



Energy and natural resource management -

SCADA via Satellite

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Energy and natural resources are typically located in remote and unforgiving environments ranging from the blistering cold of the arctic to the scorching heat of the deserts, as well as the storming conditions out on the open sea. To effectively manage resources in such remote areas, a reliable communication line is as vital as the umbilical cord is to the unborn child.

What is SCADA

SCADA is a unique aspect of energy and natural resource management in that it does not entail communication between people, but rather between machines (also known as M2M).

SCADA is an acronym for Supervisory Control And Data Acquisition and describes a computer based system which is managing mission critical process applications on the "factory floor". Frequently these applications are also critical to health, safety and the environment.

The term telemetry is often used in combination with SCADA. Telemetry describes the process of collecting data and performing actions on it remotely, via a suitable transmission media. In the context of this profile, the telemetry media is a satellite communications solution.

SCADA in energy & natural resource management

SCADA is not limited to a particular aspect of energy & natural resource management. You find SCADA applications in the upstream area of oil & gas exploration such as well monitoring, remote (hydro) power generation, pipeline operations, power transmission and distribution, in trade by facilitating fiscal metering/custody transfer/AMR operations, and in logistics in applications such as inventory management of tank storage facilities, flood warning and flood control, irrigation, waste water treatment, and environmental monitoring.

Selecting a satellite communication solution - factors to consider

Security - When selecting a satellite communications solution, there are numerous factors that must be considered. Enterprise applications like e-mail, internet access, telephony, videoconferencing etc. frequently tie into public communications infrastructure. Due to security and reliability considerations it is considered best practice to isolate mission critical SCADA communications infrastructure from public networks.

TSAT 2150 is a dedicated satellite communications network solution tailored for the SCADA applications environment. By virtue of system design, TSAT 2150 offers greater security against hacker attacks and virus infestation which mainly target computers that are connected to the Internet and are running office applications.

Reliability - Due to the critical nature of most SCADA operations, a reliable communication solution is of the utmost importance. The satellite communications industry is mature, and with a proven track record. Sat-



ellite transponder availability is typically in the 99.99 percentile range, a number far superior to that of terrestrial networks. To build on this strength, TSAT has developed a miniature satellite hub that is deployed at the end-users SCADA control centre. Data to/from the remote terminal units (RTUs) are piped directly into the SCADA system. There is no vulnerable terrestrial back-haul from a communication service providers facility, which can cause the entire network to crash if cut during public works i.e. digging.

To increase the reliability of a TSAT hub, it is frequently deployed in a redundant/load sharing configuration. This ensures that the hub is available more than 100 per cent of the time, making it far from the weakest link in the communication chain.

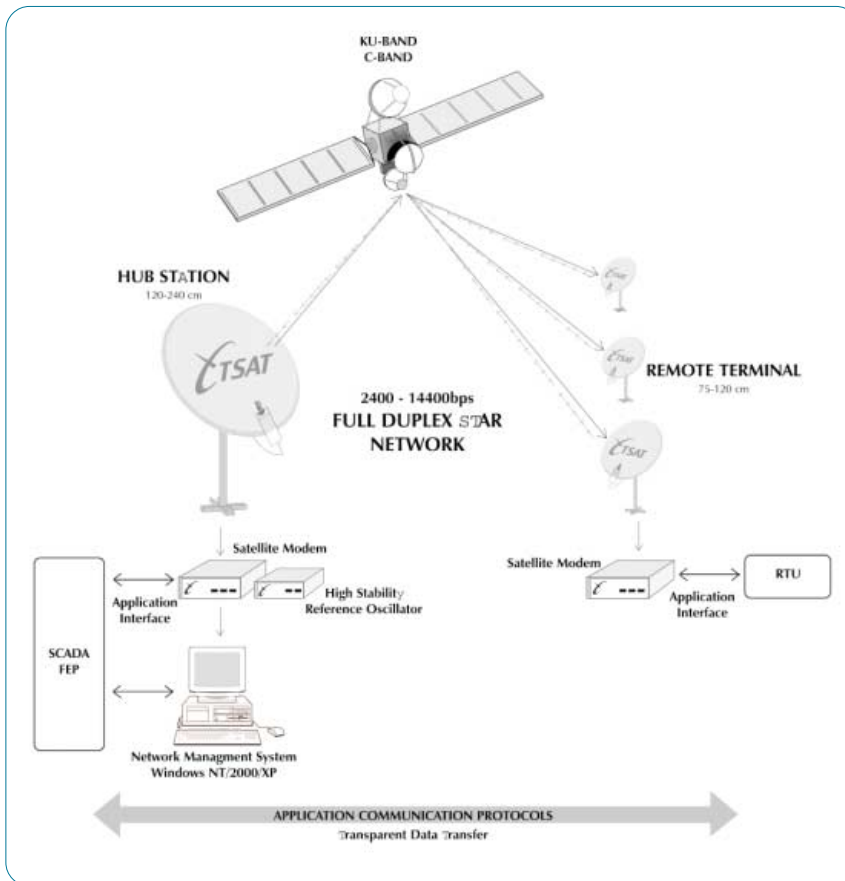
Types of connectivity - Contrary to enterprise related communications which take place randomly, SCADA communication is quite predictable. It is a continuous process, where the SCADA application polls the RTUs at regular intervals. The outgoing poll request is a short datagram (packet) containing as little as 10bytes. The returned data from the RTUs are also in a datagram format with the message size being from 10bytes to 250bytes. One could easily assume that a satellite solution based upon dial-up connectivity such as Inmarsat, Iridium or Globalstar would be ideal for this application environment. However, SCADA is not just data collection, but also control (which at times can be of an emergency nature) and you simply can't wait for the system to encounter a busy connection. What is needed is a system that provides an always-on type of connection, commonly referred to as leased line connectivity.

