A scalable Experiment to HPC Cluster Solution for Data Analysis

Used for Positron Annihilation Spectroscopy

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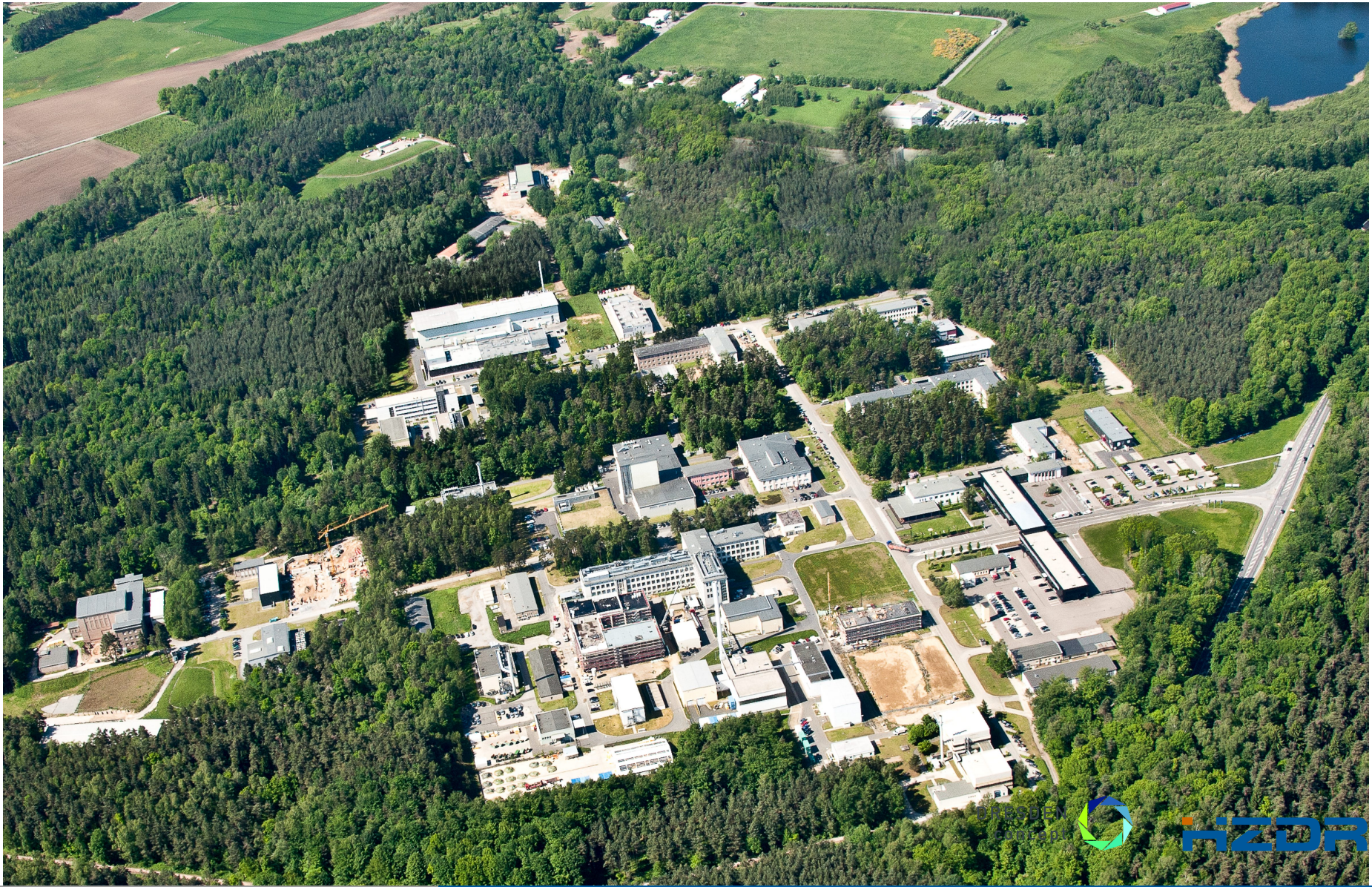
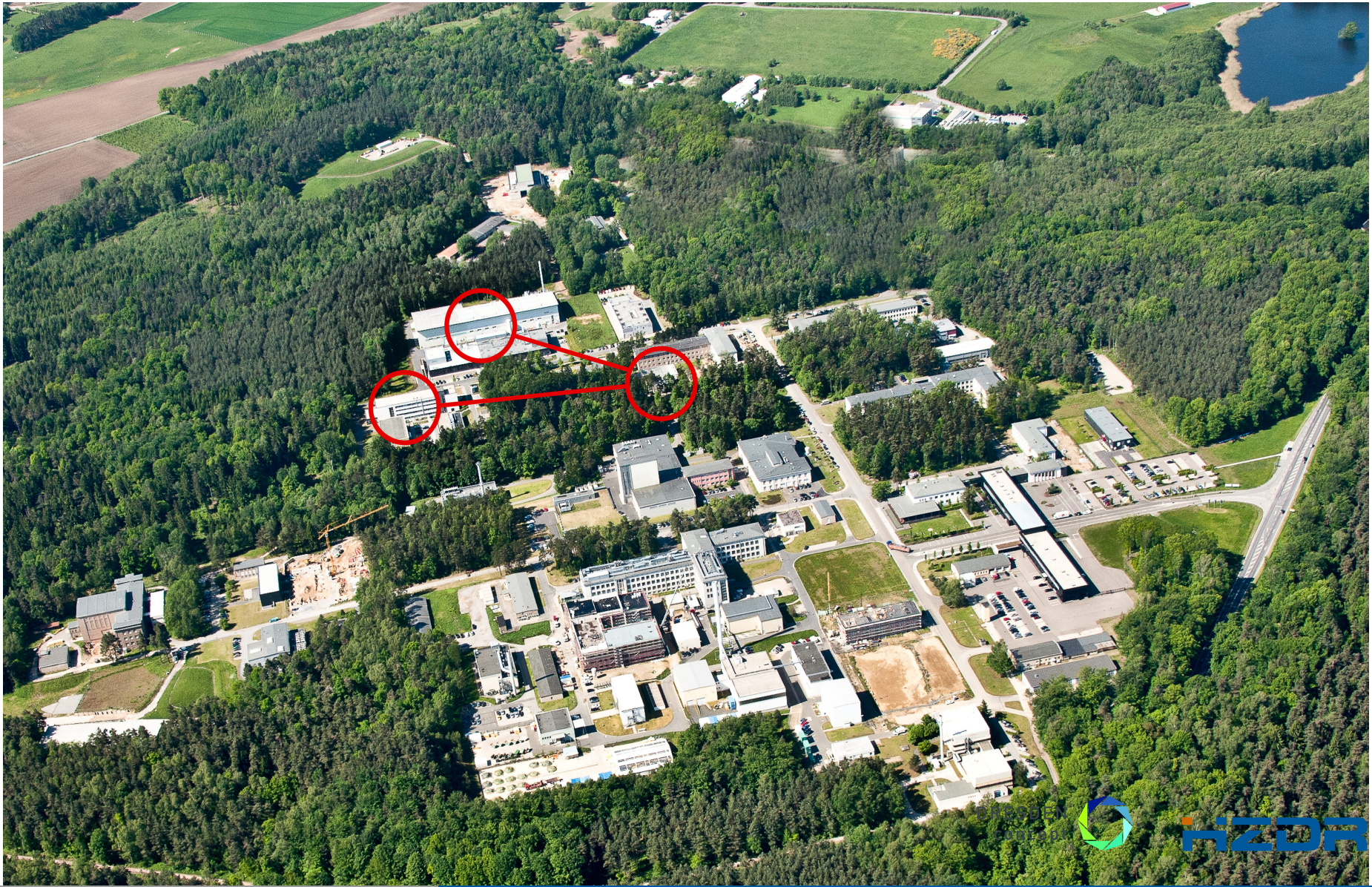
7th March 2016

