

Herwig++

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Herwig++ details

General purpose MC event generator

many matrix elements natively; underlying event;
initial/final state parton showering; Powheg matching;
cluster hadronization; individually modelled hadron/tau decays;
QED radiation

30-year history in its F77 implementation;
Hw++ is a complete redesign from ground up.

currently ~20 members of varying activity
in Durham, Manchester, Cambridge, Milan, Karlsruhe

Main reference: arXiv:0803.0883

<http://projects.hepforge.org/herwig/>

ThePEG



Toolkit for high energy
physics event generation

Herwig++

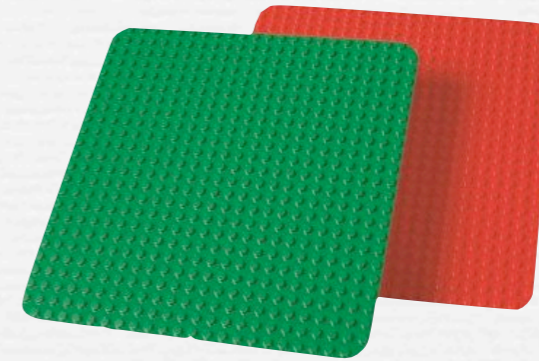


Box of physics implementations

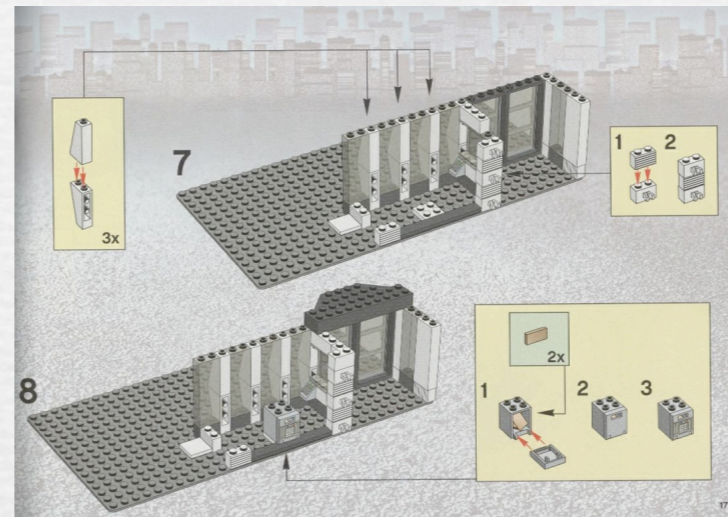
Each building block is
a compiled C++ class



