Odin

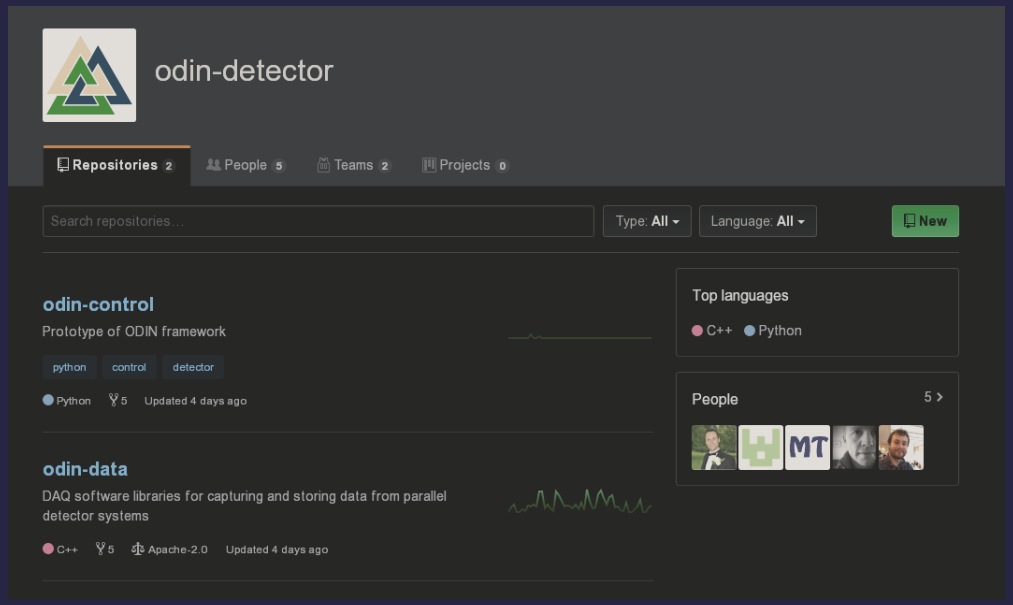
"Control and data acquisition framework for parallel detector systems"

Diamond Light Source

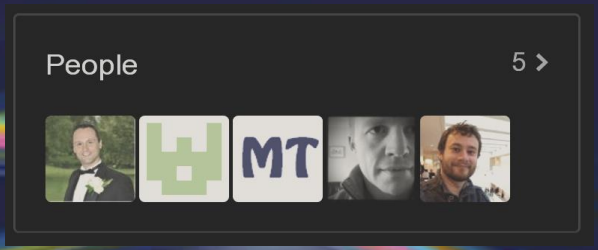
Gary Yendell

diamond

GitHub



Collaborators



Logo

Cryptic Name

odin-detector

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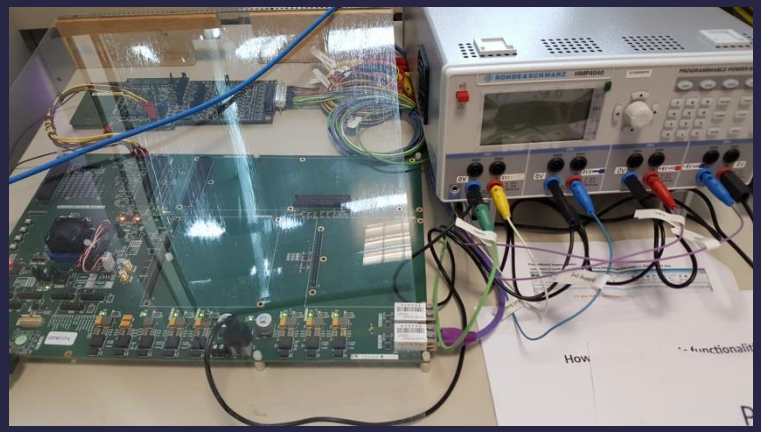
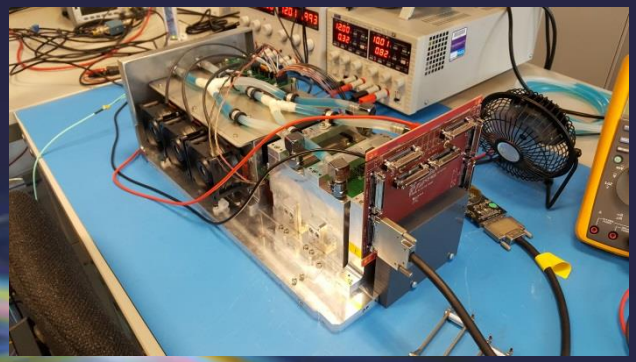
Odin Detectors

