

LSU

LOUISIANA STATE UNIVERSITY



WireCell Samples

SBND Wirecell Meeting

Prabhjot Singh, 16 April 2026

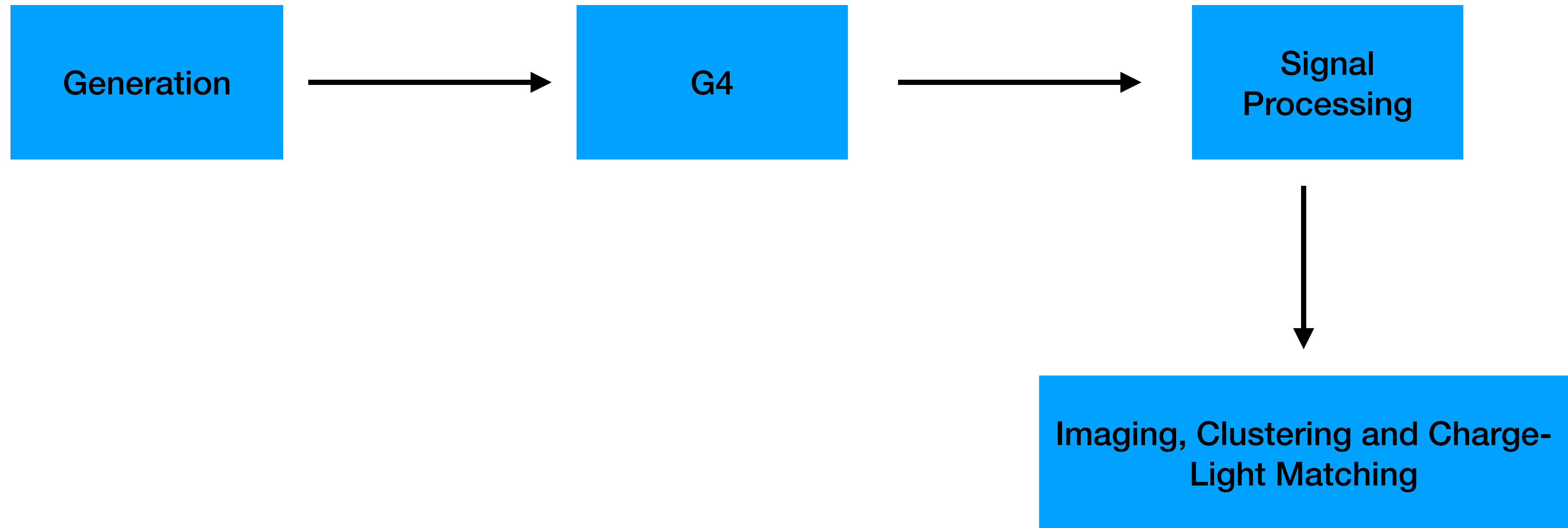
What am I doing

- I am trying to create latest wirecell reconstructed files using latest wirecell code version
- Cluster evaluation scripts are ready. We tested it on some clusters. They were tested on older wirecell version files and they only had imaging-clustering, no charge-light matching
- Our evaluation scripts are now ready to check the performance of latest wirecell version especially including charge-light matching

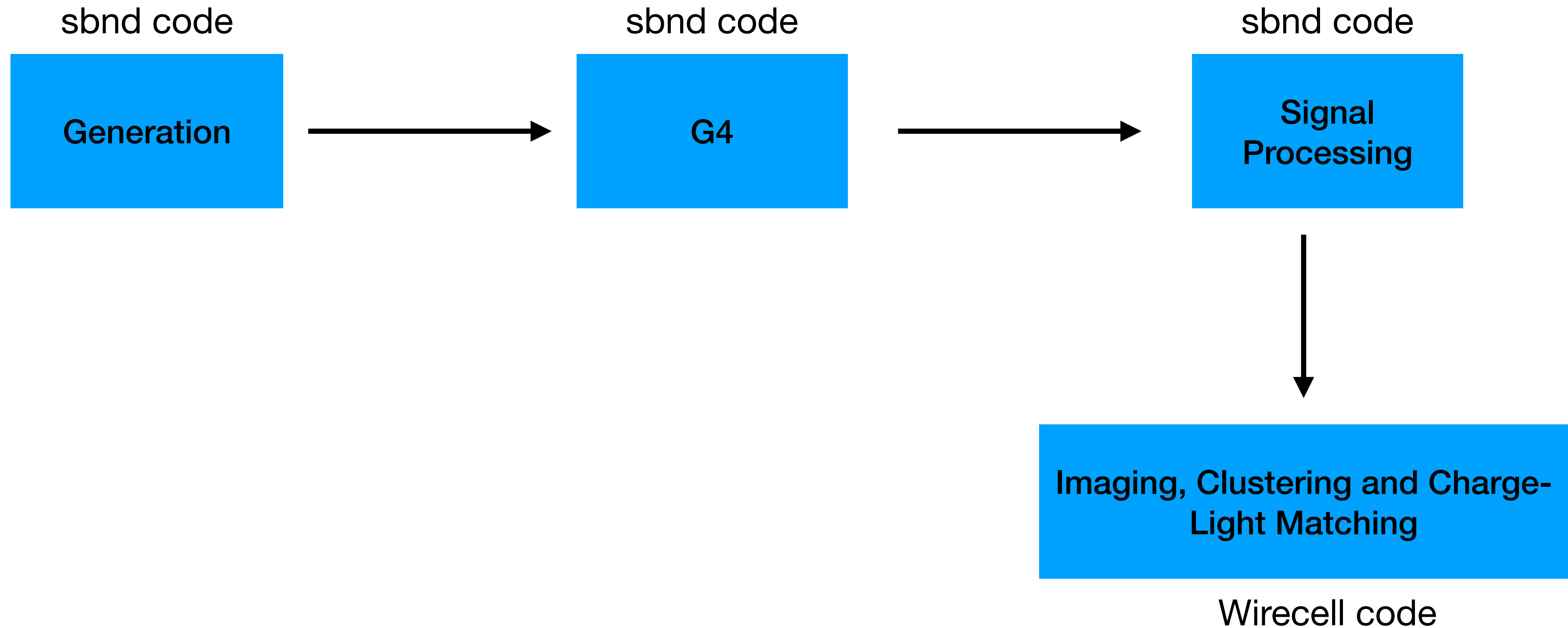
Objectives

- To produce latest files
- To understand how the whole wirecell chain works
- To update current version of wirecell in sbndcode so that next time we can run it out of the box

Process



Process



What we need

Wirecell code

Imaging, Clustering and Charge-Light Matching

cfg

Contains configurations
(Jsonnest)

Examples

```
└─ cfg
  └─ pgrapher
     ├── ar39.jsonnet
     ├── pgraph.jsonnet
     ├── vector.jsonnet
     └── wirecell.jsonnet
```

```
└─ pgrapher
  └─ experiment/sbnd
     ├── chndb-base.jsonnet
     ├── chndb-perfect.jsonnet
     ├── chndb-rel-gain.jsonnet
     ├── chndb-resp.jsonnet
     ├── chndb.jsonnet
     ├── dnnroi.jsonnet
     ├── funcs.jsonnet
     ├── img.jsonnet
     ├── magnify-sinks.jsonnet
     ├── nf-data.jsonnet
     ├── nf.jsonnet
     ├── params.jsonnet
     ├── sim.jsonnet
     ├── simparams.jsonnet
     ├── sp-filters.jsonnet
     ├── sp.jsonnet
     ├── wcls-nf-data.jsonnet
     ├── wcls-nf-sp-data.jsonnet
     └── wcls-nf-sp.jsonnet
```

What we need

Wirecell code

Imaging, Clustering and Charge-
Light Matching

cfg

data



Contains external files



Examples

```
≡ garfield-sbnd-v1.json.bz2  
≡ sbnd-noise-spectra-v1.json.bz2  
≡ sbnd-params-chresp-ideal-v1.json.bz2  
≡ sbnd-wires-geometry-v0206.json.bz2
```

Contains field-response,
Noise, geometry etc

What we need

Wirecell code

Imaging, Clustering and Charge-
Light Matching

cfg

data

Libraries



Contains libraries
needed for running wirecell

What we need

Wirecell code

Imaging, Clustering and Charge-
Light Matching

cfg

data

Libraries

These are the basic most minimum
things needed to successfully produce
wirecell reconstruction

What we need

Wirecell code

Imaging, Clustering and Charge-Light Matching

cfg

data

Libraries

Where do we get these from?

