User Stories

Contents

Wish list and lesson learned from past situations (George Velev):

1. All data to be accessible trough high level user interface, making possibility for fast statistical and computational analysis.
2. Have a possibility to produce high quality graphics for purpose of publishing.
3. Minimize the amount of storage components, all data to be accessed using the same way.
4. Scripting: using one of the common languages for scripting, Python but better C, C++ or Java.
5. To provide automatic probe ID. Probe parameters should be part of centralized data structure and taken automatically.
6. The crate embedded computer should produce harmonics and plots in real time.
7. Automatic gain control for ramps on the level of ~100 A/s
8. Ability of simultaneous Analog+Digiatal bucking
9. Statistical info about the triggers, e.g. count between index encoder pulses and accumulate information how many of them does not have the required amount of triggers.
10. The system should have the ability for a remote monitoring.

Use Cases – Magnet Measurement System (Hank Glass):

1) A new magnet in a particular series has recently had harmonics measurements performed. The analyst wishes to compare the measurement results to previous magnets in this series. The analyst queries the database and finds a collection of magnets in the series had been measured three years ago. The analyst retrieves these measurements and compares the measurements of the new magnet to those of the older magnets.

2) After doing the analysis in Case 1, the analyst discovers that the sextupole harmonic in the new magnet has a significantly different phase than the older magnets. The analyst wishes to understand any differences in running configuration which may account for this anomaly. The analyst retrieves the probes, calibrations, and other instrumentation data from the older measurements and compares these to the running configuration for the present measurements.

3) Still not having resolved the issues discovered in Cases 1 and 2, the analyst decides to test the new magnet using a different probe. This probe has not previously been used with this magnet series, but has been used with other magnet series and is believed to have recently provided reliable measurements. The analyst prepares a test configuration (“checklist” in the old system nomenclature), and asks the measurement tech to perform the new measurement. The tech performs the measurements, records comments and observations in the electronic log, and informs the analyst when the measurements are ready for review.

Use Cases – Pointscan (Mike Tartaglia):

Upcoming Examples of Planned Point Scan Measurements using Hall and NMR probes

HINS Solenoid, ILC Split Quad Z scan (also angle scans vs Z possible) using 3D Hall probe

Using Portable Windows PC system on Stand 3 or Stand 6
[Motor drive system and measurement sequence is MANUAL at present –
programatic motor control and measurement automation is needed]

NML Spectrometer Magnets, HSM02 point scans using 3D Hall probe

Stand B (or A?) measurement system (with CHISOX)
3-axis motion control and readback; probe temperature measurement with field strength
[Z motion is limited to 11" segments, pieced together with manual repositioning]
Spectrometer map may require survey of probe positions (not yet clear

- integrate (laser) survey information with probe position encoder?

3-axis Hall probe Calibrations (mostly for Mu2e)

MANY PROBES to calibrate (say 20-40), vs field, vs temperature, vs angle (ϑ,Φ, Ψ)
Up to 3 T in Calibration magnet (fixed position, but angle variation)
or up to 5 T in Tevatron Dipole magnet (angle variation, and 1D Z-motion in the bore)
goal: demonstrate 10^{-4} precision and accuracy!
with NMR reference field simultaneously with 3-axis field and temperature data
simultaneous instrumentation temperature monitoring
3-axis Hall probe noise and offset drift characterization under "representative" conditions ("fast" ADC sampling <= ~1 kHz, or spectrum analyzer)

probably exploration of various instruments to characterize/evaluate them also
using a particular/dedicated probe

Mu2e Solenoid Magnetic Field Maps

(see draft conceptual design report, located in
Q:\mu2e\Conceptual Design and Functional Specs\Solenoid Chapter of Mu2e CDR)
At remote locations (vendor, experimental hall) → portable system
Several independent mappers are planned, with differing probe array geometry
Might use the Fermilab ZipTrack system for subset of these

Integration of (laser) survey of probe positions with encoder, field data very likely

Analysis of Measurement data will be complicated, requiring application of calibration data

Script, Device Sets, Measurer, Aministrator, etc. (Dana Walbridge)

Measurement Creator Use Case

What I'd Like To Have	What Happens Now
❖ To be able to generate a set of measurement programs/scripts which could be used with multiple measurements just by changing the parameters, measurement devices, calibrations, etc. ❖ To be able to associate these sets (scripts, parameter sets, devices, calibration sets, etc.) with magnet series or subjects so that when testing a subject only the appropriate measurements are available ❖ To be able to define integrator gains based on the magnet series (or subject), probe coil configuration, current range, type of run (reference, harmonics, etc), **and** probe position. ❖ To be able to change some parameters "on the fly" in the case of a measurement error, where it can reasonably be changed so that a measurement can continue. This is particularly appropriate for the setting of integrator gains.	❖ Generate a list of checklists to peruse in order to find an appropriate one to copy: ➢ Can be all checklists… ➢ or those associated with a magnet series or subject. ❖ Extract the list of checkitems in the checklist in order to see which checkitems need to change, be removed, or be added. ❖ Extract any parameters associated with the checkitems to aid in determining if the checkitem needs to change. ❖ Create (add) new checkitems. ❖ Create (add) any needed parameters. ❖ Create new top level checklist (checkitem). ❖ Duplicate old checklist to create the new one, making any changes by adding, removing, replacing checkitems. ❖ Add checklist parameters. ❖ Attach installed instruments to the checklist. ➢ May involve existing scripts and ad-hoc queries to find suitable instruments. ❖ Attach checklist to magnet series or subjects. ❖ Set integrator gains based on magnet series or subject, probe device, probe coil configuration(s), and current range.

