



Integrating GSM technology

A white paper on the benefits of remote access technology

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Scope

This document outlines the benefits of integrating leading edge remote access technology into access control systems used in industrial, retail, and domestic locations. The technology referred to in this document relates to currently available GSM (Global System for Mobile) devices and to devices that use IP (Internet Protocol) technology.

These technologies are versatile and well tried and offer additional technology add-ons such as GPS (Global Positioning System), GPRS (General Packet Radio Service) and web access.

What can remote access technology do?

In order to understand the benefits of using remote management systems with access control technology, we will apply it to the following examples,

Shutter Controllers

What do we currently have available with this technology?

1. Push button up/down control
2. Key-switch control
3. Key fob control
4. Proximity card/Smart card control
5. Keypad control

By adding GSM technology to the shutter control products, they can be enhanced as follows,

- A. Shutter control via SMS message sent from a phone or from a PC or server with the appropriate text to SMS software – with acknowledgement returned to sender
- B. Secure multi-user remote control from mobile and fixed line telephones from anywhere in the world
- C. GPRS data transfer via the GSM device
- D. Remote control and management from one or more central sites using PCs/Servers
- E. Automatic operation via remote scheduling
- F. Remote intercom via GSM – call into and out from the GSM shutter device wirelessly from anywhere in the world with mobile phone coverage
- G. Manual shutter activation message alerts
- H. Collation of shutter usage statistics
- I. System alarm and operating condition reporting

Barrier Control

As with the shutters, the control of barriers easily facilitates the integration of remote management technology. All of the options in the previous example can also be applied to barrier control devices.

Where barrier controls are used, in locations such as car parks, there may be multiple devices to control, with thousands of different users going into and out of the gates. In such cases, in addition to the functions listed in the previous example, the remote management options are as follows,

- A. The barrier can be opened by simply calling the mobile phone number of the GSM device fitted in the barrier motor controller from any phone, fixed or mobile.
- B. Vehicle transits can be counted to tally gate receipts on pay for usage installations
- C. Activations of the barriers can be time and date stamped by using a real-time clock where available in the GSM device (also applies to shutter options)
- D. Gate access can be locked-down remotely
- E. Integration to fire alarm systems can be facilitated allowing remote opening of barriers and notification of same via SMS

Remote alarms

By employing GSM technology, the operating conditions of the controller in which the GSM device is installed can be determined.

In terms of normal alarms that may need to be reported, these can be qualified in terms of the type of shutter, barrier, or door in use. Examples are as follows,

- A. Shutter motor stalled alarm or
 - B. Edge sensor activation alarm
 - C. Shutter attack alarm – notification if the shutter or gate is being vandalised, damaged or being wind-blown above acceptable levels.
 - D. Tamper alarms – alert if the controller unit is being tampered with
 - E. Operating status alarms – Voltage, Temperature, battery level reports
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- Where applicable, custom interfaces can be implemented to pass on alarms such as limit switch failures, thermal trip-outs on motors, relay latching/welding, power failure, over or under temperature within the device, battery level (where applicable), GSM signal strength
 - In summary any alarm, once presented in an appropriate manner can be passed from the controller to a central site or to one or more mobile phones

Remote Management – “The Wider Picture”

As we have seen from the previous examples, management systems can be used to open, close, and monitor operating conditions on motor controllers. Managing small numbers of these systems is viable using mobile phones only, but where the number of sites is large, dispersed over a wide area or where there's a requirement to have them managed from one location, the benefits of a centralised management system becomes apparent.

By their nature, centrally managed systems generally require a robust scaleable IT infrastructure to be in place. This may seem to be an expensive additional element, but it can in fact, seriously improve your business efficiencies and if used correctly, improve the overall profitability of your business.

Install base management

By using remote management technology to support your business you reduce the need for support staff, increase your knowledge of the install base and collate information from which savings can be made in the overall running of your business.

By using a remote management system to develop support services, your product portfolio can be improved and your service level increased.

Support services can be based on supporting distributors, installers, and end users.

Typical revenue generating services

- On-site chargeable support for installation companies – assistance when installing
- Remote software upgrades for distributors/end users
- Tiered service level agreements based on remote accessibility
- Preventative maintenance services

Cost saving services,

- Tracking of equipment back through the repair loop
- Identification of skills deficits
- Amalgamation of product support systems
- Reduction in the number of field support staff required
- Reduction in the number of unnecessary service call-outs

Remote access – a practical example

Figure 1 below, shows how a typical centralised management system might operate. The system incorporates SMS, GPRS and web/internet access.

