Reorganisation of calorimeter digitisation code

ECFA-LC worshop @ Santander
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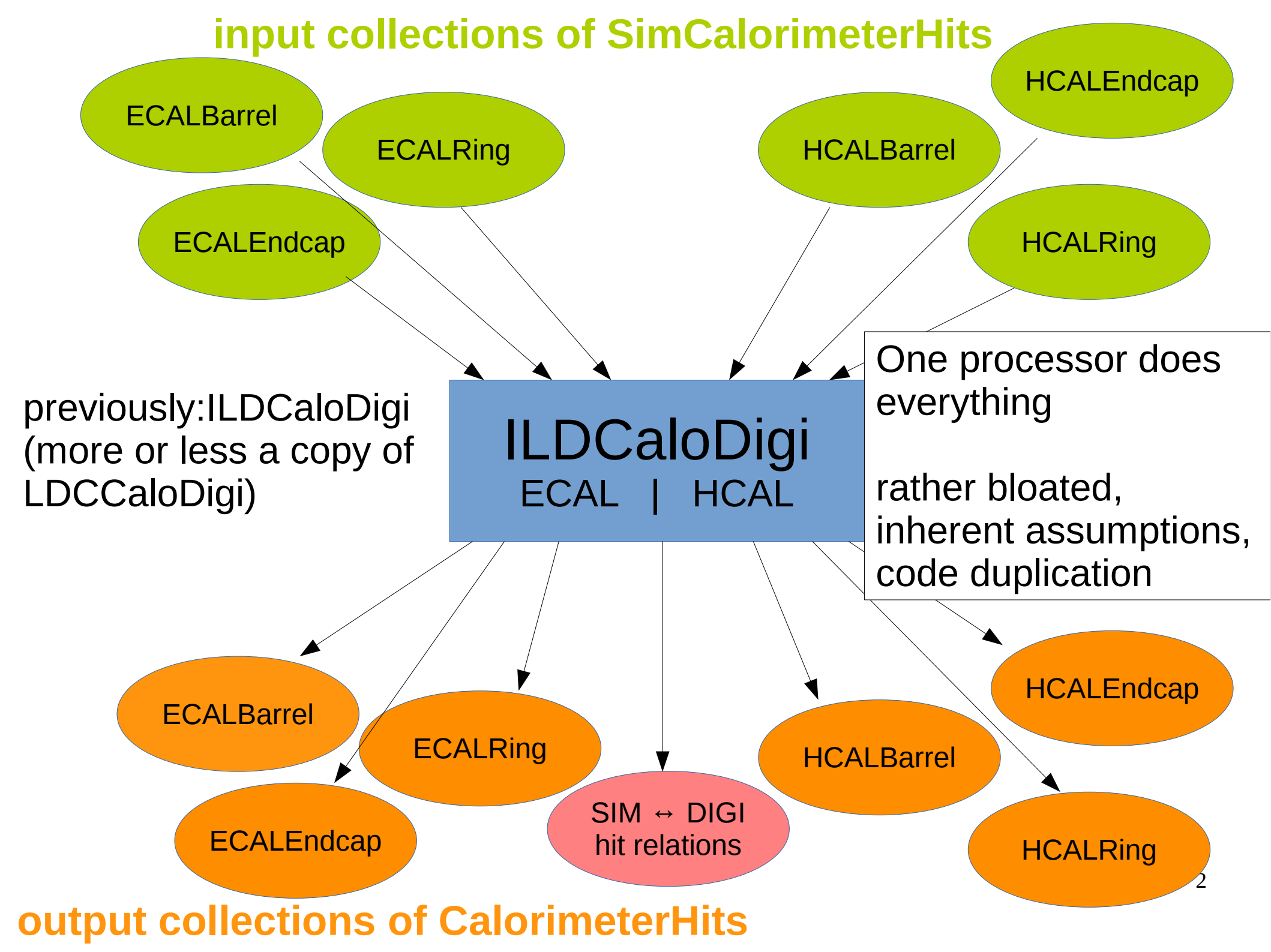
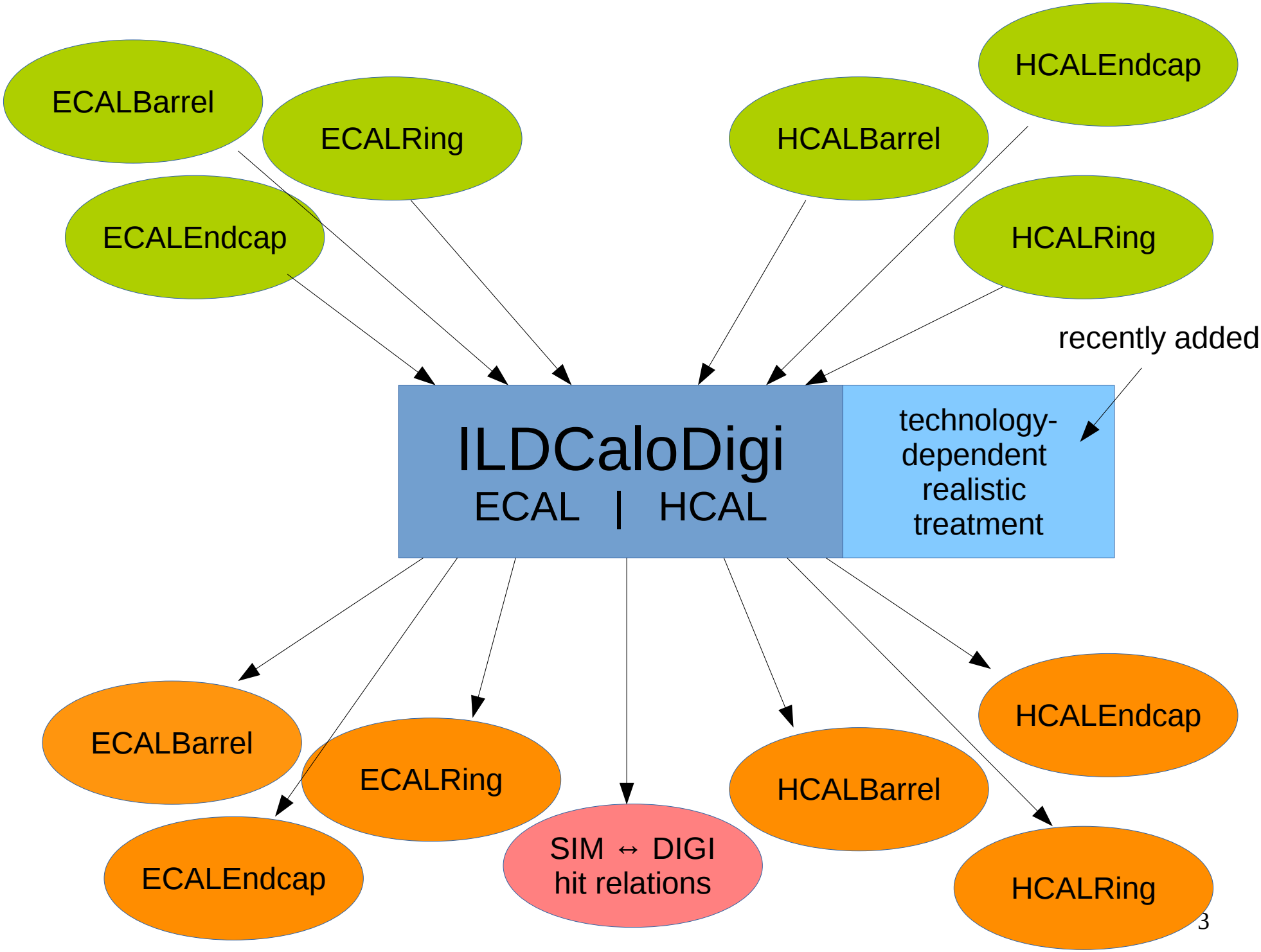
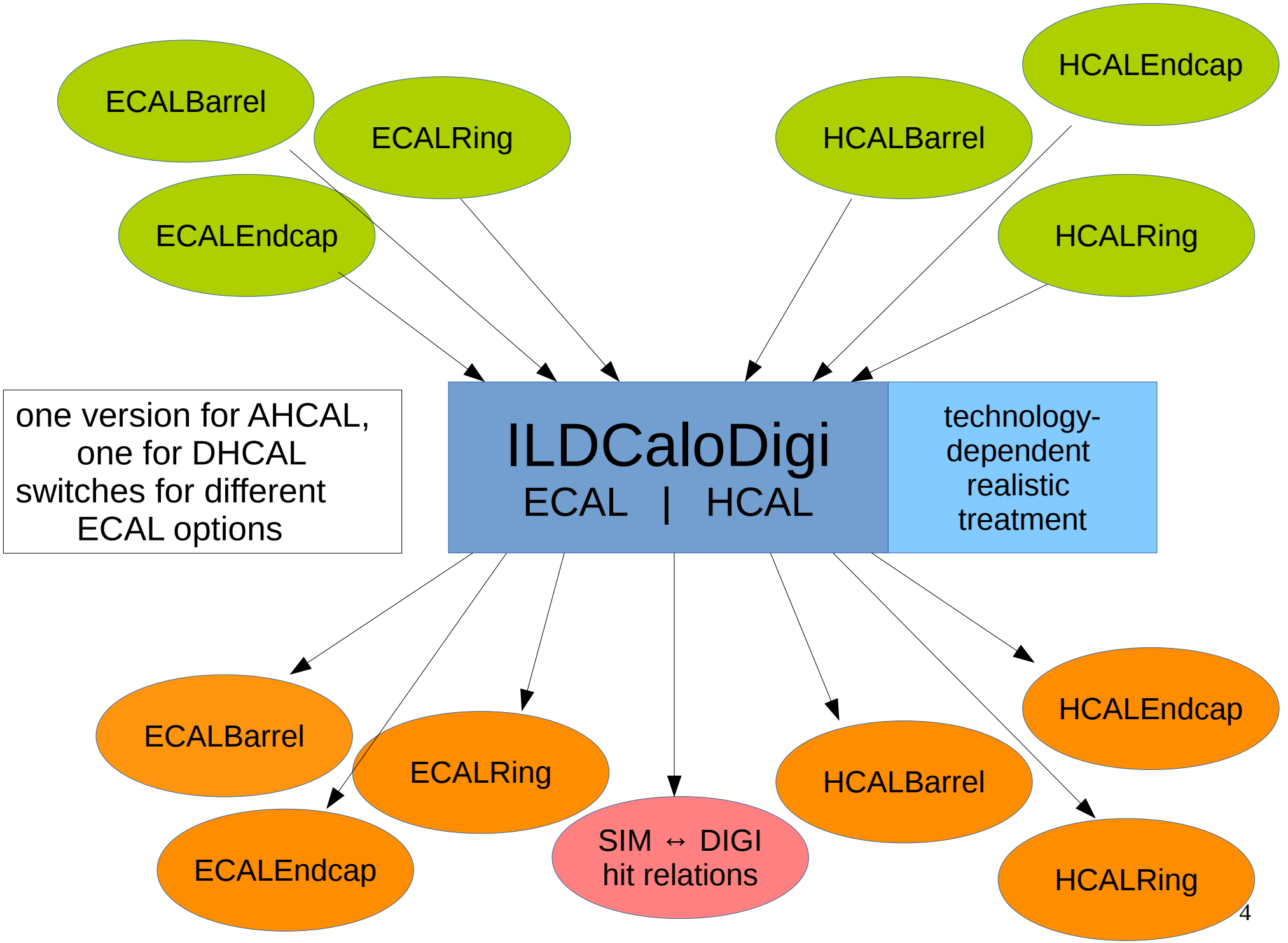

