



# Supervision of the ATLAS High Level Triggers

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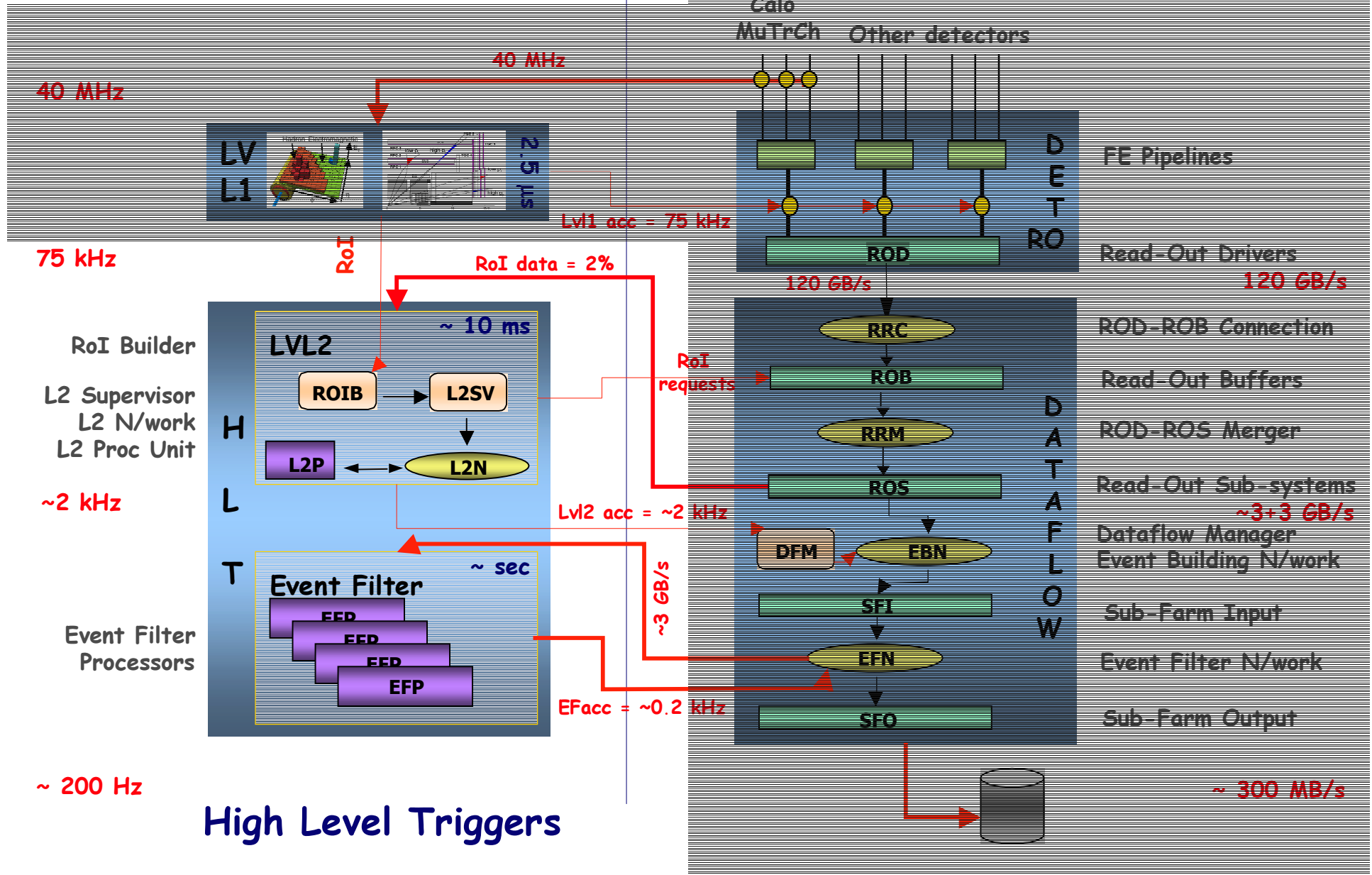
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*on behalf of the ATLAS Trigger/DAQ High Level Trigger group*

