SODA, the Time Distribution System for PANDA

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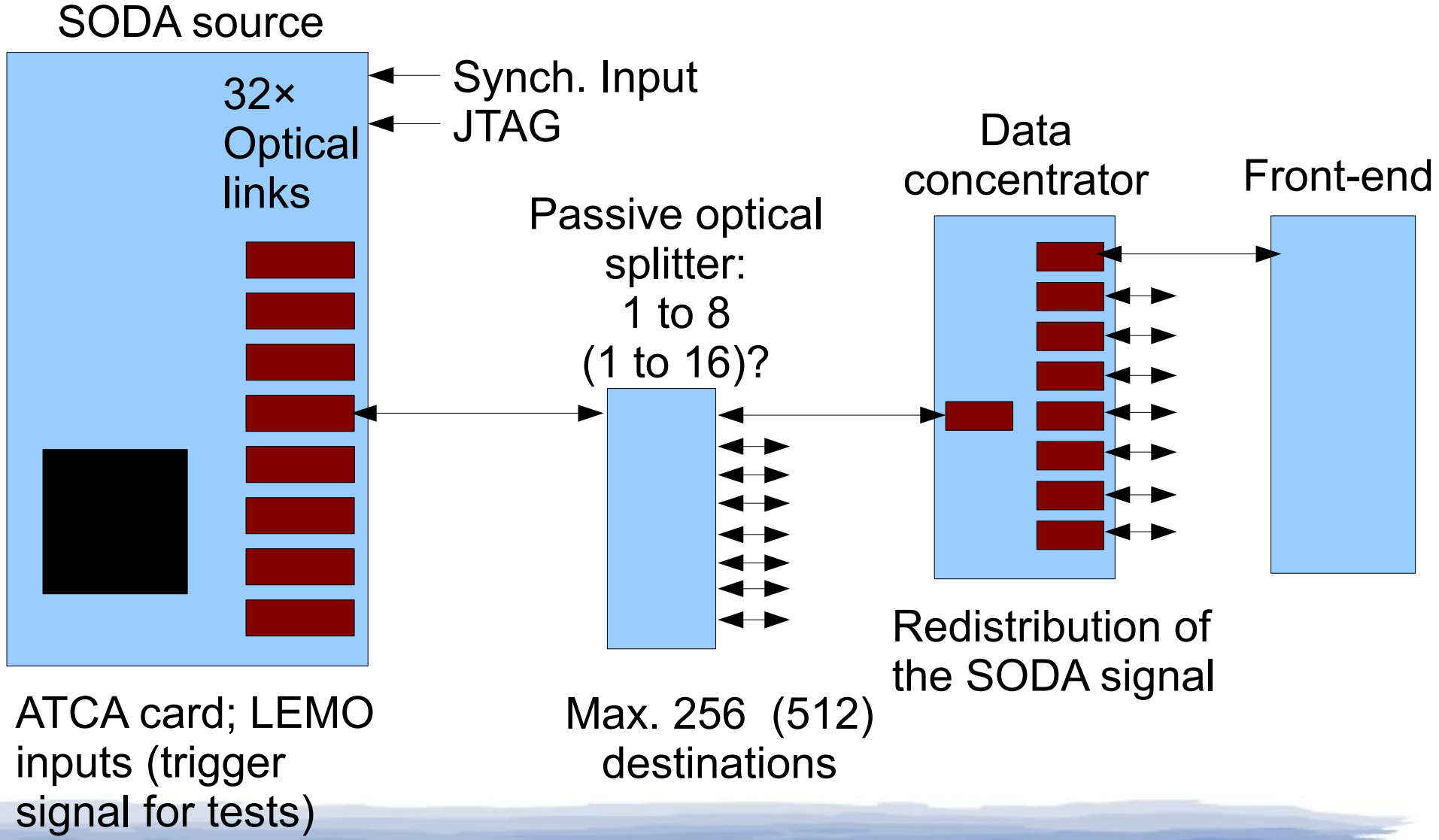
for the PANDA collaboration

SODA Architecture

Original idea: Igor Konorov [*I. Konorov et al., NSS/MIC Conf. Rec., 2009 IEEE, DOI 10.1109/NSSMIC.2009.5402172*]



SODA Functionality

SODA Source

- Distribution of the **clock** and **synchronisation signals** (burst start/end)
- Synchronisation with triggered DAQs for test experiments (trigger input to the SODA source, however, not trigger output)
- Distribution of a slow-control information; JTAG interface to data concentrators
- Receive slow-control data from the data-concentrators

SODA Functionality

Passive optical splitter

Functionality:

- Redistribution of the SODA signal to 8 (16, untested?) destinations.

