LBNE Software and Computing Face-to-Face Meeting

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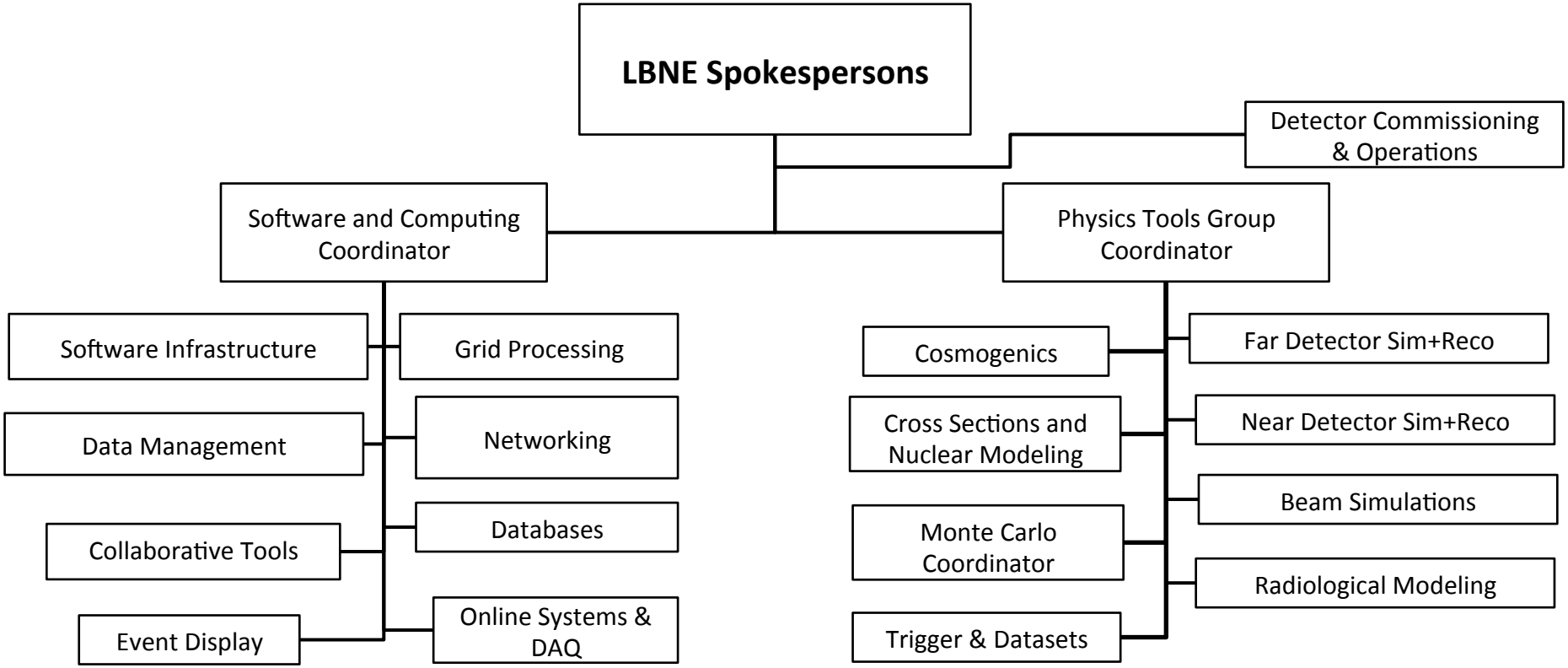
Fermilab

