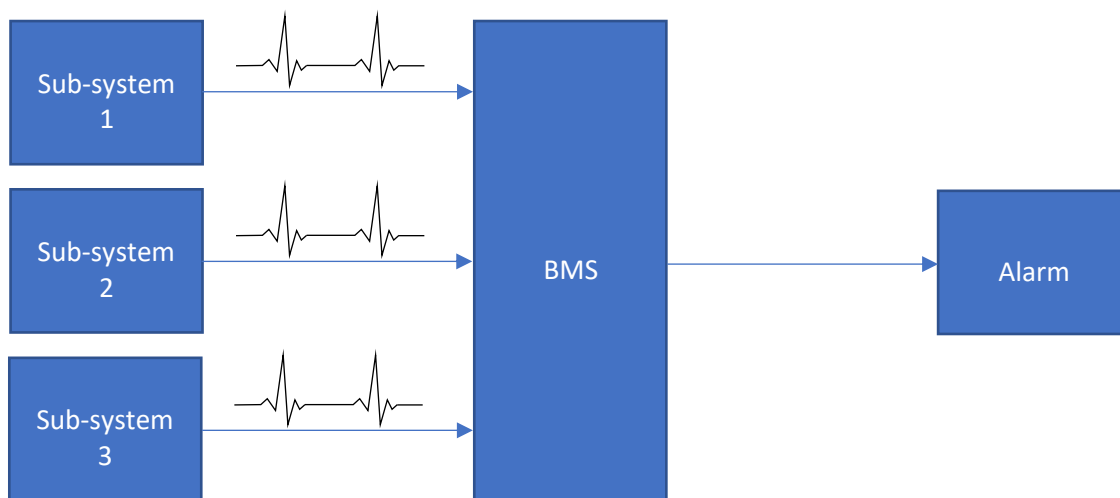


## Introduction

A common requirement of building management systems (BMS) is for the various components of the system to be monitored to ensure that they are operating correctly.

The simplest way of implementing this is through a concept commonly called a “heartbeat”, where a sub-system will send a regular signal (the “heartbeat”) to the BMS, and the BMS will check that the heartbeat is received on a regular basis. If the heartbeat is not received for a certain time (normally 2 to 3 times the heartbeat period), then the BMS will raise an alarm and/or perform some other action. A BMS performing this is commonly referred to as having a “watchdog timer”.







A BMS monitoring 3 sub-systems via heartbeats

## Implementation

A simple solution in DALI is to have a Zone toggling on a DALI Line and report the state to the BMS. However, it is not desirable to have lights flashing on and off continually, so a “virtual” zone is generally used.

### Creating the virtual Zones

For each Zone Controller and/or DALI Line that requires monitoring:

1. Create a virtual device
  - a. Select the DALI Line
  - b. Select the Addressing tab
  - c. Click on the add device button 
  - d. Select Virtual Device
  - e. Select an address (preferably not near the other real devices)
  - f. Click on **OK** to add the device
  - g. Give it a meaningful name (such as “Virtual Device”)
2. Create the virtual Zone
  - a. Select the Zones tab
  - b. Click on the add zone button 
  - c. Give the zone a meaningful name (such as “DALI Line 1 Virtual Zone”)
  - d. Click on the add zone member button 
  - e. Select the virtual DALI Short Address and click on the Add button 

### Toggling the virtual Zones

An easy way to toggle the Virtual Zones is to use logic in the Zone Controllers. For example, if there are three Zone Controllers to be monitored, and the virtual Zones are to be toggled with a period of 1 minute, then the logic code would be something like:

**Properties**

Name: 
  
☐ Include   ☐ Catch-up on Power-up
  
   Delay after logic starts:    Period:    ☒ Start Enabled

**Script**

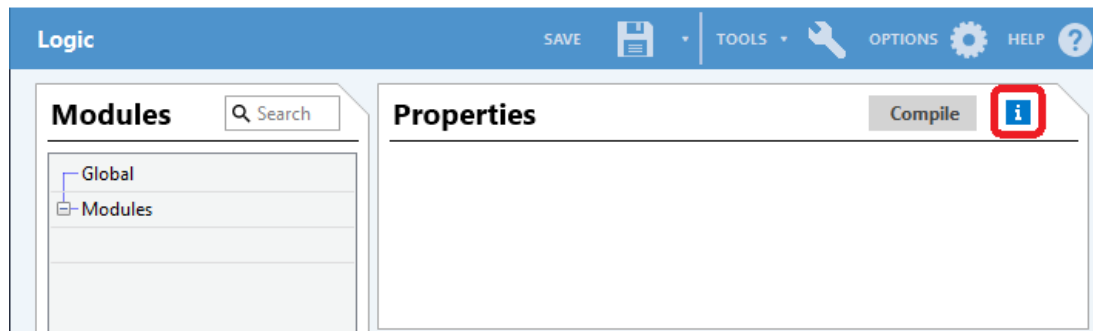
```

1 // Toggle the virtual zones with a period of 1 minute.
2 Zones["ZC 1 Virtual Zone"].On();
3 Zones["ZC 2 Virtual Zone"].On();
4 Zones["ZC 3 Virtual Zone"].On();
5 Delay(30);
6 Zones["ZC 1 Virtual Zone"].Off();
7 Zones["ZC 2 Virtual Zone"].Off();
8 Zones["ZC 3 Virtual Zone"].Off();
9 Delay(30);

