

Contents

2	Contents	i
3	List of Figures	v
4	List of Tables	vii
5	I Overview	2
6	1 Introduction (<i>Schellman/Muether/Junk/Pennacchio needs numbers and figures update - SN</i>	
7	<i>added 2/19</i>)	3
8	1.1 Mission Statement	4
9	1.2 Introduction (<i>Schellman - draft based on CHEP paper</i>)	4
10	1.3 ProtoDUNE tests at CERN (<i>Schellman/Pennacchio-draft</i>)	6
11	1.4 On to full DUNE (<i>Schellma-draft</i>)	15
12	1.5 Near Detector (<i>Junk/Muether - needs update</i>)	18
13	1.6 Relation of Physics Goals to Offline Computing Challenges (<i>Schellman-draft</i>)	20
14	1.7 Summary of Challenges (<i>Schellman-draft</i>)	22
15	2 Computing Organization Steve Timm	23
16	2.1 Internal organization	25
17	2.2 Funding Sources for Computing Development	25
18	II Single interaction scale	26
19	3 Use Cases Doug Benjamin	27
20	3.1 Introduction (<i>Schellman - draft</i>)	27
21	3.2 Data Acquisition and Storage(<i>Schellman - draft</i>)	27
22	3.3 Simulation Chain (<i>Junk and Schellman - draft</i>)	29
23	3.4 Reconstruction(<i>Junk, Muether and Schellman-draft</i>)	39
24	3.5 Visualization	42
25	3.6 Event Classification	48
26	3.7 Analysis of reduced data samples	51
27	3.8 Additional Activities - (<i>needs checking for completeness</i>)	55
28	4 Data Formats Andrew McNab	59

1	4.1	Introduction (<i>Schellman - draft</i>)	59
2	4.2	Data tiers (<i>Schellman - add a discussion here</i>)	59
3	4.3	I/O formats (<i>Schellman/Bashyal - draft</i>)	60
4	5	Frameworks (<i>Norman, Laycock, Muether</i>) Andrew McNab	61
5	5.1	Defining a Framework	61
6	5.2	Current status (<i>Junk/Muether - draft</i>)	63
7	5.3	Framework Requirements (<i>Laycock/Norman - needs update</i>)	64
8	5.4	Timeline (<i>Norman/Laycock needs a lot more</i>)	74
9	6	Databases (<i>Buchanan and Laycock - draft</i>) Kirby	76
10	6.1	Introduction (<i>Buchanan and Laycock - draft</i>)	76
11	6.2	Conditions Database (<i>Buchanan and Laycock - draft</i>)	77
12	6.3	Run Configuration Database (<i>Buchanan and Laycock - draft</i>)	79
13	6.4	Data Quality and Monitoring Database (<i>Buchanan and Laycock - draft</i>)	81
14	6.5	Offline Calibration Database (<i>Buchanan and Laycock - draft</i>)	81
15	6.6	Slow Control Database (<i>Buchanan/Laycock - draft</i>)	81
16	6.7	Beam Conditions Database - IFBeam (<i>Buchanan and Laycock - draft</i>)	82
17	6.8	Hardware Database (<i>Buchanan and Laycock - draft</i>)	82
18	6.9	Service and Maintenance (<i>Buchanan and Laycock - draft</i>)	83
19	6.10	Development Plans (<i>Buchanan and Laycock - draft</i>)	83
20	III	Global Computing Model	85
21	7	Data and Processing Volume Estimates (<i>Schellman, Junk, Muether - started numbers and figures need updating</i>) Doug Benjamin	86
22	7.1	Introduction (<i>Schellman - need a paragraph</i>)	86
23	7.2	Assumptions (<i>Schellman - draft</i>)	86
24	7.3	ProtoDUNE (<i>Schellman - draft</i>)	87
25	7.4	Far Detector Data Volume Estimates (<i>Schellman - draft</i>)	88
26	7.5	Near Detector Data Volumes (<i>Schellman/Muether - needs significant update</i>)	89
27	7.6	Summary (<i>Schellman - needs update</i>)	91
28	8	Overview of Computing Model (<i>McNab - draft</i>) Kirby	93
29	8.1	Introduction (<i>Schellman/Herner - draft, update tables</i>)	93
30	8.2	Current Performance (<i>Schellman/Herner - draft</i>)	93
31	8.3	Sites and Services (<i>McNab - draft</i>)	99
32	8.4	Sites, Federations, and Countries(<i>McNab - draft</i>)	100
33	8.5	Types of Service(<i>McNab - draft</i>)	100
34	8.6	Requirements for Computing Services (<i>McNab - needs work</i>)	101
35	9	Data Management (<i>Timm, Mandrichenko - draft</i>) Kirby	102
36	9.1	Introduction (<i>Timm - draft</i>)	102
37	9.2	Existing SAM Data Management System	102
38	9.3	Requirements for Replacing SAM Functionality (<i>Schellman/Mandrichenko - draft</i>)	103
39	9.4	Data Ingest Manager (<i>Timm - draft</i>)	107
40	9.5	Rucio Replica Manager (<i>Timm - draft</i>)	107
41			

