



Capturing the Big Data Explosion

The Age of Big Data, Intelligent Systems, and the Internet of Things

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The market for Big Data is exploding. Billions of devices connected to the Internet of Things are accelerating a new era of data analytics that promises to revolutionize efficiency and create industry-shifting services. Intel believes that this year marks an inflection point when these Big Data opportunities will move into mainstream use across a broad range of markets including automation, energy distribution, retail, healthcare, and more.

But with all this Big Data comes big challenges in the development and management of the connected devices collecting the data and, in many cases, providing first-stage (edge) analysis. Intel and the 250+ global member companies of Intel® Intelligent Systems Alliance are leading the industry forward, collaborating closely to deliver solutions that provide the necessary:

- Intelligence to respond to data
- Interoperability to exchange data
- Security to protect systems
- Manageability to reduce total cost of ownership (TCO)
- Diverse ecosystem to meet the needs of different verticals and applications, as well as work cooperatively with each other to deliver complete solutions

A Convergence of Smart Analytics, Intelligent Systems, and Big Data

Billions of devices are making trillions of connections to the Internet of Things, providing unprecedented opportunities for Big Data to improve lives and revamp entire industries. The stakes are huge for designers and developers. An IDC study sponsored by EMC Corporation, “The Digital Universe Decade—Are You Ready?” estimates the amount of digital information created and replicated worldwide will grow to more than 35 trillion Gigabytes of data. Intel estimates that this will lead to \$3 trillion USD in new business opportunities (Figure 1).

Realizing this opportunity requires the collection and processing of a vast amount of data at every step in the system—from sensor controllers to edge gateways, from cloud to client. In particular, this revolution requires using smart analytics

solutions to distribute analytics between intelligent systems at the edge and Big Data solutions in the data center to quickly, efficiently, and effectively deliver business intelligence, efficiency, and value.

An excellent example is the disruption underway in manufacturing. Factory operational technology (OT) and information technology (IT) are combining to create Enterprise Resource Planning (ERP) systems and Manufacturing Execution Systems (MES) that connect the factory floor with the supply chain, enabling automation that extends to ordering, inventory, distribution, financial projection, and more. This level of automation is driving demand for intelligent systems that can overlay legacy control equipment with new classes of industrial IT and services, such as

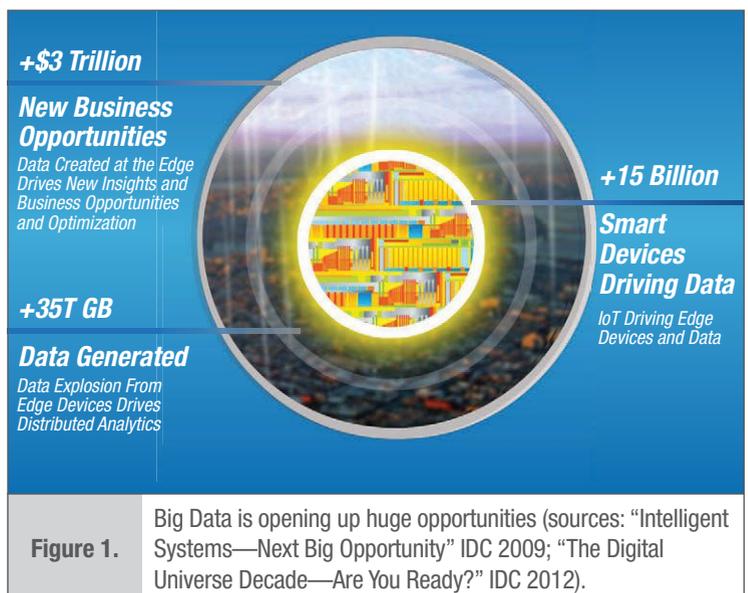


Figure 1. Big Data is opening up huge opportunities (sources: “Intelligent Systems—Next Big Opportunity” IDC 2009; “The Digital Universe Decade—Are You Ready?” IDC 2012).

data node and acquisition devices, data hub processing, industry data center servers, and machine-to-machine (M2M) gateways that will enable all this data collection, connectivity, and analysis.