ThePEG Repository

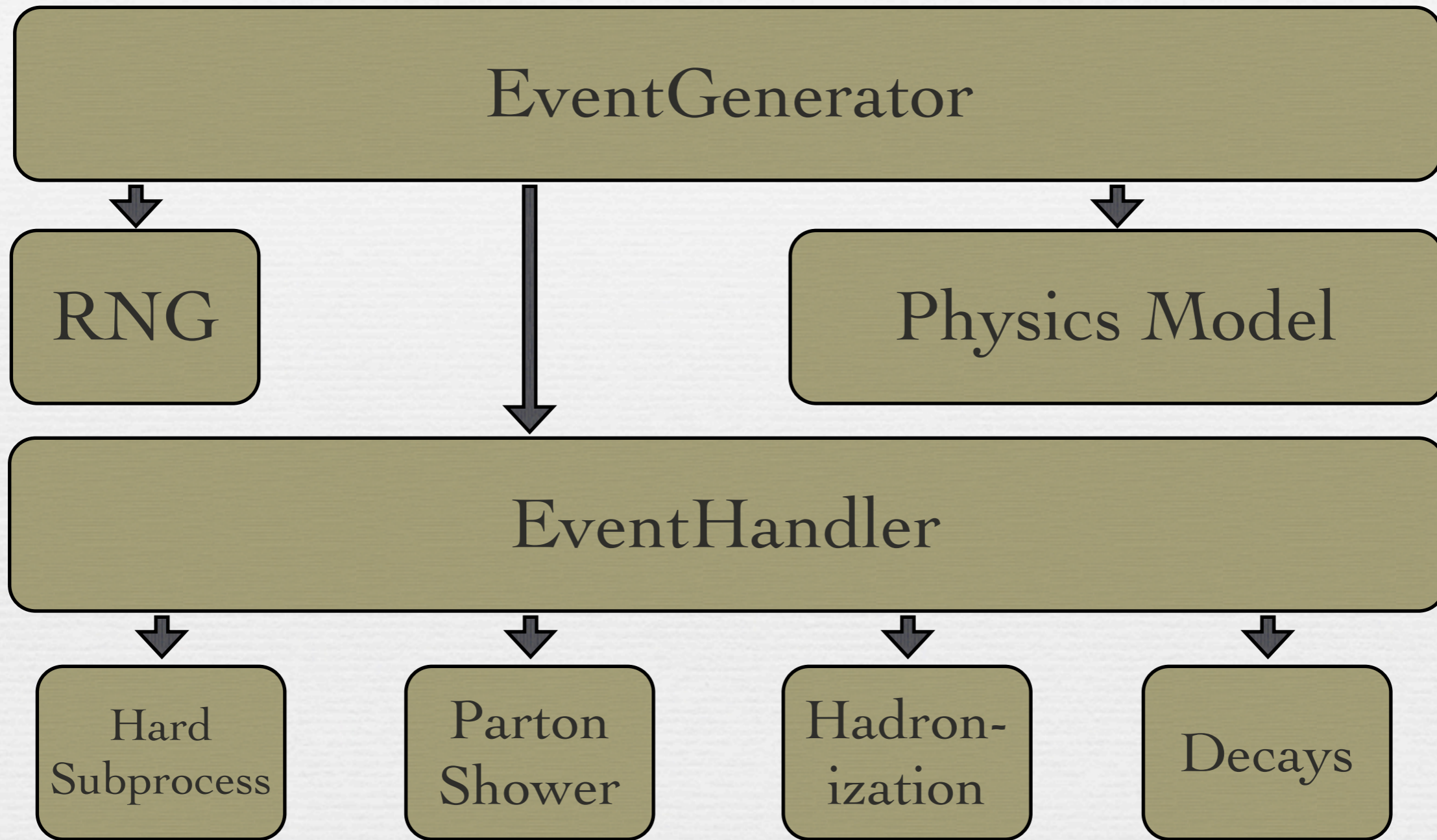


plaintext
setup files



no more compilation needed here

Default Setup



Default Setup

```
create ThePEG::StandardEventHandler /Herwig/LHCHandler
set    LHCHandler:LuminosityFunction FixedLHCLuminosity
```

```
insert LHCHandler:SubProcessHandlers[0] /Herwig/SimpleQCD
set    LHCHandler:CascadeHandler        /Herwig/ShowerHandler
set    LHCHandler:HadronizationHandler  /Herwig/ClusterHadHandler
set    LHCHandler:DecayHandler         /Herwig/DecayHandler
[...]
```

```
create ThePEG::EventGenerator /Herwig/LHCGenerator ThePEG.so
set    LHCGenerator:EventHandler /Herwig/LHCHandler
[...]
```

```
set LHCHandler:BeamA /Herwig/Particles/p+
set LHCHandler:BeamB /Herwig/Particles/p+
set FixedLHCLuminosity:Energy 14000.0
[...]
```

EventGenerator

Hard
Subprocess

Parton
Shower

Hadron-
ization

Decays

Default Setup

```
create ThePEG::StandardEventHandler /Herwig/LHCHandler
set    LHCHandler:LuminosityFunction FixedLHCLuminosity
```

```
insert LHCHandler:SubProcessHandlers[0] /Herwig/SimpleQCD
set    LHCHandler:CascadeHandler        /Herwig/ShowerHandler
set    LHCHandler:HadronizationHandler  /Herwig/ClusterHadHandler
set    LHCHandler:DecayHandler          /Herwig/DecayHandler
[...]
```

