



# ACE3600

## Motorola Solutions for Early Warning Systems

*State and local authorities and municipalities worldwide are dealing with a major challenge in providing early warning to their population, when unexpected events result in danger to the safety of the population. Such events are plentiful: heavy storms and hurricanes, forest fires, dam and river floods, earthquakes, tsunami, etc. The solution to such a system must provide fast and efficient dissemination of alerts to responsible personnel.*

*System architects have a challenge in defining an optimal architecture for their early warning system that satisfies the operating requirements, is immune to possible false alarm and ensures secure network operation. To achieve the targeted goals, operators seek use of a wide range of solutions such as: interrupt commercial TV and radio programs, activate public alert sirens, intervene with roaming police cars, etc. The solution must ensure that the message reaches as many people as possible, no matter where they are at any given moment.*

*This application note focuses on describing early warning systems utilizing a SCADA technology implemented with the ACE3600 and MOSCAD-M RTUs. These systems are used worldwide, providing both cost-effective and uncompromising solution for early warning systems using wireless or physical line communication.*



## EARLY WARNING APPLICATIONS OVERVIEW

Early warning service must be made available to a large population who at any moment may be in widespread locations: at their home, offices and factories, on the street, in shopping malls, on the beach, in forests, driving a car, traveling on ships, etc. Each such site must be linked to the source of information and a solution must be available for disseminating the warning message.

SCADA RTUs used for early warning systems are required to communicate 100% accurate messages, and must also provide means for feedback of successful message delivery back to the emergency center. They should allow reliable network communication, making sure that emergency messages are conveyed to their destination as quickly as possible, regardless of which communication medium is implemented for a specific section of

the network.

ACE3600 based solutions can be configured and optimally applied to the targeted tasks as listed below:

- Activate a selected siren from the control center
- Activate selected group(s) of sirens (broadcast/group-cast)
- Activate any single siren or group of sirens from a backup control room
- Activate any single or group of sirens from a mobile PC controller (command unit)
- Periodically perform real tests or silent tests, as applicable
- Interface to a wide range of siren equipment and public annunciation units
- Provide a reliable positive feedback on the operation of the field devices.





**A powerful combination of two functions**

Intelligent Communication Device

Programmable Logic Controller

## ACE3600 RTUs Main Features

### Communication Flexibility

When designing a communications network between field-installed RTUs serving siren equipment and the emergency control center, the system integrator must pay great attention to issues that are unique for the selected medium. Among the popular communication media supported by ACE3600 systems are fiber-optic links, telephone and leased lines, VHF/UHF conventional radio including 800 MHz trunked radio, analog and digital wireless networks, UHF Multiple Address Systems (MAS), Broadband data over Internet protocol (IP), Spread Spectrum communication, microwave, satellite, etc. In a complex system, one may have to utilize a combination of several media, carefully selected for each segment of the network.

### Data Networking

Taking advantage of the seven-layer OSI/ISO protocol, each ACE3600 RTU connected to the SCADA network may act as a communication node or Store and Forward (S&F) data-repeater. In addition to its main role, these nodes help resolve coverage issues when a certain RTU connected to a siren unit cannot communicate with other RTUs or with the control center due to geographical path or propagation problems.

Each ACE3600 RTU can be configured to relay messages between two RTUs or between the RTU and the control center, utilizing the same channel. Alternatively, it can act as a communication node, linking between two different communication media such as radio, wireline, fiber optics, satellite, microwave etc.

### Versatile Data Transactions

ACE3600 RTUs can be polled for new data by the SCADA control center, but they can also initiate unsolicited data calls via the wireless network. The typical link establishment process is very fast since radio is inherently a multi-drop medium and the only delay factor is the channel access time; typically 5-200 ms. The unsolicited call is commonly referred to as "Event Driven Report" and takes place when an unusual condition such a power outage, or other fault is detected by an RTU.

### Versatile Message Annunciation

The ACE3600 may be programmed to contain a series of pre-recorded voice messages, which can be conveyed to the public via the annunciation equipment. This solution allows early warning to the public by communicating to the RTU a simple command that performs selection of the specific message from a pre-recorded list.

ACE3600 has built-in capabilities to receive and record new messages downloaded from the control center via the data communication network.

### ACE3600 Programming Tool

Programming and configuration of the ACE3600 RTUs is performed with a Windows TM PC based tool called STS. It runs on the Microsoft operating system programs such as Window 2000 and Windows XP.

