

A METHOD AND APPARATUS FOR TRANSMITTING DATA FROM A FIELD DEVICE TO A SUBSEQUENT SERVER

5 FIELD OF INVENTION

The present invention relates to an alarm management system for field devices. More particularly, it relates to an alarm monitoring and notification system for the monitoring of multiple field devices by different types of users.

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BACKGROUND OF THE INVENTION

In a manufacturing facility, multiple field devices are typically used in a wide area
15 across the whole facility. These devices are used for monitoring different parameters such as pressure and flow rate and are typically monitored at a central location, using a central monitoring system. The state of the devices is displayed in status codes. Often, a facility uses devices provided by different manufacturers. Often, the same status codes generated by different devices of different manufacturers represent
20 different event messages. Hence, the status codes generated needs to be matched to the corresponding pre-defined event messages for a user to understand the status.

In the prior art, the monitoring of the devices is done at the maintenance level, and
25 therefore, the maintenance staff is only notified of event messages, which are alarm messages. Hence, the event messages are filtered to transmit only the alarm messages to the monitoring system. The maintenance staff views the messages from the monitoring system and attends to these alarms accordingly.

30 A conventional structure of the alarm management system for a device is shown in Figure 1.

Figure 1 is a diagram of a system structure of a general alarm management and control system. In Figure 1, reference numeral 11 designates a device to be monitored. The device 11 is a field device such as a flow meter or a pressure transmitter.

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The device 11 generates a specific code for each status that it is in. The status code from each device 11 does not contain any user comprehensible information. The information corresponding to each status code for the different devices are stored in a field control station (FCS) 12. The FCS 12 contains a database, which contains the event messages and further information for each respective status code. These status codes are provided by different manufacturers, and are invariably different.

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The status code from device 11 is transmitted to a FCS 12 to which the device 11 is in communication. The FCS 12 comprises a first database containing the event messages for the respective status codes. The event messages are matched to the status codes generated by the devices, to create the corresponding event messages.

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Further, pre-defined additional information for the event messages are included. The pre-defined additional information includes the event message priority, the object information, and the event cause and action for an event message.

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However, there is a possibility that not all the information available relating to the status codes is available in the first database. This type of information can be self-diagnostic data or advanced diagnostic data held by the individual devices 11. This information has to be independently retrieved. A device patrol 13 retrieves this information from the devices in response to a user's request. Alternatively, the device patrol 13 may also retrieve the information at user pre-determined intervals. The pre-determined intervals can be set in accordance to the criticality level of the device, or set to an 'ON' or 'OFF' state. The information added by the device patrol 13 will be added to the same database.

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All the data in the form of event messages and further information are received into a filter 15. The filter 15 allows a type of data therethrough, according to a requirement of a user. The filter 15 further includes a configurator 16, a filtering library 17 and a

message utility library 18. The configurator 16 is linked to the filtering library 17 and message utility library 18 to filter and customize the event messages

5 The filtering library 17 is a collection of instructions to filter the event messages received based on the status code. For every event message, the filter 15 determines if it is a user required term based on certain user conditions set by the filtering library functions. In an embodiment, a user requirement is for maintenance messages. Therefore, the filter is determines, if it should be passed to the maintenance staff as an alarm message based on certain conditions set by the
10 filtering library functions. The message utility library 18 is a set of functions used to normalize the format of the messages from its existing format, which is usually an Extensible Markup Language (XML) format to a format which is comprehensible when displayed to the maintenance staff or other users.

15 The configurator 16 is used to define the filtering by using the functions in the filtering library 17. The configurator 16 uses the message utility library 18 to customize the event messages, which satisfy the conditions determined for the maintenance alarms. The alarm messages are transmitted and stored in a subsequent server having a database.

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In an embodiment, the configurator 16 can be customised to stop further delivery of the event messages which do not satisfy the conditions determined for the maintenance alarms thereby acting as a filter only to allow user required data therethrough. In this embodiment, the filtered event messages, which satisfy the
25 conditions defined for maintenance alarms and the event messages, which do not satisfy any other conditions, are transmitted and stored in the second server. The latter event messages will be displayed in its default form since they are not customised using the configurator 16.

