



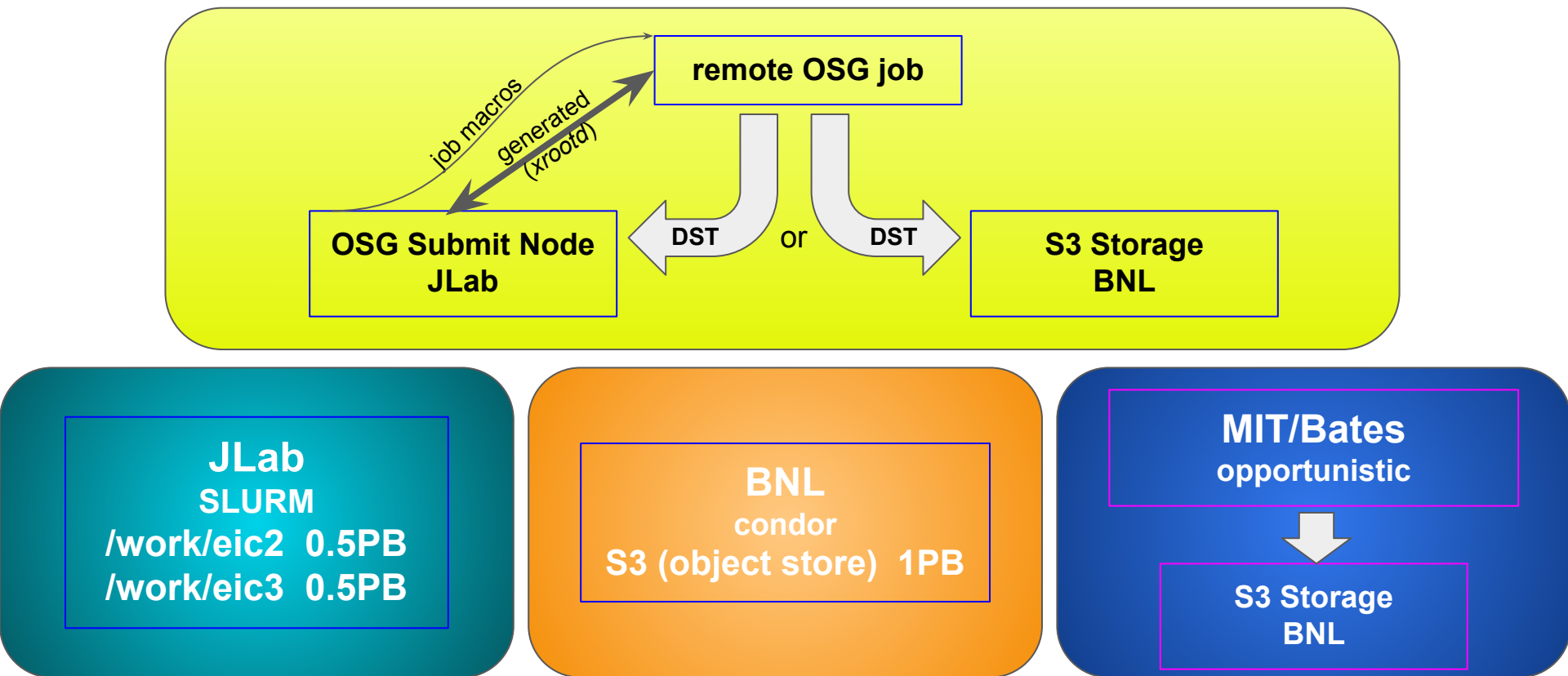
Computing Resources @ JLab and OSG

David Lawrence - Jefferson Lab



ECCE Simulation Workshop
July 8 2021

Multiple sources now configured and available for production



EIC/ECCE Computing Resources

For more information:

[J. Lauret Computing Report at EICUG, 5/20/2021](#)

Storage

- Pledged resources

BNL	1 PB
JLab	1 PB

Availability:

BNL

- physical disk in place, S3 access

JLab

- physical disk in place, local access (+some xrootd)

