Overview of the software

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External packages:

STL – `http://www.sgi.com/tech/stl/`
not exactly an external package, but you need to know how to use the C++ standard template library

ROOT – `http://root.cern.ch`
MIPP relies very much on ROOT for histograms, ntuples, I/O, mathematical routines, geometry, ...

PostgreSQL – `http://www.postgresql.org/`
Our database. Useful to know simple queries like:

```
% psql runs
psql> select * from runs where date>'2005-07-19' and runtype='Production Run';
```

XERCES – `http://xml.apache.org/xerces-c/`
XML parser. Need to install it, hope you never have to muck with it. However, MIPP makes heavy use of XML for text-file configuration so you should be familiar with XML. At this point, mostly copy-paste from existing files.

Framework packages:

- MippIO: Raw data format
- EventDataModel: ROOT data format
- RawData: ROOT version of raw data
- Raw2Root: Conversion program
- JobControl: Interface to analysis/reconstruction. Provides the main executable “anamipp”
- IoModules: interface between job control and EventDataModel
- EventDisplay: “evd” is the event display

Experiment / configuration data:

- MippDatabaseBase: MIPP/posgresql interface
- MippDatabase: user/database interface
- MippXML: MIPP/XML parser interface
- Config: Run time configuration parameters
- ConnectionMap: Hardware address maps
- RunInfo: User/run-based data interface

Detector Geometry

- e907mc: GEANT3 Monte Carlo defines geometry. Converted to root format
- Geometry: user interface to root's TGeo classes
- Bfield: magnetic field maps and interpolation

Reconstruction “Support”

- RecoBase: Base classes for reconstruction objects. Tracks, vertexes, ...
- Swimmer: Track propagation through detectorTrkRBase: Common objects and utilities for wire chamber reconstrution
- MIPPEventSummary/DSTMaker: DST ntuple and filler

Reconstruction:

- BCReco: Beam chamber track fitting
- BCkovReco: Beam particle ID
- CkovReco:
- DCReco:
- MWPCReco:
- RICHReco: RICH ring finding and fitting
- TOFReco: Time of flight reco+calibration
- TPCRecoJP: TCP track and vertex fitting
- SPFit: TPC+chamber tracking
- TrackReco:
- TrigReco: Trigger reconstruction

Reconstruction software summary

TPC

- Reliable helix track fits are available for TPC (`TPCRecoJP/TPCRTracks`)
- Vertex reconstruction exists but algorithm is somewhat ad-hoc. Resolution limited by size of distortions
- No dE/dx information yet
- See to-do's...

Tracking

- Beam chamber tracking exists (`BCReco/BCLine`)
- Prototype global tracker exists (`SPFit/SPTrack/RBTrack`)
- Requires careful tuning (TPC coordinate system not completely understood...)
- May be adequate for detector upstream of ROSY. May be too unreliable down stream of ROSY (on my to-do list to try to improve this)
- Work started to improve track fitting: Segment finding in chambers 1-3 and 4-6
- Work to standardize track fitting code (TrkRBase)

Reconstruction software summary

Vertex finding

- TPC-based vertex fit exists
- “Global” vertex fit exists
- Both algorithms are “first pass”, no vertex-constrained fitting is done

Particle ID

- Mostly all still work in progress. Expect to make lots of progress this week
- RICH ring fits are available (`RICHReco/RICHRing`)

To Do List

"Infrastructure"

- Enumerate common database searches and optimize tables for them *{?}*
- Correct wire chamber connection maps (done?) *{Andrew}*
- Migrate code to new maps *{?}*
- Learn to use dcache *{Mark,Andre,Jenn}*
- What have we learned from first attempt at batch processing, what needs fixing for the next attempt *{Mark, Andre, Jenn}*
- Exercise DST class *{All?}*
- Identify data sub sets useful for analysis.
  - Example: I'd like to have files w/ roughly 1000 events of "clean" beam tracks at each momentum *{Mark,?}*
  - Other examples?
- Create a run summary table that can be used to select "good" runs. {?}
- Re-optmize raw2root {?}
- Outline "standard procedure" for creating calibration database tables {?}

To Do list continued...

Geometry and Bfield

- Correct errors Peter found (see meeting notes) {?}
- Add information about target position. Needs to be on run-by-run basis and handle different geometries (disk, sphere, box, ...) {?}
- Optimize Bfield routines for speed {?}
- Calibrate Bfield {?}

To Do list continued...

TPC Reconstruction

- (Jon and Ron are keepers of this to-do list... here's my ideas)
- Complete/verify/tune the ExB distortion corrections {Jon/Ron}
- Complete drift velocity calibration from pass 2 {Jon}
- Complete cluster profile fitting {David M.}
- ...
- Make dEdx plot...
- Improve track finding at wide angles {Jon}
- Improve vertex finding and fitting, esp. use vertex constrained fits to associated tracks {Jon}
- Check alignment of TPC wrt beam chambers and drift chambers 123 {?}

To Do list continued...

Tracking and vertex fitting

- Re-tune SPFit to account for TPC distortion corrections and drift velocity *{Mark}*
- Use calibrated, good wires in SPFit *{Mark}*
- Complete the TrkRBase package. Including:
  - Standard set of linear fitting routines for wire sets *(Mark)*
  - ...
  - Migrate existing code to use this package (esp. BCReco)
- Pattern recognition in chambers 1-3*{Andre}*
- Pattern recognition in chambers 4-6 *{Dmitry}*
- Merging of upstream and down stream track segments *{?}*
- Merging of TPC tracks with chamber track segments *{?}*
- Improve vertex finding, including vertex constrained track fitting *{?}*
- Begin work on a Kalman filter and understand its requirements *{?}*
  - Example: Are we able to calculate the number of radiation lengths separating two detector measuring planes? *{?}*

To Do list continued...

Alignment

Once tracking is working reliably we can begin alignment

- Chambers 123 wrt each other
- Chambers 456 wrt each other
- BC's 123 wrt each other
- BC's 123 wrt Chambers 123
- TPC wrt to BC's and chambers 123
- Chambers 456 wrt chambers 123
- CKOV wrt TPC and chambers 123
- TOF wrt TPC and chambers 123
- RICH angle wrt chambers 456
- ...

To Do list continued...

Particle ID

- Work on beam particle id esp. for minority particles *{Andre}*
- (dE/dx already mentioned...)
- Complete TOF calibration *(see Josh's talk for detailed to-do list)*
- Outline to-do list for CKOV detector *(David L. may already have this...)*
- Associate RICH rings with tracks *(Sharon has started on this, track fits not good enough to make reliable associations...)*
- Re-activate the RICH likelihood tests using predicted ring centers *(Sharon, again, tracking needs to be improved for this.)*
- EM calibration *{?}*
- HCAL calibration *{?}*

Monte Carlo

- Do 0th order tuning of MC to get ADC/TDC distributions in roughly correct range {?}
- Apply bad channel masks for RICH {?}
- Identify useful (small) MC data sets, generate, and reconstruct them {?}
- Finer MC tuning {?}