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SFrame

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- SFrame – a generic analysis frame work
- A quick example using SFrame

SFrame – the idea

motivation:

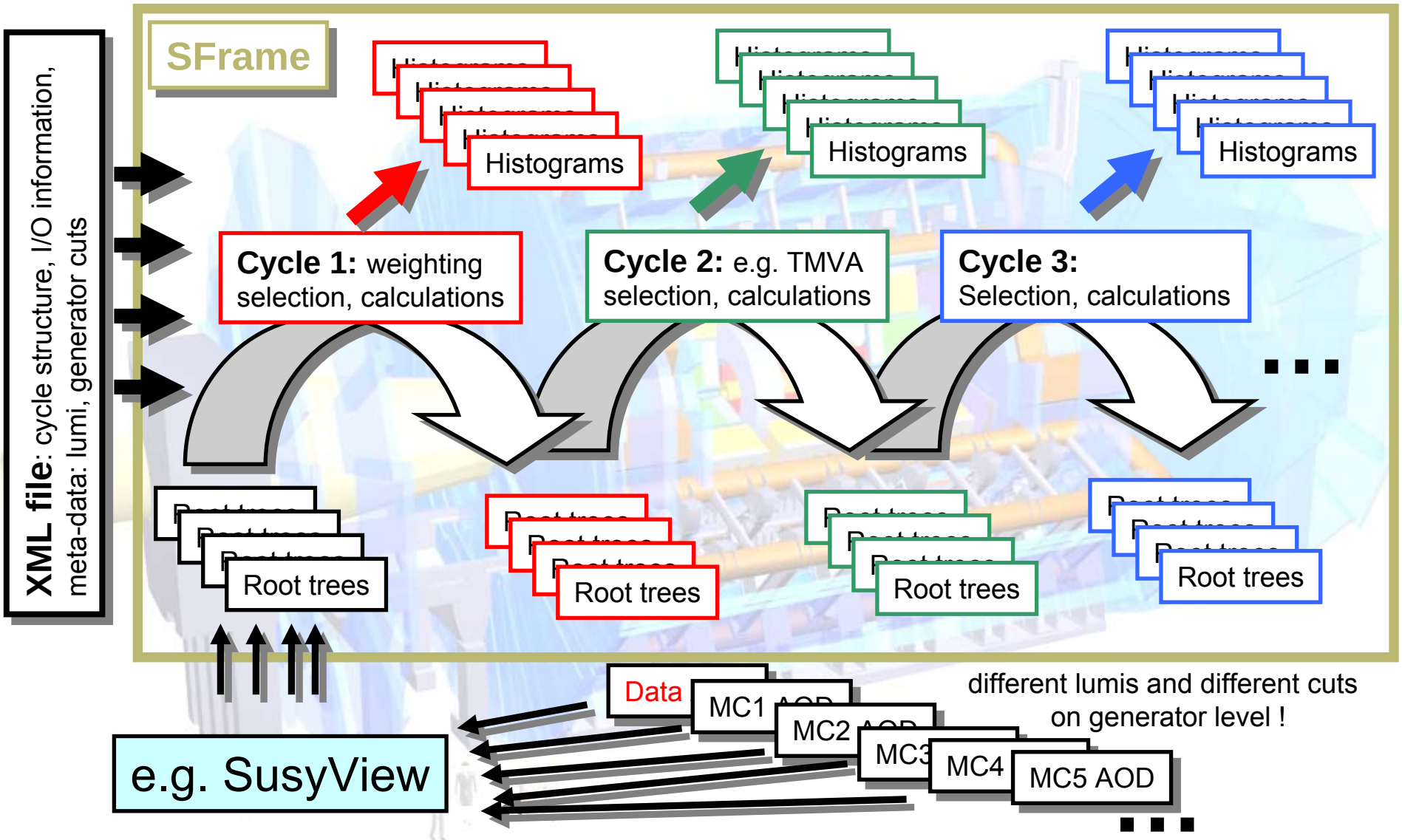
- each analysis in HEP proceeds in cycles (over events).
- each cycle:
  - cycles over input events from different sources: data and various MC types
  - a selection is done or new quantities are calculated
  - output data are written for each selected event (trees) and validation histograms are filled
- output of one cycle is input to next cycle

idea: set-up a generic analysis framework based on ROOT

history:

- SFrame development started in the CERN Atlas Trigger group.
- initially based on SusyView (developed in same group, Boyd)
- developers: S. Ask (CERN), N. Berger (CERN), T. Eifert (Geneva), J. Haller (HH), A. Höcker (CERN)

SFrame – schematic



SFrame - status

disclaimer: SFrame only provides the framework:

- I/O (controlled via XML file)
- weighting of MC samples (lumi, cuts on generator level).
- loop execution (cycles, files, events)
- filling of user-def. OO-trees and histos
- book-keeping of histos.
- (plotting: some generic macros)

user still has to provide:

- input Root trees with meta-data (type, lumi, cuts) in steering card (XML)
- implementation of cycles (C++ template, “execute event” method), incl. validation histograms
- definition of output trees, (consistent with cycle implementation).

