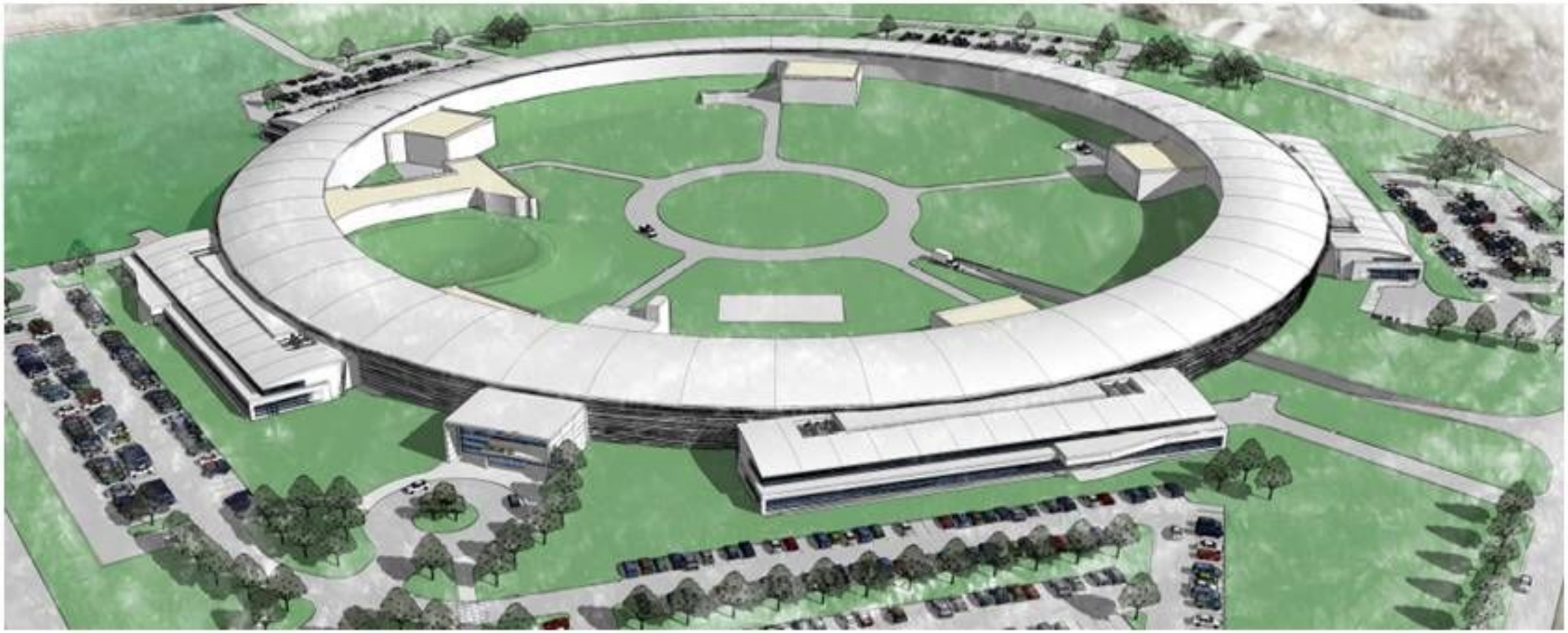


Prototype of a DDS-Based High-Level Accelerator Application Environment

N. Malitsky, J. Shah (BNL)

