

TINE Archive + Alarm Services

Overview, Status, Plans,
Features, Examples,

Disconnected Thoughts, Hopeless Ramblings,
Dreams of the Coffee Break

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(Machine-Injection - NOT the controls group)

TINE Workshop 26+27 Sep 2007

Overview

- Services: Personal Perspectives
- Archive 101
 - Getting data IN and OUT
 - Plug-And-Play, good for most applications
 - For another time: Event (Triggered) Archives
- An example of an Integrated Client-Server-Archiver Application
- Alarms: more fun than you'd imagine!
 - Generating
 - Displaying
 - Integrating in OTHER Applications (Availability!)
- Conclusions

Archiving + Alarms **System Services**

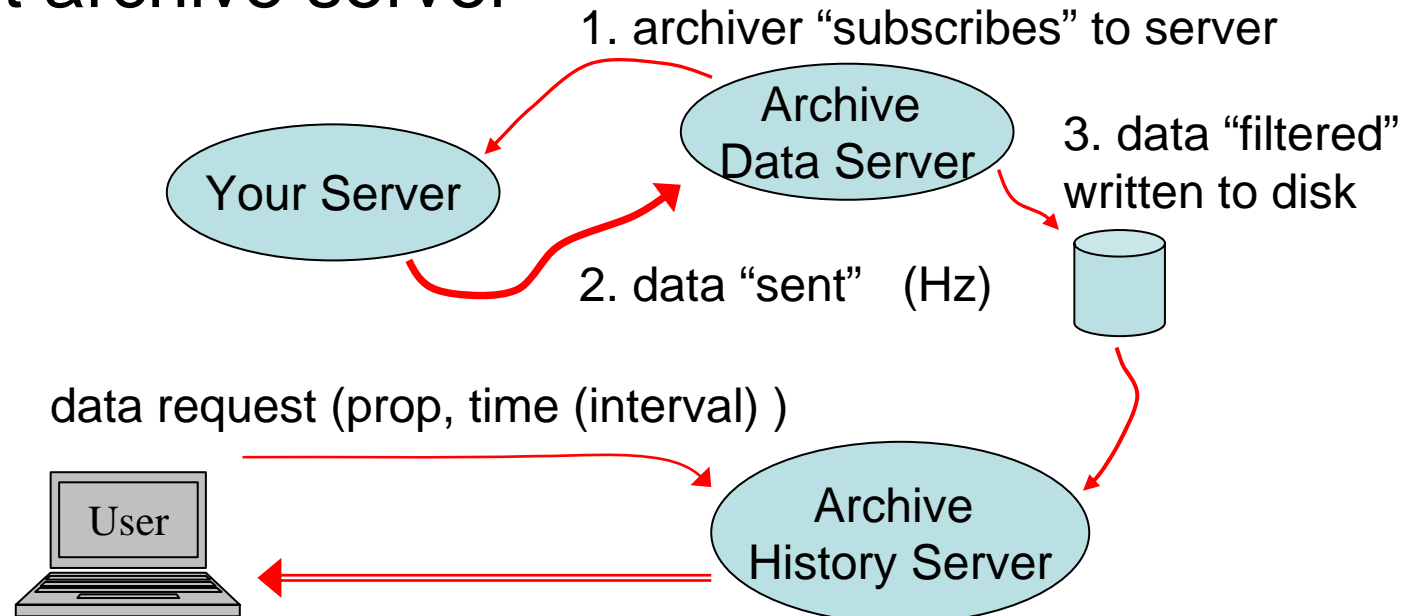
- Service Food Chain:
 - **Customers**: Control Room Shift Crew, Subsystem-Responsible-Persons, ...
 - Standard GUIs to access data, correlate, etc
 - “One-Stop-Shopping”: ALL data from ALL Systems!
 - Users**: All Server Programmers
 - Standard APIs to integrate themselves into the system, doing as little work as possible
 - Need “Common Services”
 - **The Provider**: The Service-Programmers
 - Collect (+ fulfill) the wishes from Users/Customers
 - Standard set of GUIs for customers
 - Standard APIs for programmers

Archiving System Services

- Archiving Service Food Chain:
 - **Customers:** Getting to the Data in Real-Time
 - Browsing through Data, Intuitive, Self-Explaining
 - Standard GUIs for MOST Apps – but special cases
 - RICH Clients needed to collect / present data
 - **Users:** Do as little work as possible (if any)
 - Simple configuration to get data IN
 - Standard APIs to get data OUT
 - **The Provider:**
 - Local History and Central Archiving Services
 - Standard GUIs for both

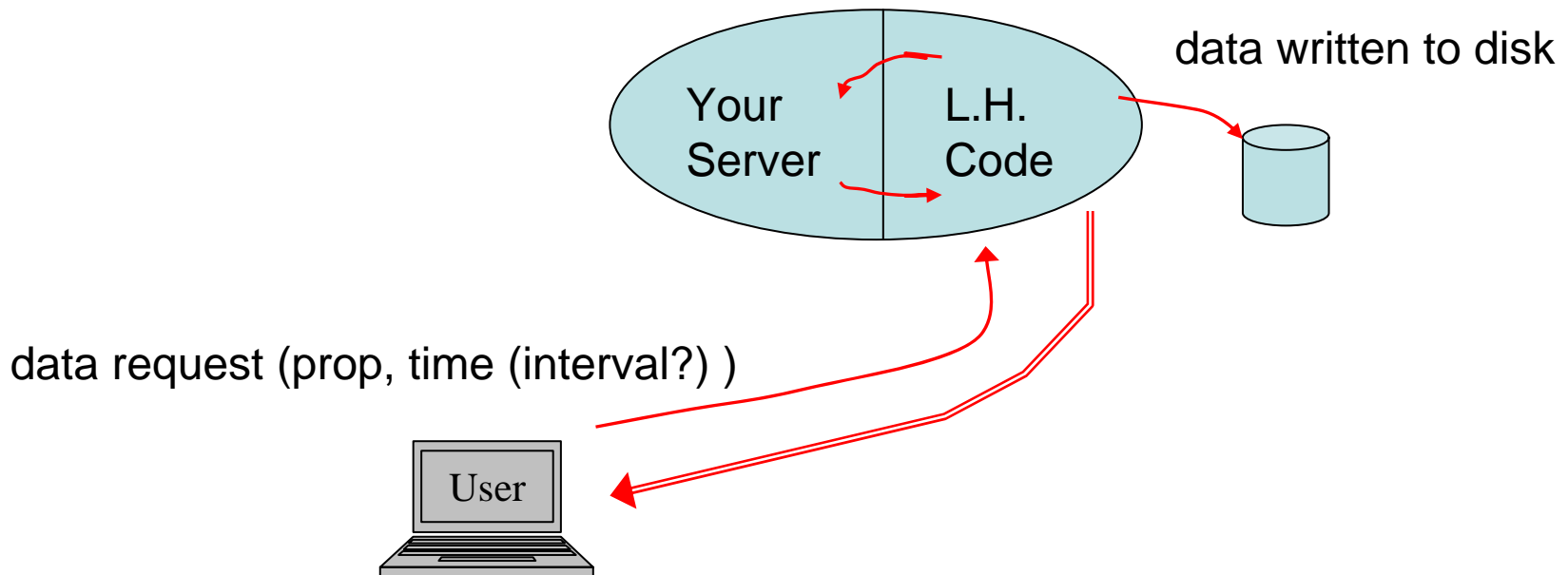
Archive 101: Central Archiving

- Add Your Data to the Central Archiver
 - define nicely structured properties (browsing!)
 - add properties to Archive Data Base
 - restart archive server



Archive 102: Local Histories

- Add to Your Server's Local History
 - Add your (nicely structured) properties to your Server's LH Data Base (e.g. history.csv)
 - restart your server