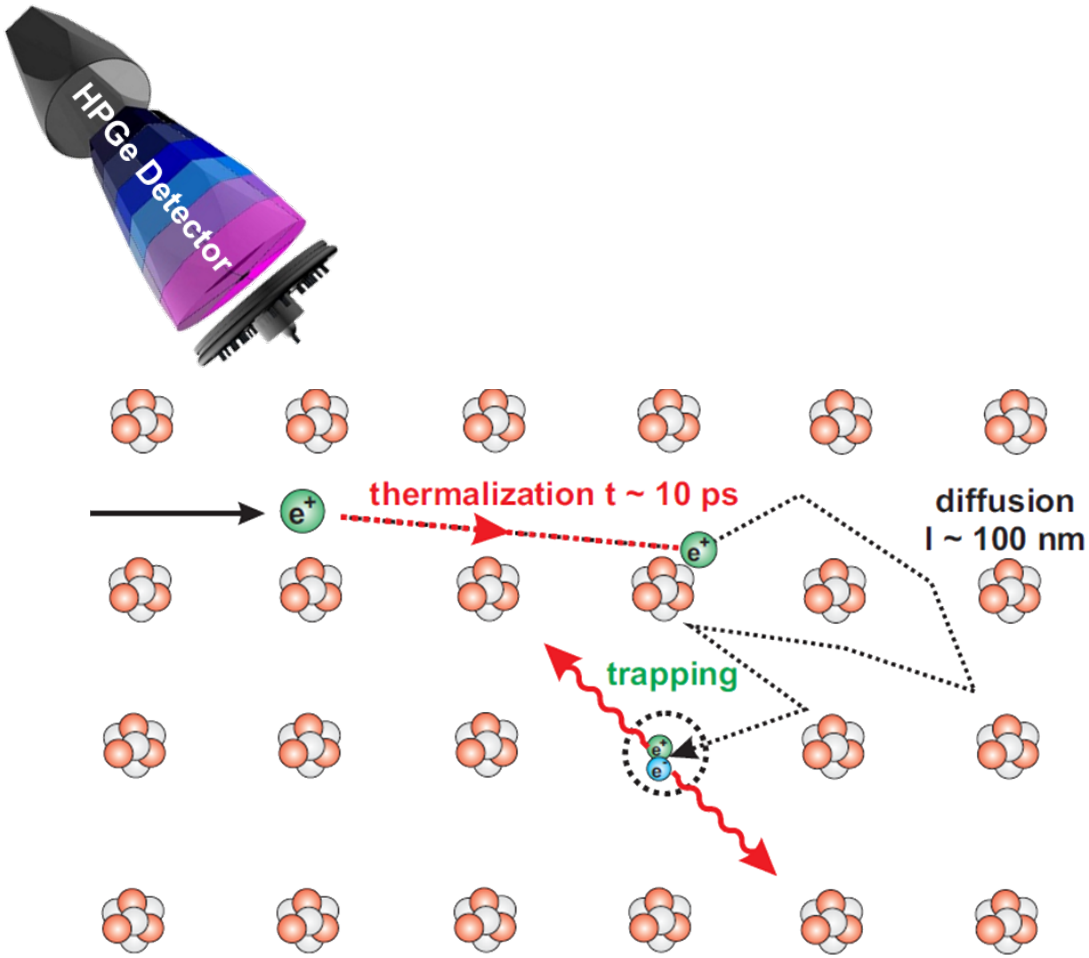
Introduction



Introduction



Positron Annihilation Spectroscopy



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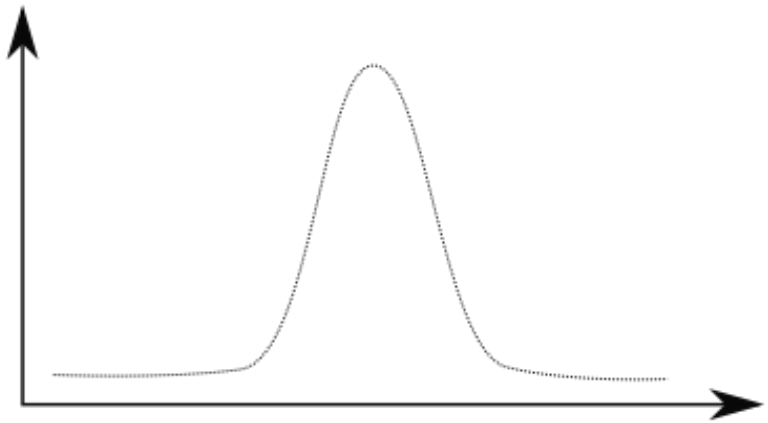
Positron Annihilation



