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!

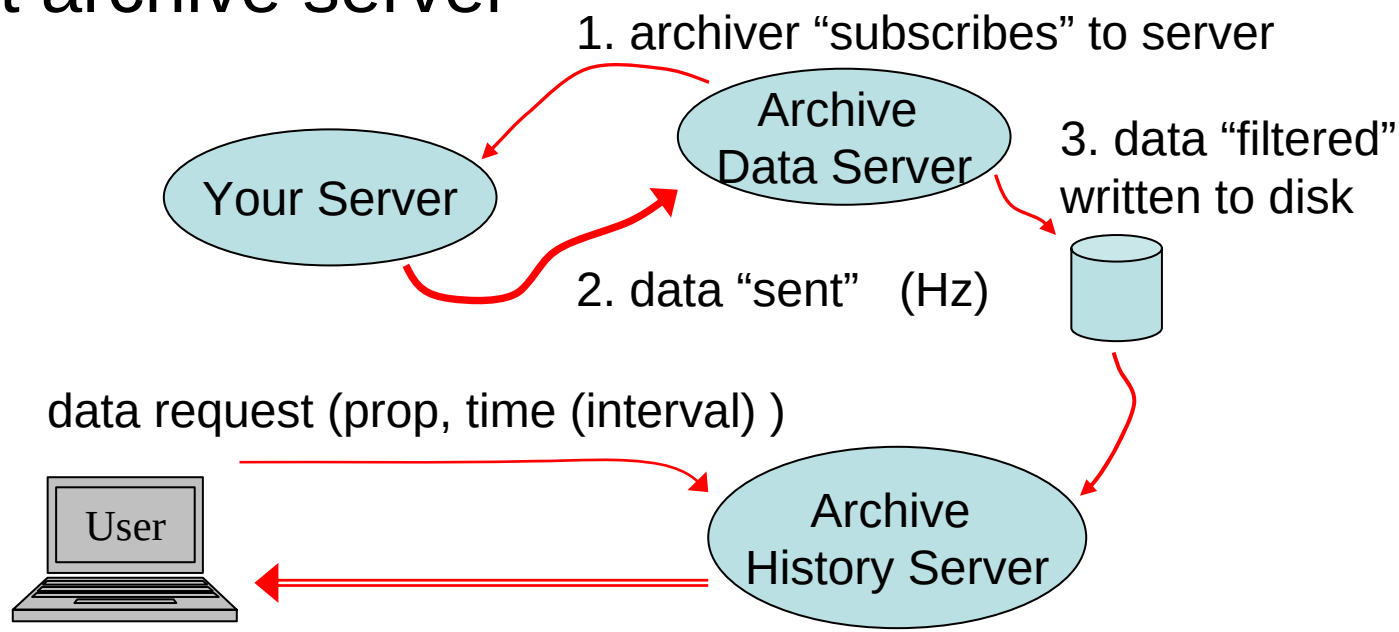
    Users: All Server Programmers
    - Standard APIs to integrate themselves into the system, doing as little work as possible
    - Need “Common Services”
  - **The Provider:** The Service-Programmers
    - Collect (+ fulfill) the wishes from Users/Customers
    - Standard set of GUIs for customers
    - 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

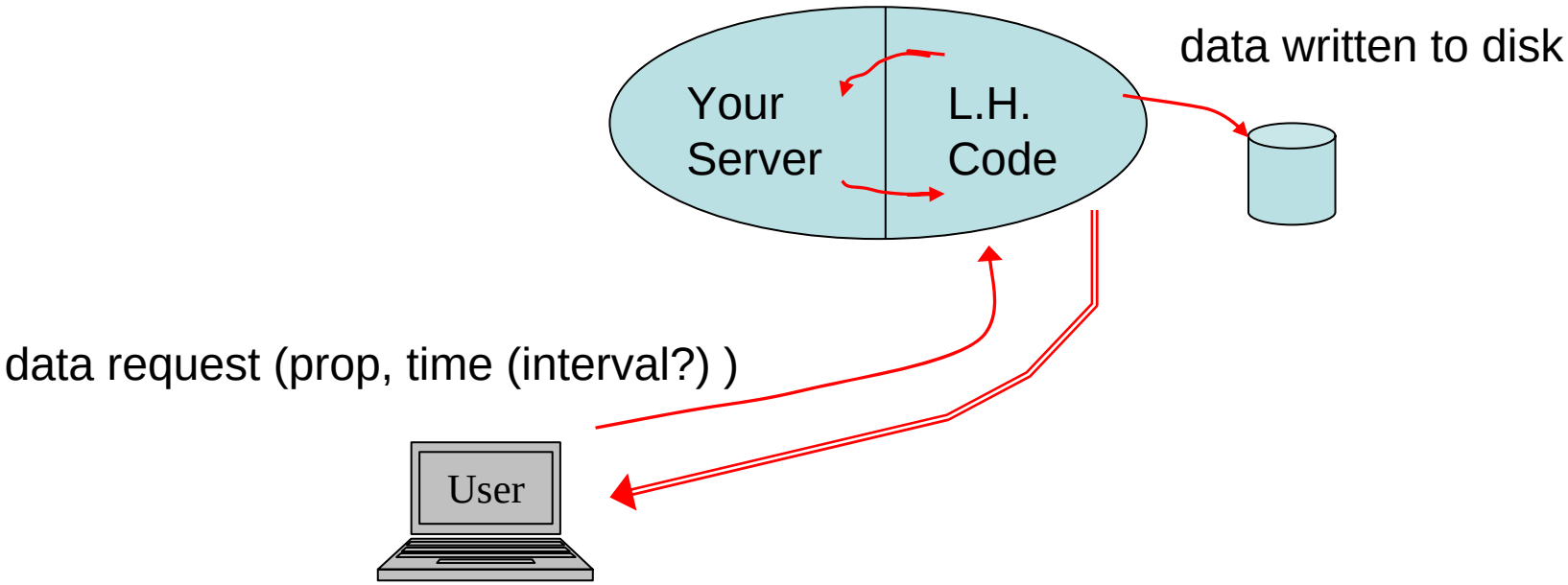
Archive 101: Central Archiving

- 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”,…

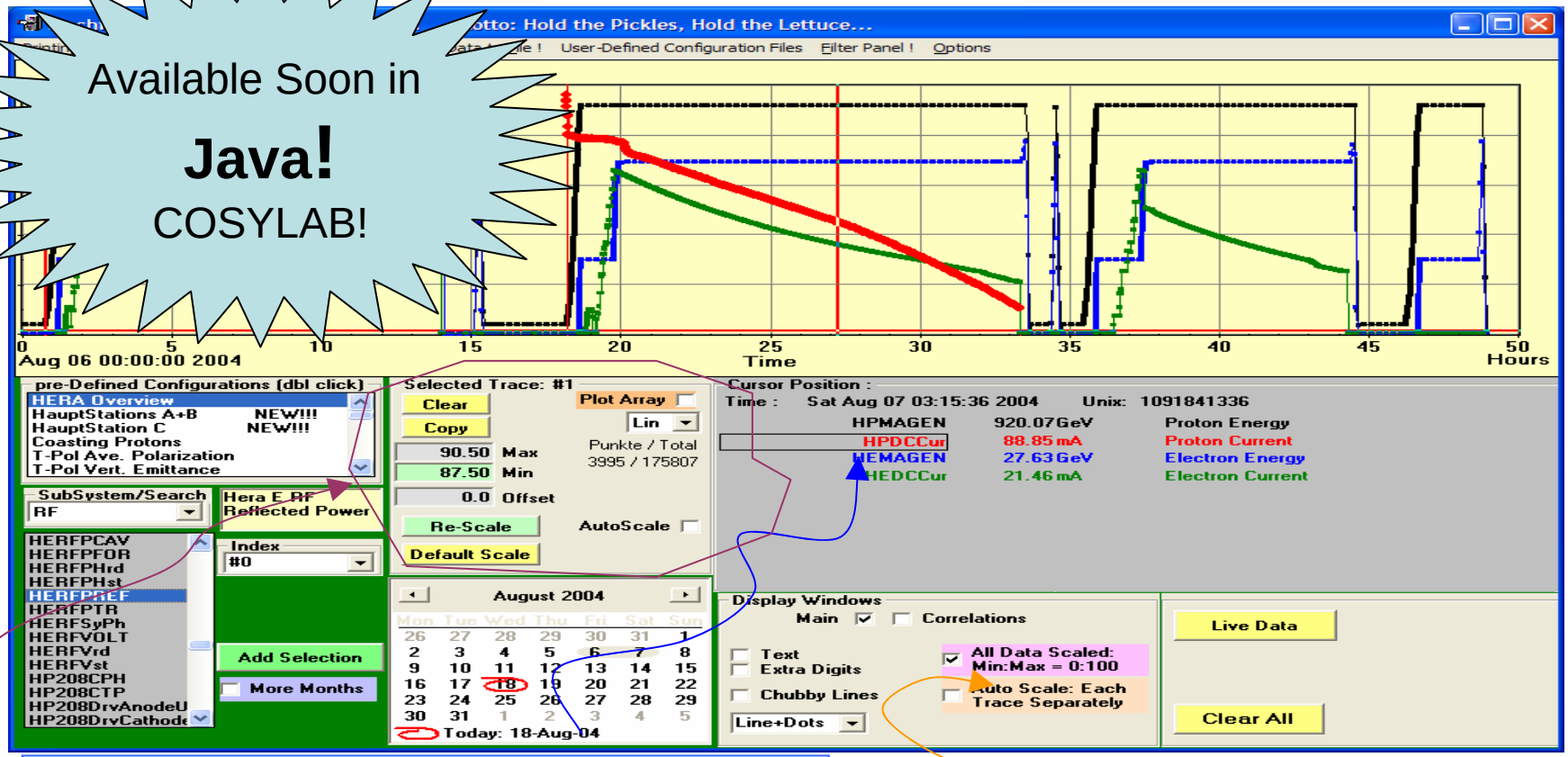
- Lots of examples of specific/special apps
- A new project: To illustrate a client-server solution which combines Live-, Local History-, and Archive Data to answer FLEXIBLE questions, on-line