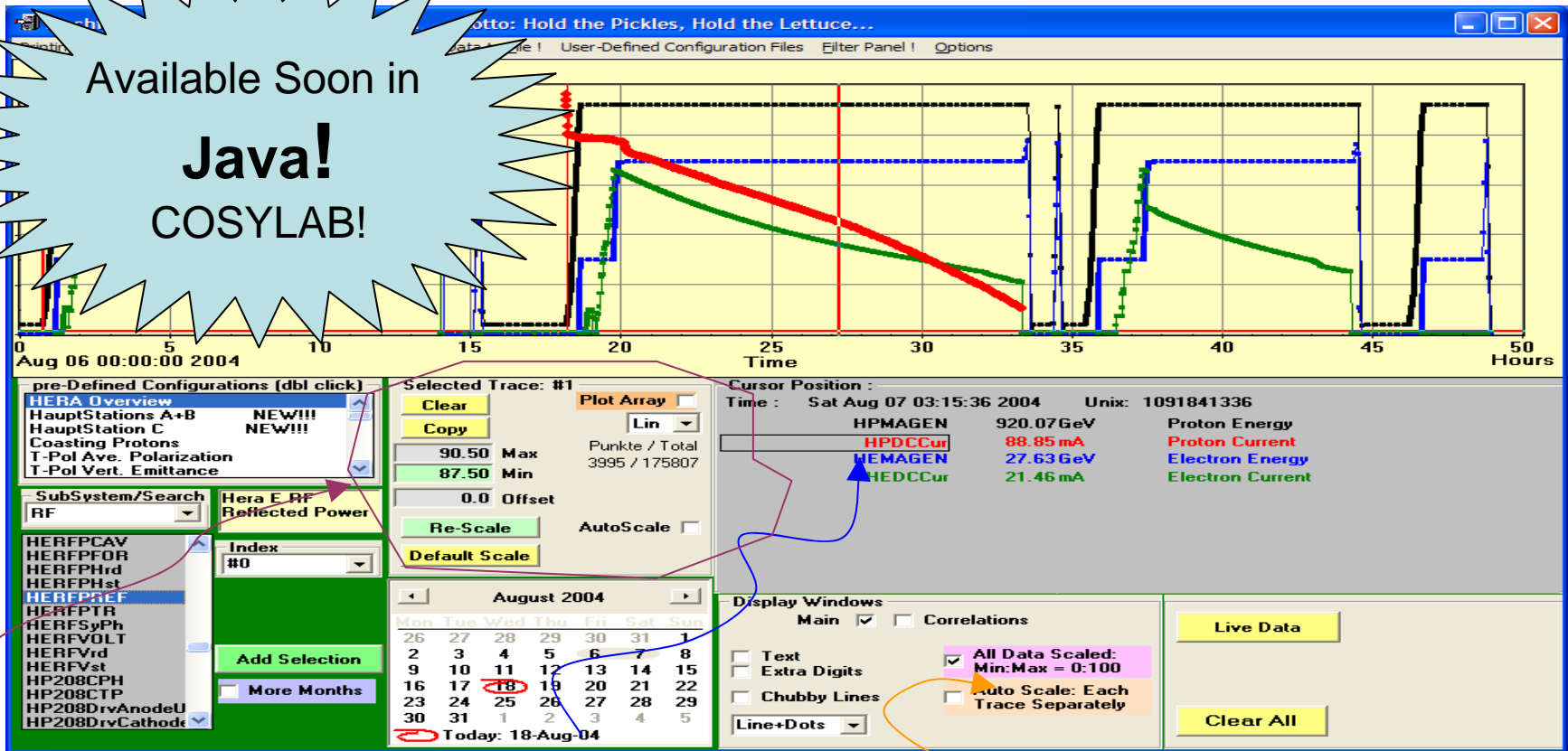


Displaying Archive/History Data

- Need RICH clients to collect and display data
- Standard API to get data out of Archiver (also Event Archives!), Local Histories
 - Specify Property
 - Time Interval (or a specific time)
- Standard GUIs (“Archive Reader”, “Multi-Channel-Array”, ...
- Lots of examples of specific/special apps
- A new project: To illustrate a client-server solution which combines Live-, Local History-, and Archive Data to answer FLEXIBLE questions, on-line

Part Two: Vertical Scaling of the data (or, How to Plot Apples with Bananas)

Available Soon in
Java!
COSYLAB!



Click on a property, and...

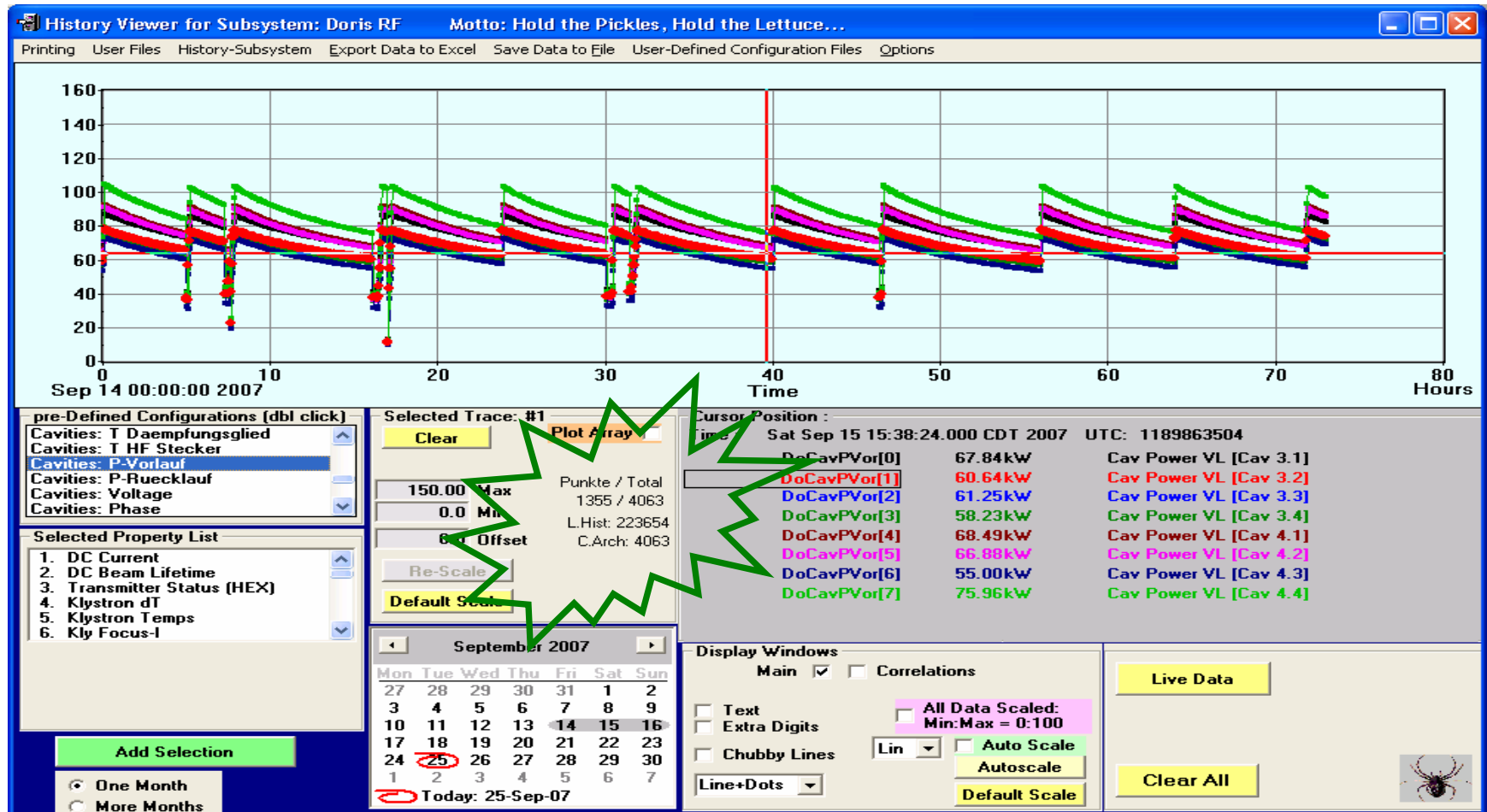
...see selected information: Default Scaling, Number of Points in archive, Number of points plotted

Use the checkbox to switch to "Relative Scaling".

Note that the is no longer a vertical scale on the plot.

