HMS Industrial Networks

Your Partner for Industrial Communication

Putting industrial applications on the cloud

Whitepaper

Best practices for managing and controlling industrial equipment remotely.

HMS Industrial Networks AB · Stationsgatan 37 · 30245 Halmstad · Sweden
Tel: +46 35 172900· Internet: www.anybus.com· E-Mail: info@hms.se

Table of contents

© Copyright 2011 - HMS Industrial Networks - All rights reserved

1. Introduction

Engineers can be a conservative lot, particularly when they are responsible for the organisation's core systems and assets. They often fight shy of new technologies, waiting to see others use them first, and it is becoming clear that they are currently missing out on the advantages of cloud computing. As management pressure increases for engineers to deliver more for less, cloud computing may provide some of the answers.

So just what is meant by cloud computing; how will it affect users of industrial applications, and what are the advantages over conventional alternatives?

These are some of the questions we will answer in this whitepaper.

Henrik Arleving, Product Manager Remote Management, HMS Global Marketing
Stuart Hannah, Business Development Manager, HMS UK

© Copyright 2011 - HMS Industrial Networks - All rights reserved

2. What is cloud computing?

The term cloud computing simply relates to the Internet. It comes from the way it is depicted graphically, typically as a cloud diagram. More specifically it relates to how services such as infrastructure, applications and business processes can be delivered on demand via the Internet.

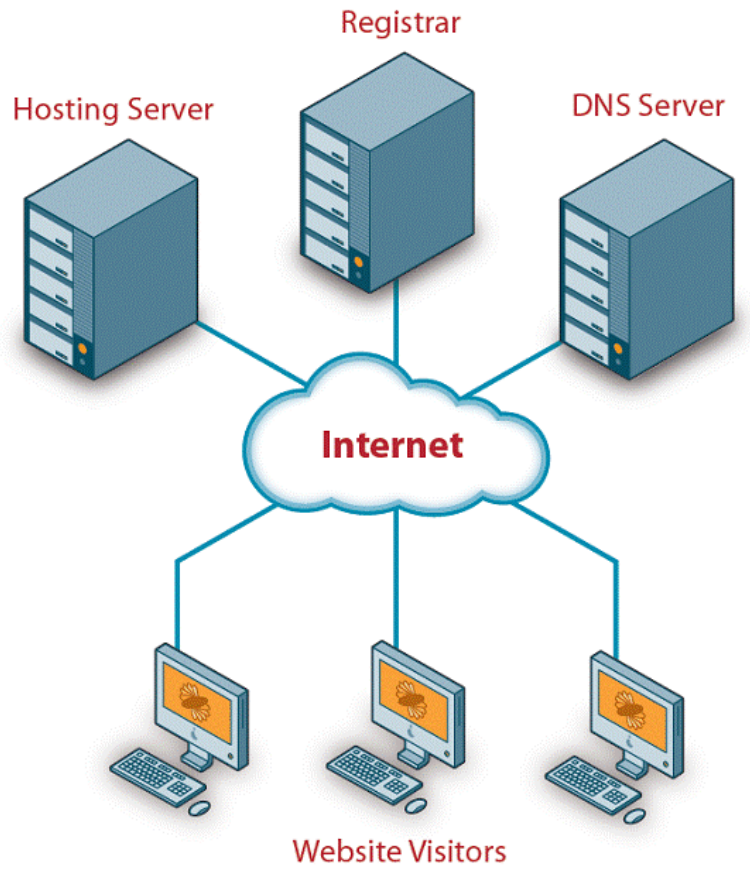

Fig 1. Typical cloud diagram

2.1 Software as a Service

One example is the provision of software as a service (SaaS) to deliver software applications via a standard web browser. This means that software such as general office desktop applications and associated data are not resident on your PC, but are hosted remotely and accessed over the Internet using a web browser. It uses a different business model, where you don't buy the software and server hardware but rather lease it, paying only when you use it, or by the volume of data stored.

The benefit is that you can remotely access all your site information from any suitable browser with Internet access. Not just your word processor but your accounting package, building management systems, or ERP, in fact almost anything.

© Copyright 2011 - HMS Industrial Networks - All rights reserved

As these services are provided via the Internet they are scalable (both up and down), reliable, are easily accessible, and they can complement or replace the user's own IT infrastructure. More importantly, new applications can be trialled, deployed and shared quickly and easily. The benefits include reduced investment, simplified maintenance and optimised plant operation. Decision making and implementation can also be faster as there is no capital expenditure needed.

External servers, virtual servers, storage and other on-demand services are available to support and back-up existing functions and can often reduce the need for new or additional infrastructure investment. Cloud computing offers other opportunities such as providing an external service platform (also referred to as „platform as a service") on which to build or run/host applications which may be too complex to implement internally. They can also be used to provide new external services to customers, with the benefit of not needing access to internal IT infrastructure from either side.

