designing the future of connected systems

current computer science operates with models of information, networking, and databases that were conceived in the mainframe and client server eras and cannot serve the needs of a truly connected world - **n.io is disrupting the status quo of platforms**

Smart Systems Design | Harbor Research

n.io®

The convergence of networked computing and large scale data management with real time machine intelligence is driving the integration of the physical and virtual worlds. The intersection of these trends - the Internet of Things, Data and People - should create unimagined new values. But will it?

The term “convergence” implies unification, but you wouldn’t know it from today’s rapidly evolving “Internet of Things” market—a fragmented landscape full of incomplete platforms, narrow point-solutions, and software incompatibility seemingly all based on the premise of some outsized dependency on big data and the cloud.

One company, n.io innovation limited, who has kindly provided us with an exclusive “insider’s” view of their developments over the last three years,** anticipates [IoT] market developers’ and users’ toughest challenges—from interoperability and latency to database dependency and user complexity—as a group of problems that can be addressed by a single, unified, scalable software solution. In taking this approach, we believe n.io is defining a new market meta-category that underscores the crucial importance of first-mover advantages and the need to empower users and developers to exploit the vast potential of complex systems intelligence and information automation.

n.io’s strategy reflects a clever combination of architectural attributes and the increasing importance of three critical elements:

» a fully configurable software platform architecture that enables peer-to-peer and client-server distribution of services;

» a platform that can simultaneously and asynchronously act on any type of information from any device, storage or streaming source; and,

» a platform that enables intelligent and real-time temporal, spatial and state-based contextual processing.

Demand for these types of capabilities is hardly new, but as they converge, radical new modes of value creation are emerging. These technologies need to be interwoven and mutually supportive; success will only go to players who effectively leverage their combined potential.

n.io is bringing fresh new thinking about computing, information management and networking to the market and demonstrating within several true market implementations that it is possible to migrate gracefully to scalable architectures truly designed for the era of pervasive computing.

** we wrote a preview about their platform development one year ago

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01
The Advent of Smart Connected Products, Systems and Services

For quite a few years now, Harbor Research has focused most of its research and consulting on what we call "Smart Systems and Services"—the convergence of pervasive or embedded computing with the packet-switching "network of networks" called the Internet.

We prefer "Smart Systems" over other terms in common use—notably Internet of Things or looking back M2M which usually stands for "machine-to-machine"—because it captures the profound enormity of the phenomenon: the world on the Internet, the Internet in the world.

Smart Systems—also commonly called "pervasive" or "ubiquitous" or "invisible" computing—usually refers to digital microprocessors and sensors embedded in everyday objects. But even this makes too many assumptions about what the Smart Systems phenomenon will be. Encoded information in physical objects is also smart computing—even without intrinsic computing ability, or, for that matter, without being electronic at all. Seen in this way, a printed bar code, a CD or DVD disc, a house key, or even the pages of a book can have the status of an "information device" on a network.

But very few people are thinking about smart connected systems on that level. Current IT and telecom technologists are operating with outdated models of data, networking and information management that were conceived in the mainframe and client-server eras and cannot serve the needs of a truly connected world. "Smart Systems" should automatically be understood as "real-time networked information and computation," but it isn't. The Internet's most profound potential lies in the integration of smart machines, information systems and people—its ability to connect billions upon billions of smart sensors, devices, and ordinary products into a "digital nervous system" that will smoothly interact with individuals and systems. The nature and behavior of a truly distributed global information system are concerns that have yet to really take center stage—not only in business communities, but in most technology communities, too.

02
Understanding n.io's Creative Combination of Technology

We have not encountered very many compelling visions about the complete integration of things, people, systems and the real-time world. The **n.io** team of innovators understand that the tools we are working with today to make products "smart" on networks were not designed to handle the scope of new capabilities and the scale and diversity of interactions.