November 13-14, 2013

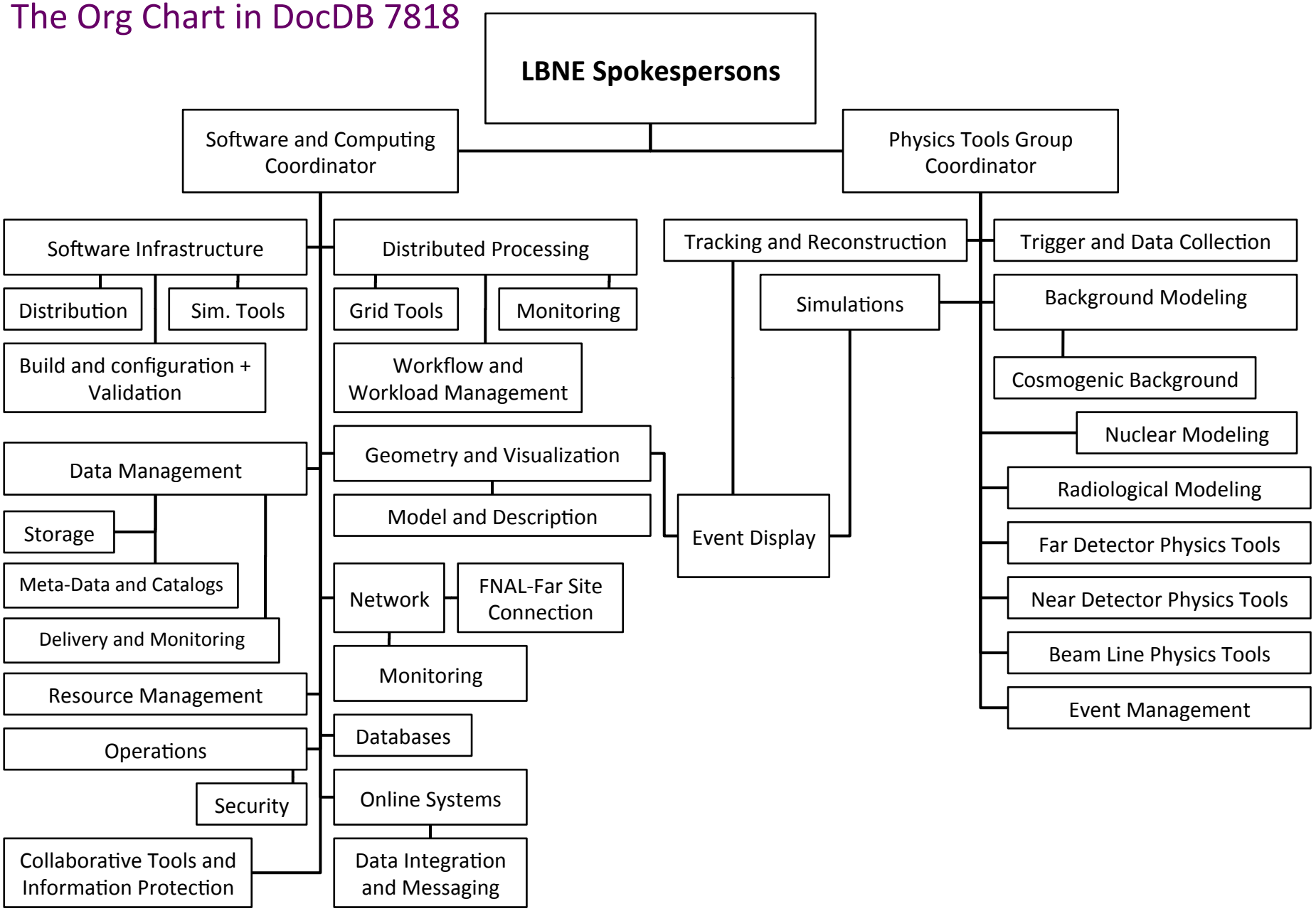
- The Computing Group – Who's Who
- Deliverables and Timeline for the Next Year
- Longer-Term Future
- Agenda for the Meeting

A More Compact LBNE Software and Computing Organization Chart For Interim Use – To Get us Through 35 t Commissioning & Operations



Positions have enough to do to need co-coordinators.
Most boxes correspond to groups of people; subgroups are not shown.

The Org Chart in DocDB 7818



Deliverables and Timeline

- **Software and Computing Pre-Plan**: See LBNE DocDB 7818. Delivered for the September, 2013 Collaboration meeting. Given to DOE on **Sep. 23, 2013**
  Lists work areas in S&C, as well as Physics Tools.

