Summary of 11-12/09/2008 tech. meeting

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Atlas Analysis Italia

September 19, 2008

Main items

- On 11 September we (W,Z analysis groups) met in Frascati to discuss technical details on analysis implementations
  - ★ Common tools
    - Started implementation of common Tag&Probe tool for performance measurements from data
    - The day after we (interested in tag&probe tools) met in Rome1 to organize coding
    - We had a phone meeting on Tuesday with M. Schott to propose our ideas: i'll briefly summarize the outcome
  - ★ Analysis EDM
    - This is a very difficult item to discuss, needs a global view of analysis model, already discussed in ATLAS without a clear conclusion (a lot of analysis frameworks are popping-up)
    - Can we suggest a proposal based on EWPA ? (briefly discussed today)
  - ★ D2PD making and handling of UserData
    - We agreed on using the EWPA EDM
- Next Wednesday there is the W,Z sub-group kick-off meeting chaired by Maarten Bonekamp
  - ★ WHAT we would like to do ?
  - ★ HOW we would like to make the analysis ?

Common tools - why we need them ?

ESD, AOD, D1PD

StoreGate

SiTrack	**SiTrackSel**	TrigIDScan
MooreTrack	MuidTrack	Electron
MuidSATrack	MuonBoyMSTrack	Photon
MuonBoyTrack	Muid	CombinedMuonFeature
MuidSel	MuonROI	TrigElectron
CaloMuon	TrigMuonEF	TrigJet

… … …

AnalysisPackage1

Particles pre-selection

Track matching

Overlap removal

Tag&Probe selection

UserData

AnalysisCode1

AnalysisPackage2

Particles pre-selection

Track matching

Overlap removal

Tag&Probe selection

UserData

AnalysisCode2

- We should be able to factorize common analysis calculations from specific ones
- These should be part of a collaboration wide set of tools

… … …

Common tools - why we need them ?

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... ...

Common Tools

InserterTools | **AssociatorTools** | **OvelapTools** | **InsituTools**

AnalysisPackage1

AnalysisCode1

AnalysisPackage2

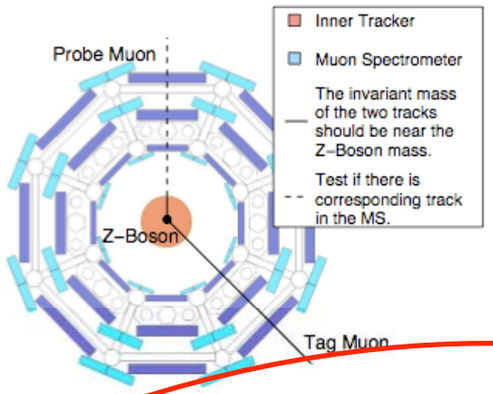
AnalysisCode2

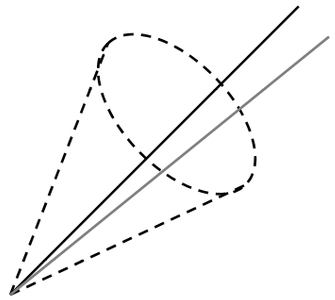
- The benefits are obvious ...
- we focused on **InsituTools**

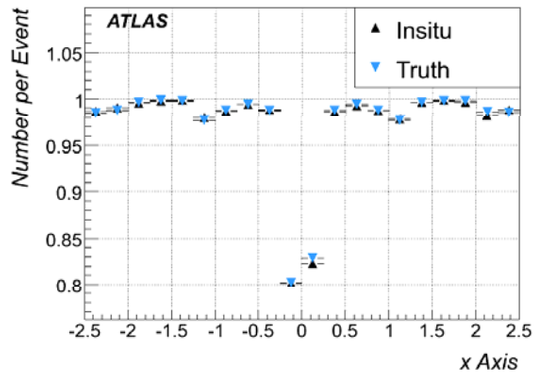
... ...
... ...

