

# TINE Release 4.1

## Responding to the User's Needs

Emphasis on *Control System Evolution*

# [ Control System Evolution ]

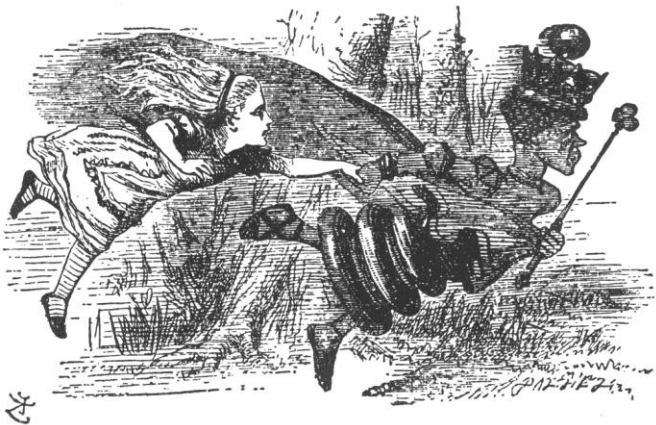
- Some forces driving ‘evolution’ :
  - Things are changing around you ...
    - 64-bit OSes are now common
    - Gigabit ethernet is now common
    - New hardware available, Old hardware is obsolete, etc.
    - New technologies appear (and disappear) all the time.
  - Users are requesting change ...
    - ‘Fix this bug ...’
    - ‘Add this feature ...’
    - ‘I need an interface to Software X ...’
  - You want to improve things anyway !

# [ The Red Queen Syndrome ]

‘The most curious part of the thing was that the trees and the other things round them never changed their places at all: however fast they went, they never seemed to pass anything.’

...

‘Now, *here*, you see, it takes all the running *you* can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!’



- Lewis Carroll, “Through the Looking Glass”

See also: “The Red Queen” by Matt Ridley

# [ The '*Race Condition*' ]

- **Predators and Prey**
  - Predators devise new ways to trap prey
  - Prey devise new ways to escape predators
- **Viruses and the Immune System**
  - (ditto)

*“The natural enemy of the control system developer is the User!”*

# [ Who are the users? ]

- Application developers
  - API problems
    - “why didn’t that work?”, “I need a method to ...”
- Hardware engineers
  - behavioral problems
    - “why don’t I have an archive of ...”
- Machine physicists/operators
  - systematic problems
    - “why do I see a fatal alarm with beam in the machine?”
- Other control systems

***problem* = bug or feature request**

# Application Developers and TINE 4.1

## ■ Some new TINE 4.1 API Features

### ○ Security :

- *Property* specific access lists
- Access locks
  - easier to use
  - offer exclusive read

`/Context/server/device [property]`

### ○ Optional **dispatch routines** :

- Property access signals
  - accessed, retried, pending, sent, etc.
- Cycle Trigger functions
  - Optional dispatch routine

### ○ Data objects 'stamped' with the **cycle number**

### ○ Scheduling can be **eager** or **lazy**

### ○ etc.

# Application Developers and TINE 4.1

- Example of new 'use case' and response :
  - Multi-Channel Arrays (MCAs)

MCAs are an efficient way to atomically deliver a collection of devices (all 300 vacuum pressures, power supply currents, BPMs, temperature sensors, etc.)

The screenshot shows the 'java Instant Client' window with the following configuration:

- Options: Device Context: PETRA, Device Subsystem: ALL, Device Server: LBRENV, Device Name: BPM\_SWR\_13, Device Property: SA\_X, Data Size: 227, Data Type: FLOAT, SA X position: SA X position, Timeout: 1000.
- Buttons: Read, Poll, Draw Mode (Text), Autoscale, Log Scale, InputPane.
- Output window: /PETRA/LBRENV/BPM\_SWR\_13 SA\_X @ 18:48:10.152

Index	Device Name	Value
(0,0)	BPM_SWR_13	855460.0
(0,1)	BPM_SWR_31	994751.0
(0,2)	BPM_SWR_46	589163.0
(0,3)	BPM_SWR_61	-1133188.0
(0,4)	BPM_SWR_75	-218711.0
(0,5)	BPM_SWR_90	362385.0
(0,6)	BPM_SWR_104	1246899.0
(0,7)	BPM_SWR_118	676285.0
(0,8)	BPM_SWR_133	55199.0
(0,9)	BPM_WI_140	-687666.0

Some applications insist on acquisition 'one at a time'!  
-> dispatch gets 300 interrupts/sec instead of 1/sec.

