THE PERVASIVE INTERNET OPPORTUNITY

Announcing a Major New Study of the Adoption

Climate, Technology Issues, and Business

Opportunities Arising from the Convergence

of Intelligent Device Networking, Machine-to-

Machine (M2M) Communication, and the Internet

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Research Study Brochure

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The Pervasive Internet Opportunity: A Harbor Research Study

By 2010, the Internet will have trillions of users it doesn't have today. Most of them will not be human beings.

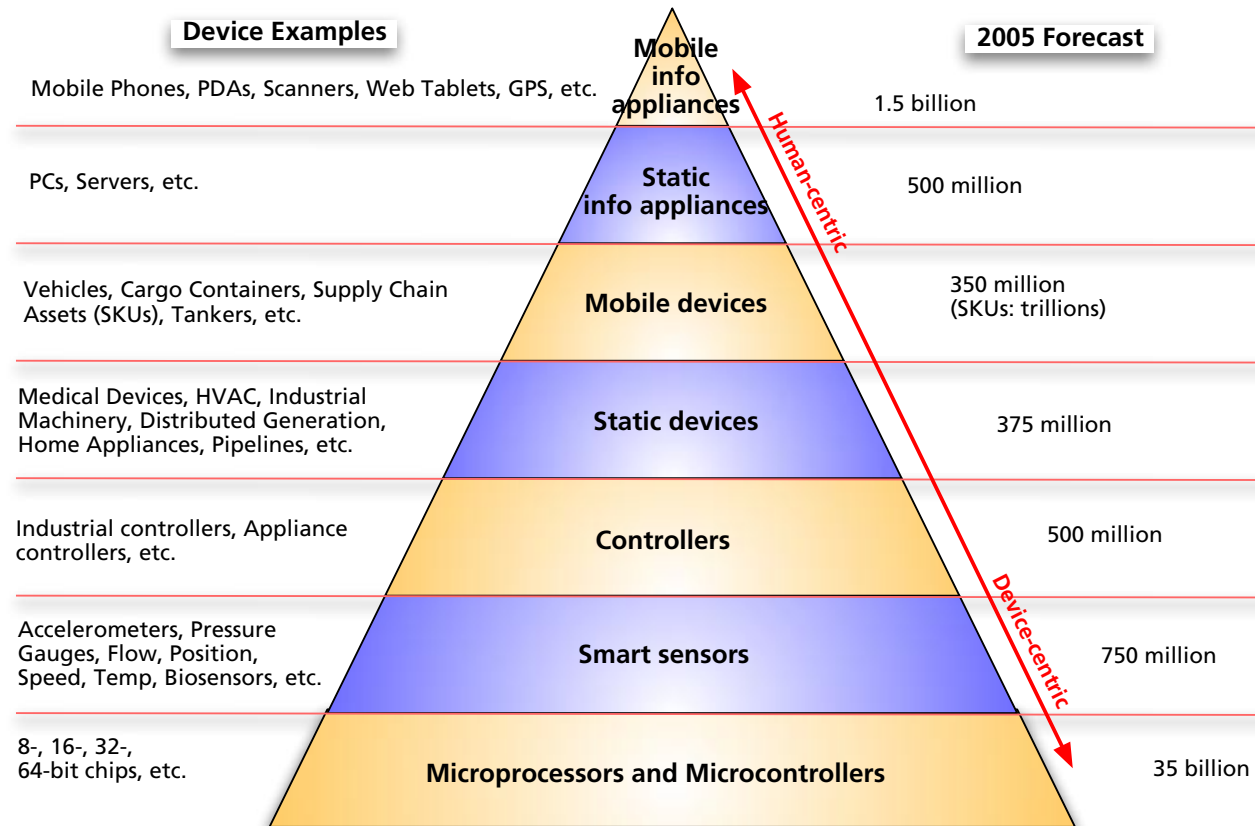## The Information Age—for real this time

We've been living in "the Information Age" for a long time now. At least that's what we keep telling ourselves. It would be more accurate to say that we've spent the last several decades in the lobby of the Information Skyscraper, waiting for the elevator.