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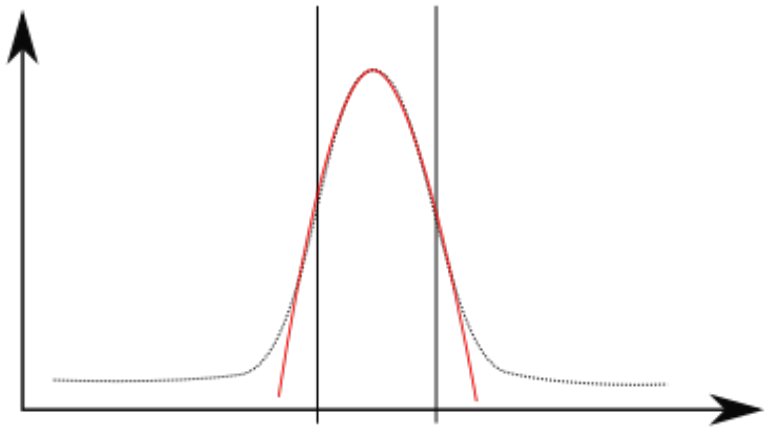
Positron Annihilation



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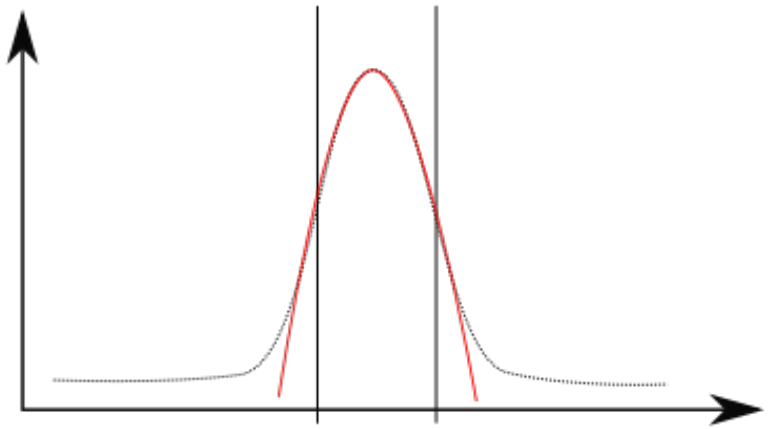
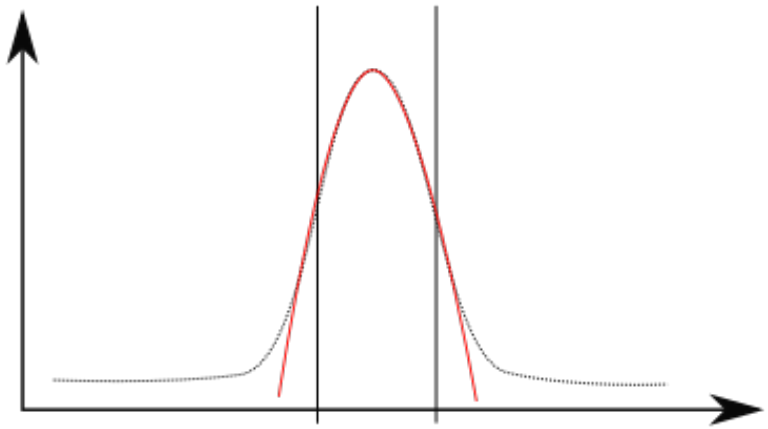
Positron Annihilation



- 8000 events/s

Positron Annihilation



- 8000 events/s
- 1000 points/event

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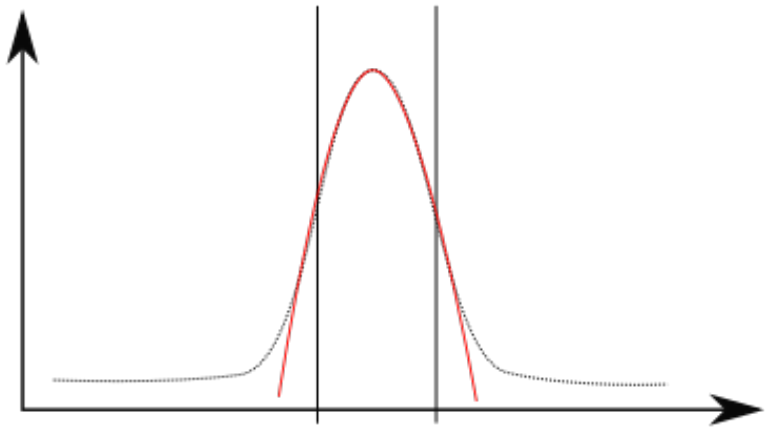
Positron Annihilation



- 8000 events/s
- 1000 points/event
- 4 KB/event

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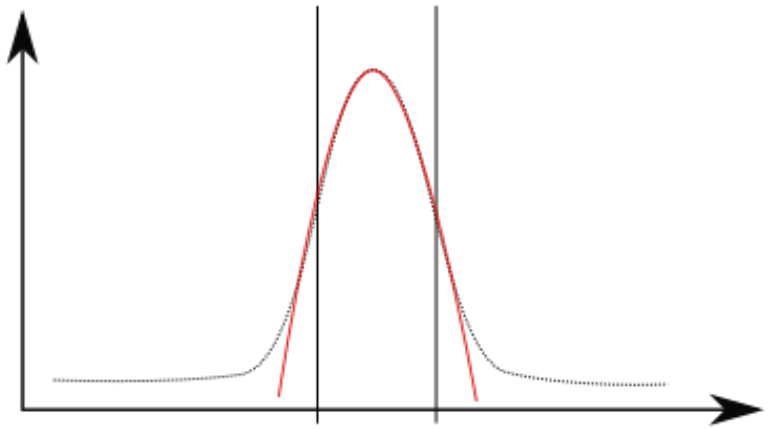
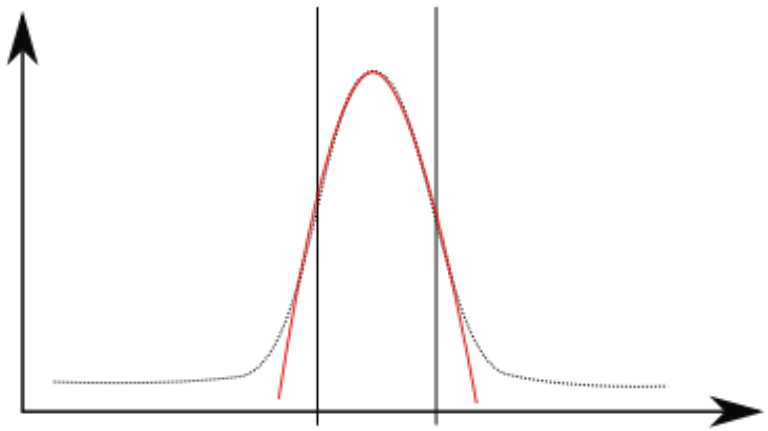
Positron Annihilation