N. Hasabnis (Stony Brook University)

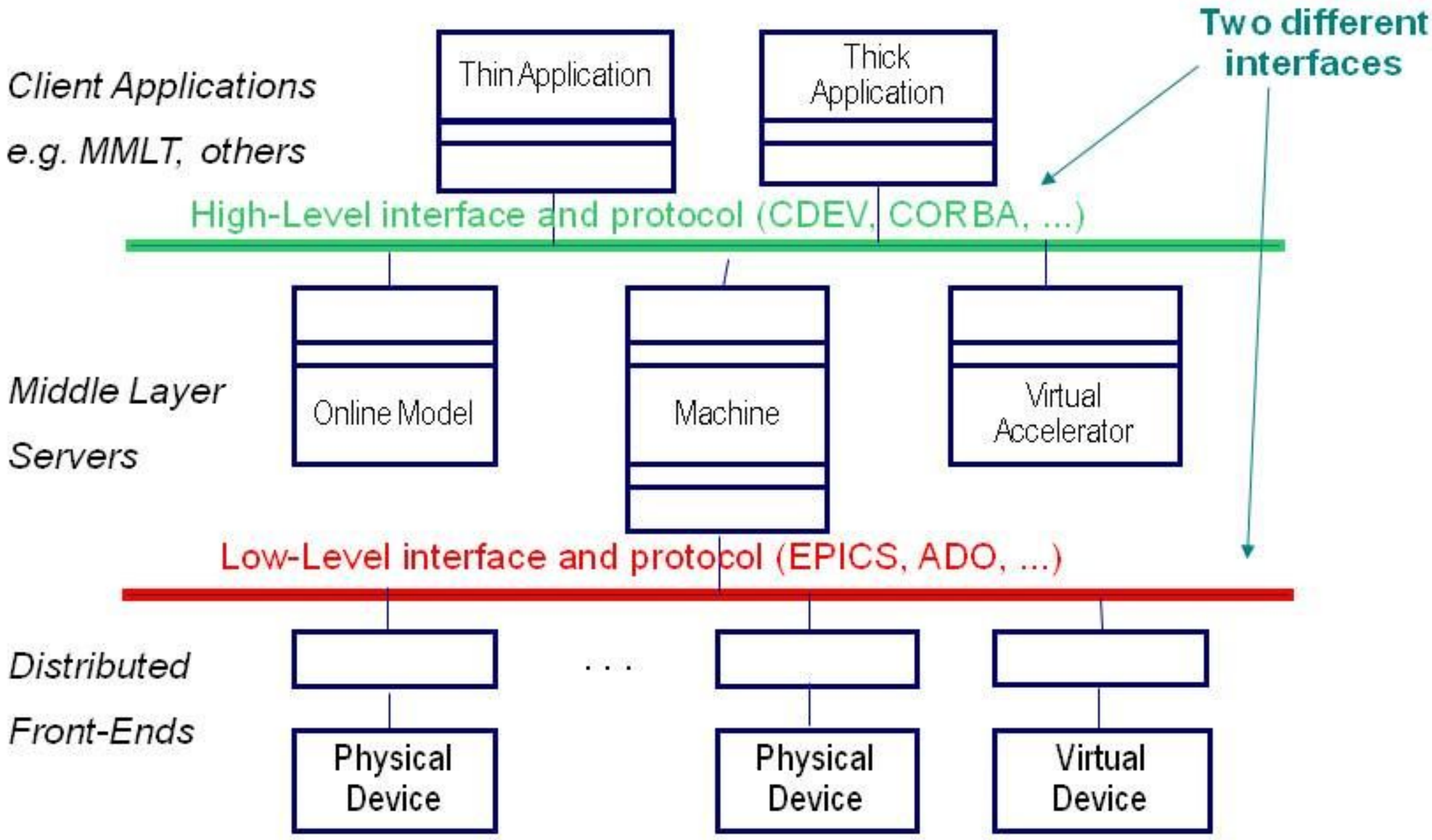
R.Talman (Cornell University)

S.Shasharina, N.Wang (Tech-X Corp)