Tapping the Opportunity

Tapping the full potential of Big Data requires industry co-innovation across three pillars (Figure 2):

- Intelligent systems that are the root of Big Data and enable acquiring this data securely and performing local analytics and filtering
- Smart systems of intelligent systems that enable seamless interfaces, ensure interoperability between edge systems, and secure and federate data between cloud and edge for analytics
- Smart analytics that create value from data across the systems of intelligent systems, provide horizontal building blocks for vertical end-to-end analytics, and distribute analytics at edge systems and in the data center

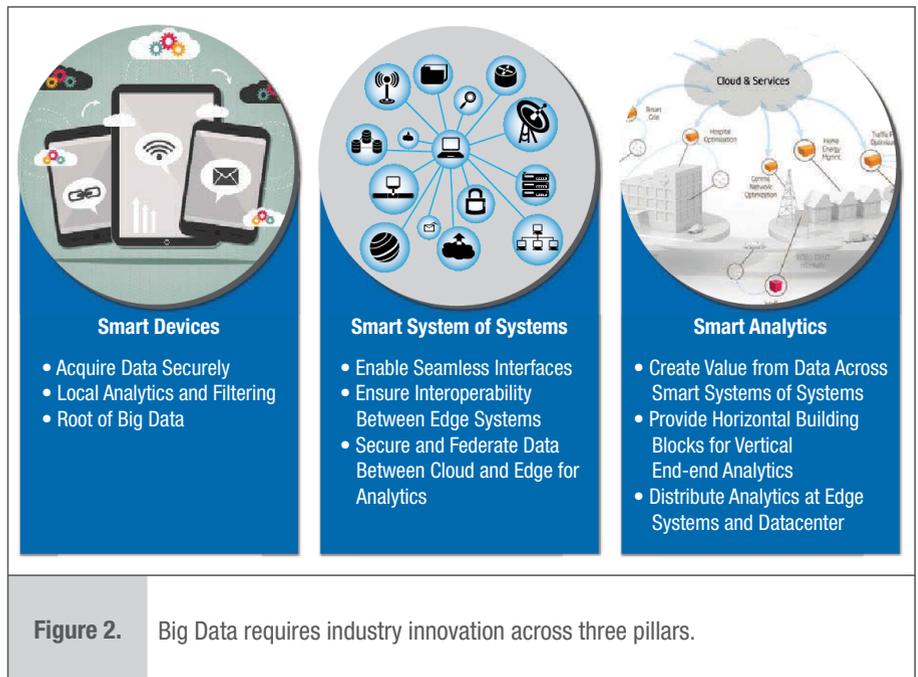
To succeed, this new generation of intelligent solutions must be highly flexible in order to address long-standing challenges, including industry fragmentation, diverse usage models, legacy environments, complex interoperability needs, and requirements to meet both global and local market needs. The solutions must also be designed to minimize security and reliability risks. The widespread communications required for Big Data will not be accepted without top-notch security. And once Big Data enables services that people depend on, it is a big problem if those services go down.

What Intel is Doing

Intel and the Alliance are working together to overcome these challenges, delivering solutions that provide the necessary performance, security, interoperability, manageability, and flexibility to usher in this new age of Big Data. A perfect example of these solutions is the new Intel® Retail Client Manager (Intel® RCM), which is bringing the benefits of Big Data to the digital signage market (Figure 3). Using Intel RCM, operators can broadcast marketing campaigns across distributed signage networks from anywhere. As illustrated in Figure 3, content can be adjusted in near real time based on weather conditions, shopper preferences, inventory levels, and other data gathered from the cloud.

Edge analysis plays a key role as well: Intel RCM can be used in conjunction with Intel® Audience Impression Metric Suite (Intel® AIM Suite), which detects viewer characteristics such as age and gender to play demographic-specific advertisements. Audit trails including view rates and customer interactions are fed back to the cloud, allowing operators to fine-tune campaigns.

Intel RCM is currently available through Seneca Data and Avnet, both Associate members of the Alliance. These systems integrators support



Intel RCM with a robust set of products and services, offering everything from off-the-shelf signage players to software integration to physical installation services. This world-class support transforms signage deployment from a time-consuming, piecemeal process into a rapid, turn-key rollout.

Intel and members of the Alliance are continuously working together to bring holistic solutions like this to the full range of Big Data applications. Key focus areas for Intel and the Alliance include:

Intelligence to respond to data—Alliance hardware and software solutions benefit from Intel's continuing ability to pack more performance into less space with greater power efficiency. For example, the Intel® Advanced Vector Extensions (Intel® AVX) 2.0 introduced in the 4th generation Intel® Core™ processor family deliver a 2x increase in peak floating-point and fixed-point throughput, significantly speeding up edge analysis for applications such as machine vision.

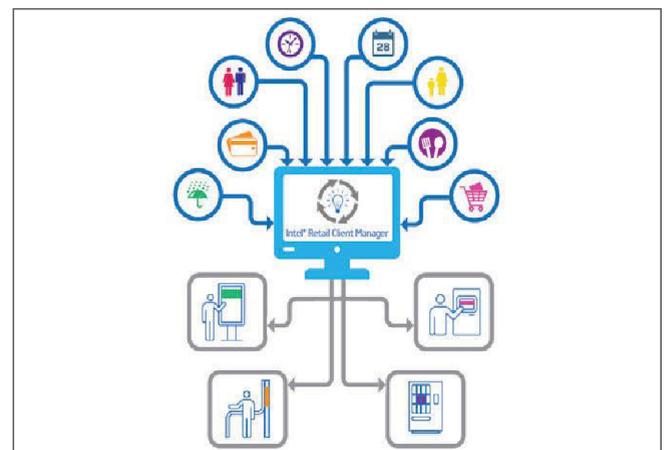


Figure 3. Intel® Retail Client Manager brings the benefits of Big Data to digital signage.