What we need

Wirecell code

Imaging, Clustering and Charge-Light Matching

cfg

data

Libraries

Where do we get these from?

What we need

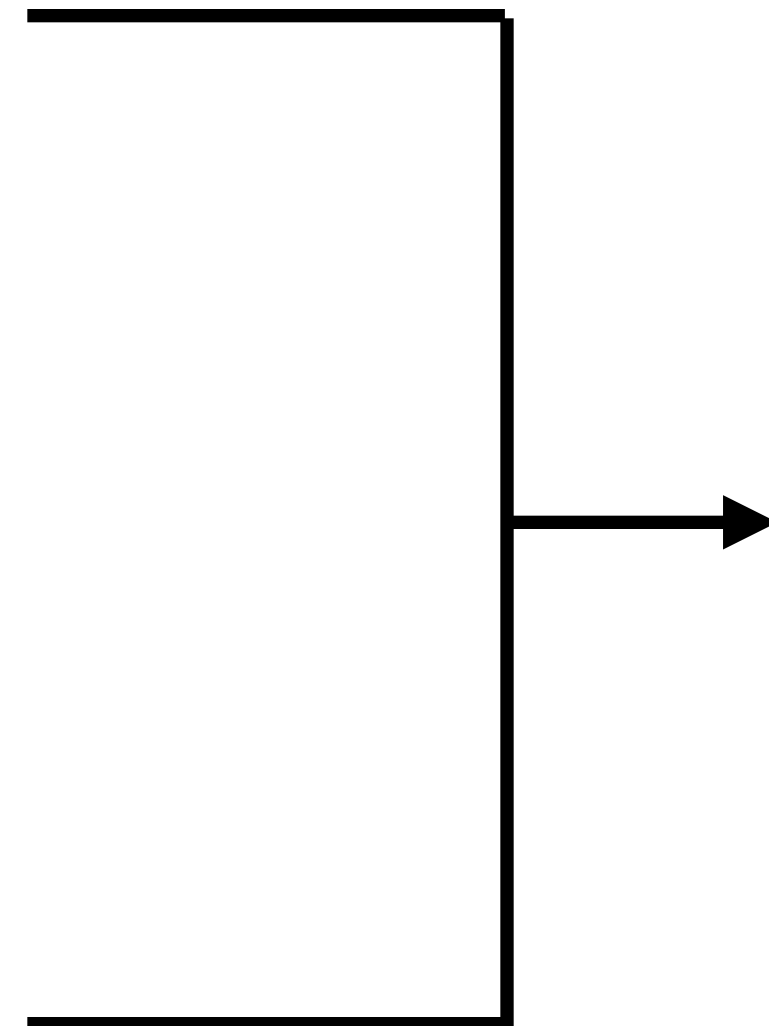
Wirecell code

Imaging, Clustering and Charge-
Light Matching

cfg

data

Libraries



- They exist in Wirecell package <https://github.com/WireCell/wire-cell-toolkit>
- Or we can find them in sbnd code version
- Or Haiwang has their local copies

Current Situation in SBND code

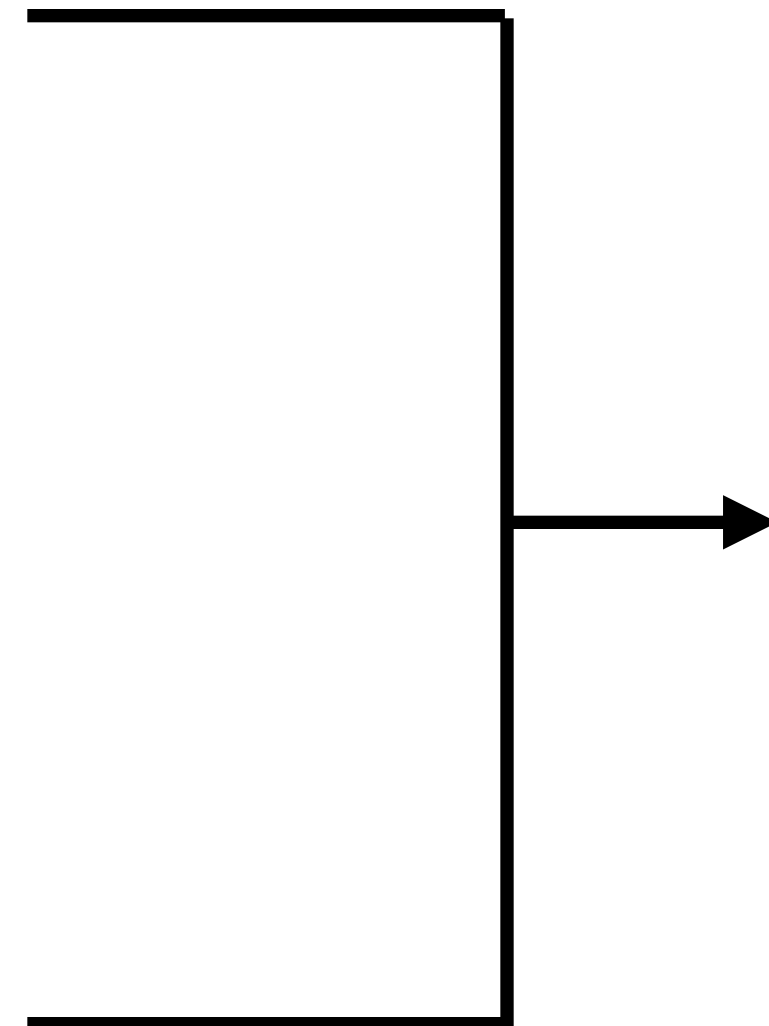
Wirecell code

Imaging, Clustering and Charge-Light Matching

cfg

data

Libraries



SBND code setup

```
source /cvmfs/sbnd.opensciencegrid.org/products/sbnd/  
setup_sbnd.sh
```

```
setup sbndcode v10_14_02_01 -q e26:prof
```

Current Situation in SBND code

Wirecell code

Imaging, Clustering and Charge-Light Matching

cfg

data

Libraries

SBND code setup

```
source /cvmfs/sbnd.opensciencegrid.org/products/sbnd/  
setup_sbnd.sh
```

```
setup sbndcode v10_14_02_01 -q e26:prof
```

```
echo $WIRECELL_PATH
```

```
/cvmfs/sbnd.opensciencegrid.org/products/sbnd/  
sbnd_data/v01_41_00/WireCell:/cvmfs/  
sbnd.opensciencegrid.org/products/sbnd/sbndcode/  
v10_14_02_01/wire-cell-cfg:/cvmfs/  
larsoft.opensciencegrid.org/products/wirecell/v0_32_1/  
Linux64bit+3.10-2.17-e26-prof/share/wirecell
```