Combining Local History + Central Archiver Data

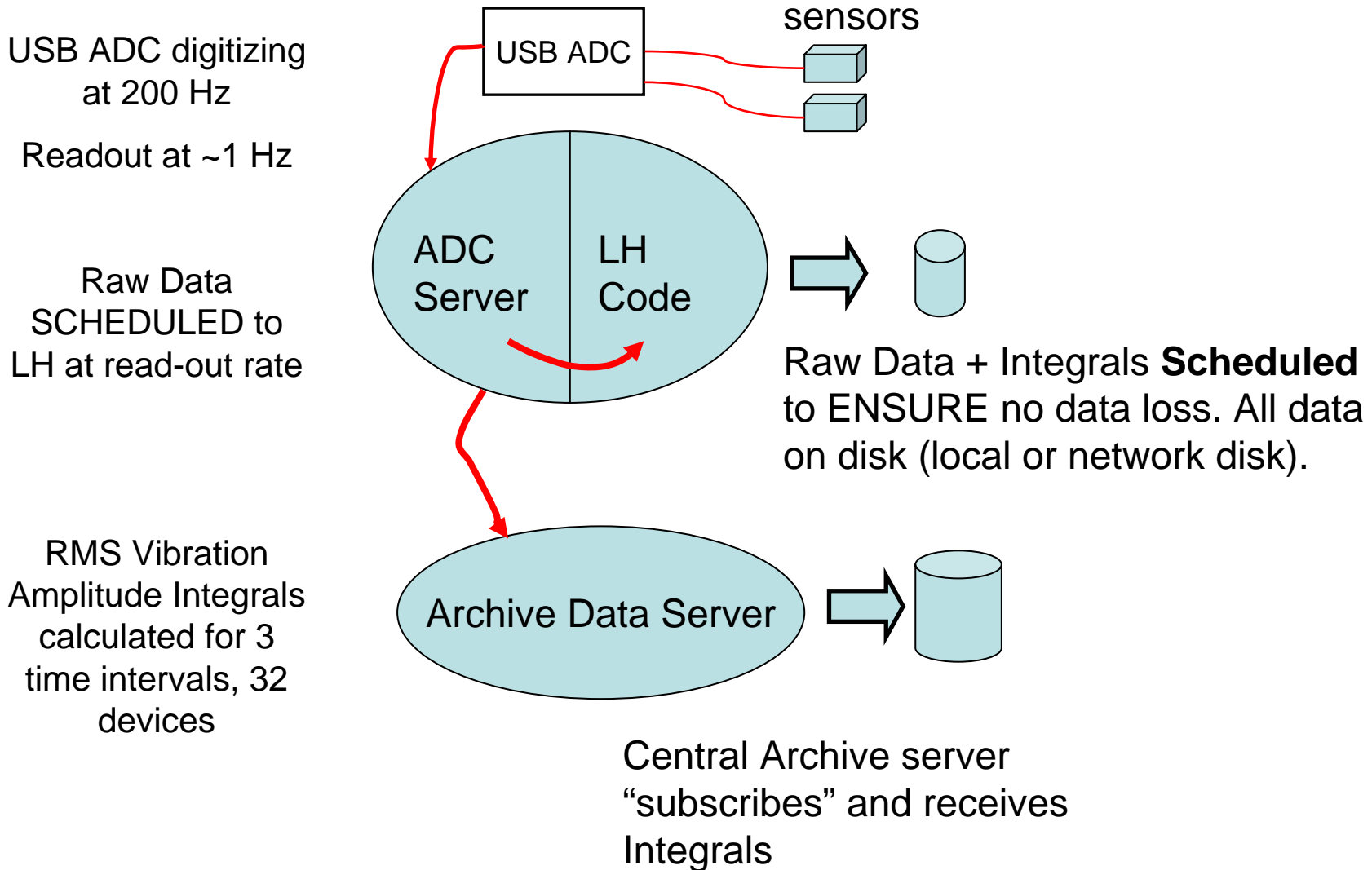
Client “checks” both data sets, decides best location to get data. Transparent to user!



Vibration Measurements

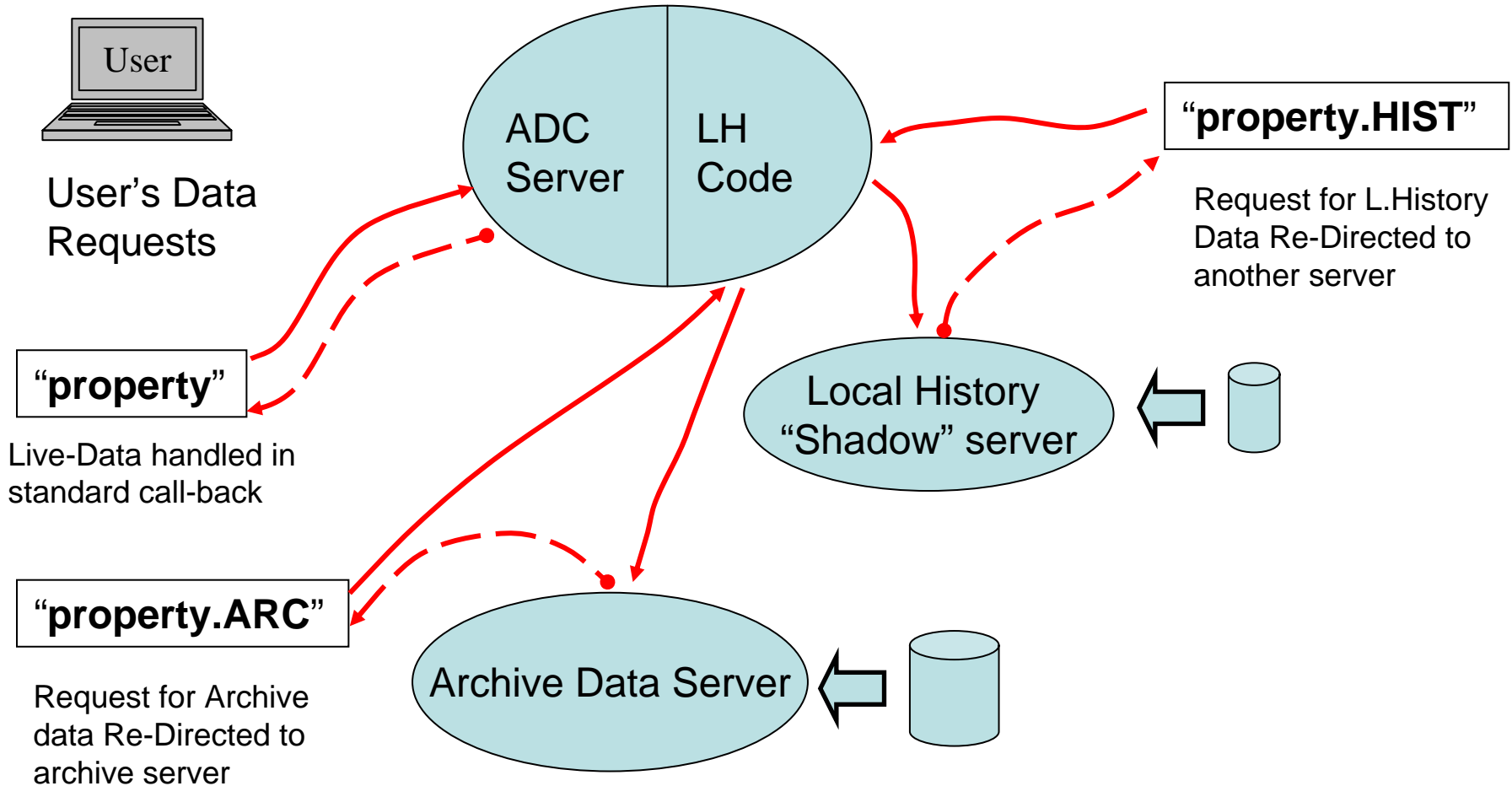
- FLASH / Cryo-Module / PETRA-3 Bau
- Measure ground vibration:
 - ~200 Hz sampling rate
 - Time Intervals for FFT Analysis
 - Accurate frequency measurements require longer time intervals
 - On-line observations need short intervals
 - FFT / Analysis of 1, 10, 16 sec blocks of data
 - Offline analysis of one-minute intervals
 - Record Continuously
 - For Trend Charts / Archiving: Central + Local Histories
 - Calculate RMS Vibration Amplitude (nm)
 - Integrated over complete Frequency interval ($1 < F < 100$ Hz)
 - Integrated in frequency bins
 - » $1 < f < 10$ Hz
 - » $10 < f < 30$ Hz
 - » $30 < f < 100$ Hz
 - For Local Histories (to analyze “off/on-line”)
 - Raw Data from ADCs: time interval can be decided later
 - 30 MB / day / Channel. PC disk has 230 GB for history data.