SFrame - status

status:

- basic version exists
- still in the development phase !!
- used by several analyses:
  - di-leptons in SUSY (CERN, HH)
  - electron id in SUSY (CERN)
  - trigger studies for top (CERN, Manchester)
  - other groups have expressed interest
- other groups are welcome to use it and comment/ request/ implement additional functionality

more information:

- SFrame TWiki: https://twiki.cern.ch/twiki/bin/view/Main/SFramePage
- CVS repository: /atlas/groups/catsusy/SFrame

Example analysis: Di-leptons in SUSY

- ROOT trees from SUSYView,
- tree tailored for di-lepton study
- produced test samples to debug analysis frame work
- CSC11: SU3, Zee, T1, J0-J8

masses in SU3

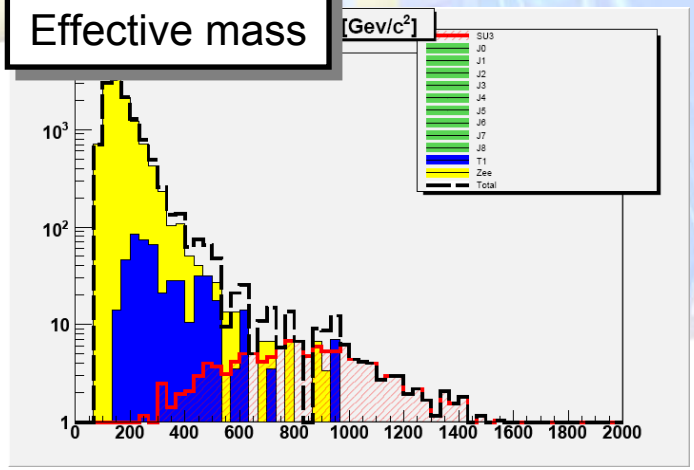
$m(\chi^0_1)$ 116 GeV
$m(\chi^0_2)$ 223 GeV
$m(\chi^0_3)$ 460 GeV
$m(e_R)$ 157 GeV
$\Delta_{xy} = m(\chi^0_x) - m(\chi^0_y)$

$$M_{\text{eff}} \equiv \sum_i |p_{T(i)}| + E_T^{\text{miss}}$$

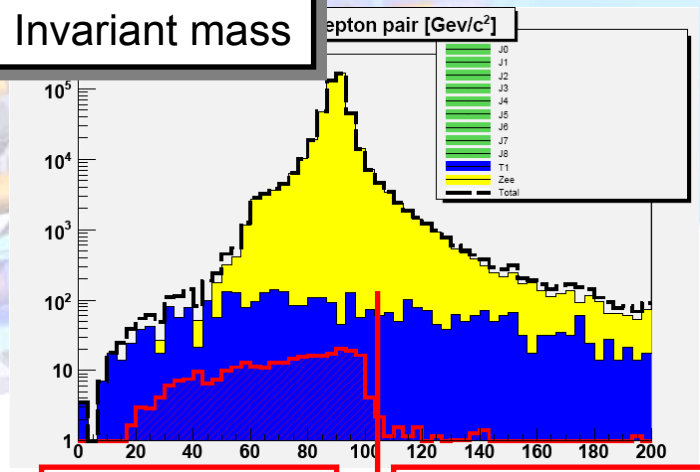
selection:

- $e^+ e^-$ with p_T >10GeV and $|\eta|$<2.5
- note: no cut on M_{eff} or $E_{T,\text{miss}}$