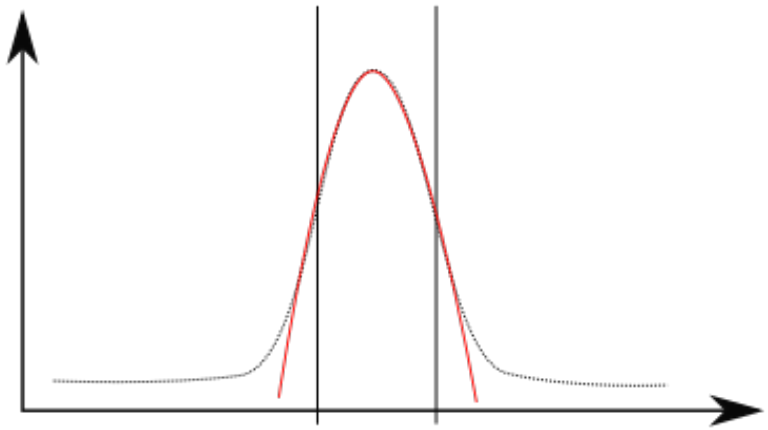
- 8000 events/s
- 1000 points/event
- 4 KB/event
- 32 MB/s
- 20 TB/week

Positron Annihilation



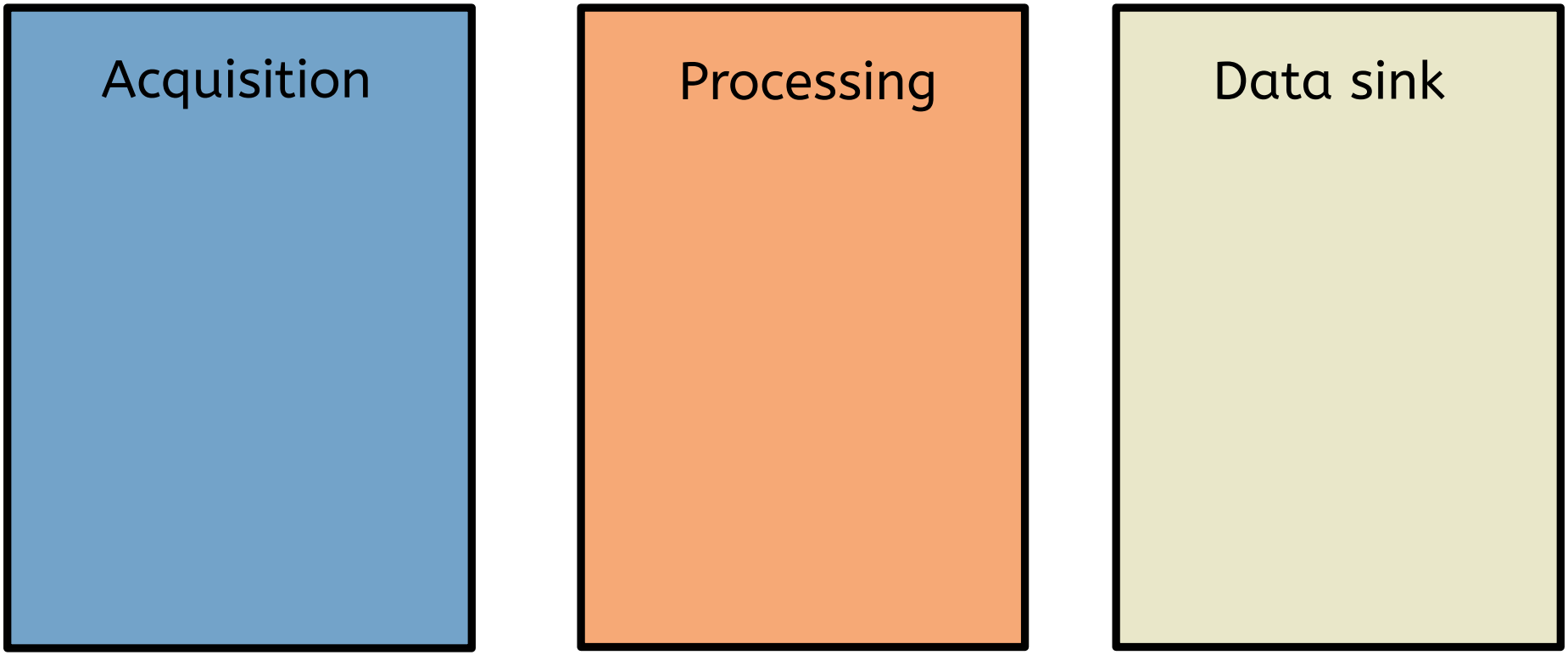
- 8000 events/s
- 1000 points/event
- 4 KB/event
- 32 MB/s
- 20 TB/week
- 3 * 4 Byte fit parameter

Positron Annihilation



- 8000 events/s
- 1000 points/event
- 4 KB/event
- 32 MB/s
- 20 TB/week
- 3 * 4 Byte fit parameter
- reduction to 60 GB/week

