critical to their deployment and use. Although these companies are focused on short to midterm revenue today, they are all developing intellectual property and market segments that will naturally draw them to location-aware networks. They are particularly interesting as all three are privately held and represent acquisition or closed investment opportunities.

ZealCore has tools that can assist in debugging complex software environments of the type we expect to see as software technologies scale out in complexity through the implementation of service-oriented architectures. These new architectures will be needed to deal with the data provided by sensor networks. Teranode is a company applying design automation to life sciences. Its tools allow scientists to better understand biochemical reactions. Life sciences will continue to represent an IT frontier for many years to come, and controlling the costs of managing large-scale systems will be a critical factor in advancing IT in life sciences.

XenSource instantly came to the forefront of hypervisor technology when Intel and AMD announced imminent hardware support in March 2005. The hypervisor promises to be as ubiquitous as the PC basic input/output system (BIOS), and will change the shape of PC software. It is a critical component for the scaling out of computer systems through another two orders of magnitude. It could turn out to be the coolest vendor of the year. Clairvoyante has innovative display technologies that can deliver more visual information at lower costs, improving the ways in which we interact with our computers.

1.0 Exavera Technologies

Exavera Technologies, Portsmouth, New Hampshire (www.exavera.com) — Exavera Technologies is a privately held company that delivers tagging solutions into healthcare applications. Exavera's system tracks the location of doctors, patients, hospital staff and assets such as drug pumps, defibrillators and wheelchairs. The system can take specific actions based on, for example, a doctor approaching a patient's bed. The patient's records can be loaded into the doctor's handheld for immediate review. Expensive assets can be better managed, and record keeping can be materially improved. Exavera is in the process of field trials for its products; succeeding in these trials represents the major challenge for Exavera.

However, the most intriguing thing about Exavera is the location technology. Exavera's tags are like thick credit cards, and they use an internal battery to transmit regular ID pulses. Exavera's 802.11b/g access points include receivers to detect these signals and report them back to the control system. The control system uses the signal-strength reading at multiple locations to deduce the location of the tag. The tag represents a middle ground between radio frequency identification (RFID) and a sensor node, and many things about Exavera's technology will seem familiar as location services become mainstream during the next five to 10 years.

The cool thing about Exavera is that it has a business model that supports this technology deployment today and will continue to drive refinement of the technology. Succeeding In selling the value proposition to hospitals will determine the midterm success of the company. This success will ultimately depend on open standards for location detection and reporting, which Exavera could drive. Although healthcare represents a major opportunity, Exavera has the potential of becoming a key player in location services technologies.

Analysis by Martin Reynolds

2.0 Dust Networks

Dust Networks, Berkeley, California (www.dustnetworks.com) — Dust Networks is a privately held wireless sensor network company. Sensor networks will extend the reach of IT systems, giving them a new connection with the physical world. Founded with research conducted at Berkeley, Dust Networks does not use the TinyOS software system that underpins most other efforts. TinyOS nodes are always on and ready to transfer messages. Dust Networks' nodes drop into a deep sleep for a preset time and transmit or transfer messages only during wake time. The sleep period is dynamically adjusted to optimize the network use, latency and power. This approach allows Dust Networks to build extremely low-power nodes that can run for several years on a small battery, giving them a jump in capability that competitors will have to wait for Moore's Law to deliver.

Although Dust Networks can support specific applications, the company's goal is to deliver components and management tools for a wireless fabric that can be integrated into any remote-sensing environment. Dust Networks' initial target market is building automation and process monitoring, in which the device count is relatively low but the return on investment high. The company is deploying small-scale installations today. Dust Networks' greatest challenge will be moving from manual to automatic location of sensors, which will dramatically increase the market opportunity. Dust Networks' coolness comes from the need to develop location technologies ahead of the market to grow its solution "footprint."

Analysis by Martin Reynolds

3.0 Impinj

Impinj, Seattle, Washington (www.impinj.com) — Impinj is founded on technology that enables nonvolatile memory to be built into a standard complementary metal-oxide semiconductor (CMOS) process. Other nonvolatile technologies compromise cost or performance of a standard CMOS process by adding nonstandard materials and processes. Impinj's technology requires more space than traditional technologies, so it is most useful in applications in which only small amounts of memory are required. Impinj's original application was to use this memory to build precision tunable analog transistors. The tuning capability allows a dramatic reduction in the size and cost of precision analog devices. Chips built using this technology could, for example, make cellular base stations less expensive, smaller and more efficient. However, the market economics of RFID are proving more attractive, and Impinj has changed its focus. In RFID, the company can combine its storage and analog technologies into tags that can read and write their nonvolatile memory inside the tiny power budgets of an RFID tag. The ability to build these storage devices on an unmodified CMOS process presents a significant cost advantage.