- **DOE Review May 12 – 16, 2014**
  - Three days of review of R&D projects
  - Two days of Software and Computing Review (Includes Physics Tools)
  - S&C Deliverables
    - Requirements Document
    - Organization Chart – complete with names in boxes.
    - Plan for 35t data taking and analysis (see deliverables under 35t)
    - Effort levels needed between the Review and CD-2
    - Current Status of deliverables
    - Current Effort and Resource Distribution
    - Storage and CPU needs for 35 t – MC, data, production, and user analysis
  - Physics Tools Deliverables
    - List of projects needed to be complete for CD-2
      - See list under CD-2 Deliverables and DocDB 7818
    - Current Status of Deliverables
    - Current Effort levels by task, and Required Effort
    - Schedule for meeting CD-2 Deadline
    - Storage and CPU needs to accomplish CD-2 tasks

Deliverables and Timeline

- **35 t Data Taking: October 2014**
  - Take data for "two months"
  - Analyze data until CD-2
  - Deliverables:
    - DAQ
    - Conditions Database
    - Run Control
    - Trigger Optimization for the measurements we want to make
      - Scintillator Paddles
      - Internal Photon Detector Trigger
      - Software trigger using TPC data, Photon Detectors, and Paddles as needed
    - DQM
    - Control-Room Tools: (logbook)
    - Data Compression
    - Data storage needs
    - Data distribution and access for analysis
    - Collaboration tools: Web pages, document and meeting handling, e-mail lists and archiving, support for analysis and publication review

Deliverables and Timeline

- **CD-2: 2016 (2017?)**. Or, "whenever we get $150M." – J. Stewart
  Deliverables:

  - Full GEANT4 Simulation and Automatic Reconstruction of the FD
    with prototype analyses capable of showing the sensitivity to the physics goals of LBNE:
    - Mass Hierarchy and δ_{CP} using the beam (and atmospherics)
    - Measurement of θ_{23} and determination of its octant
    - Nucleon Decay Search
    - Atmospheric Neutrino Measurements
    - Supernova Neutrino Physics
    - Non-Standard Interactions and Exotic Neutrino Physics
    - Verification/Adjustment of detector requirements in order to meet the physics goals
    - Cosmogenic background simulation and Cut/Analysis Optimization
    - Noise and Radiologicals modeling
    - Performance metrics: Detection efficiency by particle, detector and analysis cut acceptance, PID performance, and energy/angle/position resolutions by particle type. Performance on neutrino scattering events. Full list in DocDB 7818

Deliverables and Timeline

CD-2 (2016—2017) Deliverables, Cont'd

- Full GEANT4 Simulation of the Beamline
  - Prediction of Flux (weighted ntuples)
  - Evalulation of Systematic uncertainties
    - Beam component alignment
    - Nuclear effects
  - Verification/Adjustment of tolerance requirements in order to meet the physics goals – Will be needed well in advance of CD-3A (before CD-2) These can be most easily propagated through to the final sensitivities using the FastMC group's tools

Deliverables and Timeline

CD-2 (2016—2017) Deliverables, Cont'd

- Full GEANT4 Simulation of the ND
  - Strategy for using ND data and FD data together to constrain oscillation parameters
    See, for example, T2K: K Abe *et al.*, Phys. Rev. D **88**, 032002 (2013)
  - List of physics topics achievable with the ND, and prototype analyses using the G4-simulations of the ND data to show sensitivity
    Question – which topics require large data samples and thus take many years of data?

- Analyzed 35t Prototype results – tuned simulation to the data.
  - Ionization response
  - Purity estimate and inclusion in simulation and reconstruction
  - Calibration procedures
  - Energy response for muons and electrons
  - Photon detector calibration
  - Response inside and between APA's

- Comparing results with LArIAT – making sure that what LArIAT learns makes it into or simulations and analysis strategies

Deliverables and Timeline

CD-2 (2016—2017) Deliverables, Cont'd

- Software and Computing Requirements – DocDB 8035
  A section of the TDR should be devoted to this

- Design of the Experiment Data Acquisition and Analysis Structure
  Beam, ND, FD data storage, access, analysis, archiving. For the TDR

- Documentation! TDR chapters on Physics Tools and Software and Computing

A List of Who is Working on What in Physics Tools

List compiled September 2013, does not include Physics Working Group people.

