HOW TO CONNECT YOUR BUSINESS TO THE INTERNET OF THINGS

AN XMPRO WHITEPAPER ON THE INTERNET OF EVERYTHING

XMPRO

SENSE > DECIDE > ACT

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THE INTERNET OF EVERYTHING NEEDS THE INTERNET OF THINGS

BENEFITS OF IOT

- New Operational Efficiencies
- Improved Safety and Security
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- Faster and Better Decision Making
- New Business Opportunities and Revenue Streams

**Cisco 2013*

Every time we find a new app for our mobile phone, buy a new smart TV or have all our information synchronized across all our devices we realize that the Internet of Everything is not some science fiction story, but it is here and it is for real in the things that we do every day.

It is changing the way we do business and those organizations that “get it” are fast moving ahead of competitors in this next evolution of the new economy.

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The Internet of Everything (IoE) is a convergence of multiple Internets that includes the Internet of Information, the Internet of People, and the Internet of Places. Even though each of these has tremendous value on its own, the combined or synergistic effect of the convergence provides the biggest opportunity for competitive advantage and ultimately value to customers, organizations, employees and suppliers.

Gartner describes the Internet of Everything as a combination of:

- Internet of Information – the traditional World Wide Web
- Internet of Systems – network of business & consumer applications
- Internet of People – network of relationships in social networks
- Internet of Places – commercial and public places as Internet nodes
- Internet of Things – connected physical devices with sensors
- Internet of Virtual Entities – “intelligent” digital entities

The Internet means both public and private systems and it is the combination of all of these that is creating new business models and new revenue streams for businesses while improving the quality of life for consumers. Our connected “things” are the fast paced accelerators of the IOE. So how do we leverage the Internet of Things (IoT) for business?

BEFORE IOT WE HAD OT

So what is OT? Operational Technology is the world of physical devices that is used to monitor, record and control equipment in Mining, Oil & Gas, Process Industries, Iron and Steel, Utilities and many other Manufacturing or Engineering environments.

But OT is not limited to these “engineering” markets. We also see it more and more in Retail, Healthcare, Environmental Services, Commercial Property Management, and even in the Insurance Industries.

IT/OT CONVERGENCE

“... the benefits that come from managing IT and OT convergence, alignment and integration include
optimized business processes, enhanced information for better decisions, reduced costs, lower risks and shortened project timelines.”
Gartner

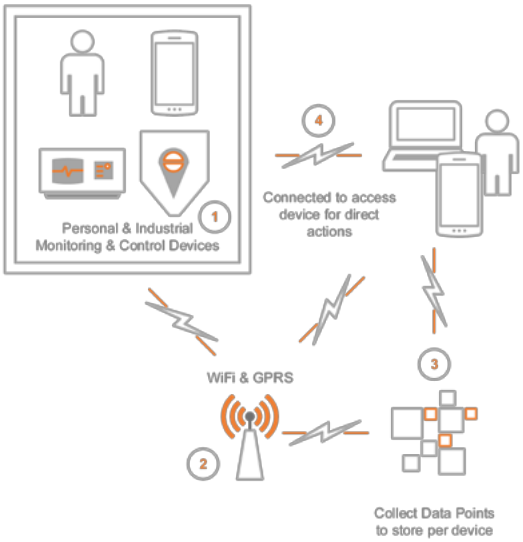
You may have seen the “pay as you drive” insurance models where you fit a GPS tracking device in the car, your driving information is logged when you drive and your premium is calculated based on usage. There are a few typical use cases listed at the end of this article.

There is much talk of the convergence of IT/OT by industry analysts and in a recent Gartner press release they state: “... the benefits that come from managing IT and OT convergence, alignment and integration include optimized business processes, enhanced information for better decisions, reduced costs, lower risks and shortened project timelines.”