The **n.io** platform is not a simple incremental improvement, patch, Band-Aid, or new flavor of what we already do. Their development represents a true shift in thinking about how devices, people and physical systems will be integrated and how they will interact. **n.io** greatly eases the friction and challenge of converting existing IT systems into interoperable systems; it's about looking forward to a single, unified platform for interactions to which any PERSON or any THING, or any DATA source can contribute, and which liberates information interactions by being interoperable with relational and unstructured data and by abandoning strictly client-server computing.

n.io's platform jumps ahead of all the current noise and clutter about the Internet of Things by providing a truly extensible software platform that enables interoperable applied intelligence and automation to any asset, any signal, any event, message, feed or stream from any source without the mandated requirement of data storage. Their core innovation has been to invent a highly adaptive real-time signal processing platform that enables universal – systemic – distributed semantic intelligence, control, and automation.

The platform takes on the toughest challenges of interoperability, latency, database dependency and user complexity and enables adaptable real-time intelligence and automation to empower users and developers to exploit the vast potential of technology and the Internet. But what does this really mean? **n.io's** key design and architectural features include:

Asynchronous Processing: no other platform can process and apply full context (temporal-spatial-state) with automation and actions from multiple content types and sources, including:

» Streams: Financial news, Twitter or Facebook or Google+ or Reddit or any stream of data even high output predictive sensors such as temperature, vibration, and amperage that can feed true predictive machine awareness.

» Data Repositories: data could be a "soft sensor" input; any database or API or SEC Filing or PRNews or virtually any IP content producers.

» Physical inputs (sensors), and physical outputs (actuators).

All processing is at stream: no other platform that Harbor Research has experienced is ambivalent to data storage – all processing is at the stream/feed/message/API level (whether on a chip or device **n.io** processes at the edge and/or stream), including:

» True real-time: without data exhaust to filter and analyze;

» Low overhead: store only the relevant context (optional)

Truly distributed semantic architecture: virtually no constraints on how it gets deployed whether chip, device, server, cloud, or hybrid. The unbiased extensibility of **n.io** will potentially create broad use and diverse market opportunities, including:

Industrial Internet/Automation	Precision Agriculture
Smart Supply Chain Optimization	Smart/Embedded Products
Artificial Intelligence	Device Management
Telematics	Location-based Services
Social Media Contextualization	AutoID and RFID
Wearable Technology	Data Visualization

There are many many more applications.....

TODAY'S IoT CHALLENGES

Our research and experience verifies that existing entrenched systems and applications are designed largely to existing IT architecture and models that continue to proliferate data storage, hardware, networks, software capital expense and function within IT system "walled gardens" …….. this architecture and systems design bias is an innovation killer!

» Proprietary & Disparate Signals: limited interoperability

» Architectural Constraints: requirements for a complete 'system'

» Latency: wide ranging definitions and delivery of "real-time"

» Performance: adaptable to the full spectrum of volume, rate, size

» Broad Functionality: can not be another "hammer to a nail"

» High and Tightly Encumbered: high cost and adoption barriers

» Bias to Data Generation, Storage, Network: high capital investment

Viewing **n.io's** platform seriously begins to look like it's not a bad idea to just junk all current IT practice in one fell swoop. The pillars of present-day information technology will not crumble overnight, nor has the great existing investment in them suddenly lost all value. There are reasonable, technically and fiscally sane paths for migrating to the future. But migrate we must. The assumptions and practices of the mainframe and PC eras are now decades old and not suitable for the smart systems era.

For more than 15 years, this has been the underlying preoccupation of the work done by Doug Standley, the founder of this new development business and the **n.io** team of innovators whose collective work is really tied to the overarching agenda of liberating information from arbitrary restrictions and restraints.

n.io and harbor research share a common view of the potential of next generation "connected" systems - digital enablement that can truly liberate information to enable the design of much more creative businesses

Companies need to move beyond a conventional orientation to IT technology skills, culture and behaviors. Organizations need a disciplined process focused on applying new digital enabling technologies to optimize all tangible and intangible skills and assets including people and competencies, brands and positioning, technical capabilities and intellectual property, alliances, relationships and business and operational processes.