Vibration Data Collection + Archiving



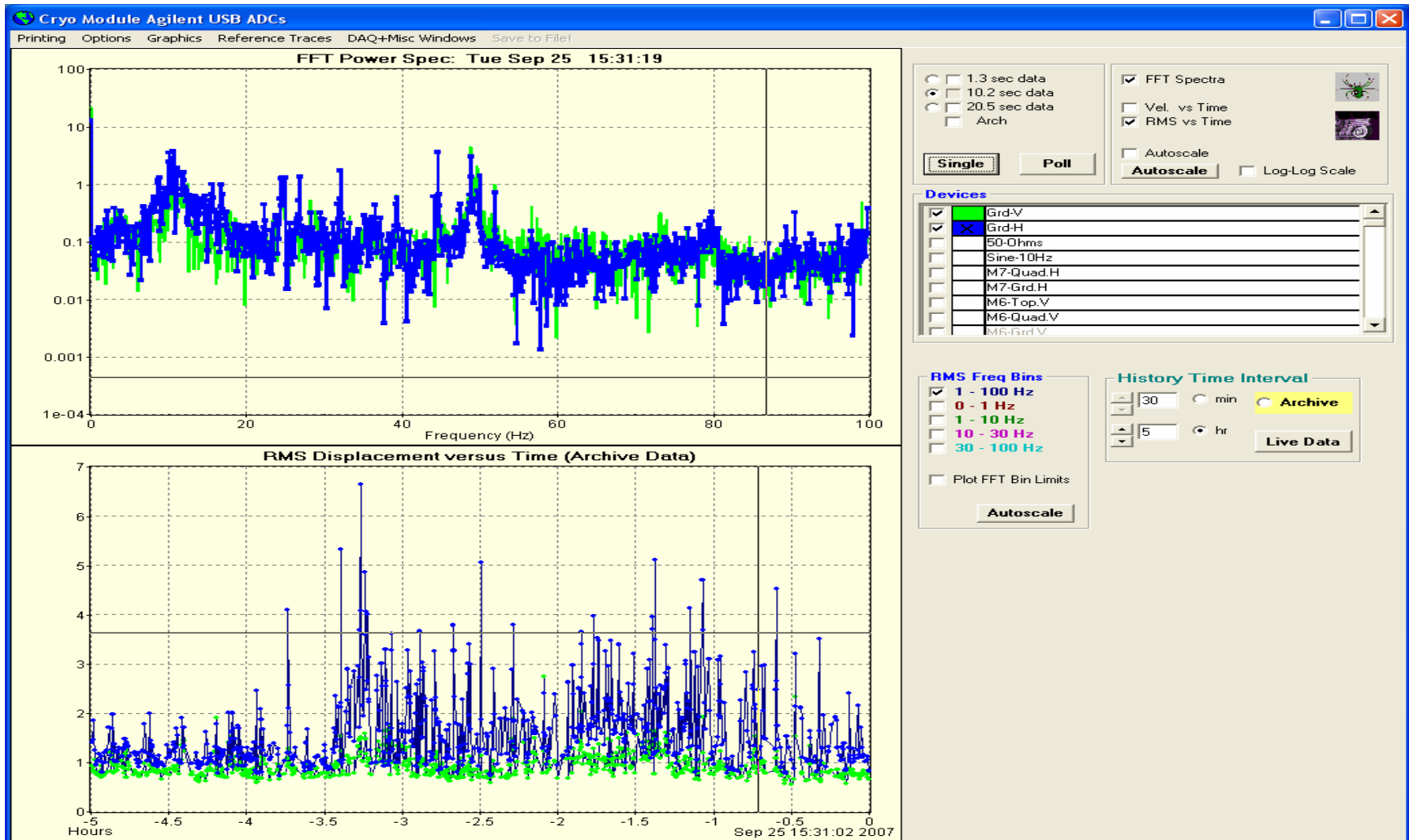
Vibration Data Retrieval

Redirection of data requests to correct server – Transparent to User!
Simple for client, doesn't disturb data taking of ADC Server



FFTs and Amplitude versus Time

Two test devices, over 5 hours



Amplitudes for one device in various Freq.-Bins

How to compare the FFTs at two times?

Select a REFERENCE (black curve)

The screenshot displays the Cryo Module Agilent USB ADCs software interface. The main window is titled "Cryo Module Agilent USB ADCs" and contains two primary plots and a control panel on the right.

Top Plot: FFT Power Spec: Tue Sep 25 08:23:18
This plot shows the Fast Fourier Transform (FFT) power spectrum. The y-axis represents power on a logarithmic scale from 1e-04 to 100. The x-axis represents Frequency (Hz) from 0 to 100. Two data series are overlaid: a blue curve and a black curve. The black curve is identified as the reference in the text above.

Bottom Plot: RMS Displacement versus Time (Archive Data)
This plot shows the Root Mean Square (RMS) displacement over time. The y-axis ranges from 0 to 9. The x-axis represents time in hours from 0 to 7. Multiple colored curves (green, purple, cyan) represent different frequency bins. A vertical dashed line is present at approximately 1.2 hours, and a vertical red line is at approximately 5.5 hours.

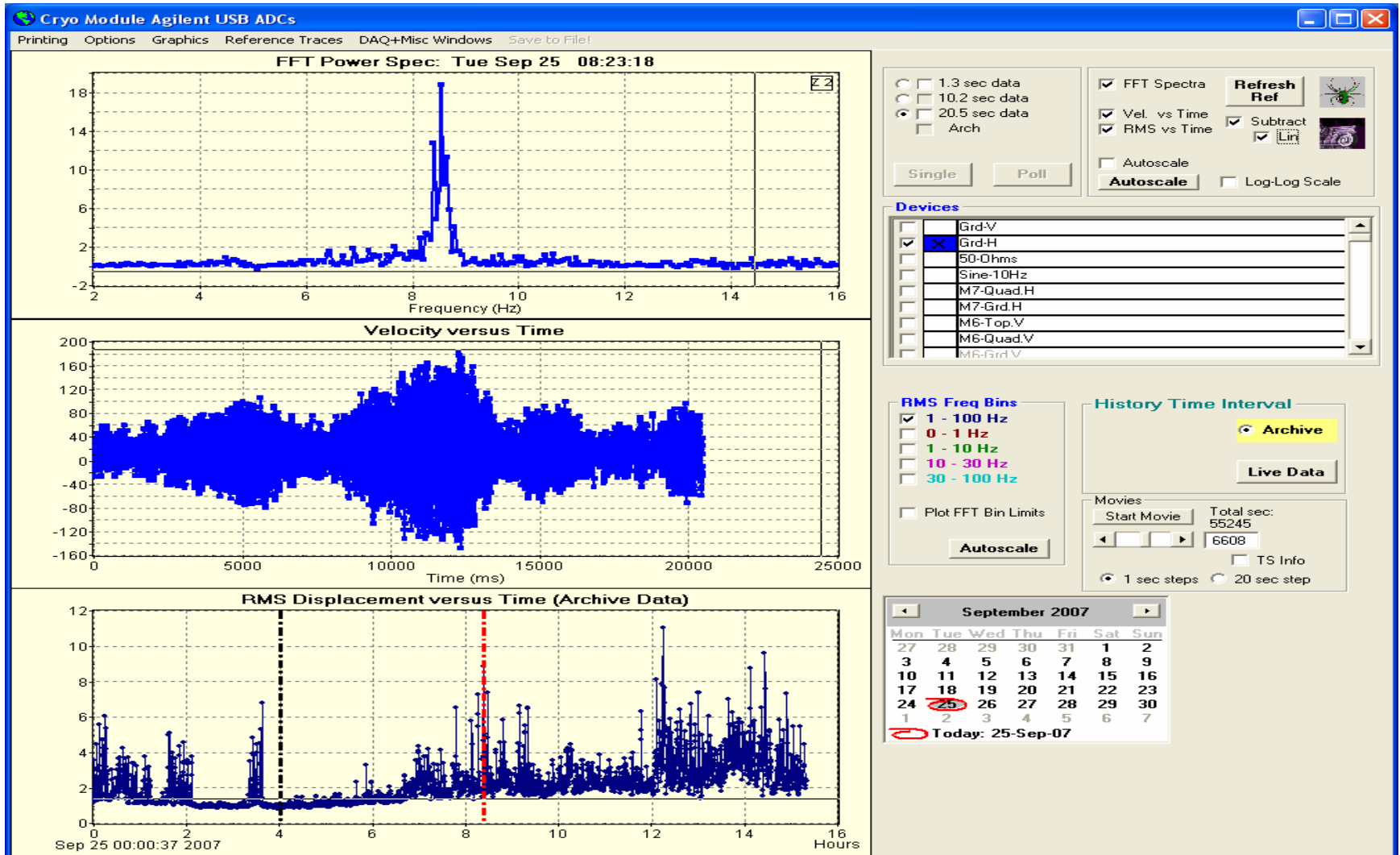
Control Panel (Right Side):

