



# PACIFIC CONTROLS DRIVES INTERNET OF THINGS INNOVATION

The Future of Real Time Managed Services Delivery



**PACIFIC CONTROLS**

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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 and People - will create unimagined new values.

Pacific Controls is forcing the pace of development in real-time “smart” systems and managed services catching larger rivals off-balance and threatening to effect fundamental shifts in technology markets. Pacific Control’s strategy reflects the increasing importance of three critical elements: end-to-end solutions; a new generation of real-time, “state-based” platforms; and large-scale ecosystem collaboration informed by truly scalable and elastic service delivery architectures.

Each of these three enablers taken individually are hardly new, but as they converge with intelligent sensors, equipment and assets, radical new modes of value creation are emerging. Only those who grasp the new rules of smart systems and collaborative market creation can win key positions. To provide complete solutions for smart systems and the Internet of Things, these technologies need to be interwoven and mutually supportive; success will only go to players who effectively leverage their combined potential.





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 information systems will emerge from large corporations and centralized authorities. But those are big, unfounded assumptions. In fact, most entrenched IT and Telco players are showing little appetite for radical departures from current practice. Yet current practice will not serve the needs of a genuinely connected world.

We believe Pacific Controls, because of its unique evolution, is at the forefront of platform, infrastructure and service delivery innovation for enterprise and publically managed solutions. Its next generation platform Galaxy 2020 platform takes a refreshingly new approach to integrating smart things, people, systems and the physical world. PCS leapfrogs the current market’s noise and clutter by viewing smart connected systems as a unified challenge that can be addressed by a single, scalable end-to-end platform. In so doing, Pacific Controls has defined a new market meta-category and underscored the crucial importance of first-mover advantages in a real-time networked world.

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01

## COMPUTING MEETS THE REAL WORLD

Experience tells us that traditional IT and network services players really do not understand how to translate the value of computing and networks into the real [physical] world.

They are clueless when it comes to integrating information and communications technologies with real time intelligent sensors, machines and infrastructure.

The next big thing is really about the idea of embedded intelligence, communication, and control in physical systems—biological, mechanical, and electronic - becoming much more intimately integrated with more general purpose computing and networked systems.

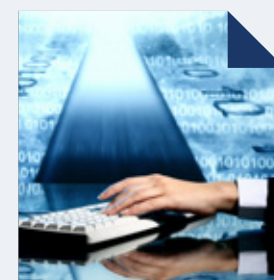
Given the immature state of today's real-world systems, most people have trouble grasping the power and importance these capabilities could potentially inform.