Over the many years we have known Doug and his team, we have shared a common view of the potential of connected digital systems; a view focused on the need to consider "design" as much [or more] as the "technology." We believe design needs to transcend discrete product or service innovation and enterprise processes and systems. Assuming that the role of design is only about making existing products or services more attractive or processes just more efficient no longer works. Business designers need to creatively imagine fully developed systems and whole marketplaces. Companies need to envision the design role as one that can address product, service and business systems holistically.

03
The Tyranny of Pre-Existing Conditions

Before delving into the new thinking that makes this story possible, let's talk about why it's necessary at all. When it comes to preparing for the global information economy of the 21st century, most people assume that "the technologists are taking care of it." They take it on faith that the best possible designs for the future of computing and information will emerge from large corporations and established authorities. But those are big, unfounded assumptions. In fact, most entrenched players are showing little appetite for radical departures from current practice. Yet current practice will not serve the needs of a genuinely connected world.

The IT and telecom sectors have failed to re-evaluate their relationship to advancing technology and to their constituents. The business and technology paradigms to which these industries cling today are far too limiting, too cumbersome and too expensive to foster and sustain new growth. They are like what the health insurance industry likes to call "pre-existing conditions," something most organizations do not want anything to do with.

From a Telco perspective, today's discussions of IoT systems focus almost exclusively on communications -- the "pipe" -- and very little on the information value. In other words, on things that look good to the carriers. There are many popular visions about wireless monitoring and wireless control. Such as it is, wireless is a fantastic new advance -- no question. But, focusing on the communication element alone as 'first-order' business value amounts to grabbing the wrong end of the technology stick. Wireless communications alone steals the limelight and potentially eclipses the real revolution -- utilizing new networking technologies and processes to liberate information from sensors and intelligent devices to leverage collective awareness and intelligence.

"n.io is applying its unique technology to turn a manually-dependent, subjective farming operation into a highly-instrumented and autonomous example of precision agriculture,"

Dell Internet of Things Team

From an IT perspective, today's corporate IT function is a direct descendent of the company mainframe, and works on the same "batched computing" model—an archival model, yielding a historian's perspective. Information about events is collected, stored, queried, analyzed, and reported upon. But all after the fact.

That's a very different thing from feeding the real-time inputs of billions of tiny "state machines" into systems that continually compare machine-state to sets of rules and then do something on that basis. In short, for connected devices to mean anything in business, the prevailing corporate IT model has to change.

The next cycle of technology and systems development in the smart connected systems arena is supposed to be setting the stage for a multi-year wave of growth based on the convergence of innovations in software architectures; back-room data center operations; wireless and broadband communications; and smaller, more powerful client devices connected to personal, local and wide-area networks. But is it?

Too many people today take it on faith that the best possible designs for the future of connected things, people, systems and information will emerge from large corporations and established authorities. Yet, in the course of the last two decades, the world has become so dependent upon the existing ways computing is organized that most people, inside IT and out, cannot bring themselves to think about it with any critical detachment. Even in sophisticated discussions, today's key enabling information technologies are usually viewed as utterly inevitable and unquestionable.

The client-server model underlying today's computing systems greatly compounds the problem. Regardless of data-structure, information in today's computing systems is machine-centric, not information-centric. Information is not free to move, and because its life is tied to the life of a physical machine, information can easily become extinct. If a particular server goes offline, temporarily or forever, the information is unavailable. You can "mirror" your data so that copies reside on multiple servers, but this does not change the fact that information is always tethered to specific locations on specific machines. All of this adds up to a huge collection of information-islands whether on your servers,

about n.io

n.io is an IP and software innovation start-up that is developing a whole new generation of information tools for managing rich, real-time streams of meaningful data to create transformational applications and services.

n.io's core innovations are focused on providing B2B and B2C developers, partners and customers with tools to facilitate data and events from anywhere, at anytime, in any format. n.io's platform addresses transactions, application development and collaboration for smart connected systems as a unified challenge that can be addressed by a single, scalable solution.

For more information visit http://n.io

your service provider's servers or anywhere else. Assuming the islands remain in existence reliably, they are still fundamentally incapable of truly interoperating with other information-islands. We can create bridges between them, but islands they remain. That's what they were designed to be.