This convergence provides the platform for the IoT to connect to the bigger IoE. This convergence is not new and happened at an increased pace over the past few years with the widespread adoption of consumer “smartphones” with Internet connectivity.

http://www.gartner.com/newsroom/id/1590814
http://www.smartinhaler.com

IOT BEFORE XMPRO



The challenge with the current state of IoT is that it is great for single control actions (open a garage door from an iPhone) and the control processes are typically rigid with very specific objectives. The diagram below shows the current approach to many IoT solutions (such as the garage door example) where the user will interact with the smart device directly.

IOT AFTER XMPRO

Applying the IoT to real industrial and commercial use cases requires a solution that integrates these devices into the broader operations and business processes of organizations, their systems and their eco-system.

The real benefits of the IoT for commercial and industrial applications are not only the ability to monitor and control these devices remotely, but to log the data from these devices to create Operational Intelligence (OI) information from it.

This OI or real-time Business Intelligence provides a platform to create predictive models for business performance optimization. Data from smart sensors can, for example, predict industrial pump failures and automatically start corrective action and remedial processes based on the type of pump or its location. Just imagine what this means for planned maintenance of the ESPs (Electric Submersible Pumps) used to pump oil from the bottom of the ocean. Predictive data is not only useful for industrial machines such as pumps but is also valuable in more personal scenarios. An example is smart inhalers that assist with improving the efficacy of prescribed medication through monitoring adherence to prescribed therapies that leads to improved disease management and reduced healthcare costs.

The XMPro IoT model below describes the real world of IoT/IoE in business and how to implement IoT as part of Intelligent Business Operations.

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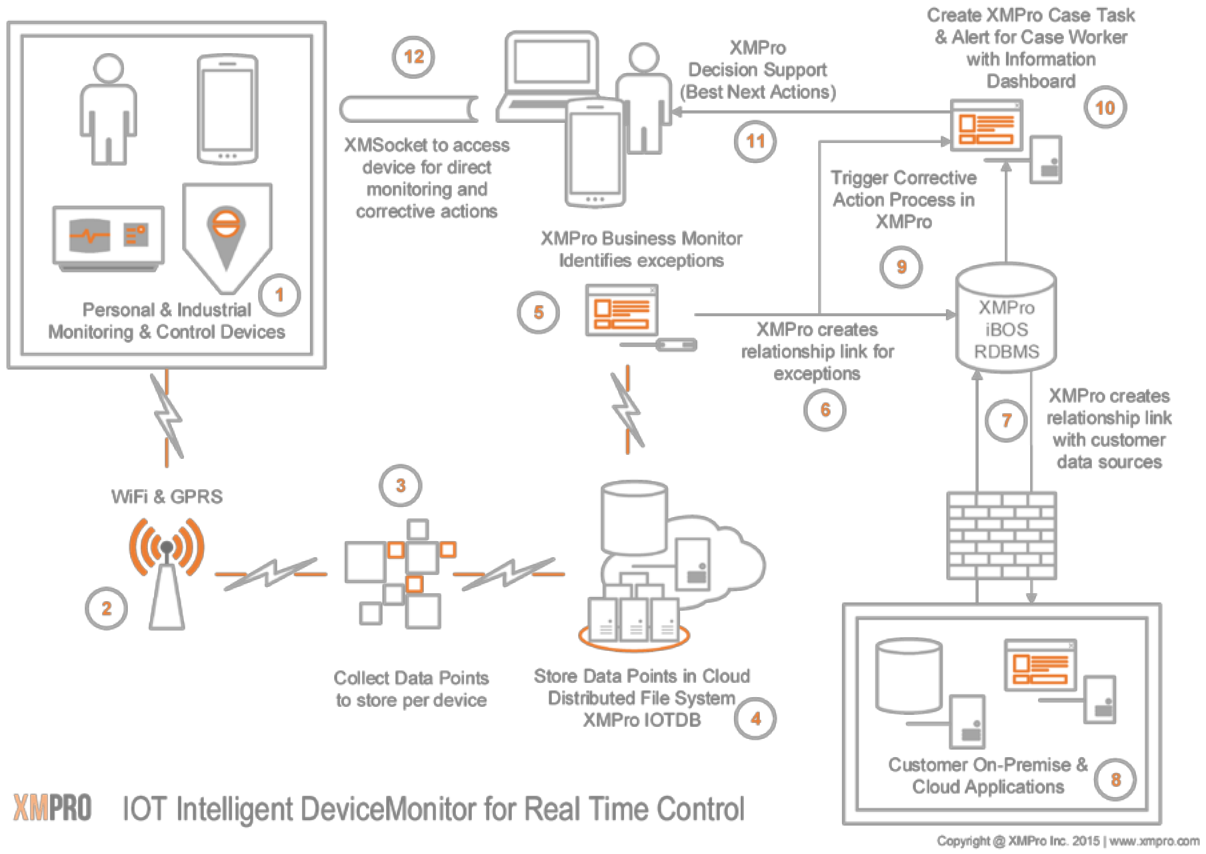