Excalibur



Percival



Tristan

Eiger…

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Control

Odin

Control and data acquisition framework for parallel detector systems

OdinControl

Python HTTP control server

OdinData

C++ data acquisition and file writing stack

ZMQ JSON

FrameReceiver

Data stream gatherer

FrameProcessor

Data processor and file writer

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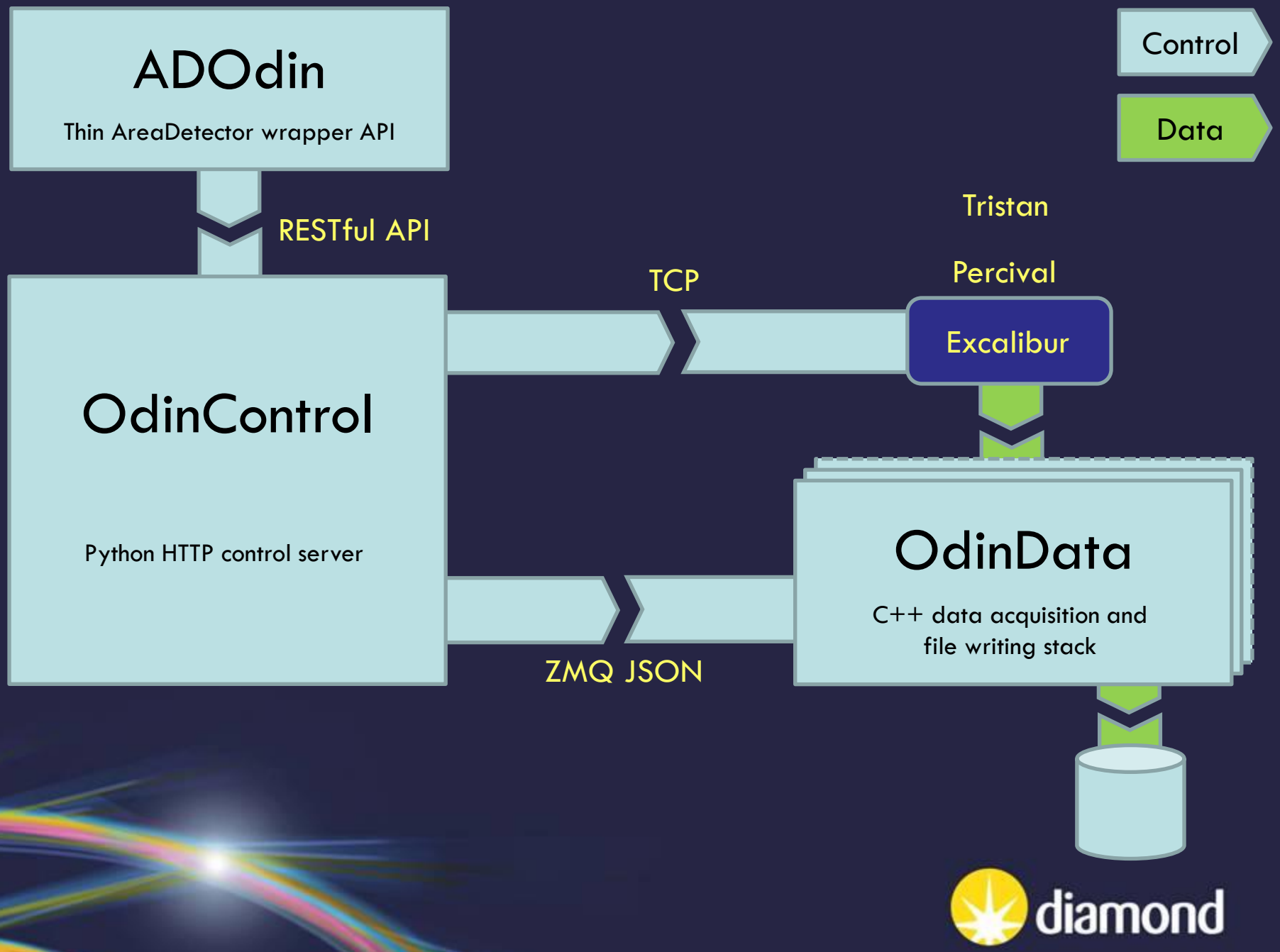
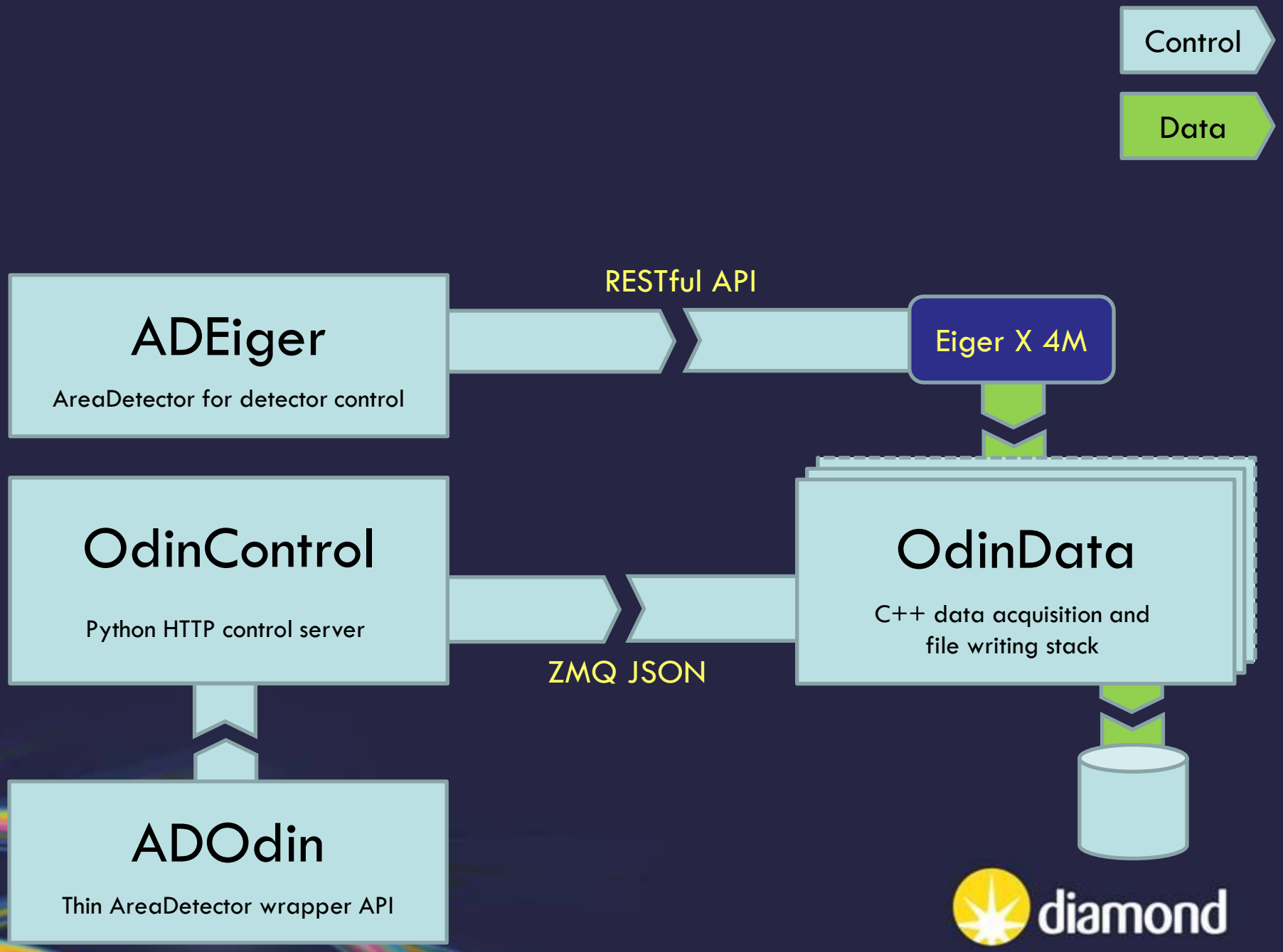