Compiled from DocDB, meeting attendance. May be incomplete

FD Simulation

Geometry
Tyler Alion (SC)
Xinchun Tian (SC)
Sanjib Mishra (SC)
Mike Kirby (FNAL)
Tom Junk (FNAL)
Brian Rebel (FNAL)
Zepeng Li (Duke)

Electron Drift
Brian Rebel (FNAL)
Eric Church (FNAL)
Matthew Szydagis (UC Davis)
Jonathan Insler (LSU)
Tom Junk (FNAL)

Photon Production and Detector Simulation
Zepeng Li (Duke)
Kate Scholberg (Duke)
Dave Muller (SLAC)
Ben Jones (MIT)
Matt Szydagis (UC Davis)
Eric Church (Yale)
Brian Rebel (FNAL)
Alex Himmel (CIT)
Craig Thorn (BNL)
Stan Seibert (Penn, moved on)
Josh Klein (Penn)
Stuart Mufson (Indiana)

Radiologicals
Tom Junk (FNAL)
Vic Gehman (LBNL)
Xinhua Bai (SDSMT)
Emily Dvorak (SDSMT)
Douglas Tiedt (SDSMT)
Luke Corwin (SDSMT)

Electric/Magnetic Field tools
David McKee (moved on)

Producing Samples
Tom Junk (FNAL)
Zepeng Li (Duke)

A List of Who is Working on What in Physics Tools

FD Reconstruction

New effort: Dan Ruterbories (CSU)

FD Event Display
Brian Rebel (FNAL)
Zepeng Li (Duke)
Seongtae Park (UTA)

FD Event Scanning
Sanjib Mishra (SC)
Libo Jiang (SC)
Tyler Alion (SC)
Andrzej Szelc (Yale)
Kayla Hasbrouck (SC)
Andrew Svenson
Jae Kim (SC)
Xinchun Tian (SC)

Hit Processing
Jonathan Insler (LSU)

Hit-finding Characterization
Jonathan Insler (LSU)
Kevin Wood (SC)
Tyler Alion (SC)

Disambiguation Algorithms
Tyler Alion (SC)
Jae Kim (SC)

Clustering
Andy Blake (Cambridge)
Mark Thompson (Cambridge)
John Marshall (Cambridge)
Ben Carls (FNAL) (MicroBooNE, plays an advisory role)
Andrzej Szelc (Yale)

Calorimetry
Andrzej Szelc (Yale)
Kevin Wood (SC)
Sanjib Mishra (SC)

Tracking
Andy Blake (Cambridge)
Mark Thompson (Cambridge)
John Marshall (Cambridge)
Herb Greenlee (FNAL) (MicroBooNE)
Eric Church (Yale)

A List of Who is Working on What in Physics Tools

FD Reconstruction (cont'd)

dE/dx reconstruction/PID

J. Insler (LSU)

Bruce Baller's the expert on ArgoNeuT

Muon charge sign from absorption

Richard Imlay (LSU)

Energy Calibration -- electrons

Kevin Wood (SC)

Sanjib Mishra (SC)

Energy Calibration -- muons

No one specific to LBNE yet -- range and multiple scattering techniques

Energy Calibration -- other particles

Protons, pions, kaons – need personnel

Energy Calibration -- reconstruction of neutrino energy

Needed. But this is down the road from the above tasks. Maybe it can be worked on making assumptions on the reco of the particles. FastMC does this.

Photon detector reconstruction

Zepeng Li (Duke)

Kate Scholberg (Duke)

Stan Seibert (Penn)

Low-Energy Reco & nuclear de-excitation gammas

Kate Scholberg (Duke)

Zepeng Li (Duke)

Mike Smy (UC Irvina)

Bob Svoboda (UC Davis)

Reconstructing ICARUS Events

Need person(s). And events.