With the sudden availability of global public Internet access in the late 1990s, the elevator arrived and opened its doors. Now we have to get on.

Let the devices do the talking

On the path to a truly "connected world," Web sites, email, IM, and other human-centric services were only the very first step. The next step will be vastly more profound, and will be based upon what is usually called "device networking" or "machine-to-machine" (M2M) messaging.

Pervasive Internet Device Hierarchy

Device Examples		2005 Forecast
Mobile Phones, PDAs, Scanners, Web Tablets, GPS, etc.	**Mobile info appliances**	1.5 billion
PCs, Servers, etc.	**Static info appliances**	500 million
Vehicles, Cargo Containers, Supply Chain Assets (SKUs), Tankers, etc.	**Mobile devices**	350 million (SKUs: trillions)
Medical Devices, HVAC, Industrial Machinery, Distributed Generation, Home Appliances, Pipelines, etc.	**Static devices**	375 million
Industrial controllers, Appliance controllers, etc.	**Controllers**	500 million
Accelerometers, Pressure Gauges, Flow, Position, Speed, Temp, Biosensors, etc.	**Smart sensors**	750 million
8-, 16-, 32-, 64-bit chips, etc.	**Microprocessors and Microcontrollers**	35 billion

Human-centric

Device-centric

Source: Harbor Research, Inc.

For decades, we have been steadily building electronic intelligence into manufactured objects by means of sensors, controllers, and microprocessors. Today, virtually all products that use electricity possess some inherent data-processing capability.

Thus, almost all electronic and electro-mechanical products now contain information about their status, usage, and performance—information that has gone largely unharvested. Were it captured and analyzed, this information could offer extraordinary business advantage to the companies that manufacture and service those products.

The transmission, harvesting and interpretation of this device-based information as a basis for strategy and action will make every form of business dramatically more efficient and profitable than ever before.

Harbor Research calls this phenomenon "The Pervasive Internet"—the fusion of pervasive computing, Internet connectivity, and new enterprise-level data-management applications and Web-based smart services.

We call its effect on commerce and the enterprise "Invisible Business."

It's not "progress," it's evolution.

The Pervasive Internet is here
The technological roadblocks to the Pervasive Internet are now essentially gone. Numerous innovators—many of whom Harbor works with directly—have solved the difficult "plumbing" issues of device connectivity.

The tools for genuine enterprise-automation are here. Many of them are painlessly plug-and-play, designed for existing enterprise systems, and come with very attractive ROI.