Common In-situ tools

- We started to develop a **common tool** to select probe tracks with the **Tag&Probe method** to be used for in-situ determination of muon trigger and offline reconstruction performances
- The tool is developed in the context of the **common in-situ tools** developed by M. Schott http://indico.cern.ch/getFile.py/access?contribId=7&resId=1&materialId=slides&confId=36884







- **MuonProbeCollectorTool**
  - ★ to select probe tracks and put them in SG
- **TriggerAnalysisTool**
  - ★ to match probe with trigger objects

1st step: Create Probe Track Collection	2nd Step: Matching	3rd Step: Representing the efficiency

• Iterate over combined muon tracks and check if
  • p_T>20 GeV, triggered, isolated
• Iterate over inner tracks: Select inner tracks as probe tracks if
  • Opposite charge, p_T>20 GeV, isolated, invariant “track” mass around Z boson
	• Match Probe Tracks with reconstructed Muonspectrometer tracks
	• Matching completely analogous to Monte Carlo Truth matching
		• Efficiency should be represented in object specific binning, e.g. in eta for muons

- here just the overall schema , more will follow soon ...

MuonProbeCollectorTool

- Developed in *PhysicsAnalysis/AnalysisCommon/InsituPerformance/InsituTools* with this general structure:

createProbeColletion() {

-1- retrieve the candidate probe from SG (**ID** or **MS** track container, **jobOpt configurable**)

-2- **selectTag** using **TRIGGER** or **OFFLINE** combined tracks (**jobOpt configurable**)

-2.1- **selectTagZmumu**, **selectTagJPsi**, **SelectTagCalo** (depending on the standard candle or on the sub-system adopted as tag, **jobOpt configurable**)

-3- for each tag

-3.1- **selectProbe**

-3.1.1- **selectProbeZmumu**, **selectProbeJPsi**, **selectProbeCalo** (again **jobOpt configutable**)

-4- **store** the **probe tracks** in **SG** with name chosen accordingly to configured options

}

- Tool can be configured by jobOption to run in different modes
- Technical aspects of MS and ID probe selections are under study to see it this can fit in a single tool or if a split is needed ...
- Associations will be stored as UserData in DPDs/ntuples for later study

Trigger associations

- We could use (just for the matching) the tool existing in the package:
  - ★ PhysicsAnalysis/AnalysisTrigger/AnalysisTriggerTools
  - ★ In particular the **MuonTriggerAnalysisTool**
- Developed some time ago within the Trigger and Higgs groups to perform AOD analysis of the trigger result
- The tool is based on the **TriggerDecisionTool**
  - ★ Back-navigation to the trigger elements corresponding to a given chain
- Some **useful features are configurable** (dR cuts, barrel/endcap separation, etc.)
  - ★ Can run on multiple chains configured through job options
  - ★ dR cuts depending on level and zone
- Can use the **same functions both on MC truth and reconstructed quantities**
  - ★ Easy comparison with the efficiency from the MC truth
- Muon section updated to deal with the new TriggerDecisionTool in release 14.X
- Used e.g. for the Higgs CSC notes and for the Z→μμ tag&probe analysis presented recently at the Muon slice meeting