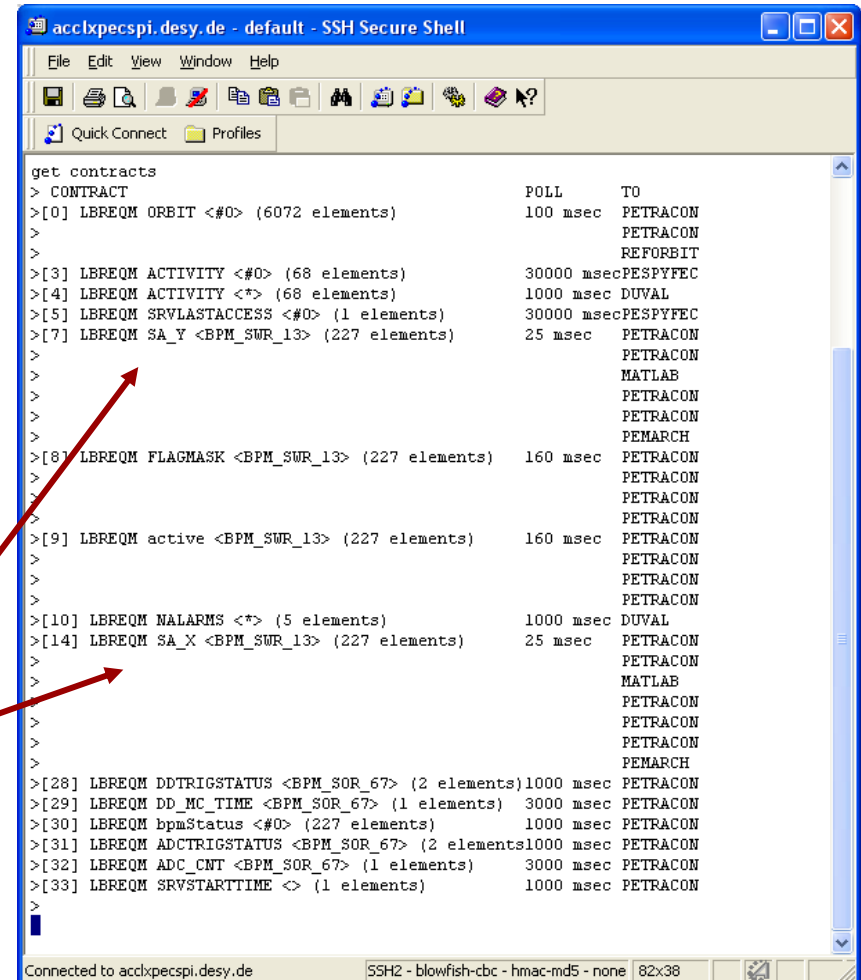
# Application Developers and TINE 4.1

## ■ Solution in TINE 4.1:

MCA acquisition enforced!

- Handshaking returns requested array index and length of array.
- All happens beneath the API !

