



The Connected Plant: Creating a Mobile and Wireless Strategy for the Industrial Enterprise



Introduction

Process control and maintenance systems for improving operational efficiency and asset performance have been in place for many years. What's been missing is the ability to connect these legacy systems with your mobile workforce. It's not about replacing these systems – it's about allowing people and systems to communicate. It's about standardizing operational processes. It's about the ability to communicate anytime, anywhere with both systems and people. It's about getting the most of out of your workforce and the systems they rely on. It's about the Connected Plant.

What's in it for My Plant?

So what if you could...

- provide personnel in the field with access to the same information as they have at their desk or console?
- provide personnel with converged voice/data communication devices designed for your environment?
- track assets as they move around – or even out of – your facility?
- capture condition monitoring data using wireless handhelds and/or wireless sensors?
- provide video surveillance to even the most remote portions of your operation?
- track personnel in an emergency?

Mobile and wireless technology is rapidly reshaping the industrial world. Within the next ten years, almost every employee will have a mobile device which will be their all-in-one communication tool. It will provide voice communications, messaging, and access to corporate data anytime, anywhere. The handheld device will be able to “talk” directly to equipment and assets in the field. In effect, everything will have a wireless computer attached to it – either something as simple as an RFID tag or as complex as a wireless sensor. And many of these wireless sensors will relay information directly into your back-end systems. Last, but not least, employees will also have smart badges alerting them to hazardous environments and notifying emergency personnel when the employee is in danger. All of the technologies, and the infrastructure to support them, are available today.

But why make the investment? For the same reasons you replaced your analog control system with a Distributed Control System (DCS). Or the same reasons you replaced your paper maintenance work order system with a computer-based one. It's about better control, better decisions, improved safety and performance, and increased productivity. More accurate and timely information about your assets will increase the return you get from them as well as reduce the risks associated with unplanned failures. Improved visibility of your facility and the personnel working in it will improve safety. Better tracking of contract personnel and equipment will reduce your costs. And a multi-faceted communication system will provide access to information and the connectivity needed to reach anyone, anywhere for more timely decision making.



Taking Operational Performance to the Next Level

Through the power of mobile and wireless applications, you can improve asset uptime, better protect employees, improve employee productivity, and achieve cost-effective compliance:

- **Improve asset reliability.** With a mobile computer in hand, workers can monitor the real-time state of machinery, able to spot and proactively address issues before they impact production. And when the asset maintenance function is mobilized, the result is proper and timely scheduling of maintenance, including visibility into what services were performed as well as how they were performed — providing the real-time data required to tightly monitor this critical function.
- **Improve employee safety.** When machinery is well maintained, workers are at less risk. But when workers have either a Real-Time Location System (RTLS) or RFID-enabled badge or an intrinsically-safe (I-Safe) mobile device with locationing capability, employee whereabouts are always known, improving safety. You can monitor the evacuation of all personnel from an area in the event of an emergency. And since these solutions allow you to monitor movement as well as lack of movement, you can easily spot a man down even in very remote areas.
- **Improve employee efficiency.** By placing all the functionality of the desk phone, a two-way radio and desktop computer in an easy to carry integrated voice and data mobile device, workers can access the information they need to tackle any task throughout the workday, wherever they happen to be. The need to spend time in the office focused on paperwork and not on job performance is practically eliminated. Workers can now access and transmit that information from the field — regardless of whether they are performing routine maintenance or monitoring production volume. And with a real-time connection to the business systems, workers on a pipeline can access information that might be required to complete a repair, right at the point of work. As a result, the hours per day spent in the office can now be spent out in the field. Time on tools is substantially increased, improving overall utilization for these high value workers.

- **Improve accuracy and reduce the cost of compliance.** A myriad of regulations requires the nearly constant collection of a large amount of data. A mobile computer significantly automates the collection of that data through drop down menus and check boxes as well as the ability to read a bar code, direct part mark or RFID tag — and you can even connect a specialized device, such as a gas detector, to the mobile computer. As a result, data can be collected in less time, with fewer errors, and instantly transmitted to your business systems. Data accuracy is improved, up to date reports are available at any point in time, and data is collected in less time, bringing a new level of cost-efficiency to the compliance function.

Overcoming the Challenges of Deploying Wireless Infrastructure in the Plant

Building the wireless infrastructure to support mobile and wireless applications is the necessary, but often overlooked, first step to the Connected Plant. There are a number of reasons for the infrastructure decision being postponed but the most common reason is lack of authority to deploy wireless technology at the plant level. The push is coming from the plant but the wireless authority and responsibility is generally held centrally by corporate IT. Compounding the problem is that corporate IT's extensive wireless expertise is typically based on office (or indoor) deployments. There is less resident experience related to industrial (outdoor) deployments that are much more complex in nature than office deployments. Environmental considerations, distance requirements, and the breadth and scope of the applications make industrial deployments inherently much more complex than office deployments.