Compute

- Pledged resources

BNL	2k cores - 4 months (75% time)
JLab	2k cores - 4 months
OSG	4k cores

Availability:

now

- ***All pledged resources are for “EIC” and not for specific proto-collaborations***
 - Fairly allocate between ECCE, ATHENA, CORE, ...
 - UG formation of Computing Coordination Group (CCG)
 - Committee forming but no word on allocation fractions (may not be needed)
 - Start with administrative controls for quota management

ECCE Compute Estimate

2 jobs run on OSG nodes

Default events from tutorial

https://www.phenix.bnl.gov/WWW/publish/phnxbld/sPHENIX/files/sPHENIX_G4Hits_sHijing_9-11fm_00000_00010.root

Total committed by $[(\text{BNL} + \text{JLab}) * 75\% + \text{OSG}] / 2 = 4\text{k cores} \times 4 \text{ months} (\times 75\%) = \mathbf{10 \text{ Mcore-hrs}}$

expect ~ 1/2 for ECCE

102 Events - avg. time : 2,644 sec (single thread)	}	time/event: 24.3 sec overhead: 166 sec
2 Events - avg. time : 215 sec (single thread)		

for 2.25B events:

15.2 Mcore-hrs for event simulation

51.9 kcore-hrs for overhead (program startup and shutdown)

assume 2k events/job

for 1.0B events:

6.8 Mcore-hrs for event simulation

23.1 kcore-hrs for overhead (program startup and shutdown)

Original estimate for 2021 ECCE storage requirement

- sPHENIX mock data challenge: 100M pp events -> 130TB
- Estimate 1B events needed for proposal development -> 1.3PB
- Include contingency for larger eA event size, etc ... -> 2PB

1M event test sets

	pythia6 - general	pythia6 - SIDIS	pythia6 - HF & Jets
DST	159GB	220GB	177GB
Evaluator	59GB	78GB	60GB
Total	218GB	298GB	237GB

↑ 4.3x smaller than sPHENIX MDC numbers

VERY PRELIMINARY

	factor	units	err on value	err on total
Total ep σ	45	μb	0	0
Integrated luminosity	5	fb-1	0	0
Fraction of total σ /physics chan.	1.00E-02		1.00E-02	2.25E+00
Frac. signal events needed for simulation	2.00E-02		2.00E-02	2.25E+00
Num. physics generators to simulate	25		5	0.45
Num. detector configurations to simulate	2		1	1.125
Total number of events to simulate	2.25 <i>Bevents</i>	billion events		<i>contingency</i> 3.4 <i>Bevents</i>
Event size	300	kB/event	150	0.34
Total number of events	2.25	billion events	3.4	1.02
Total storage	0.675 <i>PB</i>	PB		<i>contingency</i> 1.08 <i>PB</i>

Cameron's SIDIS 1M event test

Estimate + 1σ
=
1.7PB

How much do we really need?

Wikipage has table that is most accurate tally right now:

https://wiki.bnl.gov/eicug/index.php/ECCE_Simulations_Working_Group

(as of this morning, it adds up to ~250M events)

