Agata Daq technical design proposal [1]

People involved :

Hardware Management	Software Development
Nathalie Barre (50%)	Rogelio Canedo (50%)
Christophe Diarra (50%)	Dominique Delbourg (50%)
	Xavier Grave (80%)
	Eric Legay (20%)

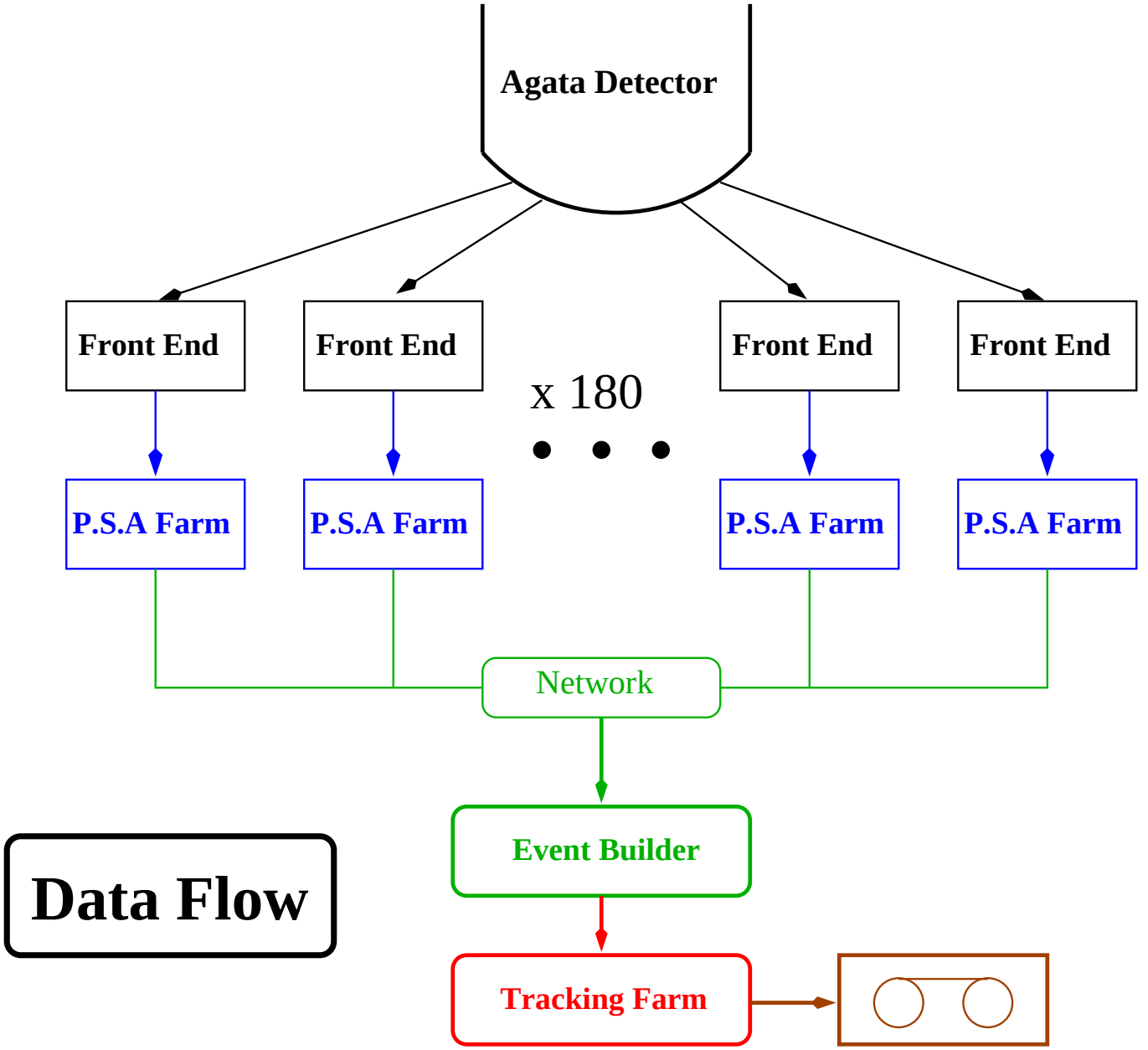
Coordinator : Amel Korichi

[1] Draft available at http ://npg.dl.ac.uk/documentation/AGATA/specifications/

Agata Daq technical design proposal

Outline :

