Suren A. Chilingaryan
Forschungszentrum Karlsruhe, Yerevan Physics Institute

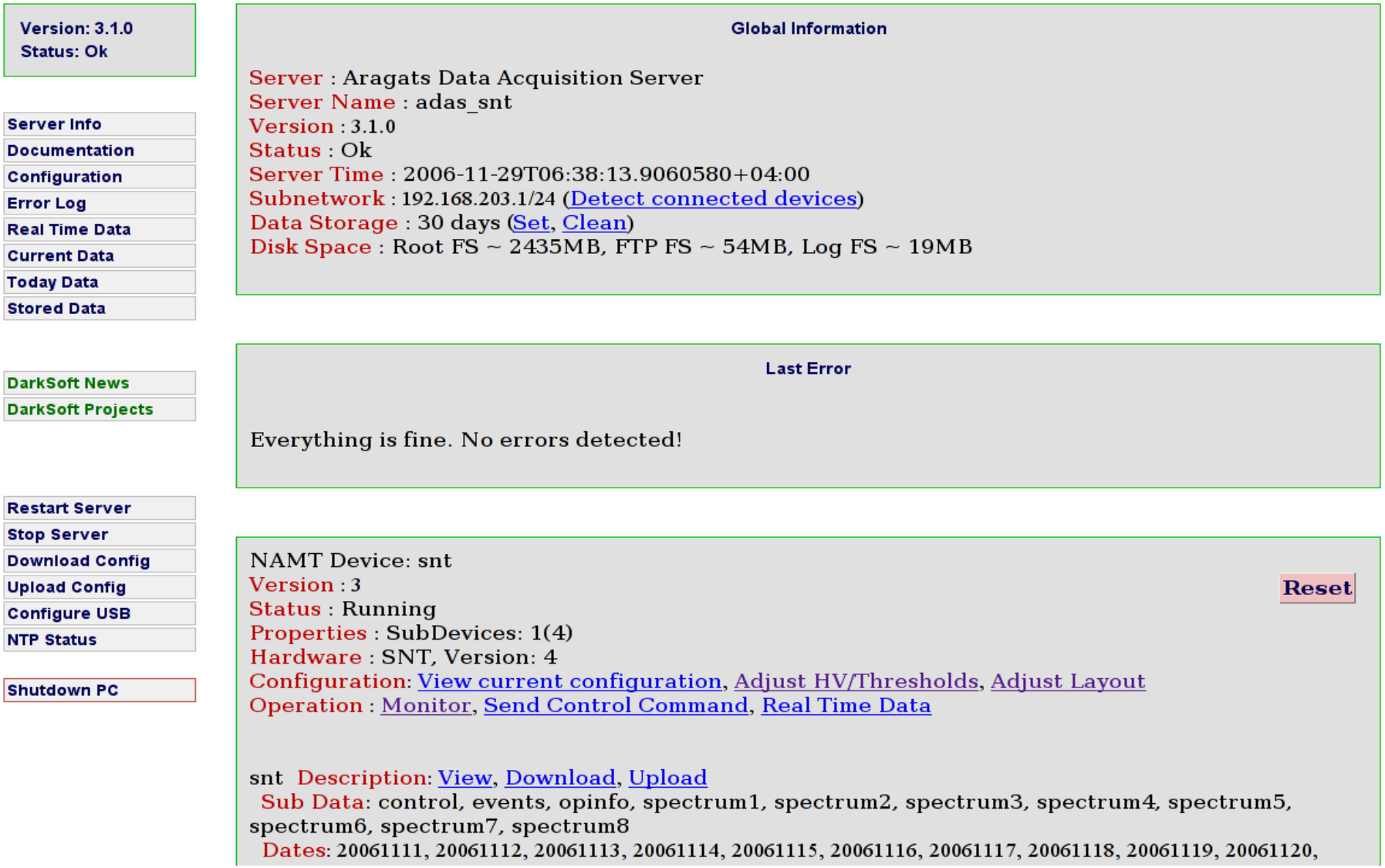
Advanced Data Acquisition System for SEVAN

