Software frameworks for KM3NeT

VLVnT ’08
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PHYSICS

Outline

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what?

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what?

what is a software framework?

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why?

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why do we need one?

how?

how does it work in detail?

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What is a software framework?

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What is a software framework?

provides services / structures to the programmer

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defines data-flow from module to module

Why do we need a framework?

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Easy to share code - collaborative work

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Flexibility

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Flexibility

A module can be removed or added without altering the others

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How does it work?

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specific framework: IceTray

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framework developed and in use by IceCube

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adapted and extended for KM3NeT/ANTARES (data structures, interfaces, calibration, analysis strategies, ...)

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IceTray - basic concepts

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connects software modules

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uses “boost” serialization

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IceTray - basic concepts - cont'd

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can be controlled by a scripting language (python)

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e.g. its own ROOT version

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e.g. its own ROOT version

collected in a single directory, BSD "ports" based

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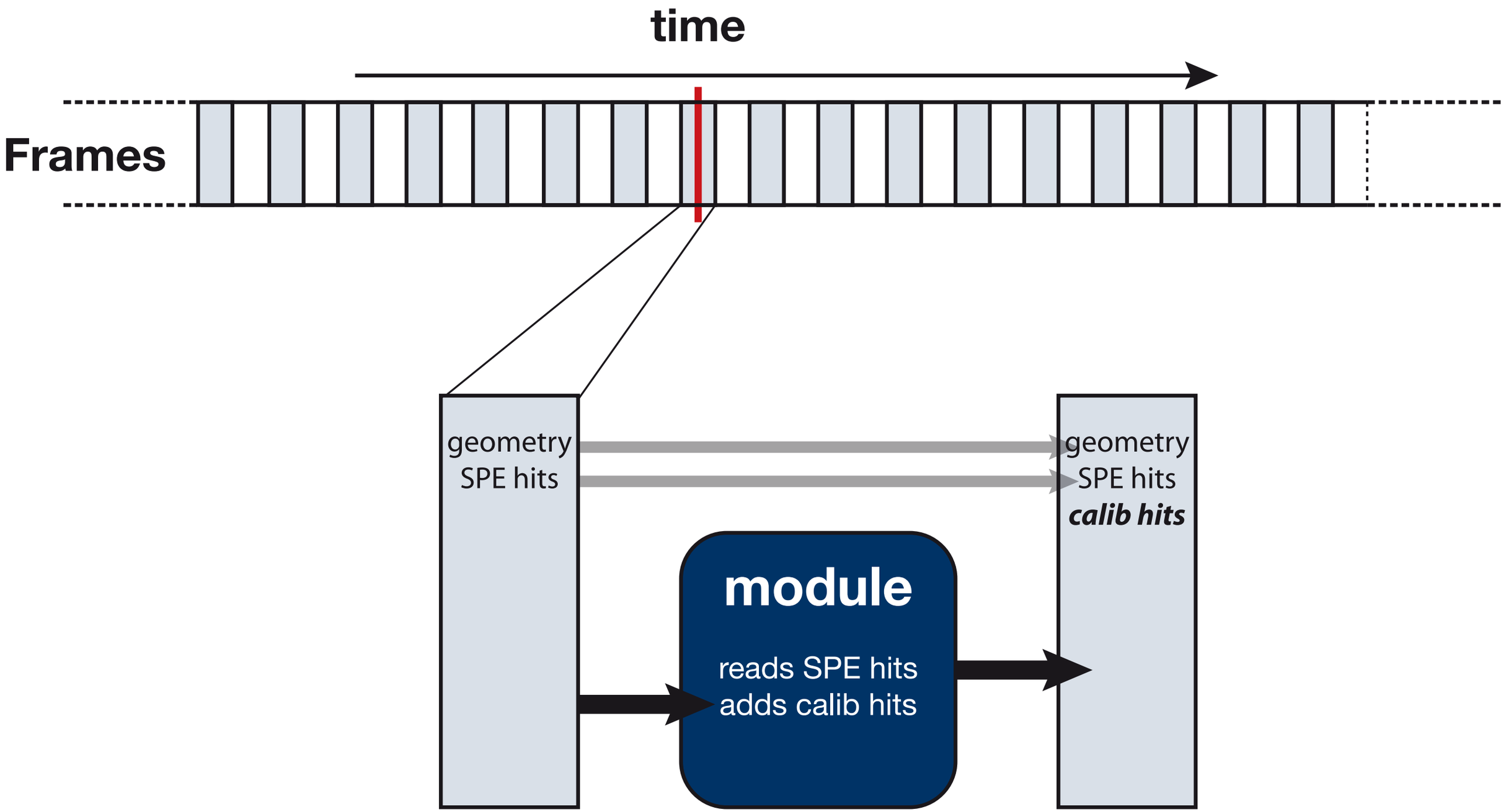
IceTray ("Frame - Stream - Stop" model)



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“dataclasses”

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standard definition of a “hit”, “particle”, “geometry”, ...

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cherenkov calculations, distance of a point from a track, ...

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“dataclasses”

standard definition of a “hit”, “particle”, “geometry”, ...

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cherenkov calculations, distance of a point from a track, ...

....

What did we add?

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What did we add?

Some extensions to existing classes
ANTARES MC file reader
ANTARES geometry file reader
DAQ data reader
DB access (calibration/alignment info)
hit calibration
ANTARES PM & readout simulation
environmental (40K) noise simulation
reconstruction strategies (“Aart” & Shower reco)
hit selections (local coincidences, big hits, ...)
event selections
ANTARES triggers (“1D”, “3D”, “3T”, ...)

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How does it work in practice? - user's POV

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Design your reconstruction chain

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which modules to use in which order?

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Write a python script

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which modules to use in which order?

Write a python script

or modify an existing one

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which modules to use in which order?

Write a python script

or modify an existing one

specify all modules and their parameters

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Design your reconstruction chain

which modules to use in which order?

Write a python script

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specify all modules and their parameters

Execute your script

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How does it work in practice? - user's POV

Design your reconstruction chain

which modules to use in which order?

Write a python script

or modify an existing one

specify all modules and their parameters

Execute your script

and wait for the results

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How does it work in practice? - user's POV

```
#!/usr/bin/env python
...
tray = I3Tray()

tray.AddService("I3AntTextFileGeometryServiceFactory","georead")(
    ("AntaresGeoFile", "detector.det"))
tray.AddService("I3AntTxtReaderServiceFactory","anttxtreader")(
    ("Infile", "event_file.evt"),
    ("RawSeriesName","EvtRawHitSeries"))
tray.AddModule("I3Muxer","muxer")
tray.AddModule("I3AartStrategy", "aartstrat")(
    ("InputHits", "EvtRawHitSeries"),
    ("OutputTrack", "AartTrack"))
tray.AddModule("I3Writer","writer")(
    ("filename", "output_file.i3"))
tray.AddModule("TrashCan", "the can")
tray.Execute()
tray.Finish()
```


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Modules can add data to the frame

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Work with it

Write the output data to the frame

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How does it work in practice? - developer's POV

```
class I3MyModule : public I3Module
{
    I3MyModule(....) {
        AddParameter(....); // defines the possible parameters/def. values
    }

    Configure() {
        GetParameter(....); // retrieves the parameters from the framework
    }

    Physics(I3FramePtr frame) {
        const &I3MyHits = frame->Get<I3MyHits>("NameOfTheHitList");

        .... // do something, create new data

        frame->Put("NameOfMyReconstructedTrack", MyNewTrack);
    }
};
```


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Conclusions

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Can easily be extended by anyone

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