Outline

- Background
- EPICS-DDS Package
- Composite Example
- Summary

Typical three-tier high level application environment



Standard Publish/Subscribe Specifications

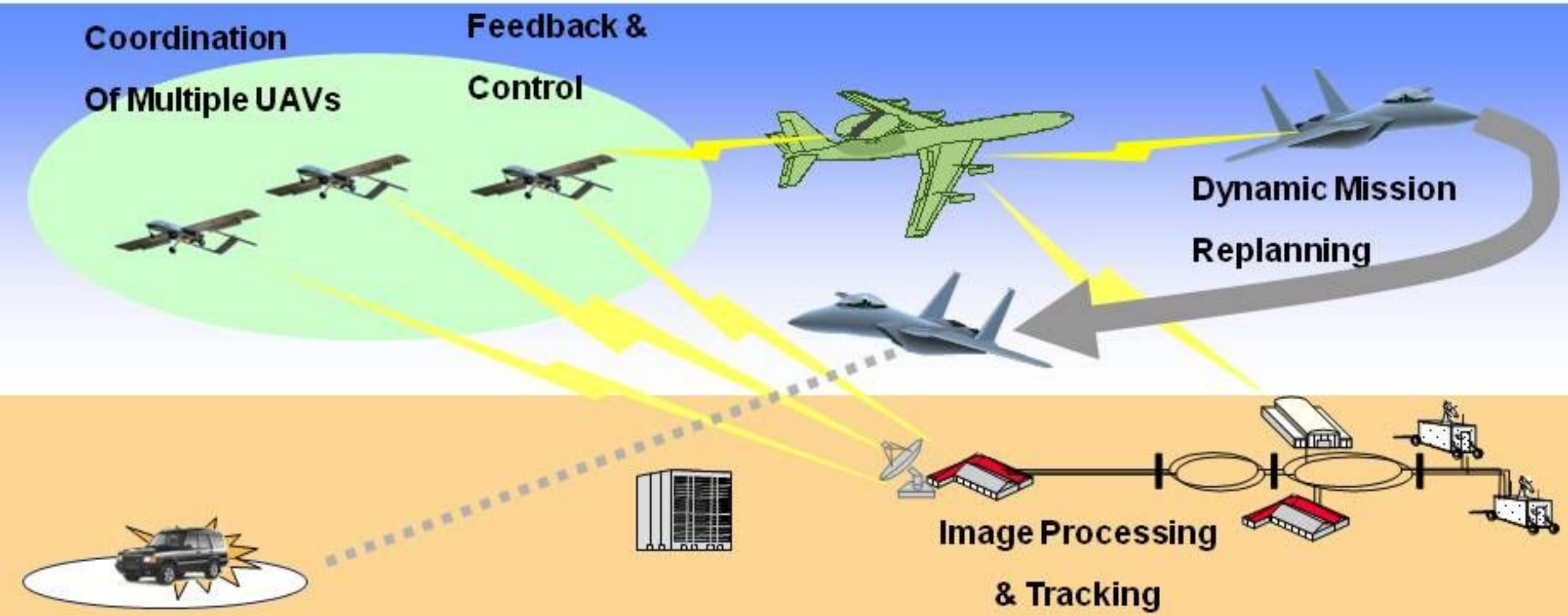
as candidates for high-level interface, [Summer 2008]

Middleware	Language	Data Type	Data Content Filtering	QoS	Complexity	Year
CORBA Event Service	C++, Java, …	Generic and typed events	no	no	hard	1997
CORBA Notification Service	C++, Java, …	Structured events	yes	yes	hard	~2000
Java Messaging Service (JMS)	Java	five types: text, map, bytes, stream, object messages	filters are message properties	no	easy	~2000
High Level Application (HLA)	C++, Java, …	Sequence of octets	no	yes	TBD	~2000
Data Distribution Service (DDS)	**C++, Java, …**	**User-specific data types**	**yes**	**yes**	**easy**	**2004**

NSLS-II commissioning : 2013

Case Study: QoS-enabled Publish/Subscribe Technologies for Tactical Information Management