Just as an entire generation of young people cannot remember a world without the Web, it will soon seem unbelievable that we once lived in a world full of countless "smart" devices whose intelligence was trapped inside their own enclosures.
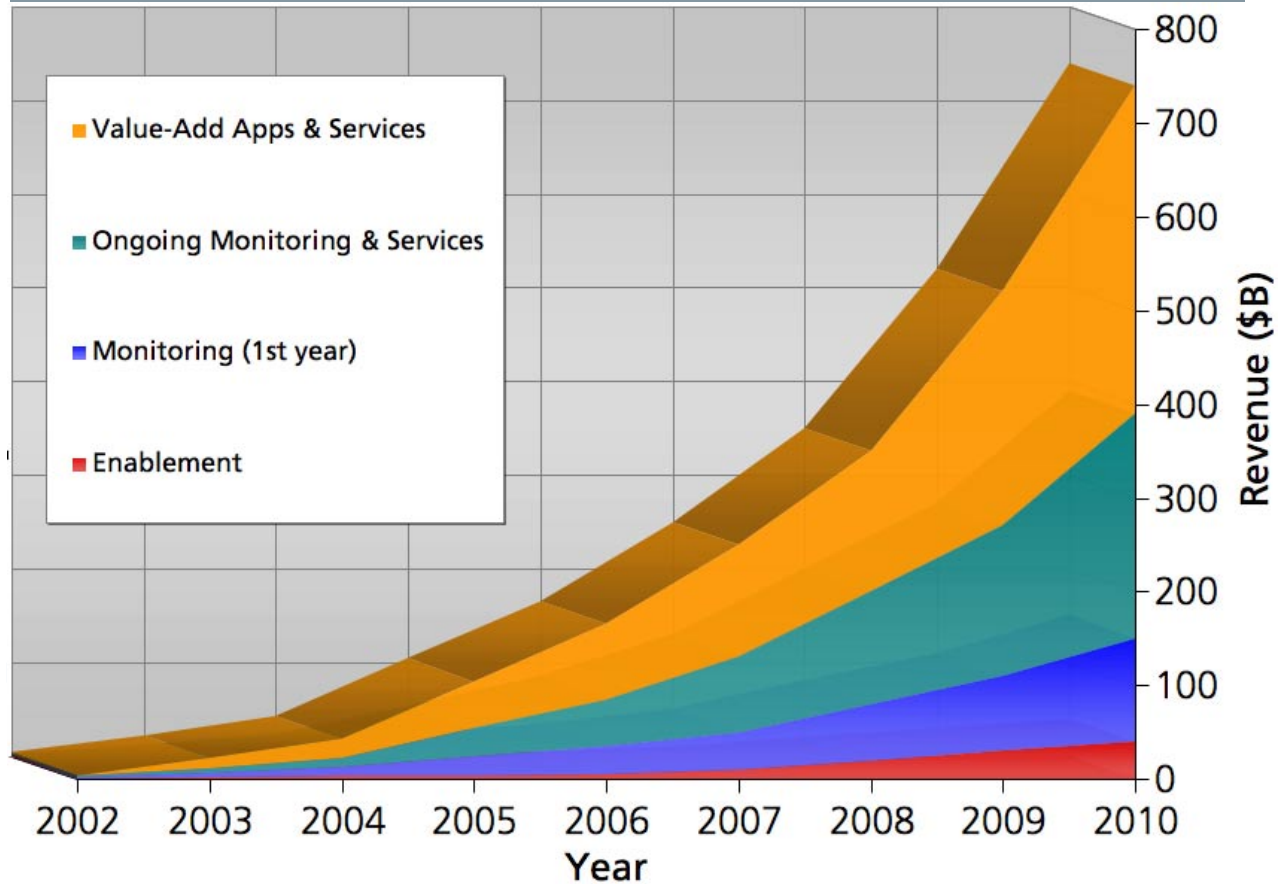
An Unbroken Circle of Information
Call it what you will: the Pervasive Internet, pervasive computing, ubiquitous computing, network computing, device networking, machine-to-machine (M2M) messaging, sensor networks. In the end, it all means the same thing: *an unbroken circle of information* from the beginning to the end of all product life-cycles, all business processes, all customer relations.

We have now entered the age when everyday objects will communicate with, and control, other objects over a global data network—24/7/365, without human attention or intervention. That network is the Internet. The objects are everything from consumer appliances to the elevator you've been waiting for. It's not "the future," it's now—this year, next year—and thus it is vitally important that business leaders understand this phenomenon, its effects on their business, and what they should do right now to position themselves for it.

Executives have technology decisions to make, but those will turn out to be easier than the business-alliance decisions they face. In a truly connected global digital economy, the days of "going it alone" are over. Creating "business webs" of strategic alliances has always been a good idea. Now it's life and death.

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Worldwide Revenue Potential from Enabled Devices and Related Services

Legend:
- Value-Add Apps & Services
- Ongoing Monitoring & Services
- Monitoring (1st year)
- Enablement

Revenue ($B) axis: 0, 100, 200, 300, 400, 500, 600, 700, 800

Year axis: 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010

Source: Harbor Research, Inc.

The first study to focus on the real-world issues faced by pervasive technology adopters

You now realize this is where it's all going, and you're going with it. But when, and how?

Harbor is well-known for its many years of advisory services to major technology suppliers. In this new study, we have taken particular pains to address the complex issues facing device networking / M2M adopters in various vertical markets (we call them "venues").

For starters, it's going to be worth it. Very worth it.

By 2010, a minimum of 1.5 billion devices will be Internet-connected worldwide, and the forces driving networking are self-perpetuating. Devices that are not connected will quickly decrease in value, thus increasing the pressure to network-enable virtually every object, if only to let it identify its location in the supply chain. Further, the "network effect" ensures that each networked device costs less to add, yet each additional device compounds the value of the network itself.