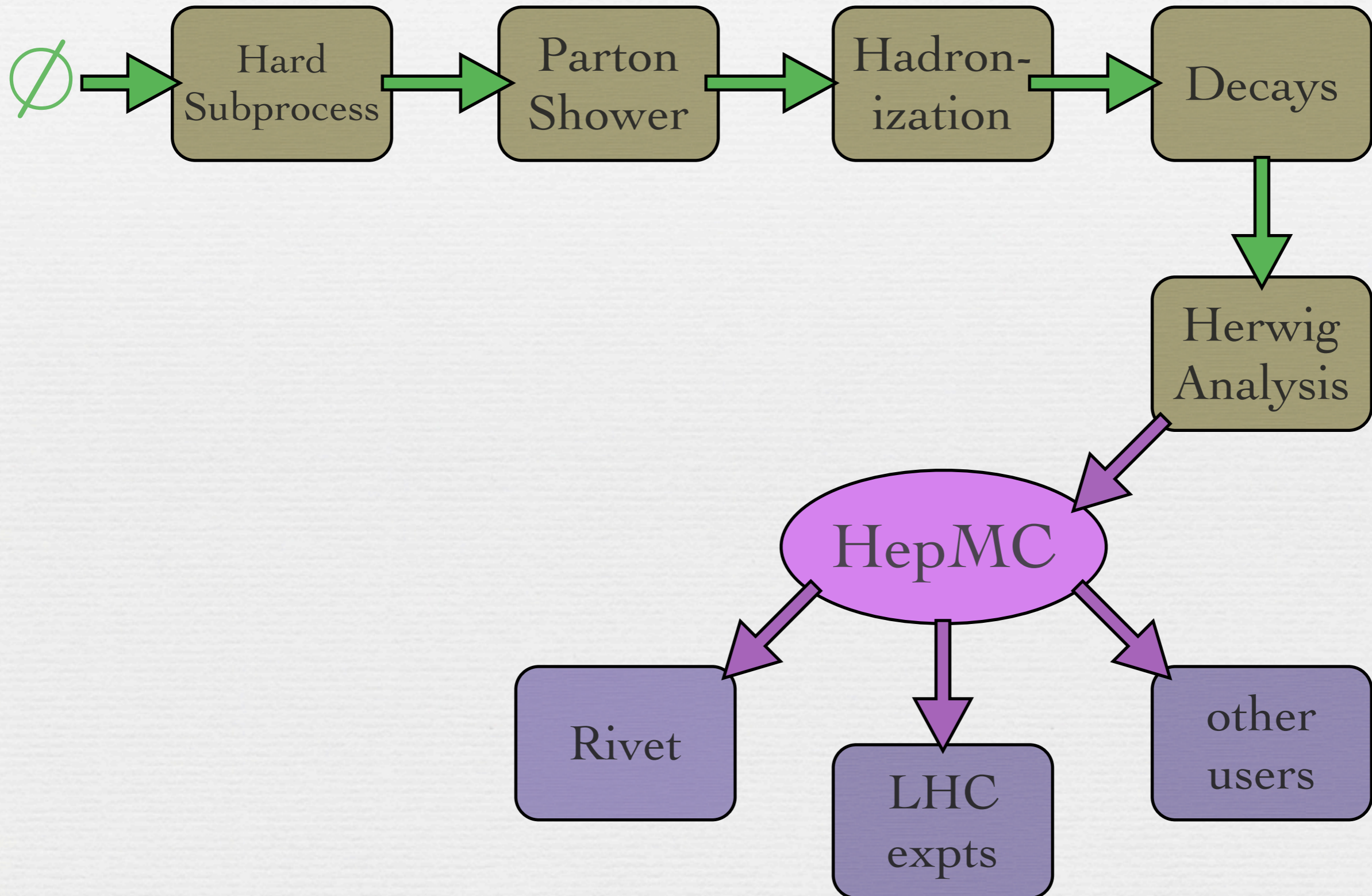
```
create ThePEG::EventGenerator /Herwig/LHCGenerator ThePEG.so
set    LHCGenerator:EventHandler /Herwig/LHCHandler
[...]
```

