RUN3 UPGRADE MC PRODUCTION AND REQUEST

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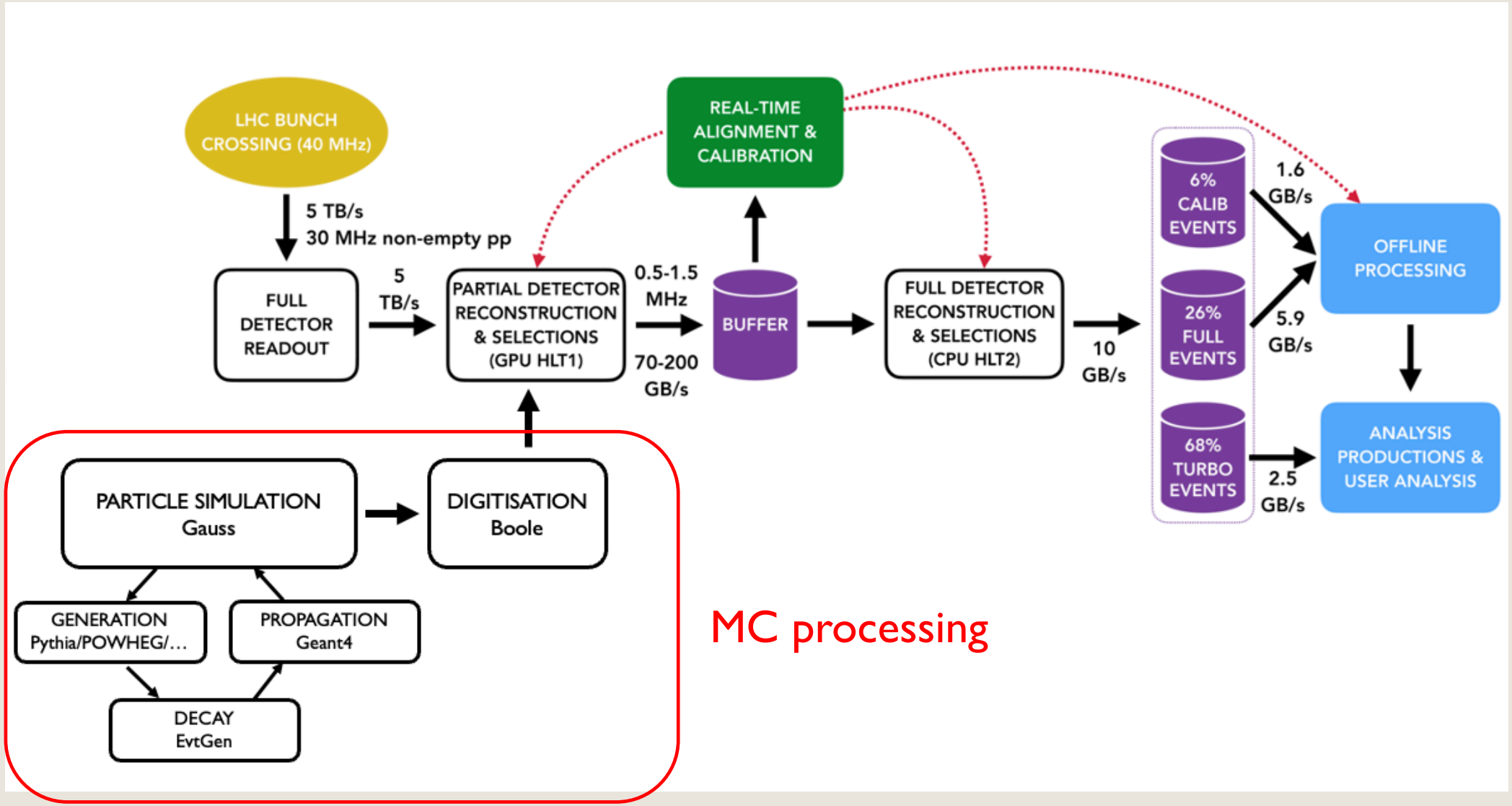
MC PROCESSING FOR THE UPGRADE