Next steps

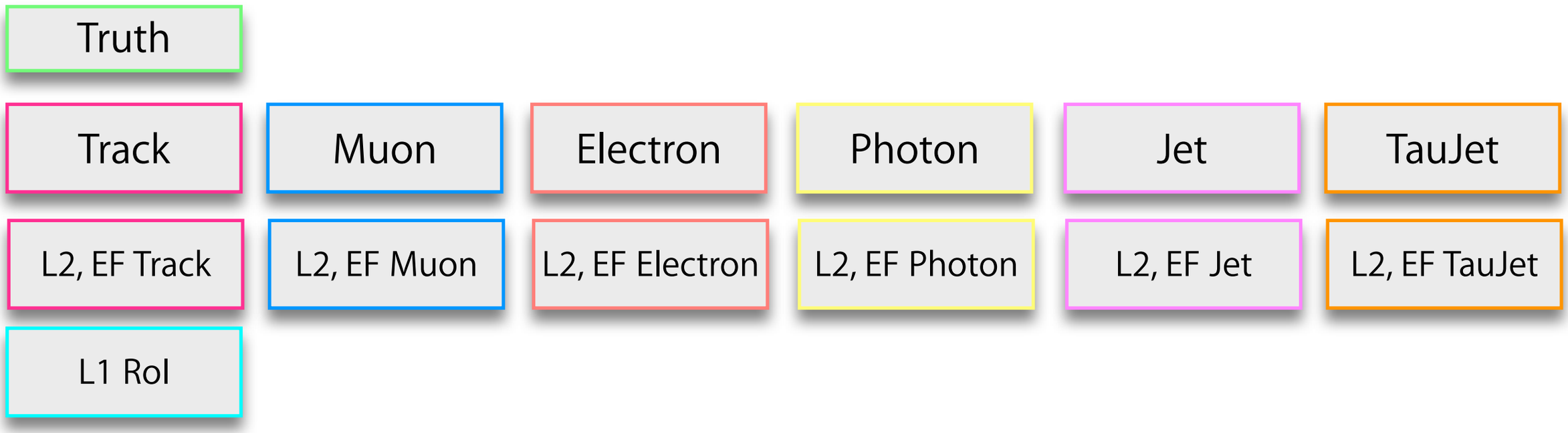
- We had a phone conference this Tuesday with M. Schott to discuss our ideas for the Tag&Probe tool for muons:
  - ★ He completely agreed with us to merge it with its implementations
  - ★ He will also try to use EWPA EDM to store UserData for Tag&Probe

- We presented these implementations at the yesterday Muon Slice Meeting receiving a very good feedback
  - ★ colleague from Japan are going to join us to implement the JPsi probe selection
