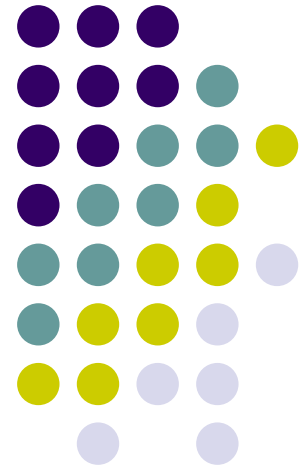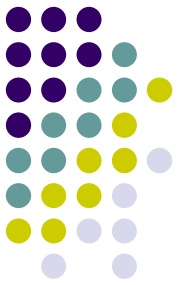# Using XML in HEP

A.Kryukov

Skobeltsyn Institute of Nuclear Physics

(kryukov@theory.sinp.msu.ru)
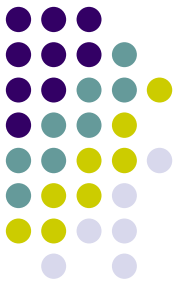
On behalf of CompHEP Collaboration
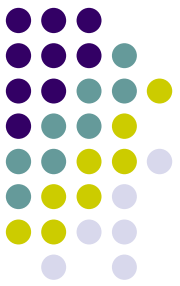
# **Outlook**

- Why XML ?
  - Describe the document structure
  - Extensible language
  - WEB ready
  - Well defined open standard
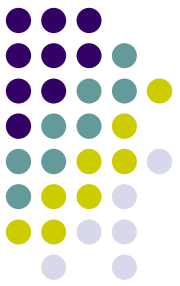  - Available tools to treat of XML

# **Outlook (continue)**

- Experimental events and/or events simulation (illustration)
  - Detector models
  - HEP models
  - Partonic event structure
  - Hadronized events
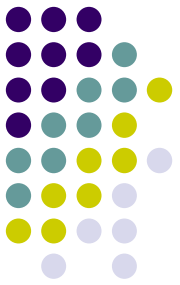  - Digitized events
- Conclusion

# Why XML ?

- XML describe the document structure.
  - Most information in HEP can be and must be presented as a tree structure or in more general case acyclic graph
- XML is extensible language
  - XML has no fixed set of targets and attributes. User can introduce own targets and attributes.
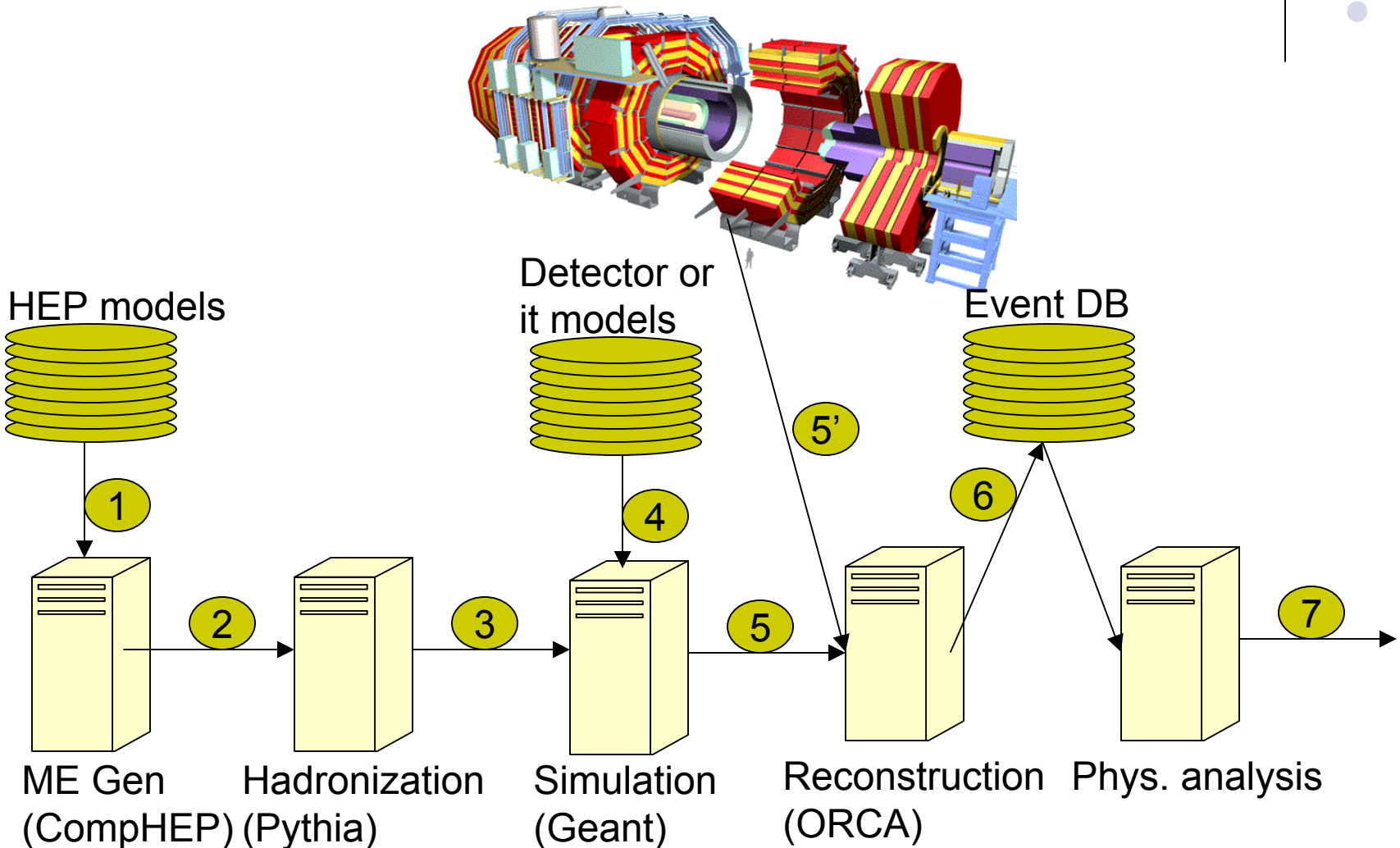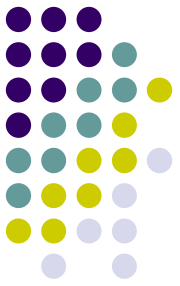
# Why XML (continue) ?

