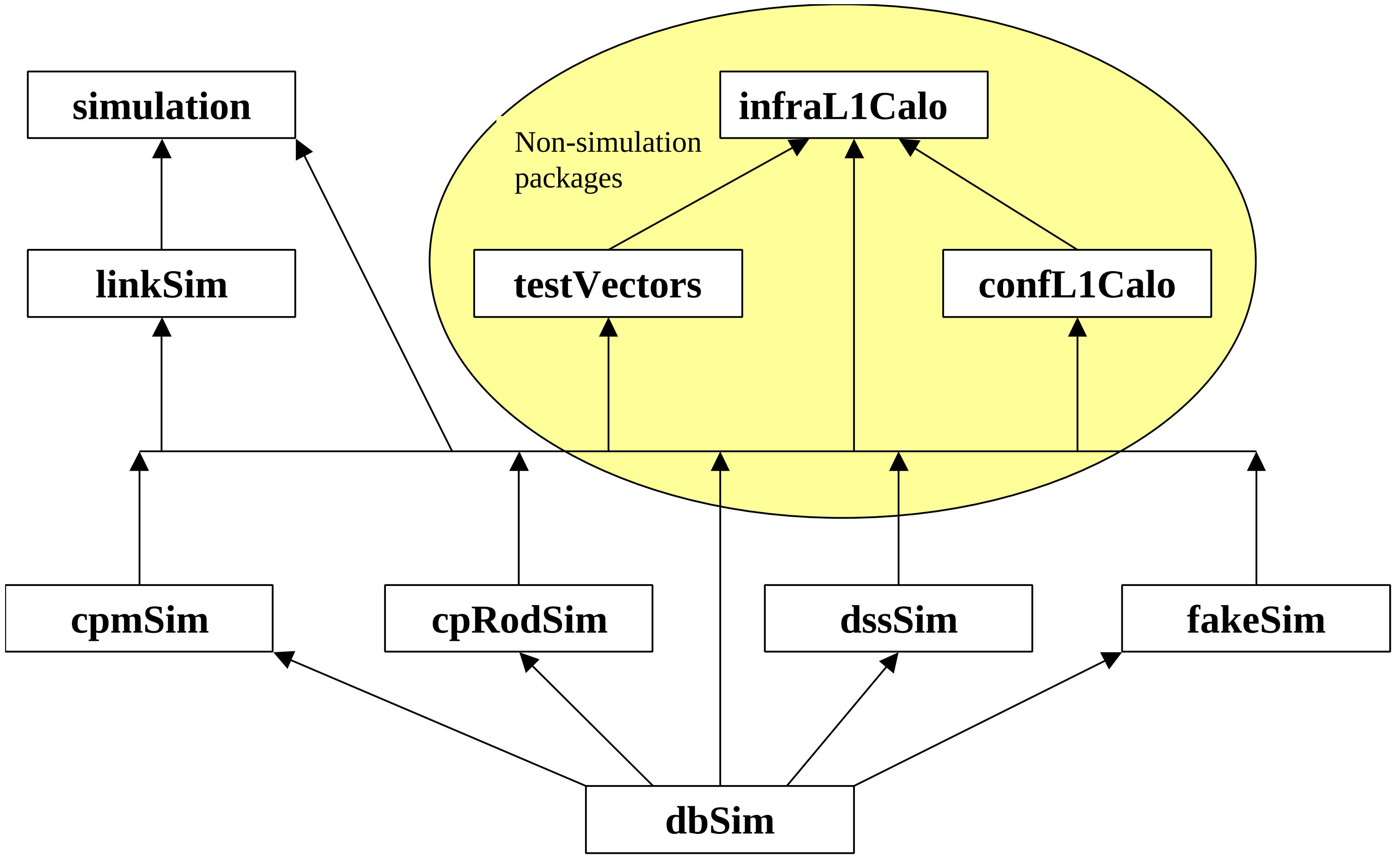
Simulation and test vectors

- Last reported at Heidelberg meeting
- As you might hope, lots of progress since then!
- Major areas of improvement:
  - Code split into several packages and put under CMT
  - Development of common L1Calo classes
  - L1A, BCnum and EventId integration
  - Addition of DSS simulation
  - Additions to CpRod and CPM simulations
  - Integration with database for:
    - Module creation and connection
    - Module settings
  - Common test-vector reading scheme
  - Test-vector generation and simulation scheme with run control
  - Integrated test with DSS/ROD test system