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

Available Soon in

Java!

COSYLAB!



Click on a property, and…

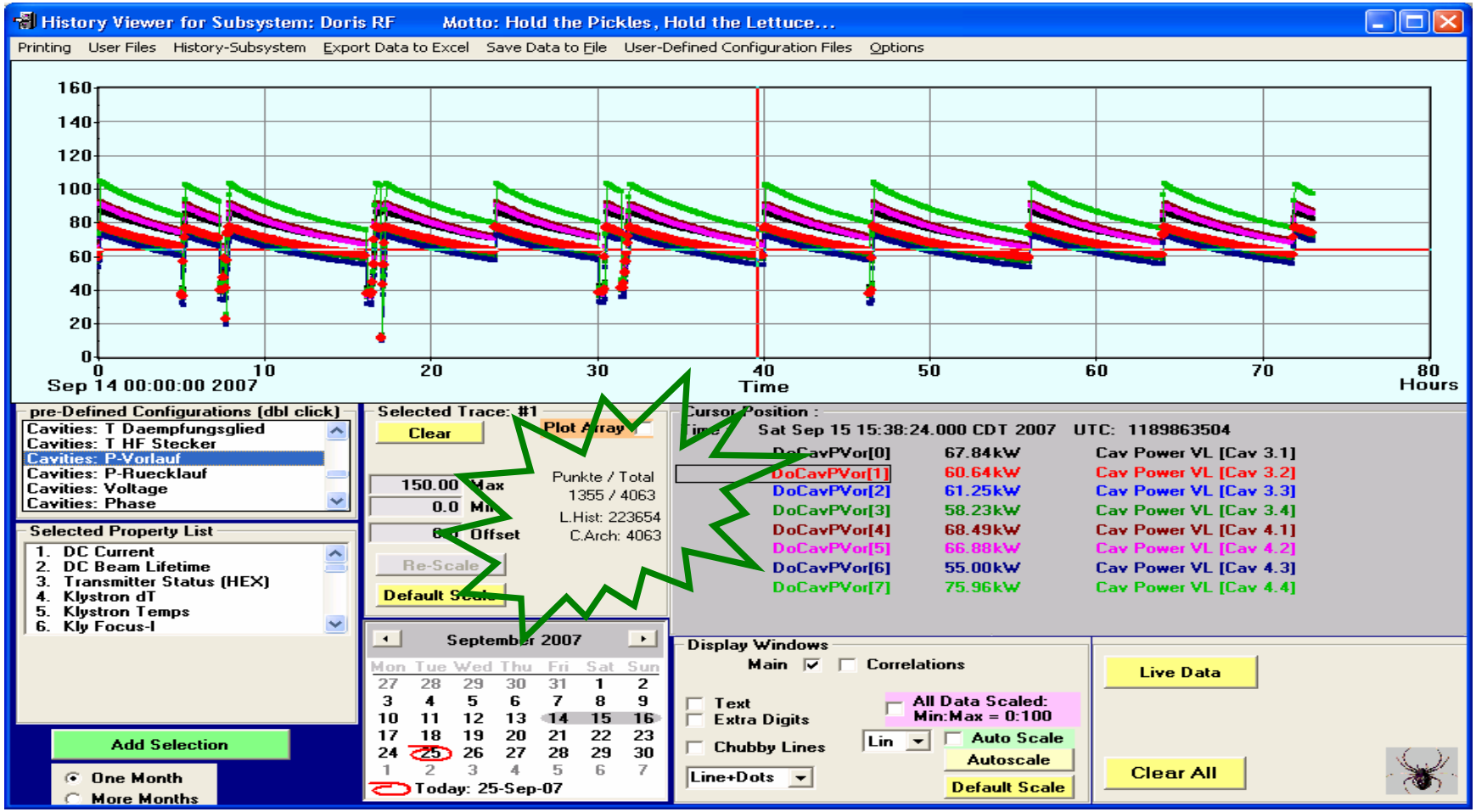
…see selected information: Default Scaling, Number of Points in archive, Number of points plotted

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.