ADOdin
Thin AreaDetector wrapper API
Control
Data
RESTful API
Tristan
Percival
TCP
Excalibur
OdinControl
Python HTTP control server
OdinData
C++ data acquisition and
file writing stack
ZMQ JSON


Control
Data
ADEiger
AreaDetector for detector control
RESTful API
Eiger X 4M
OdinControl
Python HTTP control server
OdinData
C++ data acquisition and
file writing stack
ZMQ JSON
ADOdin
Thin AreaDetector wrapper API
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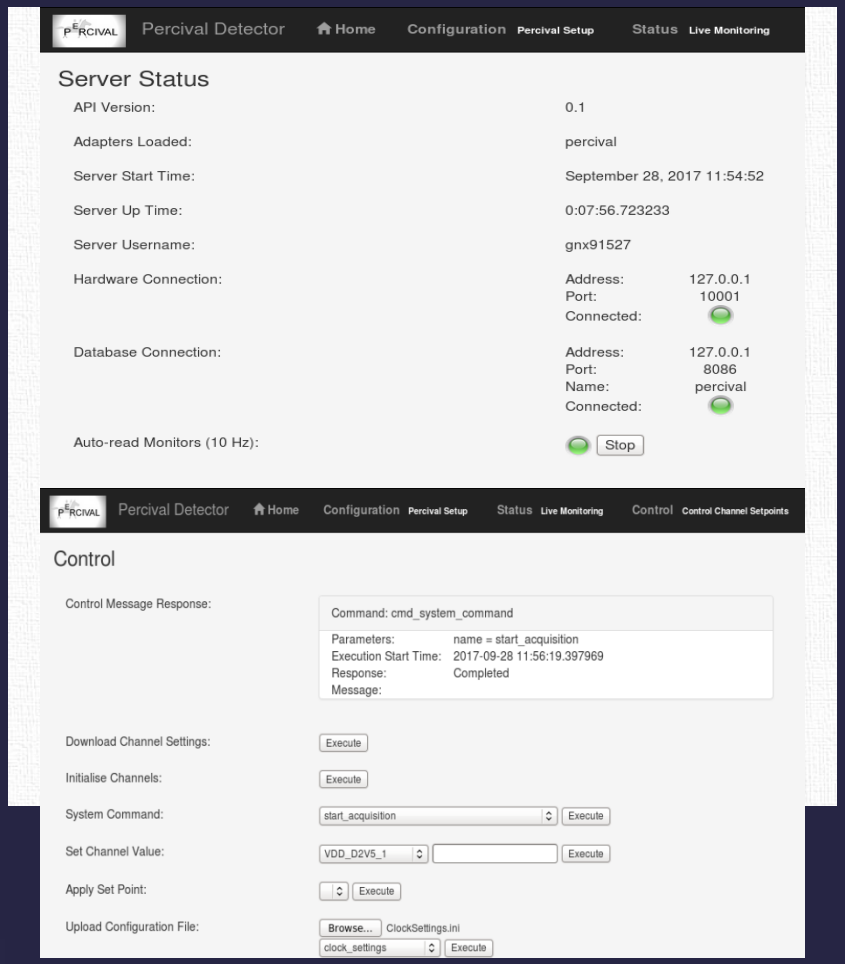
OdinControl

- Generic HTTP server
- Adapters provide functionality for each device
- Server generates RESTful API from arbitrary Adapter attributes and methods
- Control through simple webpages or client app



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OdinControl Server Configuration

- Configure server address
- Load Adapter libraries
- Configure specific Adapters

```
[server]
debug_mode = 1
http_port  = 8888
http_addr  = 0.0.0.0
adapters   = excalibur, odin_data

[tornado]
logging = debug

[adapter.excalibur]
module = excalibur.adapter.ExcaliburAdapter
detector_fems = 192.168.0.1:6969, 192.168.0.2:6969

[adapter.odin_data]
module = odin_data.odin_data_adapter.OdinDataAdapter
endpoints = 127.0.0.1:5004, 127.0.0.1:6004
update_interval = 0.5
```