3. A growing need for monitoring machinery and industrial applications

One growing demand for the use of cloud computing is for remote monitoring of plants and equipment. It is becoming increasingly important for engineers to monitor and manage machinery in order to improve up-times and reduce maintenance costs, and this can be especially important when plants are geographically widely spread. A simple solution may be to add a web server to your plant in order to view the data via the Internet, although this can leave the plant vulnerable to hackers. However, by using the SaaS model delivered over the clouds, risks and vulnerabilities are removed.

The remote monitoring of a factory does not apply only to fixed installations. Potentially any vehicle or equipment with an electrical power source can be monitored, have data exchanged, and even GPS tracking enabled. Communication with remote monitoring devices is available through a range of options. These include quad band GSM/GPRS mobile communications and Ethernet TCP/IP connectivity via LAN/WAN. Typically, the monitoring devices use serial communications such as RS-232 and RS-485 for connecting to a local plant: Modbus RTU and other popular open or proprietary network protocols may also be available.

© Copyright 2011 - HMS Industrial Networks - All rights reserved

4. How it works

There are three main elements to any cloud based remote monitoring solution. The first is the physical layer that comprises of a communication gateway that links to your equipment, acquires the data, and communicates it to the remote server. The second is the remote server that collects and stores the data, and the third is secure access to the data through a customized online dashboard.

Fig 2. Secure server for collection and storage of data from remote devices

Communication gateway devices take several forms for ease of connection to the device or equipment being monitored. The connection is generally through serial communications or by using a popular open protocol such as Modbus RTU. Additional functionalities such as global positioning systems (GPS) are available to meet the demands for location based services (LBS) like tracking and geofencing (providing notification when a tracked device enters or leaves a predetermined geographical location).

Acquired data is sent to the remote server by the gateway devices at selected logging intervals ranging from real-time to 300 seconds as demanded by the application. To communicate with the server, gateways generally use either quad-band GSM/GPRS wireless technologies or Ethernet TCP/IP connections: both may be used concurrently on the same installation. GSM (Global Systems for Mobile Communications) is the most widely used technology for mobile communications, whereas GPRS (General Packet Radio Service) is a newer function integrated into GSM that allows for the

© Copyright 2011 - HMS Industrial Networks - All rights reserved

simultaneous transmission of high speed data across a mobile telephone network. The costs for data only transmissions using GPRS are significantly lower than for voice calls.

Where the communication gateways use Ethernet based connectivity it is normally via wide/local area networks (WAN/LAN) with direct connection to the server via the Internet. The use of special firewall friendly communications between the remote gateways and the data center makes it possible to retain the existing broadband security infrastructure at the customer's site. This procedure is accepted by most IT departments and gives confidence that the installation is controlled from a security perspective. Communication gateway devices are normally pre-configured and require no programming or IT expertise, so neither virtual private network (VPN) nor static IP addresses are needed.

Data is communicated to and stored on a remote server. In the case of HMS's Netbiter Argos solution the server is located at one of three data centers and the data backed up at the other two. Information held there can be displayed graphically in the form of customized dashboards (see below), or downloaded into the customer's businesses management system for analysis and reporting.

4.1 Graphical dashboards makes for easy overview

Information on the server is viewed using a standard web browser. To simplify configuration of the graphical display, standard tools are incorporated into the server. These include downloadable device templates for establishing communications between the remote plant and the communicating device and auto web pages (dashboards). Some systems contain libraries of ready-made web page dashboards for applications such as power generators, water/waste management, base stations, building and HVAC management and many more.

