

SCADA System Alarm Notification Options for Workforce in a Plant Environment

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Abstract

For those businesses that use it, SCADA and Process Controls systems are a critical part of their infrastructure and production environment. To maximize the system's benefits, it is essential to have reliable handling of, and proper response to, alarms. This paper identifies several areas for improvement in the current alarm notification components of SCADA systems and presents solutions for significantly improving the effectiveness, security, and timeliness of SCADA system alarm notifications in a factory or plant.

SCADA systems are implemented in industrial control systems, industrial processes, infrastructure and facilities all over the world. Common SCADA characteristics include a centralized system that monitors and controls multiple systems through the acquisition and interpretation of data from multiple devices or systems. This paper focuses on how to deal with alarm notification to the workforce in a plant or factory and how new technologies are allowing innovative solutions to be developed that save time, improve resource allocation, improve safety for the people involved and increase the security of the data being shared.

Different on-call systems are used to deal with SCADA alarms. Often notification is sent to a designated person or group via an email, short message service (SMS), pager or some combination of these options. These methods are usually fire and forget - a notification is sent once with the *hope* that it reaches the intended persons in a timely manner. This does not always work out well, resulting in emails, SMS and pager notifications often getting lost or delayed. Production and IT staff in different parts of a plant need SCADA/event data delivered better and faster, for immediate attention. Without a guarantee that the alarm notification has reached the intended device in the required timeframe, assumptions are made that increase the risk of the elevated event not being properly handled. Critical events could keep escalating without the intended personnel being aware that there is an issue to address. Delays in response to alarm events lead to increased costs, decreased productivity, threat to product integrity and overall inefficiency.

Assuming the message is received, then in an efficient system the designated person acknowledges the alarm, reviews related information and takes some form of remedial action. Additionally, if a group receives the alarm notification, the designated person notifies the other members of the group that an acknowledgement has occurred and their participation is not required. However, in reality, without the proper historical data or the ability to review related events, one or more persons representing different areas of expertise often end up rushing to the alarm location to determine what corrective steps are required.

In a large manufacturing environment, participants may have to carry numerous devices, such as cell phones, pagers, laptops, and tablet devices, to handle and respond to alarms. Typically, an on-call person receiving notification of an alarm via email, SMS or pager finds an available access point to login to the SCADA system, acknowledging the alarm and determining if additional steps must be taken. Utilizing another device (e.g. a laptop) to login and respond to an alarm raises some technical issues.

Often measures to ensure accountability by tracking and auditing the alarms are insufficient. In many organizations, someone in the control room monitors events that might require an alarm. If the alarms are automatically and reliably sent out without any need for human intervention, personnel in the control room could focus on other, more productive responsibilities. If alarms are delivered more reliably and with greater visibility of the related events at the problem location, inefficiencies and even chaos can be reduced or eliminated. Recursion Software's **SCADA-Aware Mobile application™ (SAM)** is a new approach to do exactly this and more.

SCADA-Aware Mobile provides increased reliability of alarm message delivery to mobile devices with its push-pull technology and automated alarm escalations. It ends the issue of lost email, SMS and pager notifications. The alarm is based on the status of a tag, which is an input or output value monitored by the SCADA system. If the tag value goes out of a defined range, an alarm is generated. The alarm escalation settings for each tag can be set separately, giving flexibility to plant personnel and managers.

The application allows smartphones to act as both a client and a server. Besides just sending an alarm notification, it can verify if the message was received on the intended device. If the notification is not verified as delivered, automatic steps can be taken to close the gap (e.g. the alarm is escalated). Notifying, responding and analyzing alarms can occur on smart phones with the highest level of efficiency and effectiveness.

SCADA-Aware Mobile uses GPS-based location-awareness capabilities to provide more targeted alarm delivery with the intention of reducing response time. The application can query the location information of the device or devices that the alarm message is intended for. It locates the devices closest to the event and sends them the alarm notification. If no device is within a set range, the alarm is escalated.