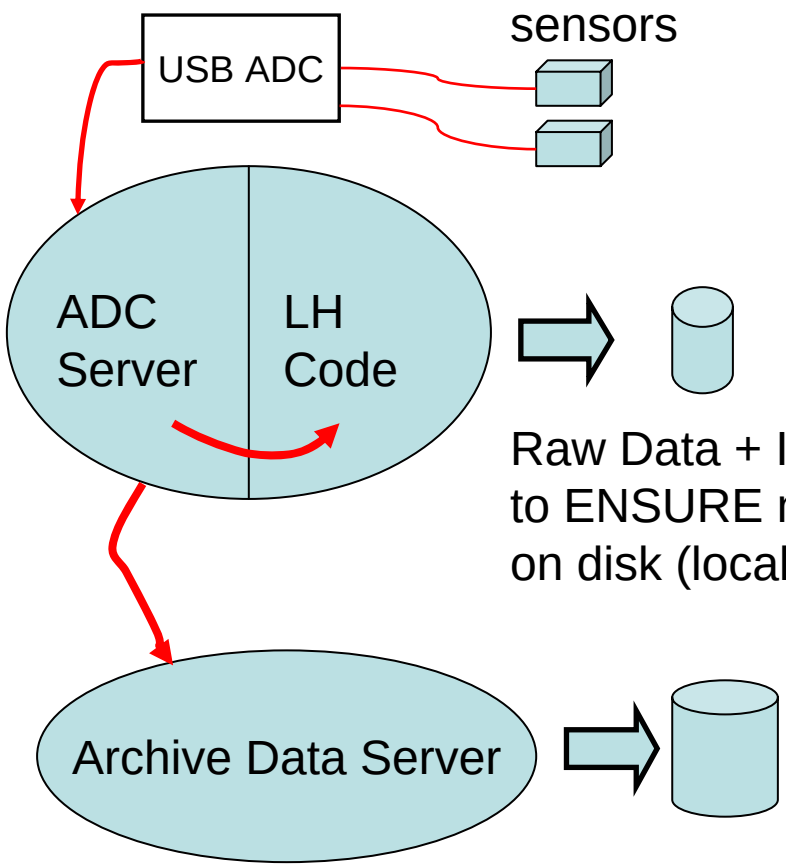
Vibration Data Collection + Archiving

USB ADC digitizing at 200 Hz

Readout at ~1 Hz

Raw Data SCHEDULED to LH at read-out rate

RMS Vibration Amplitude Integrals calculated for 3 time intervals, 32 devices



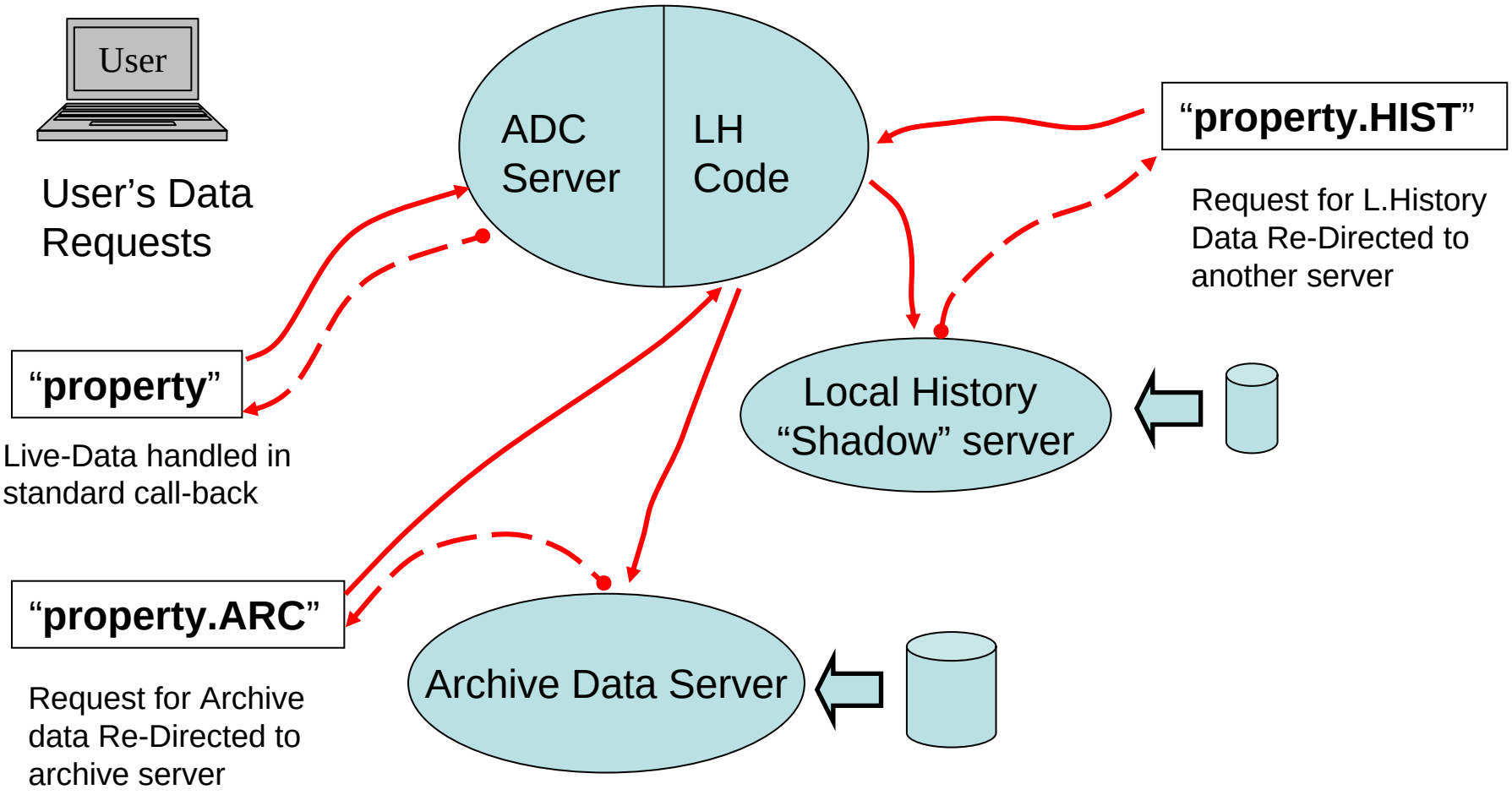
Raw Data + Integrals **Scheduled** to ENSURE no data loss. All data on disk (local or network disk).

Central Archive server “subscribes” and receives Integrals

Vibration Data Retrieval

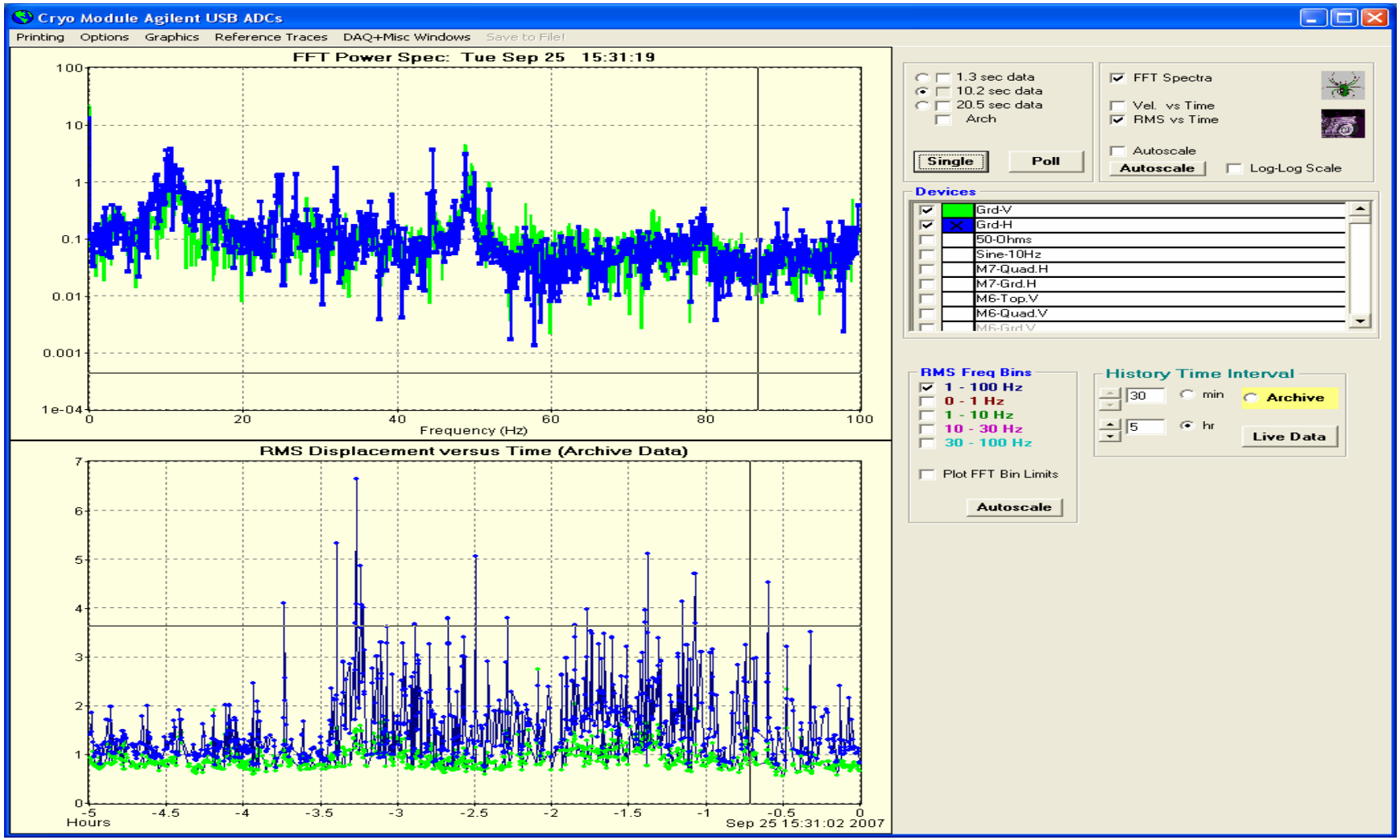
Redirection of data requests to correct server – Transparent to User!