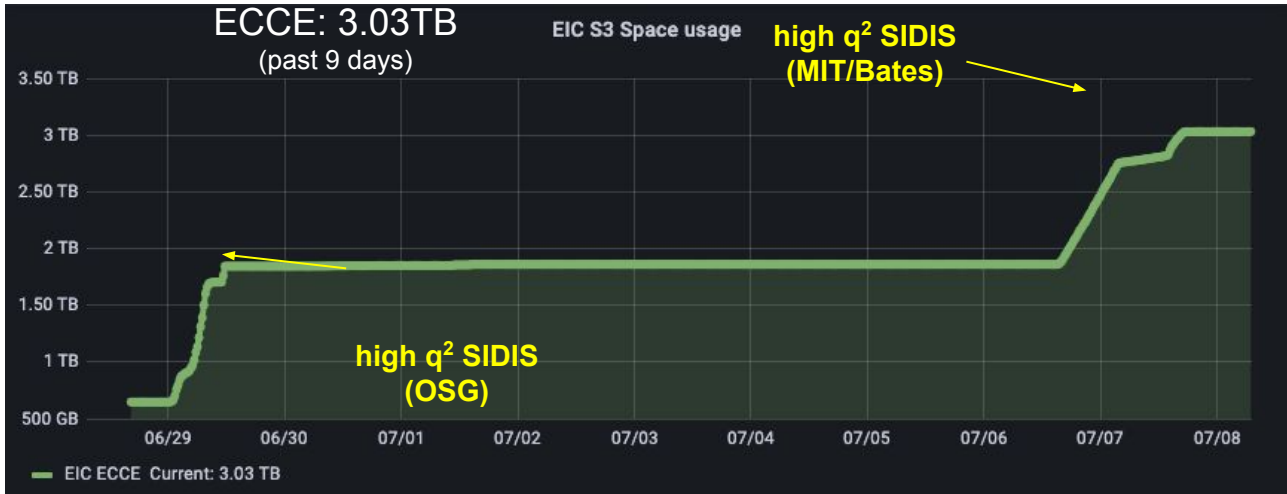
	Number of events	Storage needed (upper limit based on SIDIS)
original guesstimate	1B events	~0.3 PB
very rough estimate	2.25B events	~0.675 PB (+1PB)
wiki table	2x250M = 0.5B events	~0.15PB

*does not
account for
multiple
evaluator
passes*

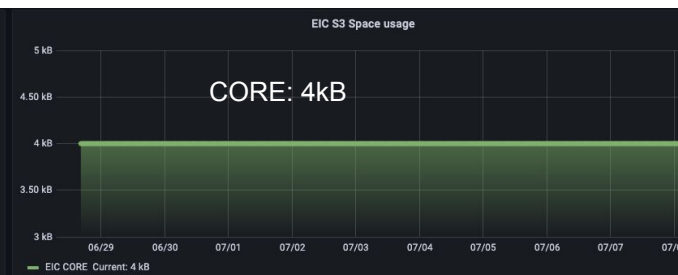
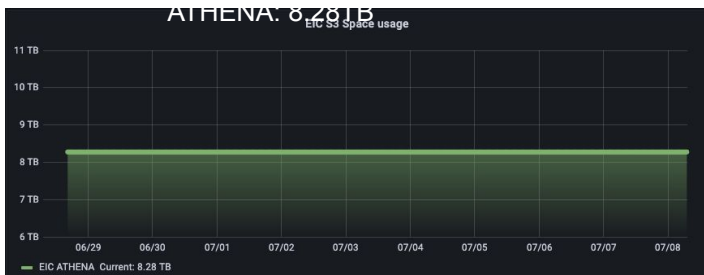
*assume 2nd campaign
and first are the same*

BNL S3 Storage

```
> alias mc=cvmfs/eic.opensciencegrid.org/ecce/gcc-8.3/opt/fun4all/utils/bin/mcs3
> mc config host add eic https://dtn01.sdcc.bnl.gov:9000/ eicS3read eicS3read
> mc ls S3/eictest/ECCE/MC/ana.14/5f210c7/SIDIS/pythia6/ep_18x100highq2/eval_00000/
```