The ACE3600 ToolBox is the only tool required to perform all programming, configuration, and network definition functions. The PC running the ToolBox pro-

gram can be connected to the ACE3600 network at any RTU site and via that connection the STS program may access all other RTUs. The STS program enables creating site and network configurations, update the system database, diagnose and analyze the quality of communication, provide error statistics, and help detecting unusual system problems.

### Program Maintenance and Remote Diagnostics

ACE3600 RTUs provide enhanced tools for convenient and efficient hardware and software diagnostics, both locally and remotely, without interrupting the RTU operation and communication. They eliminate the need for frequent visits to the remote sites by technicians for the purpose of diagnostics, calibration, program and parameter updates, etc.

Upon detection of a problem at a remote site ACE3600 allows uploading or downloading database and parameter data from any RTU connected to the network to the control center or the ACE3600 ToolBox. It also provides the ability to perform post-event examination and analyzing the source of fault.

This feature allows detecting and analyzing even very rare events, such as temporary interrupted communication interference, momentary power failure, etc., and reduces the response time for repairs and associated costs to a minimum.

# THE ACE3600 RTU has the Most Advanced Architecture

## System Modularity

Early warning systems have a need for SCADA-type solutions, which can be seamlessly adapted for controlling various types of sirens and interface with intelligent sensors. Occasionally, system operators may have a need to modify or upgrade the RTU program installed to control the siren and must be ready for easy implementation of such changes.

The ACE3600 RTU is a modular, upgradeable and expandable family of RTUs, and can be adapted to a wide variety of digital and analog I/O options and communication interfaces.

## SCADA Security

Implementation of SCADA solutions requires use of secure communications in order to avoid the possibility of fraud or intrusion related events to take place. Control systems can be vulnerable to a variety of attacks, examples of which have already occurred worldwide. It is extremely important to have an embedded end-to-end solution that ensures message security using dedicated means. ACE3600 family of RTUs provides combined prevention means involving data encryption.

## Operating Redundancy

ACE3600 RTUs support redundant communication links to the main emergency control center, and/or of a secondary or mobile (transportable) control center. These configuration options are needed in some critical applications to guarantee fail-safe transfer of the control function from the primary to secondary emergency center.

## Power Supply Solutions

A unique feature of ACE3600 RTUs is the use of a "true" power supply, which is effective as a UPS. The remotely activated siren as well as the RTU, the radio communication modem may operate either from the power supply or from the integrated backup battery. The power supply can provide full power to the radio even if the battery is dead or disconnected. This is a highly important feature in an early warning system.

Since AC power (117V/230V) might not be available at all remote installations where only sensors are used (river level, wind, etc.), MOSCAD-M RTUs feature low power consumption electronics with built-in power saving mode. A unique power management function is available with the MOSCAD-M, allowing use of

small size solar panels (less expensive and less attractive to theft). It can use a lower capacity battery while still providing extended operating time.

## High Operating Reliability

Experience has shown that typical life-cycle cost of a telemetry-hardware (RTUs, radio modems, etc.) is more than double its initial purchase cost. This figure takes into consideration the system purchase cost, programming, commissioning, post-installation modifications, maintenance and occasional repairs.

Use of ACE3600 RTUs and associated communication solutions helps to cope with these challenges aimed at reducing the total cost of implementation and ownership.

Efficient, convenient and remotely performed maintenance is highly important in SCADA systems serving the early emergency warning applications. This function includes remote configuration, upload or download of parameters and application programs. It is possible to execute this program from any RTU connected to the network, even 'over-the-air' or from a distant location or via a phone line modem connection to one of the RTUs.



# SUMMARY OF BENEFITS

The unique capabilities of ACE3600 RTUs and SCADA systems allow implementation of advanced system solutions in which each and every RTU can fulfill four important tasks:

1. ACE3600 RTUs perform monitoring and activation of early warning systems via the RTU Input/Output ports. These I/Os can be in the form of a serial port, dry or wet contact inputs, FET or relay outputs and analog inputs as required for the specific siren.