Overview



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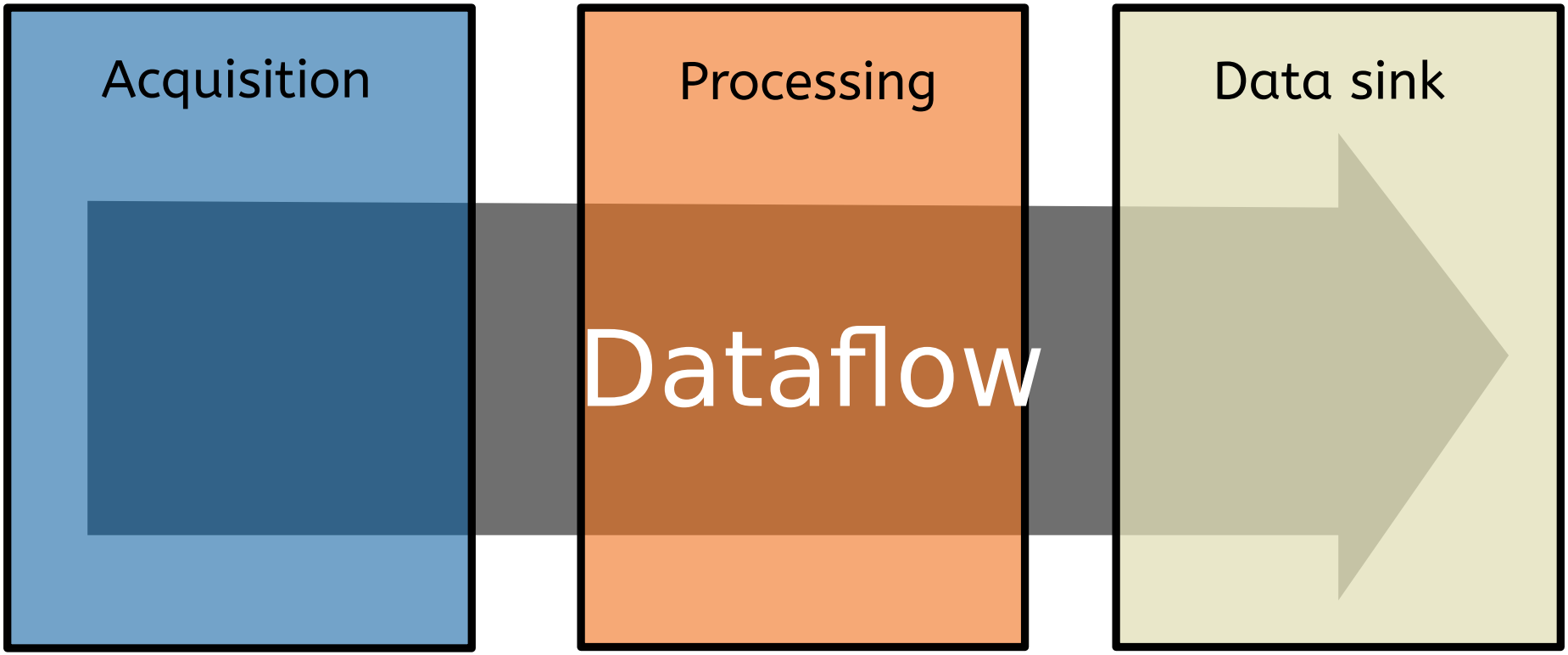

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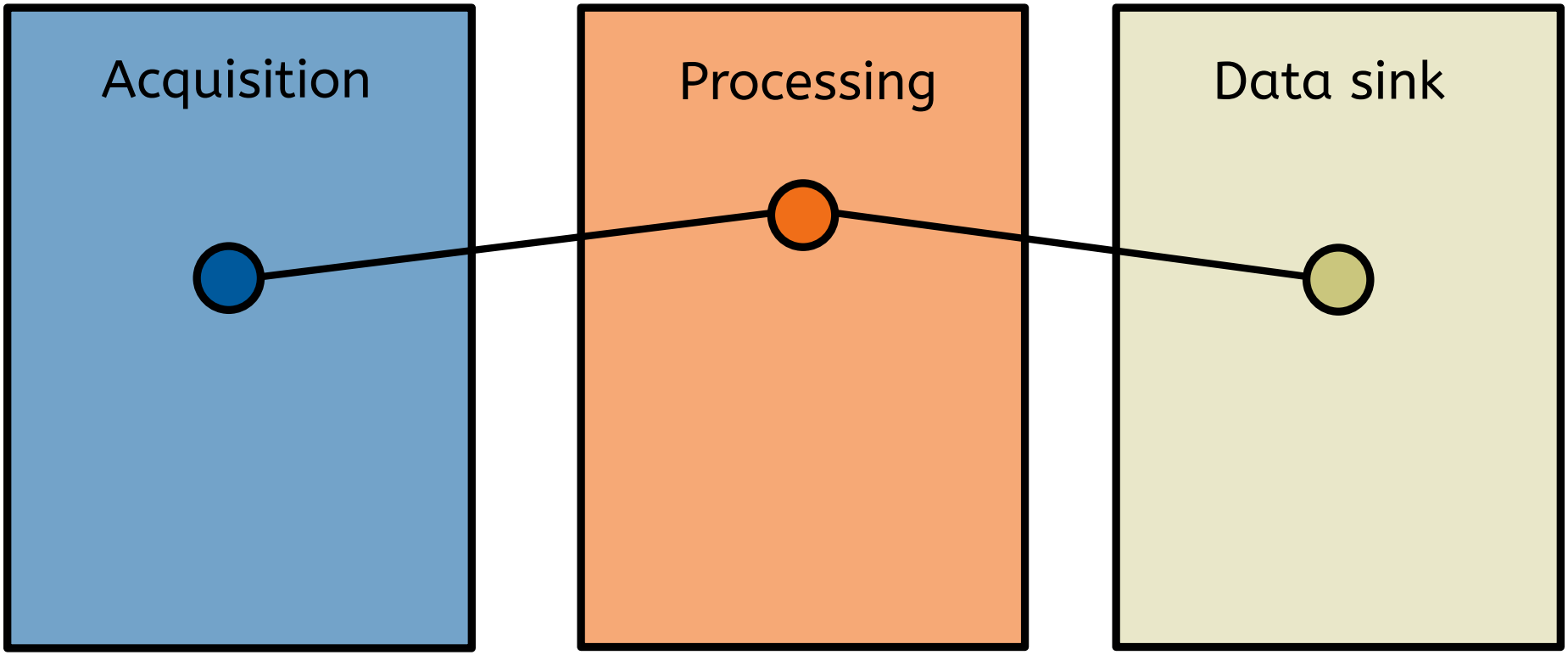