Simple for client, doesn't disturb data taking of ADC Server



FFTs and Amplitude versus Time

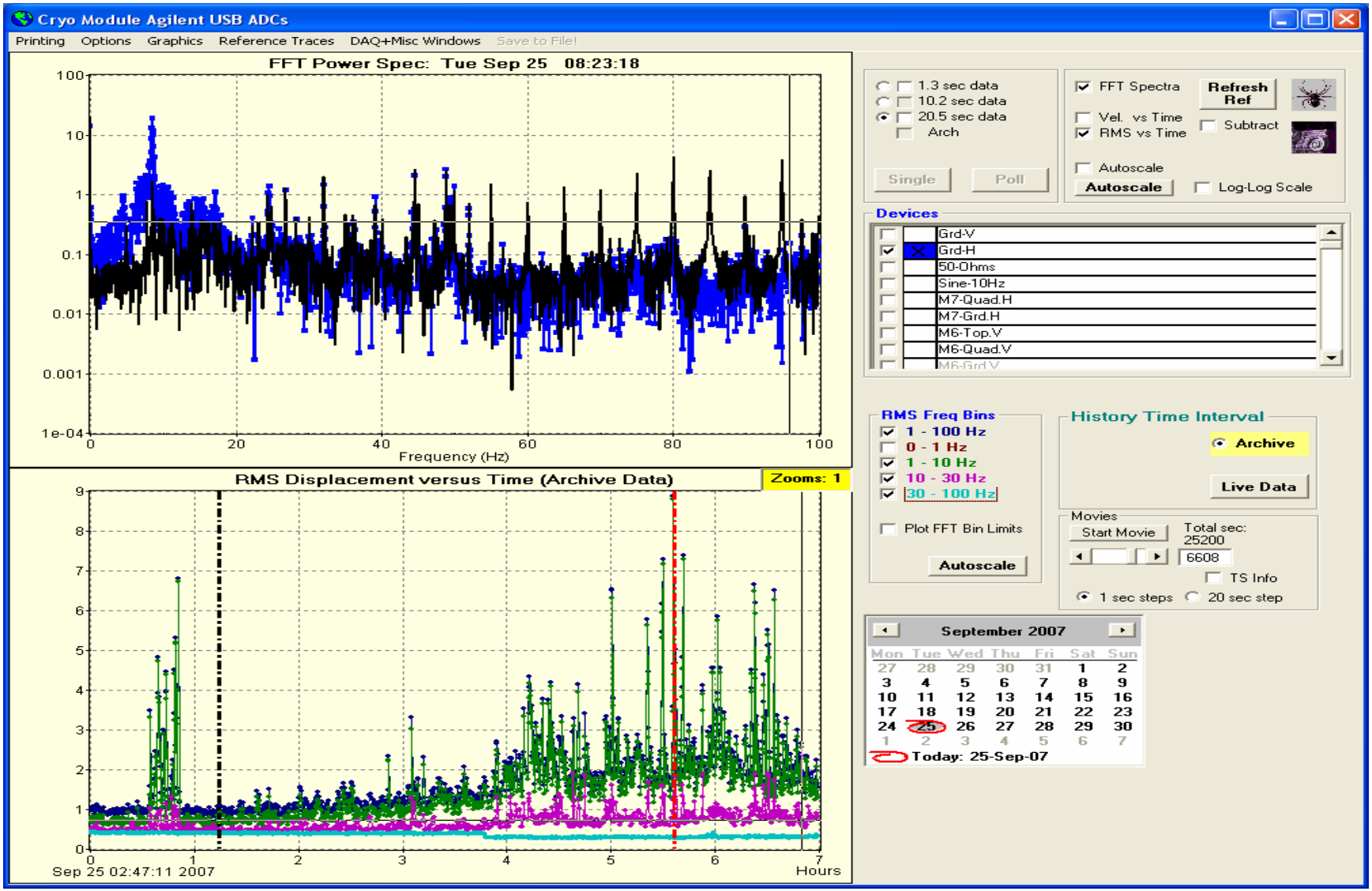
Two test devices, over 5 hours



Amplitudes for one device in various Freq.-Bins

How to compare the FFTs at two times?

Select a REFERENCE (black curce)

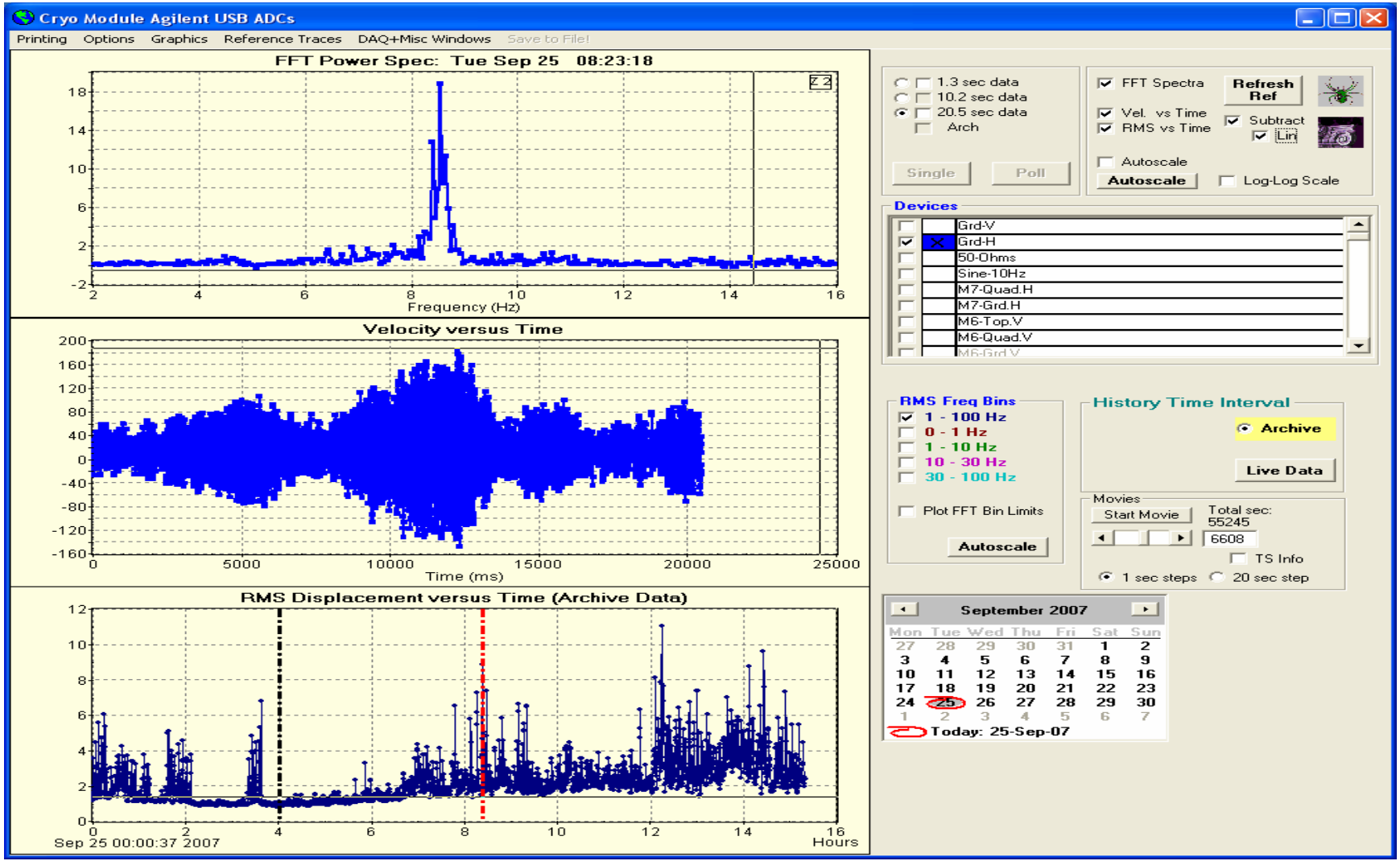


Simple Analysis: Subtract Data- Ref

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

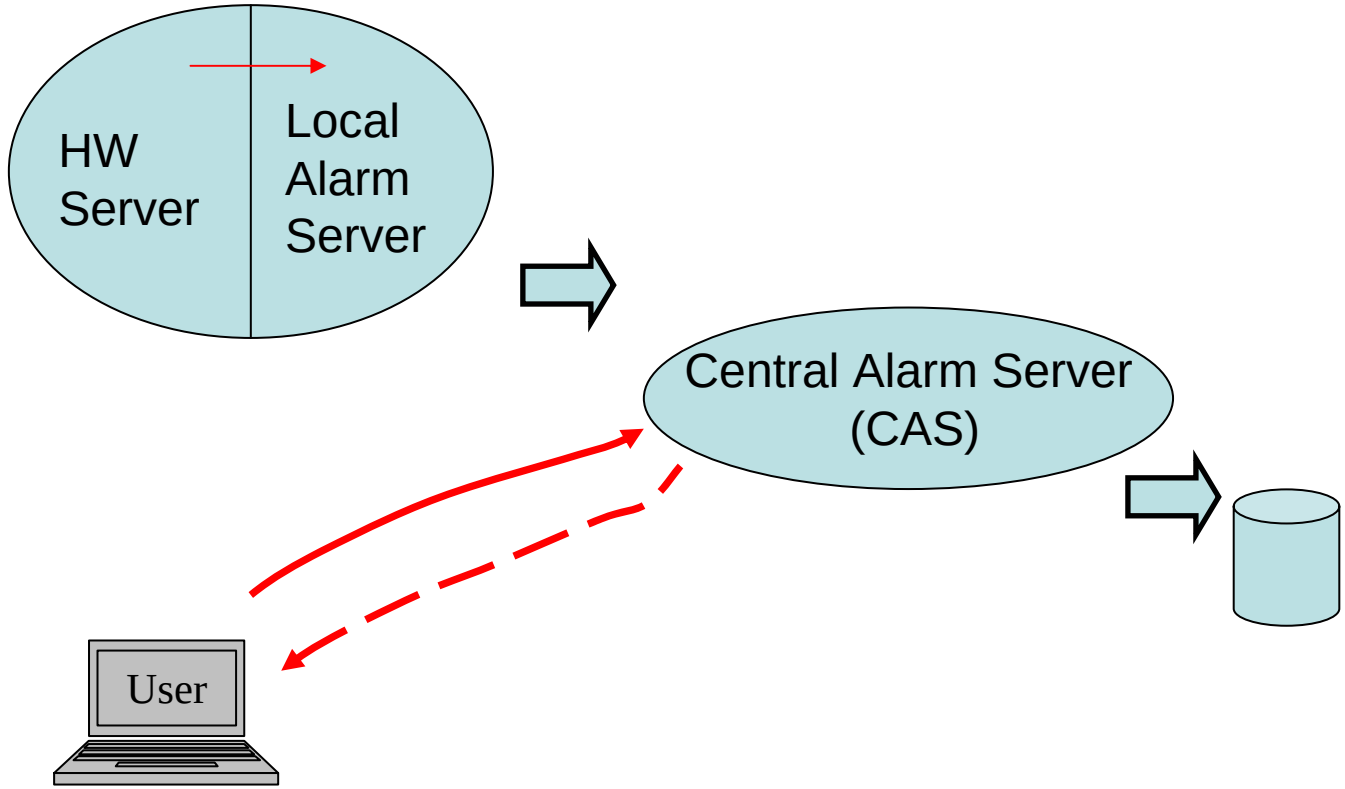
HW Server uses API to set and clear alarms in Local Alarm Server