- Data Selection:** Radio buttons for "1.3 sec data", "10.2 sec data", "20.5 sec data", and "Arch".
- Display Options:** Checkboxes for "FFT Spectra", "Vel. vs Time", "RMS vs Time", "Autoscale", and "Log-Log Scale". A "Refresh Ref" button is also present.
- Devices List:** A list of devices with checkboxes. "Grd-H" is selected.
- RMS Freq Bins:** Checkboxes for "1 - 100 Hz", "0 - 1 Hz", "1 - 10 Hz", "10 - 30 Hz", and "30 - 100 Hz".
- History Time Interval:** Radio buttons for "Archive" and "Live Data".
- Movies:** "Start Movie" button, "Total sec: 25200", and "6608".
- Calendar:** A calendar for September 2007 with the 25th highlighted in red. Below it, "Today: 25-Sep-07" is displayed.

Simple Analysis: Subtract Data- Ref

Display on linear scale

Raw Data are also valuable to have for special situations/analysis!
Careful consideration of server properties to store in LH and in central archive
allow large flexibility for client applications for ON-LINE analysis!



Alarm System Services

- Alarm Service Food Chain:
 - **Customers:**
 - BKR: Viewing Live Status
 - Grouping of alarms/servers
 - Simple, Intuitive GUI, Self-Explaining
 - System-Responsible Persons
 - Archiving: debugging when and why alarms registered
 - Subsystem Availability (certain devices causing trouble?)
 - Management: Availability
 - Goal is for >99.% Total Availability – which subsystems were down when?
 - RICH Clients needed to collect / present data
 - **Users:** (programmers)
 - Do as little work as possible: PLUG and PLAY
 - Simple configuration to CONNECT to system
 - DEFINE, SET and CLEAR Alarms
 - **One Provider:**
 - Collect (+ fulfill) the wishes from Users/Customers
 - Alarm-Data Structure to transport collect all relevant info
 - Local and Central Alarm Servers
 - Alarm Archiving

Alarms Services

- Setting + Clearing Alarms: standard API
- Displaying in a USEFUL way for the control room
- Archiving for offline analysis/de-bugging
- Availability Statistics – Counting of DOWN-TIME (for a machine, a subsystem)

Alarm Data Flow

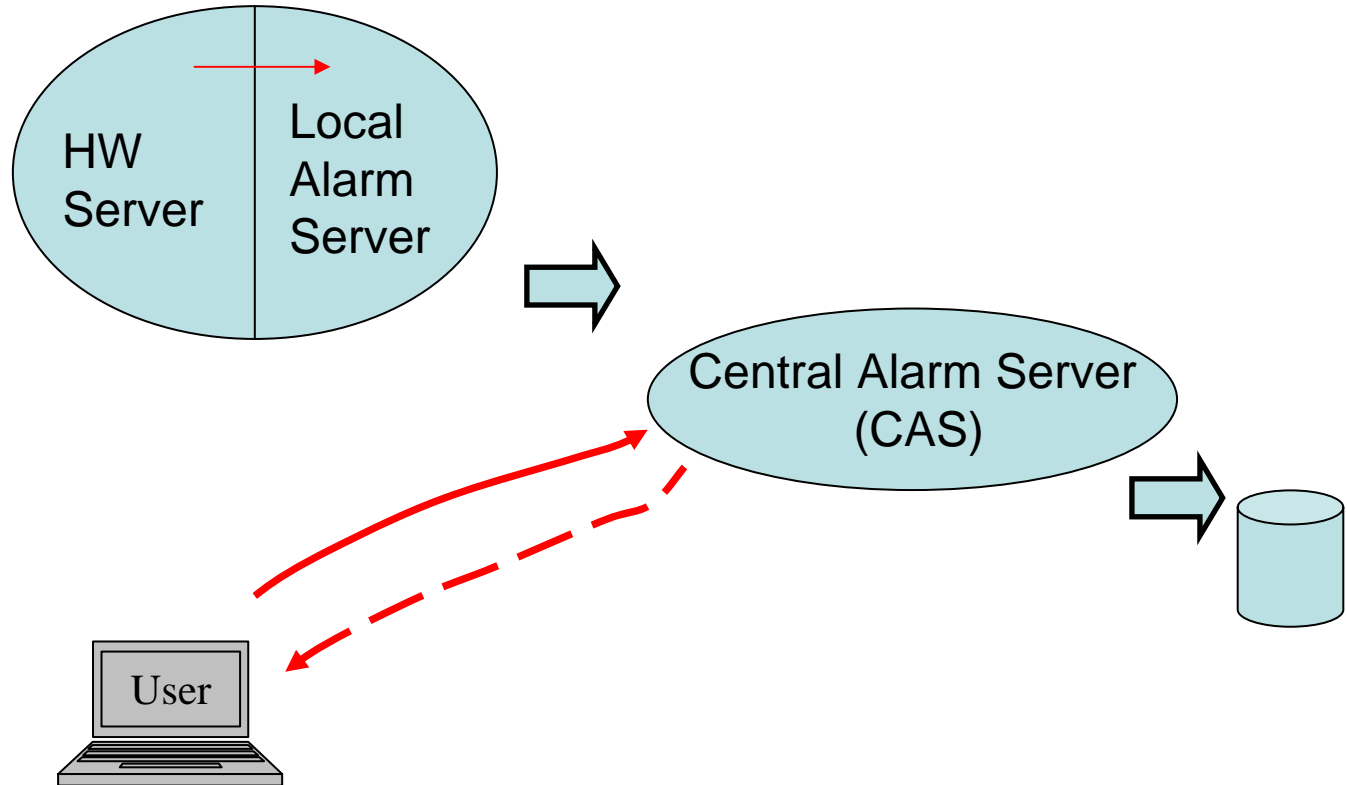
HW Server uses API to set and clear alarms in Local Alarm Server

Alarms are defined to belong to Alarm Subsystems

Local Alarm Server is connected to CAS

Clients communicate with CAS, which archives does archiving.

Here client can collect alarms "grouped" into Alarm Subsystems.



Compact View of Alarm Subgroups

Based on Long-Used Display in BKR (M.Werner)

(2 Severe Alarms in HF-Sub-group. Magnet Alarm has been cleared).

DESY2 Alarm Viewer

Printing Display Compact ! Acknowledge Alarms ! Ack Options View Options Machine Extra Forms

Info (Sev < 7)	Warnings (7 <= Sev < 12)	Fatal Alarms (Sev >= 12)
0	0	2

Tue Sep 25 14:35:03 FATAL Alarms: Severity >= 12

Alarm Display
 Live Archive
 Show Alarm List

Alarm Subsystem	Alarms	Alarm Subsystem	Alarms	Alarm Subsystem	Alarms
Magnet	1	SeKi		System	
HCorr		Peak-Strip		Hardware	
VCorr		Zyklus Gen		Radio	
HF	2	Trigger Mod		Tim. Mon	
AM-Gen		Timing		Bunche	
Vac		Schirme		I-Hist	
Per.Interlock				Profile	

Extend View for More Information

Based on another long used BKR program (“Fehler-Schirm”)

Alarm Start + Stop Times, Alarm-Data, and more...

