

Sim/Reco and Physics: Organization, connections, etc.

Ryan Patterson

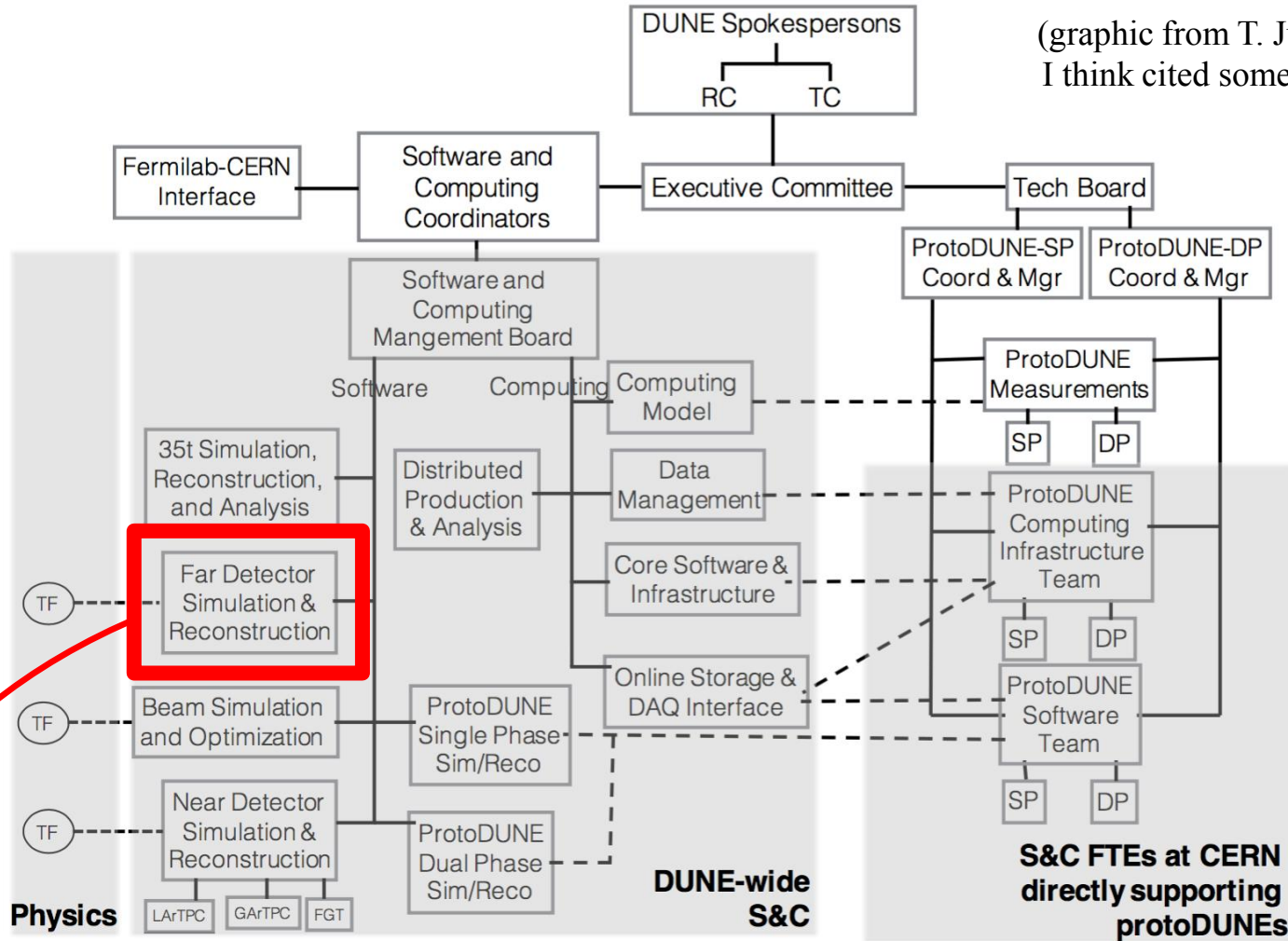
Physics Conveners Meeting
October 7, 2016

Summary

- **Uncontroversial statement:**
 - Strengthening the ties between the physics and software groups is important
- Toward this, lots of offline discussion in the weeks since the collaboration meeting
- **In this meeting:**
 - An updated organizational chart
 - More importantly, discussion about changes in “workflow”
 - Also, some special cases to note

