



Knowledge Base Article

AMS Alert Monitor Performance Recommendations

Article ID: EDE1-110-010108141803
Publish Date: 19 Feb 2001
Article Status: Approved
Article Type: General Product Technical Information
Required Action: Information Only

Article Revision History:

Revision/Publish	Description of Revision
20 Dec 2003	KnowledgeBase Article Revision History feature added. Any revisions to this article made before December 20, 2003 are not tracked by this Article Revision History feature.

Affected Products:

Product Line	Category	Device	Version
AMS	General (FAQ)	Common Problems	AMS 5.0

Description

1. INTRODUCTION

1.1 Purpose

This document will describe the performance of Alert Monitor and how to recommend maximum configurations for a given user.

1.2 References

- AMS SRS-205 Alert Monitor Enhancements
- AMS SDD 220 Alert Monitor software design specification

1.3 Glossary

Device Poll List

This list of devices is polled by the Alert Monitor application. Each device includes a configuration that specifies its poll rate and defines what device aspects (bits) are to be tested.

Poll or Polling

This is the process where the devices on the Device Poll List are interrogated and tested per their configuration. If a device fails the test then an alert condition is presented in the Active Alerts list. If a device recovers from the failure then the alert condition is removed from the Active Alerts list.

Poll Rate

The minimum interval or period of time between consecutive device polls. Note that if polling is disabled and then enabled then all timing intervals are restarted.

Poll Device

A device in this category can be polled and it may be added to the Device Poll List. A Poll Device must be an Assigned (not Spare and not Decommissioned) registered HART device that was last known to be connected to the associated AMS Plant Server.

Alert List

The primary view of the Alert Monitor application that displays this list. This list contains all devices that were last known to have an alert condition.

2. Alert Monitor Overview

2.1 Alert Monitor Configuration

The Alert Monitor Device Poll List is stored in the AMS Database. In the Jaguar release, the database may contain multiple lists. There will be one list for each AMS Plant Server attached the database. The Poll List contains the list of devices that are to be polled as well as the polling configuration (i.e. which status flags to test and the Poll Rate).

2.2 Alert Monitor Polling

When the AMS Plant Server is started up, it retrieves the Device Poll List from the database. For each device in the list, the plant server/Alert Monitor searches for the actual device on its networks. If the device is not found a device not responding event is put in the database for Audit Trail and the Alert Monitor viewer. Alert Monitor will not attempt to send another message to the device unless the device's Alert Monitor configuration is changed. (NOTE: in the future, it should be investigated whether this behavior should be changed to still create the monitoring object, but throttle how fast it generates messages to try to find the device) This is different behavior than if the device is removed after Alert Monitor has been running.

If the Plant Server/Alert Monitor locates the physical device, it then creates a device monitor object. This object is responsible for initiating a command 0 message to be sent to the device, in order for AMS to learn the device's current status.

Messages to the device are initiated based on the time the last message was sent plus the poll rate. The device monitor object will not initiate another message, if there is still an out-standing message when the poll period has elapsed (i.e. no response has been received within the poll period).

At AMS startup, since it is unknown as to when the last message was sent, the device monitor objects will kick off a message to the device right away in order to determine the device's current status. Subsequent messages are sent to the device based on the time that the Device Monitor sent the last message.

Notes:

- 1) The Poll Rate is the minimum amount of time between messages initiated by Alert Monitor. It does not try to ensure the device is polled within the configured poll rate. It attempts communication only after the poll period has elapsed.
- 2) The messages to the device are not prioritized. They go into a common simple FIFO queue in the communications stack. Other applications within AMS can also initiate HART communications. They all use the same communications queue.
- 3) If a device is disconnected after Alert Monitor is running and a monitoring object has been created for the device, communications bandwidth will be reduced. The monitoring object will initiate communications to the device after each poll period

has elapsed. Since the device will not respond to the messages being sent down, a number of communications timeouts and retries mechanisms will be invoked. This will vary depending on the interface being used. In many cases, both AMS and the HOST System may perform communication retries. This will delay other messages from going out to other devices.

4) The type of interface being used to communicate with the device (i.e. DeltaV, HART multiplexer, HART modem, etc) limits the number of outstanding messages to a network.