- Data Flow
- Hardware organization
- Software organization
- Ideas to include Ancillary data
- Performed Narval tests
- Time scale and costs
- Shopping List


Agata Detector
Front End
Front End
x 180
Front End
Front End
P.S.A Farm
P.S.A Farm
P.S.A Farm
P.S.A Farm
Network
Event Builder
Tracking Farm

Data Flow

Front End : Hardware organization

CPU can be needed :

- to support high bandwidth throughput
  concentrating data (3×75MB/s) for a triple cluster
  (trigger mode on)
- for zero suppression (optional)
- for dispatching/tagging of the events
  number of segment hit, number of interaction per hit
- to perform part of PSA (very optional)

Under investigation with PreProcessing team

Psa **Farms : Hardware organization**

Two form factors are under study :

	advantages	disadvantages
Blade	dense easy to administrate more reliable (better Mtbf)	not the cheapest
1U pizza box	cheapest	less reliable

Three kind of Cpu are under consideration :[2]

- Opteron
- PowerPc970
- Xeon64

⇒ Narval must support both architectures (x86 and ppc) : Done.

[2] one have to be careful of Cpu power consumption, 20 Cpu/Farm with 50 Watts/Cpu leads to 180 kWatts consumption for Agata

Psa Farms : Hardware organization

Hardware running at Orsay :

- seven dual PowerPc970 lames running at 2.2GHz
  installed Os : Debian, RedHat and Suse
- one dual Opteron 1U running at 2.2 GHz
  installed Os : Fedora Core3

Event builder : Hardware organization

Event building can be performed in two ways :

- Multi server
  - needs standard CPU computer
  - standard network
- Single server
  - needs high bandwidth mother board with high performance CPUs
  - less standard network (depending of the experiment rate)

Since the single case is a particular case of the multiple one
$\Rightarrow$ work mostly on the multiple case

Tracking Farms : Hardware organization

Cost from CPU hardware comes mostly from PSA farms
$\Rightarrow$ take the same hardware for tracking in order to make easier the administration of the farms

Storage

No particular needs for demonstrator (except a few TeraBytes in SATA)

R&D for full detector under way :

- For experiment site storage
  - Fiber Channel throughput
  - SATA crate disk
- Network to a computing center (with robot storage, etc...)
  - example : GANIL to CCIN2P3 will have a 10 Gb/s link
  - (dark fiber will link the two sites)

Software organization

Front End CPU :

- NARVAL producer to concentrate carrier's data
- NARVAL intermediary to perform zero suppression
- NARVAL intermediary to dispatch the data to different PSA algorithms

PSA farms :

One NARVAL intermediary per different kind of algorithm

- Genetic algorithm
- Matrix Method
- Neural Network
- Wavelets analysis
- ...

Data transport in PSA farm can be handled by MPI $\Rightarrow$ independently of the network layer (need to check speed, under investigation in NARVAL)

Software organization

Event Building :

Will be developed in a multi server scheme

- will use event number in a trigger configuration
- will use timing window based on timestamp in trigger-less configuration