Definer of Device Sets/Functionality Use Case

What I'd Like To Have	What Happens Now

❖ To be able to create and reuse "virtual instruments", which describe what is being done (i.e. set current, read current, position probe, read temperatures, get field value, etc.)
❖ To be able to easily define and select sets of hardware products which perform the task identified by the above.
❖ To be able to easily map specific devices for the functionality described above.
❖ To be able to easily define and select sets of parameters to be used with the measurement hardware.
	❖ Add any new hardware products.
	❖ Add any new hardware devices.
	❖ Create any new conceptual instruments (if needed).
	❖ Create any new virtual instruments (if needed).
	❖ Create new installed instrument.
	  ➢ Set the devices needed for creating the instrument.
	  ➢ Set any parameters associated with the instrument.
	  ➢ Create new calibration sets (if needed).
	    ▪ Define new transfer functions, if needed.
	    ▪ Add new calibration constants, if needed.
	    ▪ Define a calibration set.
	    ▪ Attach the calibration set to an installed instrument.

Measurer Use Case

What I'd Like To Have	What Happens Now
❖ Same tasks as Now ❖ To be able to use the positioning hardware via computer control to set up for measurements (as opposed to doing it all by hand as it is done now).	❖ Enter test subject. ❖ Receive test subject. ❖ Mount test subject. ❖ Run tests on the test subject. ❖ Add comments, assessments. ❖ Run analysis checklists (for production measurements). ❖ Dismount test subject.

Analyst Use Case

What I'd Like To Have	What Happens Now
❖ Same as now (or whatever will be equivalent)	❖ Run database reports in order to get the following from the database: ➢ Raw sequence (serial number). ➢ Raw run (serial number) if needed. ➢ Excitation or strength data. ➢ Harmonics, shape, or scan data. ❖ Run analysis checklist(s) for putting analyzed data in to the database. ❖ Add comments, assessments

Administrator Use Case

What I'd Like To Have	What Happens Now
❖ Same as now	❖ Adding logins, accounts, permissions. ❖ Creating tables, views, stored procedures, etc. ❖ Adding any other database features (triggers, index(es), etc.

Magnet Information Entry Use Case

What I'd Like To Have	What Happens Now
❖ Same as now (or whatever will be equivalent)	❖ Enter test series information. ❖ Enter series attribute information. ❖ Enter test series component information, if available. ❖ Enter test subject information.

Use Cases (Joe DiMarco):

1. Configuring system for test
    a. Necessary
        i. Be able to quickly configure new measurement from scratch with default/simplified/template options
        ii. Scripting, measurement loops
        iii. Be able to store configuration as a template for subsequent tests
        iv. Be able to recover the configuration of a test that has occurred
        v. Minimally intrusive version control of templates (with comments)
        vi. Be able to exercise and 'step-through' any portion of a measurement
        vii. Database of parameters used in templates – easy to search or add to it
        viii. Clear error messages on script inconsistencies/errors
    b. Niceties
        i. Be able to visualize and manipulate data as measurement is being exercised and data is being acquired (analysis environment which can interact with measurement environment)
2. Measuring
    a. Necessary
        i. Easy and clear interface for searching and starting measurements
        ii. Be able to run measurements with minimal interaction or special knowledge
            1. Provide serial sequence guidance (implicit or explicit)
            2. Constrained options appropriate to test/script step (limit rope available to hang oneself).
            3. Intuitive - no 'cheat sheet' needed for sequence on how to start
        iii. Log comments at any time with respect to test stand, magnet, time/date, etc.
        iv. Be able to configure new measurement from scratch with default/simplified/template options
    b. Niceties
        i. Logging screen snapshots at any time
        ii. Comments entries automatically forwarded to email and/or elog
        iii. Tooltips, 'help' features
3. Analyzing data offline
    a. Necessary
        i. Easy search for data of interest (by time/date, magnet, probe/device, measurer, etc.)
        ii. Easy execution of 'standard analysis'/visualization

iii. Ability to template the standard analysis and alter it, and be able to use this modified version
iv. Links to raw data available
v. Extract data to various analysis environments for further analysis
vi. Being able to easily log/publish results, visuals (graphs, screen dumps), comments, etc. at various levels (for comment/review, ‘final’, etc.)

b. Niceties
    i. Speed