

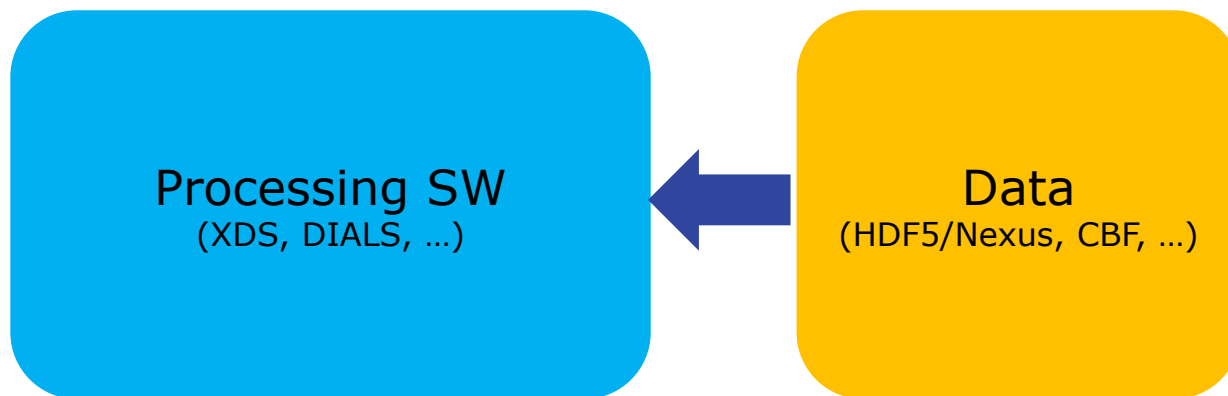
# ***A generic frame-reading API for a runtime-loadable library***

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High Data Rate MX, 2. September 2016***

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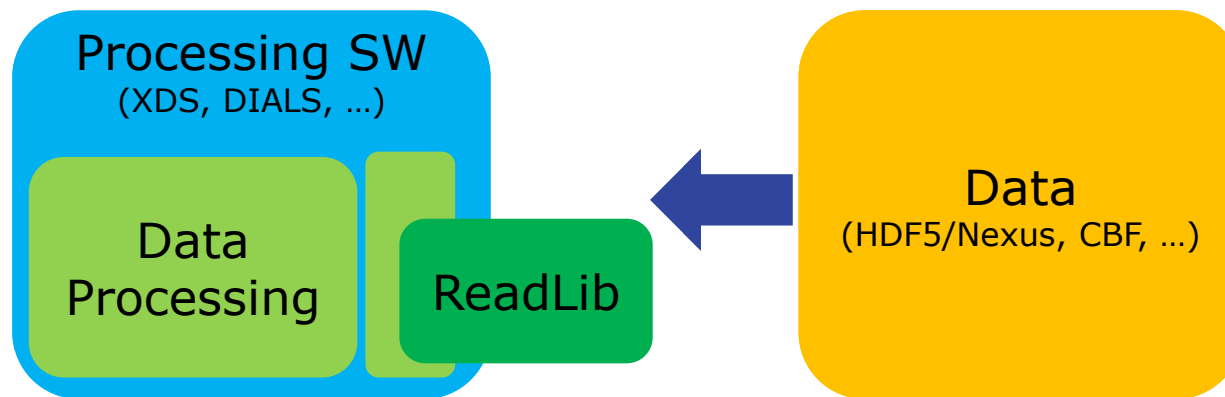
# Current Situation

- *Efficient processing of data sets requires fast parallel (threaded) reading of a dataset.*
- *Developers of processing software have little resources to keep up with the changes, and little incentive to implement yet another format. Especially the more complex it is.*
- *Users are 😞 about workarounds.*
- *Any new format or change will require adaptations in each software packages consuming this kind of data.*



# Another approach

- A separation between code for reading data and processing data would make everyone's job easier.
- The code for reading data can be physically separated from the code processing data by a plugin mechanism.
- This allows every user to feed the processing software with his data in an optimal way.
- Ideally the community agree on a common set of plugins to ensure reliable usage.