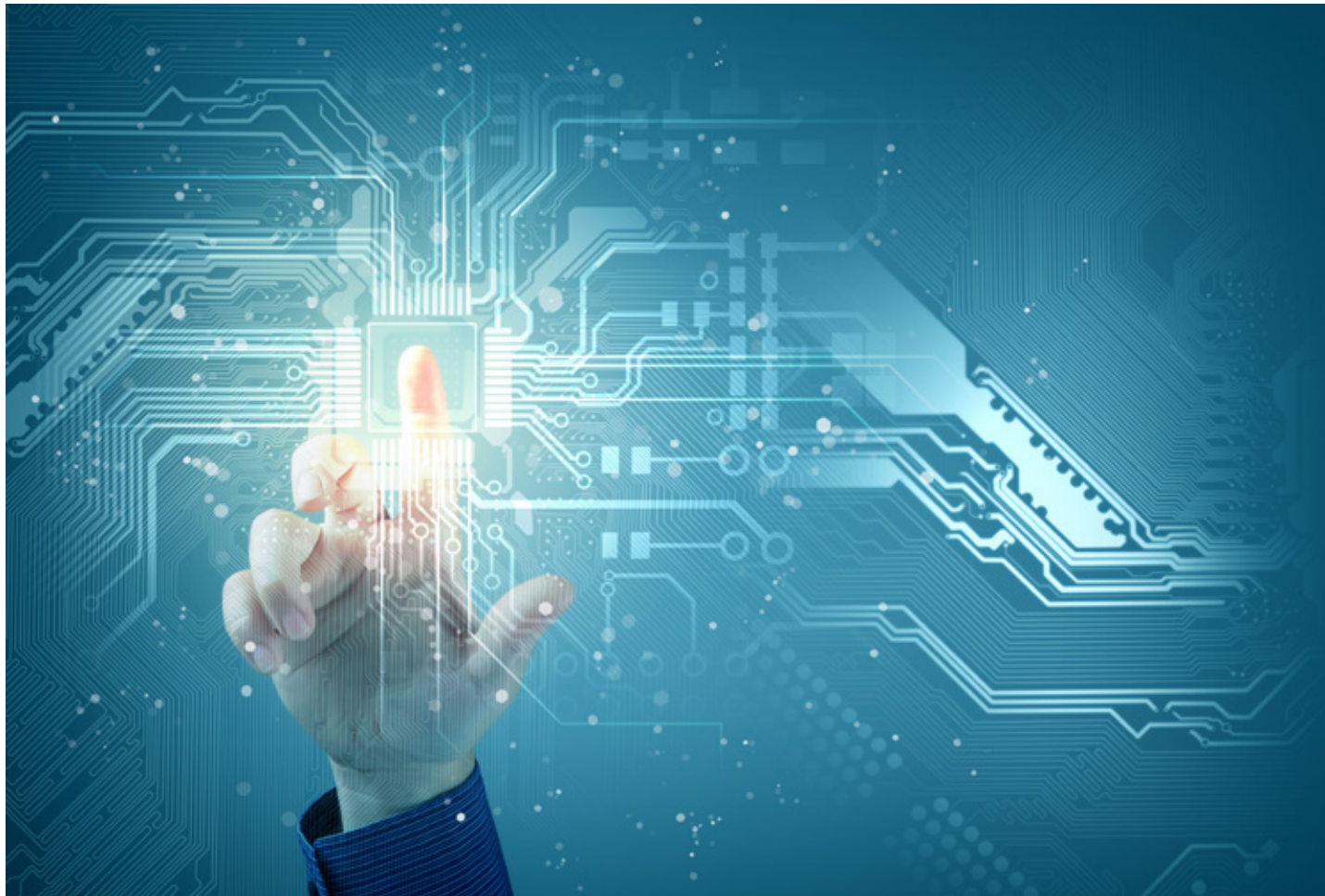
The intersection of cloud computing, big data and intelligent device connectivity creates new values across the business and public systems spectrum. Cloud computing services and large scale data management infrastructure services will increasingly dominate information and communications technology (ICT) systems and services development. Coupled with the maturing of machine-to-machine (M2M) and "Internet of Things" (IoT) technologies, these collective trends are beginning to transform enterprise and public sector systems.

This convergence is informing significant new new modes of service delivery and customer value creation. However, to leverage the full potential of this opportunity, customers will need new system platforms and partners that bring to this opportunity deep knowledge of how smart systems work in the real world. This is not something we can hope for or expect to originate from traditional IT and network services providers.

So who will be the catalyst?

The intersection of and intelligent device connectivity creates new values across the business and public systems spectrum.





02

## ENTER PACIFIC CONTROLS

In the midst of these evolving opportunities, Dubai UAE-based Pacific Controls Systems (PCS) is already at the heart of this transformation.

Pacific Controls already leads the market in providing managed services for a number of key M2M applications:

### Building Intelligence

PCS is a global market leader in energy, building monitoring and life safety and security systems with over 50,000 buildings connected.

### OEM Machine and Equipment Management

PCS is a market leader in several key product OEM equipment segments for many leading global brands.

Intelligent Commercial Vehicle Monitoring - PCS already monitors fleets in several application arenas such as police, fire and public safety.

