Mya Dead Bands

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. It is an administrative action to modify dead bands. A dead band set too low is worse than worthless, as it adds unnecessary processing overhead to Mya. A dead band set too high masks meaningful information.

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 length of our history set would be just eight months, which does not meet the 1-year requirement that was levied on the Mya design.

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. This includes both the initial fetch of history and the screen updates incurred by interacting with the GUI.

The final benefit of dead bands is the number of channels that can be archived. We are not currently near the performance limit of the Mya hardware, but could approach it rapidly as the number of database inserts per second rises.

How to specify a dead band

[<value>|<value>%|0x<mask>][:<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. Value domain is the most common category of dead band used. The requestor will supply a dead-band in one of three formats. The first is just a positive threshold value, which is interpreted in the same units 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. The second type of value domain dead band is a percentage value, entered as 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. The third type of archive delta is a mask, which 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.

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.