THE XMPRO IOT DEVICE MONITOR MODEL

The model describes a typical closed-loop process for monitoring and control devices found in both consumer and industrial use cases.

1. Both consumer and industrial hardware and devices now have the ability to embed sensors and controls that can wirelessly connect, transmit and receive data and information to monitor, and in some instances, control the behavior of these devices. Examples include temperature and speed sensors, pressure gauges, heart rate monitors, smart phones, and in extreme cases even baby diapers that will alert parents when it needs to be changed. Many of these devices now have the capability to “publish and register” themselves on the Internet, for example, smart light bulbs that register on a Building Information Modeling (BIM) solution and report its power consumption.

2. Many of these devices now have embedded wireless or cellular technology and in some instances it may still be connected to a physical network through the Ethernet protocol.

3. Sensors on these devices collect data points that are aggregated and transmitted to another device, for example, a simple smart phone application can switch lights on and off. In the XMPro IoT model the real value for business with commercial or industrial equipment is to store these data points in a time series database. These data points provide invaluable information for predictive analytics.

4. Storing these data points in a time series format is best done in a cloud-based distributed file system. This can be done in either a private or public cloud. The volume, variety and velocity of this data that is stored is typically not suitable for conventional relational databases. The XMIoTDB can be used to log this time series data with a simple identifier or ID and data points. It typically does not contain any information that would make the device identifiable in case of a security breach. The raw data is not useful without matching it to records in relational sources such as ERP and CRM solutions. This is done external to the XMIoTDB and maintains the integrity of the data. Monitoring alerts can be set on the XMIoTDB database to identify exceptions or to set control limits to notify the XMPro Business Monitor.

5. The XMPro Business Monitor receives alerts from the time-series database, other external data sources, web services, and from the device itself. These alerts can be ECG values for a cardiac arrest patient with a wearable device, or it can be a temperature sensor on the bearings of a big mining crusher that shows the operating temperature above acceptable limits. The XMPro Business Monitor creates an immediate action that notifies the correct people or other systems of the alert. It will trigger the relevant or associated XMPro workflow or case management task for corrective action.

6. The time series data in XMIoTDB contains no metadata around the device or any of its associated properties. Once the XMPro Business Monitor creates an alert, it will look to find relational and metadata around the device and the meaning of the captured data points. This ensures complete privacy of information and also removes the load on the logging database.

7. XMPro establishes the relational information needed for the business process from customer and other data sources that can be inside or outside the firewall. This approach ensures complete anonymity for the data time-series database. This can be simple matching to ERP records or it can be mapped to business entities defined in the XMPro Virtual Entity Framework. A virtual entity for a deep sea oil rig submersible pump may, for example, include a physical pump description and serial number from the engineering system, the supplier from the ERP, and GPS location or associated rig from a GIS system. An XMPro Virtual Entity is integrated to the backend systems to reflect any master or transactional data changes. This ensures that the underlying business system is always the “golden source of truth”.

8. XMPro's XMConnect provides a full SOA integration platform to connect internal and external applications and information to the processes. Business processes are integrated to ERP, CRM, MMS and other business applications as well as external data sources. An example of a web based data source is the database of submersible electric pumps found at http://jip.esprifts.com. This information can be used to help predict the failure point of a pump that currently registers a certain vibration level on the XMPro Business Monitor. In Healthcare this information is in patient records systems that requires strict privacy controls and the XMPro approach of segregated data sources improves compliance and control in an Internet of Everything world.