MC processing

PARTICLE SIMULATION AND DIGITISATION

- Particle simulation managed by the **Gauss framework**:
  - Generator Phase: p-p collisions (Pythia8,…) and the particles decay (EvtGen)
  - Simulation Phase: physics processes in our experimental setup (Geant4)
- Digitisation managed by the **Boole project**:
  - Input: hits generated by Geant4 and additional hits from Spillover events and LHC background
  - Digitization step: simulation of the detcetor response and readout electronics
  - Output: digitized data that mimics real data coming from the real detector

MC PRODUCTIONS: UPGRADE

- MC productions to match our real data:
  - Billions of different events produced
  - Different running conditions (Beam energy, Luminosity, Magnet Polarity, …)
- Samples to study our data processing:
  - Trigger studies (HLT1 and HLT2)
  - Offline processing (Sprucing, DaVinci, …)

LHCB SIMULATION VERSIONS

- SimNN define the version of the simulation software used in production:
  - Gauss and Boole versions and configurations
  - DDDB and SIMCOND tags
- Find the Upgrade simulation versions here: https://twiki.cern.ch/twiki/bin/view/LHCb/SimulationUpgrade#Upgrade_simulation_versions

DECFILES DATA PACKAGE

- Each decay is specified by EventType number defined by 8 digits "GSDCTNXU" that uniquely identifies the decay

G: General event type and production scheme.
S: Value based on the presence of certain particles.
D: Number depends on the general features of the decay.
C: Based on the number of charm hadrons and leptons.
T: Number of stable charged particles: p, π, K, e and μ.
N: Number of neutrals : K_S, lambda, K_L, gamma, n, π^0 and η.
X: Used to distinguish between different decays that share the same first 6 digits (different **Decay part of the Nickname)**
U: Used to distinguish between the same decay, but different model, cuts, options (different **Other part of the Nickname)**

- DecFiles project manages the decay.dec files which defines each EventType
- Warning! It is possible that your specific decay doesn't exist yet in the project (list in the link of the project)

DIFFERENT OUTPUT FILES

- Definition of the different output file types:
  - SIM: only the Gauss simulation part
  - DIGI: samples with Boole digitization
  - XDIGI: extended info from Gauss saved in a DIGI file (you can re-run Boole for example)
  - (μ)DST: sample with reconstruction information (Moore or Brunel)
  - XDST: extended info saved from Gauss and Boole (possible to re-run Boole or Moore/Brunel)
  - LDST: sample with reconstruction and additional linker tables stored (useful for tracking studies for example pattern recognition, clusters info, …)
  - MDF: samples emulating the real data taking samples (used for software development studies for example in Allen)

IN PRACTICE WHAT TO DO IF I NEED SOME MC SAMPLES FOR MY STUDIES

MC REQUEST: STEP BY STEP

0. Check if your decay was already produced: list

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   - If not, follow the guide to submit your decay.dec