CMT package structure



Common L1Calo classes

- simulation package provides a flexible generalised framework
- linkSim adds L1Calo specific stuff
  - Base classes for modules, crates
    - L1CaloSimModule, L1CaloSimCrate
  - Classes for objects shared between modules
    - cable connections – LvdsCable, GlinkStream
    - crate backplanes – CpBackPlane
  - Other shared implementation
    - TTC information and connections

TTC information

- Needed way to distribute TTC information in the simulation
  - Addition of TtcInfo class along with TtcInfoReader
  - All L1CaloSimModules have access to this information
    - Some (most) need for data stream
  - Provides:
    - Trigger (L1A)
    - Bunch-crossing number
    - Event Id
- Also need way to generate the information
  - Currently a zeroth order scheme implemented
  - Will be done in hardware by DSS with special load
  - Still need to simulate this DSS mode in simulation

DSS Simulation

- Partial implementation provided
  - Glink outputs
  - Slink input
  - ie all that is needed for the DSS/ROD test
  - Will need extension as tests proceed
- Why is it needed?
  - Common test-vector interface for hardware and simulation
  - Test-vector input done in hardware via DSS playback memory load, so copy this in software.
  - Mechanism is also needed for modules with playback memory
    - Aside: led to inclusion of new general playback memory class in the basic simulation library

Additions to CpRod and CPM Models

- Use common Glink class
- CPM:
  - Add playback memory functionality
  - Add Scan-path configuration
  - Integrate with L1A scheme
- CpRod:
  - Add more configuration options
  - Copes with ‘dead’ channels
  - Copes with more than one data type input
  - Proper module/channel number setting
  - Better output file information
  - Integrate with L1A scheme
  - More Glink input data types (CMM-CP, JEM Daq/RoI)

Integration with database

- New package dbSim
  - Code for running simulation from database
  - Code for generating test vectors
- Simulation run
  - Completely general
    - Modules and connections generated automatically from database hardware configuration
    - Module setting also read from database
    - Test-vectors loaded from database according to newly defined scheme
    - Important that it is general as should also cope with real data
- Generation run
  - Less general
    - Need to write a new class for a new test setup
    - Class should check database settings and warn if inconsistencies
    - Currently can generate all test vectors that I know about
      - CPM crate tests, Bill's test vectors, Bruce's test vectors, generic random glink

