The HDF Group: Thought Leader in Exascale Computing

Takes on Real-Time PCAP Ingestion, Storage, and Analytics

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The HDF Group

Who is the HDF Group?

HDF Group has developed open source solutions for Big Data challenges for nearly 30 years

Small company (~ 40 employees) with focus on High Performance Computing and Scientific Data

Offices in Champaign, IL + Boulder, CO

Our flagship platform – HDF5 – is at the heart of our open source ecosystem.

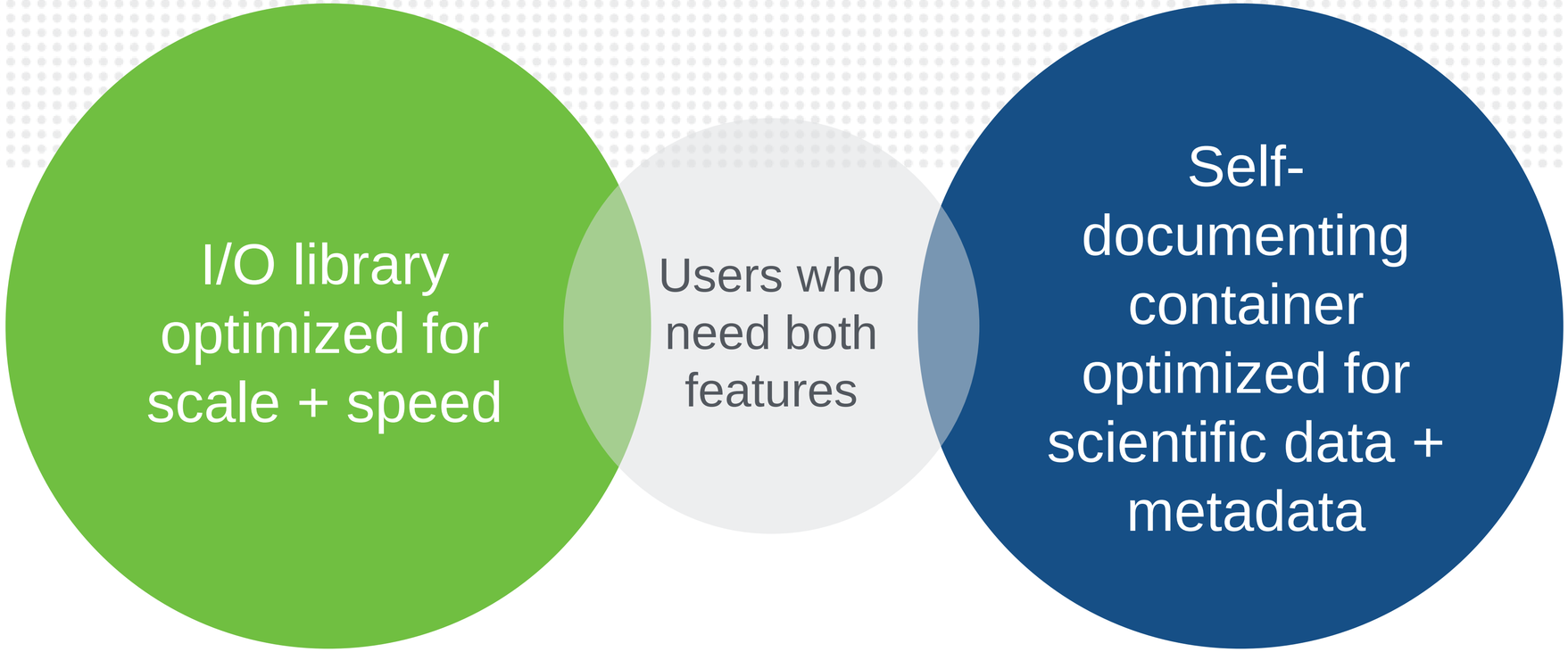
Tens of thousands use HDF5 every day, as well as build their own solutions (~~600~~ ~~700~~ 800+ projects on Github)

“De-facto standard for scientific computing” and integrated into every major analytics + visualization tool

What does the HDF Group do?

Products	• HDF Capture: Software solution for PCAP Ingest + Storage (Beta) • HDF5 Library • Connectors: ODBC + Cloud (Beta) • Add-Ons: compression + encryption
Support	• HDF Support Packages (Basic + Pro + Premier) • Support for h5py + PyTables + pandas (NEW) • Training
Consulting	• HDF: new functionality + performance tuning for specific platforms • General HPC software engineering with fintech expertise (ex. MPI implementation for back testing) • Metadata science and expert services

Why Use HDF5?