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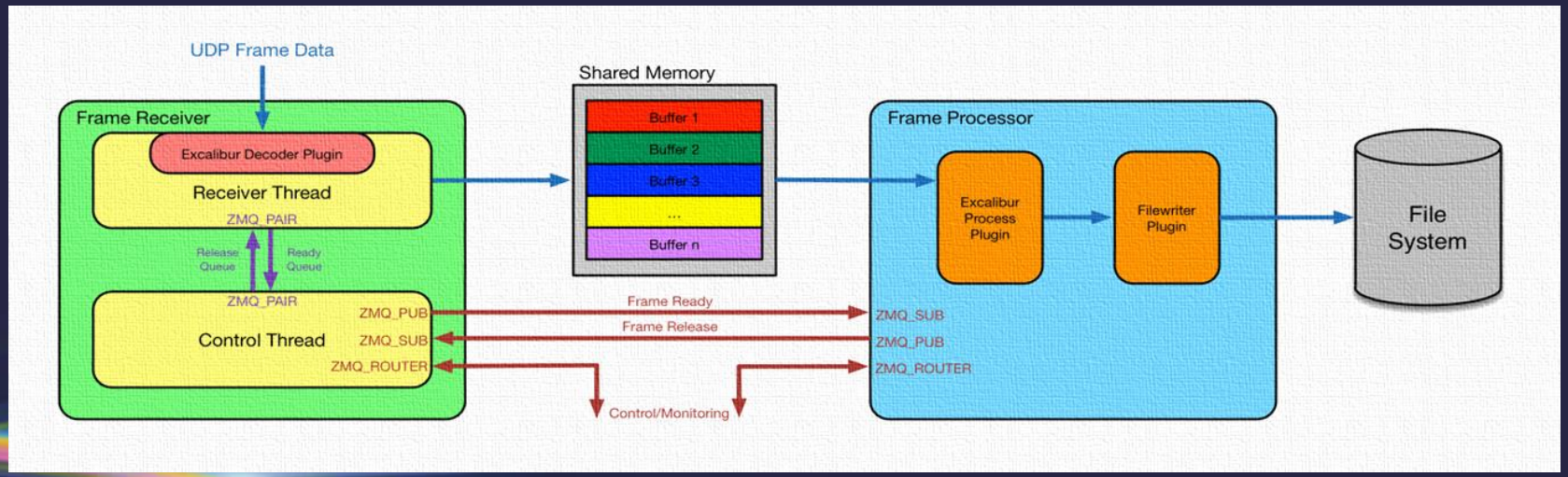
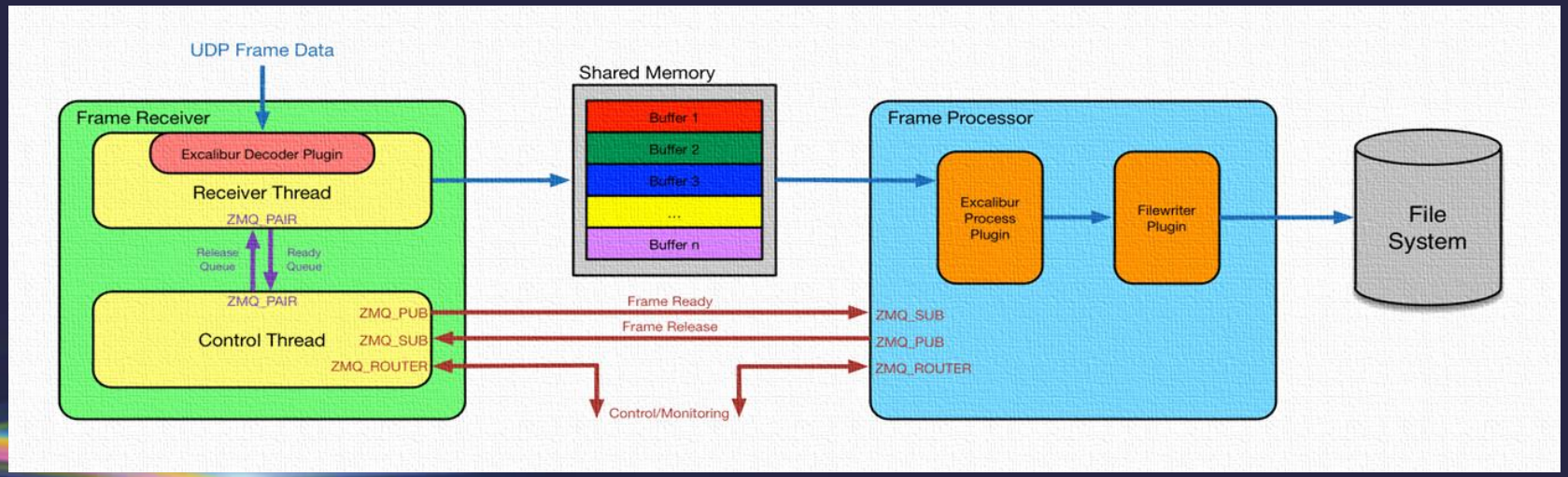
OdinData

- FrameReceiver gathers data from UDP or ZeroMQ stream
- Decoder plugin validates data packets and constructs a single frame
- Passes data frame to FrameProcessor through shared memory



