

What is an .i3 File?

- The standard file format for storing IceCube data
- Contains all the necessary information about IceCube events
- Information is categorized into different "frames"

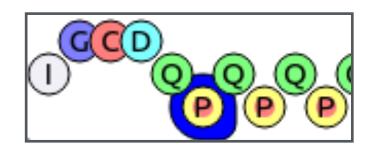
```
evel2_IC86.2015_data_Run00127619_Subrun00000051.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000051_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00
evel2_IC86.2015_data_Run00127619_Subrun00
evel2_IC86.2015_data_Run00127619_Subrun00
 evel2_IC86.2015_data_Run00127619_Subrun00000053_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000054.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000054_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun000000055.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000055_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000056.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000056_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000057.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000057_IT.i3.bz2.evel2_IC86.2015_data_Run00127619_Subrun00000058.i3.bz2.evel2_IC86.2015_data_Run00127619_Subrun00000058_IT.i3.bz2.evel2_IC86.2015_data_Run00127619_Subrun00000058_IT.i3.bz2
 evel2_IC86.2015_data_Run00127619_Subrun00000059.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000059_IT.i3.bz2
_evel2_IC86.2015_data_Run00127619_Subrun00000060.i3.bz2

_evel2_IC86.2015_data_Run00127619_Subrun00000060_IT.i3.bz2

_evel2_IC86.2015_data_Run00127619_Subrun00000061.i3.bz2

_evel2_IC86.2015_data_Run00127619_Subrun00000061_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000062.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000062_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun0
evel2_IC86.2015_data_Run00127619_Subrun0
evel2_IC86.2015_data_Run00127619_Subrun0
evel2_IC86.2015_data_Run00127619_Subrun00000064_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000065.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000065_IT.i3.bz2
       IC86.2015 data Run00127619 Subrun00000066.i3.bz2
       _IC86.2015_data_Run00127619_Subrun00000066_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000067.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000067_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun000000068.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000
evel2_IC86.2015_data_Run00127619_Subrun00000
evel2_IC86.2015_data_Run00127619_Subrun00000
evel2_IC86.2015_data_Run00127619_Subrun00000
evel2_IC86.2015_data_Run00127619_Subrun00000070.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000070_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000071.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000071_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000072.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000072_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000073.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000073_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun0
evel2_IC86.2015_data_Run00127619_Subrun0
evel2_IC86.2015_data_Run00127619_Subrun000
evel2_IC86.2015_data_Run00127619_Subrun00000075_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000076.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000076_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000077_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000078.i3.bz2
.evel2_IC86.2015_data_Run00127619_Subrun00000078_IT.i3.bz2
Level2_IC86.2015_data_Run00127619_Subrun00000079.i3.bz2
Level2_IC86.2015_data_Run00127619_Subrun00000079_IT.i3.b
Level2_IC86.2015_data_Run00127619_Subrun000000080.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun000000080.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000080_IT.i3.bz2
evel2_IC86.2015_data_Run00127610_Subrun00000080_IT.i3.bz2
 evel2_IC86.2015_data_Run00127619_Subrun00000081.i3.bz2
 evel2_IC86.2015_data_Run00127619_Subrun00000081_IT.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000082.i3.bz2
evel2_IC86.2015_data_Run00127619_Subrun00000082_IT.i3.bz2
data/exp/IceCube/2016/filtered/level2/0301/Run00127619_21 $
```

.i3 Frames



Contextual Info: typically 1 per run, separate file

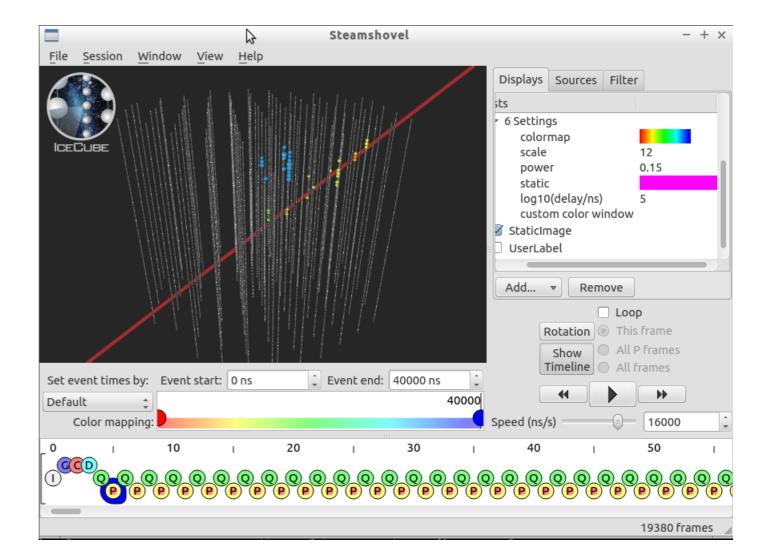
- I (TrayInfo): processing history
- G (Geometry): DOM coordinates
- C (Calibration): Waveform unit calibration
- D (Detector Status): useful DOM status information

Event Info: 1 per event

- Q (DAQ): Basic event info (e.g. charges)
- P (Physics): Q+Higher level event info (e.g. reconstructions)

What is steamshovel?