9. XMPro iBOS Intelligent Business Process Management Suite enables organizations to create unique processes to support the type of response required for a specific business monitor alert. XMPro addresses both workflow and case management (where the flow is not known in advance such is often the case with investigative or corrective action processes) in a single environment. It is designed for business champions to be able to configure these integrative processes without coding. It recognizes that the level of process maturity varies across industries and even within organizations in those industries. It supports organizations on the journey from simple basic processes to sophisticated intelligent business operations.

10. Work tasks with supporting information and dashboards from the time-series database are automatically allocated to the correct person to respond to the alert. It supports skills-based routing for specialized equipment or patient cases etc. The tasks are delivered to operations and business users on mobile and notebook/desktop user interfaces. It provides for SMS and email alerts and it ensures response through escalation processes that are linked to the severity or criticality of the task.

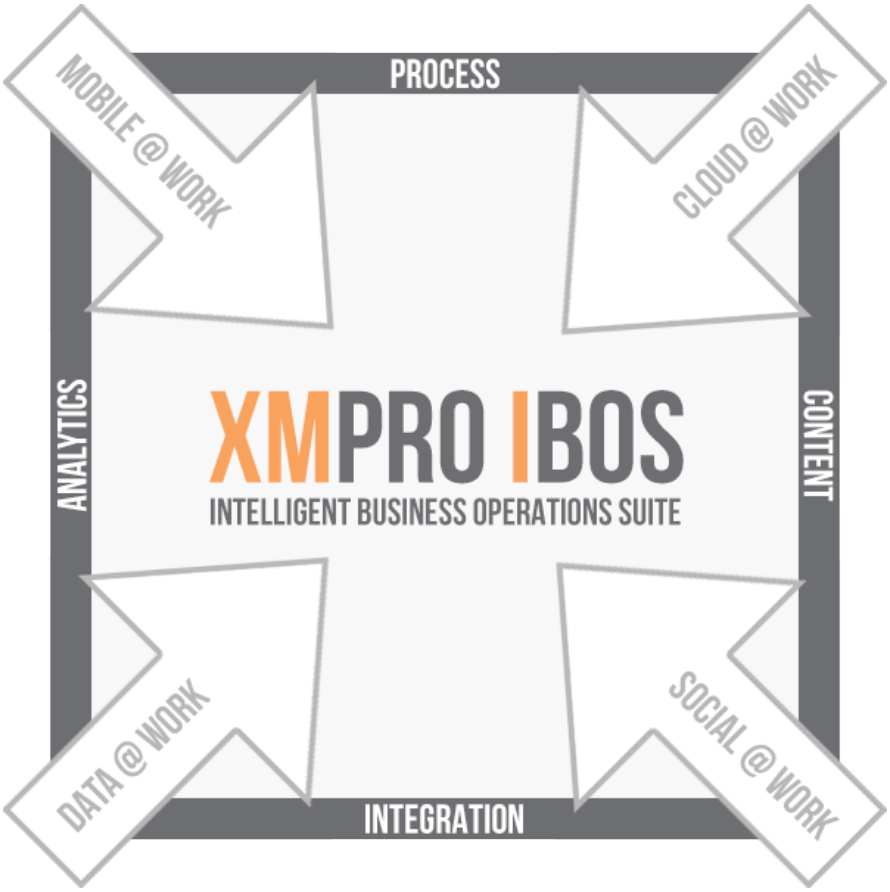
11. XMPro's iBOS is event-based for processes where the workflows are not predefined. These are processes where the next step will emerge as you are busy with the current one. This feature enables smart knowledge workers like doctors, engineers, plant operators and maintenance supervisors, amongst others, to decide on the best course of action based on the knowledge, experience and intuition. XMPro provides decision support in the form of "best next actions", predictive analytics, process mining, and in-flight dashboards to help these knowledge workers make better decisions faster.

