TINE Release 5.x.x News
(Jan 31, 2023: inching toward perfection …)

It's been a while, but …

"**Remember**: *Only the dead fish go with the flow …*"

Release 5.2.6

- Fixes, Features, and Issues …
  - *exotica* : diagnostic improvements
  - contract coercion: forcing TCP/IP
  - *new features* in C and java
    - some doocs/jddd issues
  - Bug-of-the-Year !
  - *new command line tools*

Release 5.2.6

- ## Diagnostic improvements
  - ### Save-and-Restore
    - *note*: any property can (*try to*) register itself as a '*save-and-restore*' property ...
    - *now*: all problems in error.log and fec.log. e.g. :

09.01.23 14:12:42.515 CET[PLSFEC][ERROR] PulseScanInterval is not an allowed save-and-restored property : no registered input

    - *and*: any adjustments in fec.log.   e.g.:

19.01.23 15:26:25.891 CET[SINFEC][INFO] SINEQM: Save-and-Restore for property Phase will honor 10 channel(s) rather than all 15 devices due to registration
19.01.23 15:26:25.970 CET[SINFEC][INFO] SINEQM: Save-and-Restore for property SingleValue will honor 1 channel(s) rather than all 15 devices due to registration

Release 5.2.6

- **Diagnostic improvements**
  - better logging diagnostics upon socket error.
  - manifests in cache directory.
    - i.e. <EQM>/cache
    - e.g. devices, properties, histories, alarms …

```
fecadmin@mcslxterm02:/export/tine/server$ ls bpm/bin/BPMEQM/cache/
almwatchmf.csv   devmf.csv   hstmf.csv   prpmf.csv
fecadmin@mcslxterm02:/export/tine/server$ ls sine/bin/SINEQM/cache/
almmf.csv                          devmf.csv                  Phase-members.csv          SineTable.NAM-members.csv
almwatchmf.csv                     Frequency-members.csv      prpmf.csv                  SingleValue-members.csv
Amplitude-members.csv              hstmf.csv                  SineInfo-members.csv       SingleValuePerDevice-members.csv
Damping-members.csv    Noise-members.csv    Sine-members.csv    Value-members.csv
fecadmin@mcslxterm02:/export/tine/server$ ls pulse/bin/PLSEQM/cache/
devmf.csv   hstmf.csv   prpmf.csv
```

useful for those servers which register things via API …

Release 5.2.6

a short review …

- Contract Coercion
  - *client* asks for *property* & *device* with some data *format* and *length* with some transport *mode* … and … the *server* gives the client what he wants but does it the way it wants to do it !
  - specific *return codes* initiate *extra handshaking* (all happens under the hood).
  - benefits (e.g.):
    - **MCA coercion**: server has 1 single action scheduled rather than many (i.e. fewer interrupts)
      - e.g. send ALL BPM positions (1 contract) rather than send 270 BPM positions (270 contracts)
    - **redirection**: requested property/device are handled on another server
    - **force multi-cast**: server will send requested data with 1 multicast.
      - e.g. video frame/pulse spectrum sent a single time as multicast rather than 10 times to 10 different subscribers.

    - etc.

Release 5.2.6

- New Contract Coercion possibility:
  - force TCP/IP transport

  - pass the **CA_CONNECT** bit in property registration API or "**CONNECT**" in config file (exports.csv or fec.xml) and …
    - enforce all data transport (using the associated property) to make use of TCP rather than UDP.
- *Why would you want to do this?*
  - flow control is important …
    - Server on a faster network than client
  - lossy network …
  - but TCP uses (a lot!) more resources than UDP … but then again … today's PCs don't really notice …
  - e.g. latest TINE video servers

Release 5.2.6

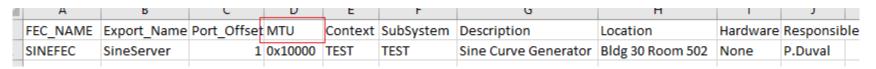- **Influencing default behavior …**
  - ○ **API**
    - ■ e.g. SetPacketMTU(0x10000);
    - ■ **BUT**: need to code and rebuild executable …
  - ○ *environment variables*
    - ■ e.g. set FEC_PACKETMTU=0x10000
    - ■ Executable does not need to be touched! ☺
  - ○ *config files …*
    - fecid.csv (or fec.xml)
    - ■ Executable does not need to be touched BUT does need to make use of config files!