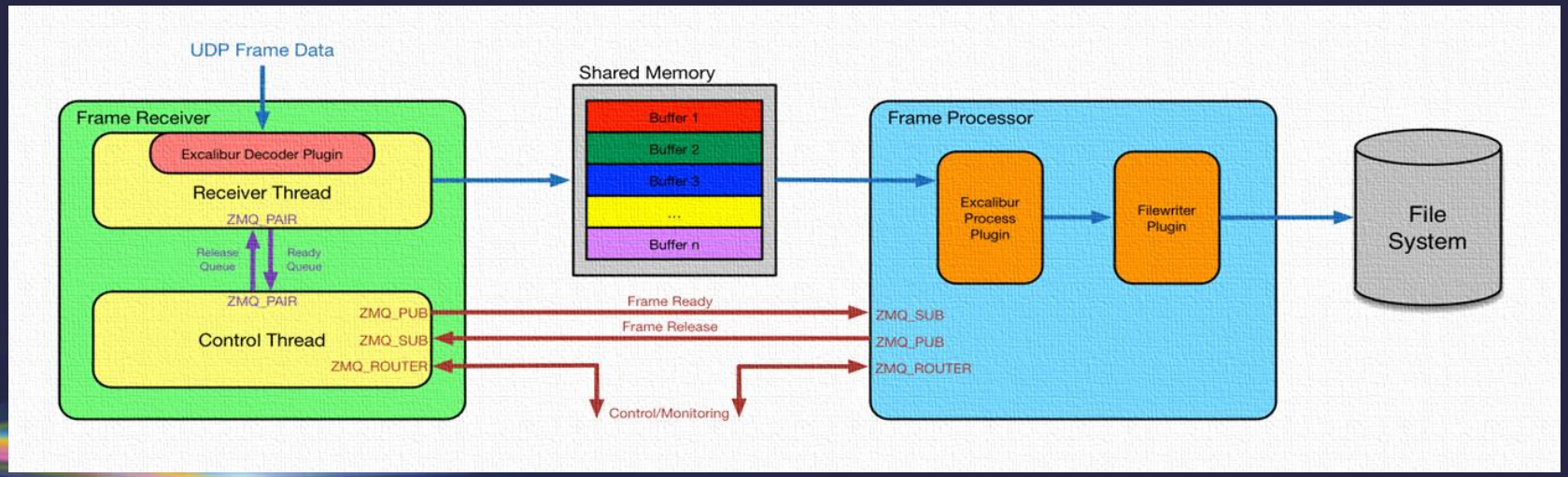
OdinData

- FrameProcessor receives message with frame pointer
- Process plugin performs data processing on the frame
- Detector agnostic FileWriterPlugin writes pre-chunked data directly to HDF5 dataset



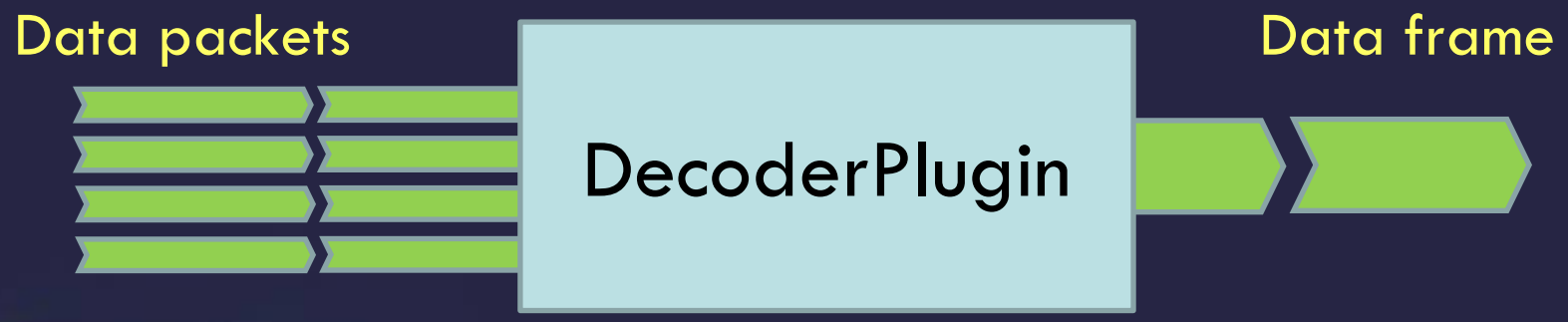
OdinData

- Write data using Direct Chunk Write
- Only the raw dataset for best performance
- A single, live, view of the data produced using Virtual Dataset and SWMR functionality



Plugins

- Simple to write plugins to extend functionality
- Decoder plugin to convert data packets to frames
- Process plugin to construct data chunk



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Plugins

- Simple to write plugins to extend functionality
- Decoder plugin to convert data packets to frames
- Process plugin to construct data chunk

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Processor Plugins

- Process plugin to construct data chunk
  - Inherit from FrameProcessorPlugin class
  - Implement process_frame()
  - connect() to an upstream plugin at runtime