# *Frame reading in XDS*

- The steps performed by XDS during processing can be cut down to four operations.*
  - Open a resource providing the frames of a dataset*
  - Gather information about the contained data*
  - Get a frame for analysis*
  - Close the resource*
- This generalization is not limited to XDS but could also be applied to other programs.*
- Plugin mechanism integrated in XDS*
  - XDS loads the library dynamically at runtime using dlopen/dlsym/dlclose.*
  - The user sets LD\_LIBRARY\_PATH to it. XDS opens the library specified with a "DETECTOR=libdectrish5toxds" line in XDS.INP, and uses the API-defined routine names.*

# DECTRIS HDF5 Plug-In

- *Two Goals*
  - *Using the plug-in mechanism to speed up processing of HDF5 data with XDS*
  - *Show HDF5 is not bound to the library provided by the HDF5 group as the format is documented*
- *HDF5 plugin*
  - *Does not use any code of the HDF5 group*
  - *Only reads a limited subset of HDF5 data*
  - *DISCLAIMER:*  
*Proof of principle, far from being production ready code*
  - *<https://github.com/dectris/dectris-xds-plugin>*

# DECTRIS HDF5 Plug-In

images	CBFs		HDF5	HDF5
DETECTOR=	PILATUS		EIGER	libdectrish5toxds
8 JOBS 8 PROCESSORS	<b>152</b> 46 79	= total = INIT.LP = INTEGRATE.LP	<b>190</b> 64 99	<b>160</b> 52 83
12 JOBS 8 PROCESSORS	<b>141</b> 47 69		<b>179</b> 65 88	<b>152</b> 51 75
8 JOBS 12 PROCESSORS	<b>142</b> 46 73		<b>178</b> 64 89	<b>157</b> 52 80
12 JOBS 12 PROCESSORS	<b>140</b> 46 71		<b>177</b> 63 89	<b>151</b> 51 75
16 JOBS 8 PROCESSORS	<b>140</b> 46 69		<b>188</b> 64 96	<b>153</b> 53 76

Datensatz: lysoHG4\_t0p01\_0p1d\_0p1s\_d150\_360deg\_master.h5 (Iz4), PSI, 3 Feb 2015  
Dell PowerEdge 930, elapsed wall-clock times for individual steps, all data on RAM disk

# ***HDF5 Hybrid Plug-In***

- HDF5 is a complex file format – no need to reinvent wheel*
- With the official hdf5 lib you are able to read all hdf5 files*
- The only time critical task is the reading of the data arrays*
  - Use official HDF5 lib for all meta data*
  - Only read the data arrays with "DECTRIS-HDF5" code to speed up thread parallel reading*
  - Fallback to official HDF5 code if "encoding" unknown*
- Next steps*
  - Release a plugin based on the official HDF5 library which will allow the native processing of all existing hdf5 files*
  - Make the DECTRIS-HDF5 plugin compatible with the HDF5 files written with EigerFW 1.6*
  - Develop the "hybrid"-plugin*

# Summary

- *One can implement arbitrary data structures (if one has to) AND fast procedures to read them.*
- *This takes away the implementation and maintenance burden from software developers - they can concentrate on improving the precision and accuracy of the data*
- *Logical separation between data and program; enhances modularity; adapts easily to e.g. HDF5-SWMMR, no external program like H5ToXds*
- *Hybrid approach to reduce complexity*
  - *HDF5 lib to read most of the data*
  - *Specialized routines to access the data array only*
- *Open: API source code is at [https://github.com/dectris/dummy\\_xds\\_hook](https://github.com/dectris/dummy_xds_hook)*
- *Open: HDF5 plugin proof of principle is at <https://github.com/dectris/dectris-xds-plugin>*



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***Thank you for  
your attention!***

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