Artificial intelligence, machine learning and the Internet of Things are all in some way trying to break from today's computing paradigms to enable real-world physical systems - particularly as they become more and more intelligent, get fully integrated onto networks, and the data they contain becomes an integral part of all information systems. But even if we can make a computer capable of beating the reigning genius of chess, we can't make a robot capable of walking across the street as well as any normal two-year-old child. The real world is not a strictly regulated, closed system like a chess game. Sensing a player's moves on a wired chessboard and responding quickly and intelligently is one thing. Sensing—and physically responding to reality - it turns out is still completely different.

"integrating our analog equipment systems, enabling bi-directional communications and leveraging the data and information from our processes in a unified system is enabling us to digitally manage our entire order and product lifecycle,"

Tim Pendley, Executive VP and COO, AZZ, Inc.
Industrial Galvanizing Operations

IT professionals talk these days about the need for ever-evolving information services that can be made available anywhere, anytime, for any kind of information. But would you or I recommend an IT person as the architect and integrator of real world physical systems with computing systems? I think not.

With each additional layer of such engineering and administration, computing systems come closer and closer to resembling a fantastically jury-rigged Rube Goldberg contraption. The reason is simple. Today's computing systems were not really designed for a world driven by pervasive diverse information flow.

What are the major pre-existing conditions that need to be overcome?

Leveraging collective intelligence: For all its sophistication, many of today's so-called smart systems are a direct descendent of the traditional cellular telephony model where each device acts in a "hub and spoke" mode. The inability of today's popular enterprise systems to interoperate and perform well with distributed heterogeneous device environments is a significant obstacle. The many "nodes" of a network may not be very "smart" in themselves, but if they are networked in a way that allows them to connect effortlessly and interoperate seamlessly, they begin to give rise to complex, system-wide behavior. This allows an entirely new order of intelligence to emerge from the system as a whole—an intelligence that could not have been predicted by looking at any of the nodes individually. What's required is to shift the focus from simple device monitoring to a model where device data is aggregated into new applications to achieve true systems intelligence.

Automated development: When telephones first came into existence, all calls were routed through switchboards and had to be connected by a live operator. It was long

ago forecast that if telephone traffic continued to grow in this way, soon everybody in the world would have to be a switchboard operator. Of course that has not happened, because automation was built into the systems to handle common tasks like connecting calls. We are quickly approaching analogous circumstances with the proliferation of smart connected devices. Each new device requires too much customization and maintenance just to perform the same basic tasks. We must develop software and methods to automate development and facilitate re-use, or risk constraining the growth of this market.

Optimizing all assets - tangible and intangible: New software technologies and applications need to help organizations address the key challenge of optimizing the value of their balance sheets, allowing them to move beyond just financial assets and liabilities to their physical assets and liabilities (like electric grids or hospitals) and then to their intangible assets and liabilities (like a skilled workforce). The task of optimizing the value of financial assets, physical assets and people assets requires new technologies that will integrate diverse asset information in unprecedented ways to solve more complex business problems.

Flexible, scalable systems: IT professionals rarely talk these days about the need for ever-evolving information services that can be made available anywhere, anytime, for any kind of information. Instead, they talk about web services, enterprise apps and now cloud computing. The Web stores information in one of two basic ways: utterly unstructured, or far too rigidly structured. The unstructured way gives us typical static Web pages, blog postings, etc., in which the basic unit of information is large, free-form, and lacking any fundamental identity. The overly structured way involves the use of relational database tables that impose rigid, pre-ordained schemas on stored information. These schemas, designed by database administrators in advance, are not at all agile or easily extensible. Making even trivial changes to these schemas is a cumbersome, expensive process that affects all the data inside them. Just as importantly, they make deep, inflexible assumptions about the meaning and context of the data they store. Both of these approaches to data-structure enforce severe limitations on the functions you want most in a global, pervasive-era information system: scalability, interoperability and seamless integration of real-time or event-driven data. The client-server model underlying the Web greatly compounds the problem.