- Resource-intensive plugins parallel to file writing plugin chain

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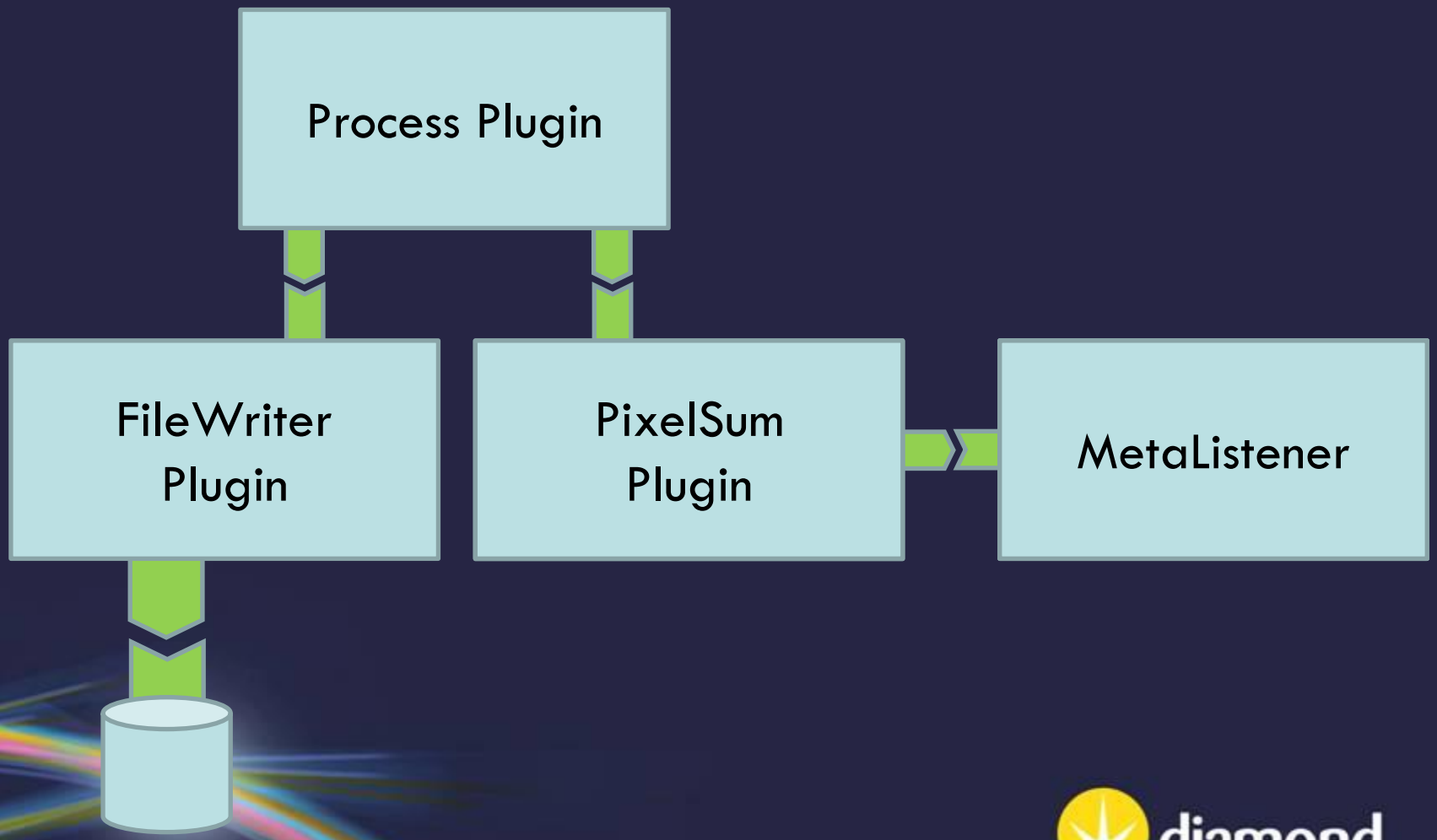
Processor Plugins



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OdinData Features

- Robust to packet loss, out of order packets, missing frames
- Perform bare minimum processing
- Write straight to disk with direct chunk write
- Scalable by addition of OdinData processes / server nodes

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HDF5 Usage

- Direct Chunk Write: Fast writes; Pre-compression support
- SWMR: Live dataset view; Ensures file integrity after failure
- VDS: Single, coherent view of dataset split across many nodes

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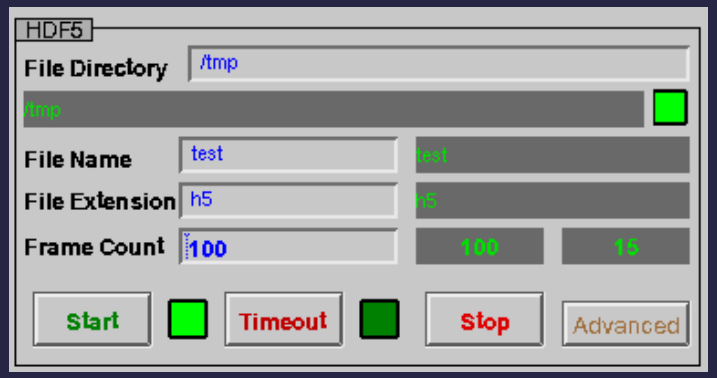
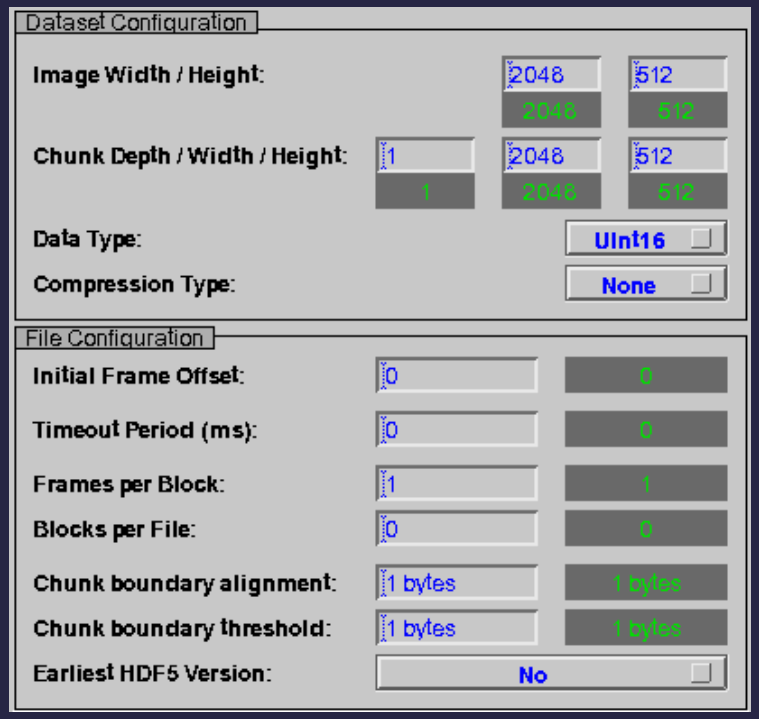
OdinData Configuration