I/O library optimized for scale + speed
Users who need both features
Self-documenting container optimized for scientific data + metadata

Why did we create HDF Capture?

Approached by PCAP appliance vendor (confidential) with Big Data challenge

- Many of their clients want to store, index, and query all the data that has ever passed through the appliance: data lake of every single transaction
- The appliance vendor supplies an API with connectors to popular solutions: Splunk, Kafka, Hadoop, etc.

However, their clients kept running into challenges

- Forced to sample or select subset of data: database or log solutions couldn't keep up
- Transformation of data from PCAP into other format meant that regulatory compliance couldn't be met
- Inability to "replay" the market: load testing of software, backtesting, etc.

Appliance vendor familiar with our work in particle physics, and asked HDF Group to create a turnkey solution

- Lots of data at once with perfect fidelity of content and long-term storage
- Challenge: build a solution that could ingest + store + index 500K messages per second

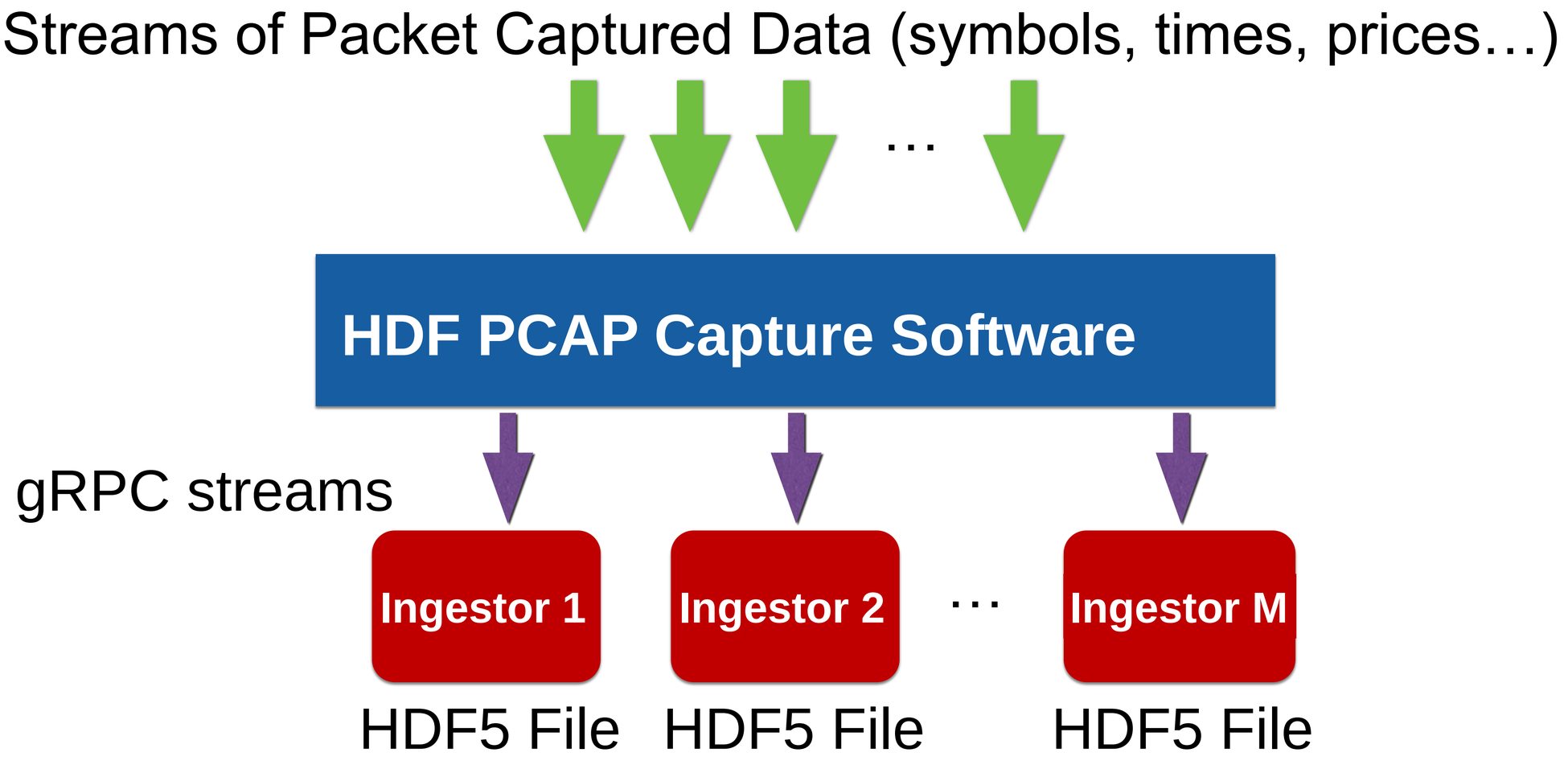
HDF5 PCAP Capture Software

- A client subscribed to ~10 streams full of financial PCAP data only needs a pipe with < 100 Mbps for ingesting all the data.

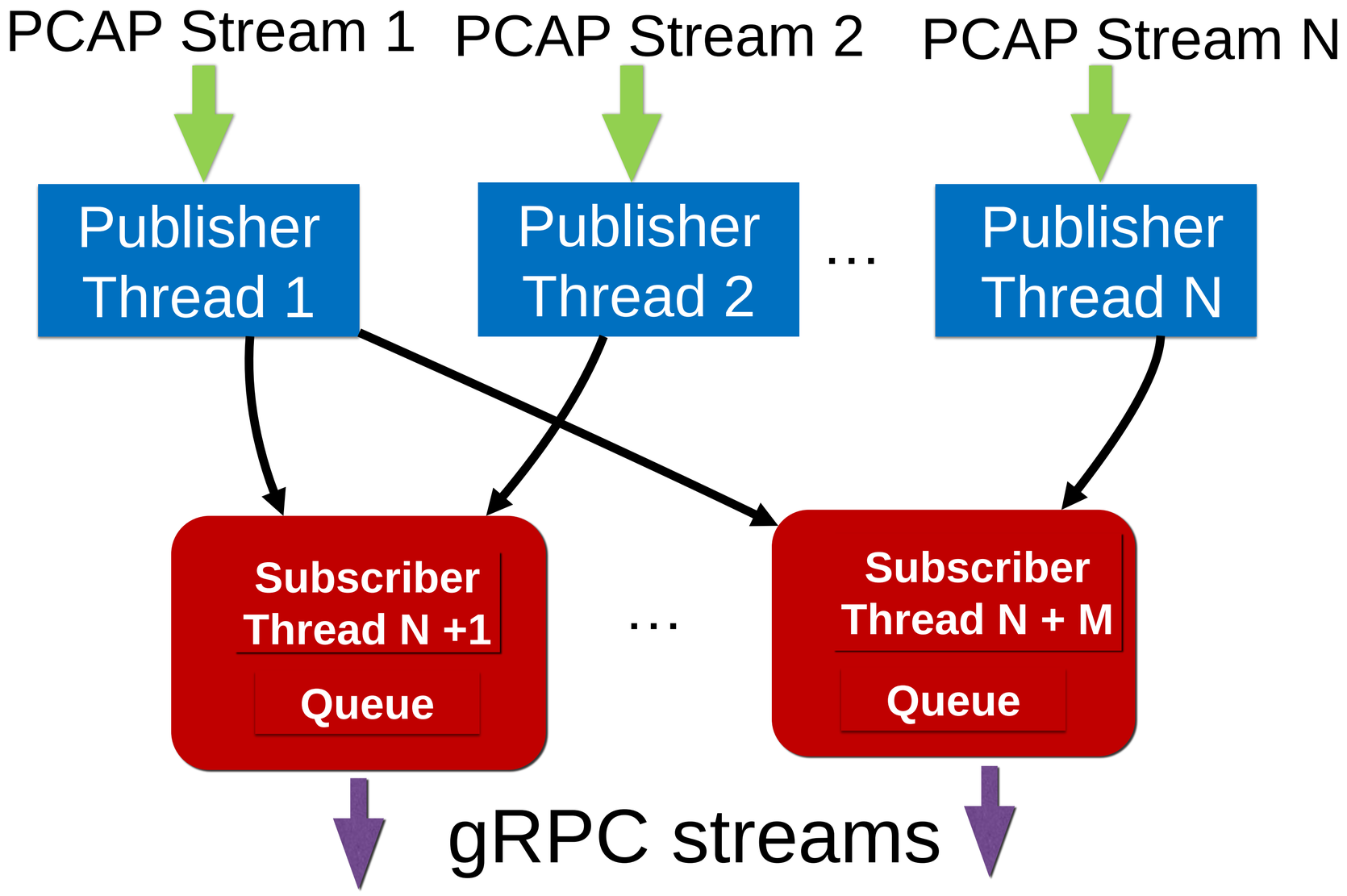
- Using compression allowed a reduction of ~5x, allowing to decrease the mean length of messages from ~100 bytes to ~20 bytes per message.