	A	B	C	D	E	F	G	H	I	J
	FEC_NAME	Export_Name	Port_Offset	MTU	Context	SubSystem	Description	Location	Hardware	Responsible
	SINEFEC	SineServer	1	0x10000	TEST	TEST	Sine Curve Generator	Bldg 30 Room 502	None	P.Duval

  - ○ Precedence ?
    - ■ API post System Init > Config File > Environment > API pre System Init

Release 5.2.6

TINE relevant environment variables :

"get env" to show current settings …

Attach FEC for PETRA/PEVAC-NO.CDI

get env   ▼ Send

Help | Clients | Contracts | Connections | Stats | Modules | Time | Version | Settings

Debug Level: ○ Off ○ 1 ○ 2 ○ 3 ○ 4

```
>TINE_FORCE_SHARED_MEMORY : not set
>TINE_MCAST_ADDR : not set
>TINE_GCAST_ADDR : not set
>TINE_MCAST_MASK : not set
>TINE_GCAST_MASK : not set
>TINE_GLOBALS_BROADCAST_ONLY : not set
>TINE_RECV_BUFFER_SIZE : not set
>TINE_SEND_BUFFER_SIZE : not set
>TINE_DBG_PIPE : not set
>TINE_START_CYCLER : not set
>TINE_REMOTE_PIPE : not set
>TINE_STD_TIME_STR : not set
>TINE_DST_TIME_STR : not set
>TINE_CYCLE_THREAD_PRIORITY : not set
>TINE_HISTORY_ALLOC_FILESET : not set
>TINE_HISTORY_HOME : ./HISTORY/
>TINE_HISTORY_FREE_BLOCKS : not set
>TINE_HISTORY_EXTRA_LOGGING : not set
>TINE_HISTORY_NOPOI : not set
>TINE_HISTORY_LATE_ADDITION_WINDOW : not set
>TINE_HISTORY_DEACTIVATE_ON_ERROR : not set
>TINE_HISTORY_AUTOREMOVE_UNSYNCHRONIZED : not set
>FEC_GCAST_ADDR : not set
>FEC_PACKETMTU : not set
>FEC_ADDRESS : not set
>FEC_LOCATION : not set
>FEC_HOME : ./config/
>FEC_LOG : ./log/
>FEC_LOGDEPTH : not set
>FEC_POLLRATE : not set
>FEC_WORKAREASIZE : not set
>FEC_REMOTE_MANAGEMENT : not set
>FEC_DIE_INUSE : not set
>FEC_DIE_SOCKETERROR : not set
>FEC_FILES_ALLOW_SCAN : not set
>FEC_LOG_COMMANDS : not set
>FEC_LAZY_SCHEDULING : not set
>FEC_MINIMUM_FREE_MAINBLOCKS : not set
>FEC_MINIMUM_FREE_DISKBLOCKS : not set
>
```
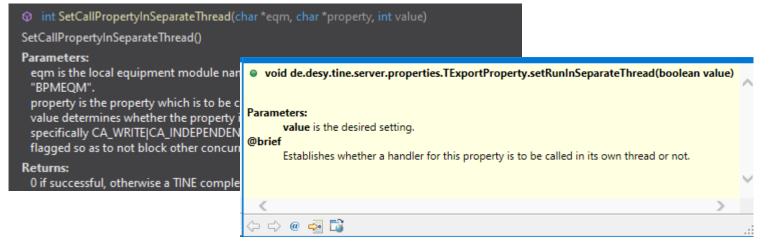
TINE

Release 5.2.6

- Registering a property to be handled in its own thread …
  - *Why do this ?*
    - equipment module/property dispatch handler will *otherwise block all other access* until the called property has finished handling the request.
    - **usually:** the handler is just doing a 'memcpy' and takes almost no CPU time. But … sometimes it does 'more things' …
    - other clients might be timing out waiting for some request that gets stuck behind some slowpoke …
    - recent examples:
      - PETRA BPM property "MAKETRIG" forwards a WRITE request to another 'slow' server which sometimes takes a lonnnnnng time …
      - a 'new' Matlab Script was calling this property regularly and when the script was running, a multitude of links for standard 'real' BPM properties were then timing out on a multitude of clients
      - XFEL SEQUENCER taking a lonnnnnng time to read and return a 'catalog file' …