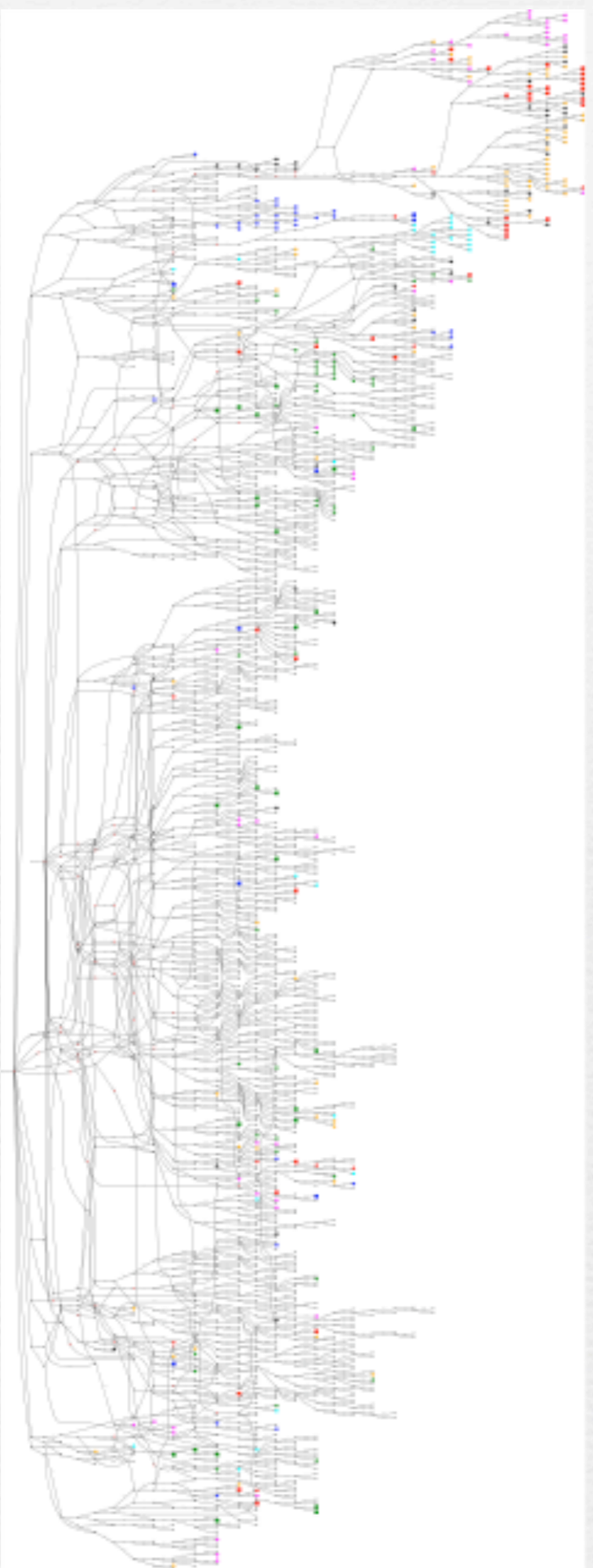
```
set LHCHandler:BeamB /Herwig/Particles/p+
set FixedLHCLuminosity:AlphaSOrder 14000
set create DGrell::Foo /DGrell/Foomaker DGrellHwPlugin.so
[...]
```

Arbitrary user extensions use `dlopen()`:

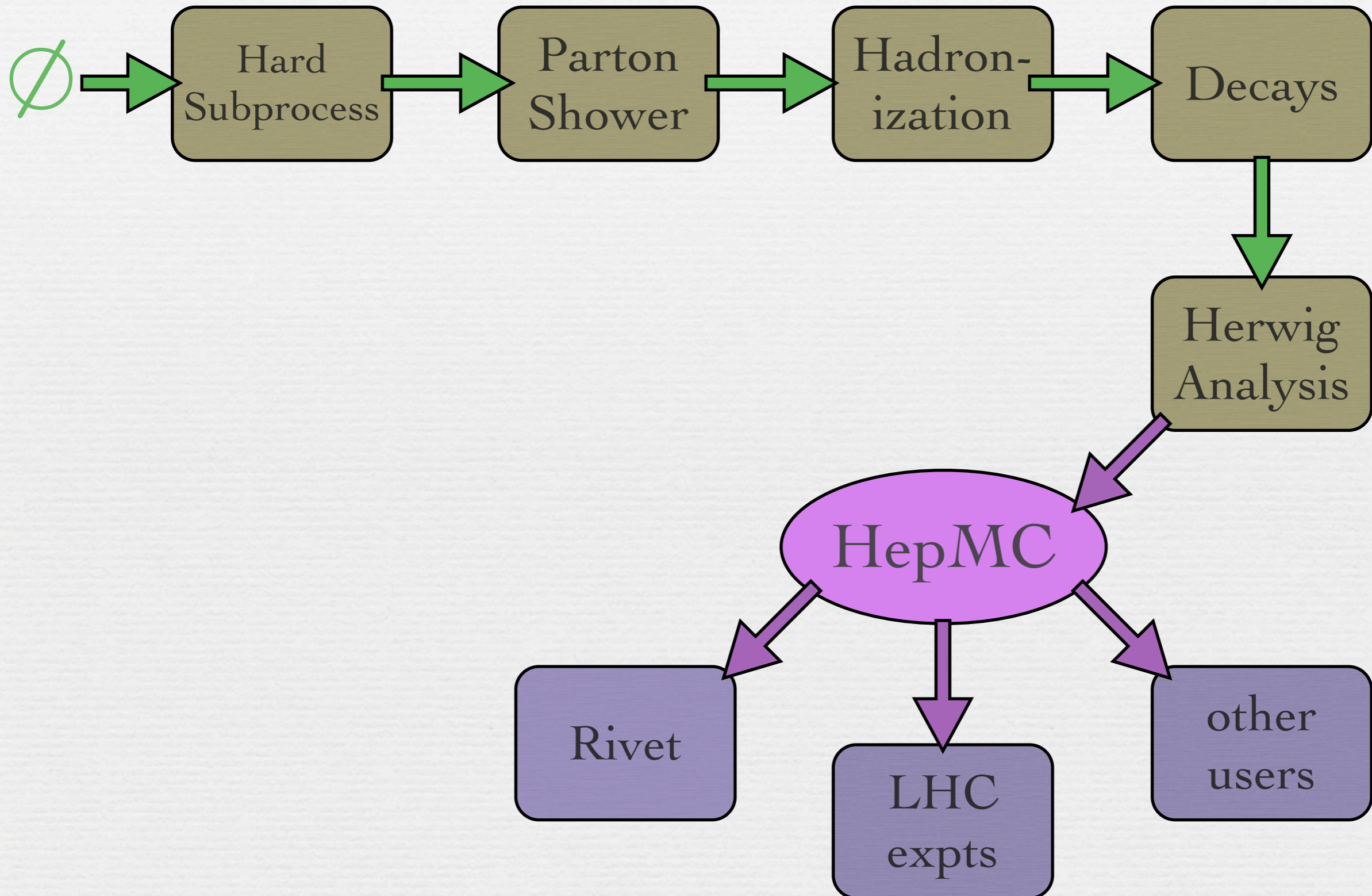
Main code *never* needs recompilation.