  - ★ PV and Rome1 are implementing the Zmumu seelction
  - ★ LNF is implementing the CaloTag selection
  - ★ we are all working in collaboration with M. Schott to fit this in the InsituPerformance tool-kit

- **This is the ATLAS official tool to be used with real data to make in-situ muon performance measurement for trigger and offline reconstruction !**

Common analysis EDM ... hmm what's ?

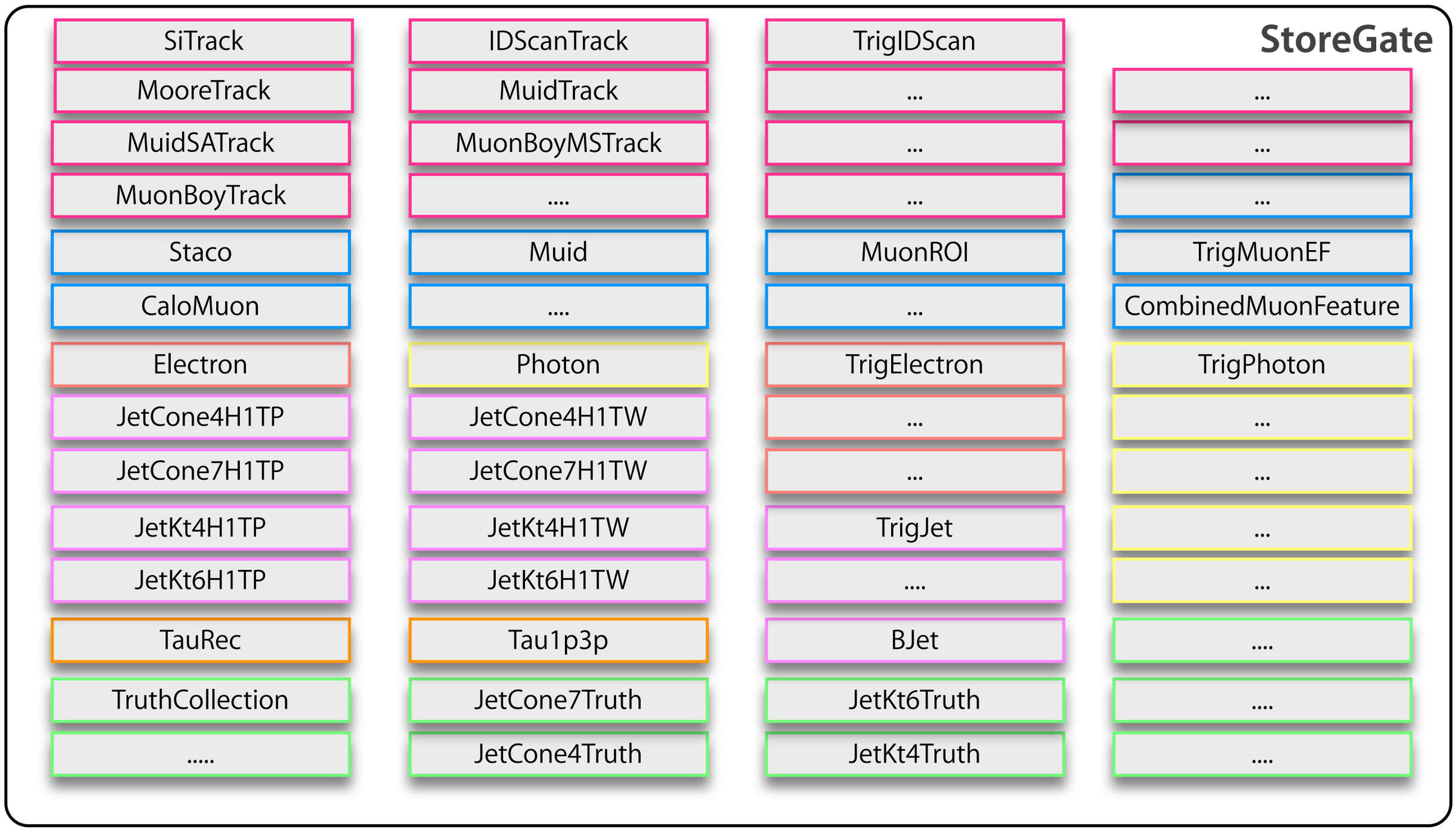
- The particle information after the reconstruction are stored in C++ classes