Release 5.2.6

- Registering a property to be handled in its own thread …
  - In addition to SetCallPropertyInSeparateThread()

int SetCallPropertyInSeparateThread(char *eqm, char *property, int value)

SetCallPropertyInSeparateThread()

Parameters:
eqm is the local equipment module nam
"BPMEQM".
property is the property which is to be c
value determines whether the property i
specifically CA_WRITE|CA_INDEPENDEN
flagged so as to not block other concur

Returns:
0 if successful, otherwise a TINE comple

void de.desy.tine.server.properties.TExportProperty.setRunInSeparateThread(boolean value)

Parameters:
        value is the desired setting.
@brief
        Establishes whether a handler for this property is to be called in its own thread or not.

NEW ->
  - also can add a "MT" to property Access in exports.csv

EXPORT_NAME	LOCAL_NAME	PROPERTY	PROPERTY_SIZE	FORMAT	PROPERTY_ID	ACCESS	DESCRIPTION
LBRENV	LBREQM	SA_X	248	float.CHANNEL	1	READ	[-2000:2000 'mm]SA X position
LBRENV	LBREQM	SA_Y	248	float.CHANNEL	2	READ	[-2000:2000 'mm]SA Y position
...	...	...	...	...	...	...	...
LBRENV	LBREQM	MAKETRIG	1	long.CHANNEL	90	WRITE|MT|INDEPENDENT	[-2000:2000 'mm]make an external trigger(0=none 2=injection)
#							

Release 5.2.6

- Registering a property to be handled in its own thread …
  - ○ **WRITE** calls will normally still 'block' due to thread safety issues (but callers will see an 'operation busy' status rather than 'timeout').

NEW ->

  - ○ **BUT**: the '**INDEPENDENT**' flag prevents a WRITE property from blocking access to the handler!
    - ■ which is what is needed for BPM property MAKETRIG.

  - ○ *Note*: some Stock Properties/Meta Properties are handled in a separate thread by default
    - ■ **LOGFILE** properties
    - ■ **.HIST** meta properties
      - ○ doocs/tine issues …

Release 5.2.6

- .HIST related doocs/tine issues …
  - *.HIST calls are run on separate threads*
    - there can be > 1 call being handled at the same time
    - doocs2tine layer did not anticipate this so …
      - a doocs .HIST call via TINE could blow up if > 1 active at the same time
      - problem fixed this past May !
      - problem became easier to notice (remember you need at least 2 on-going calls at the same time) because …

Release 5.2.6

- ## that jddd Plot Widget ...

  - at some release began (effectively) synchronously polling histories (.HIST calls) if underlying address is a TINE address.

    - possible denial of service (especially on fragmented windows file systems)

    - more likely to have > 1 call to a server at the same time.

Release 5.2.6

- New java call: ***getTrendData()***

ˢ **int de.desy.tine.histUtils.THistory.getTrendData(String context, String server, String property, String device, int index, int fieldIndex, int depthInSeconds, int interval, TCompoundDataObject[] data)**

Gets the current trend of the targeted address. The call will start an asynchronous listener to obtain the current value and append it to the current trend data. Thus, the call can be made repeatedly (logically, not more often than the given update interval). When the call is NOT made repeatedly then after 5 minutes of idle time (i.e. without an additional call) then the listener will be stopped.

Parameters:
  context is the targeted address context
  server is the targeted address server
  property is the property whose trend is desired
  device is the targeted address device
  index is the desired index (in case the target property represents an array)
  fieldIndex is the desired field index (in case the target property is of a complex or structured format)
  depthInSeconds is the desired trend depth in seconds (e.g. 3600 for 1 hour, 86400 for 1 day)
  interval is the desired update interval (passed to the asynchronous listener)
  data is the data object to hold the trend data (must be of data type DBLDBL (i.e. DBLTIME) or DBLDBLDBL
Returns:
  the number of data points in the 'data' array element with non-zero values (maximum is the array length of 'data')

- Can poll to your heart's content !