  single server scheme is easier in this case

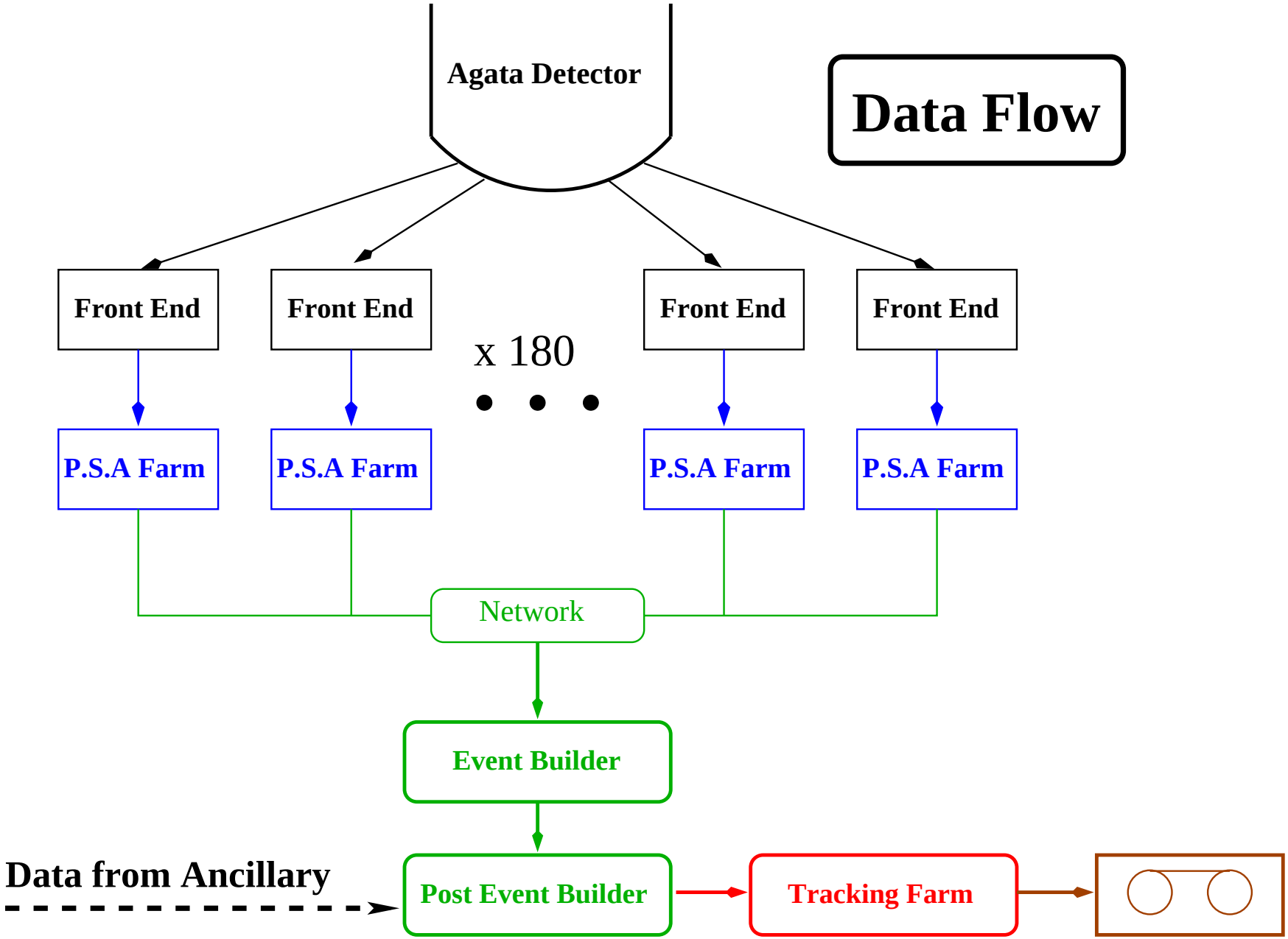
If it works in a multi server configuration, it will work in single configuration

Tracking Farm :

NARVAL intermediary to support tracking algorithms

Storage :

Need to develop a NARVAL consumer which dumps data to the chosen storage medium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Network
Event Builder
Data from Ancillary
Post Event Builder
Tracking Farm

Ideas to include Ancillary data

Add a post event builder based on :