Because of the company's unique legacy, it is at the forefront of service delivery innovation for enterprise and publically managed solutions. PCS evolved from the "real world" beginning its life as an integrator of systems for a wide range of M2M applications.

This formative stage in the company's evolution combined with its development of a managed services platform and recent investments to develop its own data services infrastructure to provide cloud computing and Infrastructure as a Service (IaaS) to and through telco carriers, have positioned the company to really understand how to integrate

complete end-to-end solutions for smart systems and the Internet of Things.

Pacific Controls is working with a broad spectrum of network operators, IT equipment players, professional services providers, software players and equipment OEMs to form partnerships to provide solutions for managing real time, real-world systems.

These new "smart" systems are quickly becoming a critical service line extension for traditional IT and telephony players - they expand the scope of value these players can provide to customers effectively bridging the divide between the physical and virtual. These new ecosystems of players are creating vast new opportunities for network service providers, IT systems providers and professional services firms to fully leverage the significant new capabilities informed by these technologies.







03

## NEXT GENERATION SMART SYSTEMS

The convergence of the Internet of Things and the Internet of People - what we like to call Smart Systems - is a significant force in the market today.

The rate of investment in both M2M and cloud computing is expected to be measurably higher than in maturing IT infrastructure and occur in key areas, including:

### **Core Connectivity, Cloud Technology & New Services Delivery Platforms:**

Next generation foundation technologies for unified communications, embedded systems, network enablement tools, virtualization technologies, and software services delivery infrastructure will be the foundation elements. Beyond these core technologies, new platform capabilities will revolve around real-time situational awareness and automated analysis. As a result, technology moves beyond just proposing task solutions — such as executing a work order or a sales order — to sensing what is happening in the world around it, analyzing that new information for risks and possibilities, presenting alternatives, and taking actions.

### **Analytics [Big Data] and Business Intelligence:**

The ability to detect patterns from large scale sensor and device data aggregation is the holy grail of smart systems because it allows not only data patterns but a whole higher order of intelligence to emerge from large collections of ordinary data. The implications of mining and analyzing “big data” are immense.

### **Business Process Integration:**

Increased utilization of sensors and instrumentation combined with new software to increase “awareness” in physical systems will drive a revolution in business processes (asset management, supply chains, energy management, etc.).

### **Smart Application Services:**

Vertically focused solutions that increasingly integrate all of the people, processes, systems and assets a company has or serves -- systems that allow for real-time energy and building management; life safety systems, healthcare delivery and intelligent transportation management to name a few.

The next cycle of technology innovation and development will set the stage for a multi-year wave of growth based on the convergence of innovations in software architectures; back-room operations; wireless and broadband communications; and smaller, more powerful client devices and sensors connected to personal, local and wide-area networks.

But are traditional IT and Telco players really capable of integrating the “IT” or information technology and “OT” or operational technology worlds?

This is a very critical but unanswered question.







04

## WHAT'S REQUIRED?

In our view, very few players are thinking about or really understand the potential impacts of smart systems.

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.

What are the major obstacles that need to be overcome?

### Leveraging collective intelligence:

For all its sophistication, many of today's M2M 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.

### 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.

### Automated development and support:

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 speed development, facilitate re-use and automate support or risk constraining the growth of this market.

### Elastic, 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.



05

## SOFTWARE INNOVATIONS ARE KEY

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 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 complex systems. The rigid and fragmented nature of software offerings available today make it extremely difficult, if not impossible, to manage real world operational systems. What is needed is a new architecture and platform that can leverage integrating diverse heterogeneous devices, integrate and manage differing data types and provide flexible, elastic services on demand.

### 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 and platform tools that allow users to quickly design and 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 and tools that leverage re-use and automated support functions - 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 as well as deploy systems that are “self-supporting” through the use of new automated services.

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.

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?

Customers expect evolving software tools to be functional, ubiquitous, and easy-to-use.