D. Schmidt. Tutorial on DDS



BOEING BBN TECHNOLOGIES LOCKHEED MARTIN VANDERBILT UNIVERSITY Carnegie Mellon

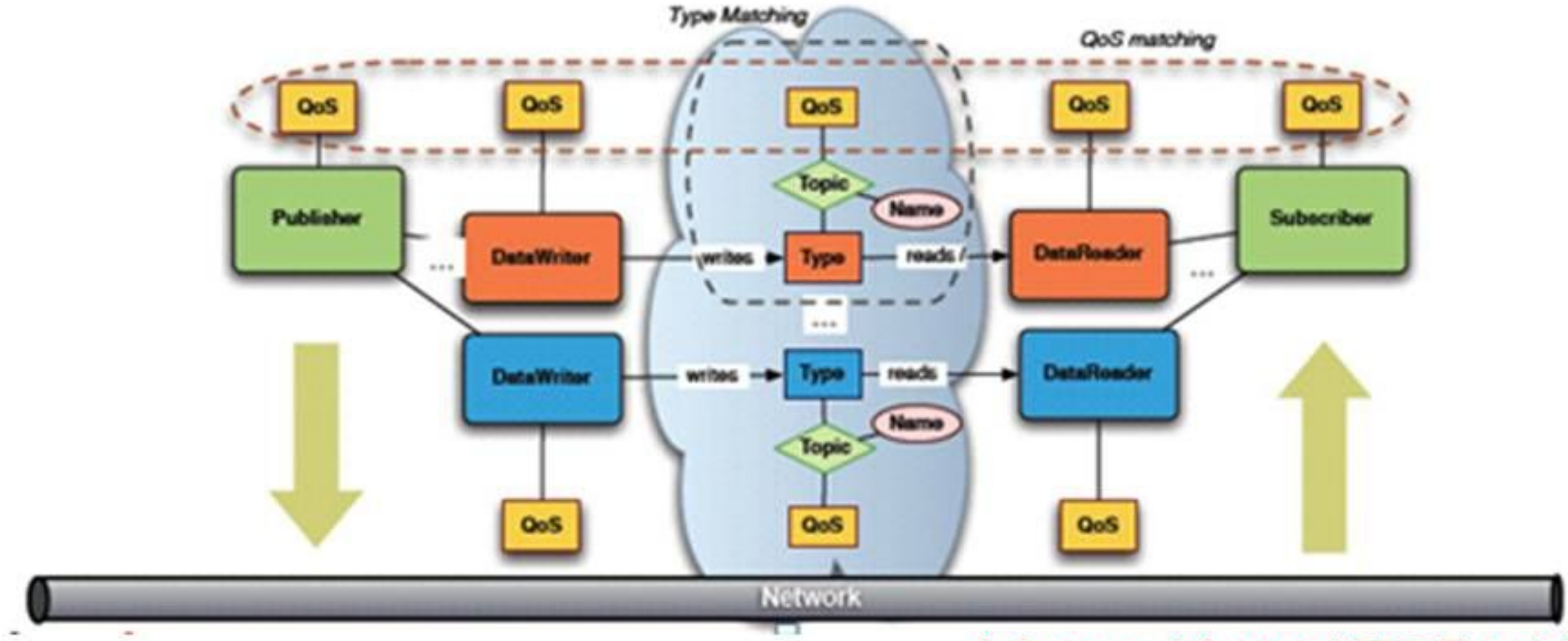
DARPA PCES Capstone demo, 4/14/05, White Sands Missile Range

DDS Data-Centric Publish Subscribe Model

Topics of Typed Global Data Space: a logical data space in which applications read and write data asynchronously, decoupled in space and time