Effective mass



Invariant mass



Δ_{12}: 107 GeV

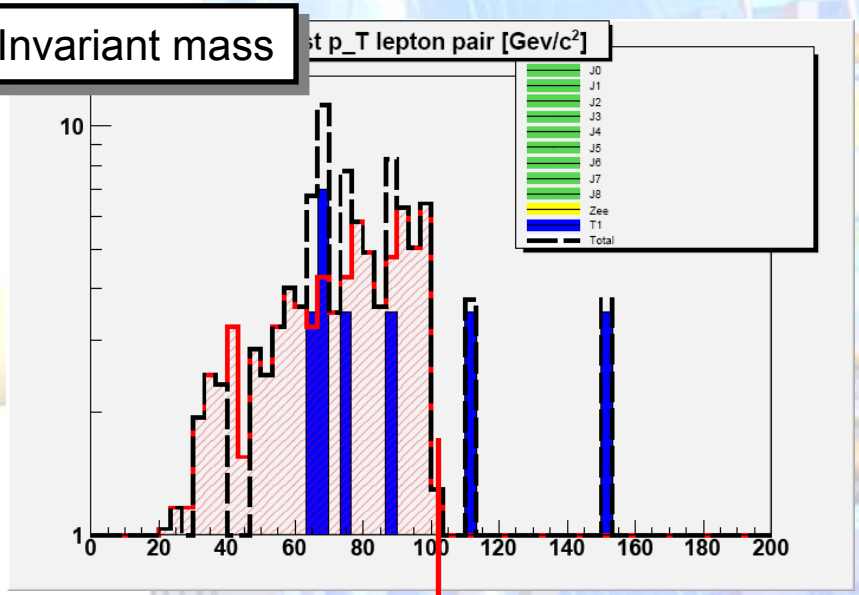
$\chi^0_2 \rightarrow \tilde{l}^- l^+ \rightarrow \chi^0_1 l^- l^+$

Example analysis: harder cuts

selection:

- $e^+ e^-$ with p_T >10GeV and $|\eta|$<2.5
- M_{eff} >600 GeV
- $E_{T,miss>}$100 GeV and $E_{T,miss}$ > 0.15*M_{eff}

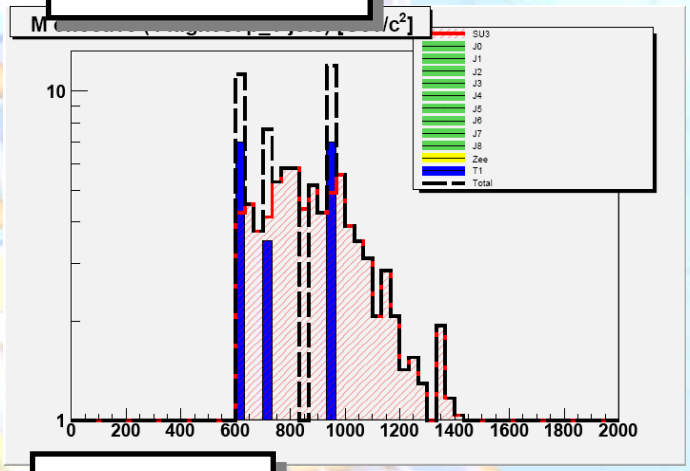
Invariant mass



Δ_{12}: 107 GeV

$\chi^0_2 \rightarrow \tilde{l}^- l^+ \rightarrow \chi^0_1 l^- l^+$

Effective mass



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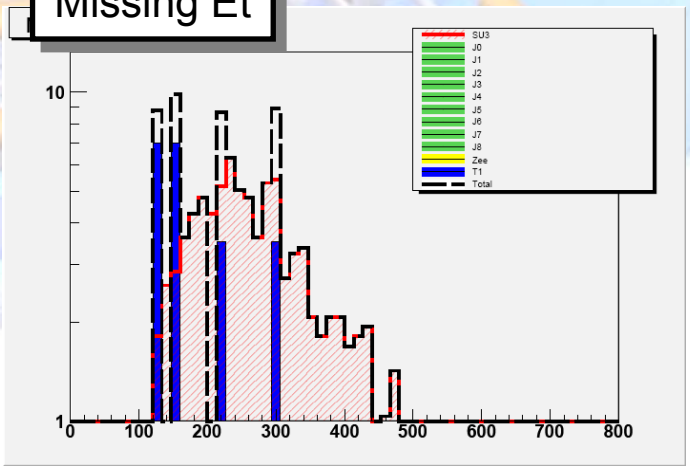

Summary

- SFrame is a generic analysis framework
  - based on ROOT
  - eases the analysis/combination of ROOT trees (fully OO) from different MC sources
  - used by some analysis activities at CERN, HH, Manchester, …
- Di-lepton signature using SusyView and SFrame
  - collaboration with CERN trigger group.
  - first analysis steps show promising results
- final remark: the proposed analysis chain [AOD→ SusyView → SFrame → Results] offers nice possibilities to collaborate.