Impinj is cool for several reasons. First, it took a novel technology and built a suite of applications and patents to build a licensing business. This licensing business provides an ongoing revenue stream from technology developments. Impinj has grown its revenue from $1.2 million in 2003 to $2 million in 2004. Second, it took those technologies and directly entered the RFID tag business, engaging with the industry to converge its technologies with future RFID standards. Its influence on the Generation 2 (Gen2) RFID standard underscores its ability to gain credibility in this market.

The company's challenge is the adoption rate of RFID, and Impinj's specific technologies. Impinj must further extend its roster of large clients (such as major retail chains) and demonstrate to future investors that it has the sales and marketing team necessary to extend the business. In the long run, Impinj's technologies are important to RFID but may well prove more valuable to the world of sensor networks.

Analysis by Martin Reynolds and Anne-Marie Roussel

4.0 ZealCore

ZealCore, Vasteras, Sweden (www.zealcore.com) — ZealCore has developed an interesting technique to monitor and debug single-tasking, multitasking, multiprocessor and distributed real-time systems. The technique is different from debugger technology from companies such as Green Hills (www.ghs.com), ARM (www.arm.com) and Wind River (www.windriver.com) in that it is based on a software component — the logger (BlackBox Recorder) — which becomes an integrated part of the system under test. This means that it is possible to reproduce the system in the development phase and in the field operation phase. The ability to identify bugs and reproduce system behavior when something happens in a "delivered" system is a key differentiator in ZealCore's technique. ZealCore believes the overhead of integrated logging is between 0.5 percent and 2 percent of CPU (based on 70 tasks, 2.5 million lines of code). The BlackBox products do not require special hardware, special operating systems or debuggers.

ZealCore's technology can be used pre- or post-deployment to identify problems, undertake preventive maintenance or for performance tuning. During runtime, a recorder monitors and stores information that can be re-executed offline, which allows for in-depth inspection and analysis. Interrupts, task switches and data can be reproduced and the system debugged forward and backward in time corresponding to the machine code instructions when the events occur. This enables testing for intricate timing problems, hard-to-reproduce failures and intermittent functional errors. The technology is especially applicable in high-availability and safety-critical systems, such as medical systems, avionic applications and industrial automation systems.

The company has a small number of clients in the industrial automation and transportation industries. The company faces competition from well-established companies, such as Green Hills (www.ghs.com), ARM (www.arm.com) and Wind River (www.windriver.com). In 2003, those three companies held 69 percent of worldwide debugger market share (more information may be obtained in "Market Trends: Embedded Software Development Tools and RTOS Markets Show Growth, Worldwide, 2003," G00126220). However, if ZealCore can rise to the challenge of developing debuggers for service-oriented architectures, it could move itself into a new fast-growing segment of the application development market.

Gartner anticipates a revolution in software architectures during the next decade, as service-oriented architecture development, virtualization and scale-out infrastructure technologies combine to create large, parallel-execution environments in which application logic paths are flexible, dynamic, distributed and parallelized. Tools using technologies such as those provided by ZealCore will become essential for deploying, debugging, tracking and maintaining these new style applications.

Analysis by Alan Mac Neela

5.0 Teranode

Teranode, Seattle, Washington (www.teranode.com) — Teranode is a privately held company established in 2002 to bring technologies invented by the founders while at the University of Washington to the life sciences market. Teranode Design Suite is an informatics platform for scientists performing drug research. It consists of the Protocol Modeler — used to graphically

design protocols for lab procedures — and Biological Modeler — used to map biologic systems and analyze experimental data. Together, these tools provide a closed-loop system for researchers to plan and execute experiments.

Today, biopharmaceutical researchers are challenged by the sheer volume of data created from the study of genomics, proteomics and metabolomics, to name a few. Many large, public databases exist, but information is not described in a common format and is not easily accessed by a researcher who might want to know, for instance, the properties of a certain protein. Being able to quickly access prior art and use known information to design experiments can reduce duplicate procedures and shorten the time it takes to create the experimental protocol. In addition, most experimental data is captured in spreadsheets that are difficult to manage. Since there is no way to record information about the parameters of the experiment, the data captured is not reusable by other researchers who might want to perform a similar experiment.

Teranode's products draw on a paradigm that became popular in the late 1980s and revolutionized electronic product design. Researchers can create a model that simulates what they think will happen in an experiment, compare the results they get to the results they expected, and update the database of results with these changes. They can also use the tool to develop estimations of the best experiments to run. This information can be searched by other researchers, so the intellectual property gained is captured and collaboration is increased. This approach reduces the number of actual experiments that must be conducted, requires fewer resources and costs significantly less. The end result is shortening the time and expense of bringing a new drug to market.