DESY2 Alarm Viewer

Printing Display Compact ! Acknowledge Alarms ! Ack Options View Options Machine Extra Forms

Info (Sev < 7)	Warnings (7 <= Sev < 12)	Fatal Alarms (Sev >= 12)
0	0	2

Tue Sep 25 14:34:07 FATAL Alarms: Severity >= 12

Alarm Display: Live Archive

Show Alarm List

Alarm Subsystem	Alarms	Alarm Subsystem	Alarms	Alarm Subsystem	Alarms
Magnet	1	SeKi		System	
HCorr		Peak-Strip		Hardware	
VCorr		Zyklus Gen		Radio	
HF	2	Trigger Mod		Tim. Mon	
AM-Gen		Timing		Bunche	
Vac		Schirme		I-Hist	
Per.Interlock				Profile	

Alarm list for all alarm subsystems : 3 alarms.

SubSystem	Loc.	Error	Severity	Alarm Time	Duration / Info
HF	DEVICE 0	Cavitystoerung	15	Sep 25 14:31:00	alarm is STILL ACTIVE!
HF	DEVICE 0	Gleichrichterspannung	15	Sep 25 14:31:00	alarm is STILL ACTIVE!
Magnet	DEVICE 19	Magnet-D2 Regler gesperrt	15	Sep 25 14:28:00	17 sec

Archived Alarms: Radiation Alarm 24.Sep, DESY-2

Select a day, select a sub-system, see archived alarms + information

DESY2 Alarm Viewer: Archived Data

Printing Display Compact! View Options Machine Alarm List to File Extra Forms

Info (Sev < 7) Warnings (7 <= Sev < 12) Fatal Alarms (Sev >= 12)

- Not Archived 1015 142

Alarm Display: Live Archive

Archived Alarms Severity >= 12 from Mon Sep 24 to Tue Sep 25

System	Alarms	System	Alarms	System	Alarms
Magnet	56	SeKi	31	System	4
HCorr		Peak-Strip		Hardware	4
VCorr	35	Zyklus Gen		Radio	
HF	11	Trigger Mod	3	Tim. Mon	
AM-Gen		Timing		Bunche	
Vac		Schirme		I-Hist	
Per.Interlock	2			Profile	

Severity: 12
The number of alarms with Severity >= 12: 146

September 2007

Mon	Tue	Wed	Thu	Fri	Sat	Sun
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
1	2	3	4	5	6	7

Today: 25-Sep-07

Alarm View

Show All Alarm-Events

Extra Info in Grid

Collect arch data ONLY for

Subsystem: SUB

Alm-Subsystem: Per.Interlock

Show Terminated Alarms

Archived Alarm list for Per.Interlock : 2 alarms.

Location/Device	Error	Severity	Alarm Time	Duration / Info
Platz-15N	Elektr Stroer	15	Sep 24 13:13:40	41 sec
Platz-24	Rad Alarm	15	Sep 24 12:49:10	Event-Alarm

Alarm Description

Elektr. Stoerung.
Dev. info: MessPlatz
Device : Platz-15N
Data info: Data-Text
Data: 2 0 0

The alarm is Terminated.

Start: Sep 24 13:13:40
Stop: Stop: Sep 24 13:14:21
Duration: 41 sec

Duration: 41 sec

Alarm from server:
/DESY2/D3Strahlung

Further Information:
not supplied

A Radiation-Alarm is an "Event" Alarm (no duration)

More Alarm Info: Data

Integration of Alarm Info into other Tools

- Use an Alarm to trigger an Event-Archive
- Count the time of non-availability
 - of single subsystems
 - the machine (all critical subsystems)

An important Ingredient:

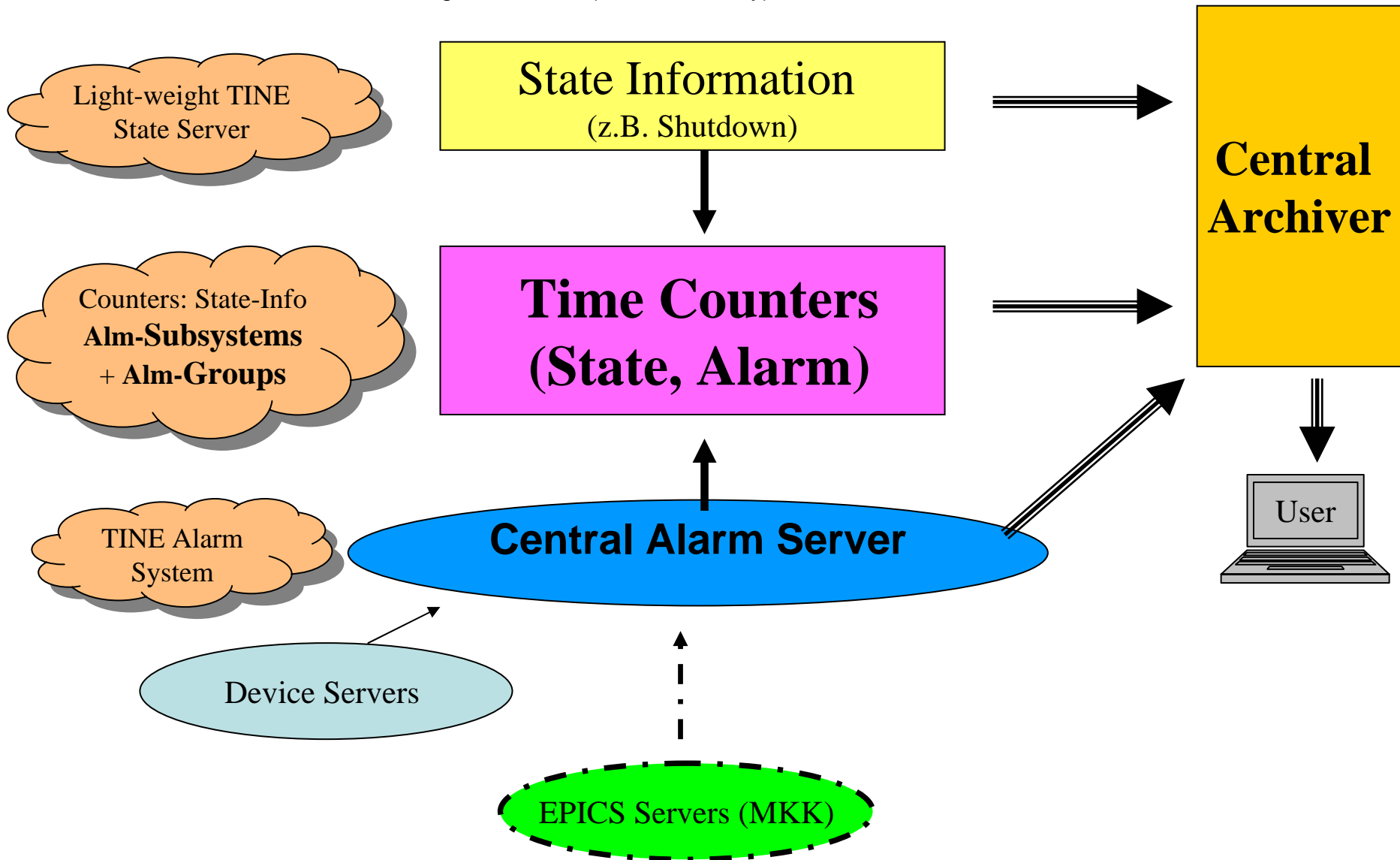
Machine STATE Information

(Injection, Stand-By, Luminosity, Synchrotron-Radiation-Run,.....)

TINE State-, Globals-, State-Counter Servers...

