Application Programming, Database

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Outline

- Application requirements.
- Technical Database.
- Plan for initial applications.

- Acknowledgements: Nikolay Malitsky, S. Sathe, J. Wei, J. Van Zeijts

Application Software List

Front End

- Beam steering - first moment tuning
- Focussing – second moment tuning

Linac

- TOF measurements to measure dE
- Steering using loss monitors
- Transverse matching software
- Halo measurements
- Acceptance measurements with pencil beam
- Calibration of steering magnets
- Periodic beam centroid measurements
- Relative phase measurement system
- Equilibrium orbit correction
- RF phase and amplitude set points

HEBT / Ring

- Run-Time Machine Modeling
  - Run-time machine transfer matrix (from power supply read-back)
  - Run-time machine tunes (from power supply read-back)
  - Run-time machine chromaticities (from power supply read-back)
  - Difference between run-time and design model on transfer matrices, tunes, and chromaticities
- Machine Optics Editor
  - Tune setting
  - Chromaticity setting (pending for sextupole power supply)
  - Decoupling
  - Resonance correction

Application Software List

Ring (continued)

- Injection
  - Orbit closure algorithm
  - HEBT-ring orbit matching algorithm
  - Run-time HEBT-ring optics matching
- Beam Orbits and Correction (BPM)
  - Turn-by-turn orbit report
  - Difference orbit, average orbit
  - Injection beam orbit monitoring
  - Local DC bump orbit correction
  - Global orbit correction

Ring (continued)

- Extraction
  - Kicker voltage and timing adjustment
  - RTBT-ring orbit matching algorithm.
- Simulations
  - Transfer matrix, real machine vs. model
  - Painting
  - Beam tail and halo development (space charge, magnetic errors, misalignment)

Application Software Specifications

- Requirements definitions are underway for the applications discussed at the Oct. 99 workshop.
  - Describe the application.
  - Define the EPICS needs.
  - Define models and mathematical tools needed.
  - Define the diagnostics needs

Application Software Specifications

Application	Epics Input	Epics Output	Database	Model	Math Methods
Ring Run time modeling					
-Transfer matrix	Magnet power supply readbacks	--	Magnet	R matrix	
-Machine tune	Magnet power supply	--	Magnet	R matrix	
-Machine chromaticity	Magnet power supply	--	Magnet	R matrix	
Ring Optics Editor	PS	PS setpoints	Magnet, Optics	R Matrix, tunes	Simplex, etc.
Ring Injection Bump	Ring, HEBT magnet PS	HEBT, Bump PS setpoints	Magnets, Optics	R Matrix	Simplex, etc.
Turn-to-Turn Orbit	Ring BPMs		BPM list	--	--
Ring closed orbit correction	Ring BPMs ring magnet PS readbacks	- corrector dipole currents setpoints	-BPM list -magnet	R matrix	SVD
Tune measurement (a)	Ring BPMs	Pinger	BPM list	----	FFT
Tune measurement (b)	Ring BPMs	Injection bump	BPM list	----	----
Extraction Optics	Ring, RTBT magnet PS	RTBT, Bump PS setpoints	Magnets, Optics	R Matrix	Simplex, etc.

Magnet/Survey Database

- Magnet and Survey Database has been designed for production magnet.
  - measured multipoles
  - quality assurance
  - field and alignment error impact analysis
  - multi-element assembly assistance and
  - ring installation assistance

- Plan for populating the database includes input from measurement, survey, and physics groups

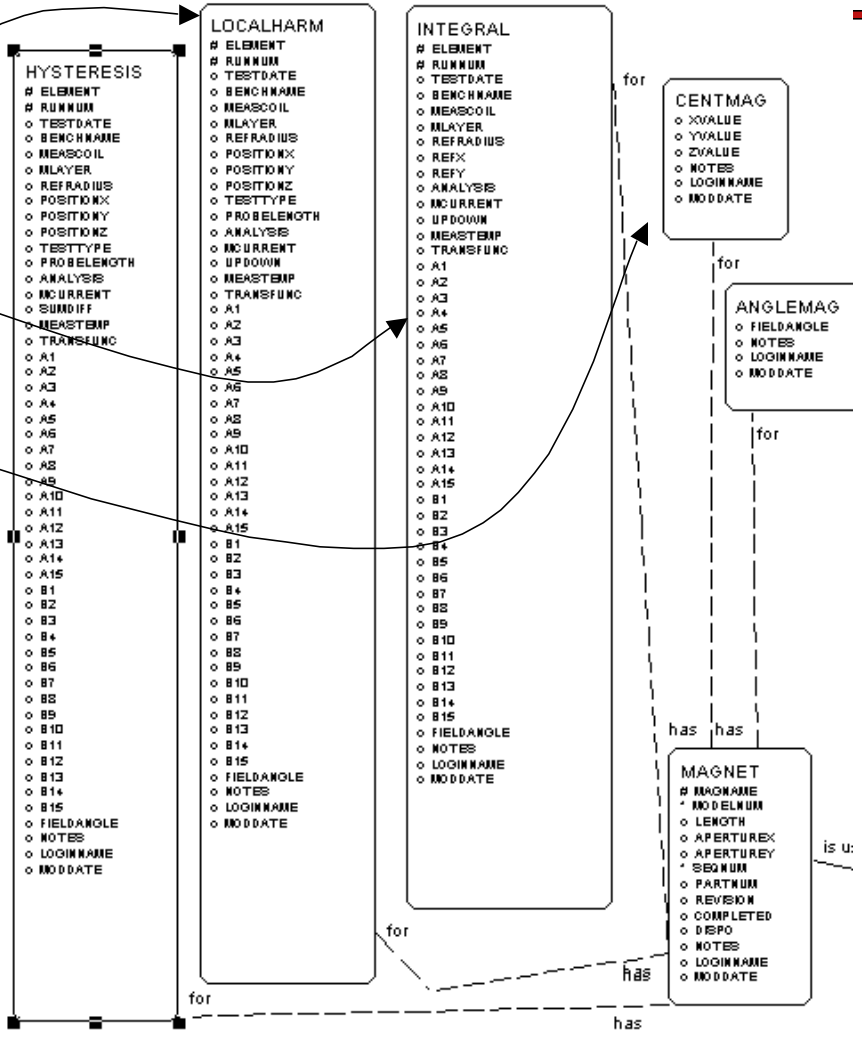
- Database information is available on the WEB to share with the collaboration

Magnet/Survey ERD

Local harmonics

Integral harmonics

Survey fiducials



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Prototype AP Approach

- Start with simple Front End / Linac apps
- Use Cdev (installed on AP server), with assistance from J. Van Zeijts/BNL.
- Set up model server to act as virtual machine (Trace 3D with C++ wrapper).
- Write apps using the model server initially (e.g. closed orbit corrector etc.)
- Use model server later for comparison with machine.
- Migrate apps to the new UAL environment as it comes online.