

RAL

DESIGN & DISCOVERY

Open Days July 1990

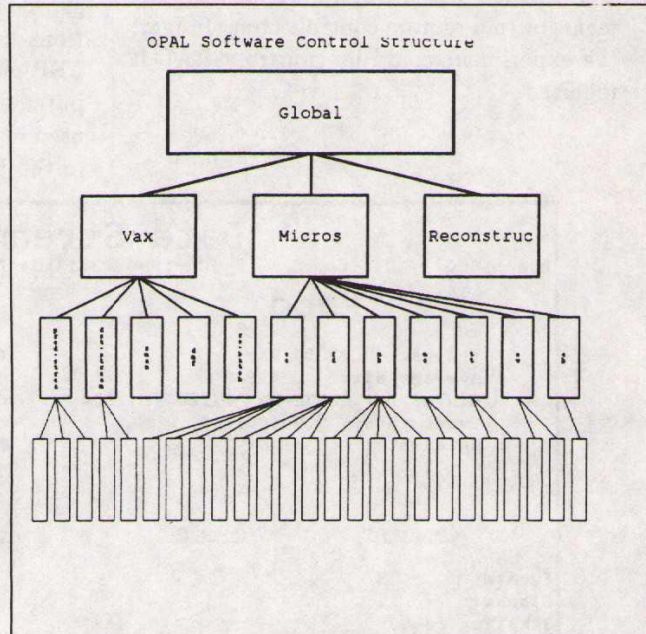
RUTHERFORD APPLETON LABORATORY
SCIENCE AND ENGINEERING RESEARCH COUNCIL

Data Acquisition and Control of the OPAL Experiment at LEP

1. A typical event in the OPAL detector produces 4,000,000 bytes of data (equivalent to 1,600 of these leaflets). Several events may occur per second, so a very powerful dedicated computer system is needed for data processing close to the experiment. This "online" computer has to collect the data from the OPAL detector, compress each event to a manageable size, and record the compressed data on magnetic tape for later detailed analysis. Pictures used by the physicist to check for faults in the detector are also generated and displayed.

2. OPAL's online system uses a variety of computers - including more than 100 microprocessors, 20 workstations and a large Vax minicomputer. Each computer has its own library of programs for data manipulation specific to one part of the detector, so that more than 1000 separate programs are needed to run the entire experiment. The programs form a tree structure, part of which is shown here.

3. A central control system makes sure that all these programs and computers work correctly together, starting and stopping them and sending commands by computer network at the right time. One of the important features of the control system is its ability to start and stop the experiment when not all detectors or computers are available, for example in the event of a fault in a computer or in the OPAL detector. If a component is later repaired, it can easily be included in the data collection suite, even while a physics run is underway.



OPAL run partition status				
global running	ez configured	ht configured	tt configured	tr_gtu hw_configured
rope stopped	eb configured	mb configured	evb undefined	
vax running	ee configured	me configured	filter unread	
vme running	fd configured	pb configured	top inactive	
cj configured	hp configured	pe configured	tr configured	
cv configured	hs configured	tb configured	tr_daq ready	

4. A colour workstation panel (above) and a mouse are used by the physicist-in-charge to control the entire experiment, using the same style of pull-down menus familiar to home computer users. It takes only a few seconds to move the panel to a different workstation, so it is easy to have the control console underground at the experiment, or in a remote control room. In fact, the experiment could be run from RAL if required.

5. Other screens show the status of the experiment in numbers - for example, the count of events read, or the amount of magnetic tape left - and any error messages if a detector or computer problem occurs. One such display is shown below.

When LEP is running, the display at RAL shows an up-to-date summary of conditions in the OPAL experiment and the LEP machine, using an international computer network. The same software can be used in any of the OPAL member institutes in the UK and worldwide.

Data Streams			
Run: 1800	7-JUN-1990 12:14:34.70		Page 12
Prod		DST	
Triggers: 23394	Bad: 0	Triggers: 0	Bad: 0
Average size: 49848		Average size: 0	
Min size: 25632	Max size: 817504	Min size: 99999	Max size: 10
Event rate: 0.00000E+00		Event rate: 0.00000E+00	
Byte rate: 0		Byte rate: 0	
	Port A	Port B	Port A
Events: 3			
Blocks: 11			
Blksize: 14400			
Used(%): 0			
Drive: MUA2			
USM: PP3978			
DSM: 01800P01			
Repr: IEEE			