- The HDF5 ingestion clients can achieve more than 500K mess/sec (~650K mess/sec by using a single machine with 16 physical cores).

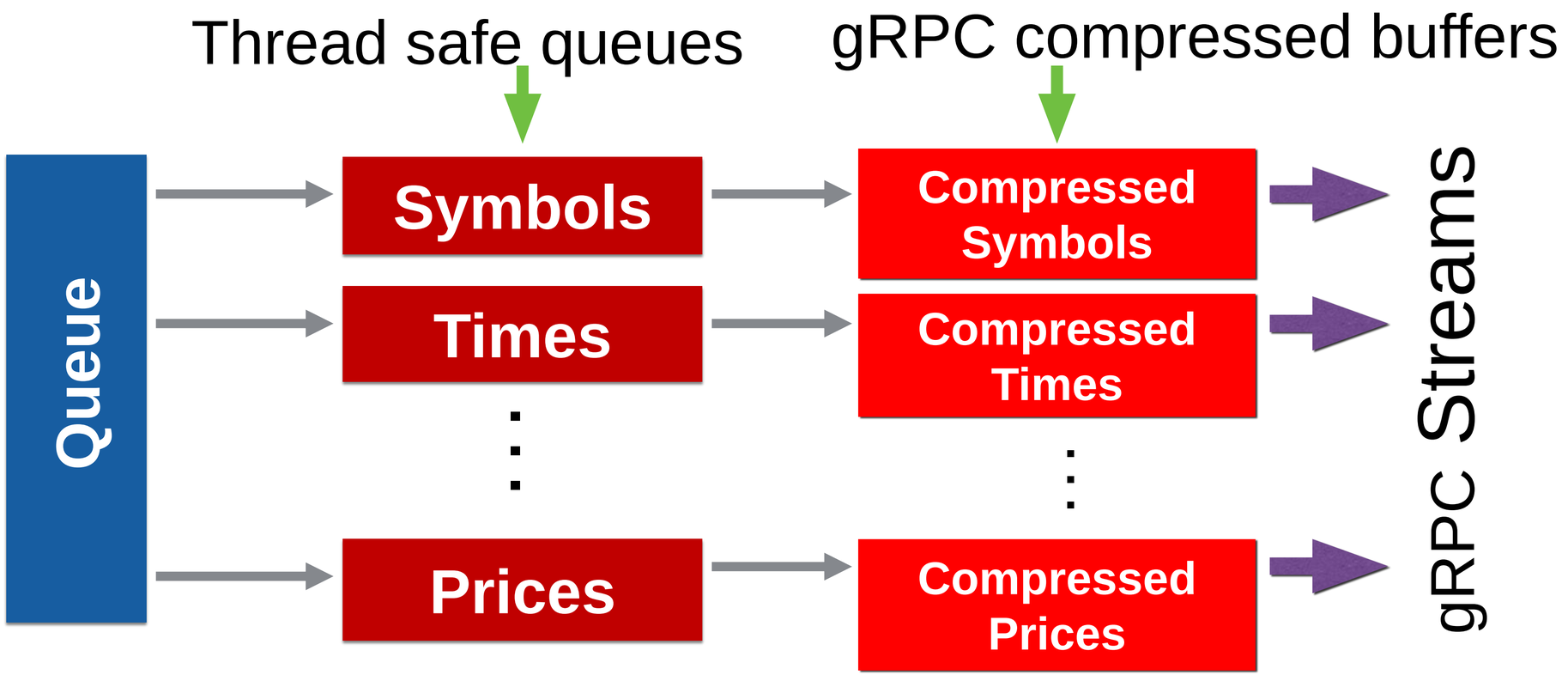
Global View


Streams of Packet Captured Data (symbols, times, prices…)
…
HDF PCAP Capture Software
gRPC streams
Ingestor 1
Ingestor 2
…
Ingestor M
HDF5 File
HDF5 File
HDF5 File

HDF5 Multi Stream Software



Detail of the Queue



- Every thread safe queue is compressed after being filled up for less memory consumption and faster transmission.

Questions? Comments?

www.hdfgroup.org

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