This sets older version of wirecell which does not have clustering

What do we do

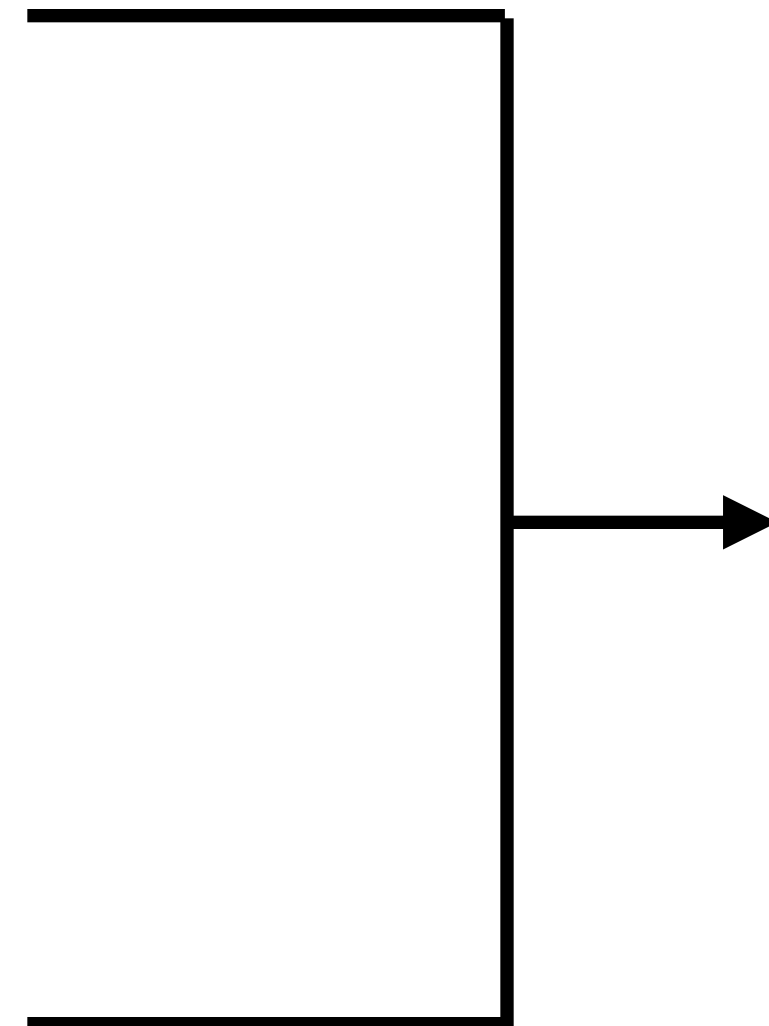
Wirecell code

Imaging, Clustering and Charge-Light Matching

cfg

data

Libraries



Hawang's setup

```
source /cvmfs/sbnd.opensciencegrid.org/products/sbnd/  
setup_sbnd.sh
```

```
source /exp/sbnd/app/users/yuhw/larsoft/v10_06_03/  
localProducts_larsoft_v10_06_00_02_e26_prof/setup
```

```
setup sbndcode v10_14_02_01 -q e26:prof
```

```
setup larwirecell v10_02_00 -q e26:prof
```

What do we do

Wirecell code

Imaging, Clustering and Charge-Light Matching

cfg

data

Libraries

Hawang's setup

```
echo $WIRECELL_PATH
```

```
/cvmfs/larsoft.opensciencegrid.org/products/wirecell/  
v0_33_0/Linux64bit+3.10-2.17-e26-prof/share/wirecell:/  
cvmfs/sbnd.opensciencegrid.org/products/sbnd/  
sbnd_data/v01_41_00/WireCell:/cvmfs/  
sbnd.opensciencegrid.org/products/sbnd/sbndcode/  
v10_14_02_01/wire-cell-cfg
```

This sets the **v0_33_0** version of wirecell which has latest libraries for imaging and clustering

What do we do

Wirecell code

Imaging, Clustering and Charge-
Light Matching

cfg

data

Libraries

Hawang's setup

```
echo $WIRECELL_PATH  
  
/cvmfs/larsoft.opensciencegrid.org/products/wirecell/  
v0_33_0/Linux64bit+3.10-2.17-e26-prof/share/wirecell:/  
cvmfs/sbnd.opensciencegrid.org/products/sbnd/  
sbnd_data/v01_41_00/WireCell:/cvmfs/  
sbnd.opensciencegrid.org/products/sbnd/sbndcode/  
v10_14_02_01/wire-cell-cfg
```

This gives path to cfg in sbndcode version

What do we do

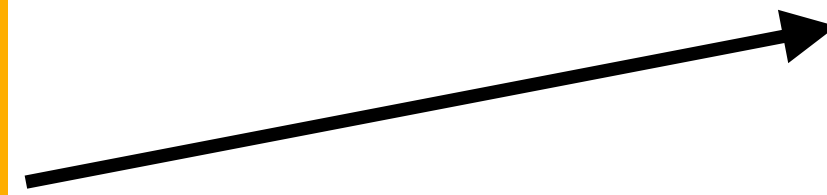
Wirecell code

Imaging, Clustering and Charge-
Light Matching

cfg

data

Libraries



Hawang's setup

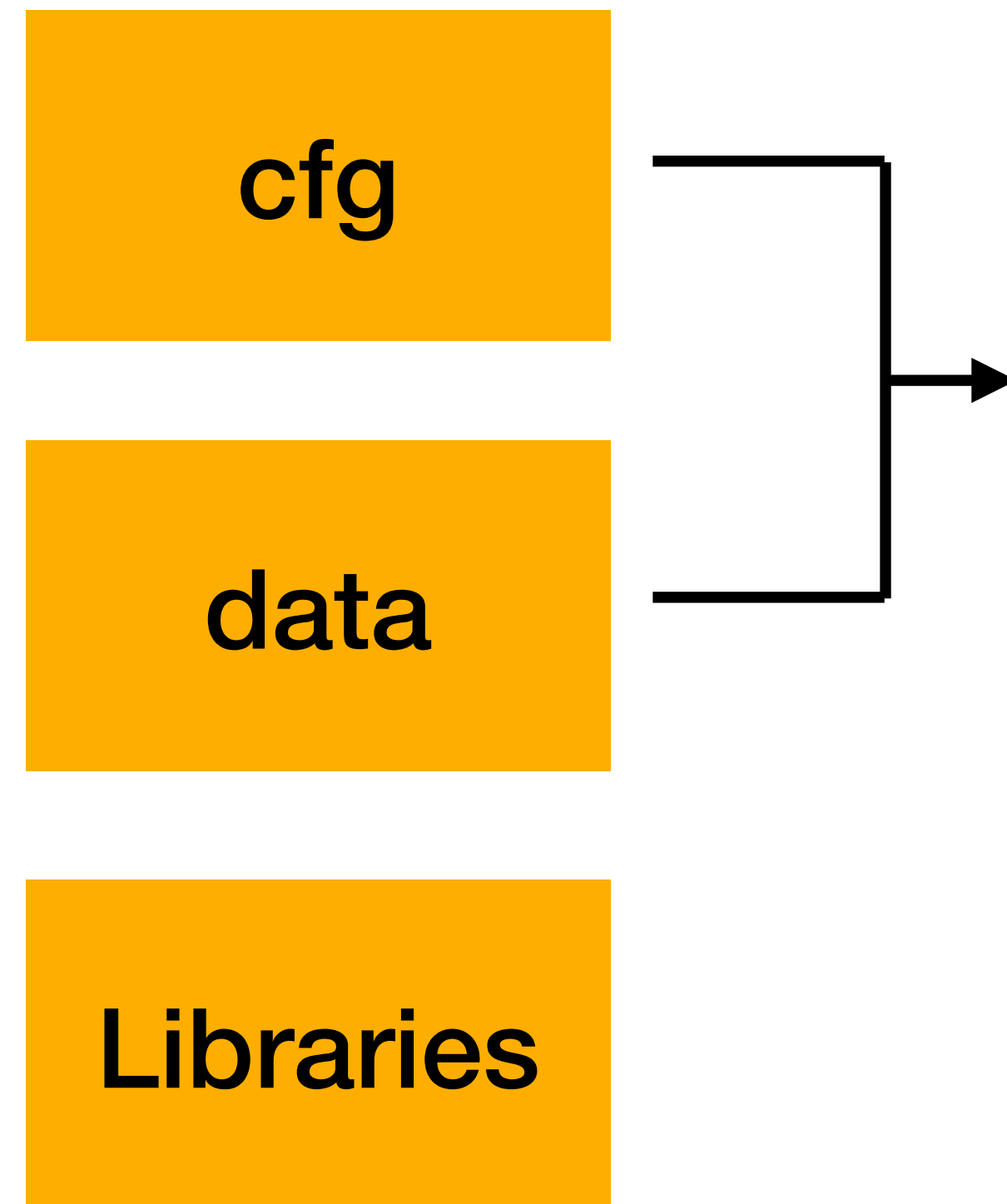
```
echo $WIRECELL_PATH  
  
/cvmfs/larsoft.opensciencegrid.org/products/wirecell/  
v0_33_0/Linux64bit+3.10-2.17-e26-prof/share/wirecell:/  
cvmfs/sbnd.opensciencegrid.org/products/sbnd/  
sbnd_data/v01_41_00/WireCell:/cvmfs/  
sbnd.opensciencegrid.org/products/sbnd/sbndcode/  
v10_14_02_01/wire-cell-cfg
```