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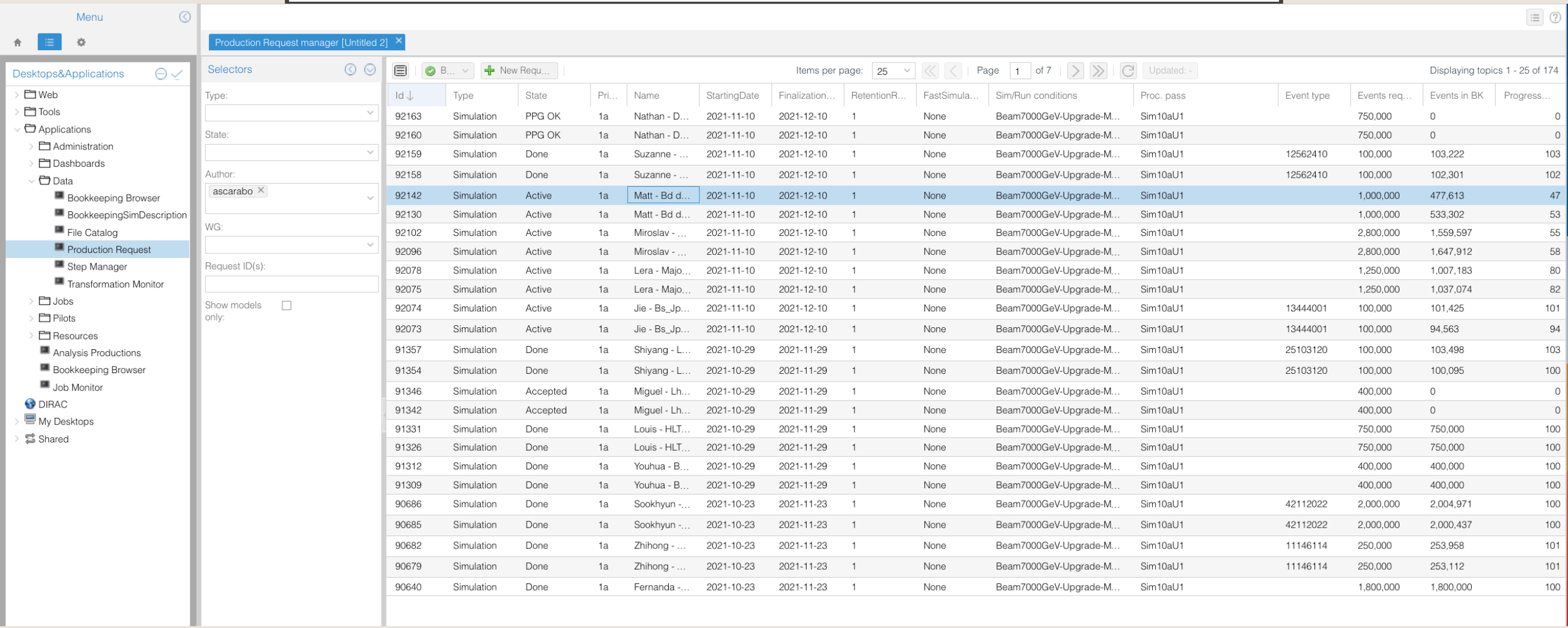
0. Check if your decay was already produced: list
1. Check if your EventType exists in the DecFiles project: link1 or link2
   - If not, follow the guide to submit your decay.dec
2. Define your request:
   - How many events? Magnet polarity?
     - Usually both polarities 100k, 250k or 500k events based on the rarity of your decay
   - For Upgrade studies, only XDIGI samples can be requested
   - Need different Simulation Conditions than the standard: beam energy 7 TeV, nu = 7.6, 25ns spillover

MC REQUEST: STEP BY STEP

0. Check if your decay was already produced: list
1. Check if your EventType exists in the DecFiles project: link1 or link2
   - If not, follow the guide to submit your decay.dec
2. Define your request (events number mainly)
3. Send an email to vladimir.gligorov@cern.ch and alessandro.scarabotto@cern.ch specifying the decay (with EventTypes) and how many events per polarity
4. Follow the status of your request on Dirac (you will receive also automatic emails)

