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SER's enhanced user interface for ProSafe-RS helps to secure major refinery expansion project for Yokogawa

SER was enhanced to provide a user-friendly view of alarm and event information to be displayed in the same view from both Triconex and ProSafe-RS safety systems.

Executive Summary

In the industrial processing facilities of today it is not enough just to survive in this highly competitive market. Companies need to improve efficiencies, modernize processes, and invest in their facilities to help meet the ever-changing needs of their customers and to grow their business.

In 2021, a large petroleum company in the Middle East invested in a large-scale modernization and expansion program to boost their processing capacity. This refinery expansion project included an additional 30,000 I/O for their Yokogawa CENTUM VP Distributed Control System (DCS) and 16,000 I/O for their Safety Instrumented¬ System (SIS), Emergency Shut Down (ESD) and Fire and Gas (F&G) protection systems. Yokogawa's ProSafe-RS safety system was selected to deliver the SIS expansion and would work alongside the pre-existing Triconex safety system.

There was a clear mandate from the customer regarding the visualization of alarm data from both Triconex and ProSafe-RS safety systems. Requiring critical alarm information to be presented in the same view, with clear specifications relating to the format and display of alarm and event messages that Operators were accustomed to with the pre-existing Triconex safety system.

As the Triconex alarm viewer was not able to show messages from ProSafe-RS, a solution was needed to present alarm data from both safety systems in a single view. To facilitate this, Exaquantum Sequence of Events Recorder (SER) from Yokogawa, was selected to provide a centralized, web-based interface, that would enable Operators to access and view the alarm data from both underlying safety systems in a user-friendly format.

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Challenges

ProSafe-RS is one of the world's leading safety systems, but the way in which original event messages are presented fell short of the customer requirements and would have been a huge setback for the project. The alarm messages in ProSafe-RS Sequence of Events (SOE) have a different structure and format compared to messages from a Triconex system and lacked some of the details and information required. Visually, these messages look very different compared to the Triconex alarm viewer, so Operators would be unfamiliar with the view of event messages coming from Prosafe-RS.

To visualize alarm and event messages from Triconex and ProSafe-RS, SER was selected due to its ability to collect data from both safety systems. However, the standard SER interface did not meet the alarm visualization specifications for this project, so modifications were needed to replicate the visual display and functionality in the Triconex alarm viewer.

Solution

To meet the specifications, the original event messages from ProSafe-RS needed to be enhanced with more detailed information. In addition, the SER user interface needed to be enhanced to present a familiar view of alarm data to Operators that was akin to the Triconex alarm viewer.

ProSafe-RS Message Conversion

Original event messages in ProSafe-RS are not presented in an easily readable format for Operators, therefore, these needed to be converted and enhanced for display in the SER user interface.

Date/Time	Source	Message	Resource	Type	ID	Quality
04/23/18 08:32:00.705	XS 230V AC FEEDER-A	FALSE	SCS	SOER	EVT_FALSE	V
04/23/18 08:46:07.904	XS 230V AC FEEDER-A	TRUE	SCS	SOER	EVT_TRUE	V
04/23/18 09:08:37.814	XS A ESD SYSTEM CABNT DOOR	TRUE	SCS	SOER	EVT_TRUE	V
04/23/18 09:32:59.301	XS A ESD SYSTEM CABNT DOOR	FALSE	SCS	SOER	EVT_FALSE	V
04/23/18 10:48:16.351	XS N DO TRMNL BRDB PWR	FALSE	SCS	SOER	EVT_FALSE	V
04/23/18 10:48:16.491	XS N DO TRMNL BRDB PWR	TRUE	SCS	SOER	EVT_TRUE	V
04/23/18 10:52:12.936	XS 230V AC FEEDER-B	FALSE	SCS	SOER	EVT_FALSE	V
04/23/18 10:52:27.880	XS 230V AC FEEDER-B	TRUE	SCS	SOER	EVT_TRUE	V
04/23/18 12:36:14.447	SCS	SCS Online Change Download (System Database) Start	SCS	BSYS	4 -4	
04/23/18 12:36:14.780	SCS	SCS IOM Definition Changed NODE 03 SLOT 07	SCS	BSYS	4 -4	
04/23/18 12:36:14.780	SCS	SCS IOM Definition Changed NODE 03 SLOT 06	SCS	BSYS	4 -4	
04/23/18 12:36:14.780	SCS	SCS IOM Definition Changed NODE 03 SLOT 05	SCS	BSYS	4 -4	
04/23/18 12:36:14.817	SCS	SCS Online Change Download (System Database) Complete	SCS	BSYS	4 -4	

Original Event Messages in ProSafe-RS

This message conversion process involved maintaining the original event messages received from ProSafe-RS and creating additional columns for Tag Name, Event Message and State. To further enhance the information, the Event Message field was modified to provide more readable and understandable descriptions that would enable Operators to better interpret information from the Triconex and ProSafe-RS safety systems.

