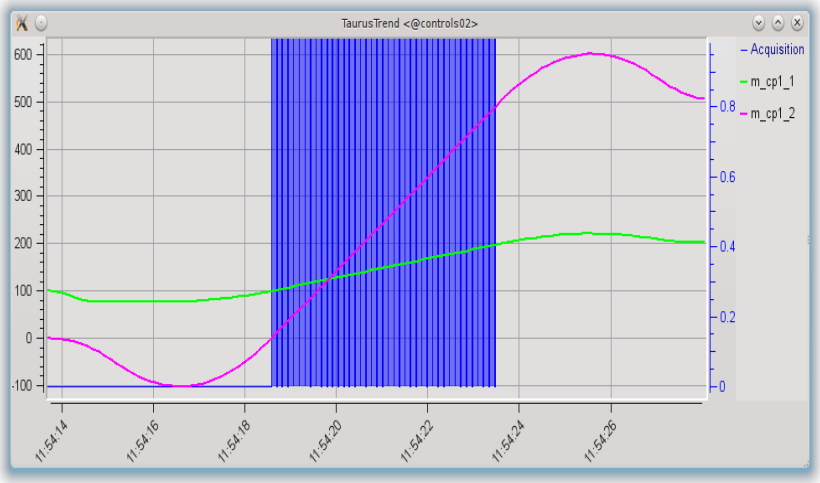
Iterative Development of the Generic Continuous Scans in Sardana



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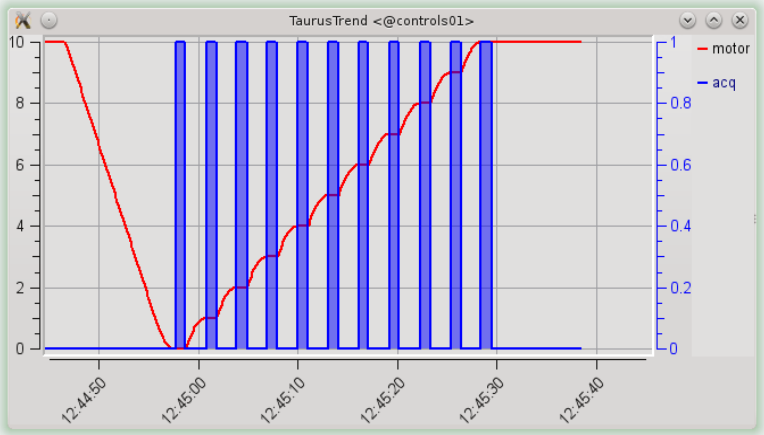
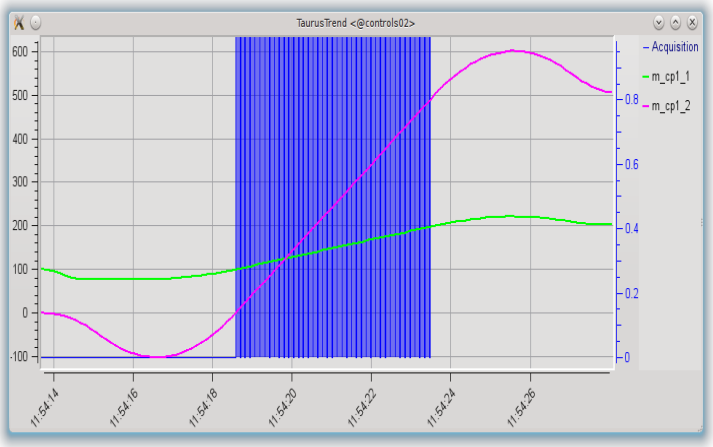
Continuous scans