06

## GALAXY 2020 PLATFORM INNOVATION

The next great step in IT and OT development—completely fluid information and fully interoperating devices, people and systems

Requires a new generation of data and application integration platform technology that will make information itself truly portable in both physical and information space, and among any conceivable smart information devices and machines.

Technology advancements need to engender new system elements and new services. Correctly balanced, technology and new service delivery modes can help customers reach their goals of increased operating efficiency, reduced costs, automated system upgrades, and more efficient operations. Achieving this critical balance is the challenge that Pacific Controls' Galaxy managed services and enterprise delivery platform is aimed squarely at solving.

Galaxy is an end to end platform for managed services that proactively monitors assets, providing transparency into how critical "real world" systems are performing (buildings, smart grid assets, etc.), where critical faults lie, and where opportunities exist to significantly reduce operational expenses.

Galaxy is also a "Platform of Platforms." It is intended to reduce a significant percentage of the complexities of application development, management and delivery. The challenges of networking smart devices, developing M2M applications, integrating complex IT systems and unifying services delivery in a coherent and cost-effective manner have been big hurdles to adoption that Pacific Controls and its Galaxy platform are finally addressing.

Here are examples of Pacific's platform, integration and application management innovations:

### Software Defined Machines:

Capturing the real value of smart connected devices goes much further than providing simple

connectivity, and databasing. For example, real pervasive managed services will allow networked, embedded devices to execute remote applications as if those applications were part of the internal operating system. Devices will need to host intelligent software components that communicate to other devices directly (peer-to-peer) or to logical collections of devices (peer-to-group) in any programming language, over any network and do so autonomously. This is a big leap from where we are today.

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 ICT—completely fluid information and fully interoperating machines, 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 devices or machines. This is where a new generation of software tools and integration technology that Pacific Controls has developed within its Galaxy platform will drive new device to systems innovation.





### **Analytics and Awareness:**

“Real-time awareness” and the Internet of Things is driving the deployment of new analytic tools to address “big data” opportunities. Analyzing and storing the massive amounts of data that will be received is only possible with extensible and adaptable systems. Analytics technologies are the critical tools for deciding which alternative courses to pursue, automatically through the application of knowledge and learning. To address big data opportunities seismic leaps will be necessary in the data flow and analytical inputs in a world of vastly expanded real-time awareness. The tools that we use for analyzing large volumes of data from the real physical world will have to evolve to be effective. Why is this?

The traditional approaches to data discovery and systems intelligence have three failings: they can't provide a holistic view of these diverse data types;

the types of intelligence tools available to users are, at best, arcane and typically limited in use to “specialists” and all of this still, for the most part, occurs in a “batched” not real time data warehouse.

We need new tools to liberate the intelligence in the world of connected things. Tools need to be able to conduct a search or query that acts on unstructured, transactional and real time data simultaneously. This would allow users to determine where deeper analytics or the creation of an ad hoc business process can add value.

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.

The world needs an entirely new approach that avoids the confinements and limitations of the today's differing data types and tools. That 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 what Pacific Controls Galaxy platform is organized to do.

### **Intelligence and Automation:**

Of all the new capabilities that Pacific Controls' technology enables is the ability of systems to automatically learn from history; learning to detect hard-to-discern patterns from installed equipment data that supports the development of algorithms that automates various response and support scenarios.





Galaxy Gbots are a family of system management and customer support software tools -- autonomous software agents which observe and act upon device, equipment and systems behavior. Gbots are enabled by "self-learning" software agents installed in devices and equipment and implemented as a managed service. These agents or "bots" are able to sense conditions (e.g. electrical system overload protection), understand customer/user preferences (e.g. is the temperature too high) and ultimately identify issues within a system to repair or initiate actions to optimize its performance.

Galaxy Gbots are not about technological drama or "futurism." It's about matching feasible technology to real customer needs and delivering it in a manner that aligns with the industry's behavior and needs. GBots are a significant step-function change in the way systems will be designed, deployed, managed and supported in the future.

