

MC Trigger Digitization Description

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A Monte Carlo trigger will be implemented in MAUS in the near term. This trigger will introduce pileup in the simulation, and correct the timing offsets of the digitized particle hits so that it references the trigger time rather than the generation time in a manner analogous to the data. To make the reconstruction agnostic to data and simulation the data structure in simulation needs to be incremented by event trigger within the spill rather than by particle. The Monte Carlo trigger needs to have a structure that is intermediate between the two structures, and so needs a structure of its own. The suggested change to the data structure is shown in Fig. 1.

The trigger will be based on the digitized TOF hits, so their digitization will be conducted on a by particle basis as it is now. These hits will be stored in a new object; "TOFMCDigits"; within the MC branch of the data structure. The TOFMCDigits will be used by the MC Trigger Digitization to define a reconstructed event based on the trigger. Reconstructed TOF digits referenced to the trigger time and a list of trigger offset times for particles within the trigger will be produced by the MC Trigger Digitization algorithm. The list of offset times is then used by subsequent detector digitization algorithms to generate the reconstructed events in the detectors. A diagram of the proposed data flow is shown in Fig. 2. In principle, MC Digits could also be made for the tracker, KL, EMR etc. as determined by a user controlled flag.

The MC Trigger digitization will need a number of inputs. A subset of these inputs should be written to the configuration database including the trigger window length, the trigger criteria (e.g. "TOF0 + TOF2"), and the trailing dead time as defined by the hardware. The decision of whether to include pileup should be made by the user at simulation time as a data card option.

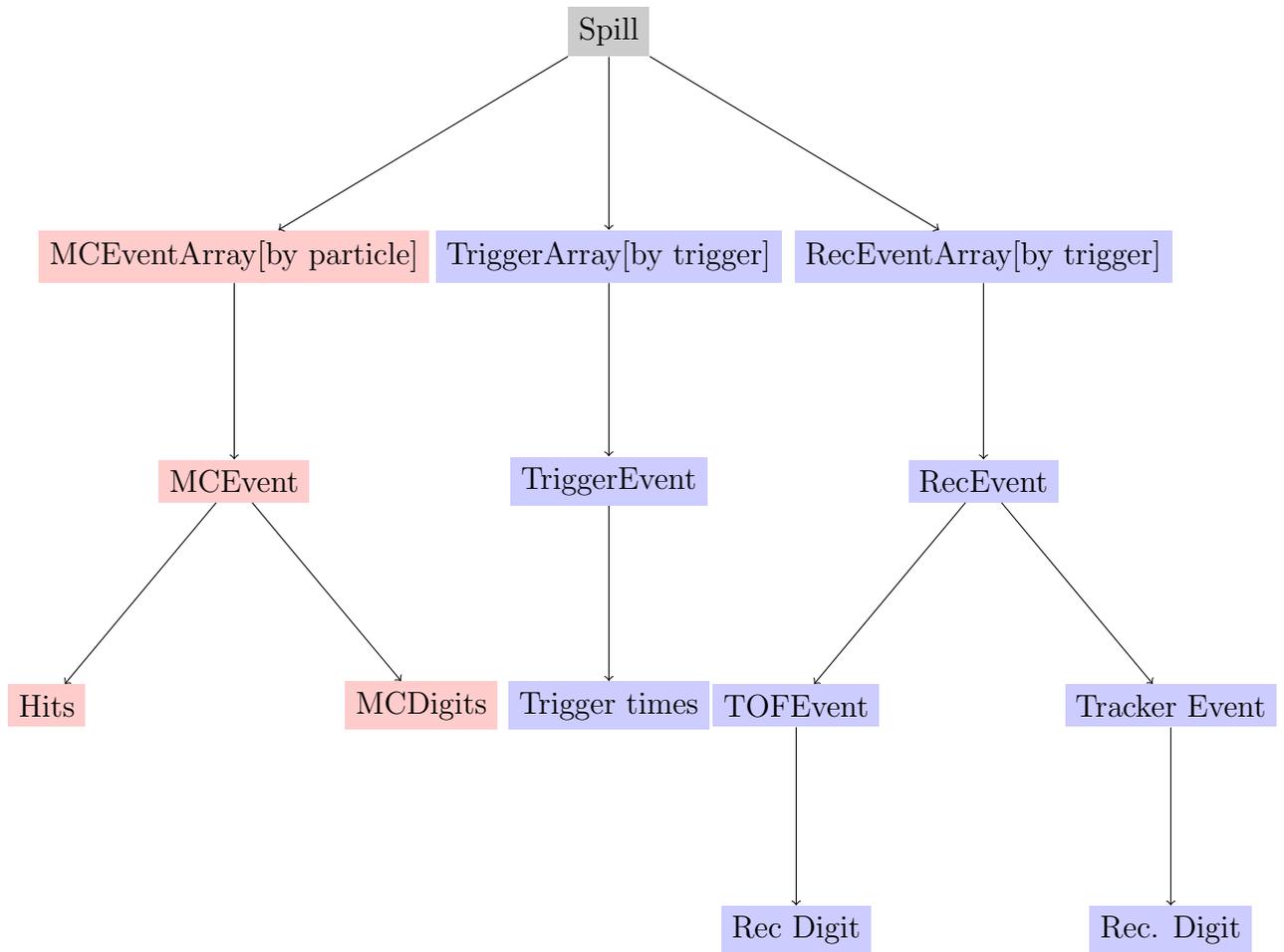


Figure 1: Representation of a subset of the data structure that is affected by the implementation of a trigger in the Monte Carlo. The Monte Carlo arrays are iterated by particle, while the “Recon” and “Trigger” arrays are iterated by trigger. The new “Trigger” structure contains the information relating the particle iterated arrays to the trigger iterated arrays, with appropriate time offsets.

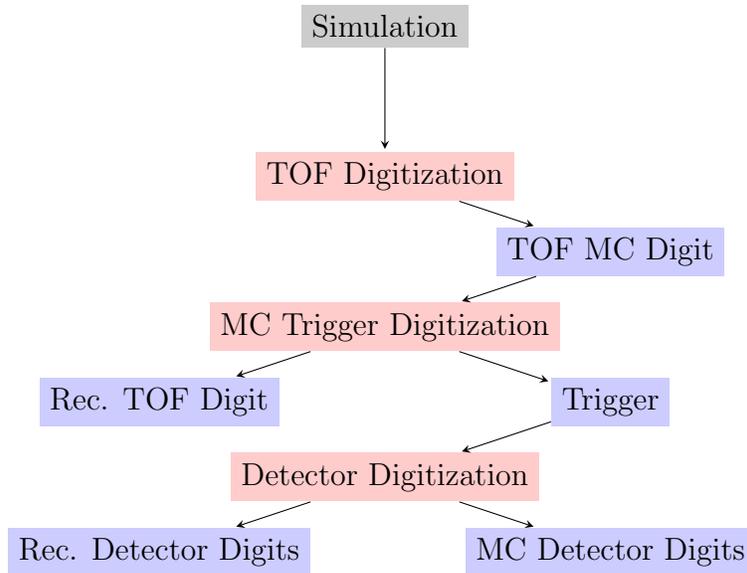


Figure 2: Conceptual depiction of the digitization of the simulation. Digits generated on a by particle basis from the TOF digitization is used by the trigger digitization to produce a set of trigger times for particles within a given trigger window, and a set of TOF digits corresponding to that trigger window. The digitization of further detectors uses the trigger information to define the reconstructed digits for the trigger window. An option will exist for the detector digitization to also generate digits by particle.