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Simulation

Monte Carlo

↓

detector simulation

↓

analysis

Detector simulation tools

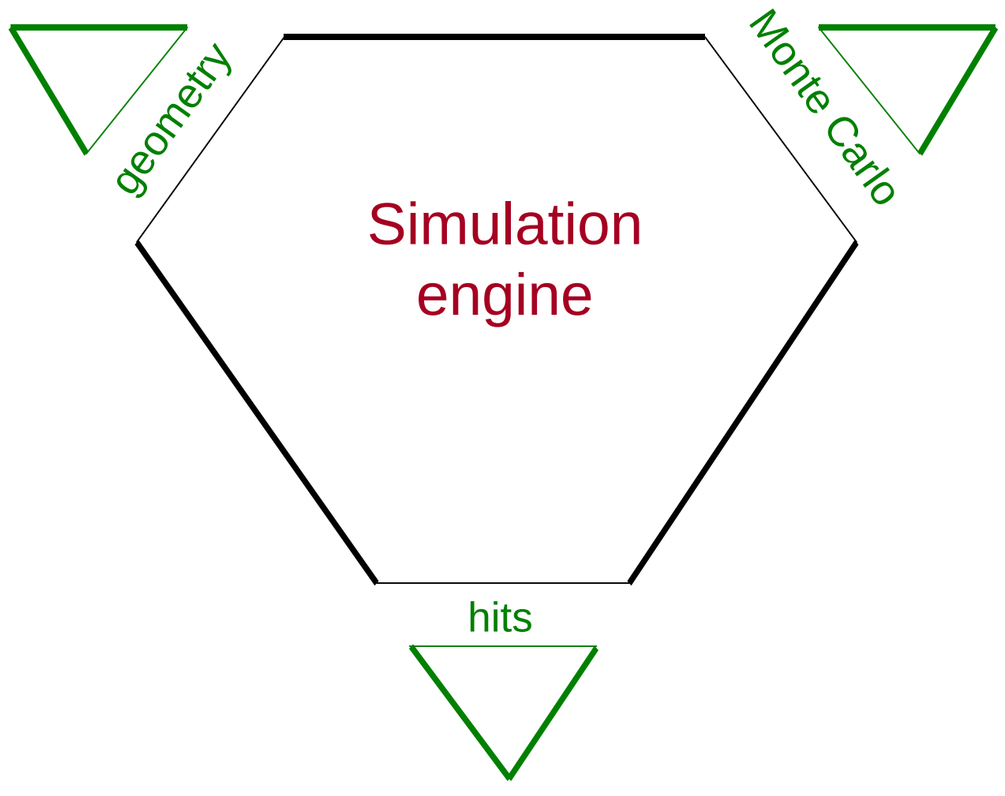
✓ **MCFast**
- reliable for acceptance, resolution
- 10^3 events/cpu/s
- in production

➲ **Geant 3**
- reliable for e-m interactions, bg
- 10 events/cpu/s
- **under development**

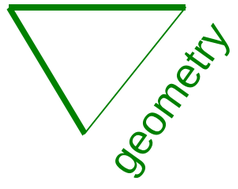
… this list will grow over time:

standard interfaces need are needed

Detector simulation interfaces



Detector simulation interfaces



Decided collaboration mtg 3/2001:

- standard geometry interface is needed
- should be expressed in xml

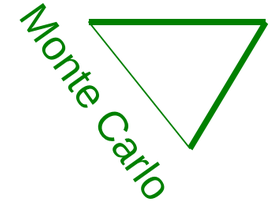
Completed 5/2001: version 1.0

- entire detector exists in prototype
- interface to Mcfast completed and tested
- interface to Geant in progress
- project web site http://zeus.phys.uconn.edu/halld/geometry

