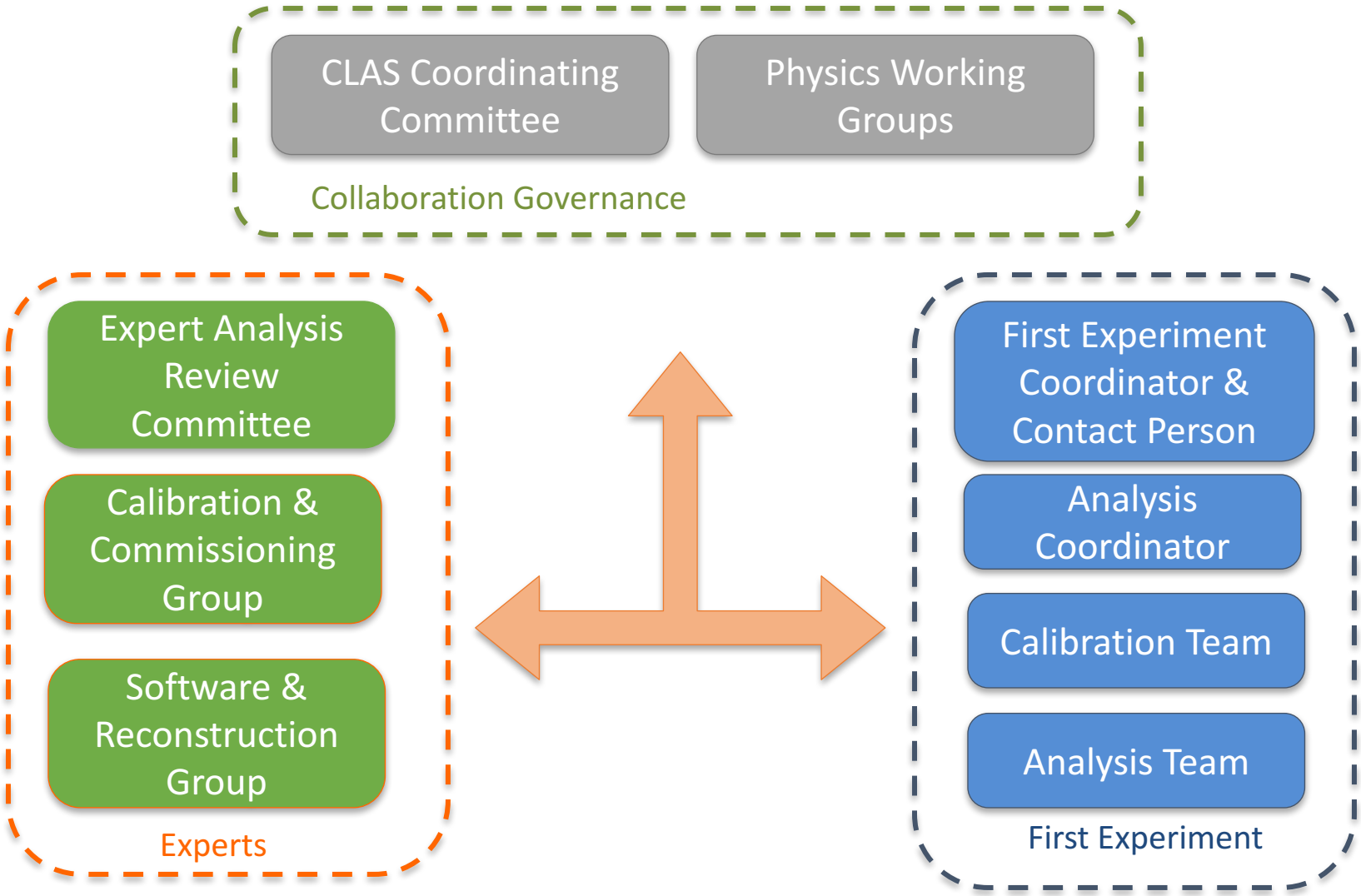
Report from the ACE: Some thoughts on the analysis procedures for CLAS12 runs