Moving deeper into the Internet of Things architecture, the new Intel® Xeon® processor E5-2600 v2 family offers an unprecedented 20 cores in an embedded two-socket configuration, providing excellent performance for packet processing and other high-performance applications. As the first multi-socket processors to use Intel's state-of-the-art 22 nm fabrication process, the Intel Xeon processor E5-2600 v2 family delivers a 25 percent greater core count in the same thermal design power (TDP) as the previous generation.

These performance upgrades are opening up exciting new opportunities across a range of markets. In the medical imaging market, for example, Alliance members are putting the performance to work in everything from portable ultrasound equipment to advanced molecular imaging—see page 12 for details. And in the mil-aero space, Alliance members like General member Curtiss-Wright are using the new processors to deliver supercomputer performance in mil/aero platforms (see page 9). Best of all, these performance upgrades are easy to leverage thanks to development tools and libraries from the Alliance. See page 28 for one example from Affiliate member company N.A. Software.

Interoperability to exchange data—Among the biggest problems today in realizing the Internet of Things is poor interoperability among individual devices and systems. Designers must spend untold hours analyzing and verifying connections and operation as new devices are added to a network. Intel® architecture-based solutions, offering a wide range of scalability in standards-based form factors, can be used to connect non-interoperable legacy systems together and provide a flexible platform for supporting many different protocols, data formats, and interfaces.

For a great overview of how Associate member Radisys is using IA-based blade technology to enable interoperable software defined networking (SDN) and Network Functions Virtualization (NFV), check out their article on page 22. And for additional insights on network infrastructure, Premier member Advantech explains how Intel server-grade processors can accelerate video traffic on page 17.

Security to protect systems—The 4th generation Intel Core processor family offers a wealth of security features to help protect the platform and data transfers. Intel® Platform Protection Technology enhances security through the bootup process via a root of trust based in the hardware and extends this safe boot capability to virtual machines. It also protects system BIOS against stealth attacks and unauthorized updates. Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI) enables fast hardware-assisted data encryption to the disk and for transfers without slowing response times. Intel® Virtualization Technology (Intel® VT) protects memory space in hardware and helps prevent attacks from malicious software when used with appropriate software. In addition, Intel is continuing to work with Associate member McAfee, a wholly owned subsidiary of Intel globally recognized for its proactive and proven security solutions, to develop hardware-enhanced software security like McAfee DeepSAFE Technology*.

These and other security features are already proving their worth across many market segments. To see how Alliance members are

putting them to work in the connected store, turn to page 42 for “Upgrade Point-of-Sale for the Online Age.” And to learn how Associate member Wind River is helping developers secure the smart grid, see page 33.

Manageability to reduce total cost of ownership—Intel® vPro™ Technology enabled when processors are paired with the Intel® Q87 Chipset, delivers expanded management capabilities and improved power management to lower TCO. A new feature, Embedded Host-Based Configuration, enables remote device provisioning without any person present at the device.

To learn how Intel vPro technology features can minimize signage operating and maintenance costs, read “Smart Digital Signage for Small Businesses” from Associate member IEL on page 48. And for a perspective on the way Alliance members are lowering TCO in industrial automation, see “Transform the Factory with the Internet of Things” on page 38.

Diverse ecosystem to meet the needs of different verticals and applications—Intel and the Alliance are the right team to enable this new age of Big Data, intelligent systems, and the Internet of Things. Intel has a long history of creating scalable technologies and supporting ecosystems that drive transformations in computing. Alliance members are forward thinking, and are looking for opportunities not only to streamline solutions, but to innovate to increase efficiencies and productivity in their markets. And as we have shown in this article, they offer cutting edge solutions for a vast array of verticals, including telecom, retail, signage, healthcare, industrial, energy, and mil-aero.

Harnessing Big Data and the Internet of Things

Intel is focusing considerable research and development, and its portfolio of silicon and technologies, on enabling businesses and consumers to benefit from the Internet of Things and the emerging Big Data economy. And the company is working with its Alliance partners who are creating a wide range of interoperable solutions designed to address connecting, managing, and securing devices and data in a consistent and scalable manner.

Intel and the Alliance see 2013 as a year of rapid transition to this new age of Big Data. This transformation is unlike other changes in the industry because it is changing the rules of what intelligent systems can be and how they can drive actionable information at a much larger level. The world of things will never be the same.



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