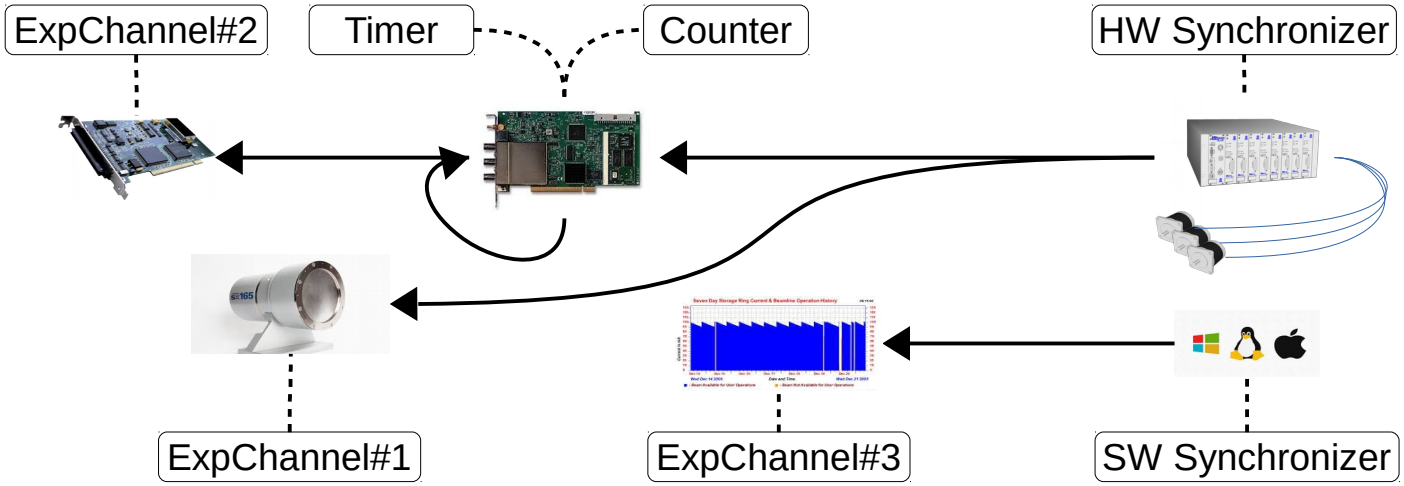
Motion & acquisition during the step scan.



Motion & acquisition during the continuous scan

- Give many benefits, but also many challenges...
- Numerous ad-hoc implementations, but hard to reuse...
- What do we want to generalize?
  - Access to the hardware.