Ken Hicks, Dave Ireland, Kyungseon Joo, Sebastian Kuhn, Silvia Niccolai, Eugene Pasyuk, Larry Weinstein

Why another committee

- Based on a recommendation of the common tools committee
- ACE mandate (from Latifa & Jerry's slides of 1/13/2017):
  - Guide the development of analysis algorithms (after calibrations)
  - PID, momentum corrections, backgrounds, fiducial cuts, etc.
  - Higher level analysis: kinematic fitting, PWA (if applicable)
  - Standardize the algorithms and software
- Separately, another committee: first experiment analysis review
  - ACE suggests a framework for the analysis, whereas FEAR does the review.
  - This should be highly collaborative—much discussion is expected!

CLAS12 First Experiment Organization



Assumptions

- Software group provides the framework for reconstruction
  - Assume this is (or will be) fully functional
  - Assume simulations are handled in the same way as data
- Calcom group provides the calibrations
  - Assume the calibration procedures are standardized
  - We might need additional corrections that come later in the analysis chain
- Reconstruction -> HIPO file -> post-processing -> DST
  - During post-processing, apply momentum corrections, fiducial cuts, etc.
  - This step (and after) is where the ACE is focusing.

What is our goal?

- To make some recommendations (for collaboration discussion) of:
  - “tool set” of proven software packages for certain analysis tasks
    - Example: define loose cuts for electron identification and procedures for tighter cuts
    - These would be reviewed **once** and only changed when improvements are reviewed
  - checklist of standard procedures that a given analysis note should include
    - Example: one checklist for cross sections, another one for asymmetry measurements
  - Work with the analysis coordinator to outline the procedures common to all physics analyses for Run A.
    - Similar to the g12 Procedures Note: luminosity, good-run list, calibrations, etc.
  - Have this ready **before** the first CLAS12 physics run.

What have we been doing?

- Working on organization for a document:
  - Discussion of particle ID (Silvia)
  - Discussion of luminosity monitoring and normalization (Eugene)
  - Discussion of how some other collaborations do analysis (Dave)
  - Discussion of vertex and momentum corrections (Sebastian/Larry)
  - Weekly meetings with various expert guests (organized by Ken)
    - Wiki documentation of meetings (with summaries) available
    - Discussions of gemc, software, tracking, calibrations, etc.
- Our first request: a tool to convert output HIPO -> root.

Collaboration Feedback

- We want to hear feedback from the collaboration
  - We will make recommendations, but these need to be vetted
  - The analysis procedures (software tools) are collaboration-wide issues
  - We are working to test these procedures ourselves
- It will take time and iteration to get it right!
  - Today: just initial discussion of some general analysis procedures
  - Next meeting: first draft of some recommendations

Categories of Recommendations

- Data cooking:
  - Calibration procedures are being discussed by CalCom
  - Data skimming: what variable should be kept for the DST?
    - How loose should the cuts be for, say, electron ID?
- Data corrections:
  - Which ones should be done as post-reconstruction?
    - Energy loss corrections, momentum corrections, loose fiducial cuts?
- Simulations:
  - What should be done post-gemc and before reconstruction?
- Radiative corrections:
  - how to calculate/correct these?

Particle ID

- Reconstruction/calibration will provide:
  - Track momentum + track TOF (+ other track info if available)
- Electron ID is common to all CLAS12 analysis (including FT)
  - Lessons learned from CLAS6: PID is reaction-dependent (inclusive/exclusive) and observable-dependent (cross sections v. asymmetries)
- Need full simulation/reconstruction chain to give qualitative advice on PID for CLAS12

Tracking Inefficiencies

- Simulating bad DC wires will require some thought:
  - Diagram suggested by Mac
  - Need a Run-DB to fill CCDB
  - Include out-of-time background for simulations
  - Is this the structure we want?
- There is a lot of work to do!!
  - MK is working on some of it
  - Need more students/postdocs