Availability: Erbsen-Flow Diagram

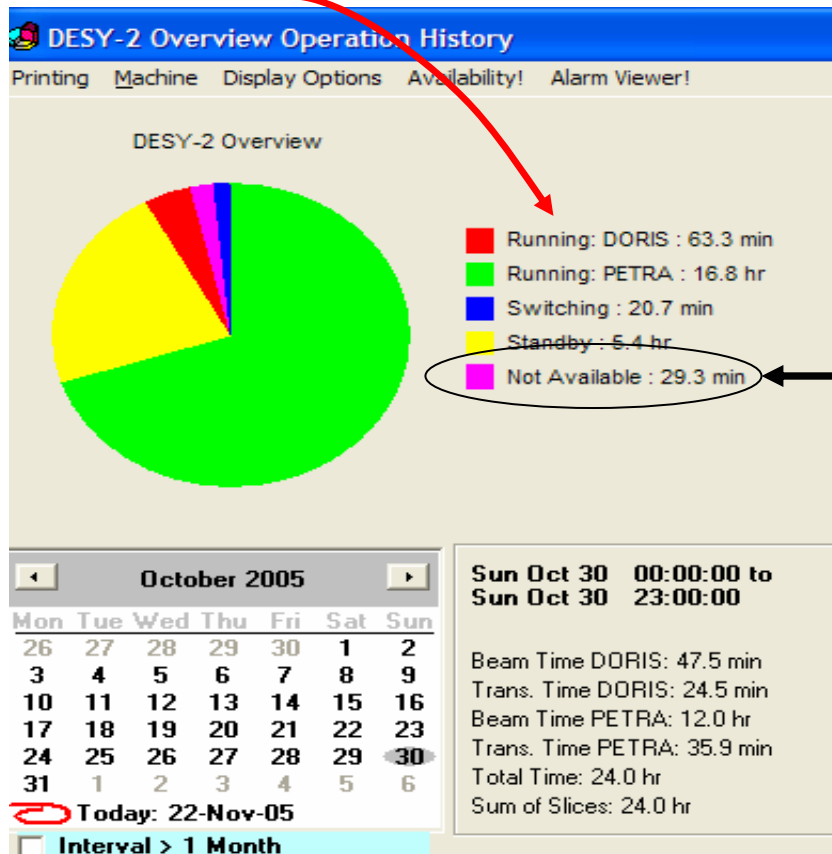
Correlating Down-Time (Non-Availability) with Machine State Information



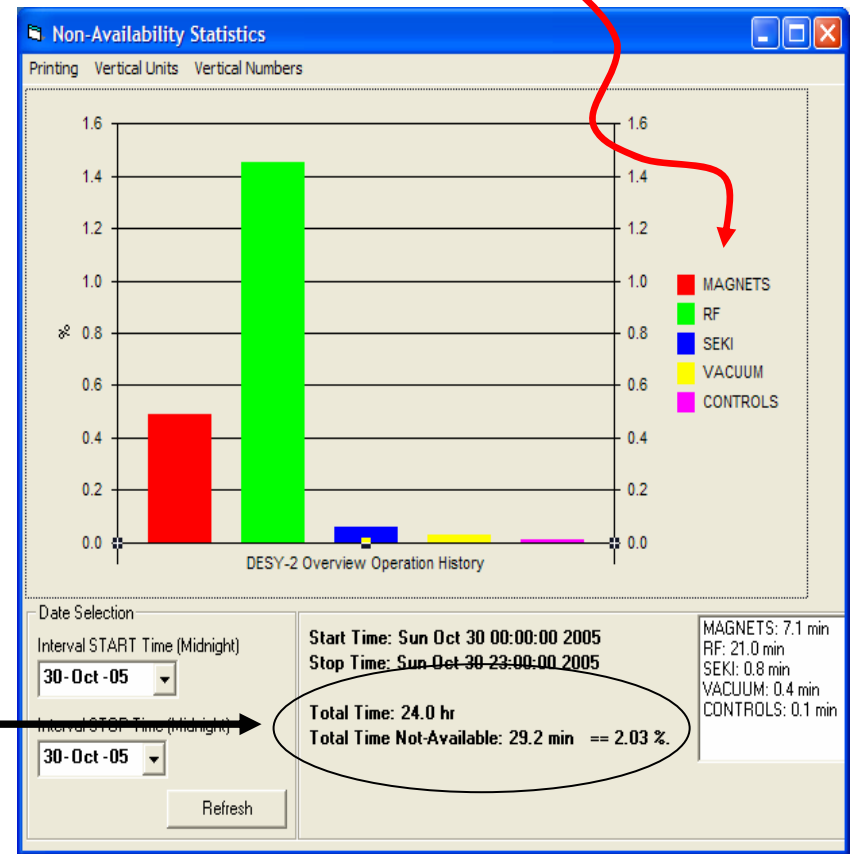
Displays of Archive Data for.....

A Quick View of the Availability!

Simple overview of state information.

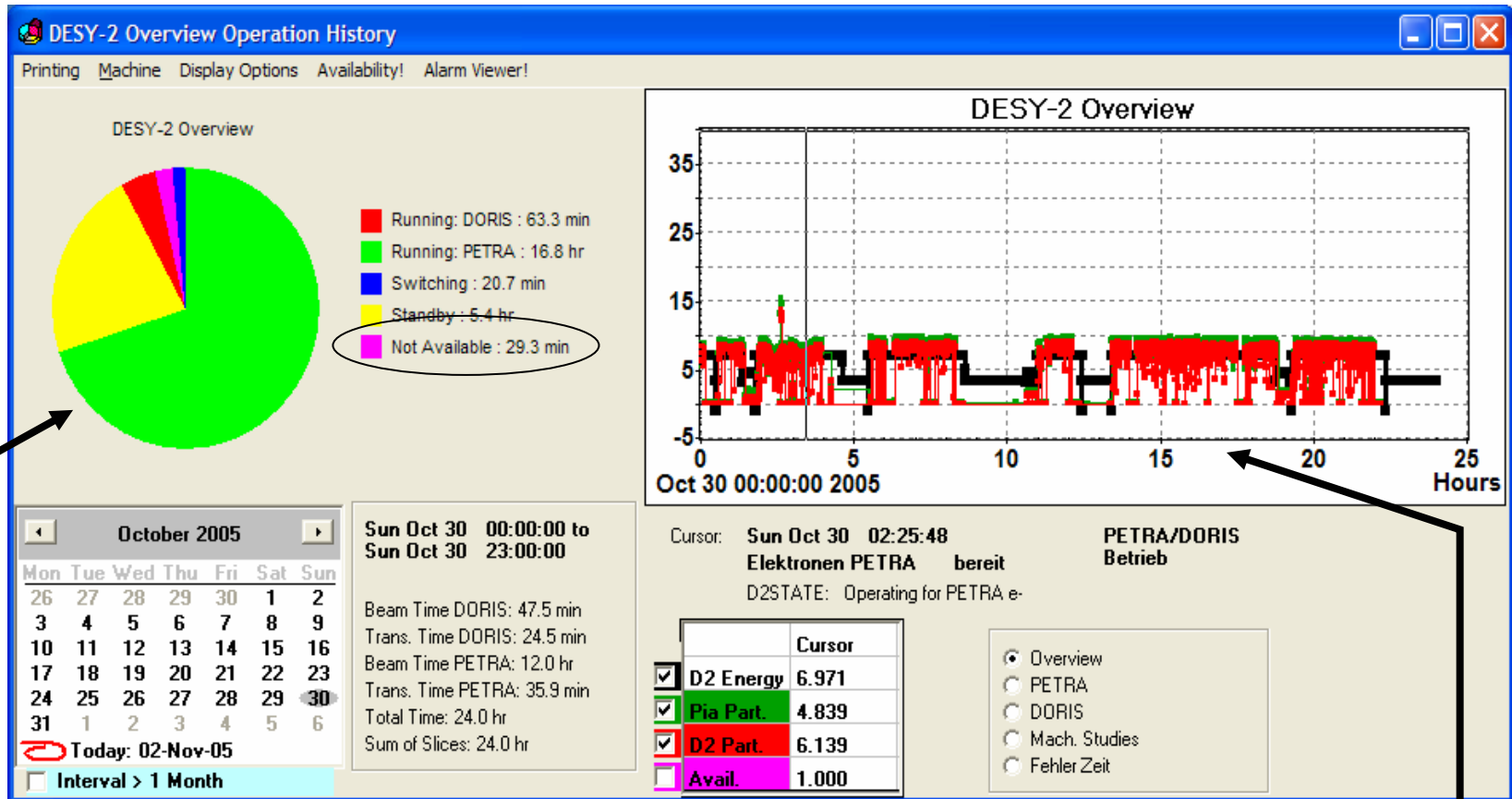


Component subgroups which were unavailable during the selected time interval.