"we have 15,000 vines that are talking to us and n.io is helping us to listen to them. n.io allows us to use existing sensors in a whole new way to turn simple data into actionable information to optimize water resources, improve vine health and maximize fruit quality,"

Phil Asmundson, Retired Partner Deloitte & Touche
Owner, Deep Sky Vineyards

Some things that look easy turn out to be hard. That's part of the strange saga of the Internet of Things and its perpetual attempts to get itself off the ground. But some things that should be kept simple are allowed to get unnecessarily complex, and that's the other part of the story. The drive to develop technology can inspire grandiose visions that make simple thinking seem somehow embarrassing or not worthwhile. That's not a good thing when defining and deploying real-world technology to deliver innovation. This is where the new values of **n.io**'s platform really come into focus.

04
The End of the Hostage Crisis

The fact that a rapidly expanding range of devices have the capability to automatically transmit information about status, performance and usage and can interact with people, existing IT systems and other devices anywhere in real time points to the increasing complexity of applications. This only compounds when we consider the billions or more of networked devices that many observers are forecasting will be deployed. Some basic design principles must be put in place to guide the development of smart connected applications.

The tools we are working with today to make products "smart" on networks were not designed to handle the scope of new capabilities, the diversity of devices and the massive volume of data-points generated from device interactions.

These challenges are diluting the ability of organizations to efficiently and effectively manage development. The rigid and fragmented nature of software offerings available today make it extremely difficult, if not impossible, to leverage design and development work sprouting up across different device domains and applications.

Customers expect evolving software tools to be functional, ubiquitous, and easy-to-use. Within this construct, however, the first two expectations run counter to the third. In order to achieve all three, a new approach is required -- but what kind of approach?

In today's world, information is not free (and that's free as in "freedom," not free as in "free of charge"). In fact, thanks to present information architectures, it's not free to easily merge with other information and enable any kind of search-based intelligence.

"retailers are seeking to deliver a unified shopper experience, integrating mobile, web and social interactions with ALL points of interaction in the store. It's a big, complex challenge with implications for cost, time and value. Working together Intel and n.io are solving this challenge by simplifying the integration of all business sources of customer and inventory information, from IoT sensors in the store through to cloud analytics in the data center. By infusing data from the edge with rich contextual information, decisions can be made more efficiently, effectively and closer to the source,"

Chris Hunt, Retail Architect, Intel

What would truly liberated information be like? It might help to think of the atoms and molecules of the physical world. They have distinct identities, of course, but they are also capable of bonding with other atoms and molecules to create entirely different kinds of matter. Often this bonding requires special circumstances, such as extreme heat or pressure, but not always.

In the world of information, such bonding is not all that easy. Today's software platforms focus on execution processes that generate one of three types of data - unstructured, transactional or time series. For each of these data types, a specific set of intelligence tools have evolved to provide "insight" but, in most cases, these tools limit the questions that can be answered to those known in advance. So for a user attempting to do something as simple as asking a certain multi-dimensional question, creating new information from multiple data types that is an easily perceivable, manipulable, or mappable "model" of the answer to that question is a significant challenge.

The **n.io** platform fundamentally changes this paradigm, treating data from things, people, systems and the physical world as "neutral" representations. In other words, treating diverse data types equally. This enables processes connecting diverse data in any combination to be rapidly built and deployed.

The traditional approaches to data discovery and systems intelligence have two failings: they can't provide a holistic view of these diverse data types and, the types of intelligence tools available to users are, at best, arcane and typically limited in use to "specialists." Given the immature state of today's real-world systems, most people have trouble grasping the power and importance these capabilities enable. The ability to detect patterns in data is the holy grail of smart systems and the Internet of Things because it allows not only patterns but a whole higher order of intelligence to emerge from large collections of ordinary data. The implications are obviously immense.

"n.io provides a platform for seamlessly integrating data from diverse sensors into a single decision center. By dynamically considering current weather conditions, forecasts, soil moisture, in canopy conditions and irrigation events we're able to develop specific farming plans for each varietal."

