The dramatic rise of smartphones and tablets, and other mobile form factors is just the beginning of the next era of computing. Increasingly, people will be connected in mobile, cloud-enabled networks that are seamless, personalized, and secure.

Technology is entering into the age of intelligent systems. The next era of computing will also include connected machines to machines which will exponentially drive the value that we see today in the systems.

So how do we define this market over the next coming years? Well the way we define “Intelligent Systems” are that they are securely managed electronic systems that run a high-level operating system autonomously, they connect to the Internet, they execute native and cloud-based applications, and analyze data in real time.

As we look out over the next five years, billions of users that we see coming online will also mean millions of applications that you will see across a various amount of ecosystems. Their first Internet experience will not be primarily on a PC but on some sort of handheld device, like a tablet or smartphone or also an intelligent system, such as a point of sale device, a kiosk, or even a signage system.

Unlike traditional embedded systems, these intelligent systems will enable multiple simultaneous functions that generate more real-world data to create a better user experience, or more information to make enterprise processes more effective and efficient.
IDC estimates that the intelligent systems market will grow from 19% of all major electronic system unit shipments in 2010, to more than one-third of all systems by 2015. As we look at the revenue opportunity for intelligent systems, we expect this to grow from more than $1 trillion in 2011, to more than $2 trillion by 2015.

IDC forecasts that the volume for embedded systems will outpace any other mainstream system type in terms of volume, reaching 8.9 billion unit shipments by 2015; 75% of the revenue opportunity will be for intelligent systems.

Intelligent systems-based devices will have higher semiconductor content, be connected to a network and other systems combined. They will also adopt new user interfaces including touch and sensors, and support various OS ecosystems and service models.

Whether you’re a decision maker in an enterprise or influence and advise the adoption of technology in any organization, as an end user you expect a complete solution that ensures the right level of support, security, and trust.

The complete solution requires consistency and must be scalable to the demands of your customers and marketplace. Microsoft is stressing tight integration between embedded systems, Cloud services and other infrastructure and lines-of-business applications.

In the next version of Windows Embedded Platform, the company will place greater emphasis on processing structured and unstructured data generated by many devices networked.

The ability to enable more customization and differentiation will include using touch, gesture-based technologies, and speech interfaces. In this way, the company can provide intelligent systems developers to create products that are integrated with the Windows operating system for integration across devices including personal computers and smartphones, all in order to take advantage of Cloud computing.

While Microsoft may have a clear advantage in enterprise desktop computing, the embedded and intelligent systems arena is still very fragmented and wide open for a leader to emerge. And one of the largest challenges we see, including a challenge for the entire industry, is that we still have to educate customers to think differently about their embedded business. Customers will need to share the vision of intelligent systems in order to really truly capitalize the success of the market over the coming years.

So over the next five years, Intelligent systems is very real as an opportunity. The combination of Intelligent systems with cloud, with location-based services, and the social networks, will reach mass adoption and touch every line of business that we know of today. Are you ready to join us on this opportunity?
Panel 1 - Entering the Age of Intelligent Systems

The dramatic rise of smartphones, tablets, and other mobile devices is just the beginning of the next era of computing. Increasingly, people will be connected across a range of devices in the enterprise -- cloud-enabled networks that are seamless, personalized, and secure. Technologies being introduced in the enterprise are enabling the transformation of intelligent systems. The next era of computing will also include connected machine to machines, and system of systems will exponentially drive the value of intelligent systems across the ICT marketplace.

Today, PCs and smartphones are what most companies consider intelligent because these devices capture and process large amounts of data and companies have become very familiar with the interfaces of each platform. This evolution will continue to drive a ripple effect across enterprises, as other enterprise-grade equipment is compelled to catch up with the intelligence of smartphones and PCs as they adapt to those devices in the environment. The next step in this evolution is the migration to more intelligent systems – solutions that combine hardware (beyond the phone and PC) and software to support enterprise service models, an offshoot of the traditional embedded systems marketplace.