The decision to deploy wireless technology in a plant is also affected by concerns around reliability and security. These concerns are often based on the assumption that the wireless infrastructure will be tied into the control system. The control systems group is typically involved in the decision to deploy wireless in the plant and has a specific interest in the deployment of wireless sensors. Senior management concerns about the deterministic ability of wireless systems may result in resistance to

control system tie-in. However, the myriad of other applications enabled by today's wireless technology justify the business case for wireless deployment – even without tie-in to the control system.

Cost can also be a barrier to deploying wireless infrastructure in an industrial environment and much of the cost can, ironically, be attributed to wires. Traditional wireless Access Points (APs) have to be wired and, in an industrial facility, wires must often be run in conduit. Combined with safety requirements, including the possible need for APs with hazardous location ratings, the cost of deployment can often be ten times the cost of the wireless gear itself. Recent advances in wireless mesh, point-to-point (PTP), and point-to-multipoint (PMP) technologies have significantly reduced the need for wires. And for the industrial enterprise, the reduction in wires translates directly into a significantly reduced cost of deployment.

Other challenges to deploying wireless technology include:

- Complex, multi-path environments,
- Need for ruggedization,
- Potential fire and explosion hazards,
- Large, dispersed coverage areas.

These challenges have been addressed by recent developments in wireless technology and products, including:

- Mesh APs designed for outdoor deployment that have multiple power options and hazardous location certifications
- New planning tools and the new 802.11n wireless standard mitigate the impact of multi-path environments
- The combination of mesh, PTP, and PMP technologies provides the coverage where you need it.

The technology barriers to deploying wireless technology in a difficult, industrial environment have been overcome and the cost of deployment has been significantly reduced. But it is still not a simple undertaking. The keys to successful deployment include understanding your technology options, taking a systems approach, and using the right planning tools.

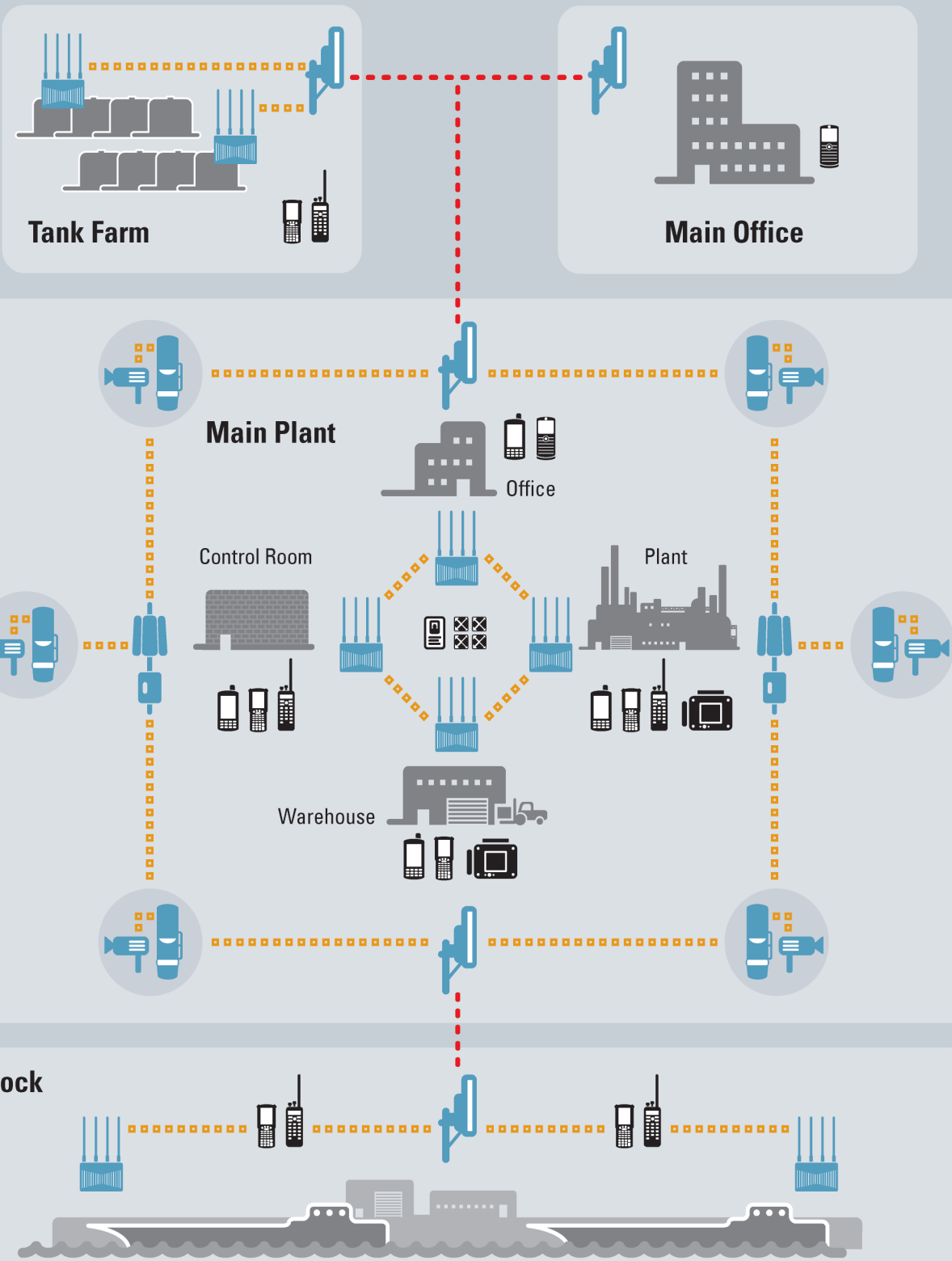
Motorola: A Systems Approach to the Connected Plant