Unfortunately, the life sciences market is flooded with vendors that claim to provide improved tools for drug discovery. Research managers often have their own discretionary budget and can purchase applications without counsel from the IT organization on how many similar tools may already be in use or how well a tool fits into the information management infrastructure. Teranode's customers are notable organizations, such as Massachusetts Institute of Technology, Pfizer and AstraZeneca. For continued growth, they will need to capitalize on the customer references they have and execute marketing strategies that allow them to cut through the noise of a busy market.

Analysis by Carol Rozwell

6.0 XenSource

XenSource, Palo Alto, California (www.xensource.com) — XenSource is a company founded to deliver the results of the Cambridge University Xen project, an open-source hypervisor. A hypervisor is a thin layer of software that runs at the hardware level of a system. Operating systems run on top of the hypervisor, but to them, it looks like hardware: it fully emulates the system platform. Hypervisors provide the necessary security and partitioning to run multiple operating environments in parallel on a single system. This technology is already common in servers using software emulation products, such as VMware and Virtual Server. Hypervisors will pervade all computing environments during the next five years, improving security, flexibility and manageability. Hypervisors are critical to reducing hardware management costs, drawing maximum value from IT investments and building massively scalable systems (tera-architectures). Until March 2005, Xen was a curio, fascinating in concept but useless to mainstream IT. Its sophisticated virtual machine management systems worked only with specially recompiled operating systems; should Xen succeed, however, we may see operating systems designed to work this way, because there are significant feature and performance advantages to be gained. However, it is designed to provide all other hypervisor features and is well-developed from that perspective. In March 2005, Intel announced the introduction of its Vanderpool hardware virtualization technology. This technology gives Xen the ability to support any operating

system. Xen is small, with only 50,000 lines of code. This simplicity and its open-source license bode well for security and stability. Its availability will drive innovation across computing platforms. The product could become as common as the PC BIOS is today. XenSource's goal is to provide services and support to help companies implement Xen-based systems. The ubiquity of Xen drives this business model, so the open-source zero-revenue model becomes a benefit rather than a cost. XenSource has backing and support form Intel; IBM; HP, AMD and others. It's really cool.

However, XenSource faces many challenges. First, it must demonstrate that Xen technology can insert into target platforms without compromising performance, reliability or supportability. Second, it must ignite an ecosystem of technology providers that plug into the Xen environment, enhancing platforms without changing one bit of the system image that runs in the platform partitions. Third, it must deal with an inevitable assault from Microsoft: Xen is a threat to Microsoft potentially greater than that posed by Linux.

Analysis by Martin Reynolds

7.0 Clairvoyante

Clairvoyante, Cupertino, California (www.clairvoyante.com) — Clairvoyante develops enhancement technologies for liquid crystal displays (LCDs). Currently, these technologies allow LCDs to use fewer pixel cells to deliver identical visual resolution (that is, as perceived by the human eye). Clairvoyante achieves this result by matching color emission and resolution to the receptors in the human eye through panel geometry and conversion algorithms. LCD panels become more power-efficient and cost less to make. High-resolution displays could one day allow users to use electronic displays more efficiently than paper hard copy. The major barrier to such developments has been operating system software designed for 100-pixels-per-inch (ppi) resolution. Using higher-resolution displays simply makes text, icons and features too small for most users — even with the limited scaling adjustments available in Windows today. This problem will evaporate in 2006 when Microsoft releases Avalon, a fully scalable display interface that will make the resolution of the human eye the limiting factor in display resolution. Clairvoyante's technology will be of greater value to users in these new displays and offers greater returns to the manufacturers than when used with smaller displays. The company is cool because it could materially advance the deployment of high-resolution displays.

The main challenge that Clairvoyante faces is convincing LCD panel manufacturers to acquire its license. The LCD business is cutthroat, and every penny of cost is scrutinized with an evil eye toward the suppliers, even though the end result cuts costs. On another front, Microsoft's "ClearType" technology provides some benefits that Clairvoyante delivers, although there is no cost savings and the results sometimes have obvious color fringing. ClearType may not be as good, but it represents an obstruction.

Analysis by Martin Reynolds

8.0 Conclusions

Some of the best investment opportunities come from pre-revenue and pre-initial public offering companies. We present five companies with potential beyond that of their current target markets. In each case, the technology ties to the continued penetration of technology into new areas and the massive proliferation of connected devices. Exavera, Dust Networks and Impinj have technologies that will contribute to the proliferation and management of sensor node technologies. ZealCore has debugging tools that could extend to complex, decoupled computing systems that are just emerging now. And Teranode creates tools to manage complex data sets.

Appendix A. Acronym Key

BIOS	basic input/output system
CMOS	complementary metal oxide semiconductor
Gen2	Generation 2
LCD	liquid crystal display
ppi	pixels per inch
RFID	radio frequency identification

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