1	9.6	Metadata Catalog (<i>Mandrichenko, Schellman - draft - too long</i>)	108
2	9.7	Metacat Data Model (<i>Timm/Mandrichenko - draft</i>)	109
3	9.8	Data Dispatcher (<i>Mandrichenko/Timm - more needed</i>)	112
4	9.9	Tools (<i>Timm - needs more</i>)	112
5	10	Networking (<i>Mike Kirby and Peter Clarke - in progress</i>) Steve Timm	113
6	11	Workflow Management (<i>McNab</i>) Kirby	117
7	11.1	Introduction (<i>McNab - draft</i>)	117
8	11.2	Current production workflow submission infrastructure (<i>Herner - draft</i>)	117
9	11.3	Workflow Proposal (<i>McNab - draft</i>)	120
10	11.4	Implementation Plan (<i>McNab/Timm/Herner needed</i>)	123
11	IV	Integration and Evolution	124
12	12	Services Overview (<i>Timm - needs more</i>) Tom Junk	125
13	12.1	Introduction	125
14	12.2	Host Lab Provided Services	125
15	12.3	Remote Site Provided Services	125
16	12.4	Cloud Hosted Services	126
17	13	Information Systems (<i>McNab - needed</i>) McNab needs to write	127
18	14	Monitoring (<i>Andrew McNab, Steve Timm, Raja Nandakumar, Jon Hays - in progress</i>)	128
19	14.1	Tools	128
20	14.2	Summary of Assumptions and Resource Requirements	130
21	15	Authentication/Authorization (<i>Timm - draft</i>) Kirby	131
22	15.1	Authentication and Authorization for Distributed Computing (<i>Timm - draft</i>)	131
23	16	Code Management (<i>Tom Junk, Mathew Muether, David Adams - draft</i>) Doug Benjamin	133
24	16.1	Liquid Argon TPC Code Management (<i>Junk/Calcutt - needs update</i>)	133
25	16.2	Near Detector Code Management (<i>Muether/Cremonisi/Junk needs update</i>)	136
26	16.3	Continuous Integration (<i>Junk - draft</i>)	136
27	17	Training and Documentation (<i>David, Kirby - draft</i>) Tom Junk	138
28	17.1	Documentation	138
29	17.2	Training (<i>David, DeMuth, Kirby - draft</i>)	139
30	18	Data Lifetimes and Preservation: (<i>Norman, Clarke, Fuess - needed</i>)	142
31	18.1	Data Management and Preservation . . . Andrew Norman	142
32	V	Conclusions and Resources	144
33	19	Resource Needs Summary Kirby	145
34	19.1	Hardware resources	145
35	19.2	Personnel needs Schellman to add the roles and responsibilities.	145

1	19.3 Summary	145
2	20 Cooperation strategy (Kirby, Schellman, McNab)	147
3	20.1 Cooperation	147
4	21 Computing Contributions Board (CCB) (Peter Clarke - draft)	149
5	Glossary	151
6	References	164

7

Possibly missing - geometry description