This also gives path to latest data in
sbndcode version

What do we do

Wirecell code

Imaging, Clustering and Charge-Light Matching



- We can copy cfg and data to our local area

What do we do

Wirecell code

Imaging, Clustering and Charge-
Light Matching

cfg

data

Libraries



- We can copy cfg and data to our local area
- We do not need to local copy of libraries as we can use **v0_33_0** version of wirecell

What do we do

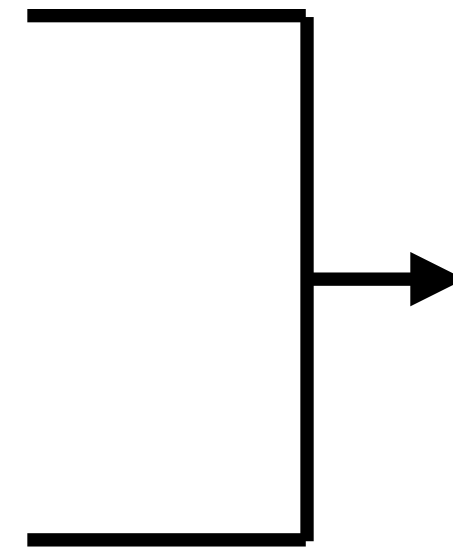
Wirecell code

Imaging, Clustering and Charge-Light Matching

cfg

data

Libraries



- I have copied them into my local area

```
sbndversion/v10_14_02_01
├── cfg
│   ├── pgrapher
│   ├── ar39.jsonnet
│   ├── pgraph.jsonnet
│   ├── vector.jsonnet
│   └── wirecell.jsonnet
├── data
│   ├── DNN_ROI
│   ├── CHANGES
│   ├── garfield-sbnd-v1.json.bz2
│   ├── sbnd-noise-spectra-v1.json.bz2
│   ├── sbnd-params-chresp-ideal-v1.json.bz2
│   └── sbnd-wires-geometry-v0206.json.bz2
```

- We already know that this version of cfg and data has missing/un-updated files
- One of the objectives of this work is to update files in my local version
- Then use local version to update them in official sbndcode version

What we compare to?

- My local copy

```
sbndversion / v10_14_02_01
├── cfg
│   ├── pgrapher
│   ├── ar39.jsonnet
│   ├── pgraph.jsonnet
│   ├── vector.jsonnet
│   └── wirecell.jsonnet
├── data
│   ├── DNN_ROI
│   ├── CHANGES
│   ├── garfield-sbnd-v1.json.bz2
│   ├── sbnd-noise-spectra-v1.json.bz2
│   ├── sbnd-params-chresp-ideal-v1.json.bz2
│   └── sbnd-wires-geometry-v0206.json.bz2
```

- Plan is to compare my local versions to what Hawang has

`/exp/sbnd/app/users/yuhw/wire-cell-toolkit/cfg`

or

`/exp/sbnd/app/users/yuhw/wct-porting/cfg`

My local version

- My local copy

```
sbndversion / v10_14_02_01
├── cfg
│   ├── pgrapher
│   ├── ar39.jsonnet
│   ├── pgraph.jsonnet
│   ├── vector.jsonnet
│   └── wirecell.jsonnet
```

- Files present only in my local copy

dnnroi.jsonnet

funcs.jsonnet

nf-data.jsonnet

wcls-nf-data.jsonnet

wcls-nf-sp-data.jsonnet

wcls-sim-drift-depoflux-nf-sp-samples_rec.jsonnet

wcls-sim-drift-depoflux-nf-sp-samples_tru.jsonnet

Haiwang's version

- Files present only Haiwang area

`/exp/sbnd/app/users/yuhw/
wire-cell-toolkit/cfg`

`clus.jsonnet`

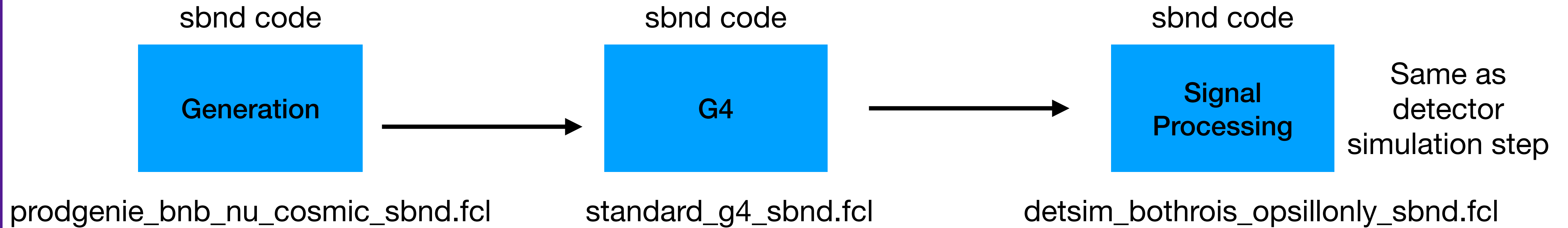
`wcls-img-clus.jsonnet`

Next Plans

- To compare and update files in my area after careful examination

Backup

Process



```
DetSim..... | simtpc2d..... | gauss..... | std::vector<recob::Wire>.....  
DetSim..... | simtpc2d..... | dnns..... | std::vector<recob::Wire>.....  
DetSim..... | simtpc2d..... | simpleSC..... | std::vector<sim::SimChannel>.....  
DetSim..... | simtpc2d..... | wiener..... | std::vector<recob::Wire>.....  
DetSim..... | crtSim..... | ..... | std::vector<sbnd::crt::FEBData>..
```