```

RAPIX Logic to toggle three virtual zones

For more details of how to use RAPIX logic, refer to the RAPIX Logic Programming Guide. It can be obtained by clicking on the logic help button.



The Logic Help Button (highlighted)

## Monitoring using the RAPIX API

If the BMS is using the RAPIX API (e.g. the EisBaer software), the process is:

1. On start-up, enable Zone Events.
2. Each time a zone status event is received from RAPIX for a virtual zone, reset a timer (period more than 2 x zone toggle period).
3. If the timer expires, then there is a problem with the related Zone Controller and/or DALI Line.

Refer to the RAPIX API documentation, available from the Ozuno web site, for details of using the RAPIX API.

## Monitoring using Modbus

If the BMS is using Modbus to communicate with RAPIX, the BMS needs to regularly poll the virtual zone addresses and check that they change state periodically.

Refer to the Application Note “APN-RAPIX-007 Using RAPIX with Modbus” for more details of using Modbus.

## Monitoring using a custom API

If the BMS is not able to use the RAPIX API or Modbus, then a custom API can be used. In this case, RAPIX logic is needed to open a TCP/IP or UDP connection to the BMS and send a message when a virtual zone changes state. The details of this are beyond the scope of this document, but there are extensive details of how to use RAPIX logic in the RAPIX Logic Programming Guide.


## Monitoring using relay output

If the BMS system has the ability to read the state of dry contact (e.g. relay) inputs, then another option is to use zones that contain DALI relay devices. These can be toggled slowly (so as to not wear them out) and the BMS can read the state.




Alternatively the RAPIX Low Power Voltage Free Relay could be used – this is a solid state relay that can't suffer mechanical wear.

## Performing an action on failure

The Watchdog Timer template can be used to detect that the virtual zone has stopped toggling and then perform a selectable action. To use the Watchdog Timer template:

1. Edit a RAPIX Device (e.g. sensor, switch input)
2. Select the **Templates** tab
3. In the **Internal Events** list, select the **Power Up** event
4. Click on the Add button 

Template Name	Event Name	Outputs
<Unused>	Power Up	
<Unused>	Timer Tick	
<Unused>	Operating Property Change	
<Unused>	Flag Change	

 Add
  Edit
  Clear

The Internal Events template list

5. Select the Watchdog Timer template
6. Select the properties
  - a. The virtual zone
  - b. The time-out period (at least twice the zone toggle period)
  - c. The action (e.g. Set all lights to 80%)

Watchdog Timer (ID 105, V 4)
 ?
×

**Watchdog Timer**  
 Performs actions if an event does not occur periodically. This is intended to detect and respond to a failure in another device.  
 A "trigger" Zone needs to be turned on regularly by some other device (this is the "event" being observed). The trigger Zone will be turned back off immediately by this template. If this event is not observed before the time-out period, one or more actions are performed.

**Trigger Zone**

Zone: ZC 1 Virtual Zone

Local Member: SA 63 - Virtual Device

▼ MORE...

**Time-out period**

Time-out Period: 120 seconds

**Zone**

☒ Set Zone Level

Zone: Floor 1 LEDs

Local Member: Group 15 - LEDs

▼ MORE...

Level: 80.3%

Fade Time: Instant

**Summary**  
 If an event for ZC 1 Virtual Zone is not observed every 120 seconds then: Set Zone Floor 1 LEDs to level 80.3%.

OK Cancel

Watchdog Timer template configured to set all lights to 80% if "ZC 1 Virtual Zone" is not turned on for 120 seconds.

7. Save the changes to the device
8. The Watchdog Timer turns the Zone off when it observes it being turned on, so in this case, the logic should be changed to just turn the Zone on every 60 seconds.

## Change History

Rev	Date	Updated By	Comment
1	29 June 2022	D. S.	First Release

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