Features, Architecture and Data Format

ADAS Features

- Collection of Data
  - Particle Counters
  - Variance & Correlations of Particle Counters
  - Coincidence / Anti-Coincidence Counters
  - Sensor Spectra (Including Conditional)
  - Individual Events (10ms precision / 10us relative precision)
- Detector Control
  - Electronics (High Voltages, Thresholds, ...)
  - Layout Configuration (Coincidences, Spectra)
  - Software Configuration
- Data Dissemination using Web Services
- Configuration/Control/Monitoring using Web Interface

Control Web Interface



Detailed Data View

SA Device: analyzer (Update)

Warning: *Last data is written 40 hours ago*

SubData: control, opinfo, spectrum1, spectrum2, spectrum3, spectrum4, spectrum5, spectrum6, spectrum7, spectrum8

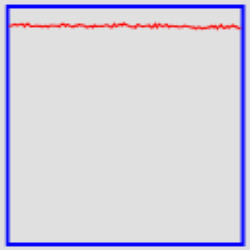
Data obtained at: 2006-11-27T14:56:00.0000000+04:00
Calculation Duration: P60.0000000
Quality: 100.00

1	Intensity of the Neutron Flux Sensor: 1	23
2	Intensity of the Muon Flux Sensor: 2	67233
3	Intensity of the Charged Particles Flux Sensor: 3	556
4	Coincidence [1-2-3]	2
5	Coincidence [1-2]	4
6	Coincidence [2-3]	315
7	Coincidence [1-3]	4
8	Variance of ID:1 targetid: 1	1.0836
9	Variance of ID:2 targetid: 2	2012.1916
10	Variance of ID:3 targetid: 3	8.9273
11	Correlation between ID:1 and ID:2 targetid1: 1, targetid2: 2	-0.4123
12	Correlation between ID:1 and ID:3 targetid1: 1, targetid2: 3	-0.0063
13	Correlation between ID:2 and ID:3 targetid1: 2, targetid2: 3	-0.4475

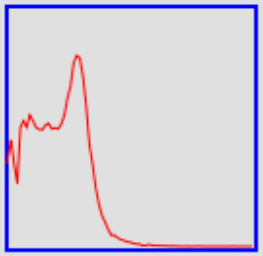
Monitoring

Channel 1 (Layer: 1, Sensor: 1)

Revised: 03:56:07 High Voltage: 1401
Counter: 41514 Threshold: 2.2300



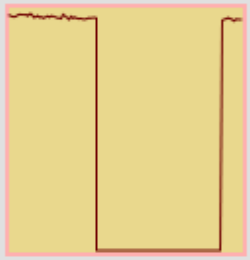
Counter



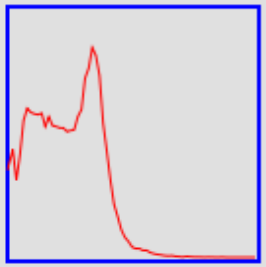
Spectrum

Channel 2 (Layer: 1, Sensor: 2)

Revised: 01:54:30 High Voltage: 1580
Counter: 43808 Threshold: 2.3000



Counter

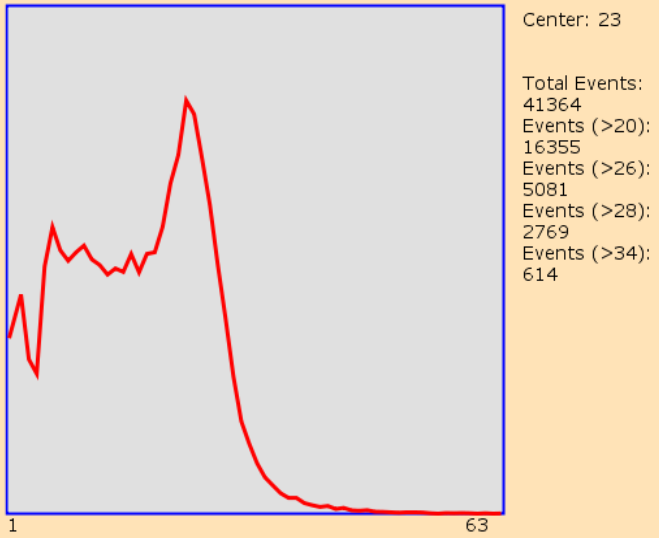


Spectrum

Channel 5 (Layer: 2, Sensor: 1)