# ATLAS Trigger and Data Acquisition

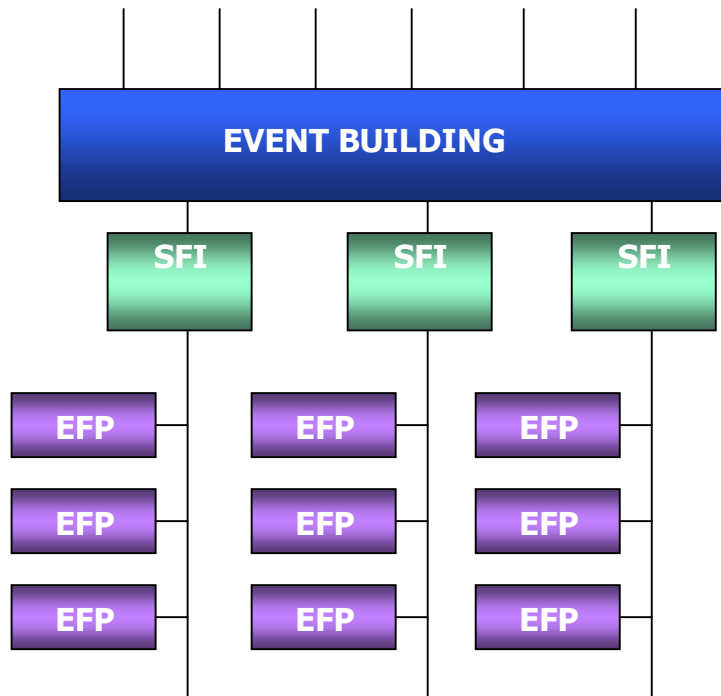
## Trigger

## DAQ





# Supervision of the HLT



- HLT implemented as hundreds of software tasks running on large processor farms
- For reasons of practicality farms split into sub-farms
- Supervision is responsible for all aspects of software task management and control
  - Configuring
  - Controlling
  - Monitoring
- Supervision is one of the areas where commonality between Level-2 and Event Filter can be effectively exploited