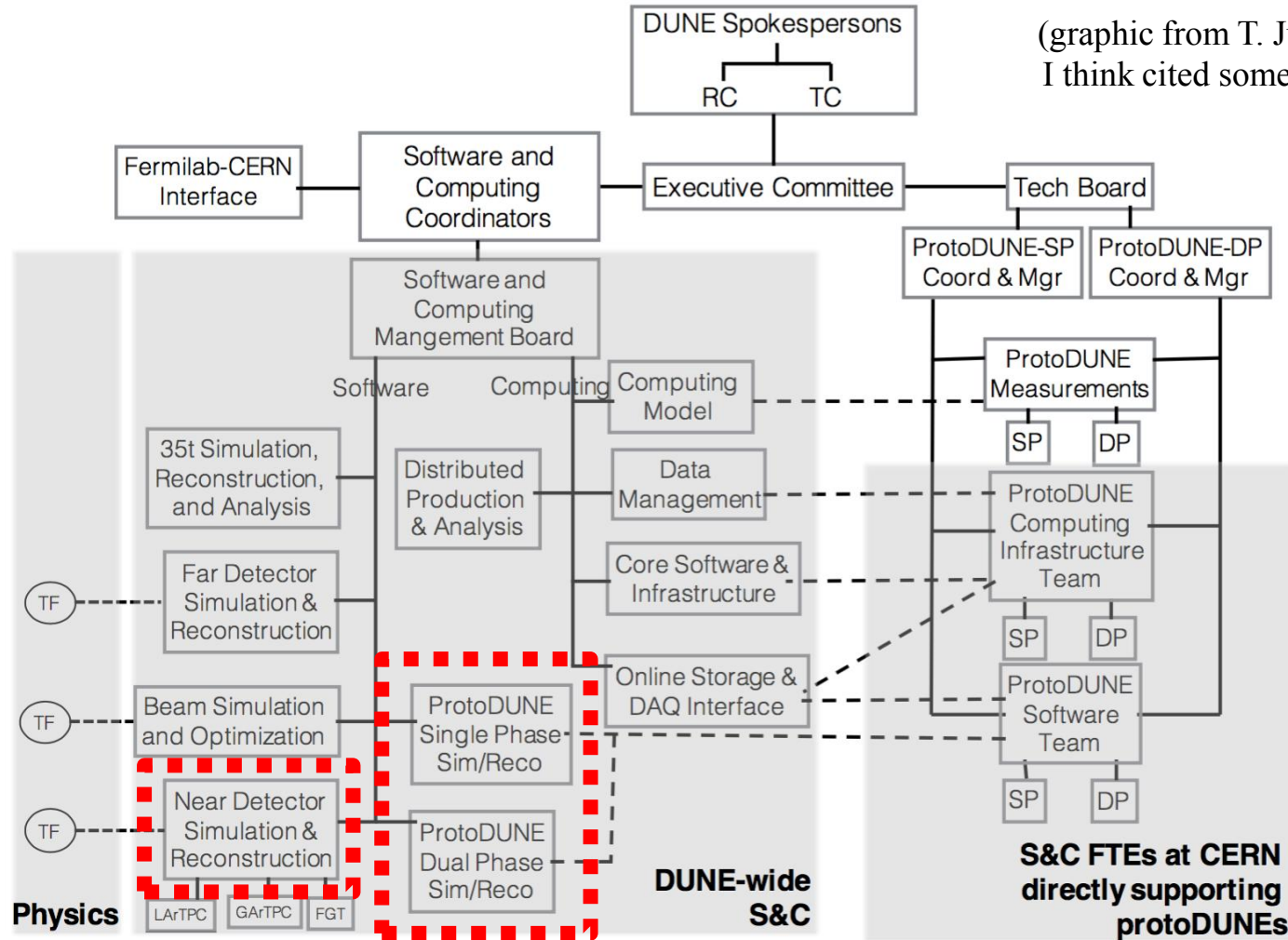
A look inside the **Software/Computing** group (old version)

(graphic from T. Junk's slides, which I think cited somebody else's slides)



Now a Physics WG

A look inside the **Software/Computing** group (old version)



No org. chart changes for these,
but see later...