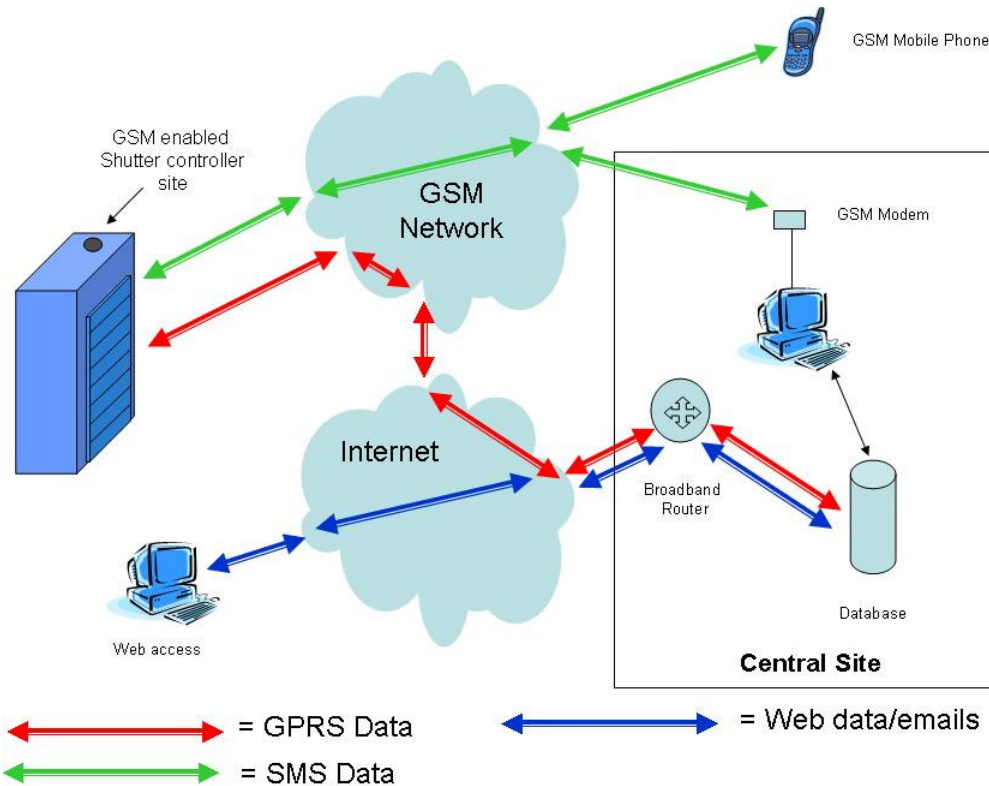


Figure 1

Using SMS to send short command instructions to and from a GSM enabled controller means that any mobile phone, or PC equipped with text to SMS software, can be used to simple effect in managing access control. This method of command and control is perfectly suited to functions such as “open” and “close”.

Where bigger amounts of data, diagnostic commands, or remote software upgrades are required, SMS is limited to 160 characters at a time. This can prove cumbersome when trying to manage and maintain multiple sites.

Where a more robust data transfer is required, GPRS can be employed. GPRS facilitates the transfer of data at rates up to 48Kbps (Kilobits per second).

GPRS is part of the GSM “family” and most state of the art GSM controllers can support it. When you use your mobile phone for emailing or for web surfing, you utilise GPRS.

Although both data types (SMS and GPRS) go over the mobile phone network, GPRS is separate from SMS and uses a separate means of communication (see figure 1).

Equipment installed in the field can be programmed to send its operating conditions via GPRS to a factory programmed IP (Internet Protocol) address, which is a more efficient means of data transfer than SMS and it costs less. The IP address can be that of the central server or database (see figure 1 above).

Data can also be sent back to the device in the field via GPRS once it has “logged on”. This process can be automated, requiring no human interaction.

Why not use GPRS instead of SMS?

GPRS transfer requires the phone user to enter the final destination IP (Internet Protocol) address of the server/host they wish to connect to. This can be complicated and difficult for the average user. In addition, the user’s phone would have to run software to connect to the server to allow basic open and close commands to be interpreted and understood by the remote GSM controller. Although technically feasible, not all mobile phones have this capability. SMS is easier and works from all phone types.

Using GPRS – how it works in practice

Most GSM devices facilitate a process called Calling Line Identification (CLI) matching. This allows the GSM device to recognise who is calling and allow the calling device to access it. In terms of controlling a GSM device via SMS, this is how users are authenticated. GPRS can use this facility to recognise who is calling, and therefore transfer the outgoing call cost to the end user.

If the incoming CLI matches a number programmed in the system, then that number is deemed suitable to allow a control message or command sequence to be activated.

In the following example (see figure 2), a remote system uses a combination of CLI and GPRS to “auto-commission” and register that fact that it is installed and operating on the central management database.