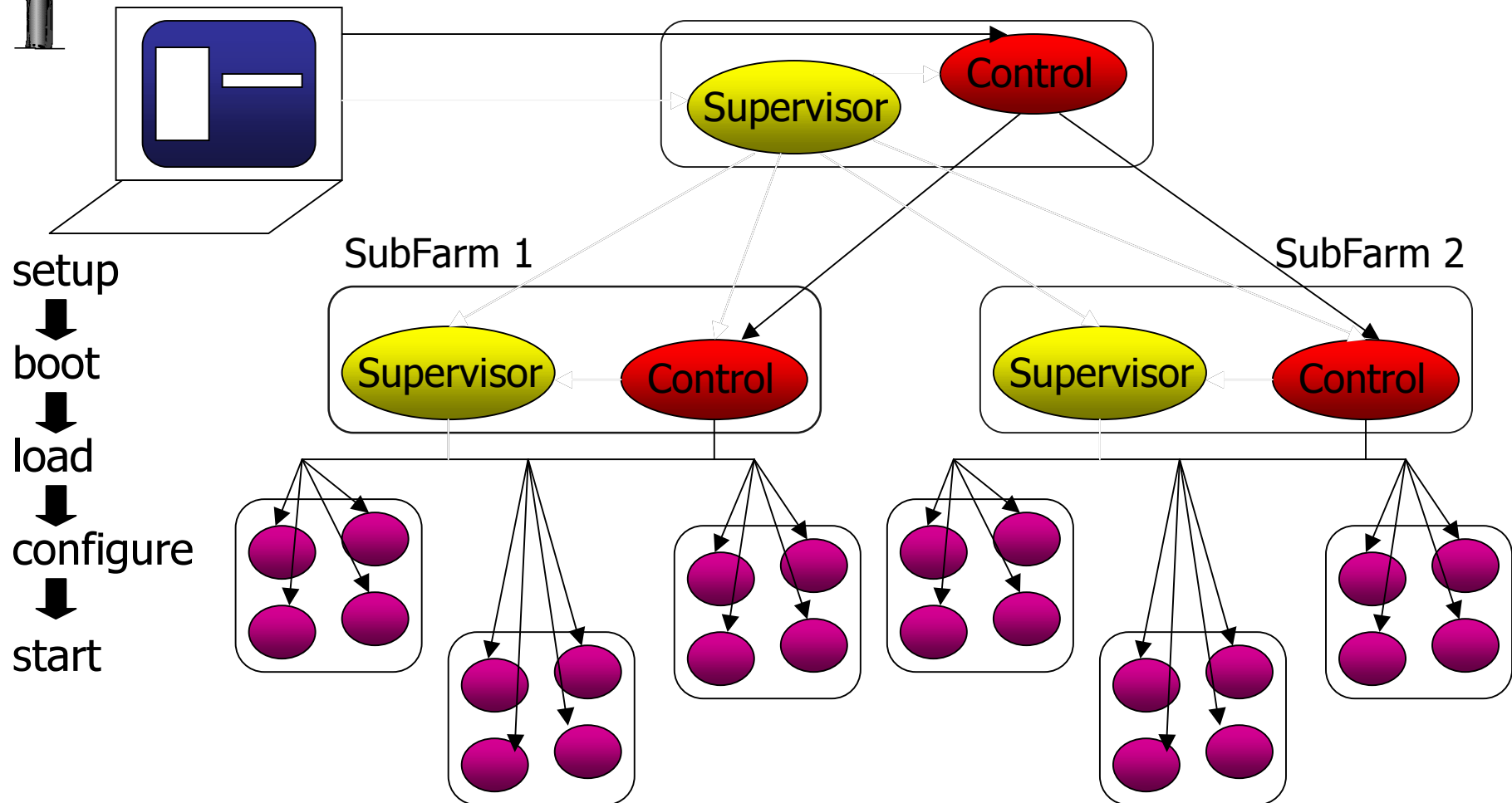
# Prototype HLT supervision system

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- Prototype HLT supervision system has been implemented using tools from the ATLAS Online Software system (OnlineSW)
- OnlineSW is a system of the ATLAS Trigger/DAQ project
- Major integration exercise: OnlineSW provides generic services for TDAQ wide configuration, control and monitoring
- Successfully adapted for use in the HLT
- For HLT control activities following OnlineSW services are used:
  - Configuration Databases
  - Run Control
  - Supervisor (Process Control)
- Controllers based on a finite-state machine are arranged in a hierarchical tree with one software controller per sub-farm and one top-level farm controller
- Controllers successfully customised for use in HLT



# Controlling a Farm





# Monitoring Aspects

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- Monitoring has been implemented using tools from OnlineSW
- Information Service
  - Statistical information written by HLT processes to information service servers and retrieved by others for e.g. display
- Error Reporting system
  - HLT processes use this service to issue error messages to any other TDAQ component e.g. the central control console where they can be displayed

Partition : **be\_test**

DAQ Supervisor Commands

DAQ state : **UP**

Shutdown

Boot

Run Control Commands

Run state : **Running**

Unload

Load

Unconfig

Config

Stop

Start

Resume

Pause

Run Parameters

Run type **Physics**

Run number 1149

Event number 0

Event rate 0

Recording **Enable**

Run Start Time 18.Mar.03 17:11:57

Run Stop Time

Run Ctrl	Run Par.	MRS	DAQ Sup.	PMG	Data Flow	Monitor	Event Filter
Subfarm #	Num. EFDS	Events IN	Events OUT	Throughput	Num. PTs		
SubFarm 1	10 / 10	1165	1100	91.7	40 / 40		
SubFarm 2	10 / 10	1133	1090	90.8	38 / 40		
SubFarm 3	9 / 10	1170	1107	92.3	34/40		
SubFarm 4	10 / 10	1099	1000	83.3	40 / 40		
SubFarm 5	9 / 10	1149	1098	91.5	36 / 40		
SubFarm 6	10 / 10	1153	1112	92.7	40 / 40		
SubFarm 7	10 / 10	1170	1120	93.3	40 / 40		
SubFarm 8	10 / 10	1151	1105	92.1	40 / 40		
SubFarm 9	8 / 10	1000	985	82.1	32 / 40		
SubFarm 10	10 / 10	1118	1089	90.8	40 / 40		