input collections of SimCalorimeterHits
ECALBarrel
ECALRing
ECALEndcap
HCALBarrel
HCALEndcap
HCALRing
previously:ILDCaloDigi
(more or less a copy of
LDCCaloDigi)
ILDCaloDigi
ECAL | HCAL
One processor does
everything
rather bloated,
inherent assumptions,
code duplication
ECALBarrel
ECALRing
ECALEndcap
SIM ↔ DIGI
hit relations
HCALBarrel
HCALEndcap
HCALRing
output collections of CalorimeterHits


ECALBarrel
ECALRing
ECALEndcap
HCALEndcap
HCALBarrel
HCALRing
recently added
ILDCaloDigi
ECAL | HCAL
technology-dependent realistic treatment
ECALBarrel
ECALRing
ECALEndcap
SIM ↔ DIGI hit relations
HCALEndcap
HCALBarrel
HCALRing


ECALBarrel
ECALRing
ECALEndcap
HCALEndcap
HCALBarrel
HCALRing
one version for AHCAL,
one for DHCAL
switches for different
ECAL options
ILDCaloDigi
ECAL | HCAL
technology-
dependent
realistic
treatment
ECALBarrel
ECALRing
ECALEndcap
SIM ↔ DIGI
hit relations
HCALEndcap
HCALBarrel
HCALRing

In new scheme try to:

divide problem into:

1) Digitisation: conversion of G4 energy deposit to some detector-related quantity (in silicon, the MIP; for scintillator, SiPM pixels)
2) Reconstruction: conversion of this detector quantity to calorimetric energy