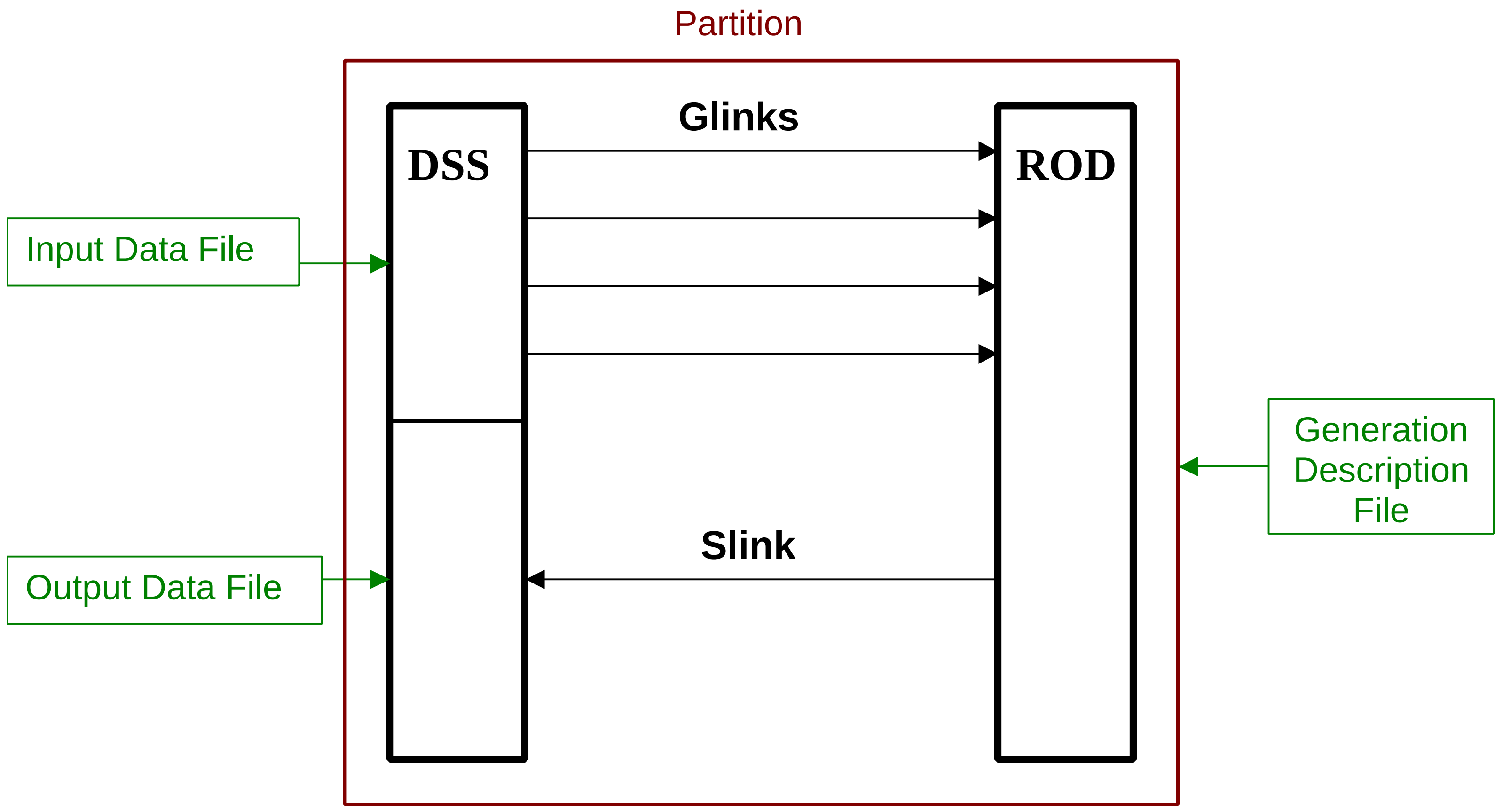
Test vector reading scheme

- New package testVectors
  - Used by simulation and moduleServices
  - Common interface for loading playback memories
  - Agreed over several meetings with Bruce and Murrough
  - At present just reads files generated by standard mechanism
- Future Direction
  - Needs to cope with more than single shot run
  - Possible test vector generation on the fly?

Run control integration

- Simple interface to dbSim
  - Test vector generation:
    - Create DbGeneration - dg(database)
    - Run it – dg.run()
    - Delete it – delete dg
  - Hardware simulation:
    - Create DbSimulation - ds(database)
    - Run it – ds.run()
    - Delete it – delete ds
- Murrough wrote a simple run controller to do this
  - Note – has to be run before data loading into modules
- It appears to work

Integration Tests: Setup



Integration test - results

- Trying to put everything together
  - First attempt: 28th August RAL
  - Unfortunately there were (known) hardware problems
  - However, integrated test was consistent with old software behaviour
    - In fact it worked slightly better!
    - Database allows easy disconnection of bad channel
    - Simulation can cope with 3 channels, old software can't
- Conclusions: needed some minor changes
  - Mostly cosmetic
  - More complex issues delayed for next release
- First software release
  - Well tested, released 24th October
  - Has been used for very careful firmware/simulation consistency checks

Plans

- Immediate
  - Check DSS/ROD with new firmware loads
  - Integrate cpmSim, cpmServices with database, run control etc
  - Try simple CPM tests from Run Control
- Longer term
  - CPM improvements – deal with >1 slice readout
  - TTC integration – generate DSS contents and L1A test patterns
  - Look at more complex generation schemes
    - Several step test sequences
    - Multi-module setups

News on other modules

- Norman has already written some code in cmmSim
  - Needs updating with recent ideas
- Paul is working on PPM simulation
  - See earlier talk(?)
- Sam's students are still working on JEM
  - Good news: they are now using my framework
  - Recently sent me code