Information for SubFarm 3

EFD	Host	Events IN	Events OUT	Throughput	NPTs	Run Control ...
EFD 57	pcatb57	130	126	10.5	4 / 4	running
EFD 58	pcatb58	125	120	10.0	4 / 4	running
EFD 59	pcatb59	141	130	10.8	4 / 4	running
EFD 60	pcatb60	131	125	10.4	4 / 4	running
EFD 61	pcatb61	127	120	10.0	4 / 4	running
EFD 62	pcatb62	150	138	11.5	4 / 4	running
EFD 63	pcatb63	135	125	10.4	4 / 4	running
EFD 64	pcatb64	116	112	9.3	3 / 4	running
EFD 65	pcatb65	115	111	9.3	3 / 4	running

MRS messages display window

17:11:57	INFORMATION	DSA_SOR	Starting SOR ...
17:11:57	INFORMATION	ROC1_START	Crate started
17:11:57	INFORMATION	RC_START	Start of Run
17:11:53	INFORMATION	PROCESS_CREATION	Process is created

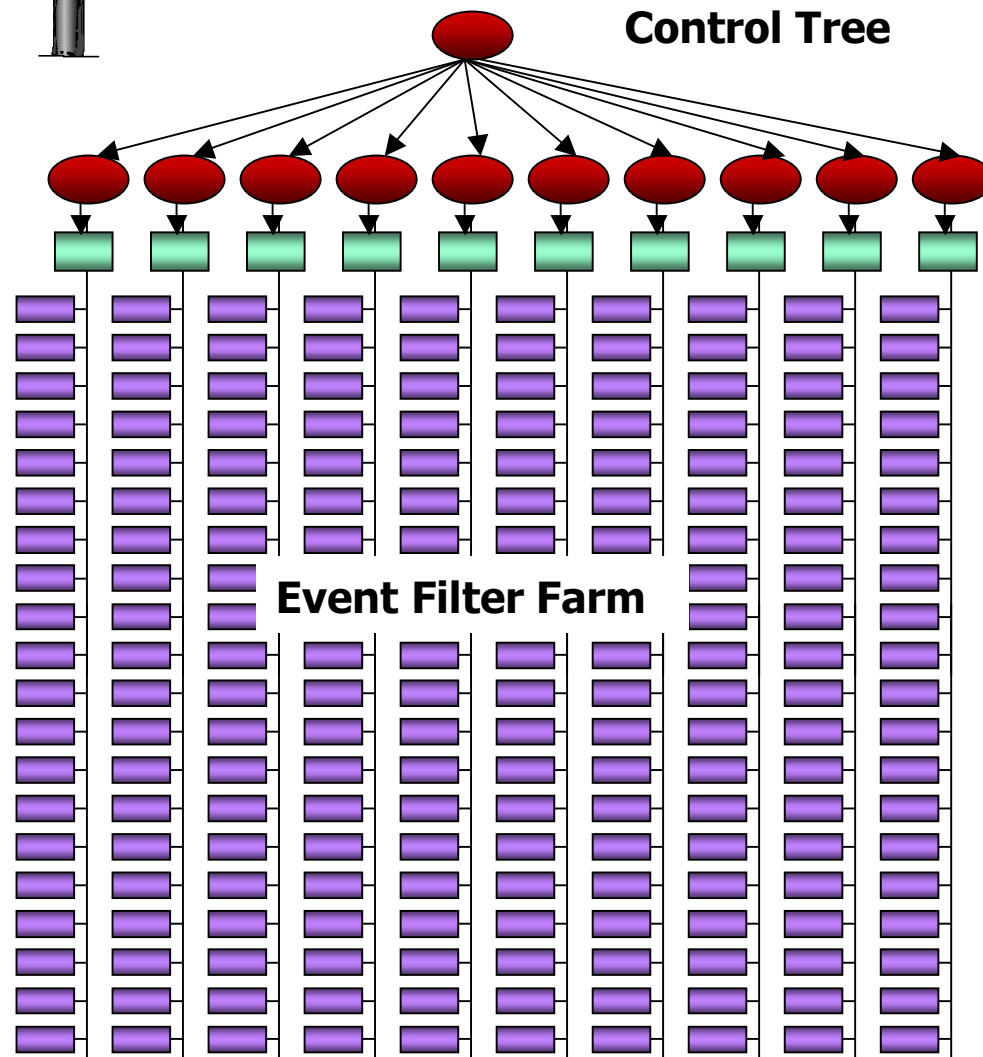
Event dump

Diagnostics

Exit



# Scalability Tests (January 2003)



- Series of tests to determine scalability of control architecture
- Carried out on 230 node IT LXPLUS cluster at CERN
- Configurations studied:
  - Constant total number of nodes split into a varying number of sub-farms
  - Constant number of sub-farms with number of nodes per sub-farm varied
- Tests focused on times to startup, prepare for data-taking & shutdown of configurations