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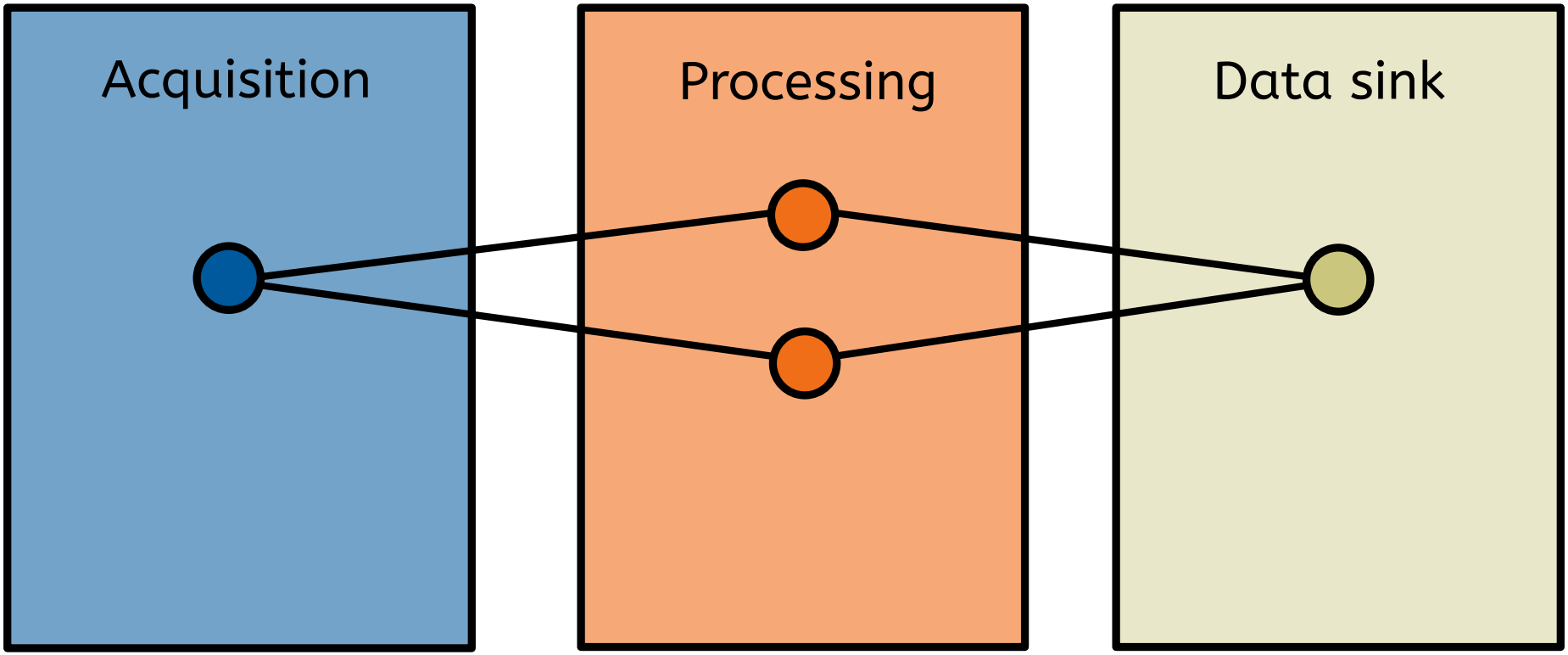

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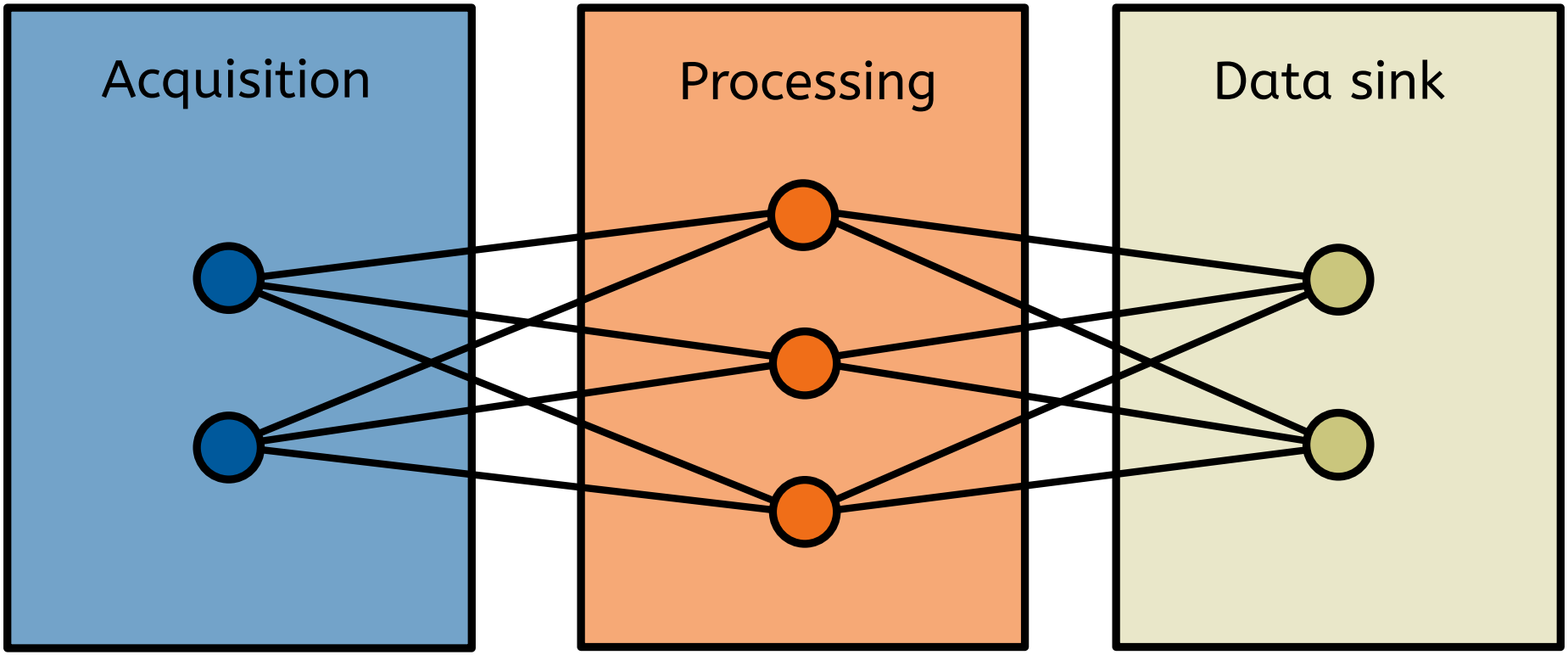
Overview