Revised: 03:56:07 High Voltage: 1349
Counter: 24455 Threshold: 2.1500

Detctor 1 Spectrum



Counter

Spectrum

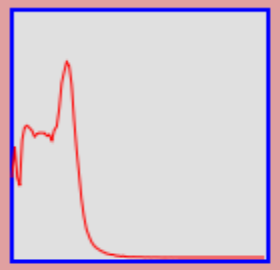
Detector Control

Channel 1 (Layer: 1, Sensor: 1)

High Voltage (V): 1500

Threshold (V): 2.2300

SoftThreshold : 1



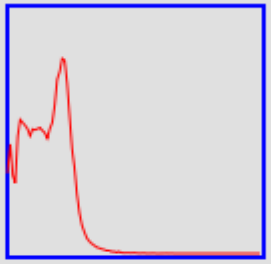
High Voltage: 1398
Cur. Counter: 671

Channel 1 (Layer: 1, Sensor: 1)

High Voltage (V): 200

Threshold (V): 2.2300

SoftThreshold : 1



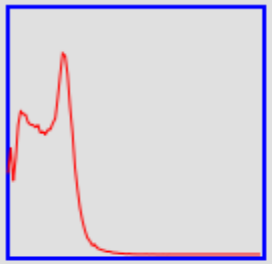
High Voltage: 1401
Cur. Counter: 713

Channel 2 (Layer: 1, Sensor: 2)

High Voltage (V): 1580

Threshold (V): 2.3000

SoftThreshold : 1



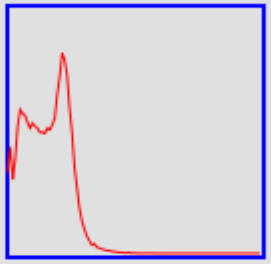
High Voltage: 1579
Cur. Counter: 709

Channel 2 (Layer: 1, Sensor: 2)