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Networked devices will create, by 2010, a minimum $700 billion total opportunity for the companies involved in enabling, monitoring, and providing value-added services for those devices. The largest opportunity will exist for value-added services providers, and thus access to device information will become a de facto part of most service or sales contracts. As chips become faster, smarter, and cheaper, connected devices will blend into every environment, and vast opportunities will arise for companies managing and responding to the data being generated.

Because the Pervasive Internet is an "information circle" of device feedback rather than than an old-fashioned "value chain," the opportunity to add service value will exist for both technology suppliers and adopters, as well as for third parties. We expect to see a "meta-market" come into being, in which various interested parties buy and sell access to device information as the fuel for their own services innovations.

Scope of Research

What We Cover
Our research answers fundamental questions that have yet to be adequately addressed:

1. What are the key devices and applications driving Internet device networking?

2. What profitable opportunities are opened up by connectivity? What applications and services will be changed or enhanced via Internet-enablement? How will this vary across venues?

3. What are the expected adoption behaviors of market venues?

4. What are the evolving business models of adopters, and how will they relate to suppliers pursuing the Pervasive Internet?

5. What are the barriers and accelerators to growth? What technology, industry standards, infrastructure, and alliance requirements must be met for the Pervasive Internet marketplace to take off?

Areas of Research
The Pervasive Internet is an all-encompassing phenomenon that could involve most electronic devices in operation today. We have built a perspective that accounts for the differences in diverse device venues (e.g., in the home, office, factory) but that also explains how common applications (e.g., condition monitoring of devices, asset tracking, energy management, etc.) could be applied to any device in any venue.

Capturing the many nuances required that we profile device demographics and their Internet-enablement adoption rates, as well as the evolving business models being used to prosecute new opportunities.

To accomplish this, we have interviewed and / or surveyed over 700 technology suppliers, device OEMs, service providers, experts and users, and we have analyzed the following areas of opportunity:

- **Buildings / Facilities**
  Office Equipment, HVAC / Environmental Systems, Access Controls

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- **Healthcare / Medical**
  Medical Devices

- **Home / Consumer**
  White Goods / Appliances, Game Systems, Consumer Electronics

- **Industrial**
  Automation & Control Equipment, Capital Equipment

- **Power**
  Meters, Distributed Generators, Electricity Grid and Pipelines

- **Retail**
  Scanners & Registers, Lighting & Refrigeration Systems

- **Transportation**
  Vehicles, Airplanes, & Intermodal Transport

We profile the ways in which companies are now using Internet-enabled devices as a vehicle to drive new business opportunities and to better satisfy customer expectations. By isolating and analyzing these best practices, we detail the key success factors for a growing and profitable approach to the Pervasive Internet.

The main areas of analysis include:

1. Adoption drivers and requirements

2. Application opportunities

3. Market sizing, growth projections, and rates of adoption for networked devices and venues

4. Business models and market development challenges

Harbor Executive Briefing
Each purchase of The Pervasive Internet Opportunity includes an in-person executive briefing in which Harbor analysts explain the direct bearing of the study findings on your company, and answer questions.

Pricing

The cost of *The Pervasive Internet Opportunity* is $5000.00(US), which includes the executive briefing noted above, and a one-year subscription to our online research tool, *Pervasive Internet Report*.

For subscribers who require specific research that exceeds the scope of the standard study, optional modules are available in two forms:

1. **A Configured Research Module:** allows the client to focus on their particular opportunity area in more detail.

2. **A Custom Workshop Session:** a facilitated in-person meeting that focuses on reviewing a strategic opportunity or designing a plan of action for the company.

The cost of additional components depends upon client requirements and scope of work.

As in all our work at Harbor Research, our goal is to assist our clients in making quick, well-informed strategic decisions. We feel confident that the findings of this study will provide a unique advantage to participants in the Pervasive Internet.

Contact
Glen Allmendinger, President
gallmendinger@harborresearch.com
800.595.9368 ext. 24
415.615.9979 ext. 24 (outside U.S.)