Release 5.2.6

- jdoocs makes use of this TINE call :

int de.desy.tine.histUtils.THistory.getArchivedData(String context, String server, String property, String device, int index, int fieldindex, double start, double stop, TCompoundDataObject[] data, THistorySource src, int timeout, boolean extendedRange)

Retrieves an archive data set. Retrieve an archive data set (value - timestamp pairs) for the target property and device given and over the time range specified. If server is null, an empty string, or "HISTORY", the central archive server is queried for the data. Otherwise the local history subsystem of the device server specified is queried.

Parameters:
    context is the desired context
    server is the device server which manages the archived parameter. If null then the central archive will

NEW ->

○ so 'if (isJddd)' force this call to call getTrendData().

Release 5.2.6

- **History configuration tips …**
  - both local and central archive allow a relative tolerance and/or an absolute tolerance.
    - i.e. commit to disk if

    $Abs(thisValue - lastArchivedValue) > absoluteTolerance + lastArchivedValue*relativeTolerance$

      - use relative tolerance when there's a large range between max and min (e.g. vacuum data).
      - use absolute tolerance in most other cases
    - how to configure ?
      - **File** : enter as percent with symbol % …

Index	LocalName	Property	Device	DataLength	Format	Heartbeat	PollingRate	ArchiveRate	Tolerance	ShortDepth	LongDepth
102	SINEQM	Amplitude	#0	10	float	900	1000	1000	1 + 10%	600	1

      - **API**: enter relative tolerance field as a fraction
        - i.e. 0.1 is 10%
      - **Archive Database Manager**: also takes a 'fraction'

Keyword	Data Format	Size	Units	Max	Min
c.IonPumps.Pressure	FLOAT	600	mb	1.0E-4	1.0E-14

Abs. Tolerance	Rel. Tolerance	Plot Style	Offset	Scale
0.0	0.15	LOG	0.0	1.0

← 15 %

Release 5.2.6

- *Those pesky umlauts …*
  - what started out as a simple "why can't I see my umlauts?" question
  - => turned into a shift in policy …
  - *Now*
    - categorically forbidden in address names.
    - replaced by pure Latin characters in all other texts.
      e.g. **ä** becomes **ae**

Release 5.2.6

- *Those pesky umlauts …*
  - **The Problem:**
    - Windows (by default) uses **CP-1252** (an extended ascii), where those pesky umlauts are still 1 byte entities
      - **windows claims "ÄäÖöÜüß" has a string length of 7**
    - Linux (by default) uses **UTF8**, where those pesky umlauts are 2-byte entities.
      - **linux claims "ÄäÖöÜüß" has a string length of 14**
    - the lower 0-127 codes (normal English/Latin characters) are identical in both worlds, but you get into a heap of trouble mixing platforms with codes > 127 (i.e. < 0).
    - (unless you do something) your eclipse on windows is also using **CP-1252** whereas your eclipse on linux is using **UTF8**
    - français, español, etc. : same issues …

Release 5.2.6

- **PyTine new parameters …**
  - PyTine.attach(…,access="WRITE",…)
    - default = "READ"
    - WRITE => mode = SINGLE
  - PyTine.set(…,callable=fcn,…)
  - PyTine.log(file=filename,message=text,…)
    - writes to fec.log if file not given
  - PyTine.history(…,start=time,…)
    - better control of 'from' -> 'to'
    - 'depth' is ignored if both start and stop are given.
    - 'flags' can specify "CONNECT" for TCP access.

Release 5.2.6

- **Time for the Bug of the Year !**
- (*Abendteuer Diagnose*)
  - **DESY2 Test-beam** Servers mysteriously crashing ~once/month almost between midnight and 2:00 a.m.
  - Servers are 'buffered servers'… but not running as simple background processes
    - there's a **GUI** using **ROOT** to plot things …

Release 5.2.6

- *if TINE Server handles a history call*
  - Then :

    ensure that **endtime** > **startime** and then

    localtime(&**endtime**) => end

    localtime(&**starttime**) => begin

    days total = numDaysInTimeSpan(begin, end);

    BUT *days total* was (on those crash occasions) < 0 !