  - Hardware & software synchronization.
  - The experiment configuration.
  - User experience with the scans: scan inputs and outputs.

Meas. Group Configuration



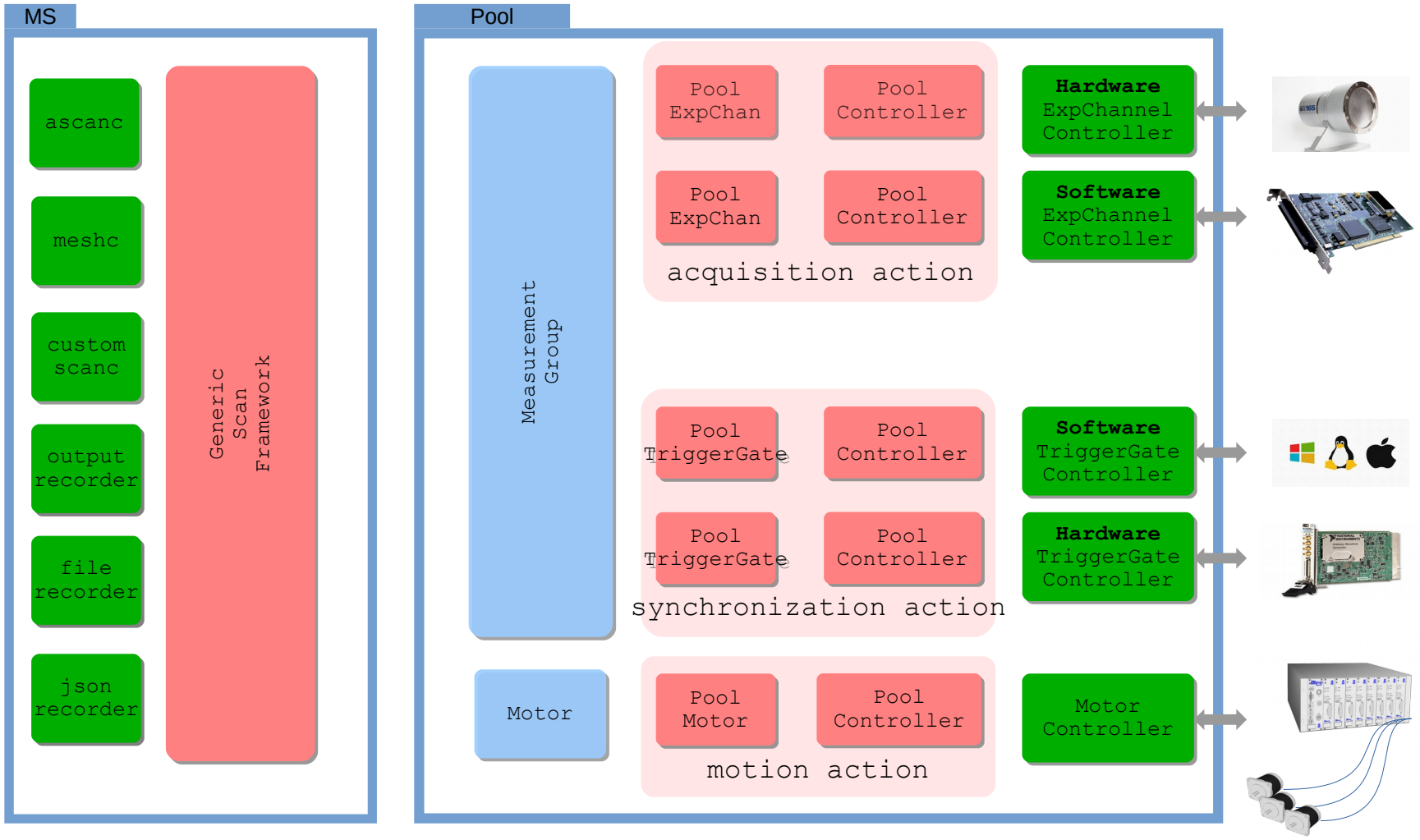
Exemplary setup involved in a continuous scan comprising mixture of hardware and software synchronization