For each tag, it can be clearly defined who should get the alarm at each level of escalation and during which shift. Thus the alarm recipients for each tag can be prioritized. When an alarm goes out the first time, it goes out for a designated group. If no one in that group responds within a specified time, then the alarm is escalated and it goes out for a new designated group. This process can be continued for three levels of escalation. Every time an escalation happens, it is reflected in the alarm status on the phone of everyone in the group designated for *that* escalation and the group or groups designated for *previous* levels of escalation. Thus everyone is updated on the alarm status.

SCADA-Aware Mobile can use both Wi-Fi and carrier network connections. It can interact with the operating system on the smartphone to detect network changes and enable a continuous connection. If users experience a dropped connection the application will recover automatically.

The responsible manager needs to know about the alarm and acknowledgment status in real-time, regardless of event location or time of day. This often does not happen in case of other alarm delivery systems. The system needs a way to determine that the device is available and in range, that the device receives notification and that the user of the device has taken ownership of the alarm and has notified other members that additional steps are not necessary. Besides improving the validation of an alarm delivery, **SCADA-Aware Mobile** aids in the acknowledgment of alarms. Often an alarm notification is sent to several individuals. With **SCADA-Aware Mobile's** collaboration capabilities, personnel can acknowledge an alarm that initiates an update to the SCADA system and assigns ownership of the alarm to the person who acknowledged it.

SCADA-Aware Mobile also provides an update to the other individuals who had received the alarm (possibly vendors or a third-party company, engaged in providing critical service or raw materials in the plant) informing them of who has taken ownership of the event. All of this interaction can occur directly from the smartphone without requiring another device (e.g. laptop) to take further action. Validation of an alarm's delivery to the smartphone and visibility of alarm acknowledgment across a group improves accountability.

Prior to acknowledging the alarm, an engineer can query related tag values and historical information to help determine next steps. Related tags may suggest that the alarm requires a specific skill set. Historical data provides an estimate of the level of urgency, based on how quickly the threshold values of the tag in question are changing. With this additional information, acknowledgment of the alarm and informed next steps can be determined. Minimizing the number of occasions personnel rush to the alarm location just to see what is going on improves employee safety. The accuracy of identifying the skill sets needed to resolve the issue is of significant value to the overall SCADA system and the plant's operations.

Timely delivery of the alarm, access to data and visibility of alarm acknowledgment increases the overall efficiency of the response. A complete alarm life-cycle audit provides increased accountability and aids in procedural and regulatory compliance. It also reduces environmental, safety and health concerns. Some of the personnel involved in the alarm response – such as those in the control room – can also be freed to focus on other duties.

This increased functionality comes with additional security considerations. **SCADA-Aware Mobile** provides several mechanisms to allow customers the flexibility to incorporate their company's security policy into the application. **SCADA-Aware Mobile** authenticates users against the corporate Open LDAP servers or Microsoft's Active Directory servers. Other authentication methods can be incorporated. Using a challenge response interaction, **SCADA-Aware Mobile** verifies the user, provides a list of access rights and roles allowed for this user or device and determines what information and actions are available to the user. The initial authentication also establishes the communities of interest and allows for team member collaboration.

After a user has been properly verified over the carrier's network, the next critical security mechanism is the encryption of data between devices. **SCADA-Aware Mobile** supports SSL between all devices, and can be extended to handle additional encryption protocols providing the necessary tools for application developers to implement a secure environment. Corporations can communicate active alarms and fulfill historical data requests while managing information visibility.

SCADA systems are a critical piece of a business' infrastructure. Reliable message delivery, user ownership, and security facilitate the proper response to an alarm and can maximize the benefits provided by the system. Recursion Software's **SCADA-Aware Mobile** provides these features for alarm message delivery to smartphones. When someone acknowledges and takes ownership of the alarm, others in his/her group can see it immediately. This person can interact with the SCADA system and pull historical and related information to better determine the appropriate next steps. Managers with 24/7 responsibilities can have additional flexibility when they are away from the plant.

SCADA-Aware Mobile's capabilities help companies maximize their SCADA investment and improve employee safety, reduce stress, and increase bottom line profits.

Contact Recursion Software, Inc. for additional information.

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