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Message conversion is performed on-the-fly using a message conversion lookup table where ProSafe-RS messages are mapped on the Type, Resource and Source attributes, allowing the Tag Name, Event Message and State attributes to be set as described:

- Tag Name - the tag name associated to the A&E message shall be displayed against each event
- Event Message - a new message attribute containing a meaningful message describing the AE event. The event description length is 255 characters, or longer to ensure it provides adequate description for Operators to comprehend and understand.
- State - the condition state associated with the A&E message. The event status message shall be configurable based on type. The Current SOE viewer displays alarm states as red and Normal states as blue.

To allow for future modifications and adjustment to made easily, the message conversion lookup table is user configurable. An import/export function is provided in CSV format enabling engineers and accredited users to edit the configuration using Microsoft Excel to keep the messages aligned to the safety system.

SER Display Enhancements

With the modifications to the event messages, SER needed some enhancements to improve the visualization and filtering capabilities and deliver an enhanced user experience that was similar to the Triconex alarm viewer station. One of the main requirements for SER was that new event occurrences shall be highlighted in a different colour. The customer wanted to show a rolling log to highlight raise events in one colour (Red) and return to normal events in another (Blue) for alarms as a visual aid for Operators.

Date/Time ↓	Source	Message	Resource	Type	ID	Quality	TagName	Event Message	State
03 Dec 2020 12:20:55.224	XS[illegible] 230V AC FEEDER-E	FALSE	PUMP 1	SOER1	EVT_FALSE	GOOD	X[illegible]	AC FEEDER FAIL	OFF
03 Dec 2020 12:20:54.823	XS[illegible] 230V AC FEEDER-D	FALSE	PUMP 1	SOER1	EVT_FALSE	GOOD	X[illegible]	AC FEEDER FAIL	OFF
03 Dec 2020 12:20:54.423	XS[illegible] 230V AC FEEDER-C	FALSE	PUMP 1	SOER1	EVT_FALSE	GOOD	X[illegible]	AC FEEDER FAIL	OFF
03 Dec 2020 12:20:54.023	XS[illegible] 230V AC FEEDER-B	FALSE	PUMP 1	SOER1	EVT_FALSE	GOOD	X[illegible]	AC FEEDER FAIL	OFF
03 Dec 2020 12:20:53.622	XS[illegible] 230V AC FEEDER-A	FALSE	PUMP 1	SOER1	EVT_FALSE	GOOD	X[illegible]	AC FEEDER FAIL	OFF
03 Dec 2020 12:20:53.222	10FZT3061 HEAD PR	LL	PUMP 6	SOER6	EVT_FALSE	ACCEPT	10FZT3061	HEAD PR FAIL	OFF
03 Dec 2020 12:20:53.022	10FZT3061 HEAD PR	LL	PUMP 6	SOER6	EVT_TRUE	ACCEPT	10FZT3061	HEAD PR HEALTHY	ON
03 Dec 2020 12:20:52.821	10FZT3051 HEAD PR	LL	PUMP 5	SOER9	EVT_FALSE	ACCEPT	10FZT3051	HEAD PR FAIL	OFF
03 Dec 2020 12:20:52.621	10FZT3051 HEAD PR	LL	PUMP 5	SOER8	EVT_TRUE	ACCEPT	10FZT3051	HEAD PR HEALTHY	ON
03 Dec 2020 12:20:52.421	10FZT3051 HEAD PR	LL	PUMP 5	SOER7	EVT_FALSE	ACCEPT	10FZT3051	HEAD PR FAIL	OFF
03 Dec 2020 12:20:52.221	10FZT3051 HEAD PR	LL	PUMP 5	SOER6	EVT_TRUE	ACCEPT	10FZT3051	HEAD PR HEALTHY	ON
03 Dec 2020 12:20:52.021	10FZT3051 HEAD PR	LL	PUMP 5	SOER5	EVT_FALSE	ACCEPT	10FZT3051	HEAD PR FAIL	OFF
03 Dec 2020 12:20:51.820	10FZT3051 HEAD PR	LL	PUMP 5	SOER5	EVT_TRUE	ACCEPT	10FZT3051	HEAD PR HEALTHY	ON
03 Dec 2020 12:20:51.620	10FZT3041 HEAD PR	LL	PUMP 4	SOER4	EVT_FALSE	ACCEPT	10FZT3041	HEAD PR FAIL	OFF
03 Dec 2020 12:20:51.420	10FZT3041 HEAD PR	LL	PUMP 4	SOER4	EVT_TRUE	ACCEPT	10FZT3041	HEAD PR HEALTHY	ON
03 Dec 2020 12:20:51.220	10FZT3031 HEAD PR	LL	PUMP 3	SOER3	EVT_FALSE	ACCEPT	10FZT3031	HEAD PR FAIL	OFF
03 Dec 2020 12:20:51.020	10FZT3031 HEAD PR	LL	PUMP 3	SOER3	EVT_TRUE	ACCEPT	10FZT3031	HEAD PR HEALTHY	ON
03 Dec 2020 12:20:50.416	10FZT3011 HEAD PR	LL	PUMP 1	SOER1	EVT_FALSE	ACCEPT	10FZT3011	HEAD PR FAIL	OFF
03 Dec 2020 12:20:50.215	10FZT3011 HEAD PR	LL	PUMP 1	SOER1	EVT_TRUE	ACCEPT	10FZT3011	HEAD PR HEALTHY	ON
03 Dec 2020 12:20:49.814	XS[illegible] 230V AC FEEDER-A	FALSE	PUMP 4	SOER5	EVT_FALSE	GOOD	X[illegible]	AC FEEDER FAIL	OFF