remove code duplication

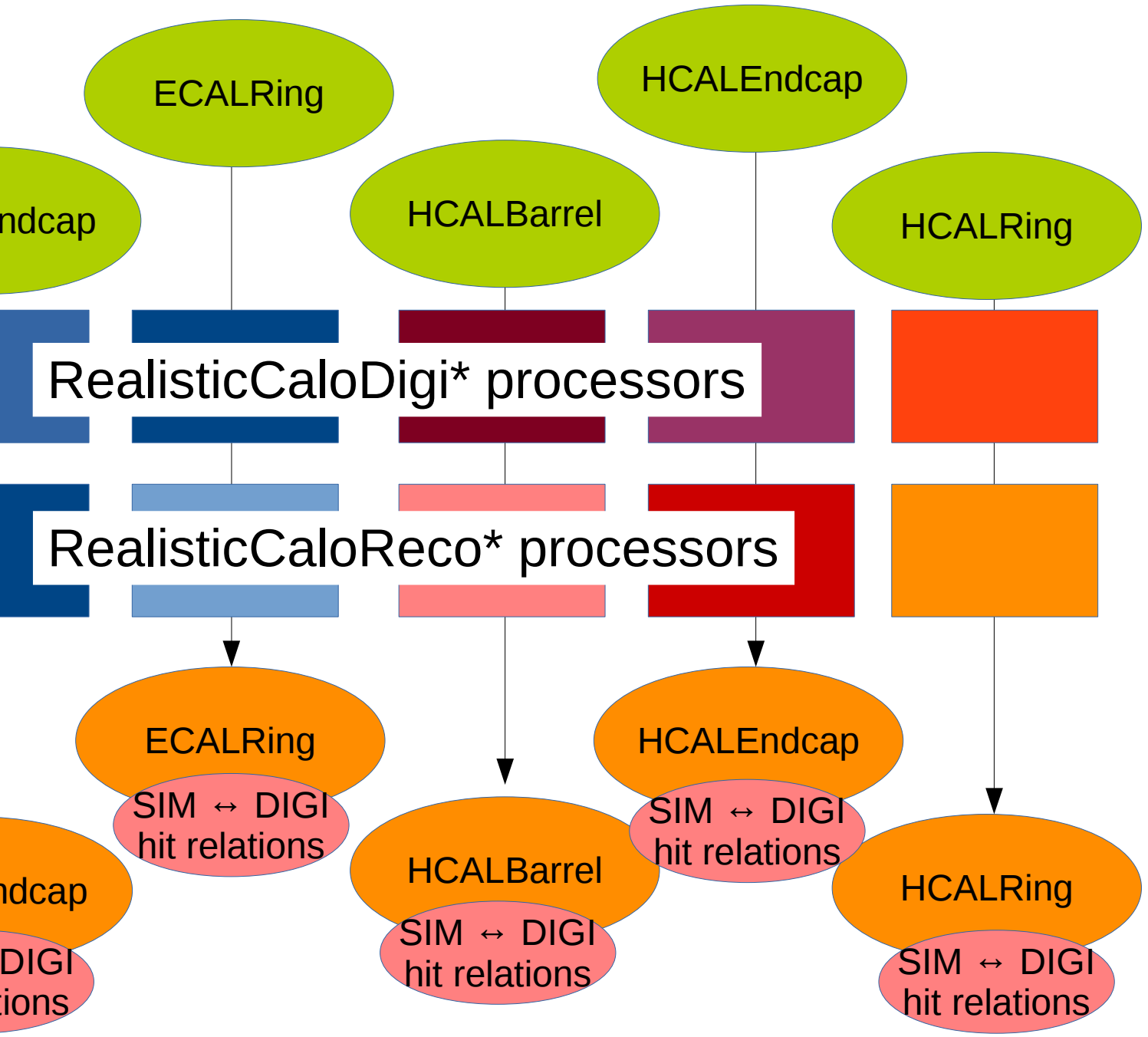
parallelise

there is no need for ECAL hit digitisation to know about the HCAL

remove inherent assumptions

(e.g. always 3 collections of output hits)

updated scheme



There are just a few technology-specific types of the processors

several instances of each are run, and can be steered separately (e.g. different calibrations in barrel & endcap)

Digitisation step : convert G4 energy to some detector quantity (MIP for silicon, fired SiPM pixels for scint.)

technology independent effects

RealisticCaloDigi

e.g.
calibration factor
timing cuts
mis-calibrations
random dead cells

technology dependent effects

RealisticCaloDigiSilicon

RealisticCaloDigiScinPpd

silicon-based detectors

scintillator-based detectors
e.g. SiPM statistics

Reconstruction step : from detector to shower energy

technology independent effects

RealisticCaloReco

e.g. calibration factor

technology dependent effects

RealisticCaloRecoSilicon

RealisticCaloRecoScinPpd

silicon-based detectors

scintillator-based detectors
e.g. unfold SiPM response

ECAL gap corrections:

guess how much energy lost in gaps between wafers

previously:

- increased energy of hits adjacent to gaps
  - (incorporated/hidden within ILDCaloDigi)

new scheme:

- split task off into separate processor
- input: collection of reconstructed hits

- creates new collection of hits,
  - positioned in the gaps
  - with appropriate energy

Summary

Calorimeter digitisation code has been modularised

Process hopefully clearer and easier to understand

Should be easy to add other technologies into this scheme

code is at:
https://svnsrv.desy.de/viewvc/marlinreco/MarlinReco/trunk/CaloDigi/Realistic/