

Streaming and Level 3

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1. Introduction

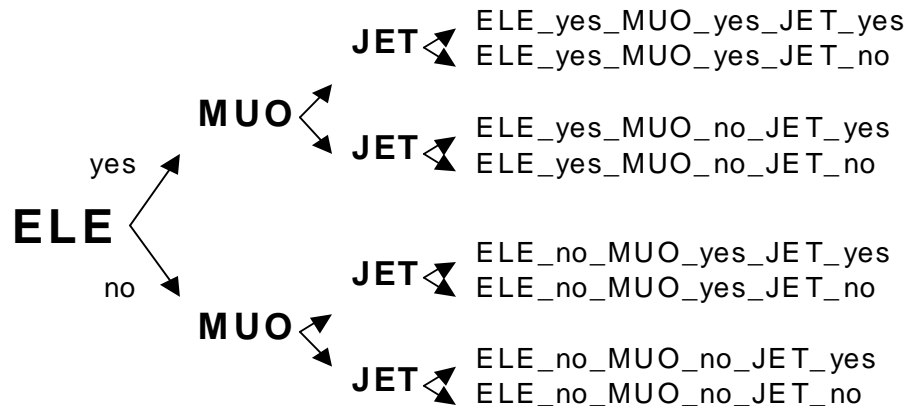
In trying to implement the streaming model a few issues present themselves:

- i) Which algorithm should be used to decide to which stream a particular event should be sent?
- ii) How should that algorithm be configured?
- iii) What format should that configuration take?
- iv) Where is the configuration stored?
- v) How does the configuration reach Level 3?

The most important of these, from a L3 software perspective, are items i) and iii) since these must be addressed in order to be able to implement streaming in Level3.

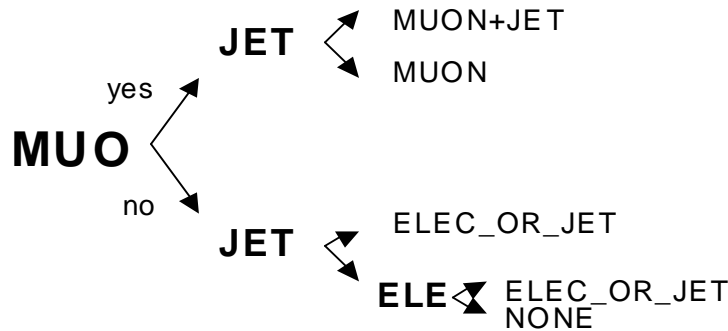
2. Choice of Algorithm (i)

Currently we have two algorithms present in the L3 code (in the l3streaming package). The first of these is the one currently (29th August 2001) running online on the NT filtering nodes. This is a simple algorithm that performs a simple one-to-one mapping between streaming primitives and physical streams. In the case where more than one primitive stream is activated for a particular event then the event is assigned to the physical stream labeled "UNKNOWN". The second method is a splitting algorithm. This consists of a binary decision tree where each "decision node" is associated with the state of a particular primitive stream. This algorithm allows the definition of any mapping between some set of primitive streams that are active for an event to a single physical stream to which the event should be written. For example, when there are three primitive streams: ELE, MUO and JET the most general mapping is:



In this example there are 8 physical streams at the end of the tree branches.

Now consider a slightly different example:



This is an example of a priority algorithm with 4 physical streams: MUON+JET, MUON, ELEC_OR_JET and NONE (although NONE is not really a stream since if no primitive streams are active then the event failed the trigger!).

This type of algorithm offers the most flexibility. The maximum number of decisions that should be necessary to assign a physical stream to the event should be equal to the number of primitive streams. It is however always possible to configure it in a non-optimal way which requires more decisions to be made. It is not anticipated that there will be any significant execution speed penalty when using this algorithm instead of a simpler less flexible algorithm.

3. Choice of Configuration (ii)

The configuration for the splitting algorithm is the designation of which primitive stream should be tested at each node in the decision tree and which physical streams sit at the end of the branches. It should be derived from the Stream Definition Table + the rules for interpreting this table. For example, for the second figure above the Stream Definition Table might look like this:

Physical Stream	Primitive Streams
MUON+JET	MUO and JET
MUON	MUO
ELEC_OR_JET	ELE or JET
NONE	Event failed

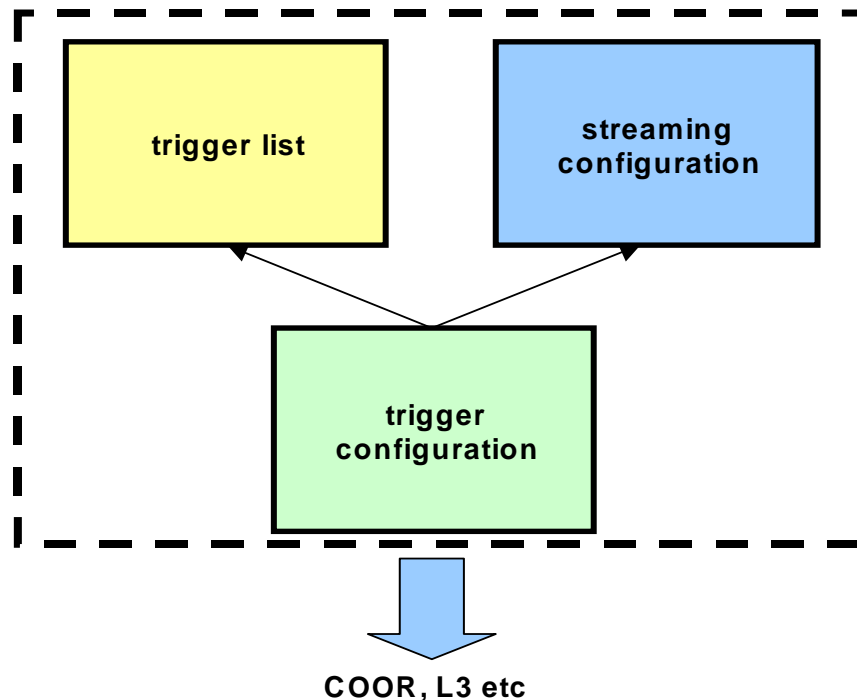
The rule for interpreting this table is that the physical streams are written in order of priority from top to bottom. This document does not attempt to address the issue of what the stream definitions actual should be.

4. Configuration format (iii)

The exact format in which the configuration should be sent to Level 3 has not yet been decided, however it was decided that it should be encoded in XML since this should allow an easy implementation of a truncated binary tree.

5. Configuration storage, version control and transmission (iv,v)

The streaming configuration is not technically a part of the triggering process – it has no influence on the rejection or acceptance of events – however, it is so strongly coupled with the trigger list that it is probably convenient to store it in the trigger DB along with, though not as a part of, the trigger lists. Each instance of the configuration should carry with it a version number/string and should be tracked in the same way a trigger list would be. The trigger list and the streaming configuration together provide the trigger configuration for a particular run and should provide all the information needed to reconstruct – after-the-fact – which physical streams are associated with which triggers.



The streaming definition should then be transmitted to L3 (in XML) as a part of the text of the trigger programming.

6. To Do

From the point of view of level 3 software development the following two steps have to be completed:

- 1) Define the XML document format to be used for the streaming configuration
- 2) Integrate the use of an XML parser into the L3 software (l3parser, l3streaming) to allow the configuration based on a test stream containing a XML document.