

# ILC Jet Energy Working Group: introduction and discussion

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# Introduction

- One of the primary goals for ILC experiments is the ability to reconstruct boson decays into dijets.
- This requires exceptional jet energy and direction resolution and is one of the driving forces in the current round of software development and will be used as a metric in the design of the detectors.
- This is a common goal and the community would benefit from close cooperation and collaboration.
- How to do this?
- WWS OC committee has proposed charging the Software Working Group to create an ILC Jet Energy Working Group.
  - Dijet Invariant Mass would be more appropriate.

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# Common Analysis Tools

- Much commonality already exists:
  - Common input data samples
    - Events in stdhep format
  - Common simulation/reconstruction output formats
    - List of ReconstructedParticles in LCIO format
- To move beyond relatively simple analyses will require more effort.
- Need to provide a number of tools to assure that some common tasks are handled in the same way.

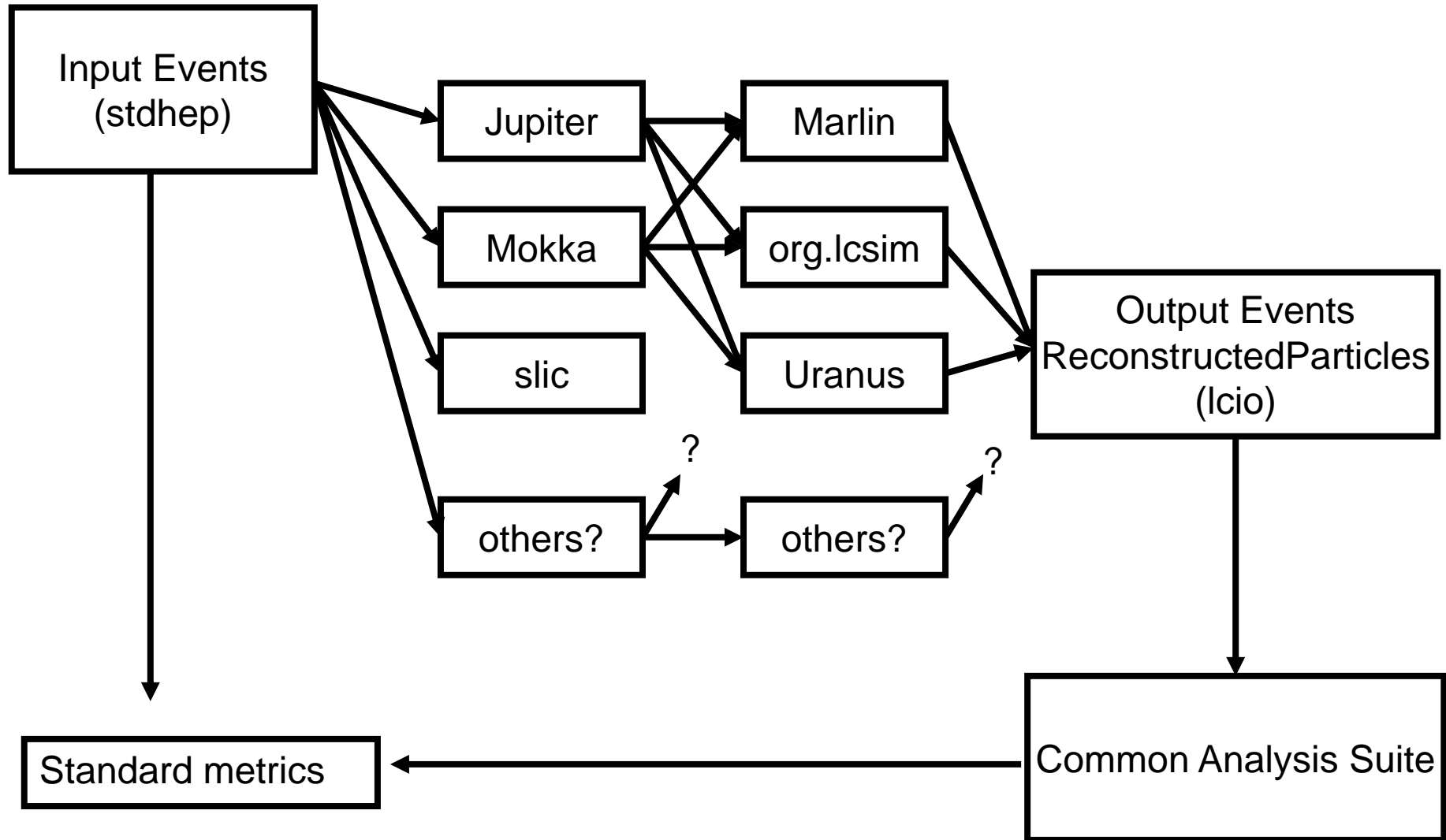
# Performance metrics

- Simple metrics, such as event energy sums or intrinsic jet energy resolution (e.g. from dijet uds at fixed cms energies), have been used to-date to qualify the reconstruction programs.
- Tremendously useful in developing event reconstruction software, but no real way to know when “good enough” is good enough. Why stop at  $30\%/\sqrt{E}$ , or 3-4%, ...?
- Physics analyses contribute additional sources of irreducible resolution:
  - Physics:
    - beam & bremsstrahlung, event generators, generator tunings,...
    - Intrinsic widths of W, Z (Lorentzian tails).
    - $\nu$  from  $\tau$  & heavy quark decays.
  - Analysis:
    - jet-finding, jet pairing combinatorics, etc.
    - bugs (or hidden assumptions) in code.

# Draft Proposal

- Transparency in the comparisons would be ensured if input and output were strictly controlled.
- Analysis emphasis on dijet invariant mass resolution in physics events:
  - $e^+e^- \rightarrow ZZ \rightarrow (vv) (qq) (uds, cc, bb)$  (2)
  - $e^+e^- \rightarrow ZZ \rightarrow (qq) (qq) \ \& \ e^+e^- \rightarrow ZZvv, WWvv$  (4)
  - $\rightarrow tt, Zhh$  (low mass higgs) (6)
  - $\rightarrow tth$  (8)
- Query user community on event generators and settings and generate a common set of input events.
  - Make available on the net & grid.
- Develop and release “canned” physics analyses to reduce systematic uncertainties in e.g. jet-finding, combinatorics, constrained fits, ...
  - Create library of analysis drivers which target LCIO lists of ReconstructedParticle.
  - Write out standard set of histograms or analysis metrics.

# Analysis Flow



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## How to proceed?

- Creating another layer of bureaucracy is probably not desirable at this stage.
- Propose growing this organically:
  - Utilize or expand regional simulation and reconstruction phone/video meetings.
  - Utilize or expand regional sim/reco mini-workshops (e.g. ALCPG in Boulder, ECFA-ILC in Orsay).
  - Evolve from sim/reco to reco/analysis.
- Other ideas?
- Feedback welcome.
  - Here & now.
  - On the forum.