Channel	Control	Synchronizer
Timer	Trigger	HW Synchronizer
ExpChannel#1	Trigger	HW Synchronizer
Counter	Gate	**Timer**
ExpChannel#2	Gate	**Timer**
ExpChannel#3	Trigger	SW Synchronizer

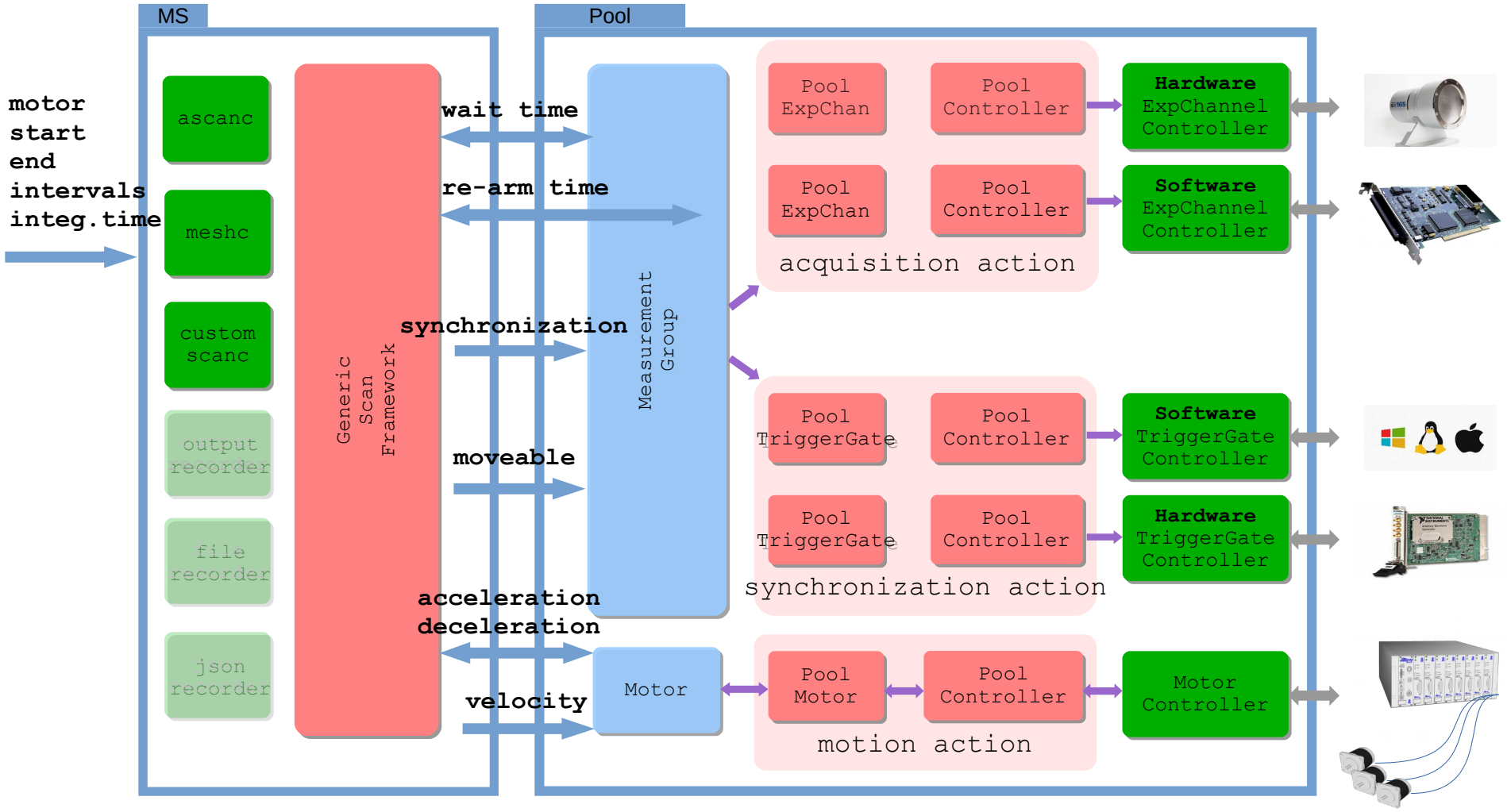
Direction of the synchronization control