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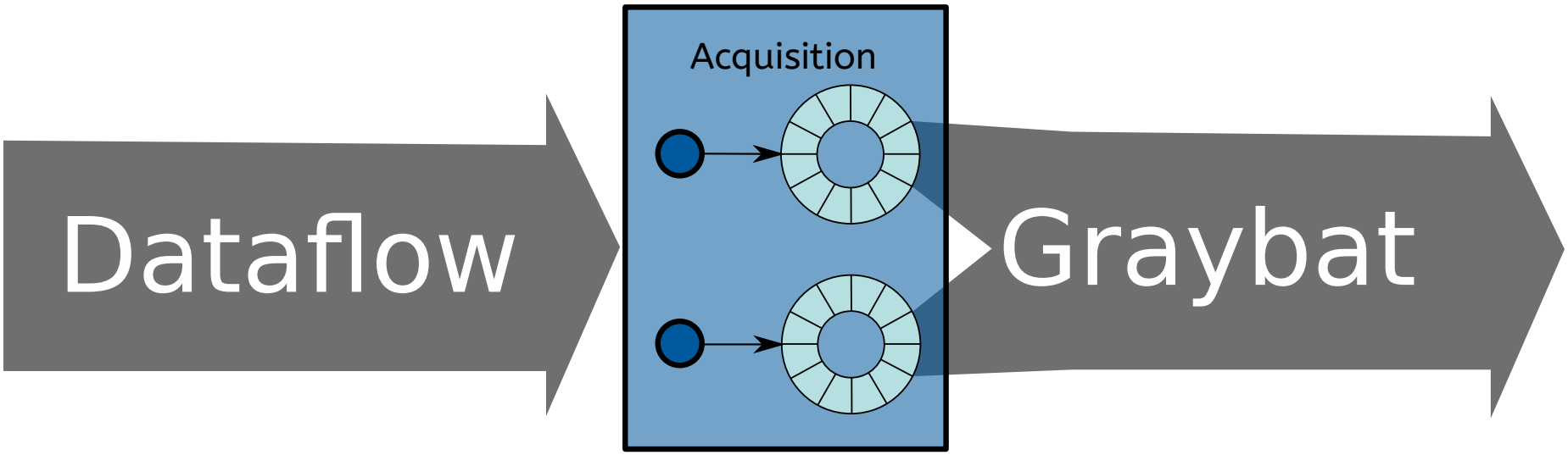
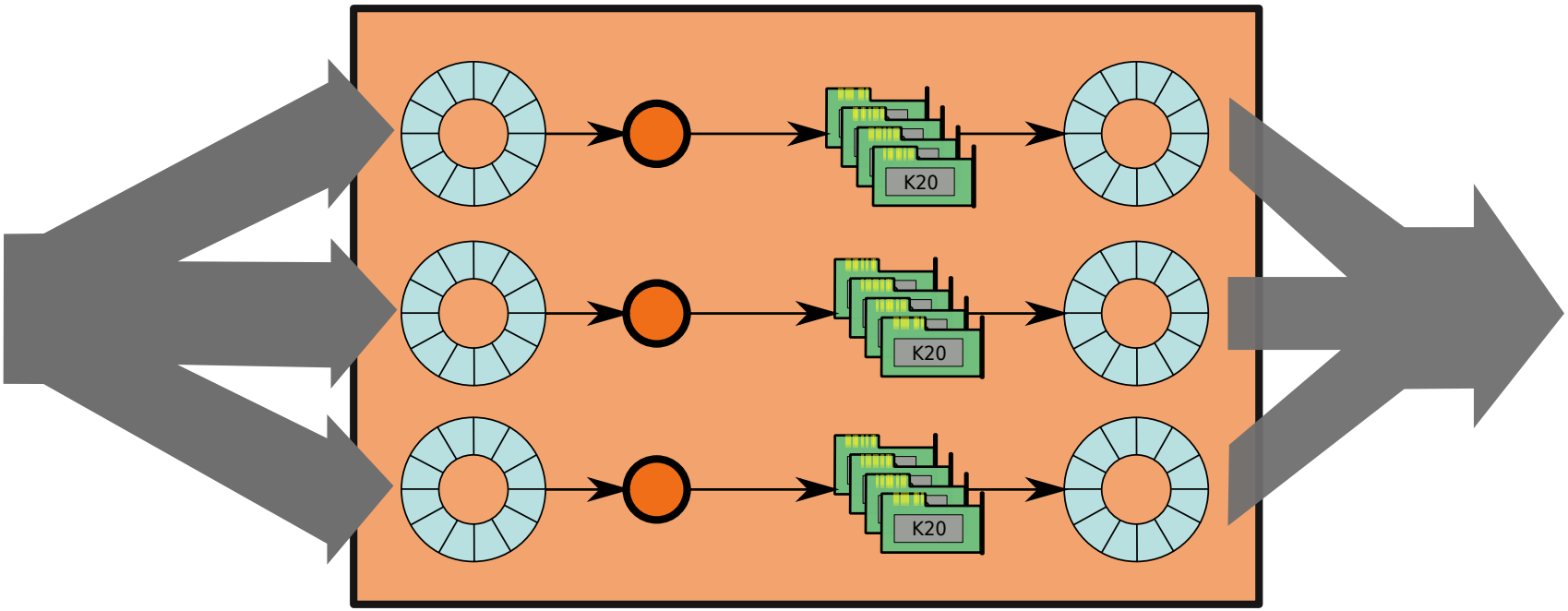
Data acquisition



Data acquisition

- A/D converter
  - Agilent U1066A / DC440
  - up to 420MS/s and 100MB/s
- File
  - process recorded data
  - testing
  - system recovery
- Generator
  - benchmark tool

Processing



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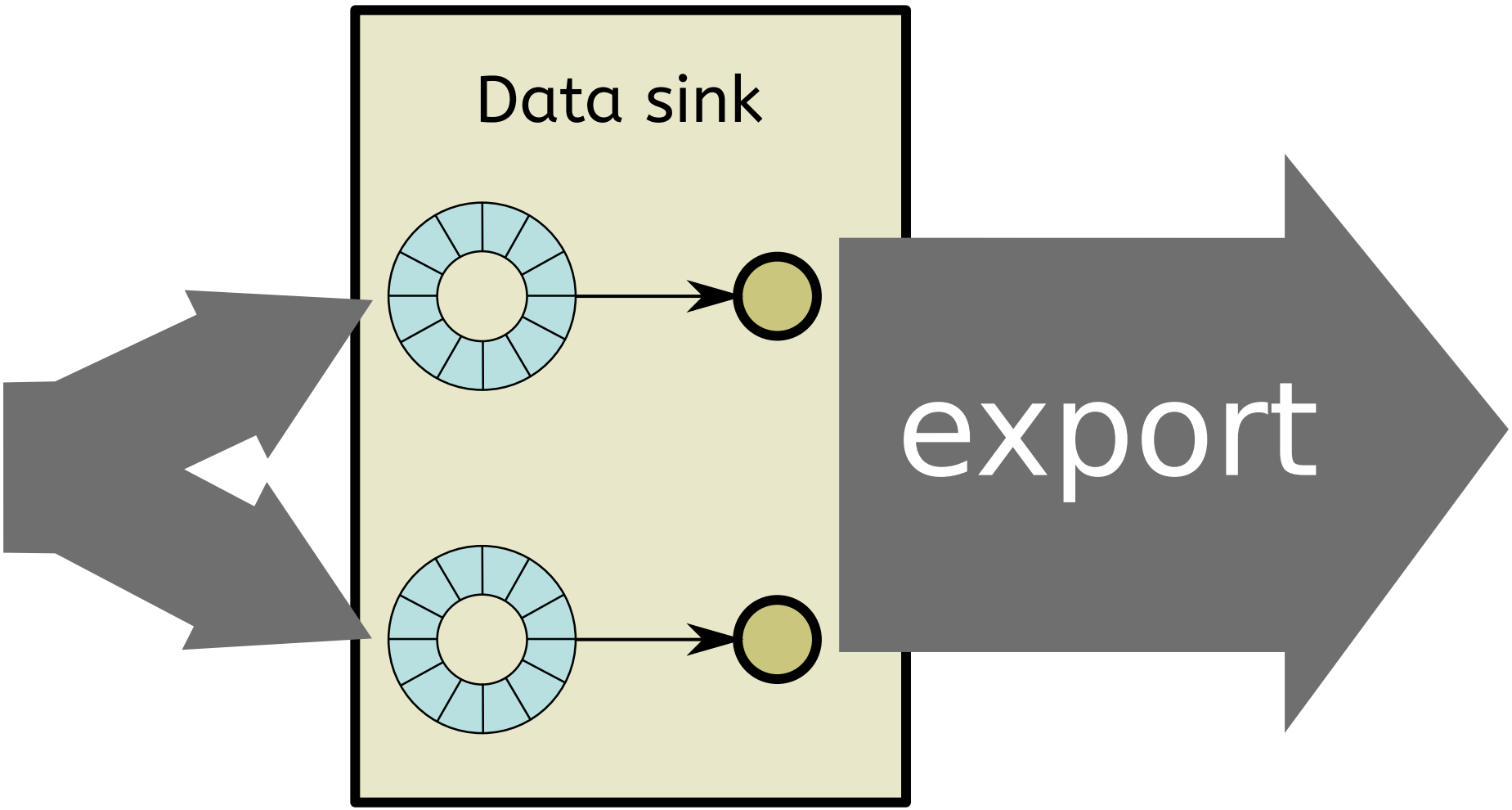
Processing