2021-06-29 07:12:50 EDT	4.0MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0090000	01000	g4fncal_eval.root
2021-06-29 07:12:49 EDT	5.2MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0090000	01000	g4fncal_eval.root
2021-06-29 07:12:49 EDT	5.0MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0090000	01000	g4fncalot_eval.root
2021-06-29 07:12:53 EDT	736KB	DST	SIDIS	pythia6	ep_18x100highq2	039	0090000	01000	g4tracking_eval.root
2021-06-29 06:04:03 EDT	29MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0091000	01000	g4cmc_eval.root
2021-06-29 06:04:05 EDT	2.3MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0091000	01000	g4cmc_eval.root
2021-06-29 06:04:02 EDT	4.0MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0091000	01000	g4event_eval.root
2021-06-29 06:04:04 EDT	4.2MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0091000	01000	g4fncm_eval.root
2021-06-29 06:04:05 EDT	4.3MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0091000	01000	g4fncal_eval.root
2021-06-29 06:04:03 EDT	5.2MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0091000	01000	g4fncal_eval.root
2021-06-29 06:04:04 EDT	5.8MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0091000	01000	g4fncalot_eval.root
2021-06-29 06:04:06 EDT	754KB	DST	SIDIS	pythia6	ep_18x100highq2	039	0091000	01000	g4tracking_eval.root
2021-06-29 06:07:11 EDT	29MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0092000	01000	g4cmc_eval.root
2021-06-29 06:07:14 EDT	2.3MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0092000	01000	g4cmc_eval.root
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2021-06-29 06:07:13 EDT	4.2MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0092000	01000	g4fncal_eval.root
2021-06-29 06:07:11 EDT	5.2MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0092000	01000	g4fncalot_eval.root
2021-06-29 06:07:12 EDT	5.7MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0092000	01000	g4fncalot_eval.root
2021-06-29 06:07:14 EDT	739KB	DST	SIDIS	pythia6	ep_18x100highq2	039	0092000	01000	g4tracking_eval.root
2021-06-29 01:59:47 EDT	29MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0093000	01000	g4cmc_eval.root
2021-06-29 01:59:54 EDT	2.3MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0093000	01000	g4cmc_eval.root
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2021-06-29 01:59:53 EDT	4.3MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0093000	01000	g4fncalot_eval.root
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2021-06-29 01:51:30 EDT	29MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0094000	01000	g4cmc_eval.root
2021-06-29 01:51:33 EDT	2.3MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0094000	01000	g4cmc_eval.root
2021-06-29 01:51:30 EDT	4.0MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0094000	01000	g4fncm_eval.root
2021-06-29 01:51:36 EDT	4.2MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0094000	01000	g4fncal_eval.root
2021-06-29 01:51:33 EDT	5.2MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0094000	01000	g4fncalot_eval.root
2021-06-29 01:51:39 EDT	5.8MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0094000	01000	g4fncalot_eval.root
2021-06-29 01:51:40 EDT	736KB	DST	SIDIS	pythia6	ep_18x100highq2	039	0094000	01000	g4tracking_eval.root
2021-06-29 01:55:03 EDT	29MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0095000	01000	g4cmc_eval.root
2021-06-29 01:55:10 EDT	2.3MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0095000	01000	g4cmc_eval.root
2021-06-29 01:55:01 EDT	4.0MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0095000	01000	g4fncm_eval.root
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2021-06-29 01:55:06 EDT	5.8MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0095000	01000	g4fncalot_eval.root
2021-06-29 01:55:11 EDT	742KB	DST	SIDIS	pythia6	ep_18x100highq2	039	0095000	01000	g4tracking_eval.root
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2021-06-29 01:55:39 EDT	29MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0097000	01000	g4cmc_eval.root
2021-06-29 01:55:47 EDT	2.3MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0097000	01000	g4cmc_eval.root
2021-06-29 01:55:37 EDT	4.0MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0097000	01000	g4fncm_eval.root
2021-06-29 01:55:44 EDT	4.2MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0097000	01000	g4fncal_eval.root
2021-06-29 01:55:45 EDT	4.3MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0097000	01000	g4fncalot_eval.root
2021-06-29 01:55:40 EDT	5.2MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0097000	01000	g4fncalot_eval.root
2021-06-29 01:55:42 EDT	5.7MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0097000	01000	g4fncalot_eval.root
2021-06-29 01:55:40 EDT	734KB	DST	SIDIS	pythia6	ep_18x100highq2	039	0097000	01000	g4tracking_eval.root
2021-06-29 01:51:40 EDT	29MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0099000	01000	g4cmc_eval.root
2021-06-29 01:51:49 EDT	2.3MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0099000	01000	g4cmc_eval.root
2021-06-29 01:51:45 EDT	4.0MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0099000	01000	g4fncm_eval.root
2021-06-29 01:51:48 EDT	4.2MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0099000	01000	g4fncal_eval.root
2021-06-29 01:51:46 EDT	5.2MB	DST	SIDIS	pythia6	ep_18x100highq2	039	0099000	01000	g4fncalot_eval.root



