

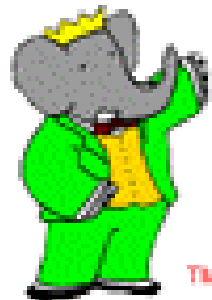
# Introduction to the Emt software

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# Goals of the workshop

- Learn about the Emt software
  - Discuss the details of the code as it stands today.
    - Useful to have a review: 3-4 years of code development.
    - Have we stuck to the original design?
  - Provide an introduction for new people.
- Identify future work
  - Design and code that could be improved ?
  - Preparation for future changes and requirements.
- Provide documentation
  - BaBar note based on the workshop proceedings.
  - Improve the Emt software web pages.

# Overview of the software

- Consists of 14 packages
  - Quite compact, bit less than DCT (~22 packages).
- The packages can be grouped into three categories:- online, offline and dual-use.
  - **Online:-** libraries designed to run on the Readout Module / VxWorks
    - Feature extraction, reading/writing registers etc.)
  - **Offline:-** libraries and executables that build on Linux/SunOS/OSF.
    - Wide range of applications ranging from TC->Digi conversion to general purposes tools and scripts.
  - **Dual-use:-** Used for both purposes, but can't depend any of the above packages, only themselves.
    - Core Emt packages that provide libraries and functions that many of the other packages use.

# Categorization of the Emt packages

Offline		Online	Dual-use
L1EmtConfig	L1EmtEnv	L1EmtOdf	L1EmtOnline
L1EmtConfigTools	L1EmtOep	L1EmtCalOdf	L1EmtCalOnline
L1EmtData	L1EmtSim	L1EmtDiagnostics	L1EmtSpy
L1EmtDataP	L1EmtTools		

# Online and dual-use packages

- Online packages are divided up into five levels:-
  - Source
    - Code running on Roms providing low level tasks of dataflow.
  - Segment
    - Also runs on the Roms and is where detector system specific code runs ie. our online libraries.
  - Fragment
    - Runs in the Slot 1 Rom of each crate and collects data from segment level code running on the other Roms.
  - Event
    - Runs in the unix farm nodes which receive data from the fragments.
  - Control
    - Runs in master unix node and is responsible for the control of the entire system.

# The flow of all these processes

- The control of the flow of all these processes is done by a finite state machine. This exists in all levels of the online code.
  - The finite state machine will be discussed in more detail later (L1EmtCalOdf and L1EmtCalOnline).
- Another area of interest is called Reverse Dataflow.
  - As its name suggests this when data must flow from mass storage to the detector.
  - This is used for configuring the system. That being able to send data from the database to the Roms in order to be able to write configuration values into the registers.
- All dataflow is done using Tagged Containers.

# L1EmtOnline and L1EmtCalOnline

- L1EmtOnline
  - Provides classes for data transfer:-
    - Into the Rom in the case of configuration.
    - Out of the Rom in the case of reading event data.
  - Contains the Emt specific derived classes from the core dataflow TC classes.
- L1EmtCalOnline
  - Code used for data collection and analysis:-
    - Classes for each step of the finite state machine.
  - Executable programs to generate CalCycleTC files:-
    - Used to define the type of calibration cycle the FSM operates

# L1EmtSpy

- This package dual-use.
- Aim of this package:-
  1. To contain code to sample the Emt input data.
  2. Apply a software simulation of the algorithm design.
  3. Generate a set of output data which can be used to cross-check that the algorithm is functioning correctly.
- Contains extra configuration constants necessary to simulate the hardware correctly.
  - These are also used by the package L1EmtSim hence this package must be dual-use.

# L1EmtOdf and L1EmtCalOdf

- L1EmtOdf
  - Provides classes used by the Rom for talking to the TPBs:-
    - Reading data from the event registers
    - Writing configuration data to Xilinx chips.
  - Interface between the Emt software and core dataflow
    - Operations depend on classes written for the dataflow API.
- L1EmtCalOdf
  - Contains classes for actions issued by the FSM for the different modes of operation:-
    - Data taking, calibration, and test runs.
  - Two categories of actions are in this package:-
    1. Those always attached to the FSM for all types of operation.
    2. Those that are attached only for specific operations.