Alarms are defined to belong to Alarm Subsystems

Local Alarm Server is connected to CAS

Clients communicate with CAS, which archives does archiving.

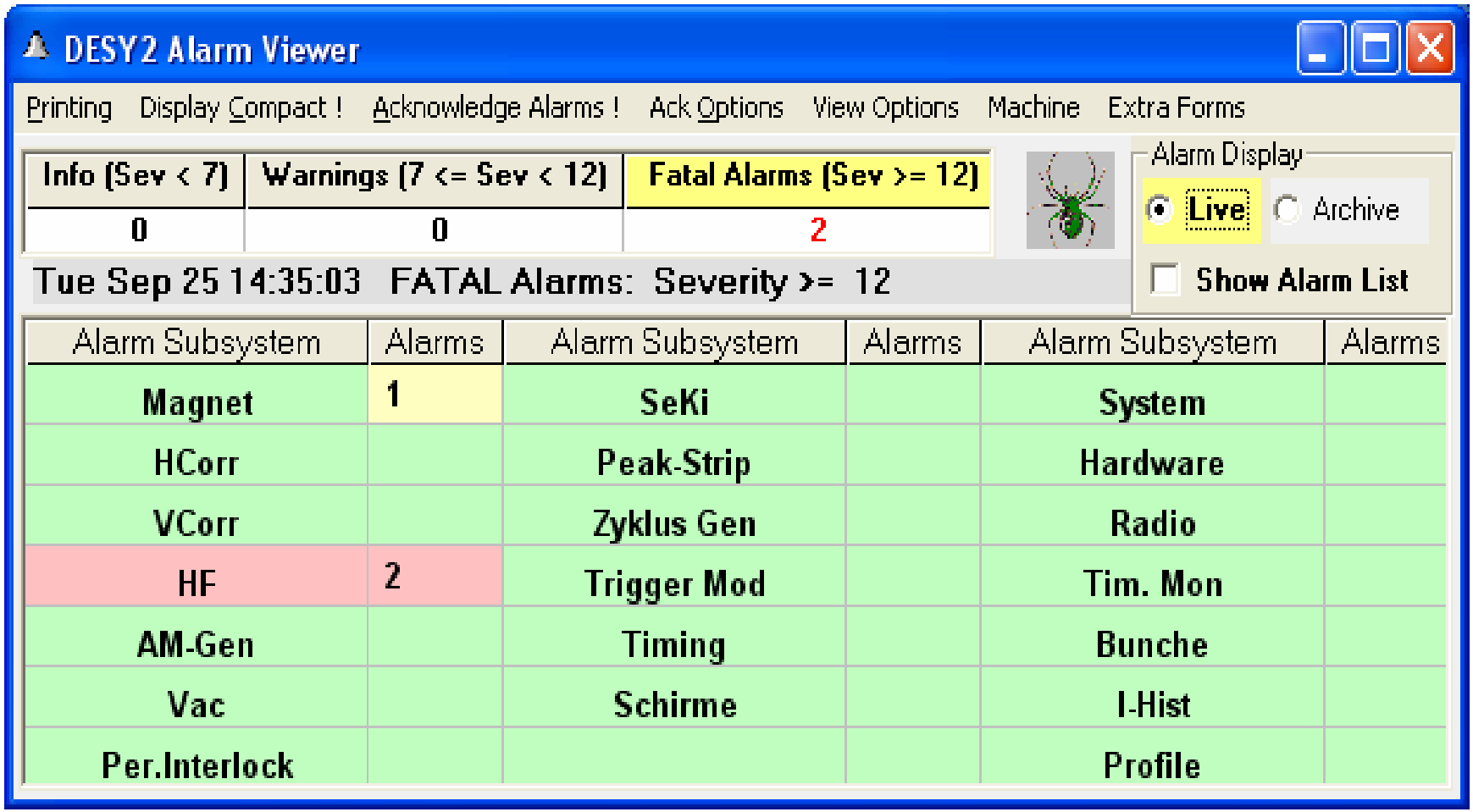
Here client can collect alarms “grouped” into Alarm Subsystems.



Compact View of Alarm Subgroups

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

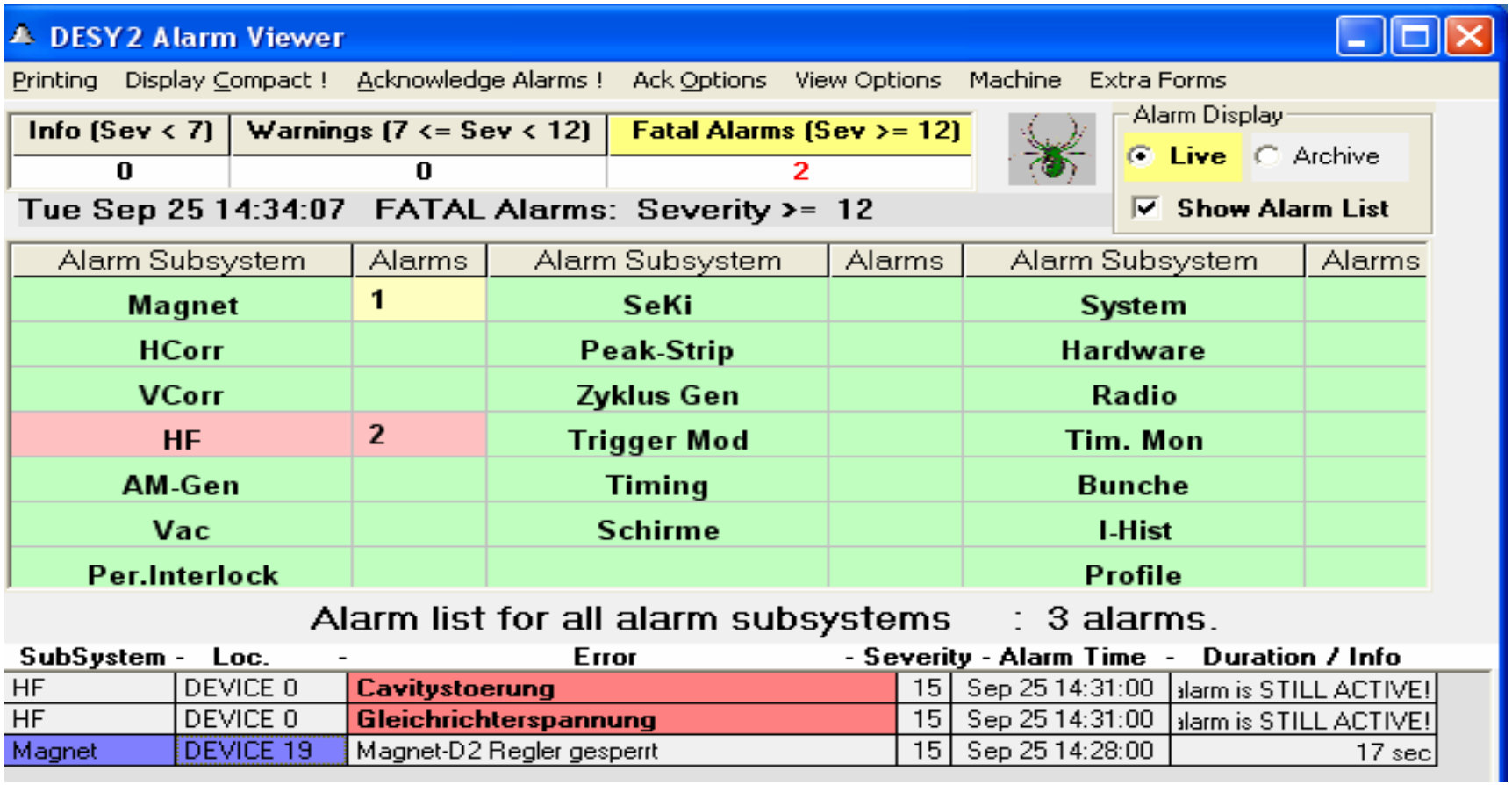
(2 Severe Alarms in HF-Sub-group. Magnet Alarm has been cleared).