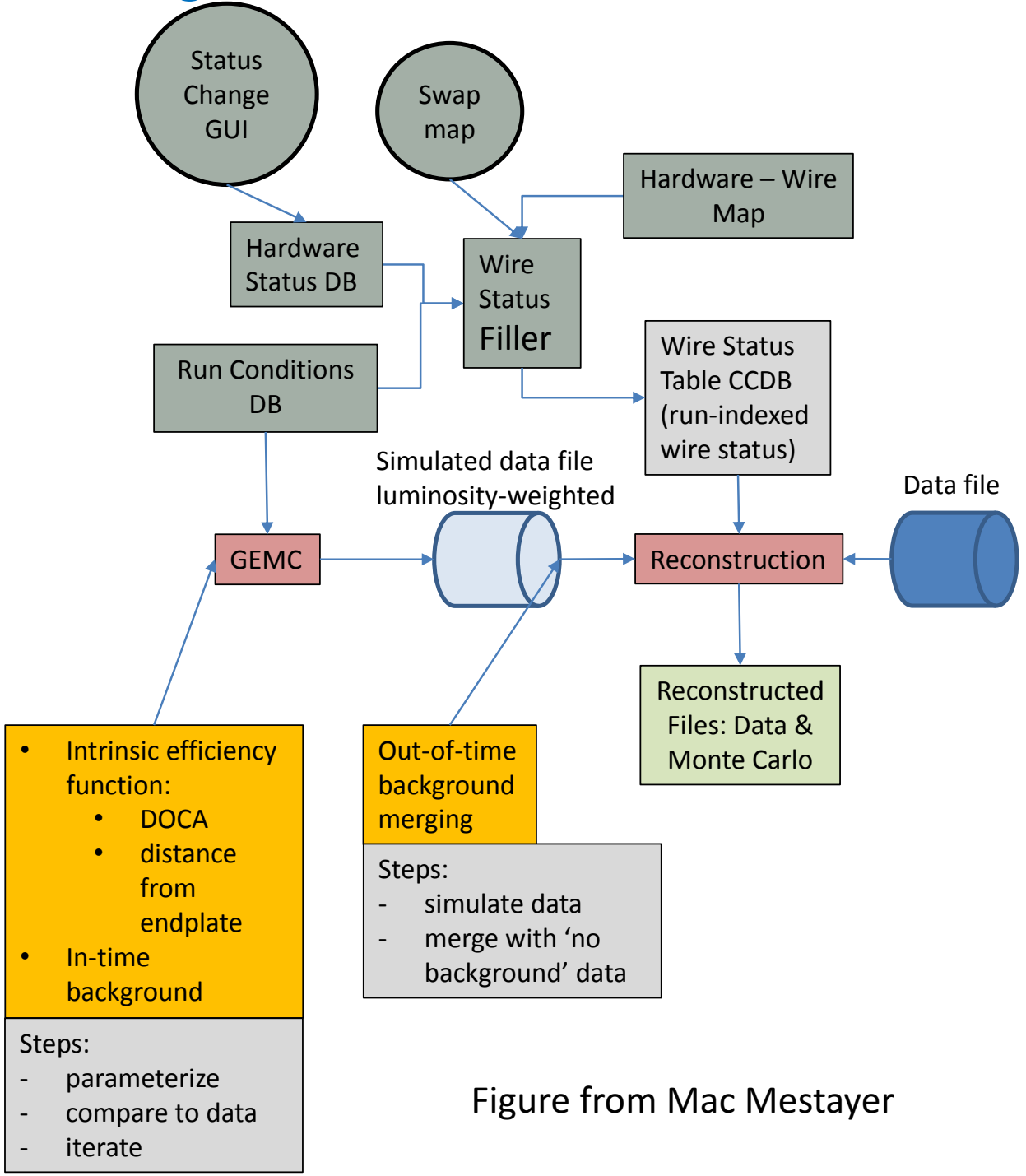


Figure from Mac Mestayer

Summary

- Can we agree on the procedures before the first CLAS12 experiment?
  - Let's make a list of recommendations for the next CLAS meeting.
  - We realize that things may change, new procedures developed.
  - Feedback from the collaboration is welcomed.
- The ACE has goals, can we meet them?
  - We've only been meeting for two months
  - We have lots of work yet to do, and only a few months to do it.
- It's essential that we cooperate with people working on analysis/reconstruction.