Detector simulation interfaces

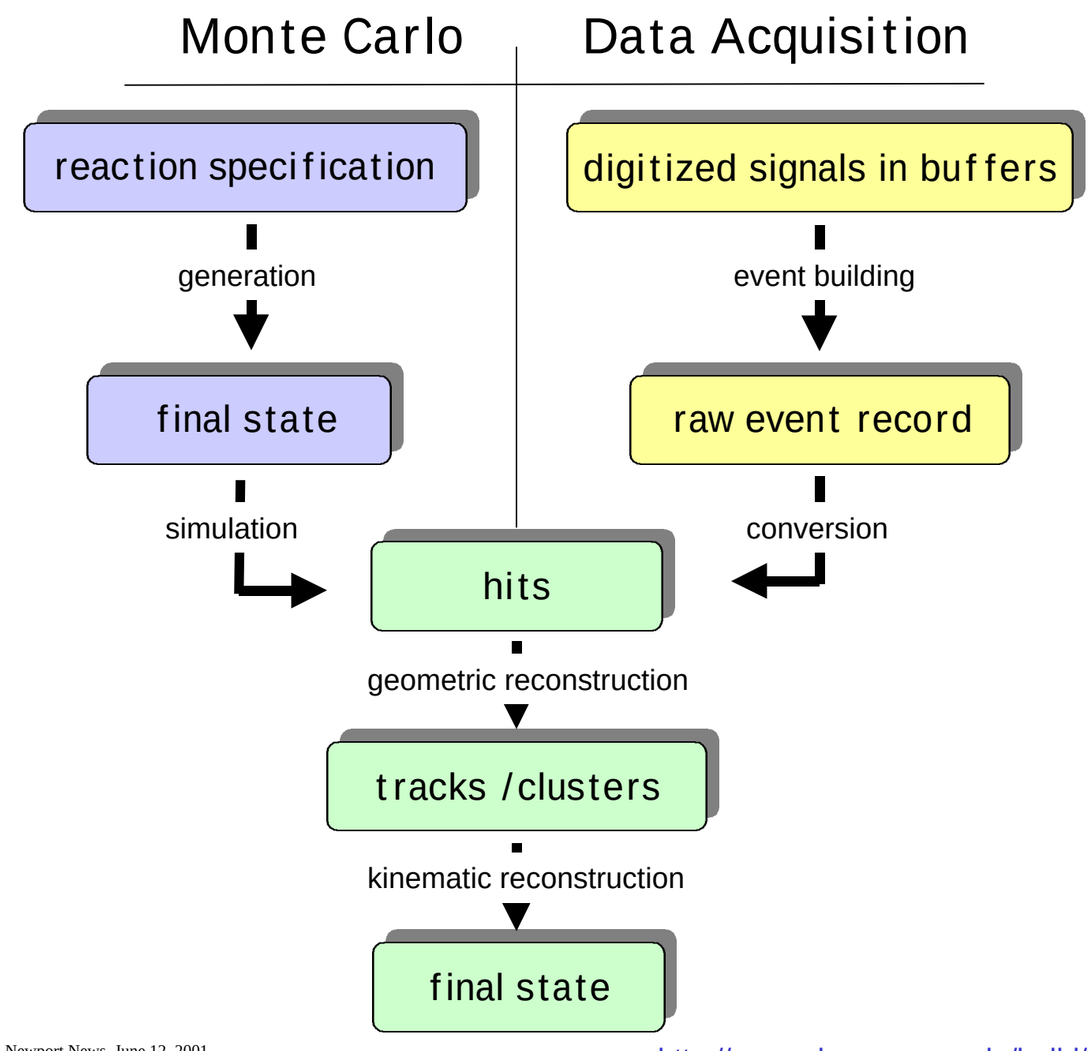
Decided at workfest 5/2001:

- standard data model is needed
- should be expressed in xml



Completed 6/2001: version 1.0

- data model for Monte Carlo generation
- interface to genr8 completed and tested
- interface to Mcfast completed
- interface to Geant in progress
- project web site http://zeus.phys.uconn.edu/halld/datamodel/doc



http://zeus.phys.uconn.edu/halld/datamodel/doc

Data Model:

Example #1: define hits in forward TOF

```
<forwardTOF>
   <slab y="float" repeat="*">
      <side end="int" repeat="*">
         <hit t="float" dE="float" repeat="*" />
      </side>
   </slab>
</forwardTOF>
```


http://zeus.phys.uconn.edu/halld/datamodel/doc

Data Model:

Example #1: define hits in forward TOF

```
typedef struct {
  t_ForwardTOF_t* forwardTOF;
} t_HDDM_t;
```

```
typedef struct {
  t_Slabs_t* slabs;
} t_ForwardTOF_t;
```

```
typedef struct {
  float  y;
  t_Sides_t*  sides;
} t_Slab_t;
```

```
typedef struct {
  int   end;
  t_Hits_t*   hits;
} t_Side_t;
```

```
typedef struct {
  float   t;
  float   dE;
} t_Hit_t;
```


http://zeus.phys.uconn.edu/halld/datamodel/doc

Data Model:

Example #2: define Monte Carlo event

```
<HDDM class="s" version="1.0">
  <physicsEvent eventNo="int" runNo="int">
    <reaction type="int" weight="float" repeat="*">
      <beam type="Particle_t">
        <momentum px="float" py="float" pz="float" E="float" />
        <properties charge="int" mass="float" />
      </beam>
      <target type="Particle_t">
        <momentum px="float" py="float" pz="float" E="float" />
        <properties charge="int" mass="float" />
      </target>
      <vertex repeat="*">
        <product type="Particle_t" decayVertex="int" repeat="*">
          <momentum px="float" py="float" pz="float" E="float" />
          <properties charge="int" mass="float" />
        </product>
        <origin vx="float" vy="float" vz="float" t="float" />
      </vertex>
    </reaction>
  </physicsEvent>
</HDDM>
```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Data Model:

Existing HDDM tools:

- ✓ hddm-c: translates hddm data model into c
- ✓ hddm-xml: converts hddm stream into xml listing
- ✓ stdhep-hddm: converts stdhep files into hddm stream

http://zeus.phys.uconn.edu/halld/datamodel/doc

Data Model:

Example: output from genr8 MC generator processed by stdhep-hddm

```
<?xml version="1.0" encoding="UTF-8" ?>
<HDDM class="s" version="1.0">
   <physicsEvent runNo="-9000" eventNo="1">
      <reaction type="0" weight="0.000000">
         <vertex>
            <product type="pi-" decayVertex="0">
               <momentum E="5.937384" px="-0.197764" py="0.586868" pz="5.903338" />
               <properties mass="0.140000" charge="-1" />
            </product>
            <product type="pi+" decayVertex="0">
               <momentum E="1.947875" px="0.001550" py="-0.182470" pz="1.934249" />
               <properties mass="0.140000" charge="1" />
            </product>
            <product type="proton" decayVertex="0">
               <momentum E="1.052739" px="0.196214" py="-0.404399" pz="0.162411" />
               <properties mass="0.938000" charge="1" />
            </product>
            <origin t="0.000000" vx="0.000000" vy="0.000000" vz="0.000000" />
         </vertex>
      </reaction>
   </physicsEvent>
   <physicsEvent runNo="-9000" eventNo="2">
   . . .
```


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