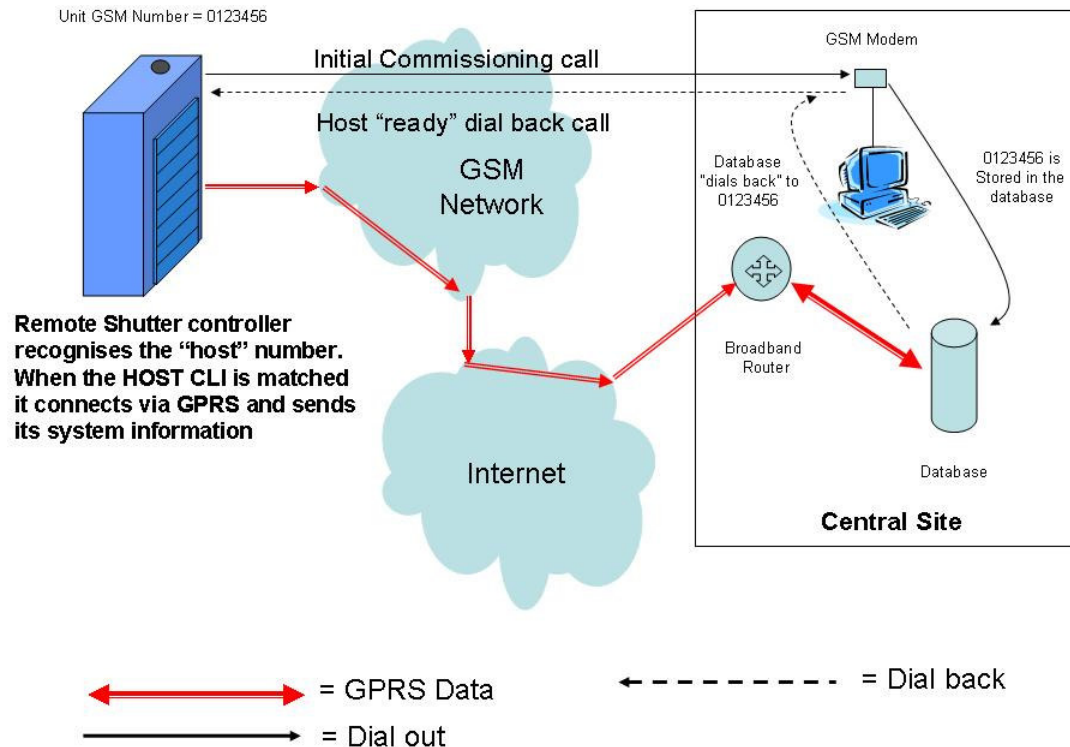


Figure 2

Let us suppose that a company ships its motor controllers with a GSM device integrated with the product. This device will have a SIM card and its own mobile phone number (0123456 in figure 2 above).

When shipped, the unit is programmed with the central site number (of the GSM modem at the central site in figure 2 above). Pre-programming the host number into the remote GSM device allows CLI (calling line identification) matching to the authentic remote server/host.

A typical commissioning sequence would occur as follows,

1. The equipment (motor controller) has been installed and the installer wants to "commission" the system. This involves executing a final test sequence on the controller to ensure it is operating correctly. The unit then goes through its self-test sequence and when it has finished it calls the central site number (automatically or by installer intervention) then hangs up after two ringing cycles.

The central site system records the incoming CLI number and now “knows” the unit is installed.

2. By not answering the call at the host side during the incoming ringing cycle, there are no (or minimal*) call charges incurred at the central site or from the remote site. *This depends on the country in question.
3. In our example above, the central site GSM modem has been programmed to only answer after three rings; however, the two rings from the remote device allows sufficient time for the host modem to recognise that the remote device has called in. The host GSM modem “sends” the CLI number that has called into the database with a time and date stamp
4. The central site database, when idle will search for incoming unanswered calls. It then rings the number back, again terminating the call after two rings.
5. The newly installed roller shutter controller with integral GSM device recognises the authorised central site number from this dial back, without having to answer the call. The software in the GSM device then makes a GPRS call out (pay per megabyte only) – logs onto the central server and sends it system information, such as serial number, software revision etc. This is data formatted in a manner comprehensible to the central site system.
6. The central site now “knows” when the system was commissioned, what type of system it is, and when the warranty period starts.
7. The GSM device can send updates on the operating status of the system at pre-determined periods thereafter

Benefits of install base management

By collecting information from the equipment in the field, the size, nature, and potential revenue model of your customer install base can be generated. In essence, the install base is your business.

Knowing what equipment is in the field, how it is operating, and what potential problems it has, provides a serious competitive advantage to those in the business who do not have such information.