High Voltage (V): 1580

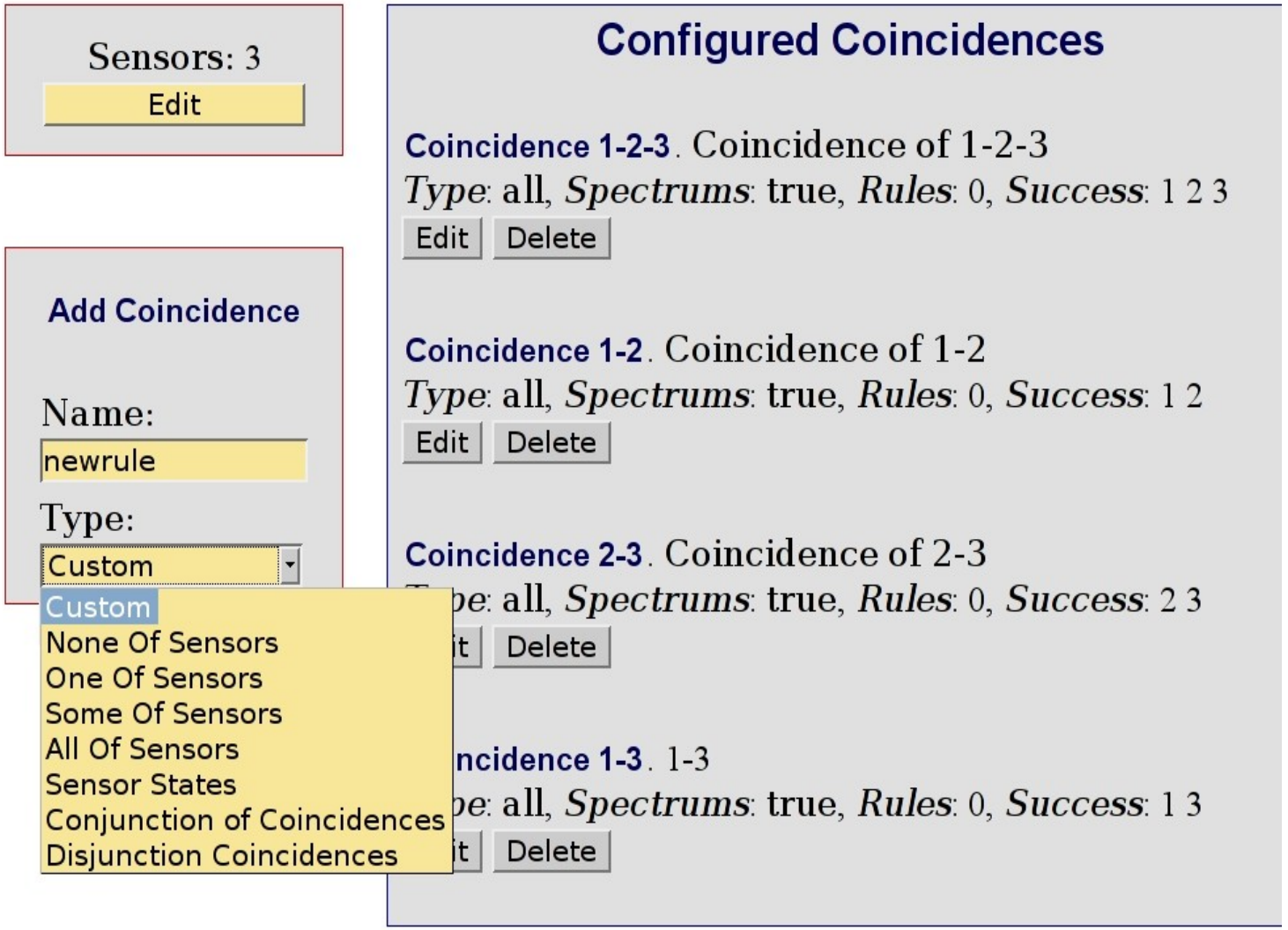
Threshold (V): 2.3000

SoftThreshold : 1

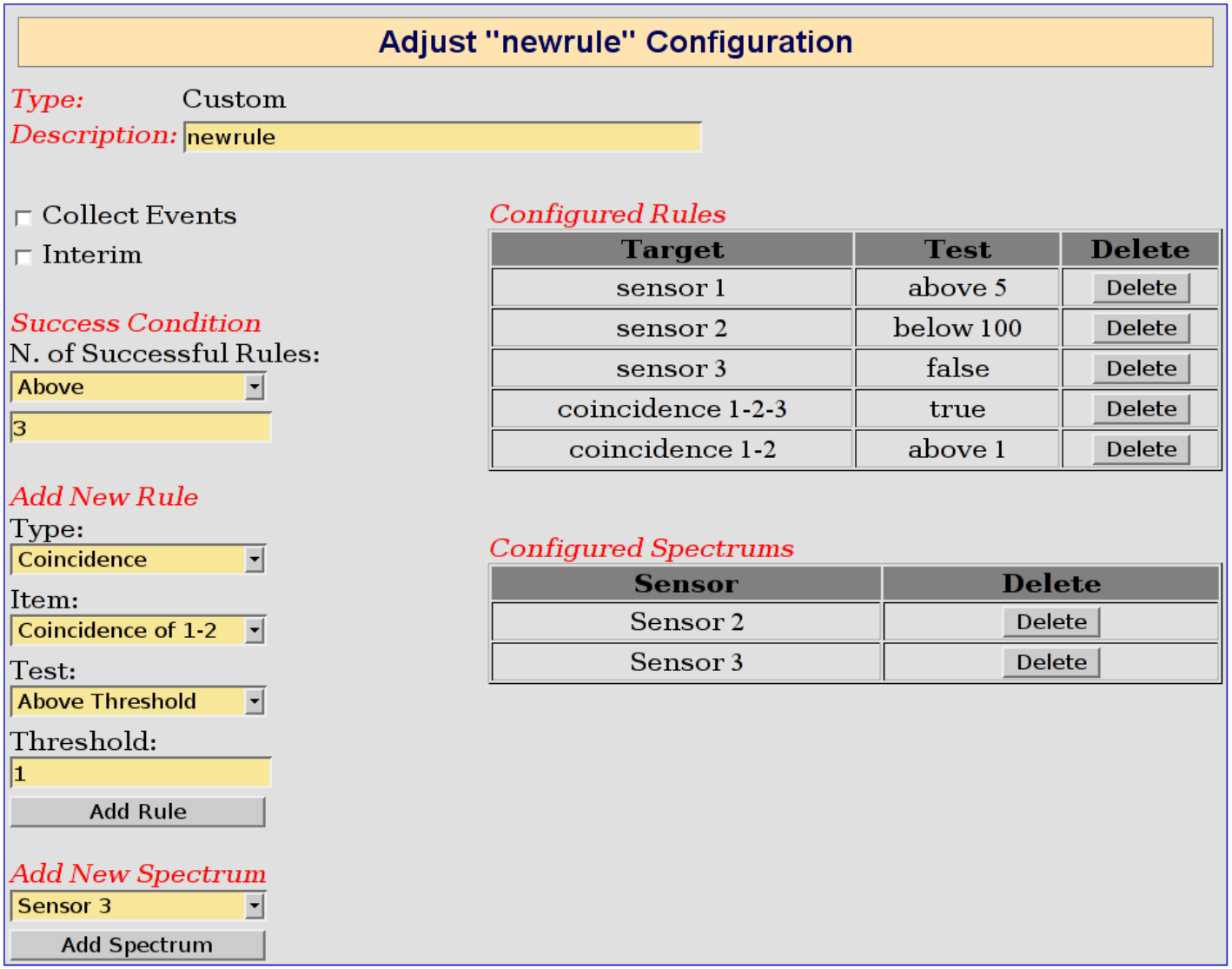


High Voltage: 1579
Cur. Counter: 718

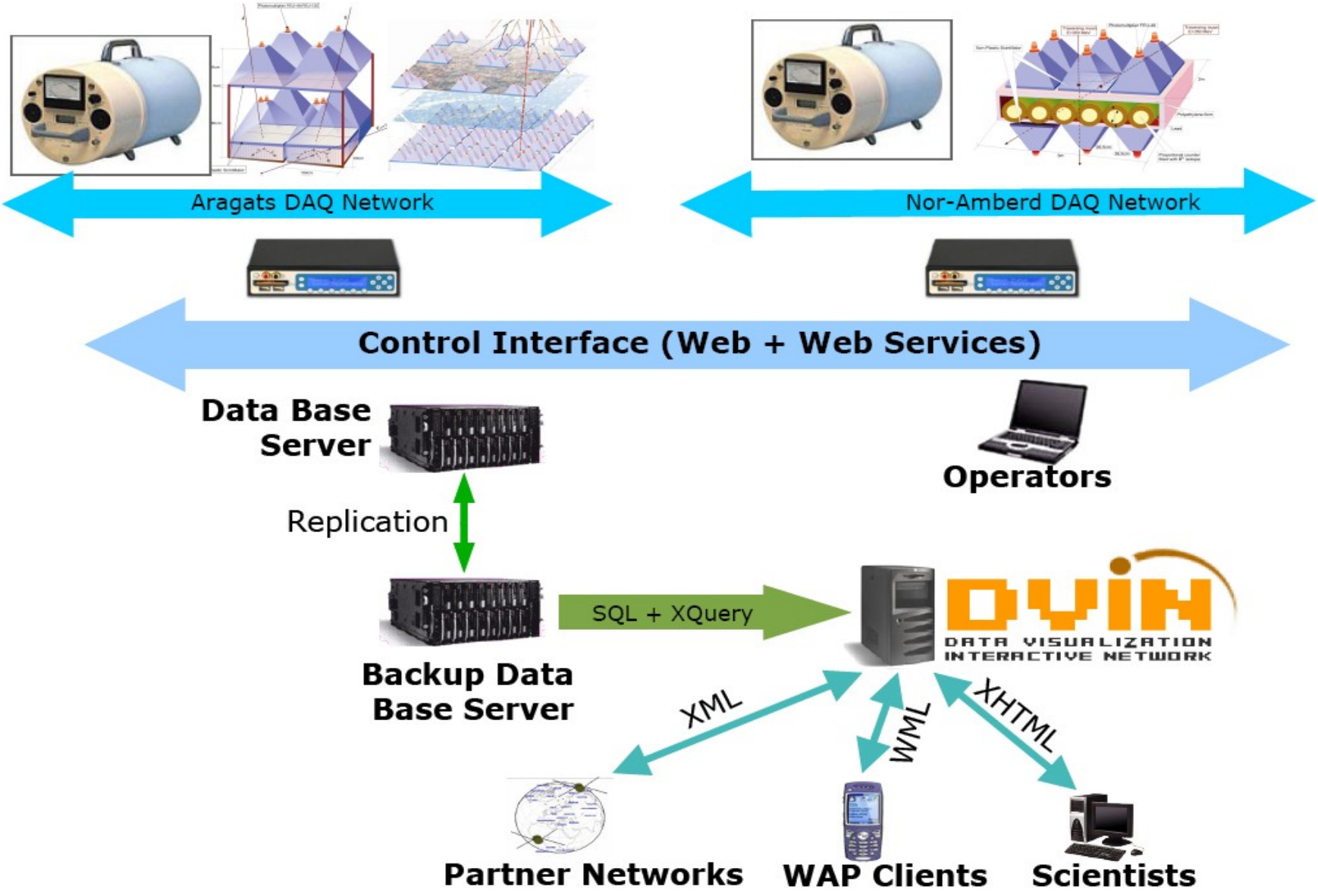
Coincidences/Spectra Configuration



Custom Rules



ADAS Architecture



Control PC