  - How was that possible ?

Release 5.2.6

- When **ROOT** plots something it (for whatever reasons) sets the current timezone to **GMT** and then sets it back when it's finished plotting.
  - As this is *multithreaded* it's possible that
    - *ROOT thread* is plotting and a history call is underway
    - switch to TINE server thread and localtime(&endtime) sees timezone = GMT
    - thread switches back to ROOT which finishes plotting and timezone is set back to CET (or CEST)
    - localtime(&starttime) now sees Timezone = CET

  - If this happens around midnight (i.e. CET midnight) GMT will claim it's 11:00 p.m. or so yesterday, so it looks like
    - n.b. 'Summer' Time, CEST, will be 2 hours ahead of GMT

    Start on Jan. 31, 2023 and end on Jan 30, 2023 !

    number of days = 30 – 31 = -1

    Fixed this past spring

Release 5.2.6

- New command line tools !

  e.g. tget, tmonitor, etc.

  well, now there's :
    - **taddtoarc** (a la taddtocas)
    - **wdogcheck**
    - **alminfocheck**

Release 5.2.2

add many servers to a CAS with a script !

■ New command line utility: **taddtocas**

```
H:\>taddtocas

Adds a server to the indicated central alarm server

Usage : taddtocas <context> <device server> /system=<alarm system> [/action=mailto:<address> /action=trigger:<event> /
action=annotate:<keyword> /code=<alarm code> /remove=<TRUE>]

        <device server> can either be prefixed with the server's context or not, in which case the CAS
        context will be assumed.
        The 'system' option must be given to specify which alarm system the added server should belong to
        You can add multiple 'action' options (e.g. multiple emails and/or events or annotations)
        However, when actions are provided, then the 'code' option must also be provided so as to
        indicate which alarm code should trigger the specifed action(s)
        An 'action' option must be prefixed with one of 'mailto:', 'trigger:', or 'annotate:'
        The 'remove' option (set = TRUE) can be used to removed a server from the CAS.  Note that the
        'system' option must also be specified so as to properly identify the server entry in the CAS database.

e.g.

        taddtocas SITE /SERVICE/WD_ACCLXSERVER1 /sys=Infastructure

or

        taddtocas SITE /SERVICE/WD_ACCLXSERVER1 /sys=Infastructure /action=mailto:Donald.Trump@Skidrow.com /code=512

or

        taddtocas SITE ARCHIVER /sys=Infastructure /action=mailto:Donald.Trump@Skidrow.com /code=999

Finally: make sure to issue a 'RESET' command to the CAS so as to instruct it to re-read its database.

e.g.
        tsend /SITE/CAS RESET

Also note that you must be a recognized CAS administrator to successfully use this tool.

H:\>_
```

Command line tools

- new command line utility: **taddtoarc**

```
'addtoarc' is not recognized as an internal or external command,
operable program or batch file.

X:\>taddtoarc

Adds a server to the indicated central archive server

Usage : taddtoarc <context> <target address> <target property> [/k=<archive keyword> /s=<archive system> [/f=<format>
 /l=<data length> /t=<tolerance>]

        <target address> can either be prefixed with the server's context or not, in which case the ARCHIVE server
        context will be assumed. In lieu of a 'target address' you can specify 'reload' as the second parameter.
        In such a case, all other input is ignored and a 'DB.RELOAD' command is sent to the central archive.
        The should be the final call to 'addtoarc' in any script which is designed to add entries to a central archiv
er.The 'keyword' option can (and should) be given to specify the desired archive keyword.  If omitted, a best-guess o
f <server.property> will be assumed.
        The 'system' option can be given to specify which archive system the added server should belong to
        The 'format' option can be used to specify a storage format, if omitted, then the registered property datatyp
e will be used
        The 'length' option can be used to specify a data length, if omitted length=1 will be assumed (unless the for
mat option is also omitted)
        The 'tolerance' option can be used to specify an archive tolerance, append a '%' to indicate percent toleranc
e
e.g.

        taddtoarc TEST /PETRA/BPM Orbit.X

or

        taddtoarc TEST /PETRA/BPM Orbit.X /k=PetraOrbit.X


Finally: make sure to issue a 'reload' command so as to instruct the central archive to re-read its database.

e.g.

        taddtoarc TEST reload

Also note that you must be a recognized ARCHIVER administrator to successfully use this tool.
```

Command line tools

Should restart/start the server !
…
but there needs to be some (adhered to) systematics in play !