- I was able to run generation, g4, and signal processing steps
- After signal processing (detsim) we do have the products that we need for DNN-ROI

Process

Wirecell code

Imaging, Clustering and Charge-
Light Matching

wcls-img-clus-matching.fcl

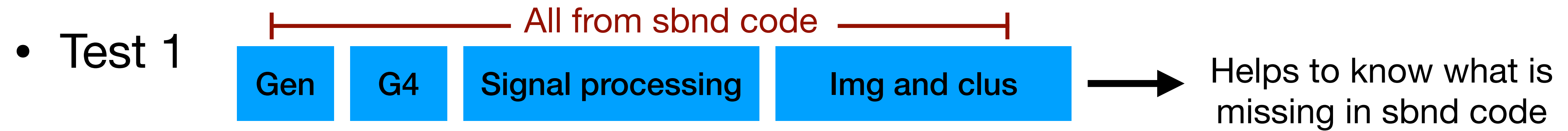
```
# sim
recobwire_tags: "[\"simtpc2d:dnnsp\", \"simtpc2d:dnnsp\"]"
```

```
[WireCell::tag_errmsg*] = no such file: wcls-img-clus-matching.jsonnet. Maybe you need to add to WIRECELL_PATH.
---- WireCellArSoft END
Exception caught while processing plugin spec: WCLS
---- Configuration END
%MSG
Art has completed and will exit with status 9.
```

- Facing issues with imaging, clustering, and charge-light matching step
- Seems like some issues in my setup
- Currently working to resolve it to produce latest samples

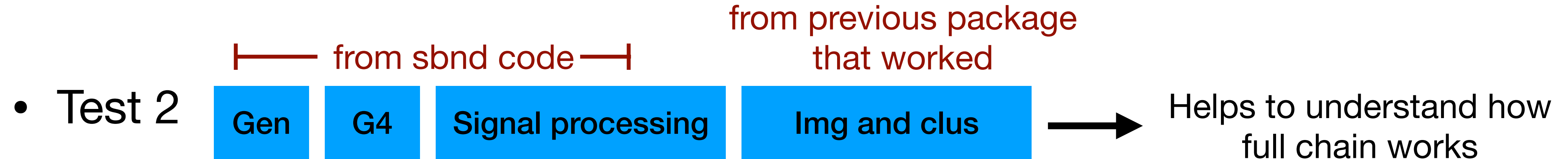
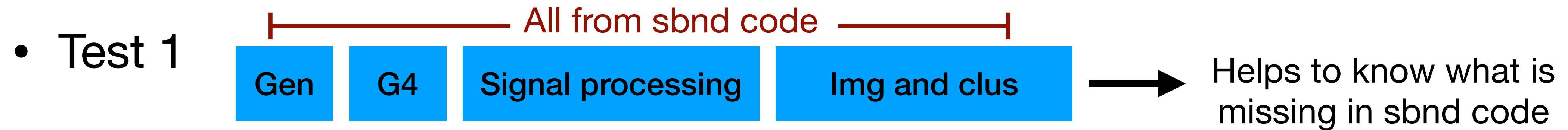
Step by Step Plans