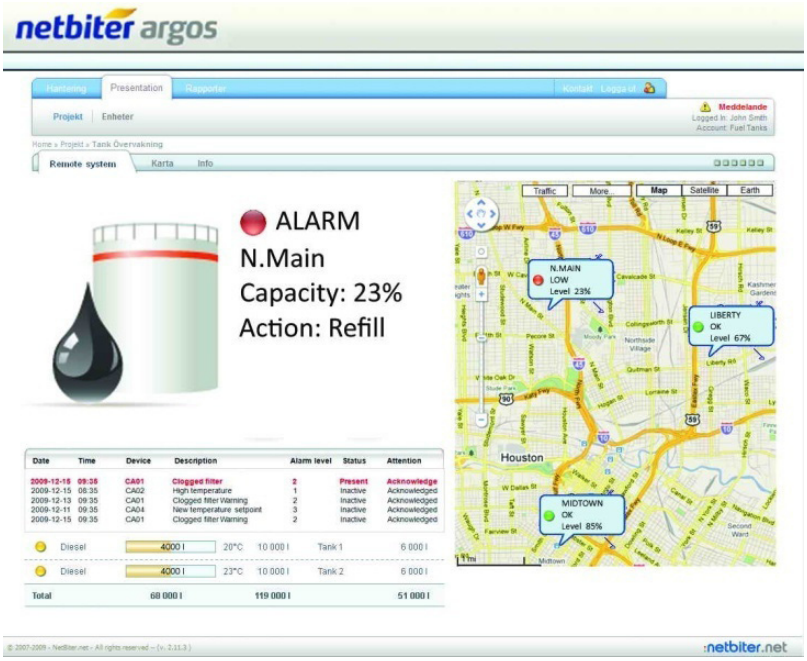

Fig 3. Remote Alarm dashboard with integrated GPS functionality

© Copyright 2011 - HMS Industrial Networks - All rights reserved

It is possible to quickly and easily create a graphical layout of the remote installation. The dashboard includes functions for loading pictures into the layout, analogue and digital graphical components (such as gauges, meters, indicators, etc.), which makes it possible to detail a remote system with a visual layout that is easy to understand. Where appropriate, GPS data makes it possible to view the location of each device in the field on an overview map (using Google maps) and the system also lets you build multiple installations.

5. Stand-alone applications such as power generators

For monitoring and controlling simple stand-alone equipment not required to communicate with the central server, a range of communication gateways with integrated web server functionality are often used. These can be wired or wireless types, and support for an external GPS receiver means that it is also possible to identify the location of the equipment. This can be particularly useful for fleets of rental machines such as standby generators.

In addition to handling communications, these devices will often provide built-in features for data logging, alarm handling (via email of SMS messaging), and configurable web pages for monitoring and control from remote locations via the Internet without special tools or software.

© Copyright 2011 - HMS Industrial Networks - All rights reserved

6. Using the data

Access to the server information means that users can log historical data and produce graphical trends or diagnostics, manage alarms, or automatically backup or restore remote configurations. Although not originally conceived as a SCADA package, the functionality exists to easily configure one. The servers data can also be accessed by the users own ERP system for further analysis and reporting.

6.1 Security of data and access

Establishing a secure and reliable communication path over the Internet requires solving a number of technical challenges such as, firewalls and public IP addresses. Rather than using complex and expensive solutions to install and manage this such as VPN, special M2M SIM cards etc., the Netbiter remote management solution has been developed to provide a simpler firewall friendly solution. This enables the user to focus on the plant issues without the needs for specialist IT skills, or calling on others to address the extensive Internet, firewall, GPRS/APN configurations.

Moving data off-site raises concerns over both its security and availability. By using special firewall-friendly communications between the remote communication gateways and the data center, it is possible to keep existing broadband security infrastructure at the customer's site. This procedure is accepted by almost all IT departments and gives confidence that the installation is secure from a security perspective.

Data storage is rigorously protected as the remote server/data center is automatically backed up, so the risk of losing data, or downtime due to access problems with the server are minimised. Data centers run on professional enterprise-class architecture that is designed to support both small and large-scale deployments. They provide 24/7 monitoring of the server health, redundant servers at different geographical locations, redundant storage, and protection against fire, theft and similar eventualities.

To ensure the security of wireless communications over GPRS, dedicated SIM cards can be selected. These mean that it is not possible to ping or try to access the remote site except through the data centre and also avoids unnecessary and costly GPRS traffic. If however the system does not need this added security normal data enabled SIM cards can be used.

Access to the online system is centrally controlled and requires password authentication. Multi-level password layers are used to provide permissions to access different functions, and the server authenticates users and ensures their correct access levels. Password activity is logged by the server, and all communications are secured using Secure Socket Layer (SSL) encryption. This is the same method banks use for secure online transactions.

© Copyright 2011 - HMS Industrial Networks - All rights reserved

7. Typical adopters

Typical adopters have been companies in machine monitoring and analysis, power generators,building automation, tank farms, pump and pumping stations, and renewable energy sites. Mobile communications via GSM and GPRS mean that monitoring even the smallest sites are viable

8. Costs and conclusion

Custom-made remote management systems are often costly to develop (although they deliver the exact functionality required). A ready-made remote management solution is substantially cheaper. For example, in the Netbiter remote managment solution from HMS, users purchase only the communication gateways which attach to their field equipment. The cloud services (in the Netbiter example, usage of www.netbiter.net) is free of charge. If information is sent over the mobile phone network, there is also a data traffic cost involved.

8.1 Quick ROI

The return on investment is quick. The costs for a gateway usually equals the costs for few service visits. By cutting down on travelling, it is also possible to reduce a company‘s carbon footprint and only do service visits when really needed.

Cloud based services may not be the answer to all manufacturing issues, but its secure performance and potential to reduce investment costs is likely to have a huge impact. Most people are comfortable with online banking for checking their assets and transferring money from one place to another, so maybe remote management of our business assets is not such a big a leap into the unknown.

© Copyright 2011 - HMS Industrial Networks - All rights reserved