OdinData Status

Advanced HDF5 Configuration



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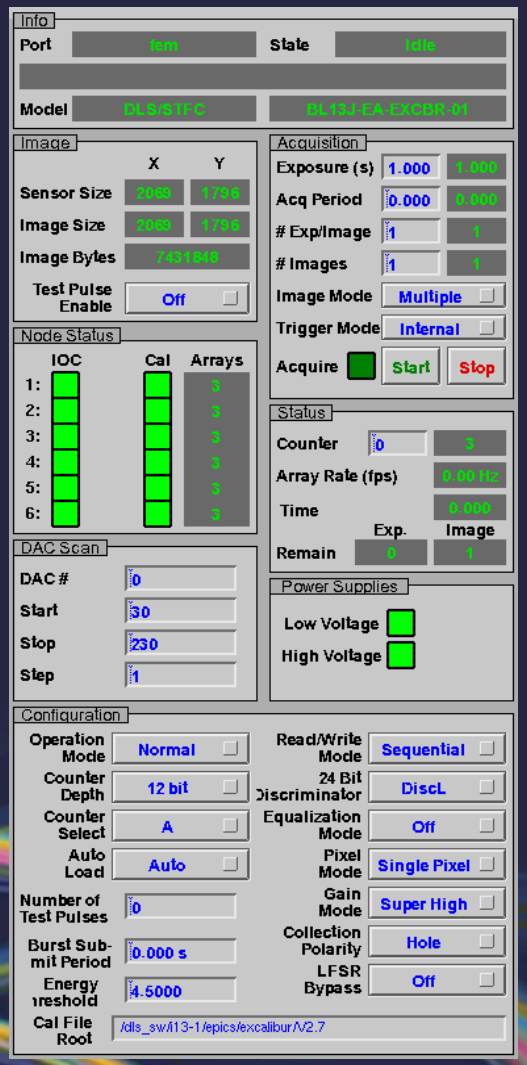
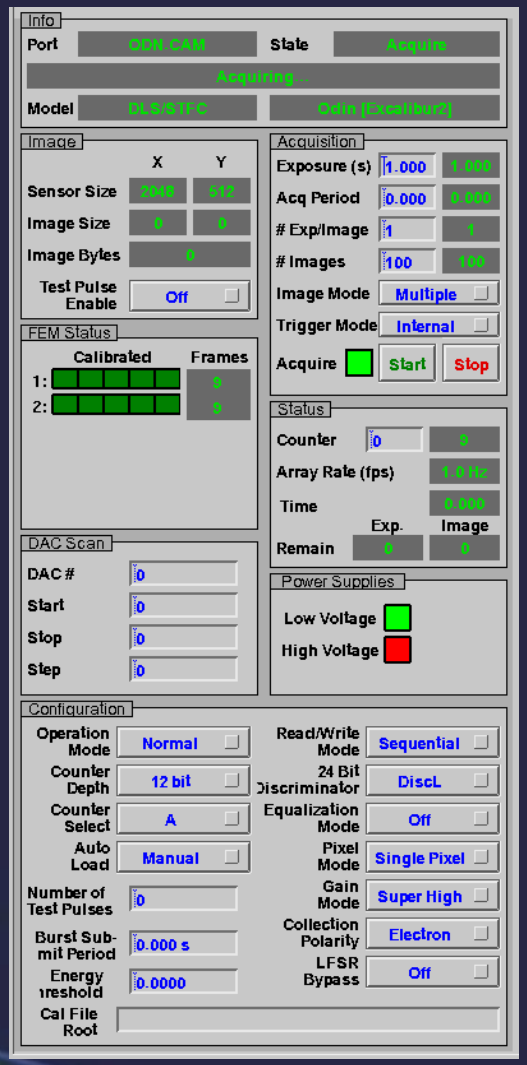
ADOdin