3. Determining recommended maximum polling rates

3.1 User Scenarios

The following are the general user scenarios:

- HEALTH MONITORING: User wants to periodically have **all** of their devices polled as a health check. In this case the user is not as concerned about how fast the devices are polled, just that they are polled and any alerts are logged to the AMS database and can be viewed in the Alert Monitor Viewer.
- HEALTH MONITORING BY GROUPS: This is basically the same as the above except, all of the devices are not poll at the same rate.
- PROBLEM DIAGNOSING: User believes that there is a possible equipment problem. They want to poll a **limited** number of devices at a reasonably fast rate to determine if there is a problem with specific HART devices and have any alerts displayed in the Alert Monitor Viewer.
- MIXED MONITORING: This is where the user wants to do PROBLEM DIAGNOSING and either HEALTH MONITORING or HEALTH MONITORING BY GROUPS.

3.2 Determining Poll Rates

How fast the AMS Alert Monitor can poll devices is mostly limited by the type of interface to the device(s). It's important not to over configure Alert Monitor to the point where all of the communications bandwidth to the devices is used up. Not only will Alert Monitor not be able to effectively poll the device for status updates, the rest of AMS will experience performance degradation of all device communications.

It is absolutely critical that you do not have a device in the Alert Monitor that is not connected, as this will greatly reduce the communication bandwidth available for messages to other devices. Note: AMS version 1.4.1 optimized some of its communications when devices are not present, but non-responding devices will still use up communications bandwidth.

Each interface has different characteristics. For a given interface/system type, communications to the device may behave differently based on the hardware being used, version of the system, loading on the system, system configuration, and system layout. Examples:

- Communications to a device on RS3 will be effected by things such as how many FIMs are on an IO line or the type of IO module (4-20mA FIC vs. MAI16)
- Communications to a device on DeltaV will be effected by the version of DeltaV being used. Newer versions of DeltaV provide better feedback, which allows AMS to optimize communication messages and future DeltaV releases will cache the command 0 information, thus providing faster response times

Below is a table that identifies the recommended maximum messages per minute to

be initiated from Alert Monitor for that interface. The average response time was as found through testing in the lab for each network type. The Recommended maximum number of messages per minute is based on average response time for that interface along with a safety factor, The safety factor is to allow bandwidth for other AMS applications to communicate with the devices, allow for the occasional More Status message that may occur, allow bandwidth when communication retries occur as a result of no device being present and other system to system variances. Note: These are only guidelines. Actual response times will vary greatly with the many variables involved in an AMS system and supporting infrastructure.

Communications Interface	Recommended Max. Messages per Minute (M)	Interface Type
Arcom style multiplexers	12	Simple
Stahl	12	Simple
Alstom	12	Simple
DeltaV 4.2 and 5.0	9	Mixed/Medium
Provox	8	Mixed/Medium
RS3	6	Complex

NOTES:

1. The response time (seconds/msg) is for a single message. Many of the communications interfaces will allow for multiple messages to be issued in parallel. There are limiting factors in each communication network. The most common limitation is that most IO cards only have one HART modem, thus only one HART message can be sent through a given IO card at a time, even though the card probably has multiple HART devices connected to it.

The following is our recommendation as to how to determine the appropriate poll rate for a device. The important thing to remember is not to overload the communications interface to the devices. The following guidelines can be applied on a per interface basis.

3.2.1 HEALTH MONITORING or DIAGNOSING A PROBLEM:

The following method can be used to determine the recommended poll rate when all devices in the Alert Monitor Poll List are using the same poll rate (i.e. there is only one group of devices).

To determine the recommended polling period (P) in minutes per device, take the number of devices (D) in the Poll List divide it by the recommended maximum number of Alert Monitor messages per minute (M) for the given interface.

$$P = D / M$$

The following embedded spreadsheet shows an example where there are 400

devices to be monitored. This interface has an $M = 9$. The result of the calculation is that the recommended poll rate would be 44 minutes for each device.

D =	Number of Devices	400
M =	Recommended max. #msg/min for that Interface	9
P =	Recommended poll rate (minutes)	44

Note: in many cases there will be occasions where it will be necessary to set up another group in order to diagnose a problem. As a result, it is a good practice to leave some of the Alert Monitor communications bandwidth available. See the next section as to how to determine device poll rates when all of the devices are not being polled at the same rate.

As mentioned earlier, these calculations can be done on a per interface basis since the interfaces work in parallel. Example if a PC has a RS3 interface with 100 devices and a HART multiplexer network with 200 devices the calculations would be as follows:

RS3: $M=6$

$P = D / M$

$P = 100 / 6 = 17$

Each device on the RS3 network should have an Alert Monitor Poll Rate of 17 minutes or greater

Mux: $M=12$

$P = D / M$

$P = 200 / 12 = 17$

Each device on the Mux network should have an Alert Monitor Poll Rate of 17 minutes or greater

Note: since each group is on a separate interface the HEALTH MONITORING method was used to determine their poll rates vs. the method for HEALTH MONITORING BY GROUP.