Event record flow

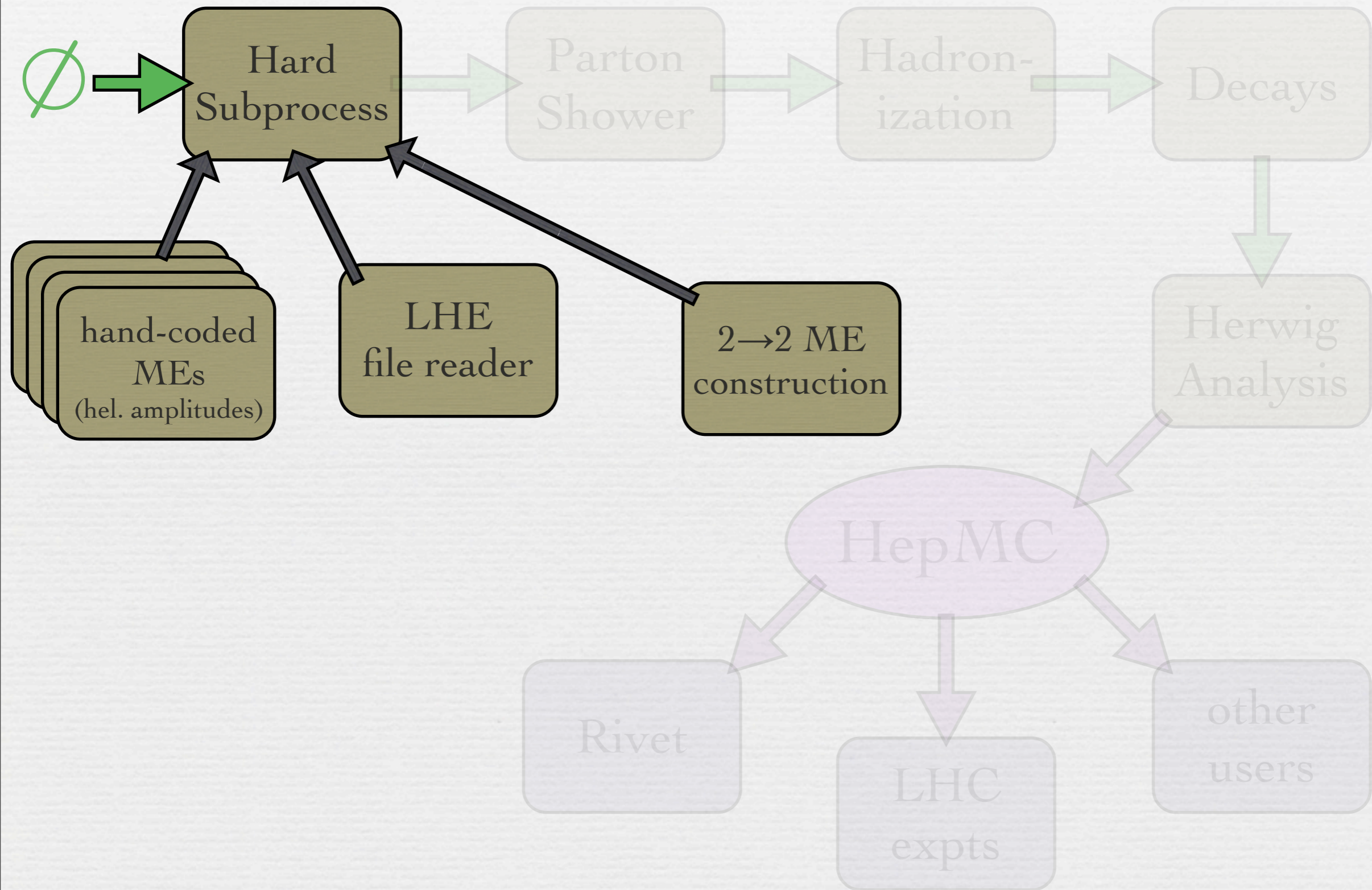




Event record flow



Event record flow



BSM model handling

Make use of existing Lorentz structures in helicity amplitude formalism

Only need to hand-code vertices for the new model, and model class to hold parameter values

Automatic determination of $2 \rightarrow 2$ MEs, as well as $1 \rightarrow 2$ and $1 \rightarrow 3$ decays, with full spin correlation

Have: MSSM (with SLHA reader), UED, Randall-Sundrum gravitons, Z' , anomalous hVV

BSM model handling

Most of the infrastructure already maps well onto FeynRules output

Will join MG.5 in using FR's Python structures

Too early for us to make wishes