30 After the configurator 16 has been customised to select a type of data, in this case maintenance alarm messages, a filtering simulation can be conducted to test the determined filter condition. This is done to ensure that the pre-defined maintenance alarm messages are filtered correctly.

The event messages in the subsequent server are displayed at a human machine user so that the maintenance staff can view and attend to these alarms accordingly.

5 In summary, the apparatus of the present invention acquires the status code of the devices. The status codes are normalized and managed as event messages. The event messages, which have been identified as alarm messages or are unclassified are then transmitted and stored in a second server. The event messages can be acknowledged from the subsequent server through the Human Machine Interface. The acknowledgement receipts are stored in the subsequent server as maintenance
10 history.

In the prior art, the maintenance staffs are those who are trained to identify and respond to alarm messages. However, besides the maintenance staff, there are also operators in the facility. Since only the alarm messages are filtered for the
15 maintenance staff, the operational staff or operators will not understand these filtered alarm messages. Although the alarm messages include further information, the operators are not trained to understand this information or their relevance to the device failure or problems. The information will cause confusion to their judgment.

20 Further, the event messages are acknowledged and the acknowledgement receipts are stored in the subsequent server. In case of an interruption in the communication system, the first server is not notified if the alarm messages are not delivered to the subsequent server. This can be disastrous, as the alarm will not be attended to as necessary.

25 Accordingly, it is an object of the present invention to ensure that all the alarms messages are delivered to the subsequent server so that the operational and/ or maintenance staff are notified.

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SUMMARY OF THE INVENTION

The present invention relates to an apparatus for providing data from a field device to a subsequent server including a filter to allow a type of data therethrough according

to a requirement of a user, said data previously received from a field device, a storage means to store said filtered type of data, a transmission means to transmit stored data to a subsequent server and a detector to detect a connection between said device to a subsequent server, wherein said detector is in communication with
5 said storage means to transmit the filtered data once a connection is established between said device and said subsequent server so as to ensure all filter data is successfully transmitted to the subsequent server.

Preferably, said data is any one of the following types of event messages including a
10 status message, an alarm message, a maintenance message, a notification message or a diagnostic message.

Still preferably, said event messages data is generated from a pre-existing status code provided by said field device, said type of data obtained by matching said status
15 code with a database having pre-defined event messages and information relating to corresponding status codes.

Still preferably, said diagnostic parameter is not automatically transmitted to the input means.

20 In an embodiment, the filter further includes a configurator to receive said event messages from a field device, identify if said event message is a filtered message; and customise said filtered message to include user-defined information relating to the filtered message for storage in the storage means for subsequent transmission to
25 the subsequent server.

Preferably, said storage means is a buffer to store said filtered data which is not transmitted when said detector detects no connection between said device and subsequent server.

30 Still preferably, the transmission means is a transmitter to transmit said stored data or filtered data when said detector establishes a connection between said apparatus to said subsequent server.

Preferably, said detector sends a notification to said storage means to store said filtered data when said detector detects the connection between said device to said subsequent server is disengaged.

- 5 Still preferably, said detector sends a subsequent notification to said transmission means to re-transmit said stored data when said detector detects the connection between said apparatus to said subsequent server is engaged.

- 10 In an embodiment, the apparatus further includes a categorising means to categorise transmitted message into user-defined categories or a formatting means to format said message in user-defined formats.

- 15 According to another aspect of the invention, there is provided a method of transmitting data from a field device to a subsequent server said method including the steps of receiving a type of data from a field device, filtering a type of data therethrough according to a requirement of a user, storing said filtered type of data, transmitting the stored data to a subsequent server and detecting a connection between said device to a subsequent server thereby transmitting the filtered data when a connection is established between said device and a subsequent server.

- 20 Preferably, said data is any one of the types of event message including a status message, an alarm message, a maintenance message, a notification message or a diagnostic message.

- 25 Still preferably, the method further includes the steps of generating said event message from a status code of said field device and matching said status code with event messages and information for the status code predefined in a database.

