DM1800
Field Node Initiated Event Messaging

Release Notes

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Overview
This note announces the release of field node initiated event messaging for the DM1800 Embedded Wireless Modules with miniMESH™ firmware Version 1.4 or later. Specifically, a DM1800 field node can now be configured so that a change in state on the digital input pin will initiate an unpolled or unsolicited message to be transmitted from the field node to the base station.

Background
The DM1800 Embedded Wireless Module incorporates RF Monolithics' miniMESH wireless mesh networking protocol. DM1800 modules can have one of three possible functions which are set at the time of manufacture:

- Base Station – the single master or coordinator node of the network that manages the network and provides the interface to external host applications
- Routers – the nodes that relay messages or communication between the base station and the field nodes, sometimes through other routers
- Field Nodes – the end nodes that connect to sensors and actuators, and that send and receive messages on their behalf

MiniMESH is a master/slave network architecture. As such, all communications from external applications to the field nodes go through the base station. All communications from the field nodes are directed to the base station.

MiniMESH is primarily a polled network. Under the default operation of miniMESH, field nodes must be polled by an external application communicating through the base station to enable them to send information to the base station and the connected external application. Field nodes do not initiate communications to the base station in the default configuration of miniMESH.

With this release, event messages can now be initiated by DM1800 field nodes in response to events on the module's digital input line.

Event messaging may appear to operate on prior versions of miniMESH firmware on DM1800 modules, but this feature has significant defects in prior versions and is not supported.

Using DM1800 Field Node Initiated Event Messaging On Digital Input

The DM1800 digital (binary) input is especially flexible. It can be configured to operate in the following modes:

- Send the current digital input value as a response to a *Read Digital Input* command
- Send the current count of input transitions (pulses) as a response to a *Read Digital Input* command, with the choice of counting all transitions, high-to-low transitions, or low-to-high transitions
- Now with this release, automatically send an *Event Message* when an input event or transition occurs, with the choice of event messaging on all transitions, high-to-low transitions, or low-to-high transitions

The digital input has built in a de-bounce filter to eliminate noise and mechanical contact bounce. A change in the digital input must remain stable for approximately 25 ms before the digital input state bit is updated to a new value.

Field node initiated event messaging triggered on the digital input can be used to supplement master-slave communications in applications where a quick response to an *occasional* event is needed, such as the activation of an alarm, or the manual activation of a remote control such as a gate or garage door opener.

Event messages sent from field nodes do not have a guarantee that they will be delivered and no acknowledgement is provided back to the field node that an event message has been delivered or not. When a field node's digital input is configured to send an event message, the event message is sent three times when the trigger condition on the digital input occurs in order to provide a high likelihood that at least one of the three messages will be delivered. The interval between the three messages is about 1.3 s, which allows each message to be routed through up to seven miniMESH routers (eight hop transmissions).

Because event messages are asynchronous to the normal DM1800 master-slave command/response operation, care must be taken with event messaging to avoid saturating a miniMESH network and interfering with normal master/slave traffic. If a sufficiently large number of event messages are initiated on a miniMESH network which is also attempting to conduct a high volume of normal master/slave traffic, then both uncoordinated data flows could interfere with each other and prevent the delivery of both the master-initiated and the field node-initiated messages.

Here are the suggested guidelines for using event messaging on a miniMESH network to minimize interference with the normal polled operation of the network:

1. Use the event message feature on digital inputs that only trigger *occasionally*. As a general rule, the total event message traffic from all field nodes (including router hops) should consume no more than 0.5% of total air time. The air time for a single hop is about 50 ms. For example, if two nodes are configured for event messages, and each node transmits an event message every 10 minutes on the average, and the miniMESH network has three routers (four transmissions):

   Air time = 2 nodes* 4 hops/node* 50 ms = 400 ms
   Percent air time = 400 ms/(10 minutes * 60,000 ms/minute) = 0.067%

2. Do not connect a sensor to a DM1800 digital input that has event messaging enabled if the sensor can send a burst of state transitions into the digital input. This could cause a burst of event messages to be sent into the DM1800 network.

3. A manual push button is usually not a problem, provided the user has some tactile, visual of audible feedback indicating the event message has been sent.

4. Do not use event messaging on a network which is primarily conducting a significant volume of master/slave traffic. [Frank – Can we provide a network capacity guideline similar to #1 for the portion of airtime that can be consumed by master/slave traffic and still be able to reasonably conduct event messaging?]

5. The field node receives no acknowledgement that the base station has received one of its event messages. So event messages should be considered in the same class as one-way transmissions with respect to communication reliability.

Judicious use of digital input event messaging allows occasional field events to be processed quickly without having to run command/response traffic at a high rate to poll for relatively infrequent events. Event messaging is especially suitable for reporting occasional events such as alarms and manual remote control commands.

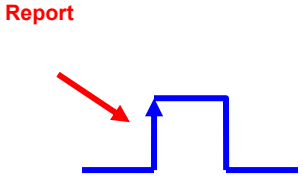
Implementing DM1800 Field Node Initiated Event Messaging On Digital Input

Field node initiated event message is when a digital state has changed on the digital input pin. The event message can be programmed to generate a message to be sent to the base station on either edge -- low going high or high going low -- or on both edges.

The following is the command sequence required to turn on (configure) field node initiated event messaging. The following example is for a bound field node with a node address of 1.

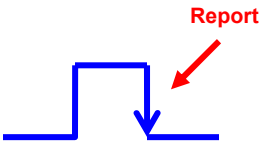
Read the state of the digital input pin:
(Example in hex)
60 00 00 00 01 19
Response
E1 02 00 00 01 09 20 00
^ state of digital input pin (low)

E1 02 00 00 01 09 21 00
^ state of digital input pin (high)



For Field Node Initiated message on low going high. Write configuration message to the field node as follows: (Example in hex)
70 00 00 00 01 55 26 00 00
^ state of digital input pin currently low

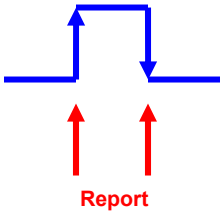
70 00 00 00 01 55 27 00 00
^ state of digital input pin currently high



For Field Node Initiated message on high going low. Write configuration message to the field node as follows: (Example in hex)
70 00 00 00 01 55 24 00 00
^ state of digital input pin currently low

70 00 00 00 01 55 25 00 00
^ state of digital input pin currently high

For Field Node Initiated message on low going high or high going low. Write configuration message to the field node as follows:
(Example in hex)
70 00 00 00 01 55 20 00 00
^ state of digital input pin currently low



70 00 00 00 01 55 21 00 00
^ state of digital input pin currently high

For Field Node Initiated Message to Base Station:
(Example in hex)
F7 08 00 00 01 1A
^ Field Node address

The above message will be sent **3 times** from the Field Node to ensure reception by the Base Station.

Additional explanation and example code can be found at our web site **WWW.MURATA.COM** in the application notes section for the DM1800.

The following application notes contain additional information on this feature:

- AN1800-1, DM1800 Application Programming
- AN1800-3, Event Demo and Application Software

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