12. The last element in this closed loop scenario is to use remote access from within XMPro (either mobile or desktop/notebook) to access the device real-time and make necessary adjustments or shut it down altogether. XMPro's XMSocket technology enables users to access smart devices from within the application and make changes through the Internet.

Here are a few use cases for the XMPro IoT DeviceMonitor solution:

- XMPro IOT WellMonitor for Oil & Gas
- XMPro IOT PatientMonitor for Healthcare (Providers & Payers)
- XMPro IOT EnergyMonitor for Property & Building Management
- XMPro IOT WasteMonitor for Water Utilities (Sewage & Water Management)
- XMPro IOT VehicleMonitor for Insurance (Premiums based on usage & behaviour)
- XMPro IOT PlantMonitor for Industrial Plants
- XMPro IOT EnviroMonitor for Disaster Management

THE DRIVERS FOR IOT - THE FORCES THAT ACCELERATE THE INTERNET OF EVERYTHING



The adoption of the “Internet of Everything” is fueled by the adoption rate of the technologies that enable it. Mobile device use is growing exponentially, cloud and big data storage make it easier to access everything through the internet, and social networks changed the way the internet networks create and consume information. XMPro harnesses these technologies through the business value focus of processes, analytics, integration and content management.

- **Mobile:** The XMPro iBOS mobility platform supports processes at all levels on all mobile devices based on a single model view. XMPro dynamically updates processes on devices as continuous process improvement changes are made to the platform.

- **Cloud:** XMPro’s Intelligent Business Operations platform is global, 24/7, available to “Always-On” employees, customers and suppliers. The platform as a service (bpmPaas) provides a low cost but secure, operational platform in the public, private and hybrid cloud deployments.

- **Big Data:** XMPro integrates data from multiple streams to create new information for decision support, competitive advantage and dynamically optimizes processes for better performance. It manages volume, variety and velocity based on requirements and maturity of business process.

- **Social:** Social for Intelligent Business Operations clearly distinguishes between social networking and social collaboration. Collaboration is supported at the transactional level, providing context and unstructured information in a visible audit trail. XMPro reduces breakout to email.

The XMPro IBO Ascendancy model provides a roadmap for adopting the technology to support the IOT at a rate that is supported by the business maturity.