# Generation of Configuration Database

Custom GUI written to create configuration database files

conf\_db\_ef\_create V1.0-22

File Tools Configure

**Top partition**

Partition parameters

Root Controller

Configuration files directory

**Default values for Sub Farms**

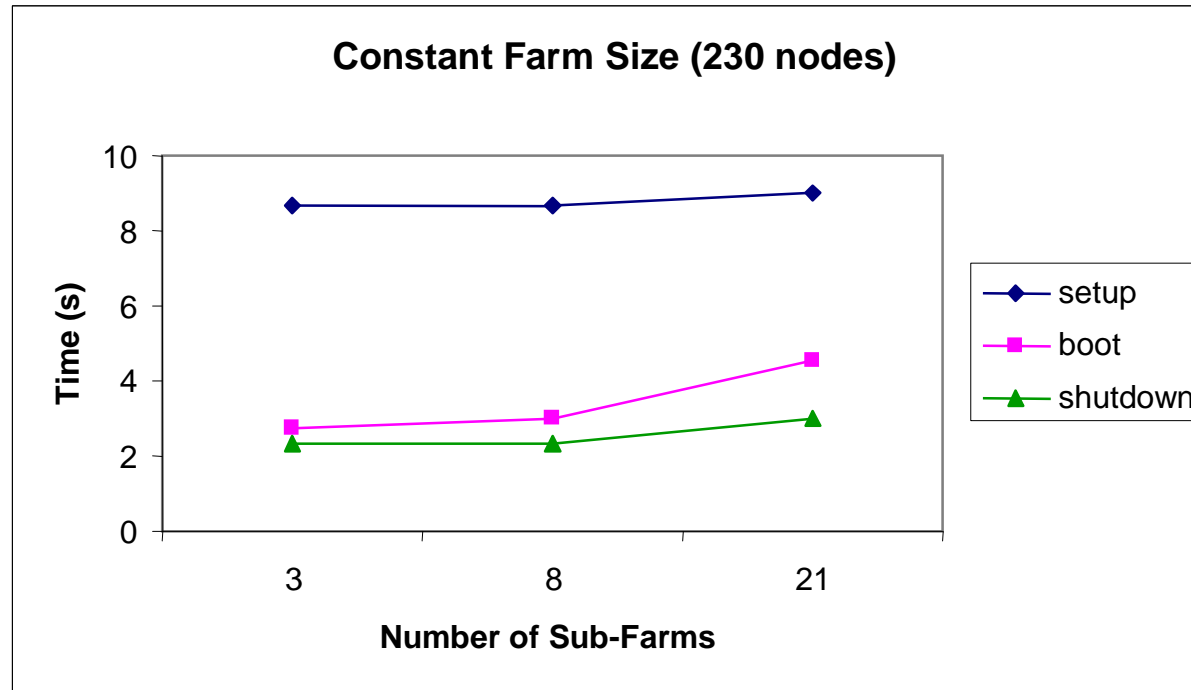
Number of sub-farms  node name  Nb nodes/sub-farm  N dig  Nb PT/node  Nb MT/node