e.g. BPM Server has several clients getting all 227 horz. and vert. orbit positions



```
acclxpecspi.desy.de - default - SSH Secure Shell
File Edit View Window Help
Quick Connect Profiles

get contracts
> CONTRACT                                POLL    TO
>[0] LBREQM ORBIT <#0> (6072 elements)      100 msec  PETRACON
>                                           PETRACON
>                                           REFORBIT
>[3] LBREQM ACTIVITY <#0> (68 elements)     30000 msecPESPYFEC
>[4] LBREQM ACTIVITY <*> (68 elements)     1000 msec  DUVAL
>[5] LBREQM SRVLASTACCESS <#0> (1 elements) 30000 msecPESPYFEC
>[7] LBREQM SA_Y <BPM_SWR_13> (227 elements) 25 msec   PETRACON
>                                           PETRACON
>                                           MATLAB
>                                           PETRACON
>                                           PETRACON
>                                           PEMARCH
>[8] LBREQM FLAGMASK <BPM_SWR_13> (227 elements) 160 msec  PETRACON
>                                           PETRACON
>                                           PETRACON
>                                           PETRACON
>[9] LBREQM active <BPM_SWR_13> (227 elements) 160 msec  PETRACON
>                                           PETRACON
>                                           PETRACON
>                                           PETRACON
>[10] LBREQM NALARMS <*> (5 elements)       1000 msec  DUVAL
>[14] LBREQM SA_X <BPM_SWR_13> (227 elements) 25 msec   PETRACON
>                                           PETRACON
>                                           MATLAB
>                                           PETRACON
>                                           PETRACON
>                                           PETRACON
>                                           PEMARCH
>[28] LBREQM DDTRIGSTATUS <BPM_SOR_67> (2 elements)1000 msec  PETRACON
>[29] LBREQM DD_MC_TIME <BPM_SOR_67> (1 elements) 3000 msec  PETRACON
>[30] LBREQM bpmStatus <#0> (227 elements)    1000 msec  PETRACON
>[31] LBREQM ADCTRIGSTATUS <BPM_SOR_67> (2 elements)1000 msec  PETRACON
>[32] LBREQM ADC_CNT <BPM_SOR_67> (1 elements) 3000 msec  PETRACON
>[33] LBREQM SRVSTARTIME <> (1 elements)      1000 msec  PETRACON
>
```



# Hardware Engineers and TINE 4.1

## ■ Example of **behavioral expectations**:

- TINE Archive is designed for **speed** !

### ■ **Lookups**

- single channel over a time-range ~ 100μsecs/channel
- MCA lookup at a single time ~ μsec/channel

### ■ **Viewers**

- Use *optical zoom* with maximum 5000 data points over a time range
- Each zoom re-acquires archive data
- Very fast browsing !

### ■ **BUT:**

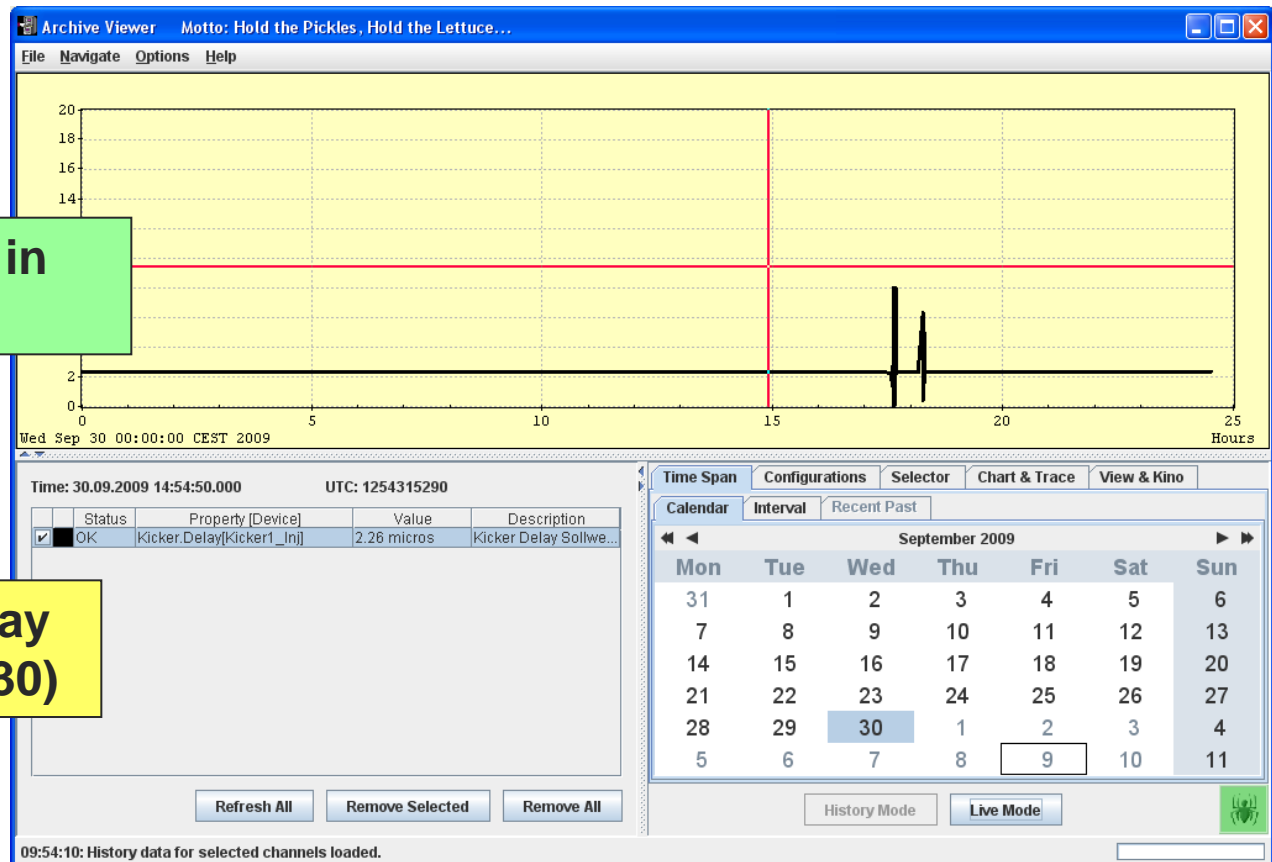
- With this viewing strategy there's a raster!
- Will I miss 'glitches' ?