Physics WGs

FD Sim & Reco is now a Physics WG

- At a bird's-eye view, this will allow more seamless coordination between the various efforts
- But the change to the org chart is a small part of the story
- Will walk through each group to talk about what changes, in practice.
 - *In some cases, little difference.*
 - *In some cases, the group has a rather different charge now.*

The changes are targeted to our needs today (in particular, toward the TDR).

The plan necessarily *de-emphasizes* some synergies in order to amplify others.

→ *The balance is guided by near-term priorities and by the timescales on which apparent synergies could realistically provide benefits.*

High level coordination

*Physics Coord.
Dep. Phys. Coord.*

Physics groups

FD Sim & Reco

Long Baseline

Nucleon Decay

Low-*E* / SNB

ND Physics

BSM/Exotics

Atmospherics

Cosmogenics

Charges of Sim/Reco + LBL

Not everything fits into clean boxes, but in broad strokes...

PREVIOUSLY:

FD Sim & Reco

Long Baseline

FD simulation:
a lot in here

“Early” reconstruction:
signal processing, hit finding, etc.

“Late” reconstruction:
tracks/showers, energies, vertices

Selections:
preselections and advanced PIDs

Charges of Sim/Reco + LBL

Not everything fits into clean boxes, but in broad strokes...

TODAY:

FD Sim & Reco

Long Baseline

FD simulation:
a lot in here

“Early” reconstruction:
signal processing, hit finding, etc.

“Late” reconstruction:
tracks/showers, energies, vertices

Selections:
preselections and advanced PIDs

- **Circled items** to be developed / presented / discussed in LBL meetings, not Sim/Reco meetings
- They must be planned always with the physics goals in the conversation.
Proxy metrics are no longer an adequate way to factor the tasks
e.g., Is that annoying reco failure mode actually worth chasing?
What gains can be had by imposing a beam-direction constraint on events?
Should effort be directed toward energy resolution rather than efficiency?
- Importantly, the “**presentation** → **feedback** → **new work** → **presentation**” cycle will be greatly sped up when it all takes place in a single forum with all cards on the table