Publisher/Subscriber: produce/consume information into/from Global Data Space

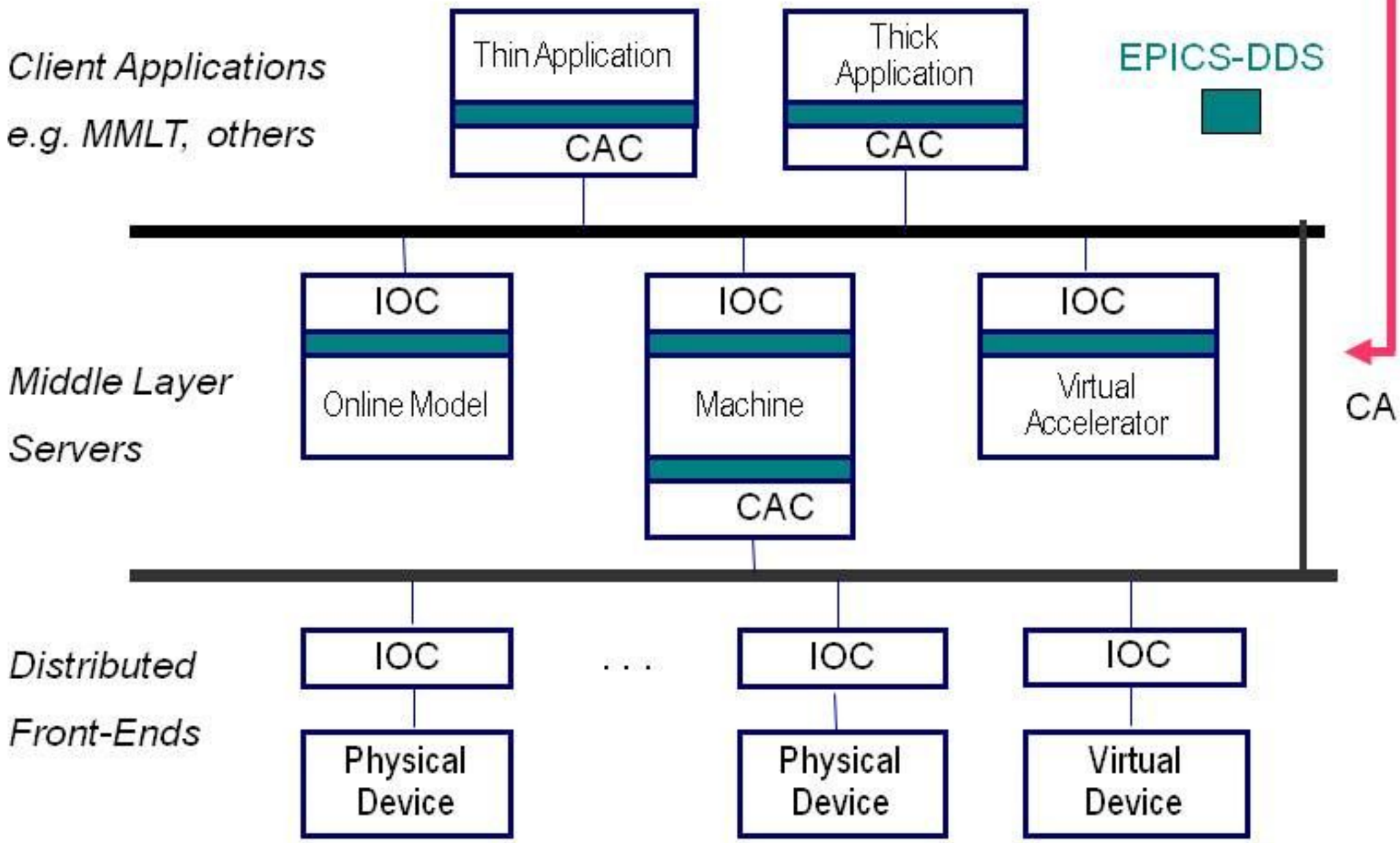
QoS: reliability, predictability, availability, timeliness, etc.



A.Corsaro. Advanced DDS Tutorial

DDS-Based Conceptual Design

Main Idea: Start the implementation of the DDS specification in the form of the EPICS extension based on the Channel Access protocol



Benefits Brought by DDS to EPICS

The integration of these two technologies addresses five major tasks:

- **First,** DDS brings an industrial standard interface to the accelerator online environment allowing to decouple a variety of high-level applications and toolkits from the underlying low-level control systems, such as EPICS, TINE, TANGO, and others.

- **Second,** the DDS topic-oriented approach elevates the EPICS Channel Access protocol to the high-level applications replacing the additional RPC-like communication interfaces.

- **Third,** DDS creates a basis of Service-Oriented Architecture (SOA) promoting decoupling of the service interfaces from their project-oriented implementations [Nanbor Wang, Tech-X Corp.]

- **Fourth,** the DDS specification introduces some guidance for extending the EPICS infrastructure with the relevant set of quality of service.