E/γ Separation

Matthew Szydagis (UC Davis)

Daniel Coelho (UC Davis)

Bob Svoboda (UC Davis)

A List of Who is Working on What in Physics Tools

Prototypes and R&D

35T Simulation
Same as the FD simulation team

35T Physics targets
Alan Hahn (FNAL)
Mark Convery (SLAC)
Michelle Stancari (FNAL)

35T Reconstruction
Seongtae Park (UTA)
Mark Convery (SLAC)
Ion Stancu (Alabama)

Long Bo Reconstruction
Michelle Stancari (FNAL)

Prototype Simulation

CSU Dewar
Norm Buchanan (CSU)
Ryan Wasserman (CSU)
Andrea Shacklock (CSU)

IU Dewar
Stuart Mufson (Indiana)
Denver Whittington (Indiana)
Ted Baptista (Indiana)
Brice Adams (Indiana)

LBL
Vic Gehman (LBL)

Argonne
Zelimir Djurcic (ANL)
Gary Drake (ANL)
Himansu Sahoo (ANL)

Los Alamos
Christopher Mauger (LANL)

A List of Who is Working on What in Physics Tools

Near Detector Physics Tools

ND Simulation/Reconstruction

Kevin Yarritu (Los Alamos)
Bipul Bhuyan (IIT Guwahati)
Ashok Kumar (Panjab)
Xinchun Tian (SC)

Muon Monitor simulation

Geoff Mills (Los Alamos)
Matthew Thiesse (Drexel)
Ben Schlitzer (Colorado)
Alysia Marino (Colorado)
Daniel Poulson (Colorado)
Rob Johnson (Colorado)
Matthew Thiesse (Drexel)

ND Physics

Sanjib Mishra (SC)
Hongyue Duyang (SC)
Jorge Morfin (FNAL)
Libo Jiang (SC)
Elena Guardincerri (LANL)
Roberto Petti (SC)

Fast MC

Daniel Cherdack (CSU)
Karl Kaess (Minnesota)
Matthew Hogan (CSU)
Xinchun Tian (SC)
Matt Bass (CSU)
Richard Gran (Minnesota)
N. Deepthi Kochibhatla (SC)
Rukmani Mohanta (SC)
Laura Fields (Northwestern)
Karl Kaess (Minnesota)

A List of Who is Working on What in Physics Tools

Beam Simulations

Kevin Yarritu (Los Alamos)
Laura Fields (Northwestern)
Seongtae Park (UTA)
Paul Lebrun (FNAL)
Amanda Steinhebel (U. CO)
Rob Johnson (U. Colorado)
Dianne Reitzner (FNAL)
Nikolai Mokhov (FNAL)
Alberto Marchionni (FNAL)
Mary Bishai (BNL)
Zeynep Isvan (BNL, moved on)
Jae Yu (UTA, supervising)
Jim Hylen (FNAL)
Sam Childress (FNAL)
Vaia Papadimitriou (FNAL)
Tom Junk (FNAL)
Bob Zwaska (FNAL)
Timothy Watson (UTA)
Amit Bashyal (UTA)
Bernard Nuar (UTA)
Yvonne Ng (UTA)
Joshua Bolton (UTA)

Cosmogenics

Vitaly Kudryavtsev (Sheffield)
Jeff de Jong (Oxford)
Franco La Zia (Catania, BNL)
Martin Richardson (Sheffield)
Gavin Day (Sheffield)
Chao Zhang (U. South Dakota)
Dongming Mei (U. South Dakota)
D'Ann Barker (U. South Dakota)
Gavin Davies (Iowa State)

Cross Sections and Nuclear Modeling

Martin Tzanov (LSU)
Daniel Cherdack (CSU)

A List of Who is Working on What in Software

Software

Tom Junk (FNAL)
Maxim Potekhin (BNL)
Brett Viren (BNL)
Qizhong Li (FNAL)
Craig Tull (LBNL)

Framework

Fermilab ART team -- managers and developers on the Redmine site:
Christopher Green, Jim Kowalkowski, Marc Paterno,
Gennadiy Lukhanin, Kurt Biery, Lynn Garren, Mark Fischler, Paul Russo,
Qiming Lu, Ron Rechenmacher, Saba Sehrish, Steve Foulkes

ART Workbook

Anne Heavey (FNAL)
Jonathan Insler (LSU)