 Tool for 3D visualization of IceCube events in a GUI



- To use:
 - 1. Enter an IceTray environment
 - → on the VM: ~/i3_software/combo/build/env-shell.sh
 - 2. For a file in .i3 format:
 - on the VM: steamshovel GCD-File.i3(.gz|.bz2) Data.i3(.gz|.bz2)

Useful Links

- steamshovel documentation:
 - http://software.icecube.wisc.edu/offline_trunk/ projects/steamshovel/index.html

Demo: using steamshovel

What is dataio-pyshovel?

Tool for easily viewing
 .i3 file content in your
 terminal

```
For help press
                                 Type:
I3Particle
                                                                   Contains:
                                                                   icecube.dataclasses.I3Particle object
                                 {\tt AtmCscdEnergyRecoParams}
                                                                    (Unreadable)
                                                                                                                   143
AtmCscdEnergyRecoParams
                                 I3Particle
                                                                    icecube.dataclasses.I3Particle object
CascadeDipoleFit
                                 I3DipoleFitParams
                                                                    icecube.recclasses.I3DipoleFitParams ...
                                 I3FillRatioInfo
I3PODHolder<double
                                                                    icecube.recclasses.I3FillRatioInfo ob...
CascadeFillRatio
                                                                    icecube.dataclasses.I3Double object
                                                                                                                   150
                                                                    icecube.dataclasses.I3Particle object
                                 I3Particle
                                 I3LineFitParams
                                                                    icecube.recclasses.I3LineFitParams ob.
                                 I3Particle
                                                                    icecube.dataclasses.I3Particle object
                                                                                                                   150
                                                                                                                   68
                                 I3CLastFitParams
                                                                   icecube.recclasses.I3CLastFitParams o...
                                 I3Particle
                                                                    icecube.dataclasses.I3Particle object
CascadeLineFitParams
                                 I3LineFitParams
                                                                    icecube.recclasses.I3LineFitParams ob...
CascadeLineFitSplit1
                                 I3Particle
                                                                    icecube.dataclasses.I3Particle object
CascadeLineFitSplit1Params
                                 I3LineFitParams
                                                                    icecube.recclasses.I3LineFitParams ob...
CascadeLineFitSplit2
                                                                                                                   150
                                 I3Particle
                                                                   icecube.dataclasses.I3Particle object
CascadeLineFitSplit2Params
                                 I3LineFitParams
                                                                    icecube.recclasses.I3LineFitParams ob...
CascadeLlhVertexFit
                                                                                                                   150
                                 I3Particle
                                                                    icecube.dataclasses.I3Particle object
                                 I3CscdLlhFitParams
CascadeLlhVertexFitParams
                                                                    icecube.recclasses.I3CscdLlhFitParams...
                                 I3RecoPulseSeriesMapMask
CascadeSplitPulses1
                                                                   Iterable with 7 items
                                                                                                                   107
150
                                 I3RecoPulseSeriesMapMask
                                                                   Iterable with 6 items
CascadeSplitPulses2
                                 I3Particle
                                                                    icecube.dataclasses.I3Particle object
                                                                                                                   78
CascadeToISplit1Params
                                 I3TensorOfInertiaFitParams
                                                                    icecube.recclasses.I3TensorOfInertiaF...
                                 I3Particle
                                                                    icecube.dataclasses.I3Particle object
CascadeToISplit2Params
                                 I3TensorOfInertiaFitParams
                                                                    icecube.recclasses.I3TensorOfInertiaF...
CleanTriggerHierarchy_IT
ClusterCleaningExcludedStat...
                                 I3Tree<I3Trigger>
                                                                   Iterable with 1 items Iterable with 0 items
                                                                                                                    92
35
                                 I3Vector<int>
                                                                   Iterable with 14 items
CorsikaWeightMap
                                 I3Map<string, double>
                                 I3Map<string, I3FilterResult>
                                                                   Iterable with 26 items
                  Run/Subrun: 1118400000/0
Event/SubEvent: 17/in_ice
                                                            Start Time: 2011-01-01 00:28:20 UTC
                 Duration: 16501 ns
```

- To use:
 - 1. Enter an IceTray environment
 - on the VM: ~/i3_software/combo/build/env-shell.sh
 - 2. For a file in .i3 format:
 - → on the VM: dataio-pyshovel Data.i3(.gz|.bz2)

Useful commands in dataio-pyshovel

- x: open a module in XML format
- enter: open a module in a cleaned, human-readable format
- g: enter a frame number to go to
- i: enter an ipython shell
- L: import a library
- h: list available commands

Demo: using dataio-pyshovel