Measurement Group configuration expressed by 1-to-1 relation between the Synchronizer and the Experimental Channel

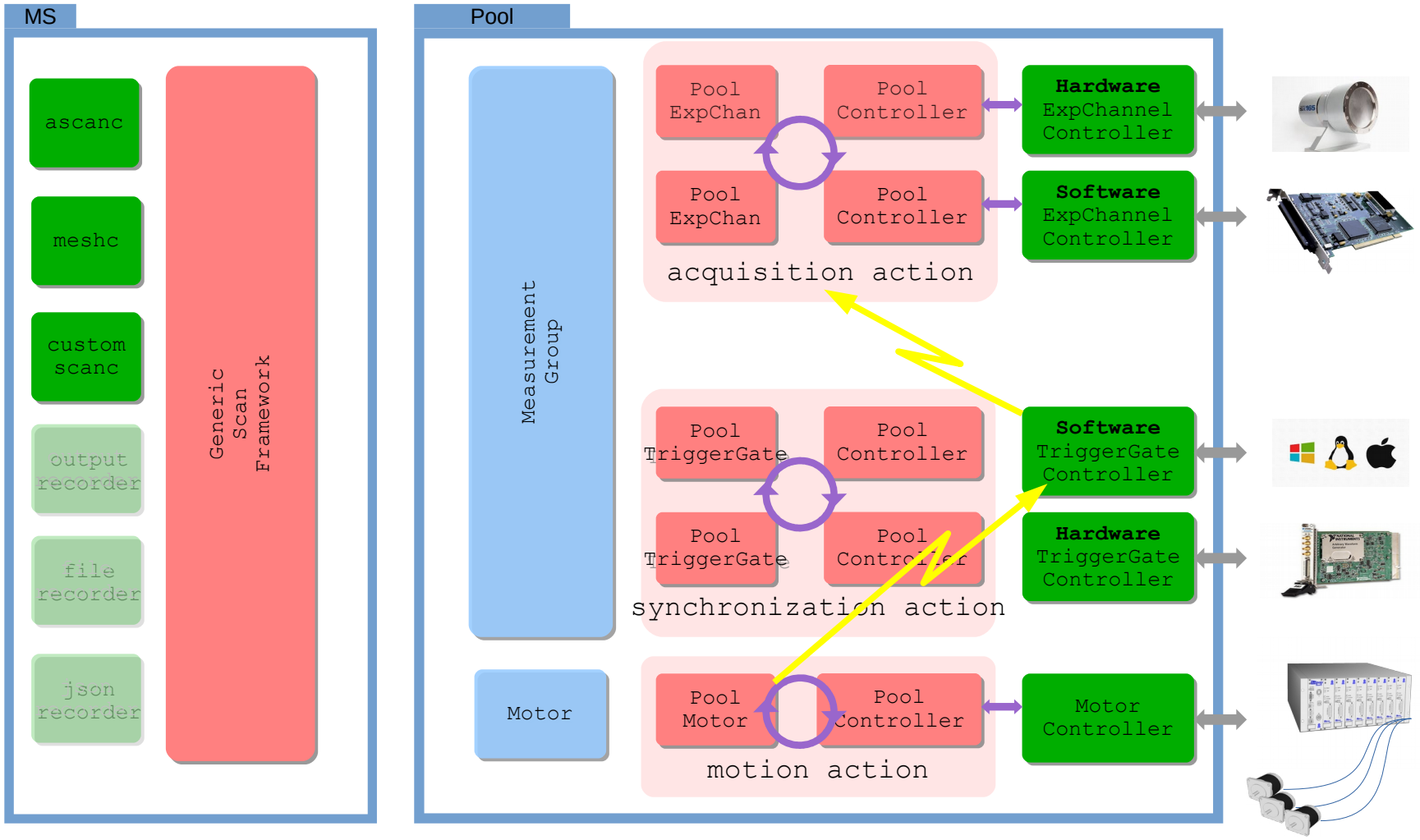
Involved elements



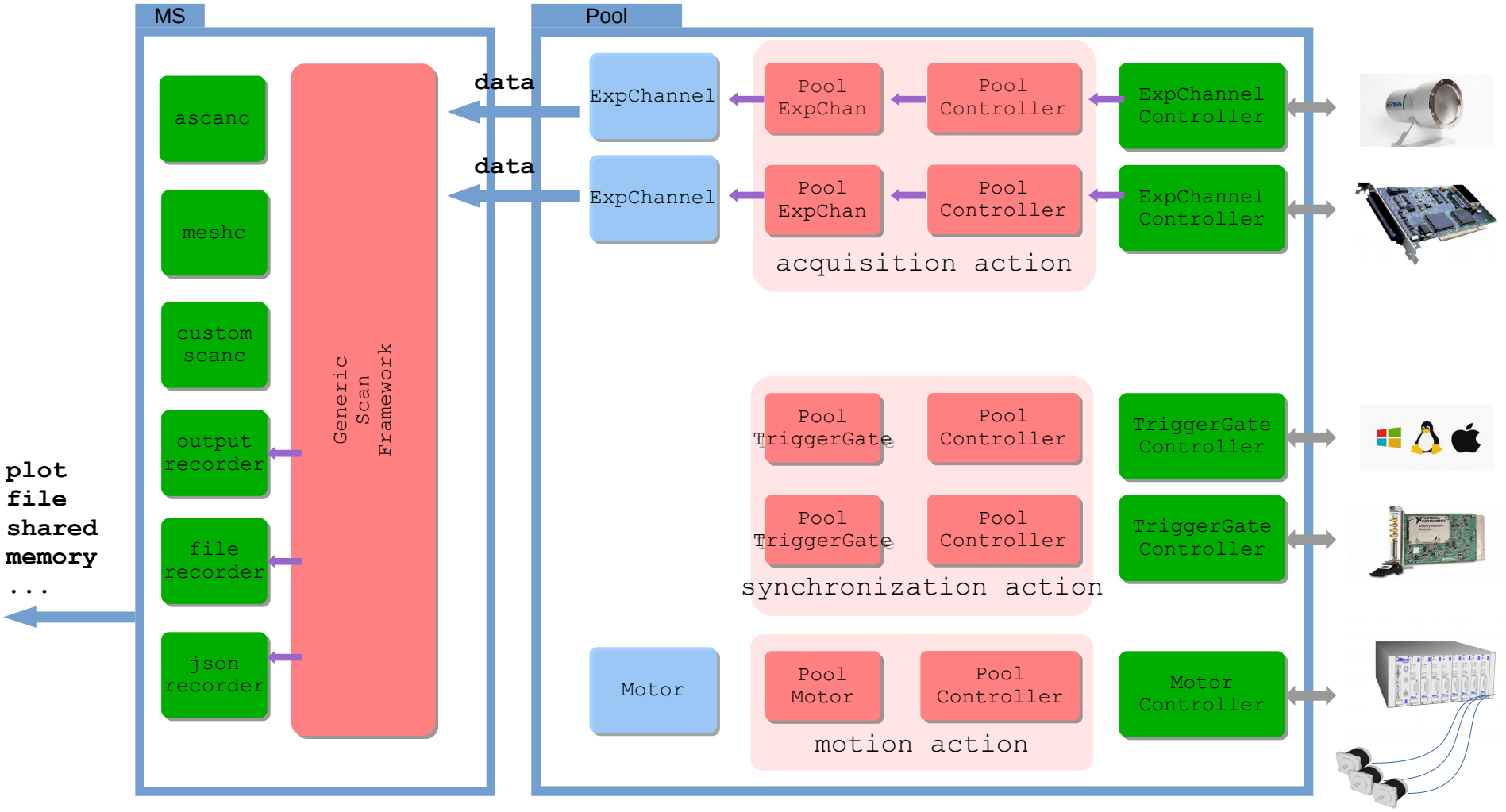
Scan configuration