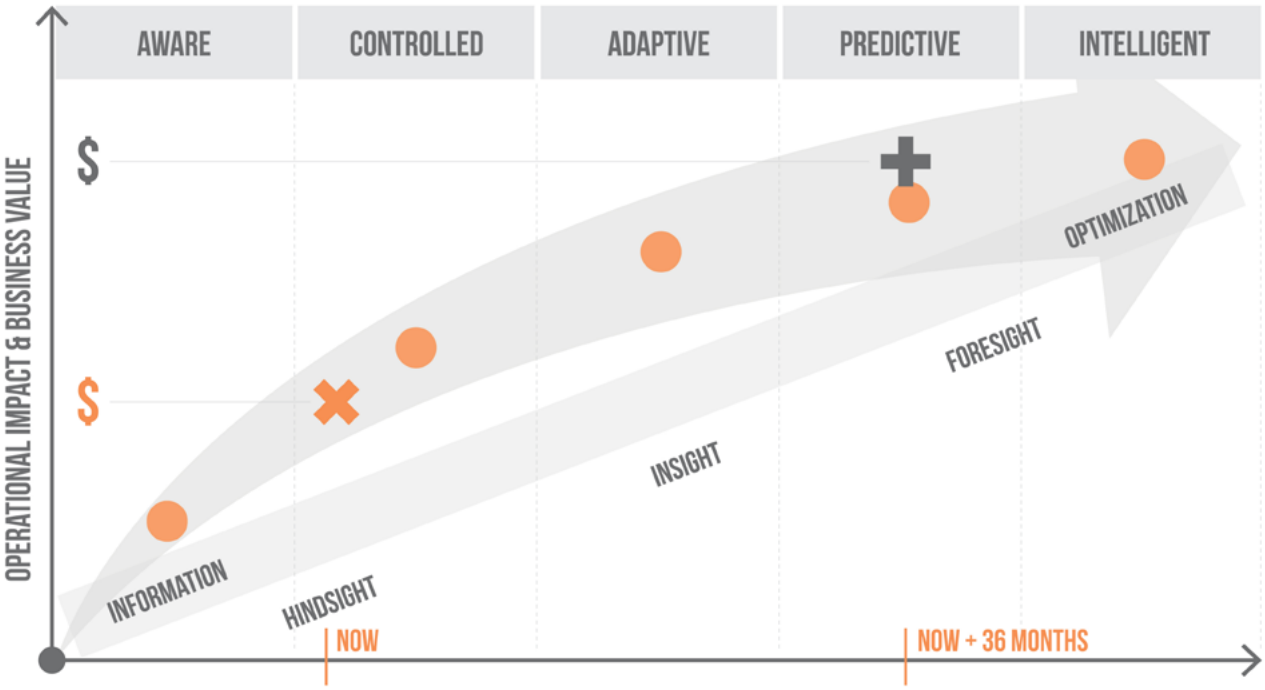
THE MATURITY MODEL - GAIN EARLY MOVER ADVANTAGE WITH XMPRO IOT ROADMAP

	AWARE	CONTROLLED	ADAPTIVE	PREDICTIVE	INTELLIGENT
CONTENT		Process related content uploaded and stored with process.	Case files integrated with ECM solutions like SharePoint etc.	Unified Comms content with entity views of auto tagged content.	Social with sentiment and analytical content for adaptive processes.
INTEGRATION		Internal application integration such as ERP and CRM.	Real time integration to external data sources and web services, IOT.	Smart integration - plant equipment (SCADA) and federated data.	No-SQL integration framework to "look" for relevant data sources.
ANALYTICS		Dashboards embedded in processes for decision support.	Process Goals and BI analytics for diagnostic decision support.	Process mining pattern discovery and Best Next Action analytics.	Embed predictive & prescriptive analytics for AI-like decision support.
PROCESS		Structured workflow processes designed without coding.	Event-based, unstructured case style process work. Hybrids.	Process options adjust dynamically to context, data and business rules.	Adaptive processes suggest actions to optimize outcomes.

OPERATIONAL IMPACT & BUSINESS VALUE

MATURITY/EFFORT

WHAT HAPPENED?	WHAT IS HAPPENING?	WHAT SHOULD HAPPEN?	WHAT WILL HAPPEN?	HOW CAN WE MAKE IT HAPPEN?
No formal operations management processes are in place. People make decisions based on information in spreadsheets, reports and basic accounting apps.	Some operational processes are mapped and managed as structured workflow. Some workflow in ERP & CRM. Dashboards provide improved data visualization.	Unstructured processes that cannot be mapped in flows are managed as adaptive events. BI analytics provide insight into performance and actions are suggested to achieve KPIs.	Process mining predicts process outcomes based on historical pattern analysis. Real time and predictive analytics provide Best Next Action suggestions for goal driven KPIs.	Connected processes with real time big data use prescription analytics and models to optimize for conflicting goals. Processes "learn" from previous successes & failures.



TALK TO US TODAY

The Internet of Everything brings with it exciting new opportunities for innovation and improving the quality of life of everyone it touches. But it also has a number of risks and implementation challenges.

Getting real busines benefits requires a proven approach to connecting, integrating and managing people and knowledge work with smart systems and devices that can sense and respond.

Learn how XMPro's Intelligent Business Operations Suite can give you a competitive advantage in the IoT/IoE economy.

Please contact info@xmpro.com and see how we can make "things" work for you.

ABOUT XMPRO

Since 2009, XMPro has been helping organizations improve operational excellence, reduce risk and improve asset utilization through its Intelligent Business Operations platform.

XMPro iBOS combines Operational Intelligence with Business Process Management, which enables organizations to sense key business events, decide if action is needed and then take the appropriate action.

XMPro is headquartered in Dallas, Texas with offices in Australia, the UK and South Africa.

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