Current Excalibur API



New Excalibur API



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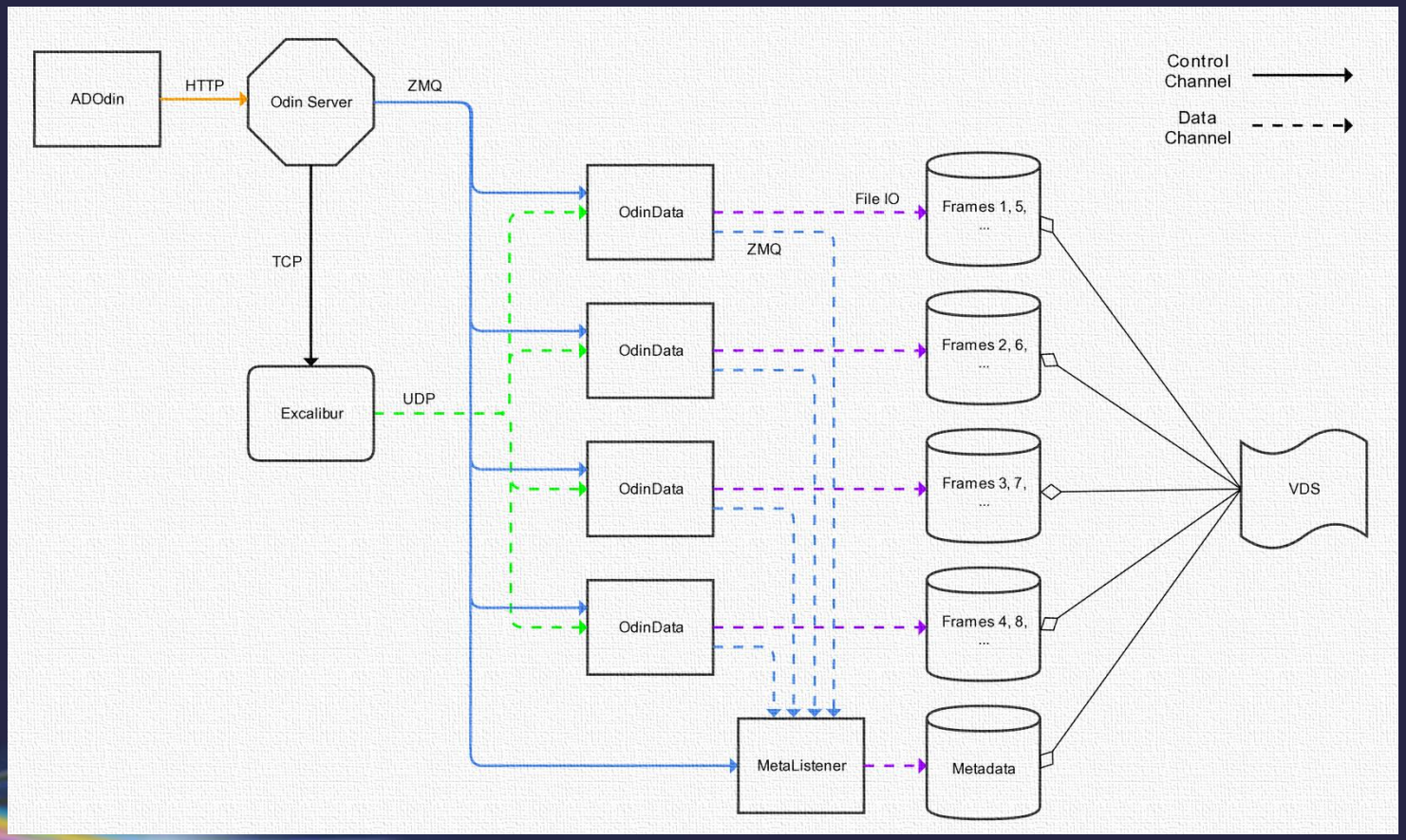
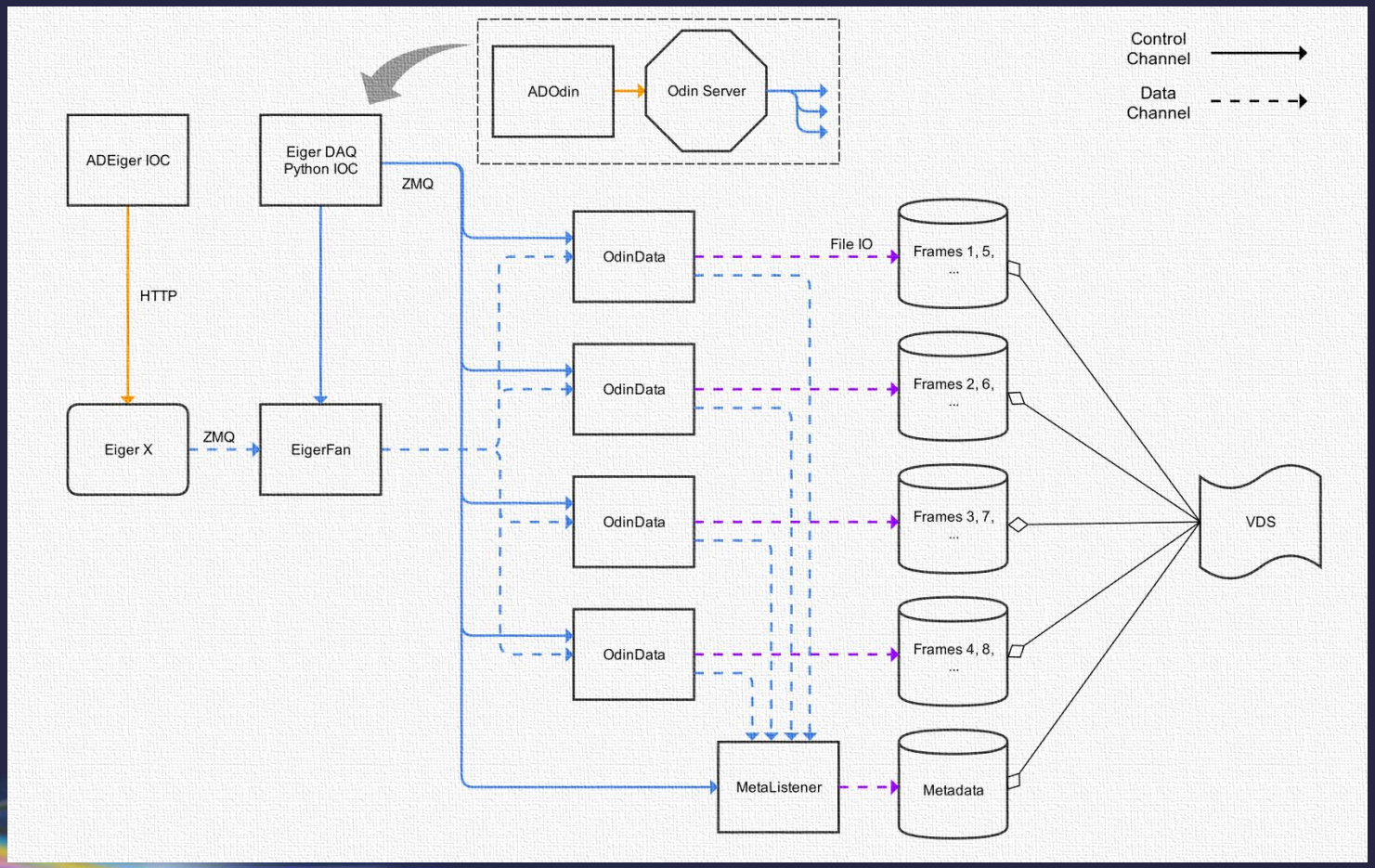
Excalibur Overview



Eiger X 4M Overview



In Summary…

- OdinControl: a control system agnostic single point of control for arbitrary devices
- OdinData: a fast, scalable data acquisition framework
- Odin integrates with and replaces some parts of AreaDetector
- Will become an integral part of the control system at DLS

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Thanks for Listening!

Questions?

Acknowledgements

Ulrik Pedersen, Alan Greer, Matthew Taylor | DLS

Tim Nicholls | STFC

More Info

Contact: gary.yendell@diamond.ac.uk

Paper: ICALEPCS 2017 – TUPHA212

GitHub: odin-detector and dls-controls

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EPICS REST Interface