Intelligent systems will increase productivity and extend the life of their devices because they are connected; each connection will drive more value as it allows companies and users to reconfigure devices, enable autonomous operation, provide access to the Internet, and extend the usage life of products by leveraging analytics to extra more value from the data being collected in the enterprise. Intelligent systems, in combination with cloud, location-based services, and social networks, therefore will be able to reach more devices and touch more businesses.

This transformation to intelligent systems will enable the extension of computing so that every system or device has the potential to capture data from other systems and the network. This market evolution goes beyond speeds and feeds including the operating system. Businesses will be able to improve the manageability of their connected systems in order to efficiently drive scale, improve time to market, and lower overall cost of doing business. For example in retail, point-of-sale (POS) devices within intelligent systems not only expedite the ordering of products, but can also automatically link customer-preference information with enterprise applications, enabling salespeople to provide better service and increase company revenue. Video surveillance devices will go beyond monitoring and recording, having the intelligence to process, identify, and send relevant video analyzed in real time. Healthcare devices will intelligently link monitoring equipment with patient records, and diagnostic tools will have a major impact on the quality of patient care and will lower costs.
As a result, embedded and intelligent systems represent a much larger opportunity than the PC, tablet, or even the smartphone market. IDC estimates that the intelligent systems market will grow from 19% of all major electronic system unit shipments in 2010, to more than 27% of all systems by 2016. Revenue for the intelligent systems market will grow from more than $649 billion in 2012, to more than $1.4 trillion in 2016 (PCs and smartphones excluded from market-size numbers).

And as the use of intelligent systems grow significantly, the amount and value of the data being captured by them will grow even faster with each system connection. Intelligent systems promise to enable new innovation, shift competition rapidly away from incumbents across the supply chain, and drive new value across a large fragmented information, communication, and technology industry.

Whether you’re a decision maker in an enterprise, or influence and advise on the adoption of technology in any organization, as an end user you expect a complete solution that ensures the right level of support, security, and trust. You will want to anticipate the intersection of intelligent systems with your specific market needs in order to ensure differentiation, and address the right opportunities for your business. The complete solution requires consistency, and must be scalable to the demands of your customers and marketplace.

Panel 2 - Intelligent Systems Defined

Intelligent Systems are securely managed electronic systems that run a high-level operating system and autonomously, with the following characteristics:

- Connect to the Internet
- Execute native or cloud-based applications, and
- Analyze data collected

An intelligent system must include the following:

- One or more programmable processing units, integrated in a system-on-chip (SoC) or as a standalone microprocessor. The integrated solution can be either a single or a heterogeneous multi-core SoC that combines applications processors, graphic processors, media accelerators, and other processors and accelerators.

- The microprocessor core (cores) must support at least a 32-bit architecture and be capable of supporting a high-level operating system (HLOS). Architectures that meet the requirements of our definition include ARM, MIPS, Power Architecture, x86, SH, and other proprietary architectures.
- Support one or more operating systems that can execute native or cloud-based applications, and be capable of Internet browsing, and supports analytics collected by the system.

Key software and service attributes include wired or wireless connectivity to a network and other systems, security, manageability, identification, UI, analytics, and commerce and services enabled by cloud computing. Logically, because of their inherent intelligence and flexibility, the makeup of intelligent systems will continue to change to accommodate emerging attributes and technologies -- especially in the areas of intelligent sensors and devices that incorporate speech control and other immersive technologies that closely link users with devices and networks.

Unlike traditional embedded systems, these intelligent systems will enable multiple simultaneous functions that generate more real-world data to create a better user experience, or more information to make enterprise processes more effective (see Figure 1).

**Figure 1**

![The Power of an Intelligent System](image)

Source: Microsoft, 2012

**Panel 3 - Driving Growth in the Intelligent Systems Market**
Fundamental trends continue to drive the evolution to intelligent systems. Embedded system-on-chips and microprocessors will scale with the next-generation networking. Improvements in performance, power, and integration combined with connectivity and robust operating systems will enable device manufacturers to address key market trends, including the following:

- Billions of Internet users will go online, using mobile devices and intelligent systems to browse, social network, entertain and conduct commerce. This
means that computing, networking, and storage technologies must be able to scale

