

Products: MultiSmart Pump Controller/RTU
Subject: Communications via IP networks to any SCADA system

1 Introduction

Traditionally, SCADA systems have used private radio networks or PSTN (phone lines) for linking to remote sites.

Over the past few years, the cellular data network has become much more reliable, and offers a very low cost communications system, especially over a wide area. A later paper will investigate the benefits and risks of a cellular network versus a radio network.

This document is aimed at explaining the connectivity issues for cellular, and also DSL modems.

The issues are true whether we are connecting the MultiSmart RTU to Outpost2 or any other SCADA system such as Wonderware, Intellution, Citect, WinCC or RSView.

2 Polling a remote station

2.1 The problem

The major issue is how the SCADA master station is able to poll the remote device. Note that this is required even if the method of communications is unsolicited reporting, e.g. in DNP3, as the master station will still need at the minimum to be able to do an integrity poll on startup, or daily.

Carriers and ISPs do have some elements in common.

They usually only allow data from an outside IP address to reach a device/PC on their network if that device/PC has requested a connection.

For example, your IP address is 165.165.165.165. On your PC you type <http://www.multitrove.com> - this goes out of your ISP but the firewall notes 165.165.165.165 has requested data from www.multitrove.com. If within X seconds, say 30, that site sends its web page back to 165.165.165.165, the firewall lets it through. Success - you get to see the web page. But suppose website www.attack.com sends you its (probably malicious) webpage, even though you never requested it. In this case the ISP or carrier's firewall will say "No entry". This is to prevent your PC, PDA, etc being "attacked" by malicious servers.

Basically carriers and ISPs have built networks designed to work in a different way from a SCADA system.

This means that most cellular data networks and ISPs will prevent a SCADA master station from connecting to a remote site.

2.2 The solution

Most cellular providers and ISPs are able to allow a SCADA system to function through their network. The technical requirements on both of them are easily handled. It is more a matter of their business process – do they want to handle this requirement?

MultiTrove has found huge differences between cellular operators in this regard. Some providers already have business processes in place for this and are ready and willing to assist. Others have no interest at all.

3 Cellular requirements

The summary requirements are that the cellular operator provides:

- a) SIMMs (for GPRS modems) for a data service (no voice is necessary) with static IP addresses
- b) VPN connection from the SCADA master station to the carrier's network so that the SCADA can access the GPRS modems as local IP addresses (on the SCADA system subnet)

In the case of CDMA data modems (1XRTT) there is no SIMM but the principle is the same.

The primary reason for the above requirements is that we need to be able to poll the devices inside the carrier network from outside (from a SCADA server) and this is not a normal capability when you simply activate a GPRS or 1XRTT data service.

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4 DSL Modems & ISPs

Sometimes there is the option of a DSL modem being installed at a pump station which puts the pump station on the internet. This presents similar problems.

4.1 Security

The SCADA server will need to address the remote unit over the internet. This presents security implications. It is possible to put a VPN client into the MultiSmart RTU which would eliminate the security problems

4.2 Polling the remote device

As discussed in section 2, the ability for the SCADA master to “get through” the ISP’s firewalls is the real challenge. The ISP needs to be asked whether they are able and willing to configure their network to allow this.

4.3 Assigning the IP address to MultiSmart

An IP address should be assigned to the MultiSmart unit and the DSL router configured to work with this fixed IP address. This is because there is currently no DHCP client in the MultiSmart unit.

5 Conclusion

Connecting SCADA to remote devices over the internet, whether wired or cellular, can be a challenge. This is simply as a result of the typical architecture used by service providers.

MultiTrode has already worked with several cellular providers to get this service – AT&T and Cingular in the USA and Vodafone and Telstra in Australia. This was originally aimed at the hosted SCADA solution of PumpView, but has also been successfully used in traditional SCADA solutions linking remote sites to the SCADA front end via cellular.



Figure 1 - MultiSmart Unit



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