Advantages:

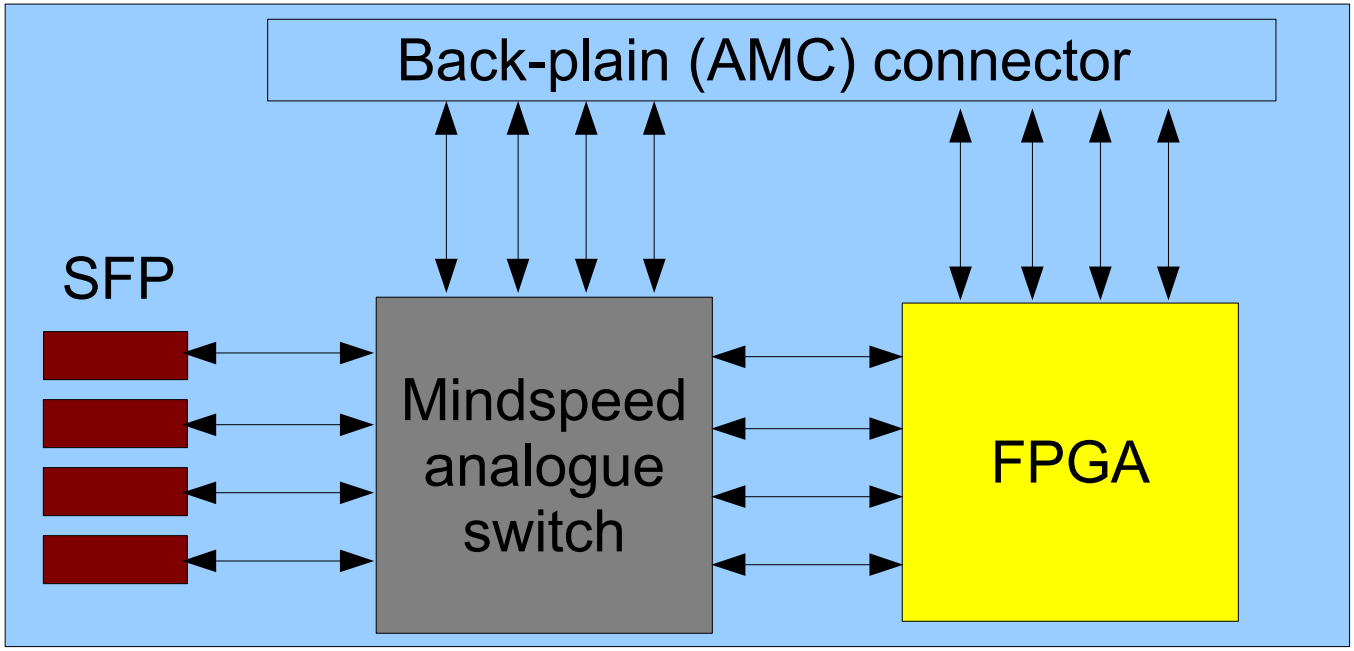
- Low jitter
- Low cost

Disadvantages:

- Complicated communication protocol (time-division multiplexing)
- Large latency of the slow-control feedback (due to the time-division multiplexing)