Command line tools

- wdogcheck [context] ... (default= SERVICE)

Command line tools

- alminfocheck

```
Scans the alarm definintions for the given context and outputs those meeting the comparison criteria

Usage : alminfocheck /c=<context> /<field><comparison><value> [/d=debug level]

        <field> can be 'severity' or 'system'
      e.g. alminfocheck /c=TEST /severity^>=8

        (note the escape '^' character needed when > or < are used.)
```

e.g. alminfocheck /c=PETRA /severity^>=12

```
--- VAC.HF_ION_PUMP : found 6 alarm definitions ---
--- ARCHIVER.MSTR : found 3 alarm definitions ---
--- LBRENV : found 11 alarm definitions ---
--- BMS_FEC : found 5 alarm definitions ---
        those with severity >= 12:
        Bunch Marker out of range (code = 5304, severity = 13, system = 951)
        fan fail (code = 5303, severity = 13, system = 951)
        no RF (code = 5302, severity = 13, system = 951)
        no Beam Detekt (code = 5301, severity = 13, system = 951)
        pll out of loop (code = 5300, severity = 13, system = 951)
--- Mag.Corr-EXL : found 92 alarm definitions ---
        those with severity >= 12:
        SEDAC Modul nicht erreichbar (code = 635, severity = 13, system = 2050)
        RMS Fehler (code = 634, severity = 13, system = 2050)
        Regelung ueberschritten: PI (code = 632, severity = 13, system = 2050)
        Regelung ueberschritten: WI (code = 631, severity = 13, system = 2050)
        Regelung ueberschritten: GI (code = 630, severity = 13, system = 2050)
        Keine Magnetfreigabe (code = 629, severity = 13, system = 2050)
```

Central Services

- **Central Services …**
  - ENS (and GENS)
  - Central Archive Server
    - *HISTORY server is now multi-threaded*
  - Event Archive Server
    - *is now multi-threaded*
  - Central Alarm Server
    - *now support 'informational alarms'*
  - State Server
  - Statistics Server
  - Globals Server (and Time Synchronization Server)
  - Cycler

Central Services

- Specialty Services …
  - *Repeater*
    - now forwards full status error string for a listening link with an error
    - sets an alarm for any (non-timeout) link errors.
  - *Combobulator*

  - *Configurable middle layer server*
    - Great for making multi-channel arrays, centralizing a collection of servers …
      - e.g. **XFEL Modulators**, **PETRA Beam Quality**, **Tango2Tine gateways** …
  - sets an alarm for link errors
  - see: TINE API: TINE API for Console Applications (desy.de)

New ->

New ->

Coming soon: combobulator database manager !

Central Services

- Central Services …
  - Settings Server
    - avoids using mailbox files on some file system!

'standard' settings for various dump energies

+ ability to tweak …

Settings Server to the rescue !

Central Services

- **Settings Server**
  - *easiest server to write ever …*
    - reads a database ("devices" and "properties")
    - makes use of *save-and-restore*, local *histories* of all settings properties

  - another example (orbit correction) :

Central Services

- Settings Server database manager :

Central Services

- ## Central Services … Availability Server

The Idea:
can I have a running account of the current availability ?