Phil Asmundson, Retired Partner Deloitte & Touche
Owner, Deep Sky Vineyards

What is needed is a common means of connected application development that can leverage tools across families of interrelated devices and diverse domains. What would this entail:

» Software and development tools to address a broad range of application requirements - increasingly, customers will need a single unified framework to design and build solutions that can interoperate across diverse data environments and under widely differing usage scenarios.

» Software that can enable asynchronous integration of any combination of signals – message – feed – stream – data - in real-time with stream processing that provides complete independence from traditional databasing schemas; processing that enables users to filter and enrich at the "edge" and forget about pushing gargantuan amounts of data to warehouses and repositories; software designed without bias and dependencies that cause integration pain.

» Software and tools that allow users to quickly build their own functions, capabilities and applications making people, devices and systems accessible as well as easily integrated with business and operations applications. Users need to be able to quickly integrate smart devices with new applications for analytics, usage and on-line collaboration that are reliable, secure and scalable.

» Software that is scalable and enables true real-time visibility of what is happening now and that does not constrain application requirements and scalability; a software platform that facilitates data and events from anywhere, at anytime, in real time, in any format and that has a small footprint and is agile. We need systems to migrate enterprise IT systems to an anywhere, anytime, any-format world.

» Software and tools that leverage re-use are required. Given the scale of the Internet of Things, it will simply not be humanly possible to write all the code required without large scale re-use and collaborative "self-service" participation.

We are reaching a critical juncture in market development where organizations will soon be crying out for a completely new approach - one where the effort invested to develop new applications can be quickly and easily utilized again and again across an ever broader spectrum of devices, integration and interaction schemes.

The bit, the byte, and later the packet made possible the entire enterprise of digital computing and global networking. Until the world agreed upon these basic concepts, it was not possible to move forward. The next great step in IT—completely fluid information and fully interoperating devices, people and systems—requires an equally simple, flexible, and universal abstraction that will make information itself truly portable in both physical and information space, and among any conceivable information devices.

n.io uses an entirely new approach that avoids the confinements and limitations of today's differing data types and tools. It allows data to maintain their fundamental identity while bonding freely with other data. Facilitating discovery, based on data and information accessibility and cumulative systems intelligence, is one of the fundamental purposes of **n.io's** platform. They are designing a system for a genuinely connected world in which there are no artificial barriers between pieces of information.

05
Digital Transcendence Across Domains

Once a device becomes networked and is monitored for the primary purposes of device status, usage tracking, and consumables replenishment, it will also serve the larger business purpose of being a key driver for the vertical customization of services in general. For example, "asset management" is an important service that incorporates a number of different variables and systems (device data logging, diagnostics for equipment health monitoring, location services for maintenance and spare parts planning, etc.).

We have historically referred to these foundation/platform functions as "systems applications." By this we mean a set of context-dependent functions - such as state, location or time - that are horizontal in nature and often characterized in a general sense as "middleware," in that they are not seen by the end user (we do not like the term middleware as it risks generalizing capabilities that are often unique to "context-based" applications and environments and not well addressed today by the majority of so-called middleware providers).

n.io is one of the few instances where we have seen a very clever combination of architectural attributes. They have taken input and output neutrality (any signal – message – event – feed – stream – data type), and tied this to data ambivalence (asynchronous stream and/or data processing), and infinite contextual configurations be they temporal or spatial or state. These context-driven application functions inform several very critical requirements in Smart Systems, including:

» **Status, Monitoring & Diagnostics:** Status applications capture and report on the operation, performance, and usage of a device, or the environment that the device is monitoring. Diagnostics applications allow for remote monitoring, troubleshooting, repair, and maintenance of networked devices.

» **Location & Tracking:** Profiling and behavior-tracking applications are used to monitor variations in geography, culture, performance, usage, and sales of a device. These applications can also be used to create a more customized or predictive response to end-users of a device.

» **Device Management, Upgrades & Configuration Management:** Device management functions improve or augment the performance or features of a device. They can prevent problems with identity management, version control, technology obsolescence, and device failure. This kind of program makes site visits to upgrade products unnecessary and eliminates the need to keep track of what has been upgraded and when, thus saving time and money.