Modified Event Messages displayed in the SER interface, in a more user-friendly format for Operators

SER was also enhanced to allow more advanced highlighting and filtering of the data, including:

- Ability to add filter groups and sub-conditions
- Ability to highlight items in different colors
- Ability to exclude or highlight items by right-clicking on an item
- Ability to save all highlights, filters and chosen columns into a filter definition file, so that standard views can later be retrieved easily

SOE Data Archive

The SER visualization developments and data filtering capabilities provides an enhanced user experience which was much more user friendly compared to the original event messages in ProSafe-RS. It was also important that a good level of performance could be maintained to display the events when any new event occurs. To ensure system performance is maintained over time, SOE data is archived every 24-hours to a designated share folder on the network in CSV format. Historical data records are easily accessible from the archive to assist with troubleshooting or more detailed data analysis in Excel by accredited users with access to the shared folder.

Key Takeaways

Show data from Triconex and ProSafe-RS in the same view

Yokogawa were successful in securing a major refinery expansion project, as they were able to meet the alarm data visualization requirements providing the same view of alarm data from both Triconex and ProSafe-RS safety systems using SER. Triconex is not able to integrate event messages from ProSafe-RS, whereas SER is able to interface data from multiple control and safety systems and provide a unified view of alarm and events messages.

Provide a familiar view of alarm data to Operators

One of the specific project requirements was to ensure Operator familiarity in terms of how alarm data is displayed and visualized. They were acclimated to the Triconex alarm viewer interface and this view needed to be replicated in any solution proposed by Yokogawa. ProSafe-RS did not provide all the data required, and SER did not provide a view of the event messages that Operators had become accustomed to. By enhancing the ProSafe-RS SOE messages and converting them into a format that Operators can understand and interpret it helped secure this important project.

Enhanced SER Display

SER was a key factor in meeting the customer requirements for the visualization of alarm data. With an enhanced SER user interface, Operators had a familiar view of alarm information, with the functionality to highlight specific alarm states in contrasting colors to help identify and process information very quickly from both safety systems. The additional filtering and highlighting of certain information provided a real benefit for Operators with quick and instant access to critical plant information.

The success of this project hinged on Yokogawa's flexibility to find a user-friendly solution that met the functional requirements regarding visualization of alarm information. This project was also a catalyst, opening up other significant opportunities and further discussions between Yokogawa and the customer in the area of alarm management.

Project Latest

At the time of writing, the modifications to SER went through a Pre-Factory Acceptance Test (FAT) in November 2021 and the FAT was done in December 2021.

For Internal Use
Released: 09/06/2022
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