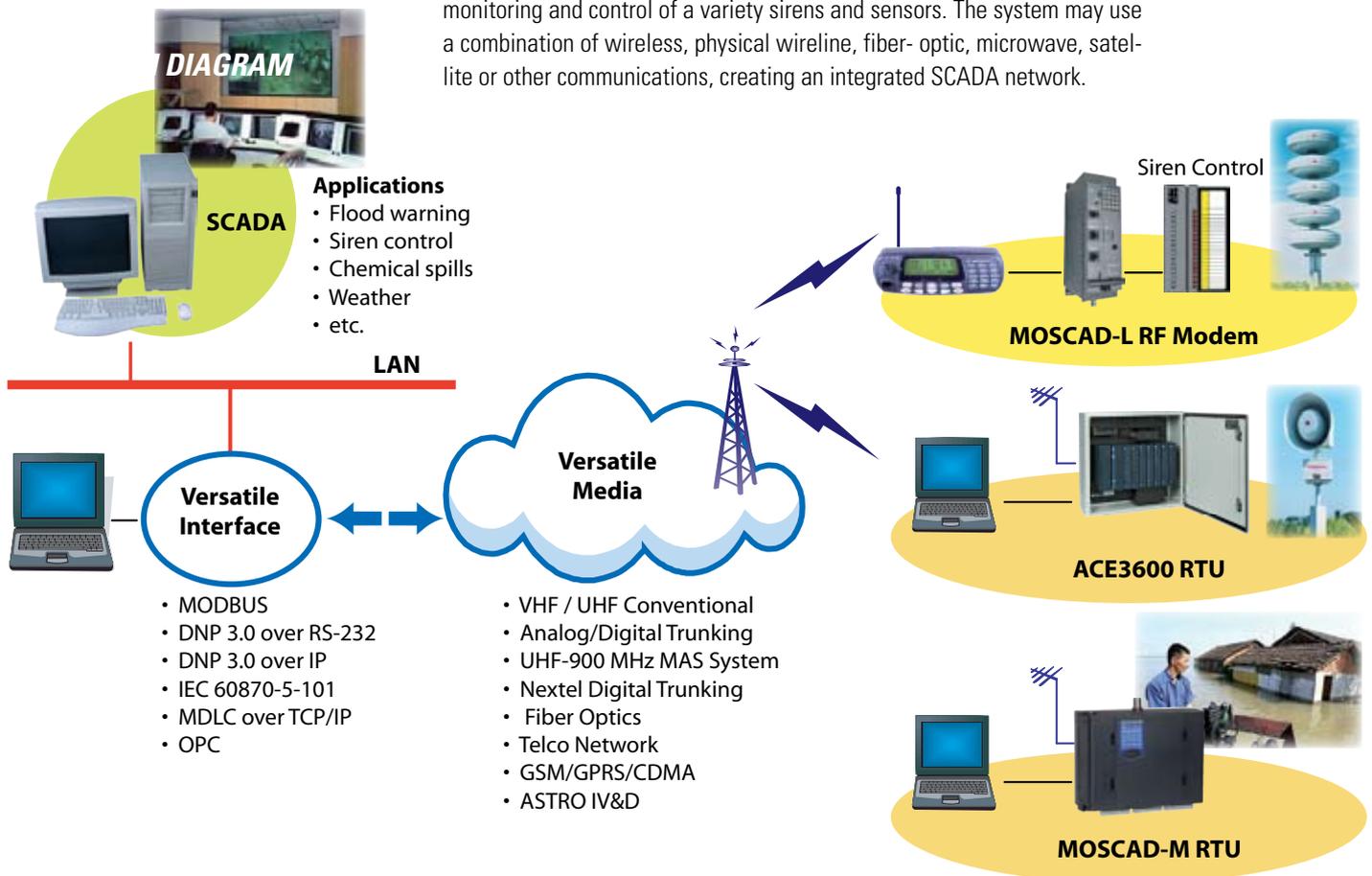
2. ACE3600 RTUs allow seamless wireless networking between RTUs, either directly or via other RTUs, which act as S&F repeater over a single radio frequency. These capabilities provide significant network cost savings eliminating the need for additional channels and reduce the need for costly repeater stations.

3. ACE3600 RTUs provide reliable data networking function, enabling an RTU to communicate

with other RTUs over a variety of communications media. In addition to its main SCADA role, each RTU may also serve as a communication node linking two or more communication media into the network.

4. ACE3600 RTUs may act as protocol translator for 3rd party siren control units. This can be achieved using either the protocol encapsulation or protocol emulation method.

A typical ACE3600 based SCADA system for early warning performs remote-monitoring and control of a variety sirens and sensors. The system may use a combination of wireless, physical wireline, fiber-optic, microwave, satellite or other communications, creating an integrated SCADA network.



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