- 30 Preferably, said filtering step further including the steps of receiving said event messages from a field device, identifying if said event message is a filtered message; and customising said filtered message to include user-defined information relating to the filtered message for storage in a storage means for subsequent transmission to the subsequent server.

Preferably, said storing step further including the step of storing to a buffer said filtered message, which is not transmitted.

5 Still preferably, the transmission step further includes transmitting said stored message or any other filtered message when a detector detects the connection between said device to said subsequent server is engaged.

10 In an embodiment, the method further includes the steps of detecting disengagement of the connection between said apparatus and said subsequent server, sending a notification to said storage means and storing said filtered message.

15 In another embodiment, the method further including the steps of establishing a connection between said device and said subsequent server, sending a subsequent notification to said transmission means and transmitting said stored message.

In yet another embodiment, the method further includes the steps of categorising said transmitted message into user-defined categories or formatting said messages in user-defined formats for display in said data display unit.

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BRIEF DESCRIPTION OF THE DRAWINGS

25 In order that the invention might be more fully understood, embodiments of the invention will be described by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is diagram of a general alarm monitoring system according to the prior art.

30 Figure 2 is a diagram of the general alarm monitoring system according to one aspect of the current invention.

Figure 3 is a flow chart of the general alarm monitoring system according to one aspect of the current invention.

The attached drawings are not necessarily drawn to scale.

DETAILED DESCRIPTION OF AN EMBODIMENT

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Reference will now be made in detail to the preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. The preferred embodiments of the invention are not intended to limit the invention in its broadest aspect to these embodiments. On the contrary, the invention is intended to cover
10 alternatives, modifications and equivalents, which may be included within the spirit and scope of the invention as defined by the appended claims. Furthermore, in the following detailed description of the embodiments, numerous specific details are set forth in order to provide an understanding of the present embodiments.

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According to the invention, there is an apparatus 200 for providing data from a field device 20 to a subsequent server 30 as seen in Figure 2. Data 22 from a field device is sent to a filter 27 to allow a type of data therethrough according to user-defined conditions. A storage means 36 is used to store the filtered messages 29 for subsequent transmission. A detector is used to detect if the device is connected to a
20 subsequent server 30. When the detector establishes a connection between the device and the subsequent server, a transmission means transmits the stored data to the subsequent server.

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The data 22 are event messages, which includes any one or all of a status message, an alarm message, a maintenance message or any other messages generated by the field device 20, which is being monitored. The field device 20 only generates status codes 21. The status codes 21 are representative of events, alarms or any other types of information encountered by the field device 20. However, the status codes 21 are not comprehensible on their own. Hence, the status codes 21 are
30 matched with a database to obtain the corresponding event messages 22 for filtering into alarm messages 23. The matching is done when the device 20 is connected to a Field Control System FCS 24 to identify the event messages 22 and obtain further information for the status code generated. The FCS 24 includes a database 25 with

event messages for the respective status codes pre-defined for the field devices 20 which are being monitored.

5 However, the event messages 22 for some status codes 21 may not be present in the database 25. These status codes may represent event messages and information which are self-diagnostic data or advanced diagnostic data held only by the field device 20. To obtain these event messages, the device is further connected to the device patrol 26. The information is retrieved by device patrol 26 and stored in the database 25.

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Further, the device 20 can be connected to other databases 25 for event messages 22 or further information generated by other means such as an intermediate monitoring system or manual entry system.

15 The event messages 22 are transmitted to a filter 27. The filter 27 includes a configurator 28 to filter event messages 22. The configurator 28 filters by matching the conditions of the event messages 22 to pre-defined conditions according to a requirement of a user for filtered messages 29. The event messages 22 which satisfy the conditions are considered filtered messages 29. In addition, the configurator 28
20 customises the filtered messages 29 to include user-defined information such as causes of the filtered messages 29 and the recommended actions in response to the filtered messages 29. The filtered messages 29 are transferred to a database 44 and stored for purposes of notification to a user, for audit or verification.

25 According to another aspect of the invention, the apparatus 200 further includes a second filter 40. In this second filter, the configurator settings may be set to allow another type of data therethrough.