- Several Steps planned to run latest wirecell reconstruction



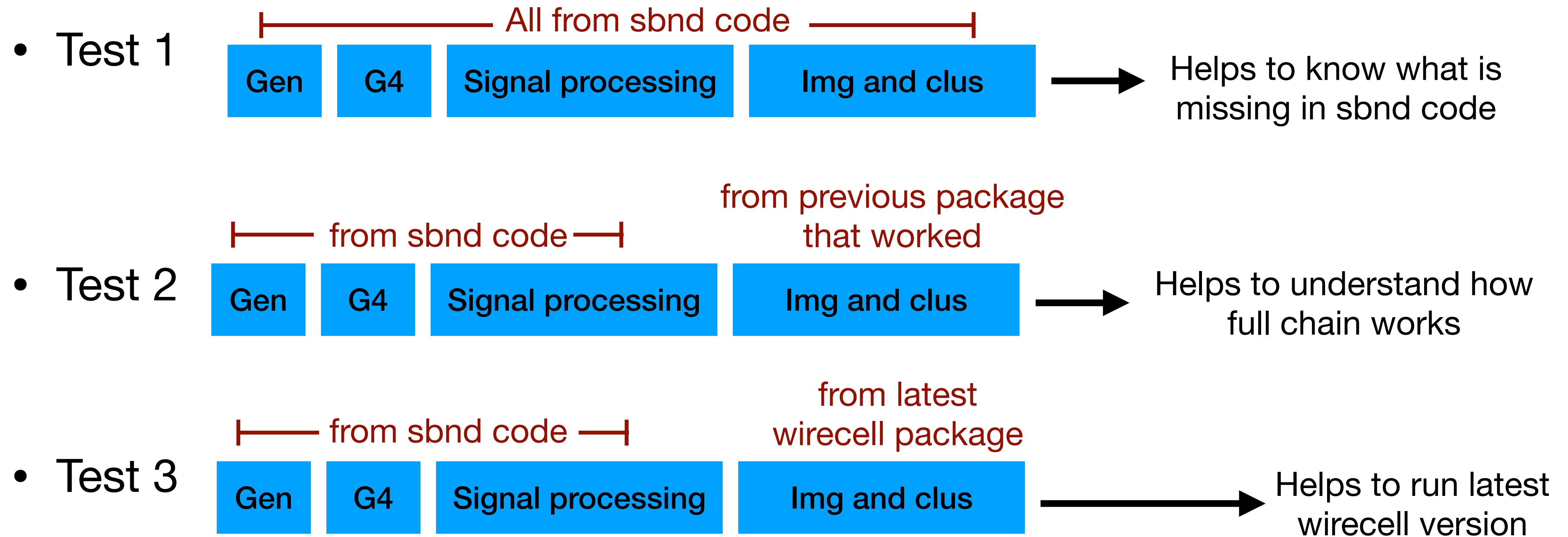
Step by Step Plans

- Several Steps planned to run latest wirecell reconstruction



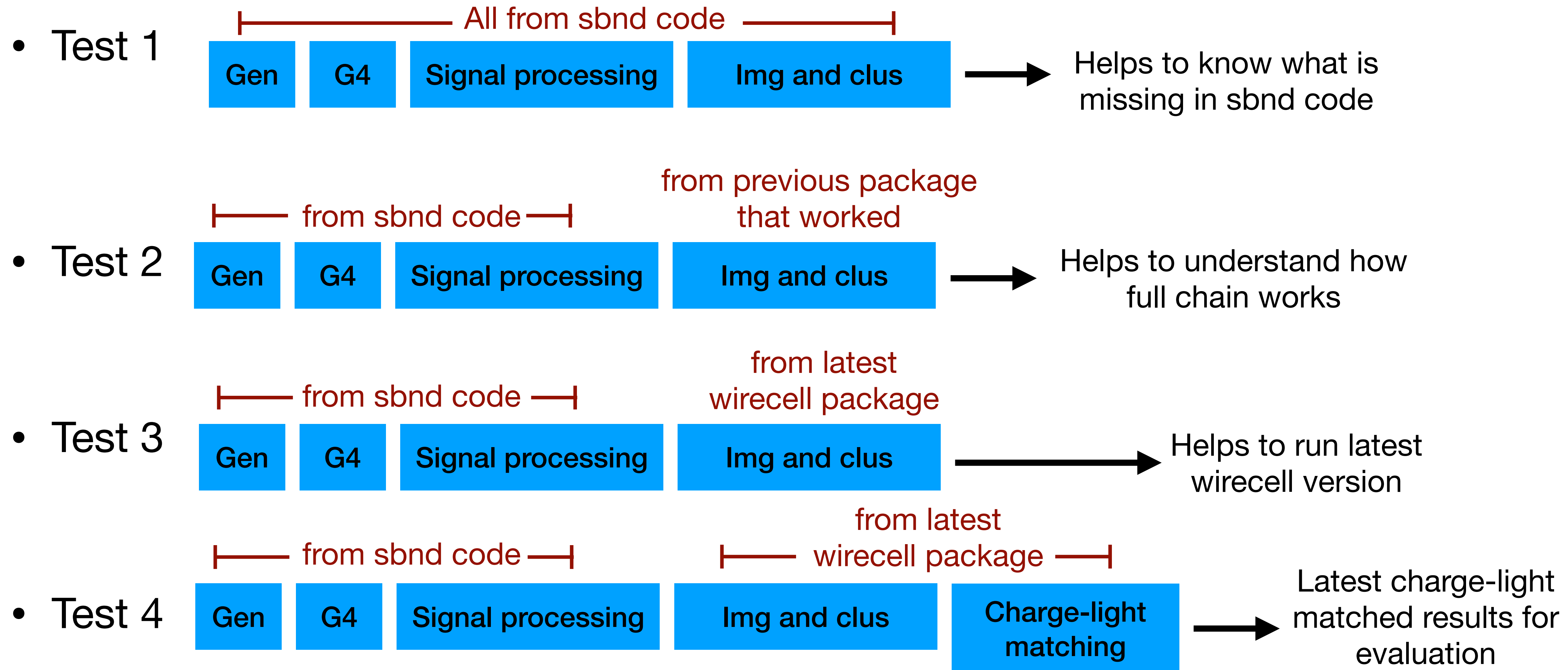
Step by Step Plans

- Several Steps planned to run latest wirecell reconstruction



Step by Step Plans

- Several Steps planned to run latest wirecell reconstruction



Test 1

- Gen, g4, signal processing from sbnd code version **Success** 
- Imaging and clustering **FAILED** 

-
- `setup sbndcode v10_14_02_01 -q e26:prof`
 - `fcl: wcls-img-clus.fcl`

```
[WireCell::tag_errmsg*] = no such file: pgrapher/experiment/sbnd/wcls-img-clus.jsonnet. Maybe you need to add to WIRECELL_PATH.  
---- WireCellArSoft END  
Exception caught while processing plugin spec: WCLS  
---- Configuration END  
%MSG
```

- Running imaging-clustering using sbnd code version fails because the *WIRECELL_PATH* is not able to find the **wcls-img-clus.jsonnet**

Test 1

- setup sbndcode v10_14_02_01 -q e26:prof
- This sbndcode version sets wirecell version v0_32_1

```
wirecell v0_32_1 Linux64bit+3.10-2.17 -q e26:prof -z /cvmfs/larsoft.opensciencegrid.org/products
```

- This also sets WIRECELL_PATH to
`/cvmfs/sbnd.opensciencegrid.org/products/sbnd/sbndcode/v10_14_02_01/wire-cell-cfg`

```
ar39.jsonnet  
pgrapher  
pgraph.jsonnet  
vector.jsonnet  
wirecell.jsonnet
```



```
common  
experiment  
ui
```

```
sbnd
```


```
simparams.jsonnet  
sp-filters.jsonnet  
sp.jsonnet  
wcls-nf-data.jsonnet  
wcls-nf-sp-data.jsonnet  
wcls-nf-sp.jsonnet  
wcls-sim-drift-depoflux-nf-sp.jsonnet  
wcls-sim-drift-depoflux-nf-sp-samples_rec.jsonnet  
wcls-sim-drift-depoflux-nf-sp-samples_tru.jsonnet  
wcls-sim-drift-simchannel-deposetsimchannelsink.jsonnet  
wcls-sim-drift-simchannel.jsonnet  
wcls-sim-drift-simchannel-nf-sp.jsonnet  
wcls-sim-drift-simchannel-simchannelsink.jsonnet  
wct-sim-check.jsonnet
```

- There is no `wcls-img-clus.jsonnet` in WIRECELL_PATH

Test 1: Conclusion


- Gen, g4, signal processing from sbnd code version **Success** 
 - Imaging and clustering **FAILED** 
-
- We can not use sbnd code version to run wirecell imaging and clustering
 - This is no surprise because we knew it would not work
 - This requires **wcls-img-clus.jsonnet** in the WIRECELL_PATH in the package
 - This tests helps us to know what we need to add in to the sbnd code version to make it work

Step by Step Plans

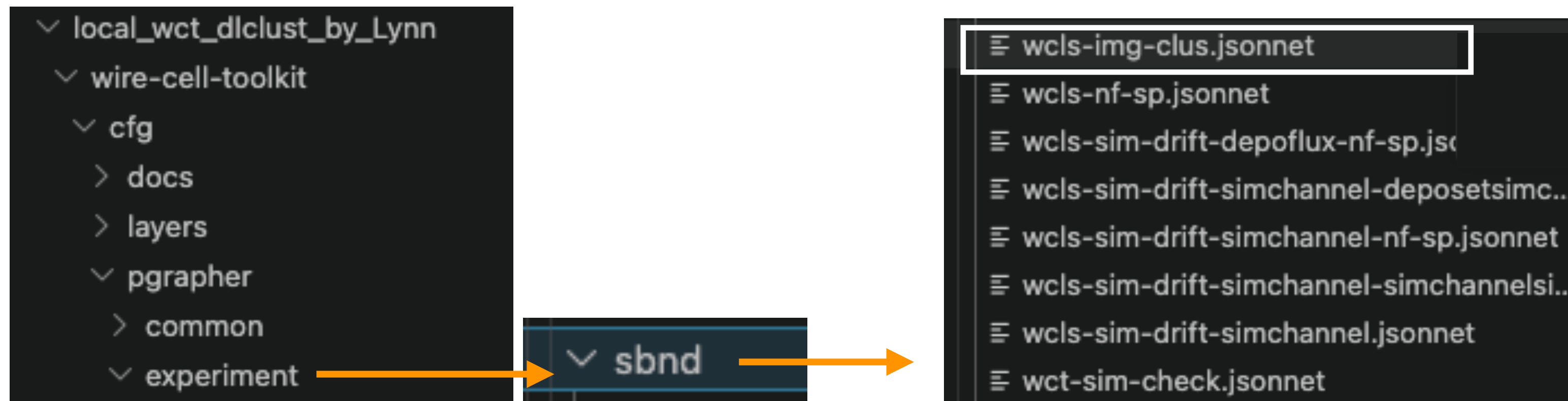
- Test 2:
 - Gen, g4, signal processing from - sbnd code version **Success** 
 - Imaging and clustering also Lynn's location (This is what I used previously to generate samples)

```
export MYWCDIR="/exp/sbnd/data/users/prabhjot/wirecell_clustering/local_wct_dlclust_by_Lynn"  
export LD_LIBRARY_PATH=$MYWCDIR"/wire-cell-toolkit/opt/lib":$LD_LIBRARY_PATH  
export WIRECELL_PATH=$MYWCDIR"/wire-cell-toolkit/cfg":$WIRECELL_PATH  
export WIRECELL_PATH=$MYWCDIR"/wire-cell-toolkit/wire-cell-data":$WIRECELL_PATH
```