- Levenberg Marquardt
- Generic modelfunction
  - arbitrary model function can be implemented
  - up to 6 fit parameter
  - known at compiletime
- Parallised using CUDA
- Data reduction rate 300 and above

Data sink



Data sink

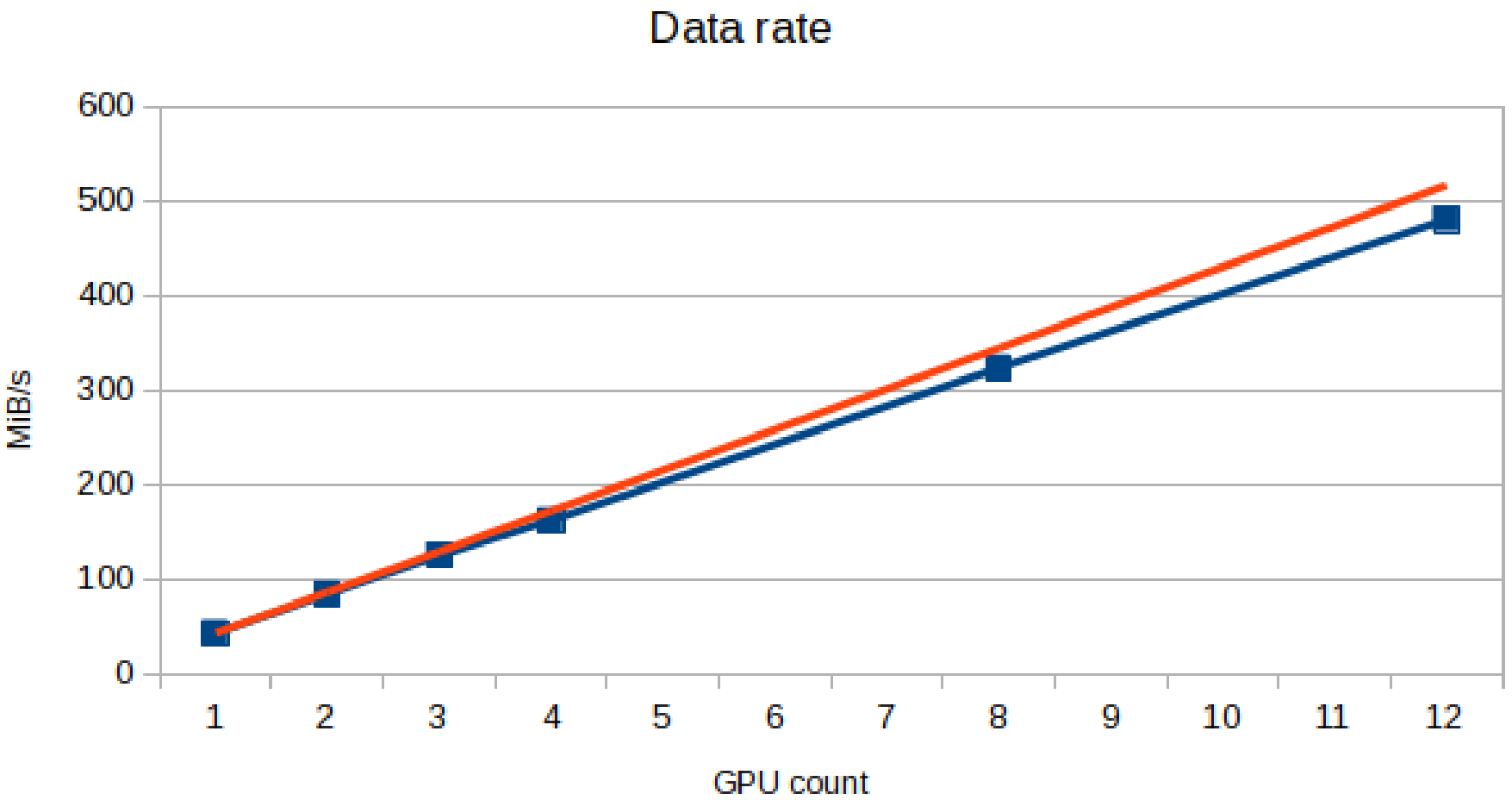
- csv data
  - human readable
  - overhead for ASCII encoded file format

Data sink

- csv data
  - human readable
  - overhead for ASCII encoded file format
- Root files
  - binary file format
  - small overhead
  - compatible to Cern Root framework and tools

Live Demo

Benchmark



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Advantages

- Graybat
  - independent of interconnect
  - dataflow reconfigureable
  - number of participants choosen at runtime
- easy to add new nodes

Future goals

- Generic tool
- Hotpluging
- Resilience
- Optimization of fitting algorithm
- Scale with experiment

Github

Code avaible under GPLv3

https://github.com/ComputationalRadiationPhysics/cracen

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