A TSAT solution supports both circuit switched (leased line, multi-drop) and packet switched (TCP/IP) applications concurrently.

Recurring communications cost - Since a typical SCADA application will run at least ten years, the cost to operate a satellite communication solution can become astronomical unless the proper solution is carefully selected. There are several commercial operators in the market that provide leased line connectivity to the oil & gas business. These operators have a business model not unlike that of the mobile phone companies. That is, they provide you with an inexpensive satellite terminal, but you are then tied to using their service exclusively. The service is metered, i.e. you pay for the amount of data being transmitted to/from each terminal.

To make satellite communications an attractive alternative for





SCADA applications, TSAT has developed a solution that is firstly utilising bandwidth effectively and secondly providing the lowest operating cost.

Since the typical SCADA RTU transmit at low data rates (from 2400 – 9600bps), TSAT has optimised the system to use a minimum of satellite transponder bandwidth. A typical TSAT network can operate with as little as 50kHz.

Since the TSAT satellite communication solution is compatible with all commercial fixed stationary satellites (FSS), having Ku- or C-band transponders. The end-user is able to select the satellite operator that has the best coverage and the best price. For end-users that are not familiar with this process, TSAT will make transponder lease arrangements on the end-users behalf. It is not unusual to see TSAT networks having recurring monthly communications costs of less than US\$1,000 for the entire network.

Dedicated network - Some times shared hub services are being promoted for the SCADA applications environment. With this type of solution, multiple customers share the same frequency spectrum. From a security perspective this may not be a desirable solution. Furthermore, as previously mentioned data, to/from the RTUs are routed through the service providers hub facility. In most cases the connection to the service providers hub is through a dedicated (leased) line. The cost for this line can be staggering, since in many cases the connection will be going to a different city, state and in some cases even a different country.

To eliminate the terrestrial back-haul, the service provider may offer and alternative method of connection called a Double-Hop. This involves the installation of a satellite terminal at the end-users SCADA control centre. With this arrangement the data has to travel from the SCADA centre up to the satellite, down to the hub, back up to the satellite and finally down to the remote terminal. The return reply from the RTU makes the same trip in reverse. The implication of this Double-Hop is a time delay. For time sensitive control applications, this additional delay may simply not be acceptable.

The TSAT hub pipes the data directly into the SCADA computer without any terrestrial back haul or Double Hop.

Communication protocols - Some service providers only support IP based application traffic. In reality, most of the SCADA world deals with legacy hardware that's based on asynchronous RS232 serial communication protocols. To complicate matters, a typical SCADA communications network may include RTUs from several manufacturers each utilising their own set of communications protocol.

TSAT is designed to manage multiple communications protocols concurrently, and transmit data transparently over the network.

Older RTUs generally do not have report by exception capabilities (RBE) which increases a SCADA systems responsiveness to real-time events. TSAT has developed protocol acceleration drivers to enable such functionality. Apart from gaining the desired responsiveness, an additional benefit is the resultant drop in traffic over the satellite link which effectively increases the throughput of the network. Throughput increases of up to 150 per cent have been realised.

End-user control - Since no two SCADA systems are alike, it is imperative that the implemented solution provides enough flexibility to allow the end-user to optimise the network design to suit the requirements of a given application. This is achieved by the logical grouping of RTUs to a specific serial port on the SCADA systems front end processor, assigning bandwidth resources to individual RTUs or group of RTUs to optimise system performance, and define the optimal satellite link access scheme for the applica-

tion etc.

The TSAT Network Management System (NMS) is provided with a graphical user interface. The product is like a professional grade tool box containing a multitude of tools that makes NMS configuration, system management and support extremely easy for the non-satellite professional SCADA engineer. Online help and useful tips are available for every system function and feature.

Utility grade equipment - Most SCADA applications involve placing the satellite terminals in unforgiving, harsh environments. The low cost satellite terminals targeting the SOHO market are designed to operate in the sheltered environment of the home or office. These terminals are also designed to operate from a 110 or 220VAC mains supply. The TSAT terminal is provided with a rugged mechanical enclosure, and is designed for the utility applications environment where power is in short supply. Along pipelines in remote areas there may not be any main supply at all, and the RTU has to operate from a solar powered battery supply. Solar panel arrays are quite expensive and if the satellite terminals draws a lot of power, large arrays and battery banks will be required. Most satellite terminals draw more than 40W continuously.

Recognising the importance of conserving power, TSAT incorporates several power saving features in its satellite terminal that can reduce the power consumption to less than 0.2W when not transmitting. TSAT is a utility proven SCADA satellite communication solution. With more than ten years of operating experience in mission critical applications, the product has certainly proven to be a favourite choice of SCADA communications professionals worldwide. **GVF**

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