Strategic product planning, software and hardware enhancements, support modelling and market penetration information can be derived from such data. In addition to this, there are other benefits. For example,

1. Where a GSM device with GPS is used (these are readily available), the remote GSM device can also send its physical location as map coordinates. GPS data can be exported to an off-the-shelf mapping application which matches map coordinates to addresses, which can then update the central site system with the physical address of the device.
2. As the customers location and installed equipment type can be ascertained, the opportunity exists to sell them a service package when the warranty expires
3. If a problem occurs in the field with a certain type of device or the operating software in it, a record of all such sites and associated addresses is available
4. A record of units sold versus units installed can be ascertained – identifying the better sales agents or distributors in a given area
5. Market penetration can be defined per area, allowing marketing to be concentrated on regions where sales and installations are lower than target
6. Maximising the support resources to where the greater number of sites exist is possible when install base information is available
7. Up-selling or product churns on obsolete system can now take place – provided the end-user agrees
8. As GPRS can be used to transmit and receive, data, such as command data software uploads or software patches, all the host system has to do is call the remote system and it can then automatically connect via GPRS and “log on”

9. Equipment sent back for repair can be traced from the original installation back through the fault diagnosis loop and back into repair, thereby tracking the device against the reported fault, verifying the quality of the diagnosis process and ensuring that viable equipment is not tagged as faulty.

What else can we do with a management system?

1. Where there's web access, the end user can connect via the web or via email and send command and control information to the controllers – open and close by email
2. End users can log in to the central site, authenticate the commissioning data, entering names, telephone numbers and personal details – allowing for future product sales opportunities, for customer profiling and for up-selling service packages.
3. Users, installers or distributors can log faults on the database – thereby freeing up support personnel who would normally field the calls
4. Users, installer, and distributors can track faults via the web, and verify that the reported faults were found. Where no faults were found this data can be used to bill customers who are out of warranty or prompt further product training requirements
5. Where there is a large customer who wants to manage their own install base, a host system can be sold to them. This effectively means that the basic controller now comes with a complete management system, which can be sold as a product in itself.
6. The host system can email or SMS service personnel with the name, address and contact details for customers who have a reported fault – service personnel don't have to be at the base.
7. The system can receive the GPS locations of service staff via GPS. Know where your service staff are using the same GPS tools used to locate your customers.
8. Sell support staff tracking as a service to installers and distributors
9. Develop product performance statistics for quality management, support and design purposes

Integrating the technology

When considering integrating remote access technology, standard business decisions must be considered. Typically, these questions will be as follows,

- What is the cost?
- What are the business benefits?
- What elements of the technology do I need?
- What training and support is available?
- What savings can be made?

In terms of cost, the number of installations/systems you deal with and the complexity of the installations is a key consideration. In order to use this technology you will require a GSM device to be installed at your customer sites. What are your options?

Bespoke solutions

In basic terms, you can opt for off the shelf GSM devices, or you can define your requirement and have a system tailor-made. If you have a large number of sites/customers, a tailor made or bespoke solutions will be cheaper, more versatile and more readily integrated into your existing product line.

The benefits of a bespoke solution are as follows,

1. The GSM device can be made to fit into your existing product. The device can be designed to meet existing product form factors, power requirements, environmental operation conditions, product communications and interface specifications
2. Costly parts and modules in technically comparable off the shelf modules, which are not used by your system, don't incur any cost or take up space in your existing product
3. You can plan your production schedules to meet supply as you are the sole recipient of the product you are not vying with other customers
4. You can define what you want the device to do with reference to your existing product roadmaps; design-in future possibilities
5. You do not have to spend money on development and gain expertise in the GSM technology
6. You do not have to develop the central site host application as this is part of the bespoke solution
7. You can define how you want a central management system to integrate into your existing IT/Support infrastructure
8. You have direct access to the development resources building your bespoke solution
9. It will be cheaper to get a mature bespoke technology than develop it from scratch
10. You will achieve a faster time to market if you are developing in parallel to interface to a bespoke solution

Off the shelf solutions

Where you have less than 300 customers, a bespoke solution may not suit, as the development costs of a bespoke solution would match or exceed the comparable cost of off the shelf units.

M2M Telematics Limited both develop and distribute the technology outlined in this white paper. For off the shelf solutions, the costs will depend upon the number of units required.

The benefits of purchasing off the shelf systems are as follows,

1. There is no development required to deliver the products
2. Product operating manuals and training material is readily available
3. No trial periods are required as the technology is already released into the market

What technology do you need?

In terms of your business, M2M Telematics can offer to consult with you, to assess what technology you have and so see what the best remote access options available to you are.

You may require a basic system – allowing remote control via SMS from mobiles and from a basic PC package. Integration of GPRS and GPS may be beyond the needs of your business.

Conversely, you may be operating with a large install base, which would benefit from a comprehensive, integrated remote management system.

In summary, M2M Telematics Limited has the technology, we have implemented this successfully, and we can deliver both off the shelf and bespoke solutions to you at very competitive rates.

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