- Consumerization of IT
- Security at every level of the solution becomes fundamental requirement for intelligent systems being driven by the enterprise
- The continued emergence of Cloud computing will put consumers, telecommunications companies and enterprises on a collision course of opportunity
- Emerging economies around the world will contribute dramatically to growth, with most new markets still just beginning to migrate to 3G and data. Many countries will leapfrog generations of connectivity and processing to rapidly catch up with more industrialized nations
- The bring your own device (BYOD) to the enterprise trend will have a huge impact on IT budgets, as multiple devices per person create more opportunity to deliver on user expectations that for the same consistent experience, as users begin to drive more IT decisions. Data sharing becomes a fundamental requirement for end users and organizations

Emerging markets will share the same appetite for data, content, and services that advanced economies do, but because they are being underserved or are economically hindered, their service providers will also be more open to alternative ecosystems. Pervasive demand for data from consumers and enterprises will continue to exceed the capacity of networks for several years, so there is a large opportunity for enterprises that build intelligent, efficient, and flexible networks. These networks must support heterogeneous architectures as they become the standard building blocks of intelligent systems.

**Panel 4 - Intelligent Systems Market Forecast**

Overall, these market trends point to greater adoption of intelligent systems. IDC forecasts that the volume for embedded systems will outpace any other mainstream system type, reaching 8.9 billion unit shipments by 2015 with 75% of revenue opportunity in intelligent systems. Of these units, intelligent systems will account for more than one-third of that volume (see Figure 2).
As the value of intelligent systems adds to the “consumerization of IT” and the ability to link more intelligent devices together, the growth of intelligent devices will skyrocket. In fact, traditional embedded system shipments and revenue, when looked at by market segment, will show a decrease in CAGR for a number of segments.

Those same market segments will see a dramatic CAGR increase in intelligent system shipments and revenue. For example, point-of-sale devices with intelligent systems technology can not only expedite the ordering of products, but can also automatically link customer preference information with enterprise applications, enabling salespeople to provide better service and increase company revenue. Video surveillance devices can not only record, but actually have the intelligence to monitor and send data that can be analyzed rapidly. In transportation, intelligent devices can improve efficiency by automating tracking and route planning with information about traffic problems from the Internet.
Applications in the energy industry include links to intelligent power grids that reroute resources or interface with smart houses – another opportunity – to automate energy conservation. In healthcare, devices that can intelligently link monitoring equipment with patient records and diagnostic tools will have a major impact on the quality of patient care.

From a units-shipped perspective, intelligent systems for communications will see a CAGR of 30% from 2010-2015; in consumer devices the CAGR will be 28%, in energy the CAGR will be 39%, in healthcare the figure is 42% and in transportation, the CAGR will be 29% (see Figure 3).

**Figure 3**

Key Intelligent System Market Opportunities

![Figure 3: Key Intelligent System Market Opportunities](image)

<table>
<thead>
<tr>
<th>Market</th>
<th>Unit Shipment CAGR 2010–2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intelligent Systems - Total</td>
<td>24%</td>
</tr>
<tr>
<td>Digital Signage</td>
<td>21%</td>
</tr>
<tr>
<td>Video Surveillance</td>
<td>33%</td>
</tr>
<tr>
<td>Point of Sale</td>
<td>39%</td>
</tr>
<tr>
<td>Energy</td>
<td>13%</td>
</tr>
<tr>
<td>Industrial Automation</td>
<td>10%</td>
</tr>
<tr>
<td>Transportation</td>
<td>29%</td>
</tr>
<tr>
<td>Communications Infrastructure</td>
<td>15%</td>
</tr>
<tr>
<td>Kiosks</td>
<td>7%</td>
</tr>
</tbody>
</table>

Source: IDC, 2012

**Panel 5 - Technologies to Watch**

The advances in intelligent systems will drive greater opportunity for suppliers, which will in turn generate more demand. For example, intelligent systems will expand access to Cloud computing and data. This will continue to drive the migration from
3G to 4G networks, which in turn will increase demand for more intelligence and the 
focus on mobile devices will continue to shift from voice to data (mobile broadband). 
The increase in WiFi will add to this demand, as will the rise for WPANs (wireless
personal area networks) to link intelligent devices in an office or workspace rises.