Harbor Research Inc. has been a leader in providing strategic consulting and research services to leaders in communications, computing, control and content since 1983. The firm has built extended relationships with larger multi-line companies including AT&T, ABB, General Electric, Danaher, Eaton, Emerson, Hewlett Packard, Honeywell, Hughes, IBM, Intel, Invensys, Lucent, Motorola, Rockwell, Siemens, Texas Instruments, as well as focused growth companies such as EMC, Cadence Design, PRI Automation, Conexant, Qualcomm, SAP and PTC.

Harbor is organized around emergent and disruptive opportunities in high technology, with a unique focus on the impact of the Pervasive Internet—the concept of the Internet enabling all sorts of devices and systems via embedded and networking technologies to unleash new modes of client interaction and service delivery. ■

Venue Segmentation Map for Intelligent Device Networking and Management

The Pervasive Internet

Government / Security

Infrastructure
- Fueling Stations
- Navigation Systems
- Traffic Control & Highway Systems

Transportation

Vehicles
- Cars/Trucks
- Aircraft
- Watercraft
- Construction
- Off-Hway Vehicles

Devices: Vehicles, Roads, Gas stations, signage, etc.

Retail

Demand side
- Distribution (Utility)
- Residential
- Industrial
- Small Commercial
- Large Commercial

Supply side
- Generation
- Transmission

Devices: Central plants, Distributed resources, etc.

Power

Lab
- Point-of-Care diagnostics
- Lab diagnostics

Medical

Home/In Vivo
- Implants
- Point-of-Care (home)

Doc. office/Care facility
- Point-of-Care (office)
- Lab facilities

Devices: MRI, PDAs, Implants, Surgical Equip, Pumps, Monitors, Telemedicine, etc.

Industrial

Hospital
- Point-of-Care (in hospital)
- ER
- Mobile Point-of-Care

Buildings

Commercial / Institutional
- Office
- Education
- Retail
- Hospitality
- Healthcare
- Grocery
- Airports
- Stadiums
- Data Centers

Industrial
- Process
  - Semi Fabs
  - Chemical
  - Pharma
  - Refining
- Pulp/Paper
- Discrete
- Batch

Residential
- Single family
- Multi-family

Devices: HVAC, Vertical Transport, Fire & Safety, Lighting, Security & Access, etc.

Consumer

Mobile
- Audio
- Video
- Communication
- Multi-purpose

Entertainment
- Audio
- Video
- Gaming

Appliance
- Laundry
- Kitchen
- Environmental
- Information
- Lighting
- Security
- Climate

Devices: TVs, VCRs, Dishwashers, Washer/Dryers, Refrigerators, Lights, Computers, etc.

Signage / Display
- In-store signage
- Remote signage
- Display equipment

Infrastructure
- Distribution centers
- Shopping centers

Point-of-sale
- Complex machines
- Simple/standard machines

Devices: POS terminals, Tags, Cash registers, Payment terminals, Signs, etc.

Lab
- Process equip.
- Product diagnosis

Misc. Infrastructure
- Facility management
- Infrastructure

Electronics / Semicon
- Semicon
  - Semi Tools
  - Wafer Hand
  - Test Sys
- Electronics
  - T&M
  - Comp
  - Placement & Board Assembly

Industrial Process Control
- SCADA
- Instrument / sensor
- CDS

Machine control
- Complex machines
- Simple/standard machines

Devices: Pumps, Valves, Vats, Conveyors, Pipelines, Motors, Drives, Switches, Machines, etc.

Security / Surveillance
- Radar / Satellite
- Environment

Personnel
- People
- Machines

Material
- Weapons
- Supplies
- Other

Vehicles
- Land
- Air
- Sea

Devices: Weapons, Vehicles, Soldiers, Unmanned drones, etc.

Lab
- Water Treatment
- Building Environment
- General Environment

Public Infrastructure
- Water/Wastewater Equip. & Personnel
- Other e.g. Library, etc.

Public Safety
- Police Equip. & Personnel
- Fire Equip. & Personnel
- Other Regulatory Equip. & Personnel

Legislature
- Documents, Records
- Voting, Polling
- Other

Devices: Voting booths Information cards, Scanners, Public infrastructure, etc.

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