3.2.2 HEALTH MONITORING BY GROUP or MIXED MONITORING:

The user determines the appropriate poll rates for these two scenarios by using the same method. NOTE: if each group is on a different interface, the poll rate for each group is determined independantly (i.e. use the method described under HEALTH MONITORING.

If the groups are on the same interface use the following method. The simple way is to first divide up the devices into as many groups as necessary based on how many different polling rates are required. Next enter in the poll rates you desire for each group. Generally if there are two groups, the larger group should have a poll rate that is inversely slower. Put the numbers into the equation below to determine (Mmi). The end result (Mmi) is the sum of the number of messages per minute being generated by each group. This number must be less than or equal to the recommended max msg/min. The easiest thing is to iteratively adjust the poll rates until the sum is less than the recommended max.

P1: Poll period for group1

D1: number of devices in group 1

P2: Poll period for group 2

D2: number of devices in group 2

Px: Poll period for group x

Dx: number of devices in group x

Mmi: Average messages per minute for this interface

M: recommended max msg/min for that interface (See table)

$Mmi = (D1/P1) + (D2/P2) + \dots + (Dx/Px)$ for each group

$Mmi < M$ The average messages per minute for this interface must be less than the recommended maximum messages per minute for this interface.

Below is an embedded spread sheet example. Groups (1,2,3) are for only HEALTH MONITORING. Group 4 is a PROBLEM DIAGNOSING group.

	Number of Devices	Poll Rate for each device (minutes)	
Group 1	200	450	
Group 2	100	400	
Group 3	50	150	
Average msg/min (groups 1, 2, 3)	1.0	HEALTH MONITORING	
Group 4	5	1	
Average msg/min (group 4)	5	PROBLEM DIAGNOSTING	
Average msg/min (group 1,2,3,4)	6.0	COMBINED	

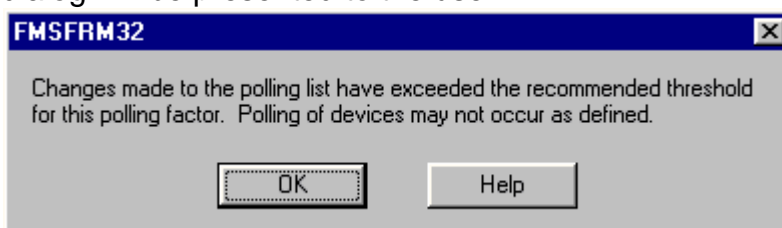
Note: It is important to notice the impact of polling even a small number of devices quickly. Group 4 only has 5 devices, but they are being polled every 1 minute this calculates out that they are using the majority of the bandwidth, while groups 1, 2, and 3 have 350 device and are using one sixth of the bandwidth. This highlights the need to only perform fast polling on a small number of devices and only for a limited time.

4. Configuration Limit Reached Warning

An Alert Monitor enhancement, introduced as part of the AMS 5.0 release, is a configuration limit warning.

4.1.1 Configuration Limit Calculation and Warning Dialog

When the user opens the Alert Monitor Device Poll List window or applies any change to the Alert Monitor configuration the application will recheck the poll list configuration. The Device Polling List will be read and the average number of devices to be polled per minute will be calculated and compared to a predefined limit. If the calculated value exceeds the selected threshold limit then a warning dialog will be presented to the user.



The AMS Alert Monitor subsystem will have three predefined thresholds. One for a simple network configuration (fastest device responses), one for a complex network

configuration (slowest device responses), and one for mixed simple and complex networks or a network with medium device responses. Internally this will represent devices per minute maximum. The thresholds will be derived from the tests that were performed by the DVT group.

Services Are Delivered Through
Our Global Services Network.
To Reach Us, Go To The World
Wide Web:

www.emersonprocess.com/systems/reach/

DeltaV, PROVOX, AMS, RS3, and PlantWeb are marks of Emerson Process Management LLLP. All other marks are the property of their respective owners. While this information is presented in good faith and believed to be accurate, Emerson Process Management LLLP does not guarantee satisfactory results from reliance upon such information. NOTHING CONTAINED HEREIN IS TO BE CONSTRUED AS A WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, REGARDING THE PERFORMANCE, MERCHANTABILITY, FITNESS, OR OTHER MATTER WITH RESPECT TO THE PRODUCTS, NOR AS A RECOMMENDATION TO USE ANY PRODUCT OR PROCESS IN CONFLICT WITH ANY PATENT. Emerson Process Management LLLP reserves the right, without notice, to alter or improve the designs or specifications of the products described herein.

© 2004 Emerson Process Management LLLP All rights reserved.