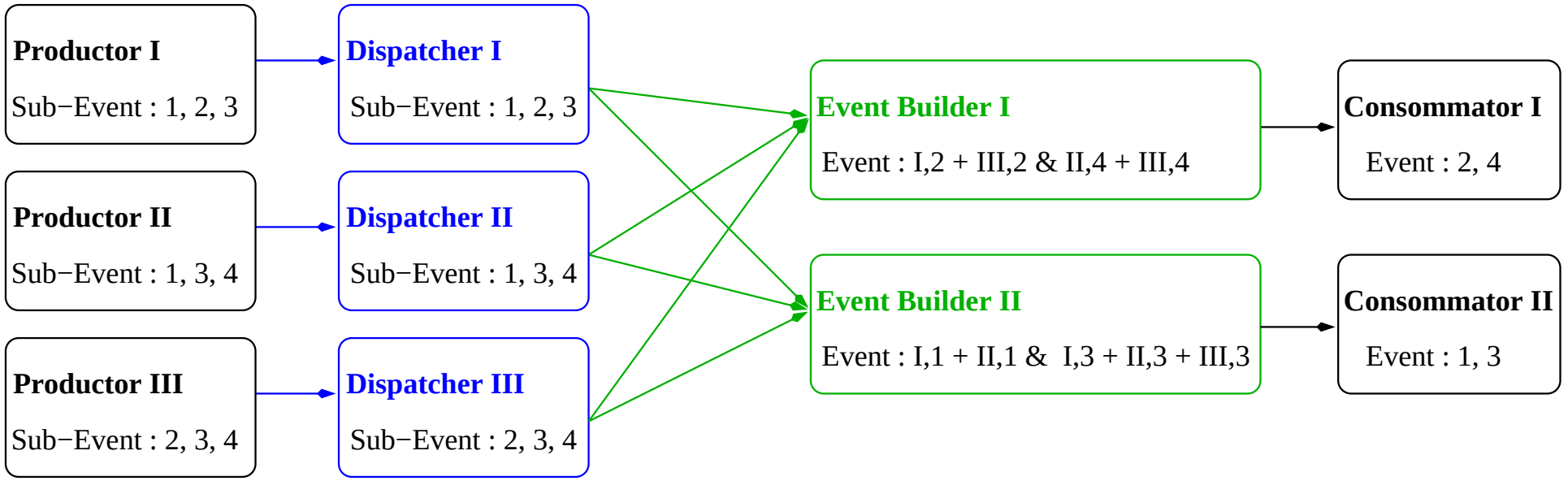
- timing window algorithm (using timestamped information) if no trigger information correlation possibility
  $\Rightarrow$ need synchronized clock between detectors
- event number if common trigger information available

Performed NARVAL Tests

Point to point transfer on Gigabit Ethernet :

NARVAL on LINUX box running 2.4 and 2.6 kernel saturates TCP/IP interfaces

Tests on Event building



Time scale and costs

Costs :

PSA Farm	30 k€ x α x 15
Event Builder (Farm)	22 k€
Gigabit switch	1x15 k€
Tracking Farm	30 k€
Run Control	12 k€
Storage 15 TeraBytes	30 k€
Total for demonstrator (2007)	109 + 450 = 559 k€ (if α=1)

α is depending on the PSA algorithms performances

Time scale and costs

Time scale :

Summer 2005	DAQ for 1 detector with Run Control minimal storage system
Winter 2005	PSA infrastructure in place for 1 detector
Spring 2006	Event builder in place
Summer 2006	Tracking system in place DAQ debugged and running for a tripled cluster
Winter 2006	Storage system in place DAQ debugged and running few detectors at limited rate (due to the missing computing power of the PSA farm)
Spring 2007	All DAQ components received, system integration started
Summer 2007	Commissioning of the system

Shopping list

- Algorithm/DAQ interfaces to be defined
- Run control/DAQ interfaces to be defined
- Other NARVAL tests
  - with more realistic data and reconstruction algorithms
  - second step scalability
- Data format to be defined
- Clear definition of the events rate
  - for demonstrator/full AGATA
  - trigger/trigger-less mode
- Fault tolerance
  - hardware
  - software
- Documentation to improve

People willing to play with NARVAL are welcome