30 For example, there may be more than one group of users monitoring the filtered messages. The users can be operational staff or maintenance staff. The maintenance staff is notified of the alarm messages 29 which are critical. These alarm messages 29 with their customised information are usually not comprehensible to the operational staff. However, the operational staff is likely to need further information with the pre-existing event messages and more event messages 22 so

that they can react in anticipation of any critical alarm messages 29. Hence, there is a need for more than one filter.

To ensure that all alarm messages 29 are transmitted successfully, a detector 34 and
 5 a storage means 36 are further included. The detector 34 monitors the connection between the apparatus 200 and the subsequent server 30. The storage means 36 stores filtered messages 29 for transmission to the subsequent server.

When there is an interruption or disconnection in the connection between the
 10 apparatus 200 and the subsequent server 30, the detector 34 sends a notification 35 to the storage means 36. The filtered messages 29 are stored as pending messages 37 in the storage means 36.

When the connection between the apparatus 200 and the subsequent server 30 is
 15 established, the detector 34 sends a subsequent notification 35 to the transmission means to re-transmit the stored message 37. .

Hence, with the apparatus 200, all alarm messages 29 will be transmitted to the
 20 subsequent server 30.

The subsequent server 30 includes an acknowledgement system to generate an
 acknowledgement receipt 32 for the alarm messages 29 received. The
 acknowledgement receipts 32 are stored in the subsequent server 30 forming the
 maintenance history.

25 The transmitted messages 29 in the subsequent server 30 are displayed on a human machine interface 38 for the maintenance staff to view and respond accordingly.

30 Still further, the filtered messages 29 will be displayed on the human interface station 38 by way of a display system 45. The display system 45 allows the operator to select the category of the filtered messages 29 for display so that the operator is not overwhelmed by the bulk of information. With this display system 45, the

maintenance staff can refer to the same human machine interface 38 to review the alarm messages.

In the preferred embodiment, there is provided a categorising means to categorise the information of the alarm messages 29 into different categories and levels. For example, the filtered messages 29 can be defined into different categories by the criticality. A first category can be for messages pertaining to alerting the operators of a potential alarm, a second category can be for messages pertaining to the occurrence of an alarm, a third category can be for messages pertaining to a reoccurrence of an alarm and so forth. In addition, a formatting means is provided to format the filtered message in user-defined formats, such as to highlight the different categories of alarms in different colours or fonts.

Figure 3 is an explanatory flow chart of the principle of the present invention. The apparatus checks for any stored messages 37. If there are pending messages 37, the transmission means will transmit the messages 37 to the subsequent server 30 for display on the human machine interface 38.

If there are no pending messages 37 or after all the pending messages 37 have been transmitted, the filter 40 will process the event messages 22. The filtering will be done by the configurator 42 and customised with pre-defined information as filtered messages 29. The filtered alarm messages 29 are transmitted to the subsequent server 30. If the detector 34 detects that the connection between the device 200 and the subsequent server 30 is disengaged, a notification 35 will be sent to the storage means to store the filtered messages 29 as a pending message 37.

As explained above, this invention will ensure that all alarm messages 29 deciphered from the status codes 21 of the monitored field devices 20, and filtered, by customised configurators 28, 42, are transmitted successfully, ensured by a storage means 36, a detector 34 and a transmission means.

In addition, the invention teaches a method of transmitting data from a field device to a subsequent server including the steps of receiving data from a field device. The

data is filtered according to a requirement of a user. After the filtering, the data is stored and transmitted to a subsequent server when a connection is detected between the device and the subsequent server.

- 5 The data are event messages, which includes a status message, an alarm message, a maintenance message or any other messages generated as status codes by the field device which is being monitored. The status codes are matched with event messages and information for the status code predefined in a database.
- 10 The filtering is done by receiving the event messages from a field device. The messages are identified if they are filtered messages. Then the filtered messages are customised to include user-defined information relating to the filtered message.

- 15 During the transmission, when disengagement between the device and the subsequent server is detected, a notification is sent to a storage means to store the filtered messages. When a connection between the device and the subsequent server is established, a subsequent notification is sent to a transmitter to transmit the stored message.