TUP034

# Hardware Engineers and TINE 4.1

Spikes appear in the afternoon

e.g. Kicker Delay Setting (Sept. 30)



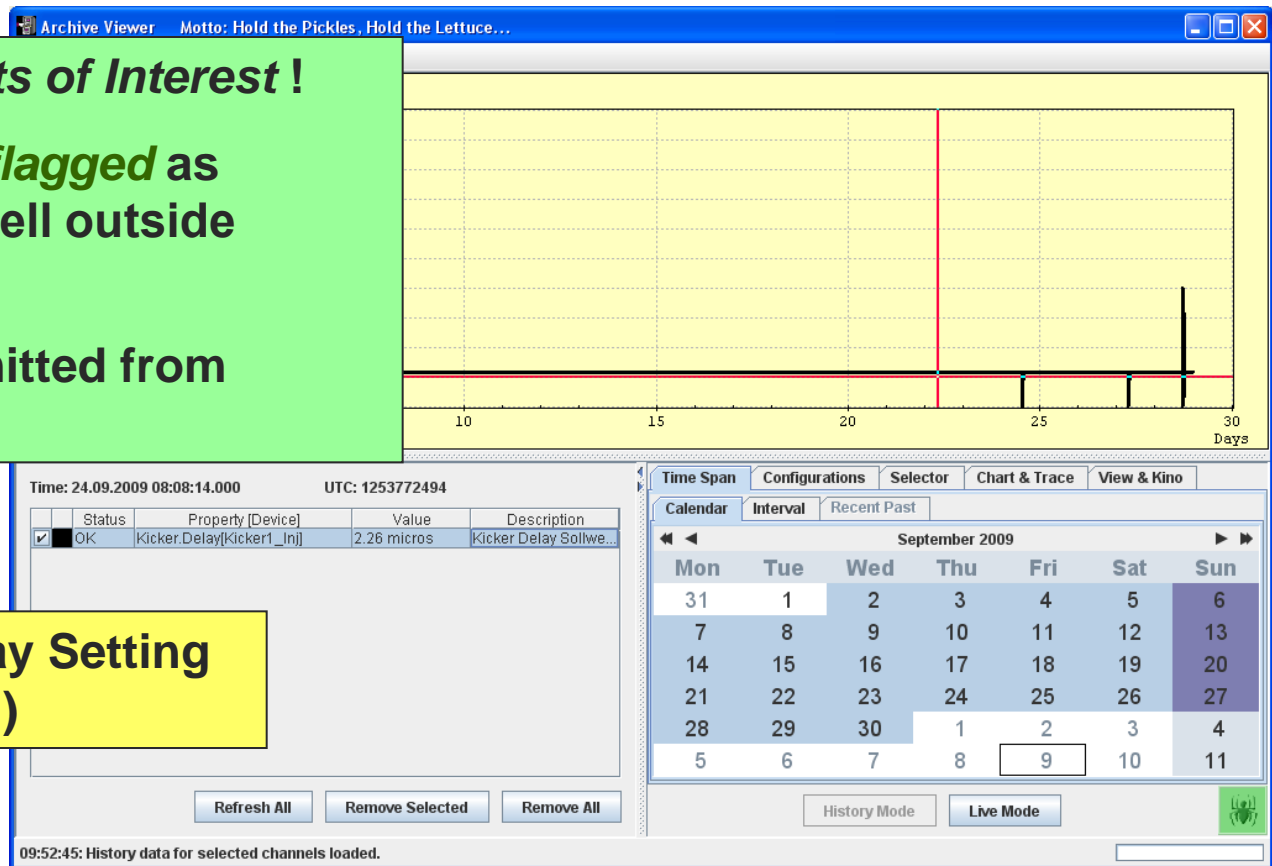
# Hardware Engineers and TINE 4.1

Introduce: *Points of Interest* !

-Archived data *flagged* as '*interesting*' if well outside tolerance!

-Will NOT be omitted from archive call!

e.g. Kicker Delay Setting  
(month of Sept.)



## Machine Physicists/Operators and TINE 4.1

- Led to improvements in **TINE Alarm System**
- Expectations led to improvements in **performance**
  - e.g. real-time video over Gigabit ethernet should allow lossless video at 100 Mbytes/sec, right?

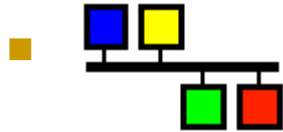
# Interoperability and TINE 4.1

## ■ DOOCS

- TINE is **embedded** !
- Many *impedance mismatches* found and fixed.
- Make sure name-space, format space, etc. remain **synchronized**.
- Alarms and Archives must map properly
- **Turing Test**: “Is it DOOCS or is it TINE?”

# Interoperability and TINE 4.1

## EPICS



- Need fully functional mapping between TINE and EPICS
  - `epics2tine` runs embedded on the IOC
  - `javaIOC` also has a TINE interface (cosylab)
- Understand difference between `pvData` and device server `property access`.
  - Database view vs. Property calls to a device instance.
  - Mapping is mostly straightforward
- `javaIOC`