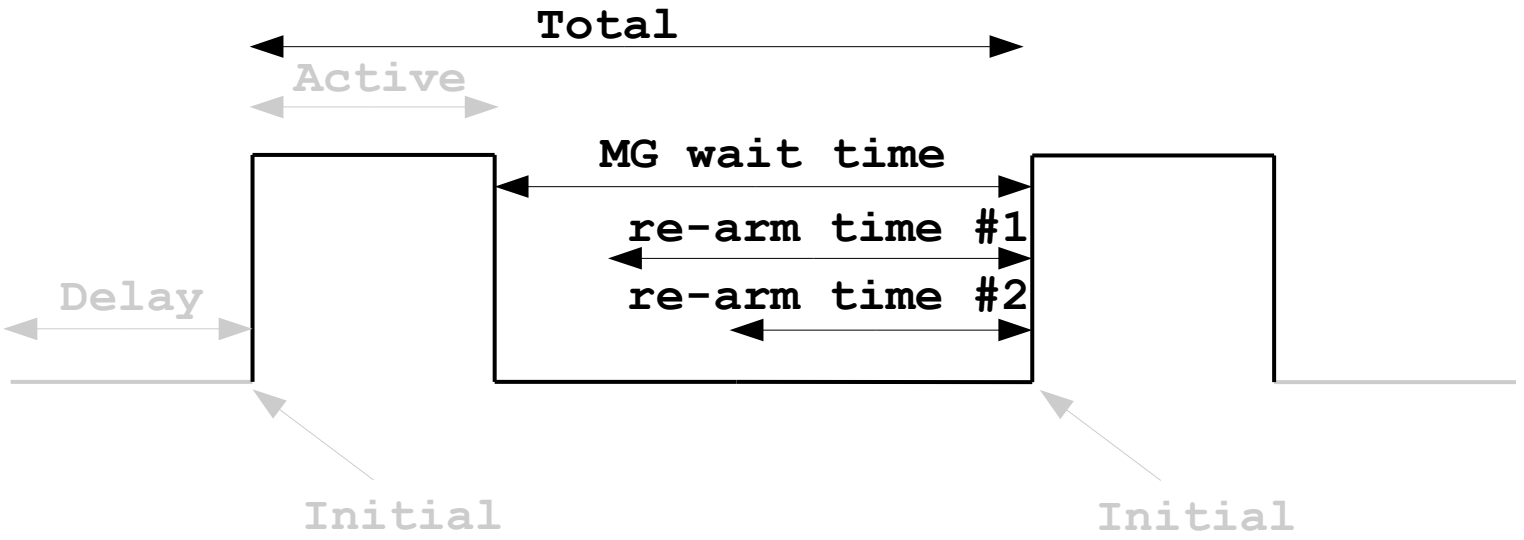
Synchronization and acquisition



Data transfer, merging, storage

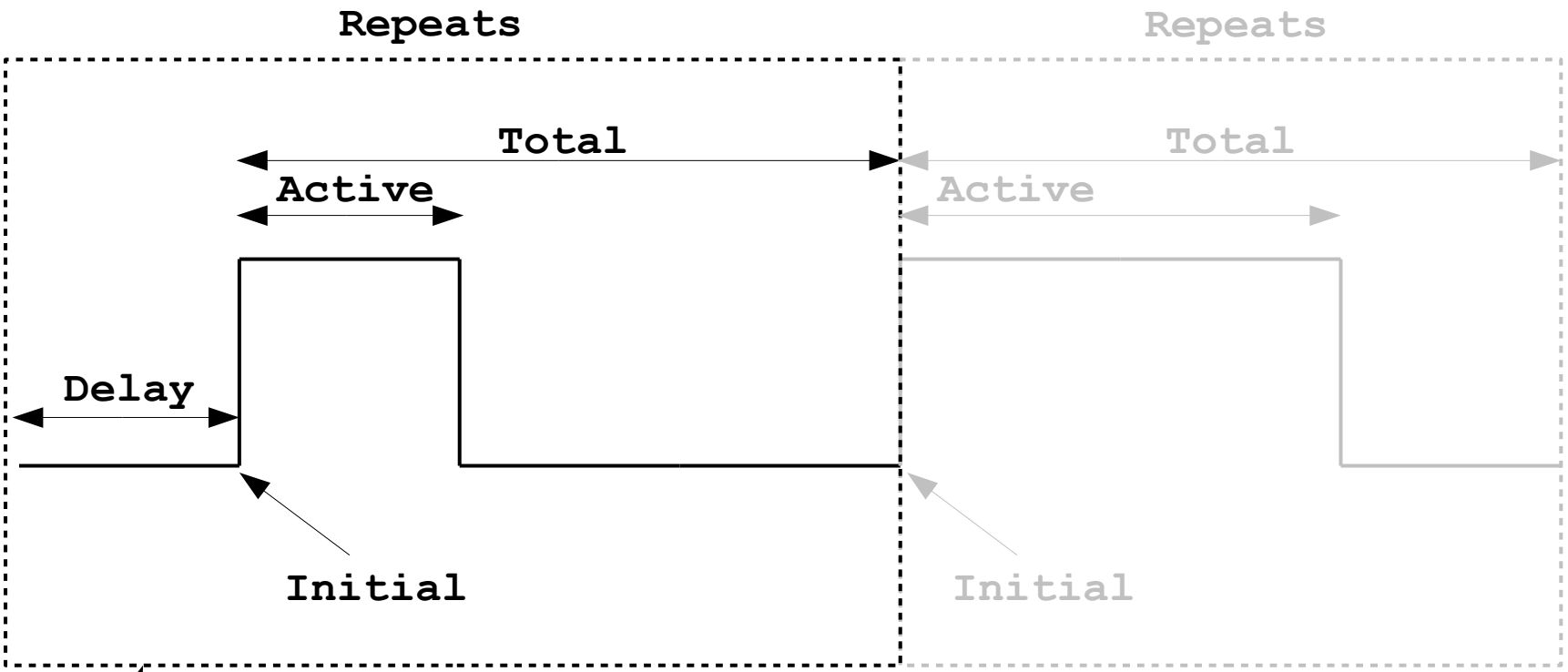


MG wait time & re-arm time



- MG wait time – configurable by users, useful when software synchronization is in use – helps to avoid skipped acquisitions.
- re-arm time – specification parameter defined by the hardware controller
- Passive = max(re-arm time #1, re-arm time #2, MG wait time)
- Affects directly total interval (time) and indirectly motors' velocities.