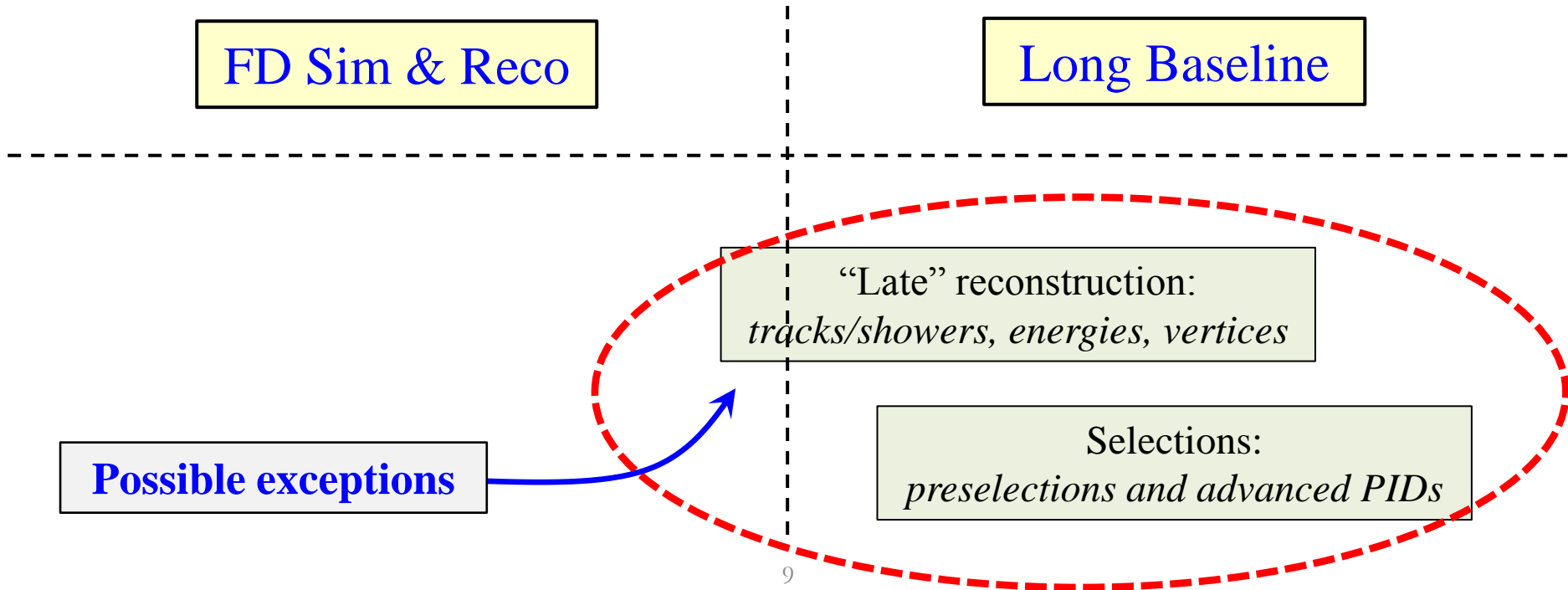
FD Sim & Reco

Long Baseline

“Late” reconstruction:
tracks/showers, energies, vertices

Selections:
preselections and advanced PIDs

- **Possible exceptions** might be:
 - reco software infrastructure issues with no algorithmic impact
 - truly undirected R&D [*Carefully coordinated! Will it advance things on TDR timescales?*]
 - dedicated cosmic muon tracking efforts, perhaps [*no other clear home?*]
- Looking through the past year+ of Sim/Reco agendas, I saw no items that fell into a gray area. But I expect some will arise.
- This brings us to one “de-emphasized” synergy...



Charges of Sim/Reco + NDK/Atmos/Cosmo

- **Previously**, all reco/PID efforts were centralized in the Sim/Reco group
 - *the philosophy was to feed all physics groups simultaneously*
 - *this is likely how we'll want to structure ourselves some years from now*
- **Now**, we are effectively forking the reco/PID efforts

Philosophy: we will not “solve” the general LAr TPC reconstruction/PID problem for all DUNE high- E analyses on a TDR timescale.

- *The LBL group will need to start making analysis-specific decisions about reco*
- *The NDK group will need to start making analysis-specific decisions about reco*

(cont'd)

- All groups need a **faster turnaround** on the specific reco issues that effect *them*.
- **Example: obviously wrong vertexing for $p \rightarrow K\bar{\nu}$ events**
 - Not easily solved (or relatively prioritized) in a “general reco” context
 - Straightforward to attack for the specific physics goal, and a reasonably sized task for a WG member (*assuming appropriate training through “hack days”, etc.*)
- **Culture:** individual groups will have a **stronger sense of ownership** of the reco
 - *Can bring more personnel to reco work if the reco isn't a vaguely understood piece of code being developed “over there”, but rather a central part of the work of the physics group.*
- Where **cross-pollination between groups** is beneficial, the Sim/Reco Conveners and the Physics Coordinators are charged with ensuring that it happens efficiently.

Notes

- **This is a big change in workflow for the groups discussed so far.**
- **NDK/Atmos/Cosmo** groups have had a lot of reco activity lately, so the change is perhaps less abrupt.
- The **LBL** group has not had much:
 - Moving forward, reco/PID/selections/etc. discussion **should dominate LBL mtgs.**

Other groups are a little different...

ND Physics WG

- **Essentially decoupled from these changes**

Low-E/SN

- **Already operating this way:**
 - internally developed reco, energy estimation, etc.
 - also: MARLEY generator (part of SN group charge, not Sim/Reco group)

BSM/Exotics

- By and large, BSM group will **not be developing reconstruction**
- For most signatures, they can eventually draw on the work developed elsewhere
- In the near term, will continue to use cheated/parameterized reconstruction
(and possibly into the TDR itself)
- Main TDR deliverable for BSM group is showcasing new physics opportunities, not demonstrating that the baseline detector design works

ProtoDUNEs

- **ProtoDUNE Sim/Reco** remains its own group
- Is **closely coordinating** its meetings with FD Sim/Reco:
 - lots of overlap on **simulation needs**
 - lots of overlap on **“early” reconstruction needs**
- Later stages of reco/PID diverge somewhat from FD:
 - In ProtoDUNEs: pileup, trigger connections, single-track interactions, known particle types, known particle trajectories...

Parameterized MC

- The existing fast MC, or a suitable replacement, is **needed by the BSM group**
- It's also **needed by *all* groups** for patching holes come TDR crunch time.
- It's a topic for another day, but we'll need to work out how best to **keep this line of effort healthy**

Additional practical issues

- ...in slides for the next agenda item (*e.g., getting new folks ramped-up, etc.*)