Extend View for More Information

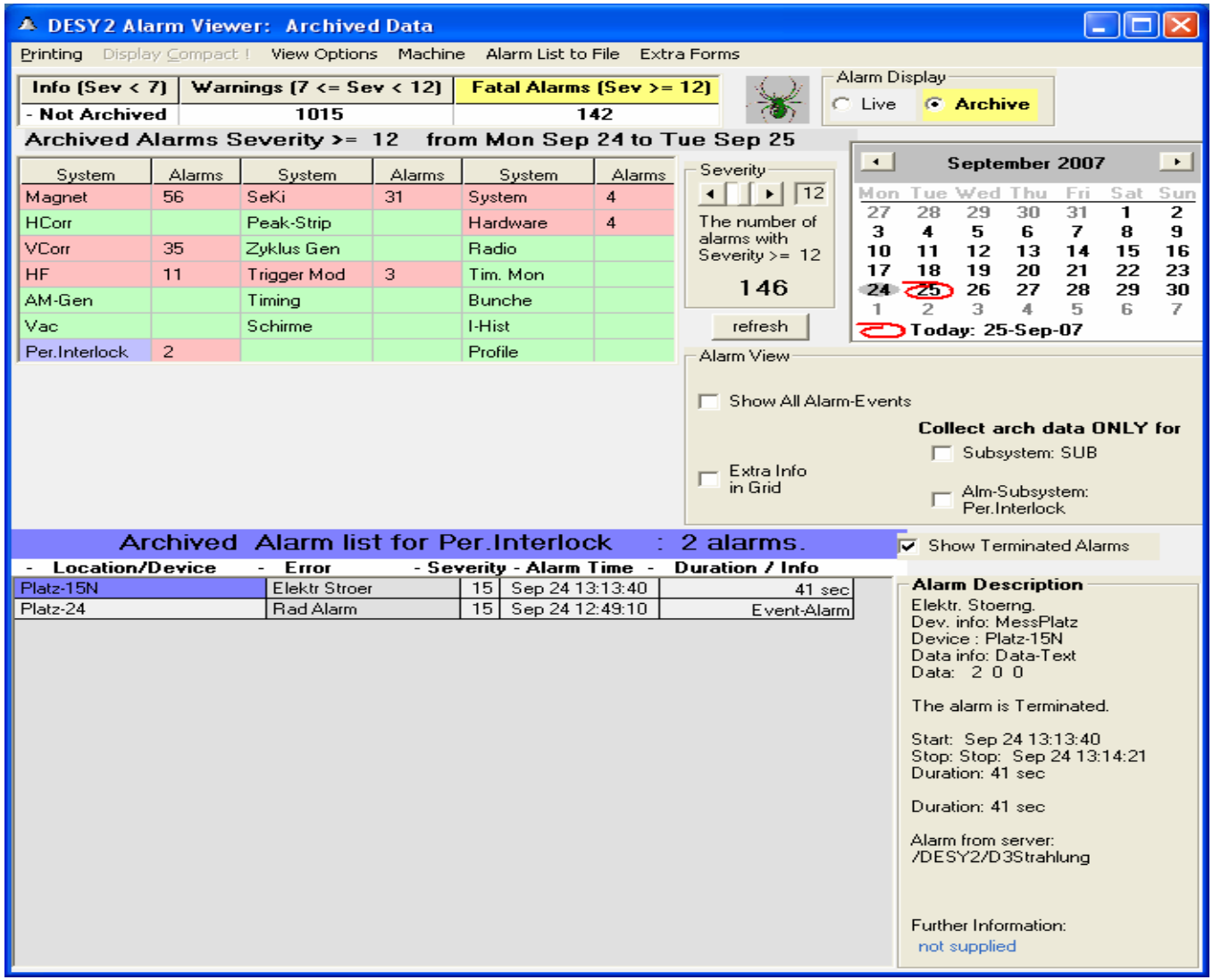
Based on another long used BKR program (“Fehler-Schirm”)

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



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

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



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:

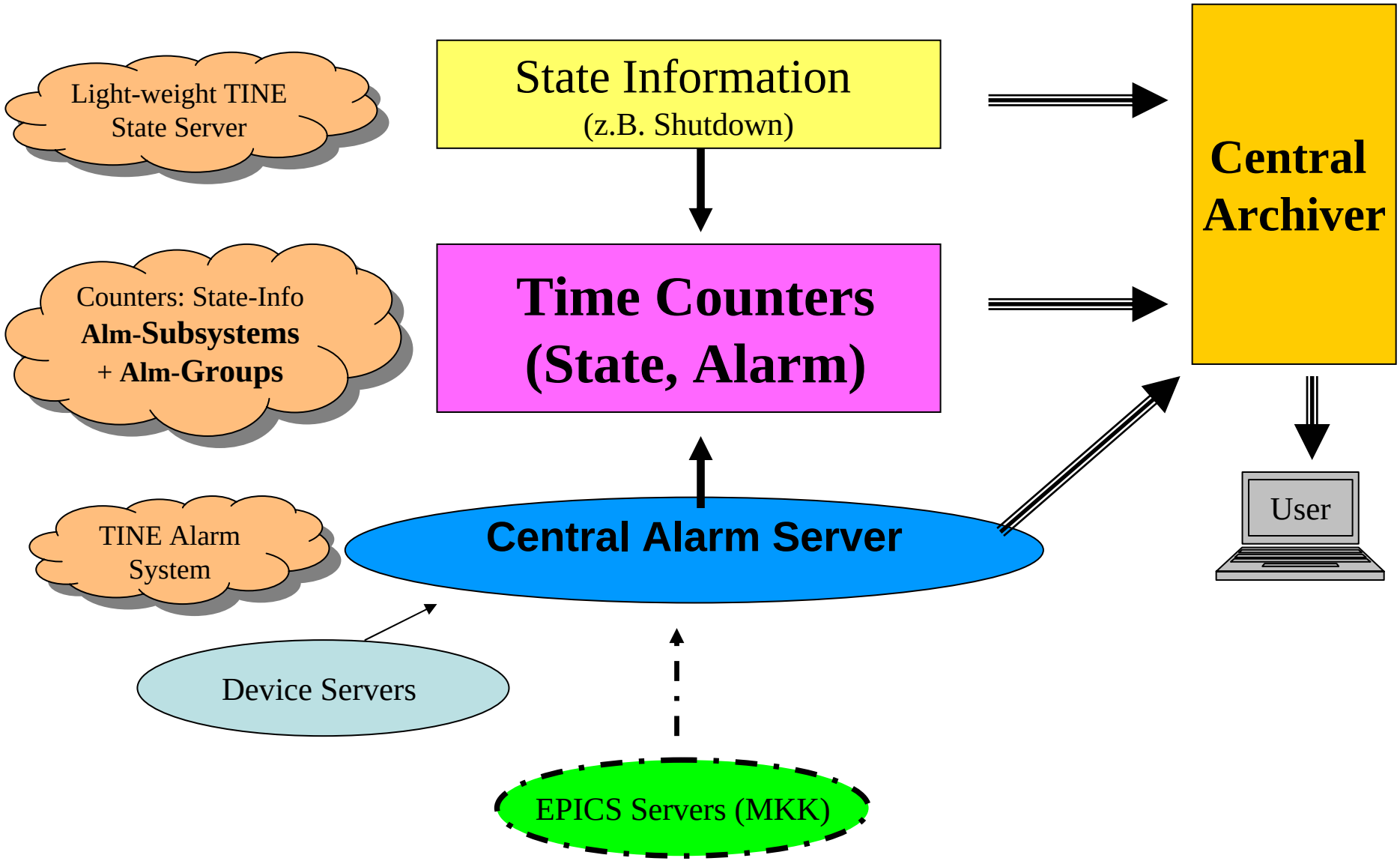
Machine STATE Information

(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

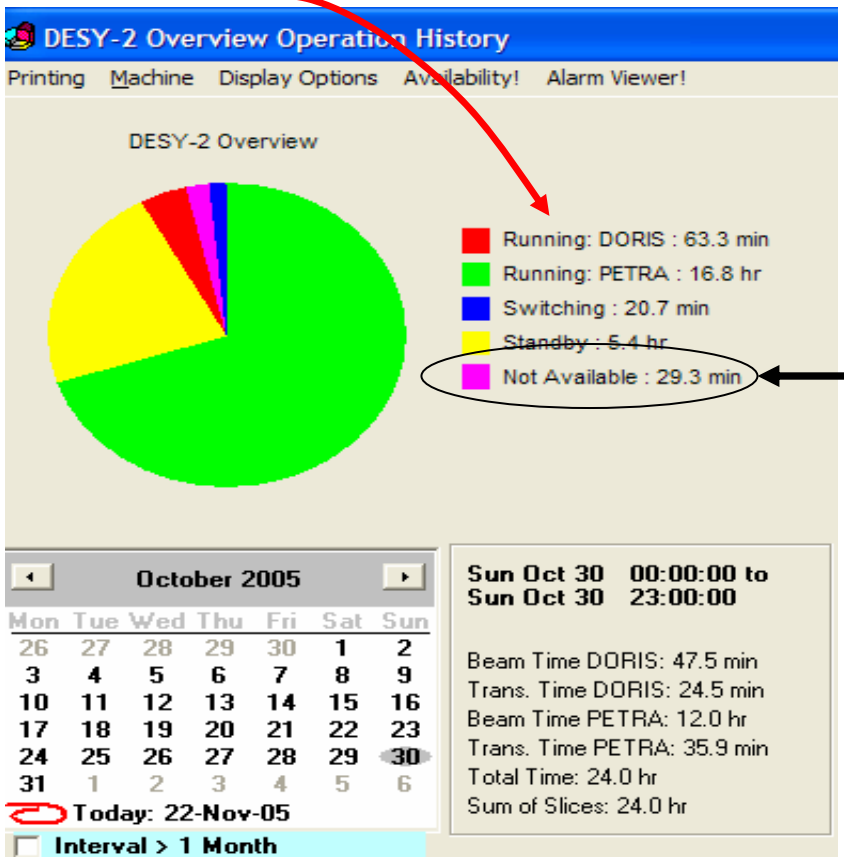


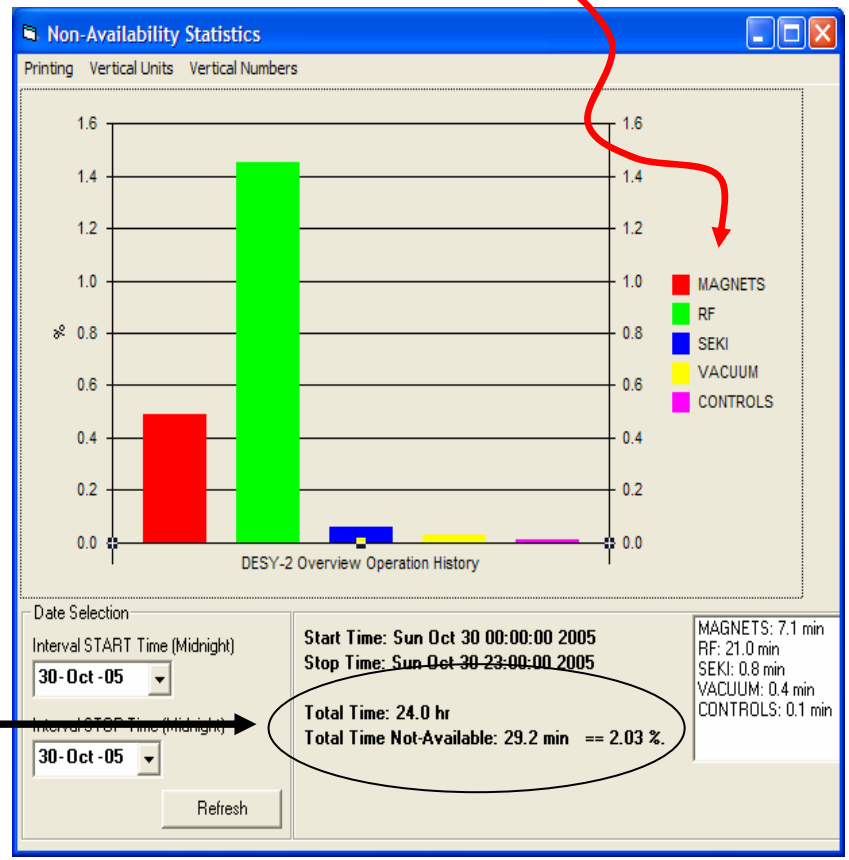
Displays of Archive Data for…..

A Quick View of the Availability!

Simple overview of state information.

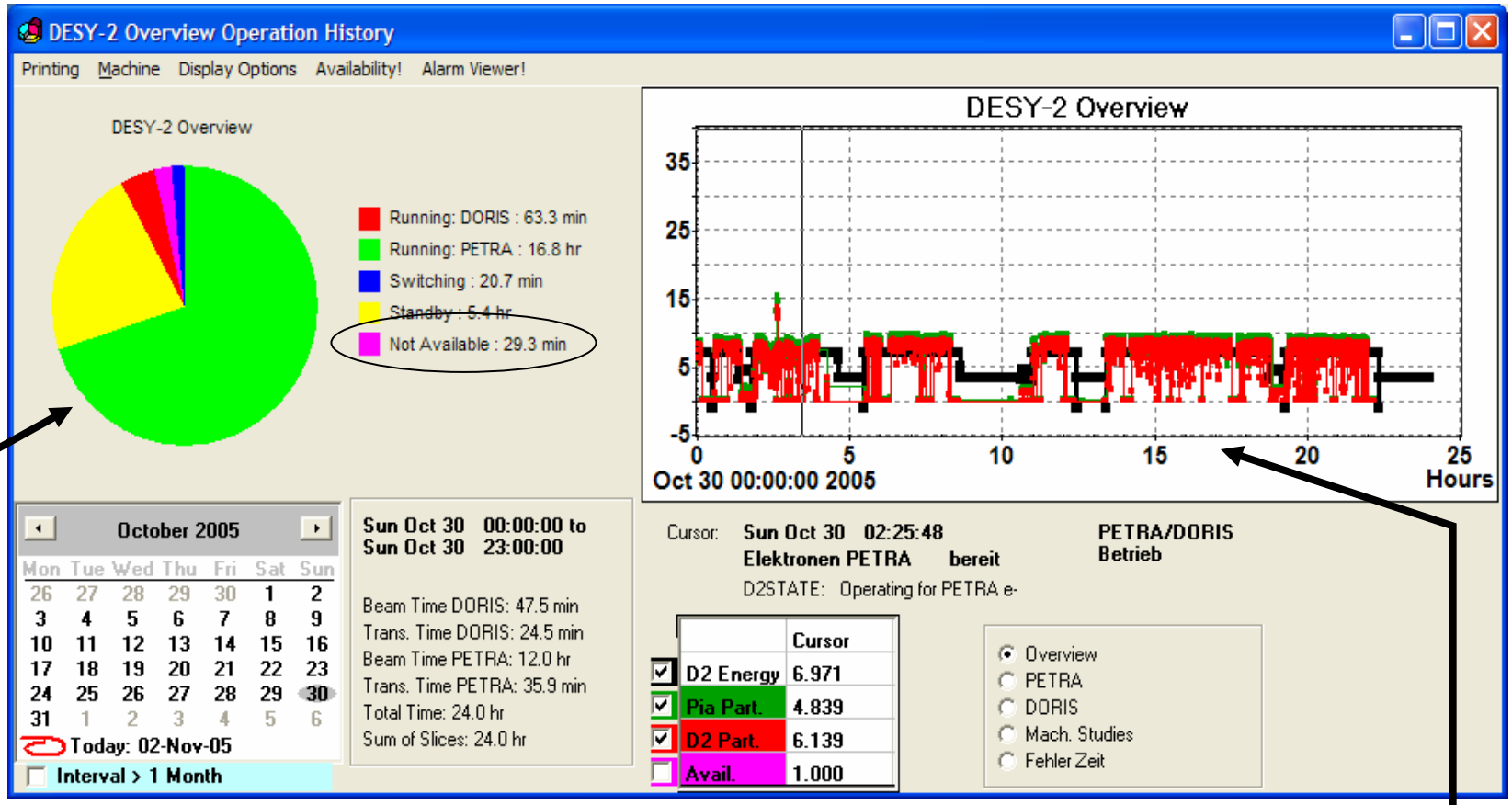
Component subgroups which were unavailable during the selected time interval.