» **Control & Automation:** Control and automation applications coordinate devices into a sequenced pattern of behavior. These applications also allow for special-case discrete actions of a device under certain circumstances.

» **Data Management & Analytics:** Data filtering, normalization, enrichment, or intelligence such as predictive analytics, pattern recognition or machine learning algorithms.

"working with diverse partners like Intel, Dell and others, n.io is leveraging the combined value of shared architectural models which helps to reduce cost and risk, helping to drive faster time to value."

Jon Stine, Intel Retail Systems

Unlike most others purveying platforms for IoT, **n.io** has conceptualized how platforms would support managed application services. They understand that these context-based application functions would be called upon and integrated in differing configurations to provide vertical value-added application services. For example, a combination of monitoring, diagnostic, control and tracking functions could be configured to provide the basic functionality required to enable an energy management application. What **n.io** understands is these platform functions will be configured to support a wide range of vertically focused application services such as:

» Asset management and optimization
» Supply chain integration & business process management
» Customer support
» Energy management
» Security management

The true potential of an architecture and platform such as **n.io** has developed lies in the integration of diverse machines, information systems and people—its ability to connect billions upon billions of smart sensors, devices, and ordinary products into a "digital nervous system" that will smoothly interact with individuals and the physical world.

06
n.io's real world benefits

The **n.io** team is demonstrating in several true market implementations the real nature of and opportunities that flow from complex system integration and application services. Examples of early "anchor" adopting customers using the **n.io** platform include:

» In collaboration with Intel's Global Retail team, **n.io** is introducing true retail innovation with its asynchronous real-time platform automating and optimizing a retailer's supply chain and distribution system to achieve vastly improved services levels based on fusing POS, inventory, social media, and customer data to simulate demand requirements and levels;

» Providing AZZ, the largest global industrial galvanizing company, with a next generation shop floor system that is enabling an across-the-board conversion from analog to digital processes and managing their entire order and product lifecycles including posting directly into their Oracle system;

» Integrating sensors and equipment deployed at Deep Sky Vineyard to leverage diverse data sources such as soil conditions, weather patterns, water supplies and peak usage requirements to optimize grapes and yield. In short, **n.io** is enabling a contextually aware digital control system that is based on both manual [people] observation and analog inputs.

These early adopters of **n.io's** platform want help in optimizing their ability to supply consistent and high-quality products and services to their customers. Taken one step further, the implementations that n.io has focused on early are validating the benefits from enabling diverse interactions between and among devices, sub-systems, people and operations processes. These types of interactions extend and expand the value from digital collaboration and large scale data integration and analytics.

These real world implementations are showing that it is possible to completely re-think the whole relationship of people and devices to business systems and processes and that if you design these new smart systems such that they are built upon true, across-the-board digital automation, accomplished by enabling everyday electronic devices to communicate with and control each other, supplemented by a whole new generation of information tools for managing rich, vast streams of meaningful data. **n.io** is demonstrating that you can fully integrate people and assets into smart systems that are self-sensing, self-controlling, and self-optimizing—automatically.

ABOUT THE AUTHOR

Glen Allmendinger - Founder and President, Harbor Research

Glen has managed Harbor's consulting and research activities since its inception. Glen has worked with a range of leading technology innovators, product OEMs and service providers, assisting them with strategy and market development for new smart product, systems and services opportunities. He has participated in pioneering work in the Smart Buildings, Healthcare, Retail, Transportation, Energy and Industrial arenas, helping clients determine the structure of emerging opportunities, competitive positioning and design of new business models. Glen co-authored the pioneering article "Four Strategies For The Age Of Smart Services," Harvard Business Review, October 2005 and has also authored articles for a wide range of publications, including The Economist and The Wall Street Journal, as well as being a frequent speaker at industry forums.

ABOUT HARBOR RESEARCH

Founded in 1984, Harbor Research Inc. has more than twenty five years of experience in providing strategic consulting and research services that enable our clients to understand and capitalize on emergent and disruptive opportunities driven by information and communications technology. The firm has established a unique competence in developing business models and strategy for the convergence of pervasive computing, global networking and smart systems.