VIA Eden Platform

Minibox M100 /C3 533MHZ, 512MB RAM/

- Improved stability due to fan-less and disk-less design
- Reduced power consumption
- Embedded Linux running from Compact Flash Memory Card
  - Easy Maintenance
  - Real-time capabilities
- Small Size
  - Allows integration with readout electronics
- LCD Screen with Keypad
  - Error Reporting
  - Basic Data Monitoring

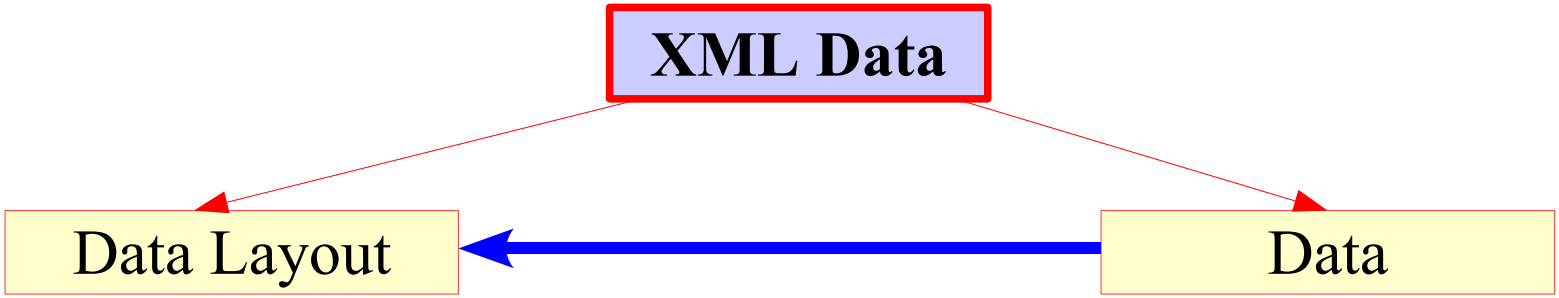
Old ASCII Data Format

10:29:00	54	51	48	52	57	54	45
10:30:00	56	54	46	51	44	52	47
10:31:00	60	48	43	39	50	54	50
10:32:00	44	42	53	53	47	55	50
10:33:00	48	54	50	53	46	55	40
10:34:00	50	56	50	43	55	47	64

Meaning of the data?