- WEB ready
  - XML document can be distribute through Internet
  - XML document can be displayed in different way depends on the user request (XSLT, XSD)
  - Most modern Web-browsers (Mozilla, IE) can display XML documents by default.
- Well defined open standard
  - Recomended by W3C
  - Supported by IBM, Sun, Microsoft, Linux/UN*X community

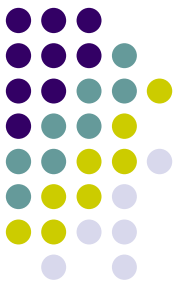# Why XML (continue) ?

- Available tools to treat of XML
  - SAX - Java
  - Expat – C/C++
  - Perl
  - Python
  - Other …

- SW developer can re-use these tools for applications

# Experimental events and/or simulated events



HEP models

Detector or it models

Event DB

5'

1

4

6

ME Gen (CompHEP)

2

Hadronization (Pythia)

3

Simulation (Geant)

5

Reconstruction (ORCA)

Phys. analysis

7

# 1. HEP models

```xml
<model>
    <name>QED</name>
    <parameters>
        <parameter name="alpha" type="float" value="0.00729927">
                Alpha QED (1/137)
        </ parameter>
    </parameters>
    <particles>
        <particle id="e" mass="0.511" type="fermion">
                Electron
        </particle>
    </particles>
</model>
```
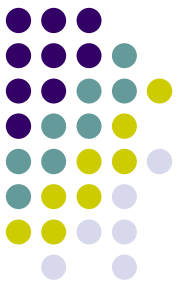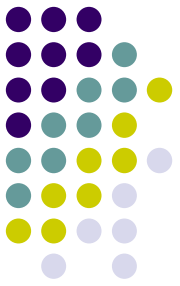
(See more details in A.Demichev, A.Kryukov, A.Rodionov, hep-ph/0203102. See also http://theory.sinp.msu.ru/FeynXML)

# 2. ME events: partonic level

```
<Machine> The LHC project
  <Beam id="1" energy="7.00000E+03">
    <Particle name="proton" KF="2212" mass="9.38000E-01"/>
    <Strfun name='CTEQ' version='5l'> <PDFLIBinfo id="46" gr="4"/>
  </Beam>
</Machine>
<Task>
  <Process ID="1"> u, D -> n, e, E, b, B </Process>
    <GeneralInfo>
      <CrosSection value="1.11227E-03" error="1.90987E-03" Nevent="100"/>
      <Generator name="CompHEP" version="4.2.0"/>
    </GeneralInfo>
</Task>
```

…(Below  partonic events. NOT in XML format!)…

(See more details in A.Sherstnev, XMLHEP: proposal for a structure of partonic events files, this meeting)
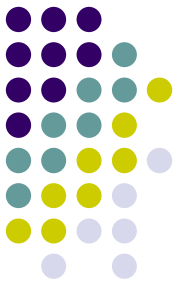
# 3. Simulated events: particle level (illustration)

```xml
<header>
    <experiment name="CMS" date="20070101"/>
    <beam type="pp" energy="14000"/>
    <!– etc. →
</header>
```
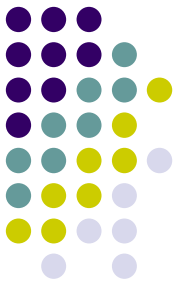
(Below Pythia-like events. NOT in XML format!)
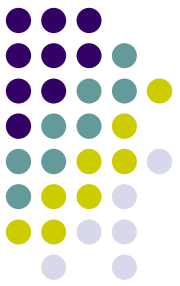
# 4. Detector models (illustration)

```xml
<detector>
    <name id="CMS" version="2.33">
        Compact Muon Solenoid
    </name>
    <basic_element id=1 URI="http://xxx.cern.ch/cms/belement1" />
    <basic_element id=1 URI="http://xxx.cern.ch/cms/belement2" />
    <unit name="shift" dim="mm"/>
    <unit name="rotate" dim="grad"/>
    <element deploy_from=1 shift="x,y,z" rotate="a,b,g" number="100"/>
    <element deploy_from=2 shift="0.0.0" rotate="10.0.0" material="Si"/>
    <element deploy_from=2 shift="x,y,z" rotate="0.0.0" material="Cu"/>
    <!– etc. →
</detector>
```
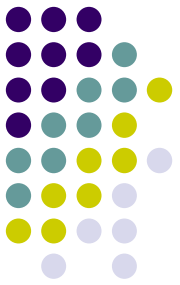
# Next points …

5.    Simulated/experimental events
6.    Reconstructed events
7.    Visualization, Web browsing
8.    What else?

# **Conclusions (pro)**

- XML is very useful for presentation of structured data
  - Models, Events
- Easy for realization on Java, C/C++, Perl, …
- Give a lot of possibilities for publication results through the WEB.
- Unify interfaces of application software
- XML DB id native format of data base for XML presented data.

# **Conclusions (contra)**

- Poor structured information

- Huge amount of information with strong defined and fixed structure
  - ME generated events, Pythia events and others

# Main conclusion: XML has great advantage in HEP application

Thank you for attention!