Motorola is a market leader in wireless and mobile technologies for the industrial enterprise. We design our systems to optimize functionality, maximize ROI, and minimize risk. Our systems are characterized by the following:

- A holistic approach to deploying a robust and reliable industrial wireless network;
- A wireless network design that considers all potential scenarios including integrated voice;
- An affordable and non-disruptive remote infrastructure and device management solution;
- Effective security for protecting information and assets from unwanted intrusions;
- Technology that meets mobile workers' needs and reinforces corporate policies and procedures; and,
- A commitment to standards that reduce the costs of deployment and integration.

Perhaps the biggest challenge is to provide all of this without introducing so much complexity that enterprise mobility becomes impossible to manage as it expands. **Figure 1 (on page 5)** schematically shows the results of a well planned and executed industrial wireless voice and data strategy.

The Connected Plant



- - - Wireless connection
 - - - Long-distance wireless connection
- Wireless infrastructure:**

 Video Camera
 Canopy PMP Subscriber Unit
 PTP Module
 Canopy AP Cluster
 Outdoor Mesh AP
- Wireless Devices:**

 MC75
 TEAM VoWLAN Handsets
 MC909X
 Motorola 2-way Radio
 RD5000
 Employee Badge
 RFID Tag

Figure 1: Integrated Voice and Data for the Connected Plant

The core of the wireless infrastructure in **Figure 1** is a network of outdoor mesh APs – such as the **AP5181** – that are designed for use in an industrial environment (with hazardous location certification as required). The APs provide the necessary wireless umbrella over the facility allowing mobile workers, remote sensors, and asset tags to communicate with each other and into backend systems. The wireless infrastructure also provides the backbone for the deployment of a Voice over Wireless LAN (VoWLAN) system to support converged voice/data communications.

Tying your wireless mesh networks together is accomplished with Motorola's Wireless Broadband solutions – including **Canopy PMP** networks and **PTP** wireless ethernet bridges. These proven wireless broadband networks allow you to connect the plant to the tank farm, the marine terminal, and even a remote office that may be more than 100 miles away. They also support the deployment of a cost-effective video surveillance network regardless of the size of your facility. They are effectively the wireless equivalent of a broadband backbone connecting your multiple wireless subnets.

Mobile computers – such as the **MC909X** and **MC75** – provide real-time connectivity to asset tags, sensors, and operating/maintenance systems. These rugged handheld devices provide your mobile workforce with access to the same data and communication capabilities they would otherwise get in the office – regardless of whether they are in the plant, the tank farm, or at the marine terminal. Additional functionality includes the ability to read barcodes and/or RFID tags, communicate with peripherals such as vibration sensors, and communicate over the Motorola radio network (with the installation of the TEAM VoWLAN solution).

Other elements of the Connected Plant supported by the wireless network include wireless sensors, WiFi tags, and RFID subsystems – such as the **RD5000** – for monitoring and tracking assets and personnel. A combination of a commitment to standards, partner collaboration, and pre-integrated components allow us to deliver a system today that grows as your needs grow well into the future.

To learn more about how an integrated approach can help you create the Connected Plant, contact Motorola's Enterprise Mobility Business – a leader in wireless voice and data systems for all types of enterprises.



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