LArSoft

Rick Snider (FNAL)
Brian Rebel (FNAL)
Eric Church (FNAL)
Herb Greenlee (FNAL)

A List of Who is Working on What in Software

Remote Builds

Brett Viren (BNL)
Jim Kowalkowski (FNAL)
Chris Green (FNAL)
Marc Paterno (FNAL)
Lynn Garren (FNAL)
Gavin Davies (NOvA, ISU)
Andy Blake (Cambridge)
Yujing Sun (Alabama)

Data Handling

Qizhong Li (FNAL)

Collaboration tools

Eileen Berman (FNAL)
Anne Heavey (FNAL)

FNAL Computer Accounts

Eileen Berman (FNAL)
Tom Junk (FNAL)
Anne Heavey (FNAL)

Computing Infrastructure (FNAL)

Mike Kirby (FNAL)
Dennis Box,
Steve Timm,
Mark Mengel,
Art Kreymer
Adam Lyon

Databases

Jonathan Paley (ANL)
Eileen Berman (FNAL)
Igor Mandrichenko (FNAL)

Wants to work on software: Amir Farbin (UTA)

Agenda for the LBNE Software and Computing Face-to-Face Meeting

Indico:

https://indico.fnal.gov/conferenceDisplay.py?confId=7640

Wednesday 13 November 2013

Weds Afternoon Session (15:00-17:30)

- Conveners: Dr. Junk, Thomas; Dr. Li, Qizhong; Dr. Potekhin, Maxim; Dr. Viren, Brett

time	[id] title	presenter
15:00	[0] Introduction and Milestones (00h10')	Dr. JUNK, Thomas
15:10	[1] Meeting Goals (00h05')	Dr. POTEKHIN, Maxim
15:15	[2] Physics Tools/Software/Projections (00h30')	Dr. JUNK, Thomas
15:45	[3] Code Refactoring & LArSoft Transition to git and cmake (00h15')	SNIDER, Rick
16:00	Coffee (00h15')	
16:15	[5] FIFE Status (00h15')	Dr. KIRBY, Michael
16:30	[6] DAQ Status & Implications for S Reqirements (00h45')	GRAHAM, Mathew
17:15	[7] Remote Build/Topics for Thursday (00h15')	Dr. VIREN, Brett

Thursday 14 November 2013

ART Technical Meeting - WH1E (09:00-10:45)

- Conveners: Mr. Kowalkowski, Jim; Dr. Viren, Brett

Focus Meeting: WBS (10:45-11:45)

- Conveners: Dr. Junk, Thomas; Dr. Potekhin, Maxim; Dr. Malon, David; Dr. Viren, Brett; Dr. Paley, Jonathan

Lunch (11:45-12:30)

Meeting with the SAM Team - FCC2B (12:30-13:30)

- Conveners: Dr. Li, Qizhong

time	[id] title	presenter
12:30	[16] SharePoint Agenda (01h00')	Dr. LI, Qizhong Dr. LYON, Adam Ms. BERMAN, eileen

Thurs Afternoon Session - FNAL Bld 327, Long Baseline (13:30-16:00)

- Conveners: Dr. Junk, Thomas; Dr. Potekhin, Maxim; Dr. Viren, Brett; Dr. Li, Qizhong

time	[id] title	presenter
13:30	[8] S Requirements (00h40')	Dr. VIREN, Brett Dr. JUNK, Thomas
14:10	[9] LBNE Job Wrapper (00h10')	Dr. POTEKHIN, Maxim
14:20	[10] Data Management Status and Plans (00h10')	Dr. LI, Qizhong
14:30	[11] Experience with large scale distributed data management and Meta-Data (00h20')	Dr. MALON, David
14:50	Coffee (00h10')	
15:00	[12] Worch: A Toolkit for building LBNE Software (00h20')	Dr. VIREN, Brett
15:20	[13] Proposed WBS Items (00h10')	Dr. POTEKHIN, Maxim
15:30	[14] Thoughts on geometry model and description (00h15')	Dr. VIREN, Brett Dr. POTEKHIN, Maxim
15:45	[15] General Discussion (00h15')	