Other emerging technologies will increase demand for intelligent systems. GPS
location-based services, for example, will have several applications. This service
links devices through a mobile network and uses the geographic position of the
device for entertainment, work, healthcare monitoring, etc. Intelligent systems will be
necessary to provide the processing and connectivity as users demand more
complex applications. More intelligent sensors will link devices to the Cloud and will
support analytics natively and provide new interaction methods such as multi-
camera security systems with gesture recognition and enhanced real-time
interpretation.

Intelligent systems near-field communications (NFC) devices will enable simple
transactions and data exchange across short devices. For example, smartphones
with NFC chips can wave their devices over a reader on a cash register to make a
payment, rather than using a credit or debit card. In addition, ultra-wideband
communications to link game controllers, printers, scanners, hard drives and media
players will enable applications such as wireless home video streaming.

Embedding intelligent systems will provide system and technology solutions that
address emerging markets by enabling low cost services, network infrastructure,
and smart devices. Power and performance improvements will drive process
improvements from a mobile workforce that comprises heterogeneous architecture
and communications technologies, ranging from radio connectivity to infrared to
other wireless transmission.

Use of intelligent systems will become ubiquitous and will have applications in smart
appliances, home networks, intelligent cities, point-of-sale kiosks, surveillance,
sensors, manufacturing, healthcare, transport and logistics and many other areas
requiring complicated integration between user, information and network.

Panel 6 - Considering Microsoft

Given the vast potential of intelligent systems, Windows Embedded Group at
Microsoft has been working over the past year to lay out its vision for this emerging
market. In October 2011, the company announced a strategic product roadmap for
helping hardware and software developers create specialized devices and solutions
for intelligent systems — and capitalize on today’s powerful computing capabilities to
use vast amounts of data in new ways.

The company is stressing tight integration between the device layer, server and
database software, cloud services and other infrastructure and line-of-business
applications. They remain the only major software platform with such a cohesive stack. To create intelligent systems on any competing platform at this point requires a large investment to integrate third-party technologies.

With this vision in mind, Microsoft has reorganized its Windows Embedded development teams to focus on core products that take advantage of Windows and all its associated benefits. Many customers will want to look into Windows Embedded Standard 8, designed to create a new generation of intelligent, specialized devices on the Windows 8 platform. To complement Windows Embedded Standard, Windows Embedded Compact will continue to support traditional and small form-factor devices, while the flagship Windows Embedded Enterprise will provide full Windows application compatibility for devices such as ATMs and kiosks.

By integrating the platform so closely with Windows, the company hopes to give developers all the tools they’ll need to create real synchronicity in building intelligent systems from the device, to the back-end, and back again.

Microsoft will also place greater emphasis on processing structured and unstructured data generated by many devices, as well as the ability to enable more customization and differentiation through the Windows Embedded platforms, such as natural user interfaces involving speech, touch and gestures.

Moving forward, instead of infrequent large-scale upgrades, the company will also release code cycles more frequently, enabling intelligent systems product developers to keep their products on the cutting edge. Microsoft’s goal is to provide an environment that will power devices for a long period of time with little or no IT support and let developers shorten their time to market. Solutions built on the Windows platform will enable organizations to realize the full potential of intelligent systems, going beyond the operating system and enabling the solution to take full advantage of the data that is captured in the course of business operations.

Microsoft does face challenges, however. Because of the enormous opportunity that intelligent systems represent, developers working with other operating systems will begin to focus on this new category, especially mobile phone developers who will jump at the chance to expand customers’ reliance on their environments. The clear advantages Microsoft has in enterprise desktop computing, as well as the fact that they provide a true end-to-end, integrated technology stack, must overcome an embedded systems arena that is still very fragmented.

In addition, the Microsoft tradition of major operating systems upgrades is counter to the company’s strategy of more frequent, less dramatic upgrades for Windows Embedded. Microsoft will face a challenge in educating customers to think differently about their embedded business. Customers will need to share the vision of intelligent systems in order to share in the success.
Overall, level of commitment Microsoft has to this category is currently unrivaled in this rapidly growing area. They remain the only software manufacturer capable of offering an integrated stack of complementary technologies that spans all points of the intelligent systems vision.