FOLLOW THE STATUS OF PRODUCTION



Id	Type	State	Pri...	Name	StartingDate	Finalization...	RetentionR...	FastSimula...	Sim/Run conditions	Proc. pass	Event type	Events req...	Events in BK	Progress...
92163	Simulation	PPG OK	1a	Nathan - D...	2021-11-10	2021-12-10	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1		750,000	0	0
92160	Simulation	PPG OK	1a	Nathan - D...	2021-11-10	2021-12-10	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1		750,000	0	0
92159	Simulation	Done	1a	Suzanne - ...	2021-11-10	2021-12-10	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1	12562410	100,000	103,222	103
92158	Simulation	Done	1a	Suzanne - ...	2021-11-10	2021-12-10	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1	12562410	100,000	102,301	102
92142	Simulation	Active	1a	Matt - Bd d...	2021-11-10	2021-12-10	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1		1,000,000	477,613	47
92130	Simulation	Active	1a	Matt - Bd d...	2021-11-10	2021-12-10	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1		1,000,000	533,302	53
92102	Simulation	Active	1a	Miroslav - ...	2021-11-10	2021-12-10	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1		2,800,000	1,559,597	55
92096	Simulation	Active	1a	Miroslav - ...	2021-11-10	2021-12-10	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1		2,800,000	1,647,912	58
92078	Simulation	Active	1a	Lera - Majo...	2021-11-10	2021-12-10	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1		1,250,000	1,007,183	80
92075	Simulation	Active	1a	Lera - Majo...	2021-11-10	2021-12-10	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1		1,250,000	1,037,074	82
92074	Simulation	Active	1a	Jie - Bs_Jp...	2021-11-10	2021-12-10	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1	13444001	100,000	101,425	101
92073	Simulation	Active	1a	Jie - Bs_Jp...	2021-11-10	2021-12-10	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1	13444001	100,000	94,563	94
91357	Simulation	Done	1a	Shiyang - L...	2021-10-29	2021-11-29	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1	25103120	100,000	103,498	103
91354	Simulation	Done	1a	Shiyang - L...	2021-10-29	2021-11-29	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1	25103120	100,000	100,095	100
91346	Simulation	Accepted	1a	Miguel - Lh...	2021-10-29	2021-11-29	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1		400,000	0	0
91342	Simulation	Accepted	1a	Miguel - Lh...	2021-10-29	2021-11-29	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1		400,000	0	0
91331	Simulation	Done	1a	Louis - HLT...	2021-10-29	2021-11-29	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1		750,000	750,000	100
91326	Simulation	Done	1a	Louis - HLT...	2021-10-29	2021-11-29	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1		750,000	750,000	100
91312	Simulation	Done	1a	Youhua - B...	2021-10-29	2021-11-29	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1		400,000	400,000	100
91309	Simulation	Done	1a	Youhua - B...	2021-10-29	2021-11-29	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1		400,000	400,000	100
90686	Simulation	Done	1a	Sookhyun -...	2021-10-23	2021-11-23	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1	42112022	2,000,000	2,004,971	100
90685	Simulation	Done	1a	Sookhyun -...	2021-10-23	2021-11-23	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1	42112022	2,000,000	2,000,437	100
90682	Simulation	Done	1a	Zhihong - ...	2021-10-23	2021-11-23	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1	11146114	250,000	253,958	101
90679	Simulation	Done	1a	Zhihong - ...	2021-10-23	2021-11-23	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1	11146114	250,000	253,112	101
90640	Simulation	Done	1a	Fernanda -...	2021-10-23	2021-11-23	1	None	Beam7000GeV-Upgrade-M...	Sim10aU1		1,800,000	1,800,000	100

EXAMPLE OF REQUEST

Dear Alessandro and Vava,

I would like to raise another upgrade MC request, this time mainly aimed for topological trigger studies and rare decays lines development.

List of decfiles:

11314001 (Bd_Kstemu=DecProdCut,PHSP)
12513020 (Bu_3munu=DecProdCut)
13314023 (Bs_phiemu,KK=PHSP,DecProdCut)
23123022 (Ds_phipi,ee=DecProdCut)
23173003 (Ds_phipi,mm=FromD)
23513016 (Ds_taunu,mmm=FromD)
31113001 (tau_mumumu=DecProdCut)
31113006 (tau+_p+mu+mu-=DecProdCut)
31113010 (tau_mu-pi+pi-=DecProdCut)
31113013 (tau_mumue=OS,DecProdCut)
31113044 (tau_muphi,KK=DecProdCut)

For most of the modes I think that 200 000 events per polarity is enough, but can I ask for like 0.5 M events per polarity for 31113001 (tau->3mu) and 31113013 (tau->2mumue)?

Thank you.