- 20 In a preferred embodiment, the filtered messages are categorised into user-defined categories or formatted in user-defined formats for display.

What is claimed is:

1. An apparatus for providing data from a field device to a subsequent server including

a filter to allow a type of data therethrough according to a requirement of a user, said data previously received from a field device;

a storage means to store said filtered type of data;

a transmission means to transmit stored data to a subsequent server; and

a detector to detect a connection between said apparatus to a subsequent server

wherein said detector is in communication with said storage means to transmit the filtered data once a connection is established between said device and said subsequent server so as to ensure all filter data is successfully transmitted to the subsequent server.

2. An apparatus as claimed in claim 1 wherein said data is any one of the following types of event messages including a status message, an alarm message, a maintenance message, a notification message or a diagnostic message.

3. An apparatus as claimed in any of the preceding claims wherein said event messages data is generated from a pre-existing status code provided by said field device, said type of data obtained by matching said status code with a database having pre-defined event messages and information relating to corresponding status codes.

4. An apparatus as claimed in any of the preceding claims wherein said diagnostic parameter is not automatically transmitted to the input means.

5. An apparatus as claimed in any of the preceding claims wherein said filter further includes a configurator to

receive said event messages from a field device;

identify if said event message is a filtered message; and

customise said filtered message to include user-defined information relating to the filtered message for storage in the storage means for subsequent transmission to the subsequent server.

6. An apparatus as claimed in any of the preceding claims wherein said storage means is a buffer to store said filtered data which is not transmitted when said detector detects no connection between said device and subsequent server.

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7. An apparatus as claimed in claim 6 wherein said transmission means is a transmitter to transmit said stored data or filtered data when said detector establishes a connection between said apparatus to said subsequent server.

10 8. An apparatus as claimed in claim 6 wherein said detector sends a notification to said storage means to store said filtered data when said detector detects the connection between said device to said subsequent server is disengaged.

15 9. An apparatus as claimed in claim 7 wherein said detector sends a subsequent notification to said transmission means to re-transmit said stored data when said detector detects the connection between said device to said subsequent server is engaged.

20 10. An apparatus as claimed in claim 9 further includes
a categorising means to categorise transmitted message into user-defined categories; or
a formatting means to format said message in user-defined formats.

25 11. A method of transmitting data from a field device to a subsequent server said method including the steps of
receiving a type of data from a field device;
filtering a type of data therethrough according to a requirement of a user;
storing said filtered type of data;
transmitting the stored data to a subsequent server; and
30 detecting a connection between said device to a subsequent server
thereby transmitting the filtered data when a connection is established between said device and a subsequent server.

12. A method of transmitting data as claimed in claim 11 wherein said data is any one of the types of event message including a status message, an alarm message, a maintenance message, a notification message or a diagnostic message.

5 13. A method of transmitting data as claimed in any of the claims 11 or 12 further includes the steps of

generating said event message from a status code of said field device; and

matching said status code with event messages and information for the status code predefined in a database.

10 14. A method of transmitting data as claimed in claim 13, wherein said filtering step further including the steps of

receiving said event messages from a field device;

identifying if said event message is a filtered message; and

15 customising said filtered message to include user-defined information relating to the filtered message for storage in a storage means for subsequent transmission to the subsequent server.

20 15. A method of transmitting data as claimed in claim 14 wherein said storing step further including the step of storing to a buffer said filtered message, which is not transmitted.

25 16. A method of transmitting data as claimed in claim 15 wherein said transmission step further includes transmitting said stored message or any other filtered message when a detector detects the connection between said device to said subsequent server is engaged.

17. A method of transmitting data as claimed in claim 16 further including the steps of detecting disengagement of the connection between said device and said subsequent server;

30 sending a notification to said storage means; and

storing said filtered message.

18. A method of transmitting data as claimed in claim 17 further including the steps of establishing a connection between said device and said subsequent server;

sending a subsequent notification to said transmission means; and
transmitting said stored message.

19. A method of transmitting data as claimed in claim 21 further including
- 5 categorising said transmitted message into user-defined categories; or
 formatting said messages in user-defined formats for display in said data
display unit.