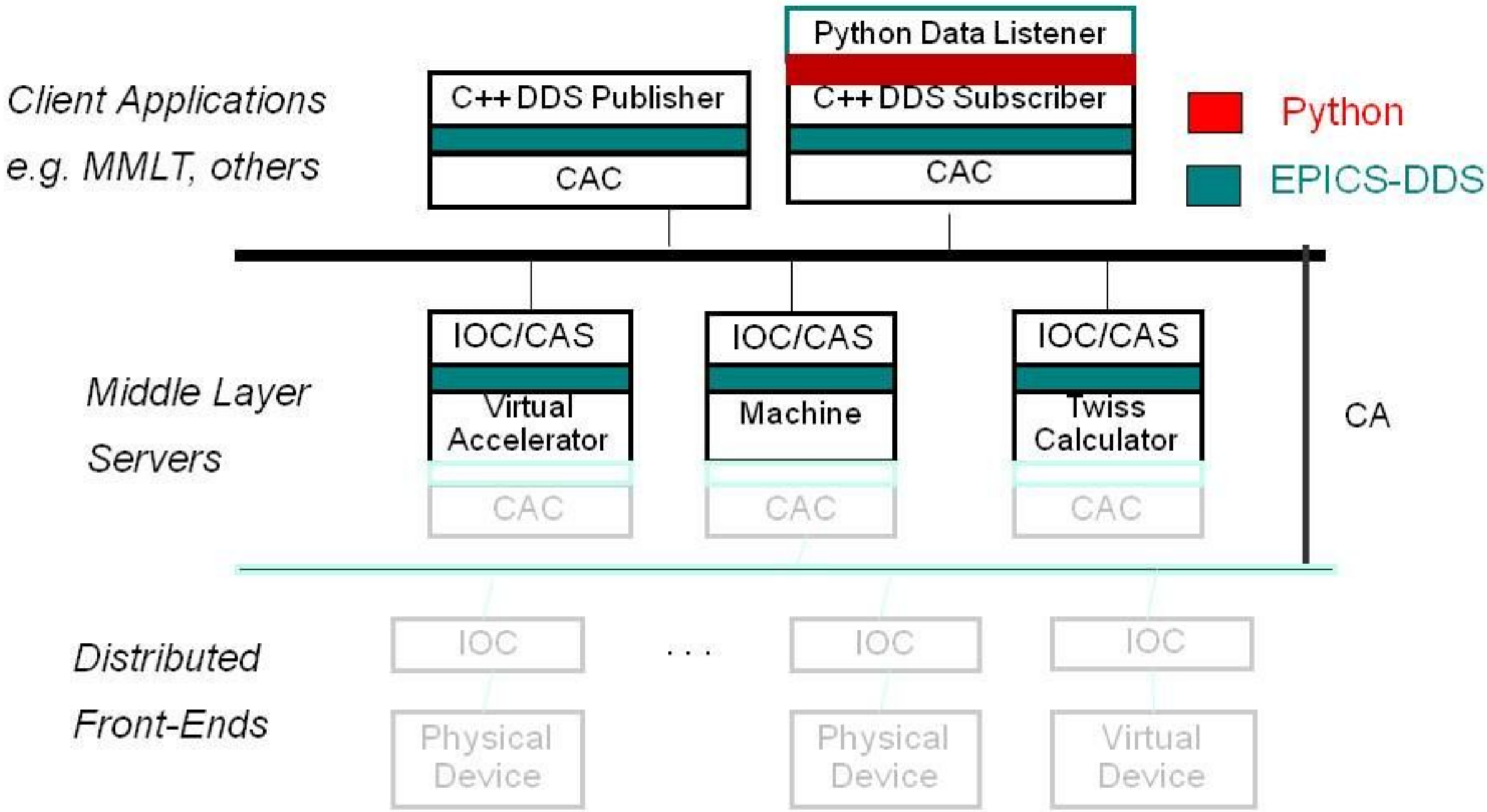
- **Finally,** the DDS technology extends the EPICS run-time environment with the relational model creating a platform for adding relational queries and integration of full-scale Data Stream Management Systems (DSMS) for data stream processing and archiving.

EPICS-DDS Package

http://sourceforge.net/projects/epics-dds/

- **EPICS-DDS Middleware**: implementation of the OMG Data Distribution Service (DDS) interface based on the EPICS Channel Access (CA) protocol
- **PV Data**: generic hierarchical collection of FieldType's and PVField's including the PV Structure suggested by the Java IOC project
- **Accelerator Model Interfaces (AMI)**: collection of the accelerator-specific interfaces and data containers based on the PV Structure
- **Accelerator Model Servers (AMS)**: accelerator-specific middle layer based on the EPICS Portable CA Server (PCAS)
- **UI**: EPICS-DDS script bindings including Python

Composite Example



Benefits Brought by EPICS to DDS:

- **First,** EPICS represents *de facto* standard open-source software with a multi-year history of numerous successful projects. As a result, it creates a solid basis for developing the open source implementation of the DDS specification.

- **Moreover**, the special features of the Channel Access approach provide the advantageous means for solving the complex DDS issues, for example server-based event filtering. The new PVData concept from the coming EPICS 4 version introduces another important idea addressing the recent OMG RFP: Extensible and Dynamic Topic Types for DDS.

New Tasks (life after ICALEPCS'09 ....)