  - requirement of structures with mutable strings
  - TINE 4.1: allow TINE structures to contain variable length data types (STRING, IMAGE, SPECTRUM)

# Interoperability and TINE 4.1

## ■ TANGO

- Generally a good fit!
- **tango2tine:**
  - TANGO has no name length restrictions; TINE does. (does one worry about this? Device Names can contain up to 1024 chars)
  - TANGO classes can either map to TINE device servers or a TINE device group
- **tine2tango:**
  - TINE structures aren't mapped at the moment
  - Servers with 'property-query precedence' do not map well.

# Interoperability and TINE 4.1

## ■ STARS/COACK

- STARS bridge to TINE maps well
- BUT:
  - STARS has no hierarchy limitations
    - Hierarchy beyond /context/server/device (i.e. sub-device, etc.) gets assigned to 'device'
    - Device names such as “device/sub-device/sub-sub-device/etc” are in general not a problem for TINE.



# [ Other Factors ... ]

- Keeping pace with [LabView](#)
- Keeping pace with [MatLab](#)
- Keeping pace with [.NET](#)
- Keeping pace with [java](#)
- Keeping pace with [Operating Systems](#) (64bit or otherwise)
  - Subtle behavioral changes with Winsock starting with Vista!
- Etc.

# [ The Future ... ]

- Keep running in place toward TINE 4.2 !

Thanks for your attention ...

see <http://tine.desy.de> for details ...