**Sub Farms 0-9**

Sub Farm	Run_Ctrl	DSA_Spv	IS_srv	Appl	Env	node name	range	N dig
Sub Farm 0	<input type="text" value="Run_Ctrl"/>	<input type="text" value="DSA_Spv"/>	<input type="text" value="IS_srv"/>	<input type="text" value="Appl"/>	<input type="text" value="Env"/>	tbed	1 4-6 8-19 21-24	4
Sub Farm 1	<input type="text" value="Run_Ctrl"/>	<input type="text" value="DSA_Spv"/>	<input type="text" value="IS_srv"/>	<input type="text" value="Appl"/>	<input type="text" value="Env"/>	tbed	25 26 28-45	4
Sub Farm 2	<input type="text" value="Run_Ctrl"/>	<input type="text" value="DSA_Spv"/>	<input type="text" value="IS_srv"/>	<input type="text" value="Appl"/>	<input type="text" value="Env"/>	tbed	46-57 59-66	4
Sub Farm 3	<input type="text" value="Run_Ctrl"/>	<input type="text" value="DSA_Spv"/>	<input type="text" value="IS_srv"/>	<input type="text" value="Appl"/>	<input type="text" value="Env"/>	tbed	67 68 70 71 73-81 83-88 90	4
Sub Farm 4	<input type="text" value="Run_Ctrl"/>	<input type="text" value="DSA_Spv"/>	<input type="text" value="IS_srv"/>	<input type="text" value="Appl"/>	<input type="text" value="Env"/>	tbed	92-96 98-105 108-114	4
Sub Farm 5	<input type="text" value="Run_Ctrl"/>	<input type="text" value="DSA_Spv"/>	<input type="text" value="IS_srv"/>	<input type="text" value="Appl"/>	<input type="text" value="Env"/>	tbed	115-134	4
Sub Farm 6	<input type="text" value="Run_Ctrl"/>	<input type="text" value="DSA_Spv"/>	<input type="text" value="IS_srv"/>	<input type="text" value="Appl"/>	<input type="text" value="Env"/>	tbed	145 135-144 146-154	4
Sub Farm 7	<input type="text" value="Run_Ctrl"/>	<input type="text" value="DSA_Spv"/>	<input type="text" value="IS_srv"/>	<input type="text" value="Appl"/>	<input type="text" value="Env"/>	tbed	155-172 174 175	4
Sub Farm 8	<input type="text" value="Run_Ctrl"/>	<input type="text" value="DSA_Spv"/>	<input type="text" value="IS_srv"/>	<input type="text" value="Appl"/>	<input type="text" value="Env"/>	tbed	177-196	4
Sub Farm 9	<input type="text" value="Run_Ctrl"/>	<input type="text" value="DSA_Spv"/>	<input type="text" value="IS_srv"/>	<input type="text" value="Appl"/>	<input type="text" value="Env"/>	lxshare	273-279 281 293	4