- We call this set of data-classes our **Event Data Model** (**EDM**)
- They are collected in vectors inside **ESD**, **AOD**, **D1PD**, **D2PD**: the "**collections**" or "**containers**"
  - ★ What about if you do your analysis in Athena ?
  - ★ How do you get access to particles and how much flexibility do you have to handle them ?

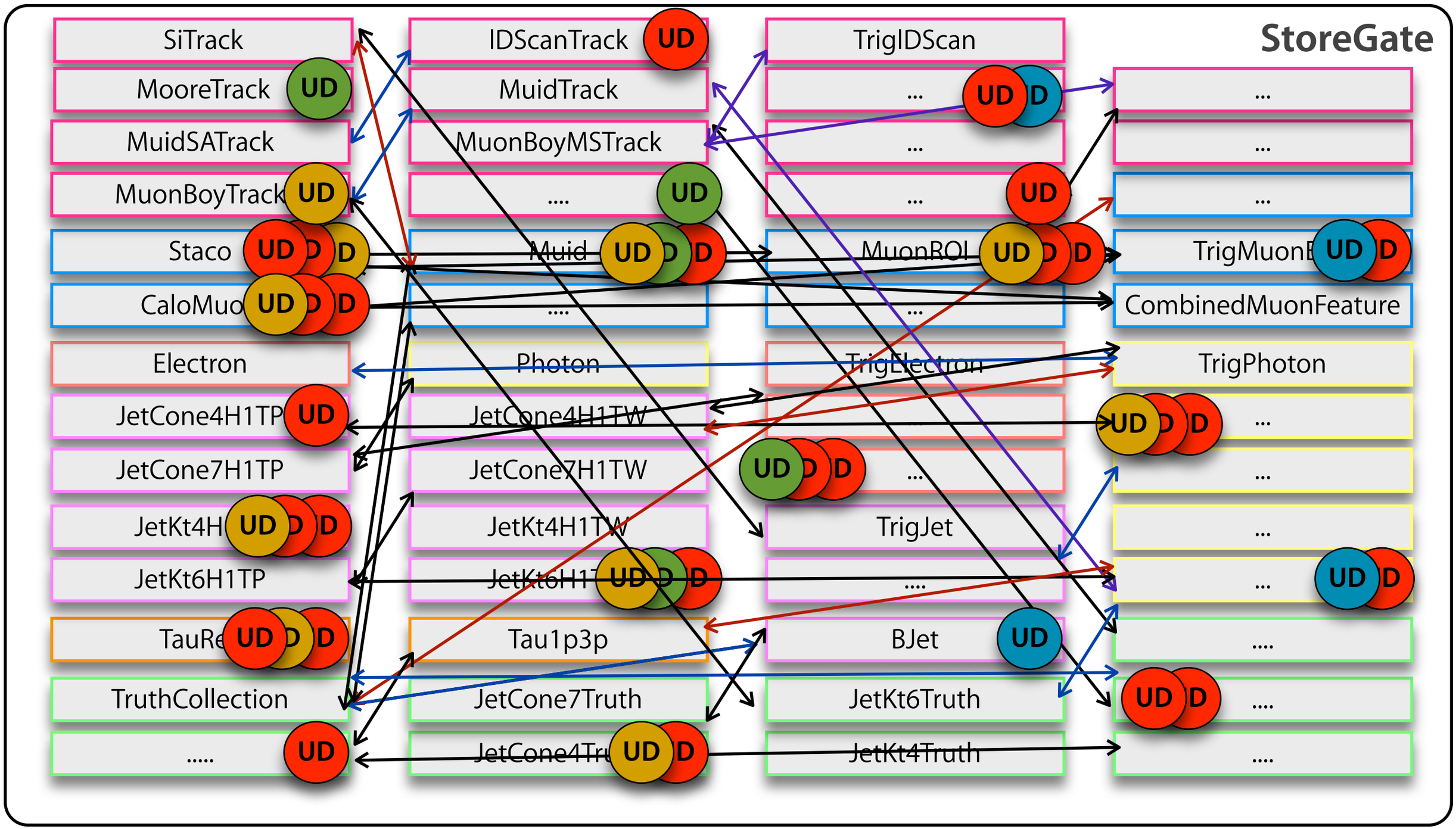
Common analysis EDM ... hmm what's ?

- StoreGate is where particle collections are stored in memory ...



Common analysis EDM ... hmm what's ?

- if you start to make **inter-container links** and add **UserData** things can become complicated both in **memory management** and when trying to **save this information on D2PDs** ...



Common analysis picture

ESD, AOD, D1PD

StoreGate

SiTrack	**SiTrackSel**	TrigIDScan
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Common Tools