The value of this type of capability is probably best exemplified by Amazon and Google. Amazon's ability to recommend various books and publications to users based on profiling patterns and Google's indexing of web and related content to drive advertising revenue underscore the new economic value of smart systems.



Amazon stopped being a "store" and started being an intelligent entity that, to some very real degree, understood who you were and what you cared about. Google quickly transcended being a search engine and reached for an understanding of what the population found interesting and designed targeted advertising as an entirely new business model.

### Next Gen Architecture:

The conversion of process applications to service-oriented architectures will allow process apps to be adapted to business scenarios, with specific components pushed down to intelligent devices where they can execute a specified action. For example, alerting a citizen on her smartphone to the updated arrival time of a bus that was stuck in traffic, notifying a doctor on a tablet device about the drug allergies of a patient he is about to see, or directing the thermostat in an individual home to raise the temperature by turning down the air conditioner by three degrees.

Players will create solutions that combine elements of industry-specialized hardware devices, vertical industry software, and industry-focused wireless/wired networks with industry-oriented analytics to optimize business processes and performance both operationally as well as financially.

Effectively combining these elements has not been addressed by the existing players in the marketplace. The inability of today's popular enterprise IT services to interoperate and perform well with distributed smart device environments is an obstacle that integrated delivery platforms like Pacific Control's Galaxy are finally overcoming.







07

## LEVERAGING THE ECOSYSTEM

IT and network service players worldwide have seen a steady march to maturity for their core business. This has led to critical introspection of their traditional business models.

As a result, many players are racing to develop new opportunities enabled by “cloud” services and are also turning their attention to non-IT devices capable of being connected to a network and integrated into cloud services - the Internet of Things.

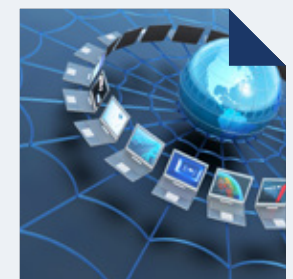
Many ICT players think offering some level of non-IT device connectivity and on-demand IT services will differentiate them. But will it? In short, many IT and network services providers are coming to realize the prevailing model for offering generic cloud services and M2M connectivity services is not robust enough for market differentiation.

The combined M2M cloud computing opportunity presents multiple challenges for ICT systems and services providers. From the business model, to the supply chain, to vertical applications, to ongoing support challenges, Market development represents a very complex set of inter-related elements. Designing an effective business involves optimizing all of these elements.

### ICT players face a two-fold challenge:

To address the many technical issues across systems and service delivery chains and to

ensure the whole solution functions properly and continuously. This is not something any single firm can do alone - partnerships and collaboration are necessary ingredients for success. To successfully develop this market, IT equipment players and carriers will need to think and act differently. A renewed focus on developing ecosystems and the critical relationships that will drive value are key to success.







08

## CHOOSING THE RIGHT PARTNER

We are on the cusp of a transformation in the smart systems marketplace.

Over the next five years we will see a dramatic breakthrough in M2M applications as organizations recognize the potential it represents for reducing operating and maintenance costs, for revenue generation and for improved customer satisfaction.

Global M2M applications are highly specialized. Embedding connectivity into the next generation of devices, ensuring they are deployed profitably and that new cloud and services delivery capabilities can scale across multiple countries and countries, are challenging tasks.

Integrating the physical and virtual systems will require expert application knowledge as well as a deep understanding how these systems will work. Choosing the right partner, one that fully understands the different elements involved and that is financially stable, and correctly aligned with delivery infrastructure partners will be critical to successful deployments. Working with a managed solution provider, like Pacific Controls, that has a

deep rooted understanding of the complexities of large global deployments will ensure that the solution is successfully delivered. A new chapter in the story of M2M, IT and Telco partnerships has begun. that will inform new value in the converged Internet of Things and People.







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