Step by Step Plans

- Test 2:
 - Gen, g4, signal processing from - sbnd code version **Success** 
 - Imaging and clustering also Lynn's location (This is what I used previously to generate samples)


```
export MYWCDIR="/exp/sbnd/data/users/prabhjot/wirecell_clustering/local_wct_dlclust_by_Lynn"  
export LD_LIBRARY_PATH=$MYWCDIR"/wire-cell-toolkit/opt/lib":$LD_LIBRARY_PATH  
export WIRECELL_PATH=$MYWCDIR"/wire-cell-toolkit/cfg":$WIRECELL_PATH  
export WIRECELL_PATH=$MYWCDIR"/wire-cell-toolkit/wire-cell-data":$WIRECELL_PATH
```



- It has **wcls-img-clus.jsonnet** required by imaging-clustering job

Step by Step Plans

- Test 2:

- Gen, g4, signal processing from - sbnd code version **Success** 

- Imaging and clustering also Lynn's location
(This is what I used previously to generate samples) 

```
15# main in lar
16# __libc_start_main in /lib64/libc.so.6
17# 0x00000000004012D0 in lar

[WireCell::tag_errmsg*] = failed to load plugin: WireCellImg
---- WireCellLarSoft END
Exception caught while processing plugin spec: WCLS
---- Configuration END
%MSG
Art has completed and will exit with status 9
```

- Failed while loading plugins

- fcl has some plugging: wcls-img-clus.fcl

```
plugins: ["WireCellImg", "WireCellClus", "WireCellPgraph", "WireCellSio", "WireCellRoot",  
         "WireCellLarsoft"]
```

Step by Step Plans

- Test 2:

- Gen, g4, signal processing from - sbnd code version **Success**



- Imaging and clustering also Lynn's location
(This is what I used previously to generate samples)

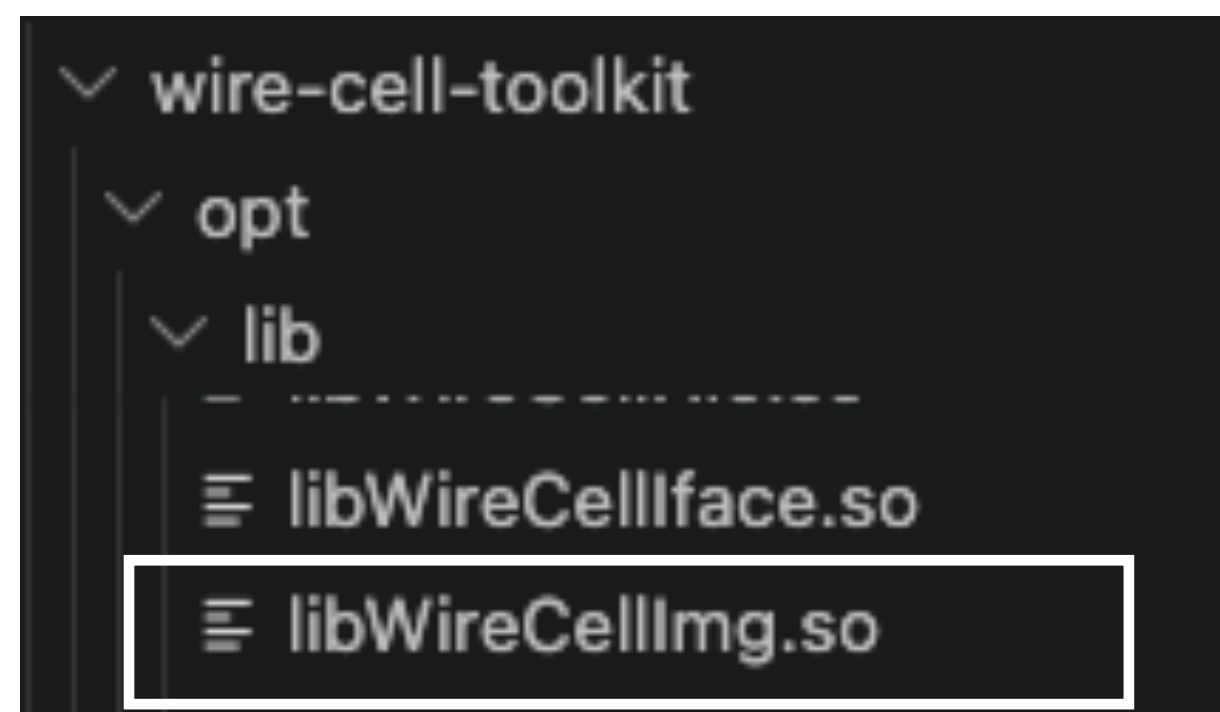


```
SL7> [sbndgpvm02 12:02:34 PM] Test2_Imaging_Clustering_From_Lynn_Local_Path > echo "$LD_LIBRARY_PATH" | awk -v RS=":" '/wire-cell-toolkit/'  
/exp/sbnd/data/users/prabhjot/wirecell_clustering/local_wct_dlclust_by_Lynn/wire-cell-toolkit/opt/lib
```

Library path set correctly

```
SL7> [sbndgpvm02 12:03:23 PM] Test2_Imaging_Clustering_From_Lynn_Local_Path > echo "$WIRECELL_PATH" | awk -v RS=":" '/wire-cell-toolkit/'  
/exp/sbnd/data/users/prabhjot/wirecell_clustering/local_wct_dlclust_by_Lynn/wire-cell-toolkit/wire-cell-data  
/exp/sbnd/data/users/prabhjot/wirecell_clustering/local_wct_dlclust_by_Lynn/wire-cell-toolkit/cfg
```


WIRECELL_PATH set correctly



Required libraries are present in the library path

Conclusion from Test 2

- Test 2:

- Gen, g4, signal processing from - sbnd code version **Success** 

- Imaging and clustering also Lynn's location
(This is what I used previously to generate samples) 

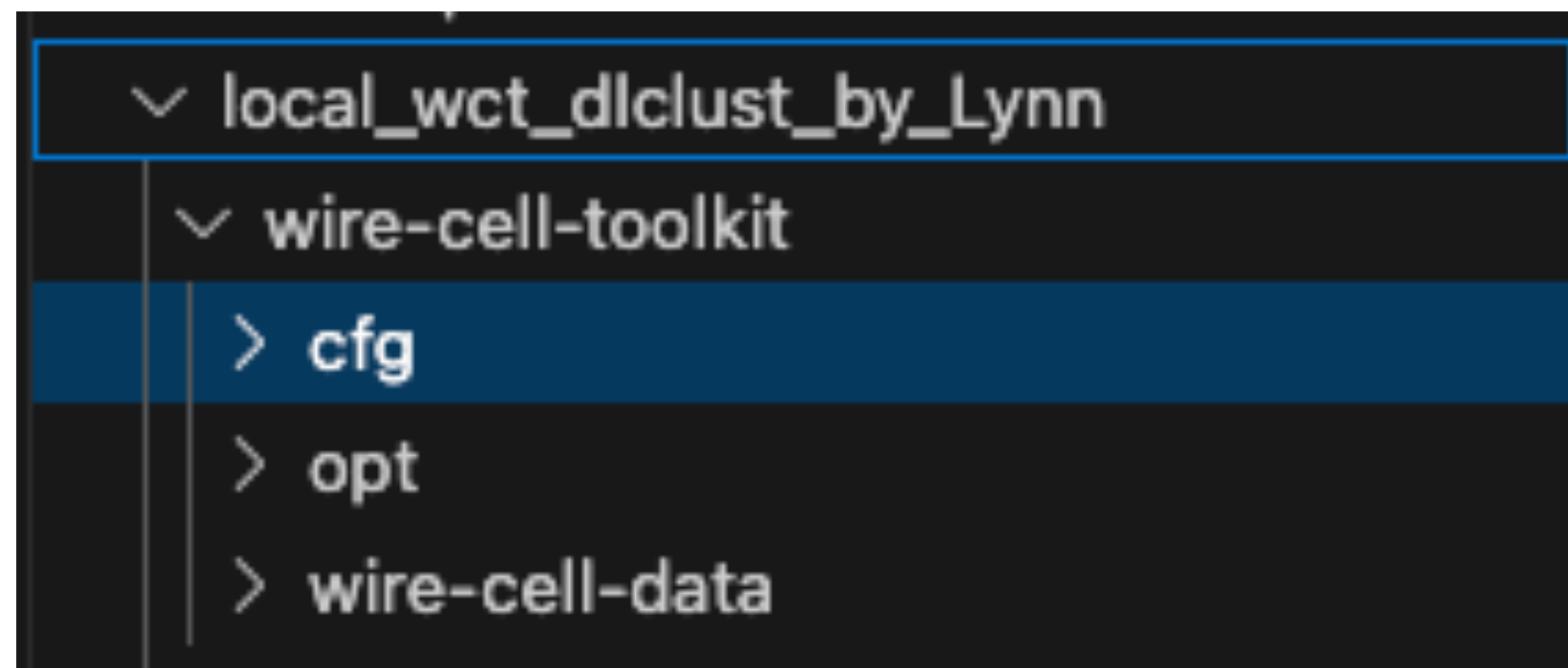
- Something is still missing that is why the imaging and clustering is not able to see the required library
- If I resolve this then I would be able to setup my own paths by checking out the wire-cell-toolkit and wire-cell-data from Github to setup my own chain