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

Operations Overview: a Typical Day at DESY-2

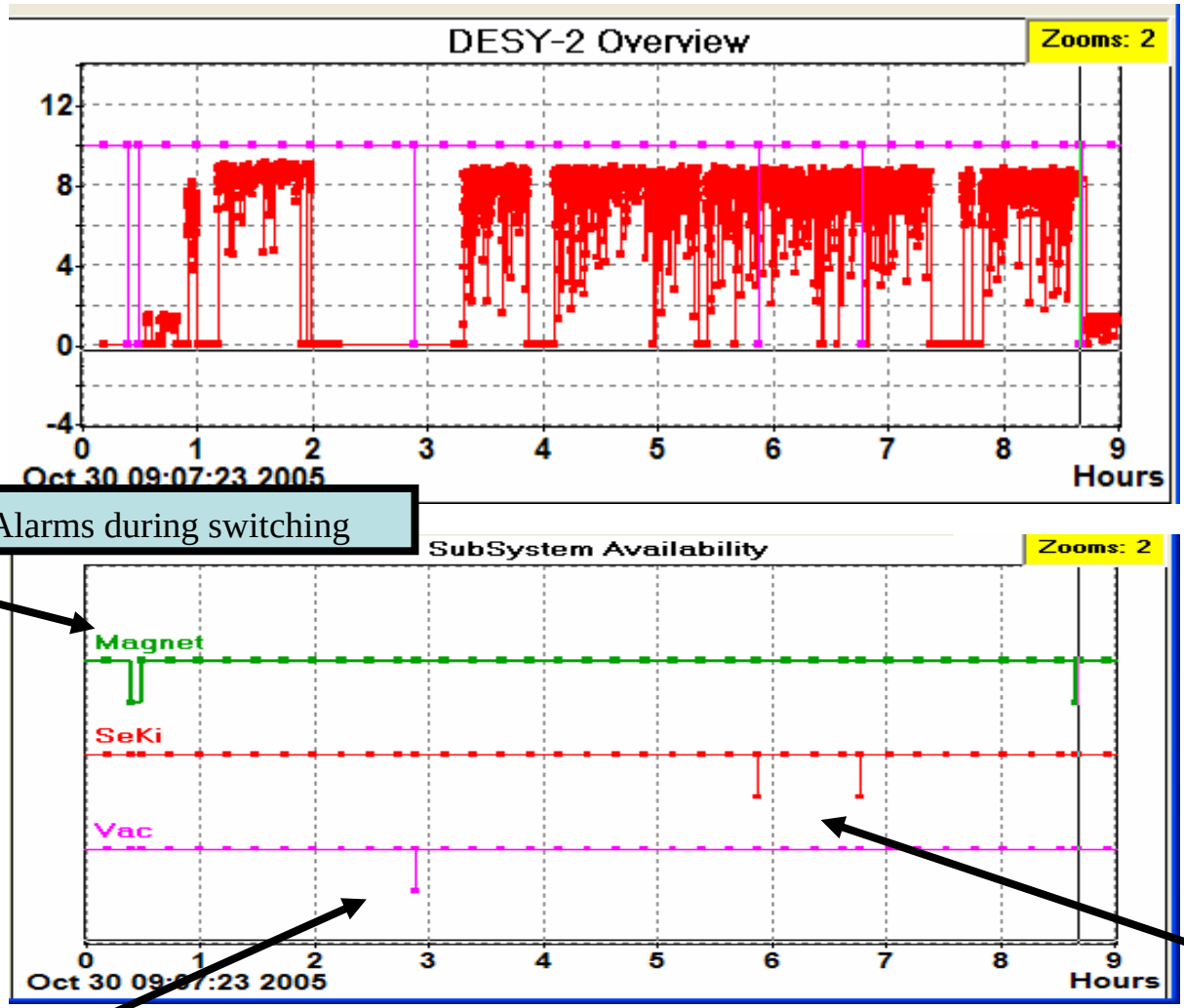


State Information (running mode) during 24 hours

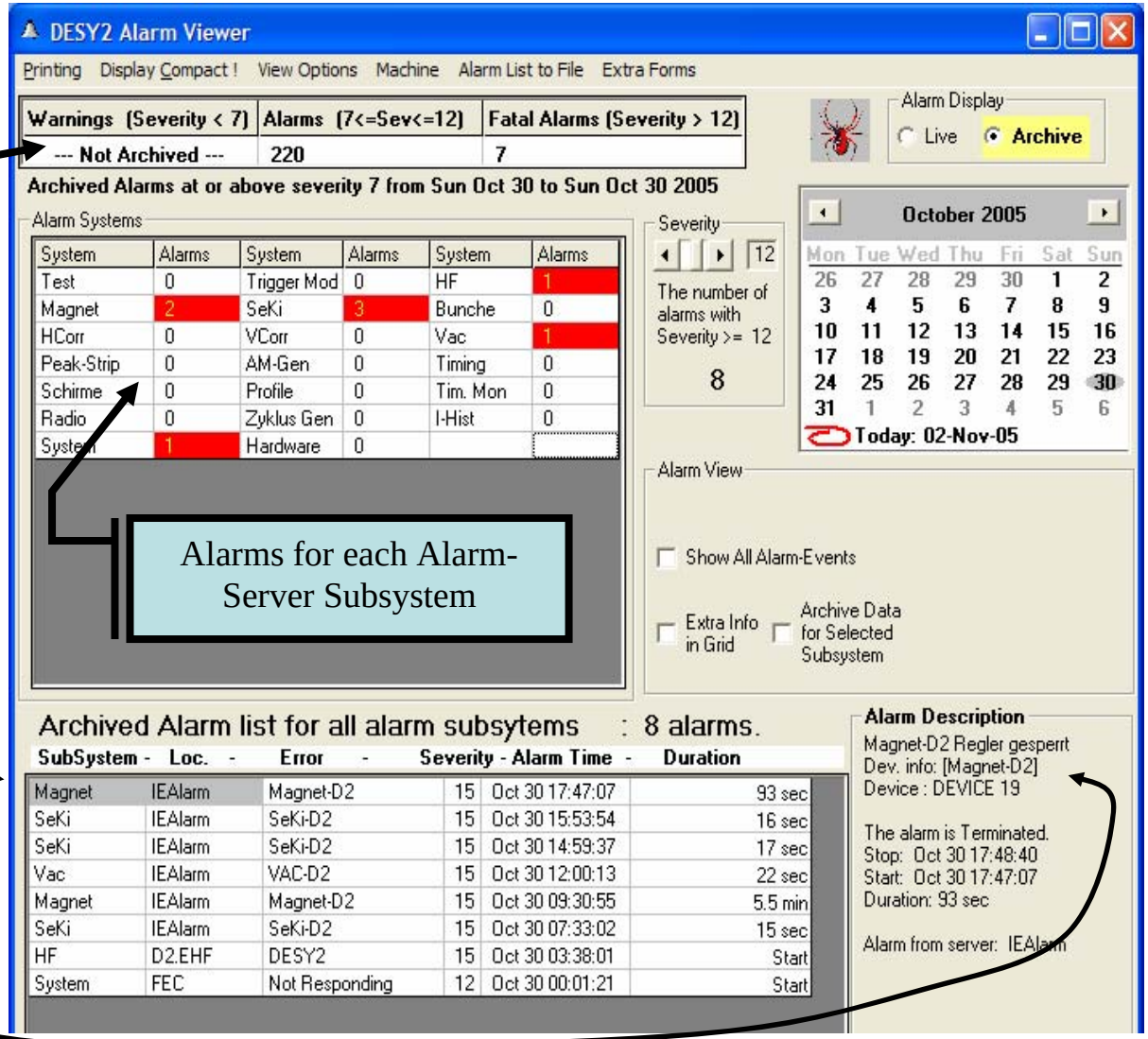
Overview of beam current and energy during 24 hours

A Closer Look: Machine Operation with Fatal Errors?

A Zoom into the Non-Availability



Alarm Overview (Archive Data)



Alarms classified by severity

Alarms for each Alarm-Server Subsystem

List of Alarms during Selected Time Interval

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! (KMueller, 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!