- Channel Type
- Particles registered
- Min/Max Energies
- Direction
- Engineering Units
- Precision
- Duration
- Algorithms used
- Alert Conditions

New Format: Data and Layout



XML File / XML Database
- Installation Description
- Installation Geometry
- Data Layout

ASCII File / SQL Database
- Used Layout
- Time / Quality / Duration
- ASCII Data

<Detector type="neutron" emin="120">**1**</Detector>
<Detector type="neutron" emin="190">**2**</Detector>
<Detector type="neutron" emin="290">**3**</Detector>
<Detector type="neutron" emin="490">**4**</Detector>
<Detector type="muon">**5**</Detector>

6572 1830 472 239 580
6570 1834 469 241 581

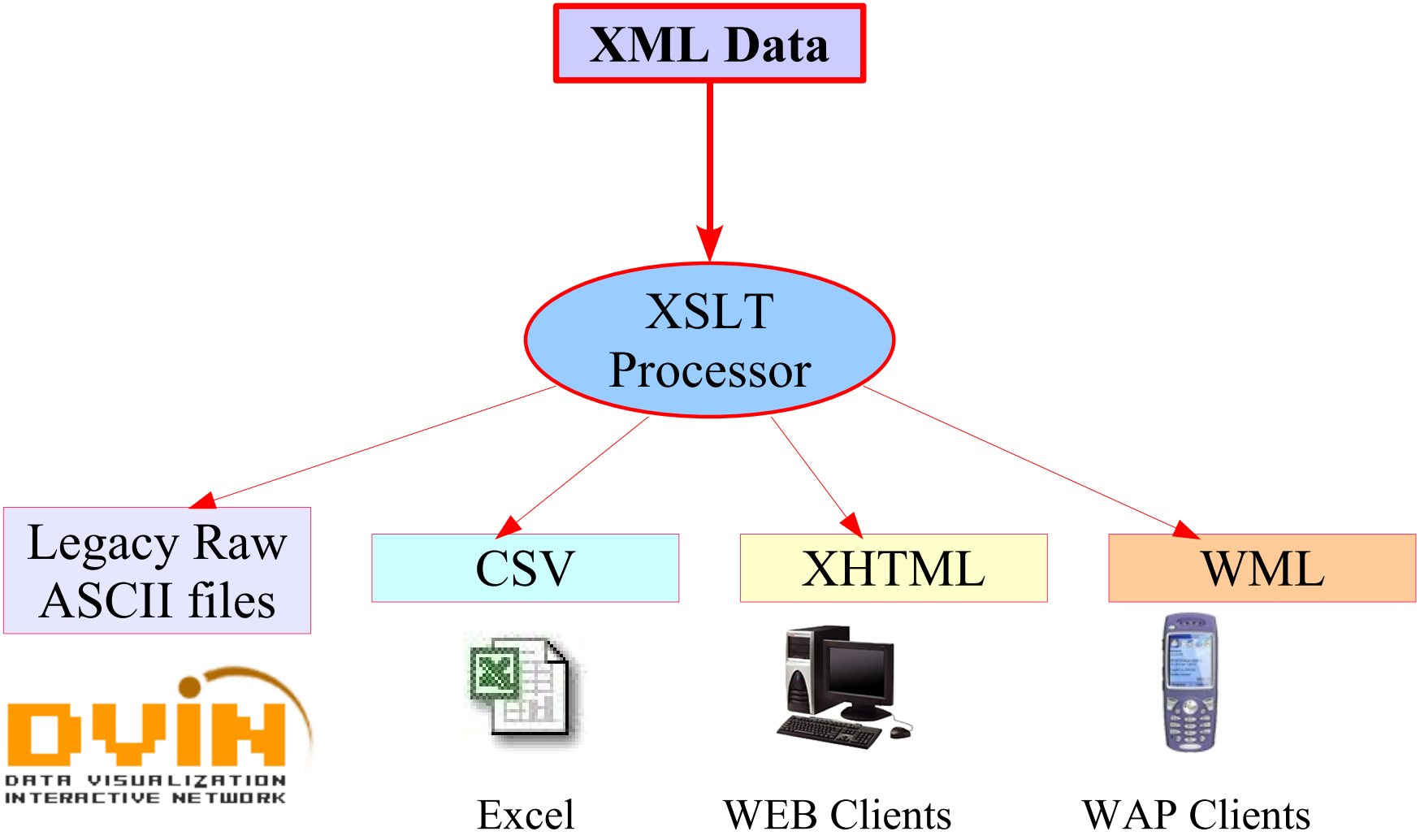
XML: Advantages/Disadvantages

- Good for Heterogeneous Environments
- Readable
- Extensible
- High Level Standard
- XSLT Filter Support