InserterTools | **AssociatorTools** | **OvelapTools** | **Tag&ProbeTools**

analysis EDM

EWEventObject (SiTrack *)
Inter-Cont links, UserData

EWEventObject (Muid *)
Inter-Cont links, UserData

EWEventObject (Jet *)
Inter-Cont links, UserData

EWEventLibrary

AnalysisPackage1

AnalysisCode1

AnalysisPackage2

AnalysisCode2

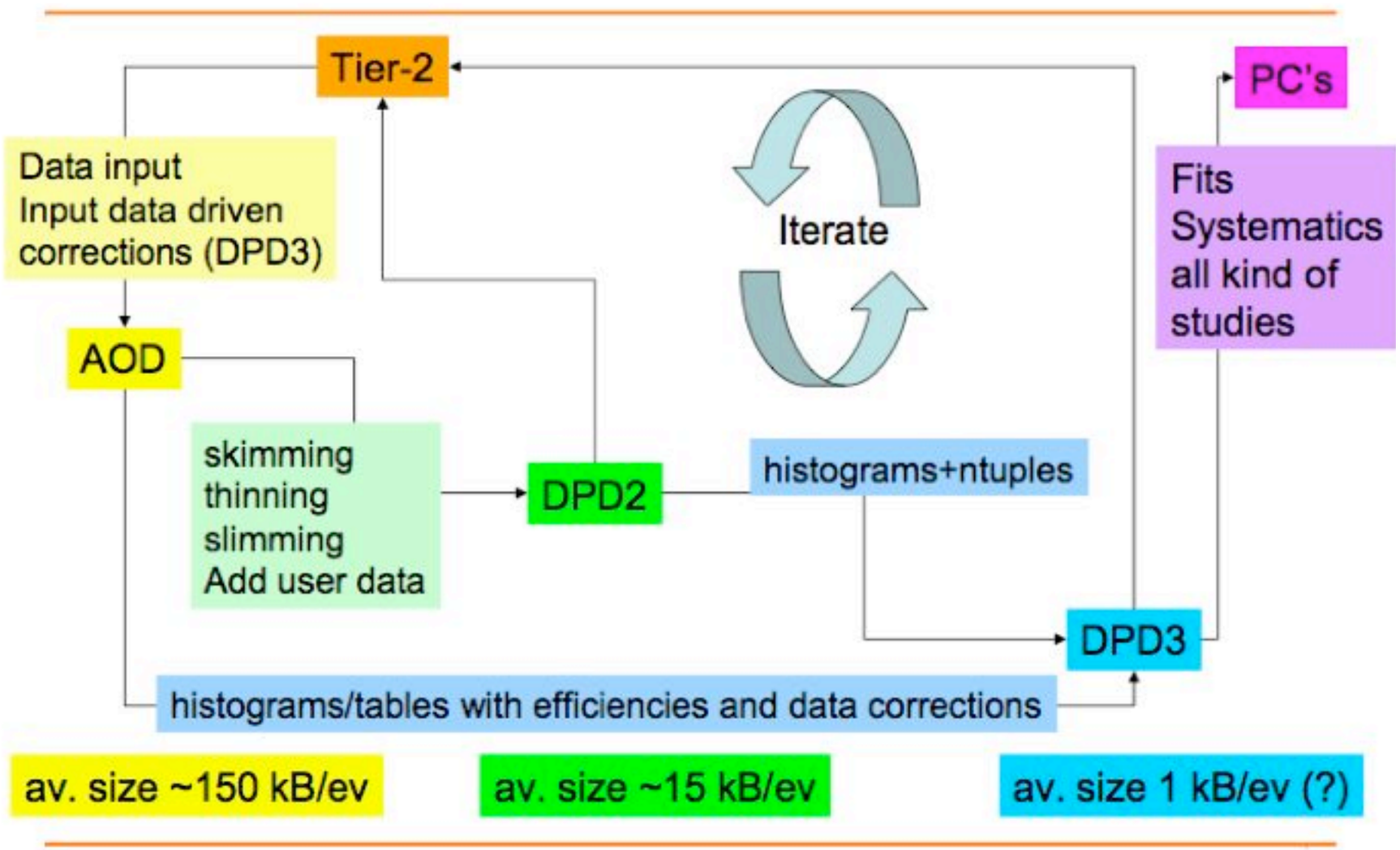
… … …

D2PD

useful particle links & UD
usable in Athena/ARA

D2PD production

- Start with the D2PD production from FDR2 data
  - ★ ganga script and test of the skimming/thinning selections to optimize resources



Summary table

analysis items	tools	groups
AOD (D1PD) -> D2PD, D3PD productions - signal and backgrounds with a dedicated storage area - automatization of ganga submission with dedicated scripts - local analysis of D2PD, D3PD	EWPA	PV, LNF
Acceptances studies - comparison of various effects (ISR, FSR, k_T, UE, ME, PDF's, NLO QCD/EW, ...)	cod. priv. (EWPA?)	Roma2, PV
Efficiency from data - development and validation of common tool for Tag&Probe to be used for Zmumu, JPsi, CaloTagging.	MuonProbeCollectorTool (InsituTools)	Roma1, PV, LNF
Momentum scale and resolutions - analysis code developments - D2PD production with corrections and DB interfacing	EWPA (EWMuCP)	Roma3, LNF
Missing ET scale - interaction with tau group for W ? corrections in D2PD ? DB ?	ARana ?	Mi
Signal and Background studies - analysis code developments (accordingly to W,Z gr. indications)	EWPA (EWBosonSeletor) + analisi indipendente da EWPA ? (Roma1 dixit)	~ tutti (!?!)