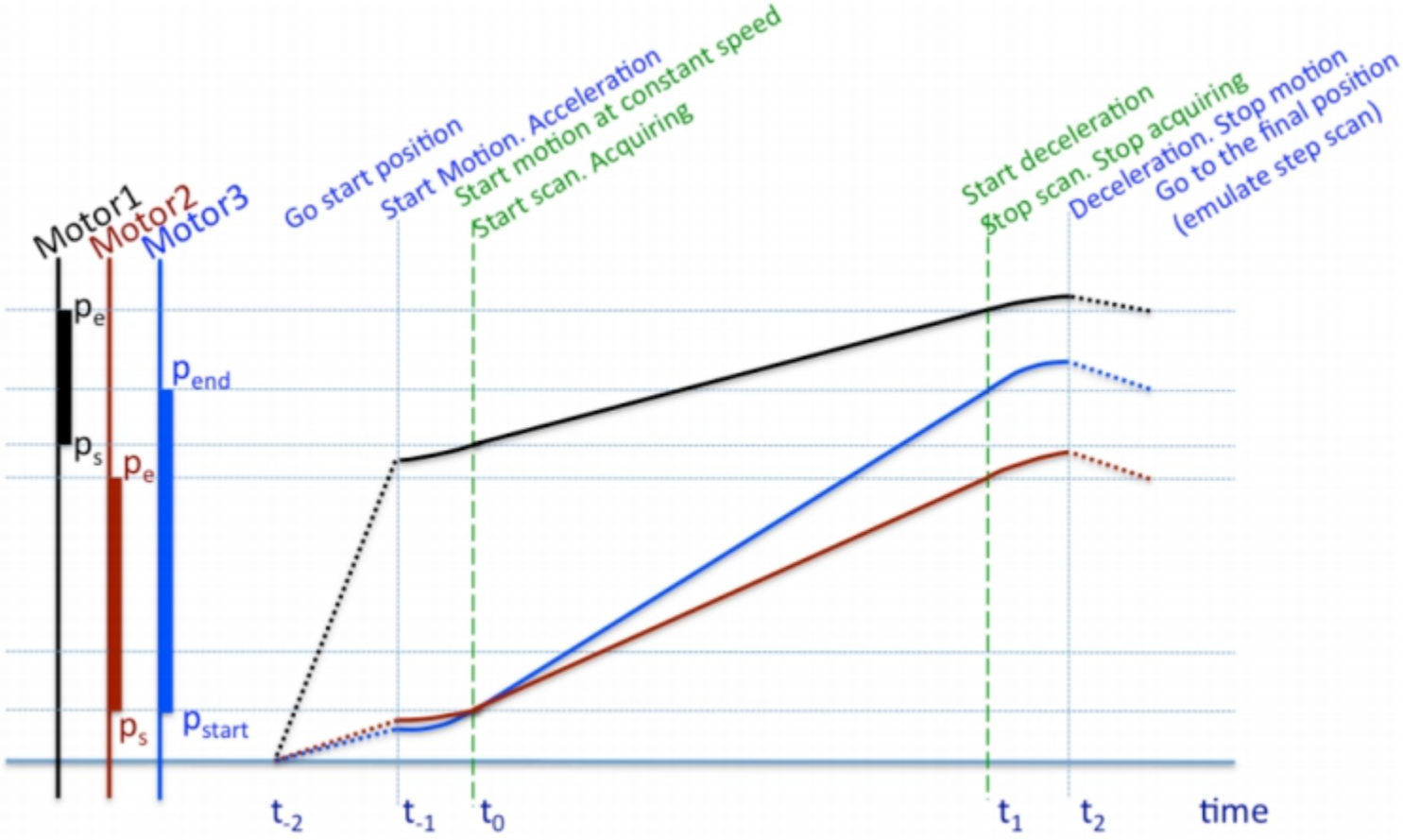
Synchronization description




```
[{Delay:    {Time: 0.3, Position: 400},
  Initial:  {Time: None, Position: 0},
  Active:   {Time: 0.1, Position: 10},
  Total:    {Time: 0.15, Position: 15},
  Repeats:  1000},
 ...]
```

Motion

- Physical motors maintain constant velocities while scanning – no trajectory control.



Data merging

- Every acquired value is stamped with the absolute time and the acquisition **index.**
- GSF **receives data in chunks** and fills the records in base of the indexes.
- Software synchronized channels do not guarantee to provide data for each record.
- **Zero order hold** (constant interpolation) is applied in case of skipped acquisitions in order to fill the gaps.
- Interpolated data must be easily distinguishable from the raw data.

Summary

- Design of the generic continuous scan model for Sardana is complete (for the equidistant scans).
- Implementation is still ongoing – its increments are gradually deployed in three Alba's beamlines.
- Non-equidistant scans will be possible by exchanging the scan configuration layer and use of multiple groups in the synchronization definition.
- Trajectory control is planned to be supported in the future.

Questions