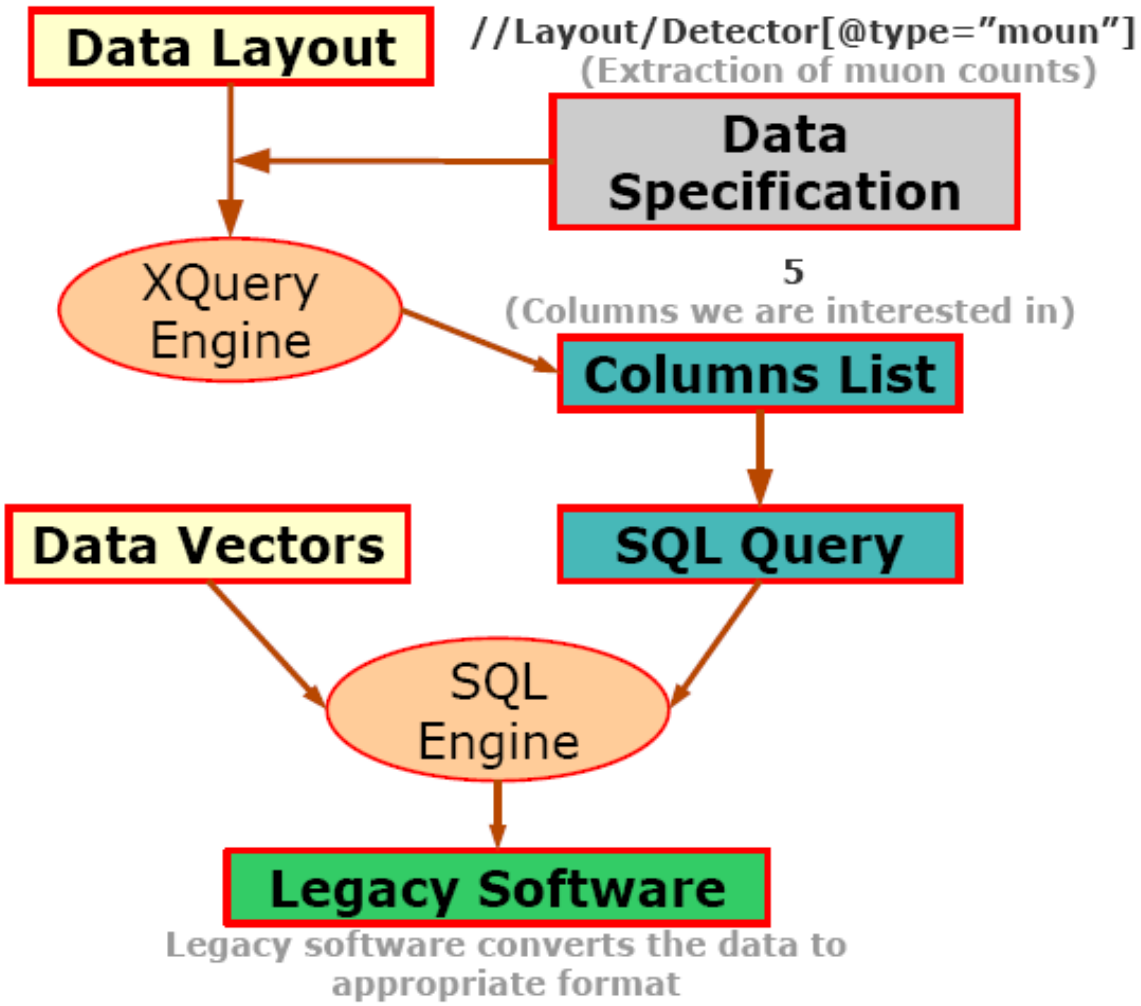
```
<Data>
   <Time>12.01.2005</Time>
   <Value>64</Value>
   <Units>MEV</Units>
</Data>
```

- Extremely Large Data Size
- XML Processing is Required to Extract Data
- Incompatibility with current software
- XML Databases are terribly slow

XSLT Filters



Fast Data Access



Conclusion: Standardization

- Standard Transport Protocol: Ethernet
- Standard Data Acquisition Modules: VIA Eden
- Standard Data Acquisition Software
- Standard Data Exchange Interface
- Self Describing Data Format
- Web Based Control/Monitoring Interface