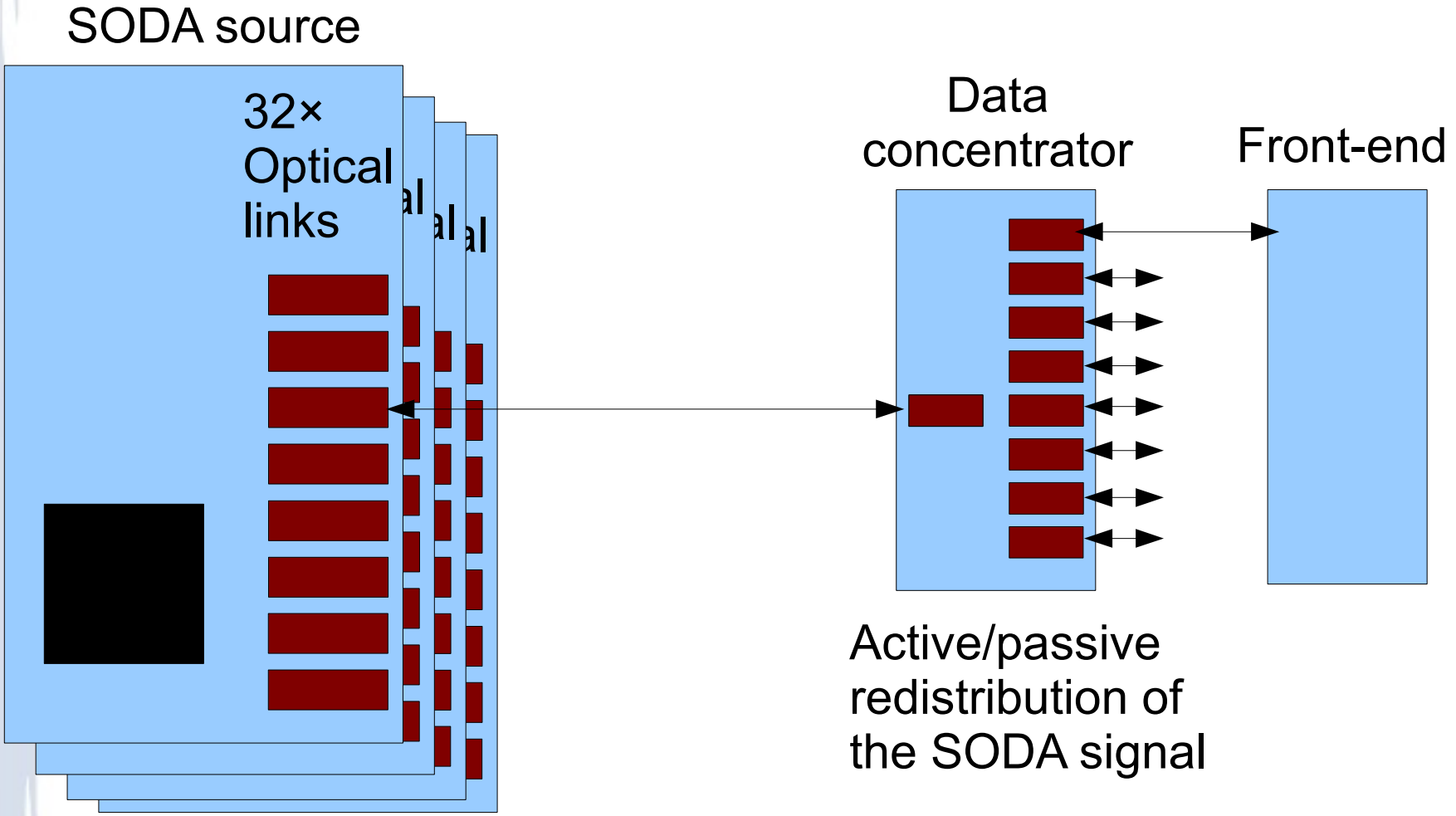
Concept of a Data-Concentrator

Original idea: Igor Konorov [*A. Mann et al., NSS/MIC Conf. Rec., 2010 IEEE, DOI 10.1109/RTC.2010.5750387*]



- Analogue switch allows to broadcast SODA signal from one input SFP to all output SFPs, connected to a front-end. SODA signal can be broadcasted via back-plain to SFPs, located in the other modules.
- Advantage: Scalable system with low extra jitter
- Disadvantage: impossible to add extra slow-control information at the level of data-concentrator: All slow-control information has to be broadcasted by the SODA source (not possible to realize local watch-dogs for the monitoring/reconfiguring FPGA-based front-end)

Possible SODA Architecture



ATCA cards:

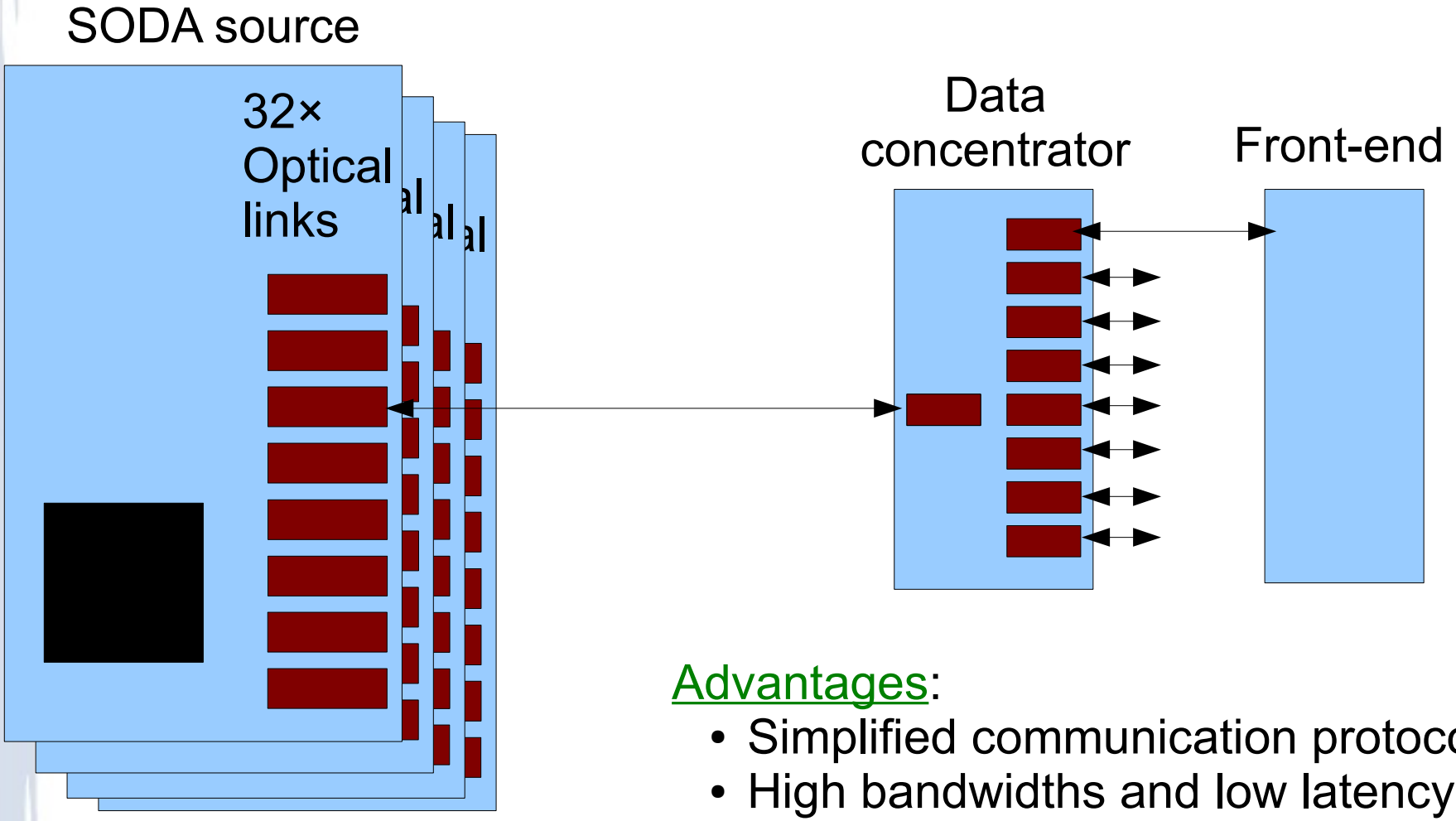
- Master card (source)
- Redistribution cards

Redistribution done using back-plain (and analogue switches)

SODA receiver interface:

- Piggyback board
- Integrated into FEE

Possible SODA Architecture



ATCA cards:

- Master card (source)
- Redistribution cards

Redistribution done using back-plain (and analogue switches)

Advantages:

- Simplified communication protocol
- High bandwidths and low latency available for a slow-control
- Larger resources available to implement slow control of the complete FEE

Disadvantages:

- Possibly higher jitter
- More expansive

SODA, Open Questions

To optimize SODA architecture, we have to define:

- SODA protocol
  - Unidirectional (source → FEE)
  - Bidirectional (source ↔ FEE)
    - Passive signal splitting (optical splitters)
    - Active signal splitting (using Mindspeed switches)
  - Measurement of the propagation time?
- Flow of a slow-control information
  - Is the SODA the only network for a slow-control of the front-end
  - Is it crucial to have a possibility of a local slow-control loops (at the level of FEE ↔ data-concentrator)

Required input:

- Maximum tolerated jitter of the SODA signal for each subsystem
- Rough number of data-concentrators (directly connected to the SODA source) for each subsystem