i.e. a number I can use as a live update in applications ?
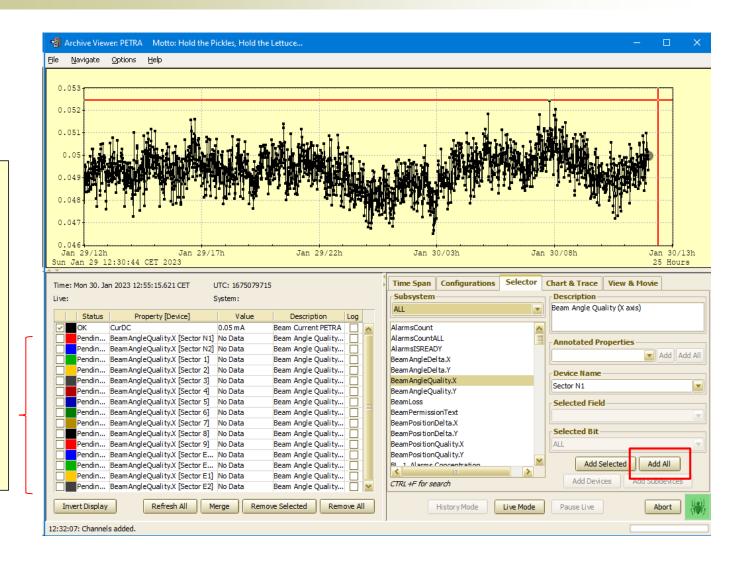
Requires:
State, Alarm, and Archive Servers …

Central Services

Availability Server

- **keeps running account of cumulative availability (over 5 epochs)**
- **applies any state 'corrections' which ensue to both live and history data**
- **add info to Linac2, Desy2, and Petra cockpits**
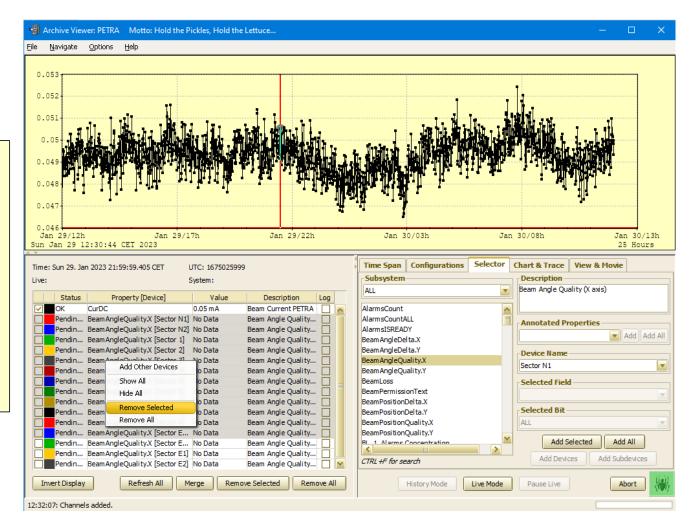
TINE Studio : Archive Viewer

Hit the 'Add All' button and now all channels are 'Pending' …

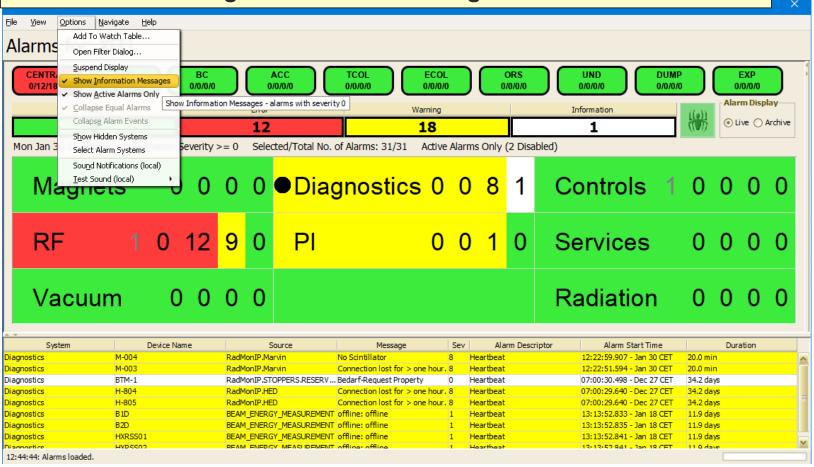i.e. no waiting while the trends of all channels are obtained

TINE Studio : Archive Viewer

Select and
- **remove if you don't want these**
- **check one of the check boxes if you do want them**

TINE Studio : Alarm Viewer

Can now display 'information' messages if desired
Information messages can also be configured to send Emails …

Odds and Ends

- ## TINE_RESTful
  - web apps using IONIC, REACT …
- ## Future TINE Web Site
  - build and deploy strategies …