Mya Dead Bands

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Mya archives the history of EPICS channels. It does not take regular samples of the channels that it archives, but saves each significant change in a channel's value. Whether or not a change is significant depends on a channel's dead band. Note that a dead band for a channel is optional, in which case all changes to a channel are recorded.

A channel's dead band is defined when the channel is added to Mya. The requestor has the responsibility of choosing an appropriate dead band. Channel dead bands may be modified after archiving of the channel has begun by submitting a request to the Mya administrator. Requestors should consider their dead band values carefully, as a dead band set too low is worse than worthless, as it adds unnecessary processing overhead to Mya. A dead band set too high discards meaningful information about a channel's value history.

Why have dead bands?

Some people wonder why Mya uses dead bands when archiving channel history. There are three reasons for having dead bands as described below.

Disk space consumption is by far the most important reason for having dead bands. This issue impacts the user in the length of the channel history set available to channel history users. Mya has enough high performance and high reliability (expensive) disk storage to provide about two years of channel history to the user community at our current load and hardware configuration. Our dead band definitions currently reduce the amount of updates to the channel history set by about 66%. If we did not have dead bands, the span of our history set would be just eight months; which would limit all user's ability to analyze the past performance of their systems.

Users of channel history also gain from having dead bands in the performance of channel history tools. There are many very noisy channels in the control system and fetches of large time spans of channel events can significantly bog down tools like *MyaViewer* when the amount of meaningless data points is overwhelming.

The final benefit of dead bands is the number of channels that can be archived. We are not currently at the performance limit of the Mya hardware, but could approach it rapidly as the number of database inserts per second rises. This has become more important in the past few years as the number of channels being archived has expanded greatly; significantly taxing the Mya hardware.

How to specify a dead band

[*<value>*|*<value>*%|0x*<mask>*|=*<f(x)>*][:*<time>*]

There are several types of dead bands from which a user may choose. At the highest level, there are both value and time domain dead bands. Value domain dead bands use the change in a channel's value

to determine if the update is significant. Time domain dead bands look at the elapsed time between two updates to determine significance. Requestors may choose one or both of these categories of dead bands. The syntax diagram above shows you can request one of four value domain dead bands with the optional time domain dead band. Note that dead bands are ignored for EPICS string and vector channels.

Value domain is the most common category of dead band used. The requestor will supply a dead band in one of the following four formats.

- Constant threshold – The positive value is interpreted in the same units and data type as the channel to which it is applied. An update to a channel's value is considered significant when the magnitude of the change from the last recorded value is greater or equal to the supplied threshold.
- Percentage – This is any positive real number with a '%' symbol appended to the end. MYA will consider an update as significant when the difference between the two values is greater than or equal to the specified percentage of the average of the two values.
- Mask - This is an unsigned hexadecimal number with a prefix of '0x'. A change in a channel is considered significant only if bits selected in the mask have changed.
- Dynamic threshold – This style of dead band is the same as the constant threshold style, however the value of the threshold changes to be a user supplied function of the last established channel value. This style is specified by starting with the '=' character. A function may be any valid expression that conforms to the syntax of the Expression Evaluation library class. Any variable name may be used in the expression to represent the last established value of the channel, but by convention the variable named 'x' is used.

Time domain dead bands are just a real number in units of seconds. A ':' character separates the value and the time domain dead bands, and is still required when no value domain dead band is specified. A channel update is considered significant when the elapsed time is greater than or equal to the time domain dead band. Note this is not a way of sampling a channel at a fixed rate, as the time domain dead band enforces at least the specified amount of time has lapsed. In actuality, the elapsed time may be much larger for a channel that does not update often. Be judicious on using time domain dead bands, as significant value change events can be discarded. Time domain dead bands are most useful when system analysts are interested in trends over large amounts of time, and do not care about short term spikes.

Dead band examples

.025	Constant threshold
5%	Percentage
0x407	Mask
=2.5*$sqrt($abs(x))	Dynamic threshold
.1:2.5	Threshold with time
:1	Time domain only