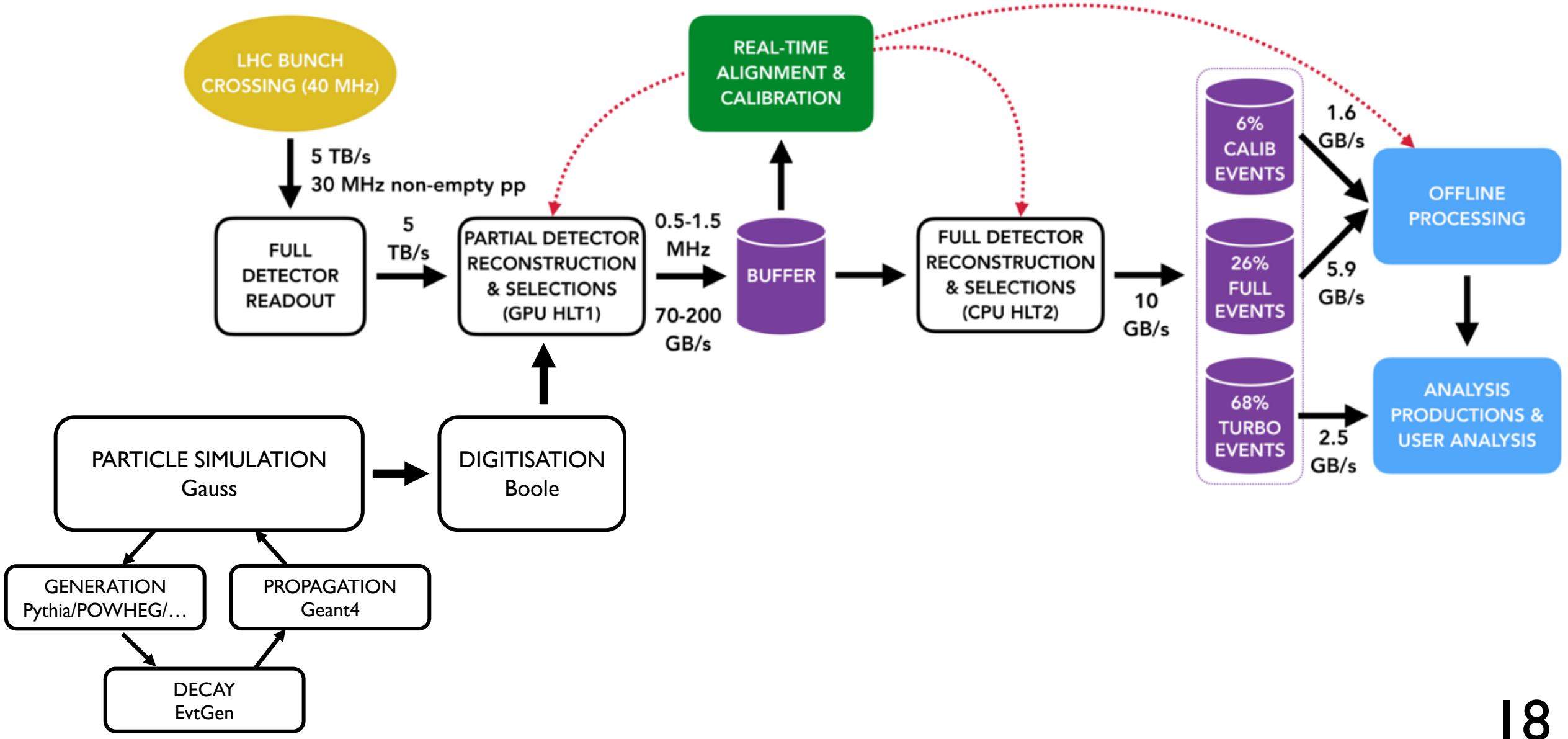
PRODUCTION TIMESCALE

- Link to prestation at EMTF meeting: https://indico.cern.ch/event/1061617/#5-emtf-mc-productions
- The production period is changing depending on the queues but in summary at the highest possible speed 2M events can be produced in one week (but I would say the normal speed is lower, about 0.5-1M events per week)

CONCLUSION

- Upgrade MC productions are very important to study and test the LHCb software that will be used for Run3
- Some of you will have to create HLT lines (mainly HLT2) for your decay channel to study with Run3 data
- Follow the MC request checklist presented here
- Please contact me alessandro.scarabotto@cern.ch or Mattermost @ascarabo if you have any issues or questions

BACKUP


LHC BUNCH CROSSING (40 MHz)
5 TB/s
30 MHz non-empty pp
FULL DETECTOR READOUT
5 TB/s
PARTIAL DETECTOR RECONSTRUCTION & SELECTIONS (GPU HLT1)
0.5-1.5 MHz
70-200 GB/s
BUFFER
REAL-TIME ALIGNMENT & CALIBRATION
FULL DETECTOR RECONSTRUCTION & SELECTIONS (CPU HLT2)
10 GB/s
6% CALIB EVENTS
26% FULL EVENTS
68% TURBO EVENTS
1.6 GB/s
5.9 GB/s
2.5 GB/s
OFFLINE PROCESSING
ANALYSIS PRODUCTIONS & USER ANALYSIS
PARTICLE SIMULATION Gauss
DIGITISATION Boole
GENERATION Pythia/POWHEG/…
PROPAGATION Geant4
DECAY EvtGen