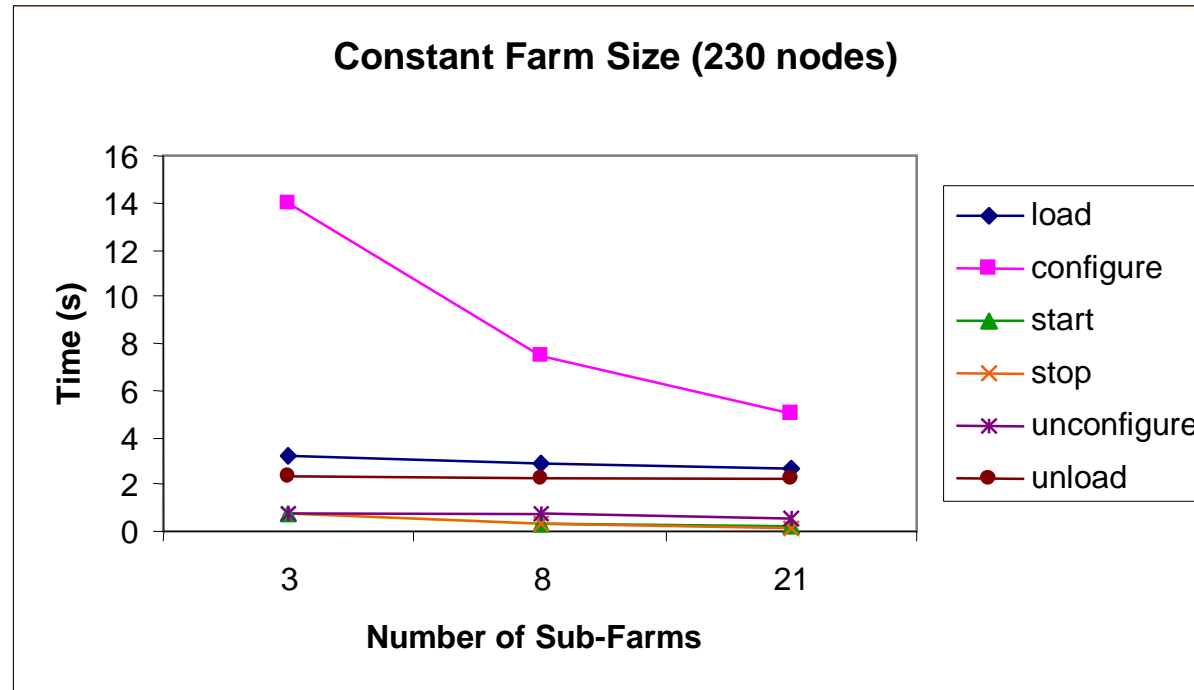
## Results – Constant number of Nodes



- Graph shows times to start and stop control infrastructure
- Increase in times seen with number of sub-farms
- More sub-farms mean more controller and supervisor processes



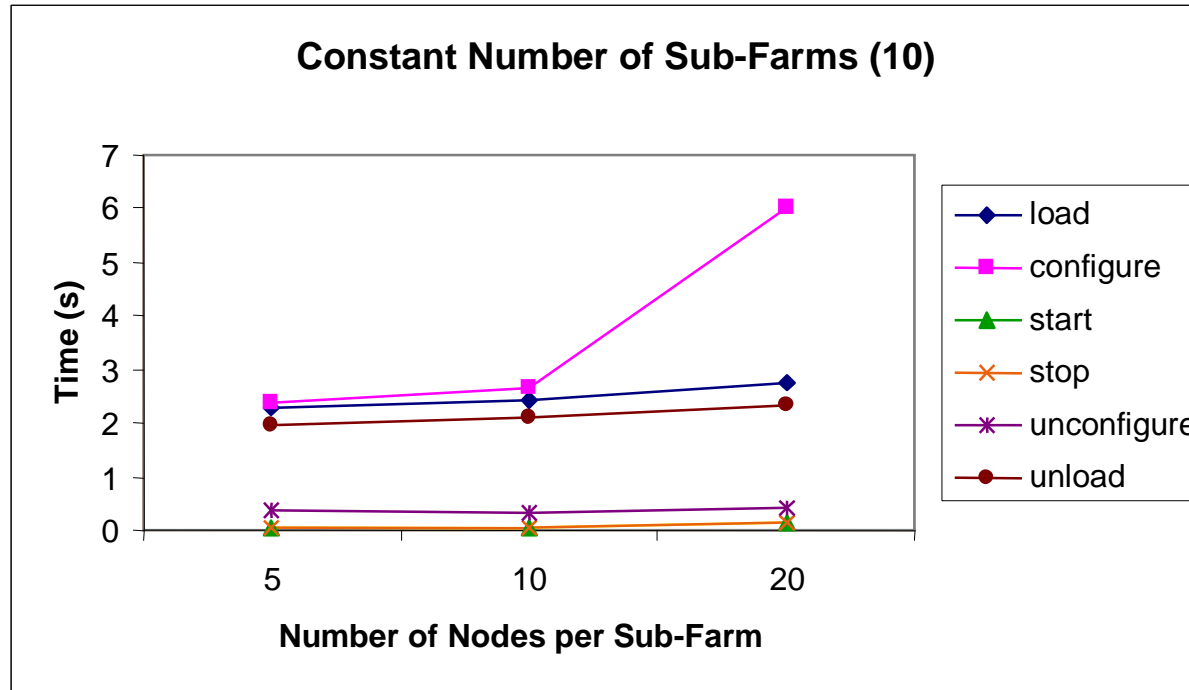
## Results – Constant number of Nodes



- Graph shows times to cycle through run control sequence
- Decrease seen with number of sub-farms
- More sub-farms imply fewer nodes, therefore fewer trigger processes to control per sub-farm



# Results – Constant number of Sub-Farms



- Times increase with increasing numbers of nodes and processes to control as expected



## Conclusions and future

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- Results are very promising for the implementation of the HLT supervision system for the first ATLAS run
- All operations required to startup, prepare for data-taking and shutdown configurations take of the order of a few seconds to complete
- Largest tested configurations represent 10-20% of final system
- Future enhancements of supervision system to include:
  - Combined Run Control/Process Control component
  - Parallelised communication between control and trigger processes
  - Distributed configuration database