One Step Back, to better study the reasons for the non-availability....

Operations Overview: a Typical Day at DESY-2

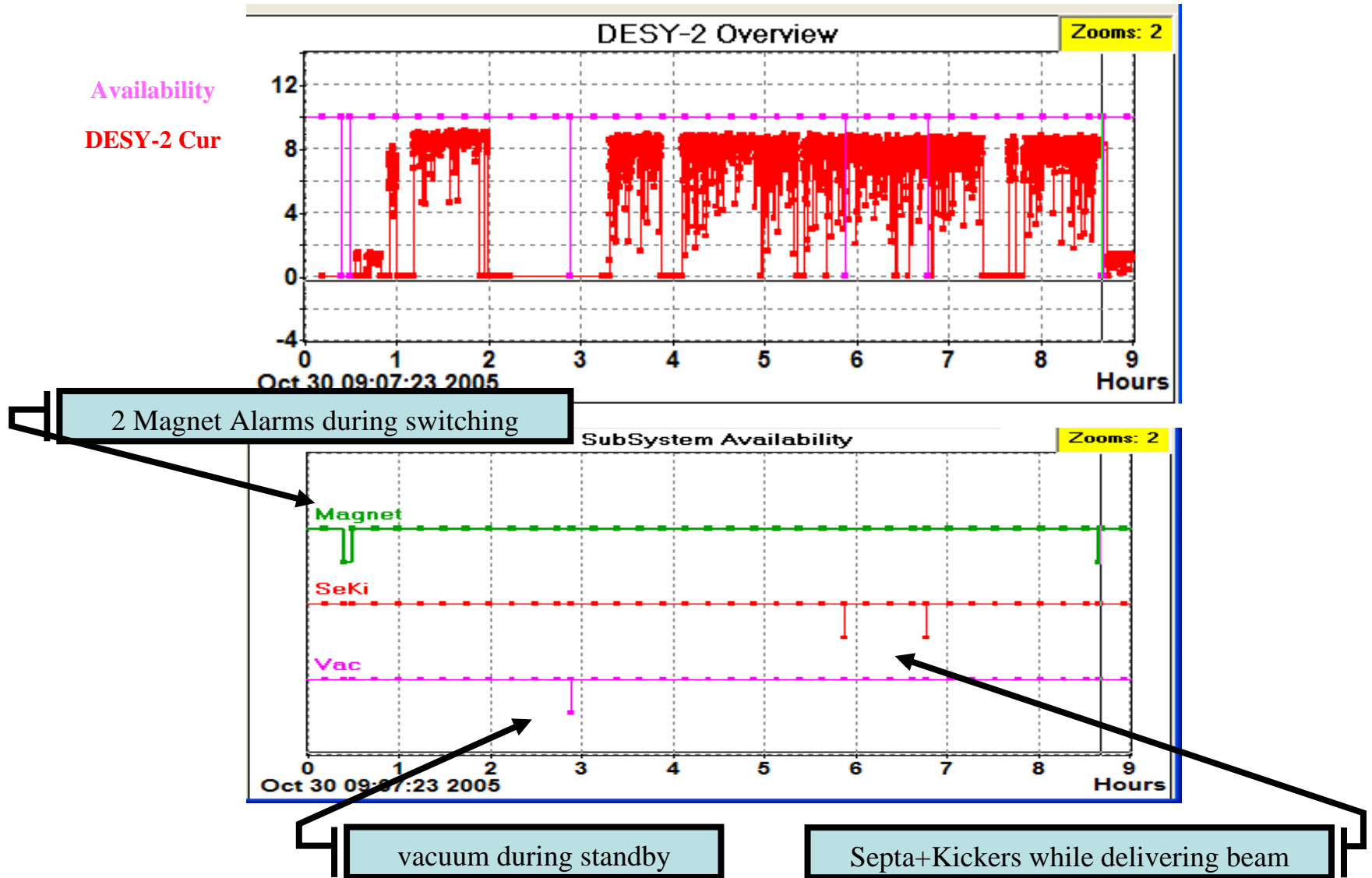


State Information (running mode) during 24 hours

Overview of beam current and energy during 24 hours

A Closer Look: Machine Operation with Fatal Errors?

A Zoom into the Non-Availability



The Heart of Availability-Counting: the Central Alarm Server

Alarm Overview (Archive Data)

DESY2 Alarm Viewer
Printing Display_Compact! View Options Machine Alarm List to File Extra Forms

Warnings [Severity < 7] Alarms [7<=Sev<=12] Fatal Alarms [Severity > 12]
--- Not Archived --- 220 7

Alarm Display
 Live Archive

Archived Alarms at or above severity 7 from Sun Oct 30 to Sun Oct 30 2005

Alarm Systems

System	Alarms	System	Alarms	System	Alarms
Test	0	Trigger Mod	0	HF	1
Magnet	2	SeKi	3	Bunche	0
HCCorr	0	VCCorr	0	Vac	1
Peak-Strip	0	AM-Gen	0	Timing	0
Schirme	0	Profile	0	Tim. Mon	0
Radio	0	Zyklus Gen	0	I-Hist	0
System	1	Hardware	0		

Severity
The number of alarms with Severity >= 12
8

October 2005
Mon Tue Wed Thu Fri Sat Sun
26 27 28 29 30 1 2
3 4 5 6 7 8 9
10 11 12 13 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28 29 30
31 1 2 3 4 5 6
Today: 02-Nov-05

Alarm View
 Show All Alarm-Events
 Extra Info in Grid Archive Data for Selected Subsystem

Archived Alarm list for all alarm subsystems : 8 alarms.

SubSystem	Loc.	Error	Severity	Alarm Time	Duration
Magnet	IEAlarm	Magnet-D2	15	Oct 30 17:47:07	93 sec
SeKi	IEAlarm	SeKi-D2	15	Oct 30 15:53:54	16 sec
SeKi	IEAlarm	SeKi-D2	15	Oct 30 14:59:37	17 sec
Vac	IEAlarm	VAC-D2	15	Oct 30 12:00:13	22 sec
Magnet	IEAlarm	Magnet-D2	15	Oct 30 09:30:55	5.5 min
SeKi	IEAlarm	SeKi-D2	15	Oct 30 07:33:02	15 sec
HF	D2.EHF	DESY2	15	Oct 30 03:38:01	Start
System	FEC	Not Responding	12	Oct 30 00:01:21	Start

Alarm Description
Magnet-D2 Regler gesperrt
Dev. info: [Magnet-D2]
Device : DEVICE 19

The alarm is Terminated.
Stop: Oct 30 17:48:40
Start: Oct 30 17:47:07
Duration: 93 sec

Alarm from server: IEAlarm

Alarms classified by severity

List of Alarms during Selected Time Interval

Alarms for each Alarm-Server Subsystem

Info for Selected Alarm

A+A Services Status

- Good Foundations for Services
 - Tools started at HERA (Big!) and have been in use for other machines for years now. Good basis for PETRA-3.
- Lots of established tools for archiving
 - Simple plug-and-play configuration
 - Standard powerful GUIs for viewing data
 - Many Rich-Clients written for special applications to integrate smoothly live+history+archive data
- Lots of established tools for Alarms
 - Simple APIs for servers to define, set, clear alarms
 - GUIs for BKR
 - Archiving for de-bugging
 - Statistics, State-Servers
 - Foundations for tools to record and study availability
- More

A+A Services: Plans

- Release 4: many (small?) improvements
 - After years of experience, time for next version of system-structures (e.g. Alarm-Data Structures)
 - Time Synchronization of servers: DESY-2 Injecton Cycle ~6 Hz.
- **Java** (Machine-independent Standard GUIs! First test versions ready!)
- GUIs: more features!
 - Browsing 2-D channel arrays! (e.g. Vibr: select a Device and a Freq. Interval)
 - Re-scaling + Shifting data like on an oscilloscope! (KMuedler, MIN)
- After 15 years of archiving, still room for bigger-faster-stronger!!!!

Developments in these areas driven by **USERS!** + **CUSTOMERS!**
Like the old Burger Ad, Special Orders are welcome!