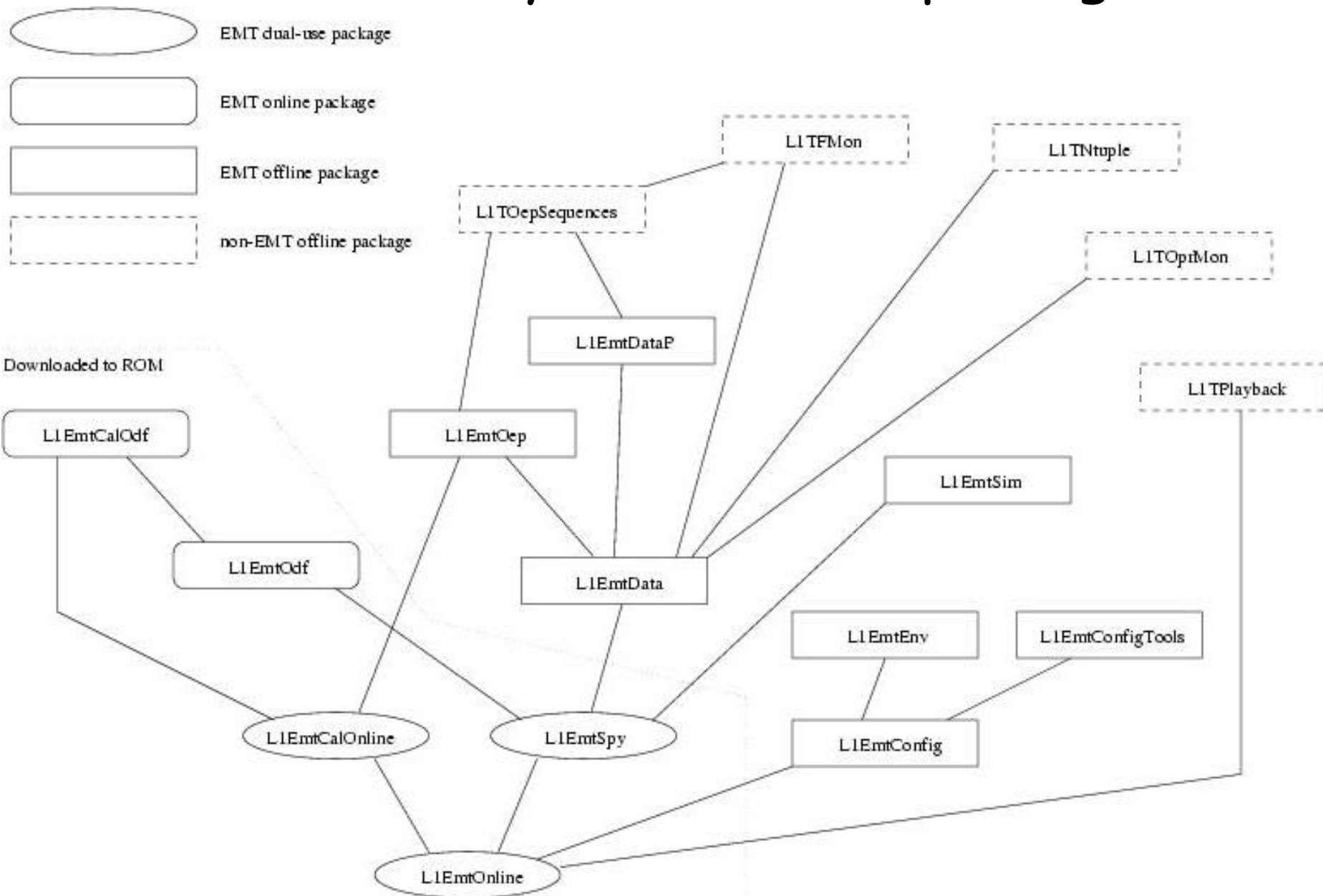
# The offline world

- L1EmtData
  - Classes providing the transient data objects(digis).
- L1EmtDataP
  - Provides the persistent form of the digis for storage in the database
- L1EmtEnv
  - The Emt environment which is used to get Emt information into the event.
- L1EmtOep
  - TC -> Digi conversion and diagnostics applications that can run on xtc files or on digis.

# The offline world continued

- L1EmtConfig
  - Classes to store configuration data in database.
- L1EmtConfigTools
  - Tools for inspecting and changing the Emt configuration data in the database.
- L1EmtSim
  - The Emt simulation used for MC production.
- L1EmtTools
  - General purpose tools.

# The hierarchy of the Emt packages



# Summary

- Eight offline packages.
  - with a wide range of purposes.
    - Analysis of data for monitoring, manipulating configuration data, providing Emt trigger simulation, TC-> Digi conversion etc.
- Three online packages and three dual-use packages.
  - Core segment level online code used in the Emt Rom to run the system.
    - Not covered L1EmtDiagnostics. This package is there if we need to contain any low level TPB test code at SLAC
- Now let us look into the packages in turn.