- NOT Amazon S3
- object store (must copy entire file out in order to read)

JLab Storage

- 2 new work directories:
 - `/work/eic2` (0.5PB)
 - `/work/eic3` (0.5PB)
 - (don't use `/work/eic` for large file sets -- limited space)
- Put your stuff in:
 - `/work/eic2/ECCE/users`
- Production simulations can be found in:
 - `/work/eic2/ECCE/MC`
 - `/work/eic3/ECCE/MC`
 - `/work/osgpool/eic/ECCE/MC` (*select evaluators only*)

xrootd: remote file access

- Install xrootd : <https://xrootd.slac.stanford.edu/>
 - e.g. yum install xrootd
- Set environment variable:
 - export LD_PRELOAD=/usr/lib64/libXrdPosixPreload.so
 - export LD_PRELOAD=\$ROOTSYS/lib/libXrdPosixPreload.so
- Use normal tools
 - ls root://sci-xrootd.jlab.org//osgpool/eic
 - root root://sci-xrootd.jlab.org//osgpool/eic/ECCE/MC/ana.14/5f210c7/
SIDIS/pythia6/ep_18x100highq2/eval_00000/DST_SIDIS_pythia6_ep_1
8x100highq2_027_0037000_01000_g4tracking_eval.root

n.b. double '/' is not a typo!

/work/osgpool = root://sci-xrootd.jlab.org//osgpool/eic

at JLab

everywhere else

Utilizing BNL and JLab storage for OSG jobs

- JLab
 - Use built-in GridFTP mechanism
 - files copied back to `/work/eic2` or `/work/eic3`
- BNL
 - Write to S3 storage from remote node
 - Minio client installed in `/cvmfs/eic.opensciencegrid.org/ecce/gcc-8.3/opt/fun4all/utils/bin/mcs3`
 - Authentication:
 - transfer script from secure area with job
 - run script using modified HOME to install secrets in cwd on remote node
 - delete `“.mcs3”` (aka `“.mc”`) directory when job finishes
- <https://github.com/ECCE-EIC/productions/tree/master/OSG>

ECCE OSG Production Scripts

These scripts are used to submit and run ecce simulation production jobs on the OSG. They were developed at JLab using the scosg16 submit node.

The simulation output can be directed to go either to JLab storage or BNL S3. This is specified by editing the makeOSGJobs.py script and modifying the line in class pars to be something like one of these:

```
simulationsTopDir = 'S3://eictest/ECCE/MC'  
simulationsTopDir = '/work/eic2/ECCE/MC'
```

If set to the first value, the output files will be pushed to BNL S3 storage straight from the remote OSG node. The files be placed in a directory tree starting with "eictest/ECCE/MC". All subdirectories will be automatically created.

If the second form in the above examples is used then the files will be sent back to JLab where they will be stored in the specified directory.