How it worked last time

Wirecell code
wcls-img-clus.fcl

Imaging and Clustering

```
<stage name="img-clus">
  <datafiletypes>npz,zip,json,root,out</datafiletypes>
  <fcl>/exp/sbnd/data/users/lynnt/wirecell/clustering/dl-light/sample_gen_workflow_localwct/fcls/celltree_sbnd_ap0.fcl</fcl>
  <fcl>/exp/sbnd/data/users/lynnt/wirecell/clustering/dl-light/sample_gen_workflow_localwct/fcls/celltree_sbnd_ap1.fcl</fcl>
  <fcl>/exp/sbnd/data/users/lynnt/wirecell/clustering/dl-light/sample_gen_workflow_localwct/fcls/wcls-img-clus.fcl</fcl>
  <inputlist>&outdir;/&name;/&release;/detsim/files.list</inputlist>
  <initsource>/exp/sbnd/data/users/lynnt/wirecell/clustering/dl-light/sample_gen_workflow_localwct/fcls/wirecell_init.sh</initsource>
  <endscript>/exp/sbnd/data/users/lynnt/wirecell/clustering/dl-light/sample_gen_workflow_localwct/fcls/celltree_macro.sh</endscript>
  <outdir>&outdir;/&name;/&release;/img-clus</outdir>
  <workdir>&outdir;/&name;/&release;/img-clus</workdir>
  <numjobs>48</numjobs>
  <memory>2000</memory>
  <jobsub> --expected-lifetime=1h --use-cvmfs-dropbox --tar_file_name=dropbox:///pnfs/sbnd/resilient/users/lynnt/local-wct_dlclust.tar --lines '+F
  <disk>10GB</disk>
</stage>
```

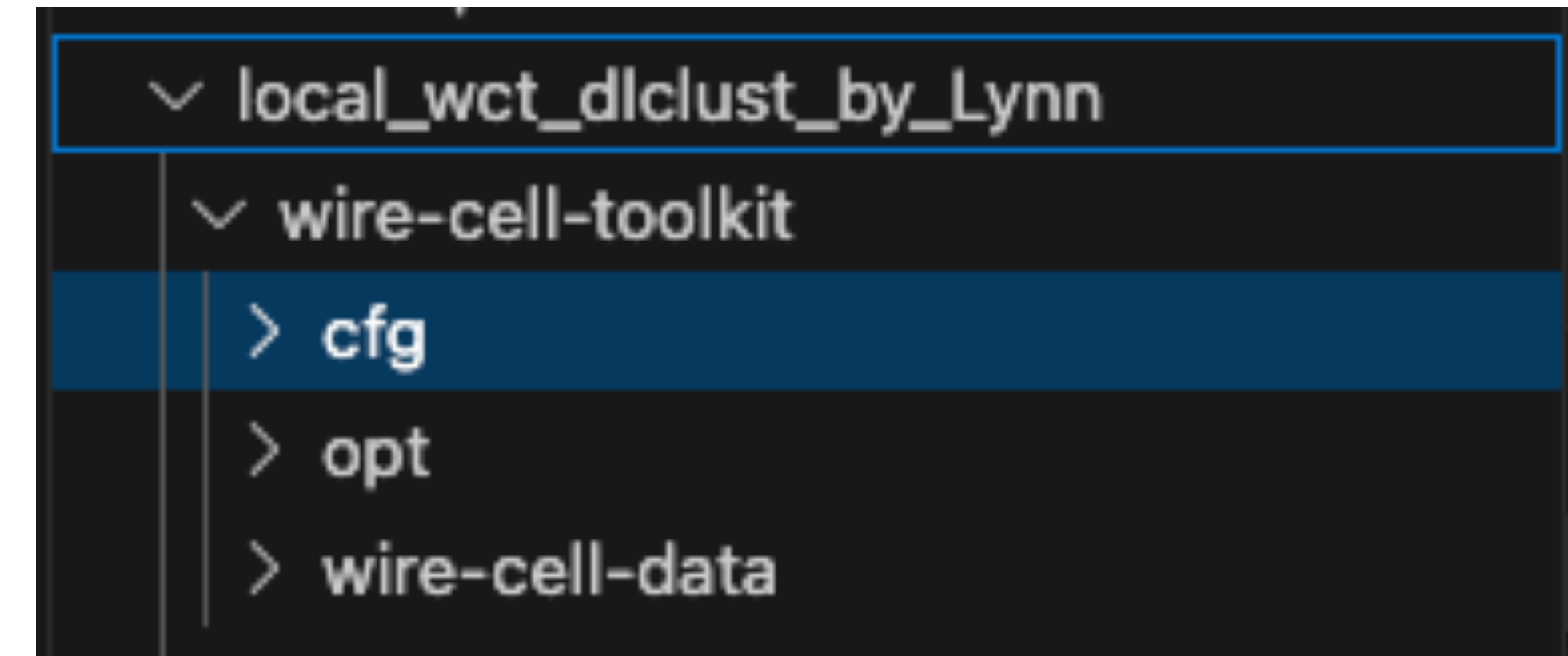


- Previous I was successfully able to produce samples on the grid using Lynn's tar and xml files

Testing

Sent by Lynn

- I have two ideas to successfully troubleshoot it
 - Set WIRECELL_PATH to Directory Lynn sent earlier
 - This will help me to understand the structure of how to get my jobs running interactively
- Second idea is to set WIRECELL_PATH to Haiwang's area



Haiwang's location

```
ls -lh /exp/sbnd/app/users/yuhw/
```

drwxr-sr-x	30	yuhw	sbnd	42	Dec	2	08:13	wct-porting
drwxr-sr-x	3	yuhw	sbnd	124	Nov	12	08:42	wire-cell-data
drwxr-sr-x	10	yuhw	sbnd	14	Nov	11	21:29	wire-cell-python
drwxr-sr-x	31	yuhw	sbnd	50	Jan	20	11:28	wire-cell-toolkit