Event Reproducibility

Michael Kuss

INFN Pisa

Analysis Group Meeting

19 September 2005
Random Seed Generation

in `GlastSvc/src/GlastRandomSvc/GlastRandomSvc.cxx`:

```cpp
int multiplier = 1;
int dummy = 0; // for 2nd argument to setSeed
EngineMap::const_iterator dllEngine;

for ( dllEngine=m_engineMap.begin(); dllEngine!=m_engineMap.end(); ++dllEngine ) {
    long theSeed = multiplier * 100000 * ((runNo+1) % 20000) + 2*seqNo+1;
    dllEngine->second->setSeed(theSeed, dummy);
    ++multiplier;
}
```

multiplier 1 (Linux): 20000 runs with 50k events each
multiplier 6 (windows): 3333 runs with 300k events each
Initial Conditions

in the job options:

```
GlastRandomSvc.RunNumber = -1;
GlastRandomSvc.InitialSequenceNumber = 0;
FluxSvc.StartTime = 0;
```

The first event will have:

```
EvtEventId = 0
EvtElapsedTime = 0 + dt(random)
```
Initial Conditions for $n^{th}$ Event

in the job options:

```
GlastRandomSvc.RunNumber = -1;
GlastRandomSvc.InitialSequenceNumber = <n>;
FluxSvc.StartTime = <StartTime of $(n-1)^{th}$ event>;
```

creates an event with:

```
EvtEventId = <n>
EvtElapsedTime = <StartTime of $(n-1)^{th}$ event> + dt(random)
```
When Are Two Events Equal?

If every single bit in the MeritTuple is equal!

Class `checkSum` in `ntupleWriterSvc/src/checksum.cxx` sums all bytes of an event of the `MeritTuple` and writes `EvtEventId`, `EvtElapsedTime`, and the "check sum" to file.

```cpp
FluxAlg.source_name = "muon_pencil_angle";
GlastRandomSvc.InitialSequenceNumber = 0;
FluxSvc.StartTime = 0;
RootTupleSvc.checksumfilename = "cl.txt";
```

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2.25349044172052405e-02</td>
<td>87410</td>
</tr>
<tr>
<td>1</td>
<td>8.27345332713414899e-02</td>
<td>86760</td>
</tr>
<tr>
<td>2</td>
<td>2.27063284529481935e-01</td>
<td>88886</td>
</tr>
<tr>
<td>3</td>
<td>4.27511578234473943e-01</td>
<td>87016</td>
</tr>
<tr>
<td>4</td>
<td>4.81300049419533471e-01</td>
<td>87760</td>
</tr>
</tbody>
</table>
When Are Two Events Equal?

If every single bit in the MeritTuple is equal!

```
FluxAlg.source_name = "muon_pencil_angle";
GlastRandomSvc.InitialSequenceNumber = 0;
FluxSvc.StartTime = 0;
RootTupleSvc.checksumfilename = "c1.txt";
```

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>2.25349044172052405e-02</th>
<th>87410</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>8.27345332713414899e-02</td>
<td>86760</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2.27063284529481935e-01</td>
<td>88886</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>4.27511578234473943e-01</td>
<td>87016</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>4.81300049419533471e-01</td>
<td>87760</td>
</tr>
</tbody>
</table>

```
FluxAlg.source_name = "muon_pencil_angle";
GlastRandomSvc.InitialSequenceNumber = 3;
FluxSvc.StartTime = 2.27063284529481935e-01;
RootTupleSvc.checksumfilename = "c2.txt";
```

<table>
<thead>
<tr>
<th></th>
<th>3</th>
<th>4.27511578234473943e-01</th>
<th>87016</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>4</td>
<td>4.81300049419533471e-01</td>
<td>87760</td>
</tr>
</tbody>
</table>

Cave: doesn’t work for GR v7r0p[1-3]. Fix is in CVS!
When Are Two Events Equal (II)?

When the check sum file is missing:

- extract from the root files all information of the event in consideration
- re-simulate the event using the appropriate `StartTime` and `InitialSequenceNumber`
- extract from the root files …
- compare

Should be equal (famous last words)!