S3 Write access

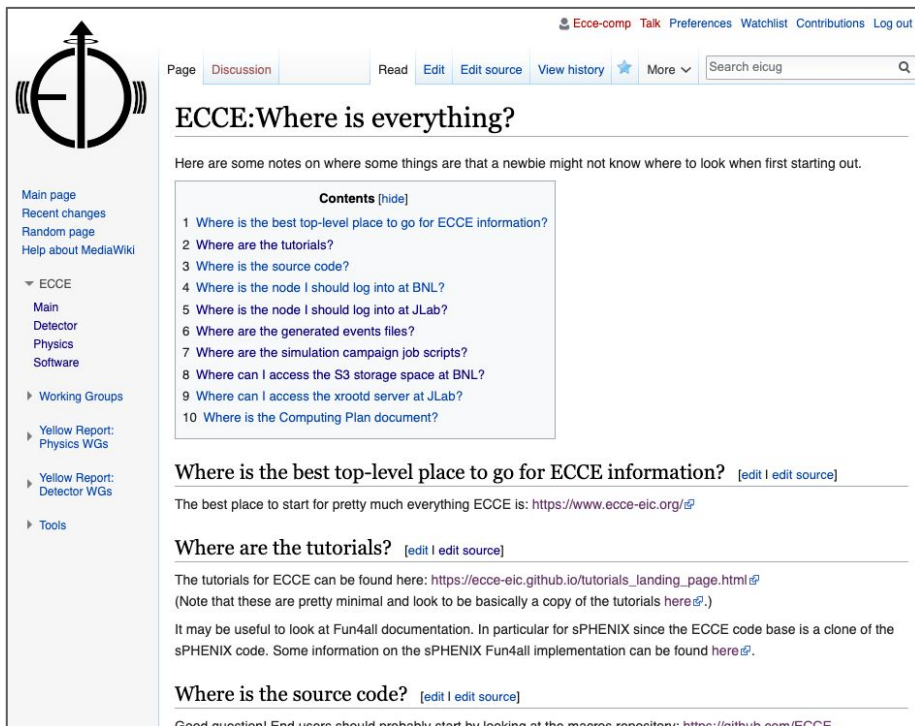
The BNL S3 storage can be accessed from anywhere, but requires a username/accesskey pair with write privileges if one wishes to write to it. These are currently limited to only a few people. The way this works is the copy_to_S3.py file must be copied to the directory where the condor_submit command is being executed from and modified to include the secret information. For example

```
cp OSG/copy_to_S3.py .  
chmod 700 copy_to_S3.py  
<edit copy_to_S3.py to include write-authorized username/accesskey>  
condor_submit path/to/file.job
```

Condor will take care of securely transferring the "copy_to_S3.py" file to the remote site. At the end of the job, the script is run where it will copy all of the files back. The "copy_to_S3.py" script will set the HOME directory to the local working directory so the minio client will only write the secret information locally. It will also remove the configuration just before the script exits to ensure the secret information is not left on the remote job node.

Where is Everything? wiki page

https://wiki.bnl.gov/eicug/index.php/ECCE:Where_is_everything%3F



The screenshot shows a MediaWiki page titled "ECCE:Where is everything?". The page has a sidebar on the left with navigation links: Main page, Recent changes, Random page, Help about MediaWiki, and a list of ECCE-related topics (Main, Detector, Physics, Software, Working Groups, Yellow Report: Physics WGs, Yellow Report: Detector WGs, Tools). The main content area has a top navigation bar with links like "Page", "Discussion", "Read", "Edit", "Edit source", "View history", and a search box. Below the navigation bar is a table of contents for the page, listing 10 items. The first item, "Where is the best top-level place to go for ECCE information?", is expanded, showing a paragraph of text and a link to the ECCE website. The second item, "Where are the tutorials?", is also expanded, showing a paragraph of text and a link to the ECCE tutorials page. The third item, "Where is the source code?", is expanded, showing a paragraph of text and a link to the ECCE code repository.

ECCE:Where is everything?

Here are some notes on where some things are that a newbie might not know where to look when first starting out.

Contents [hide]

- 1 Where is the best top-level place to go for ECCE information?
- 2 Where are the tutorials?
- 3 Where is the source code?
- 4 Where is the node I should log into at BNL?
- 5 Where is the node I should log into at JLab?
- 6 Where are the generated events files?
- 7 Where are the simulation campaign job scripts?
- 8 Where can I access the S3 storage space at BNL?
- 9 Where can I access the xrootd server at JLab?
- 10 Where is the Computing Plan document?

Where is the best top-level place to go for ECCE information? [edit | edit source]

The best place to start for pretty much everything ECCE is: <https://www.ecce-eic.org/>

Where are the tutorials? [edit | edit source]

The tutorials for ECCE can be found here: https://ecce-eic.github.io/tutorials_landing_page.html

(Note that these are pretty minimal and look to be basically a copy of the tutorials [here](#).)

It may be useful to look at Fun4all documentation. In particular for sPHENIX since the ECCE code base is a clone of the sPHENIX code. Some information on the sPHENIX Fun4all implementation can be found [here](#).

Where is the source code? [edit | edit source]

Good question! End users should probably start by looking at the macros repository: <https://github.com/ECCE->