

EPICS 7 – Introduction and Overview

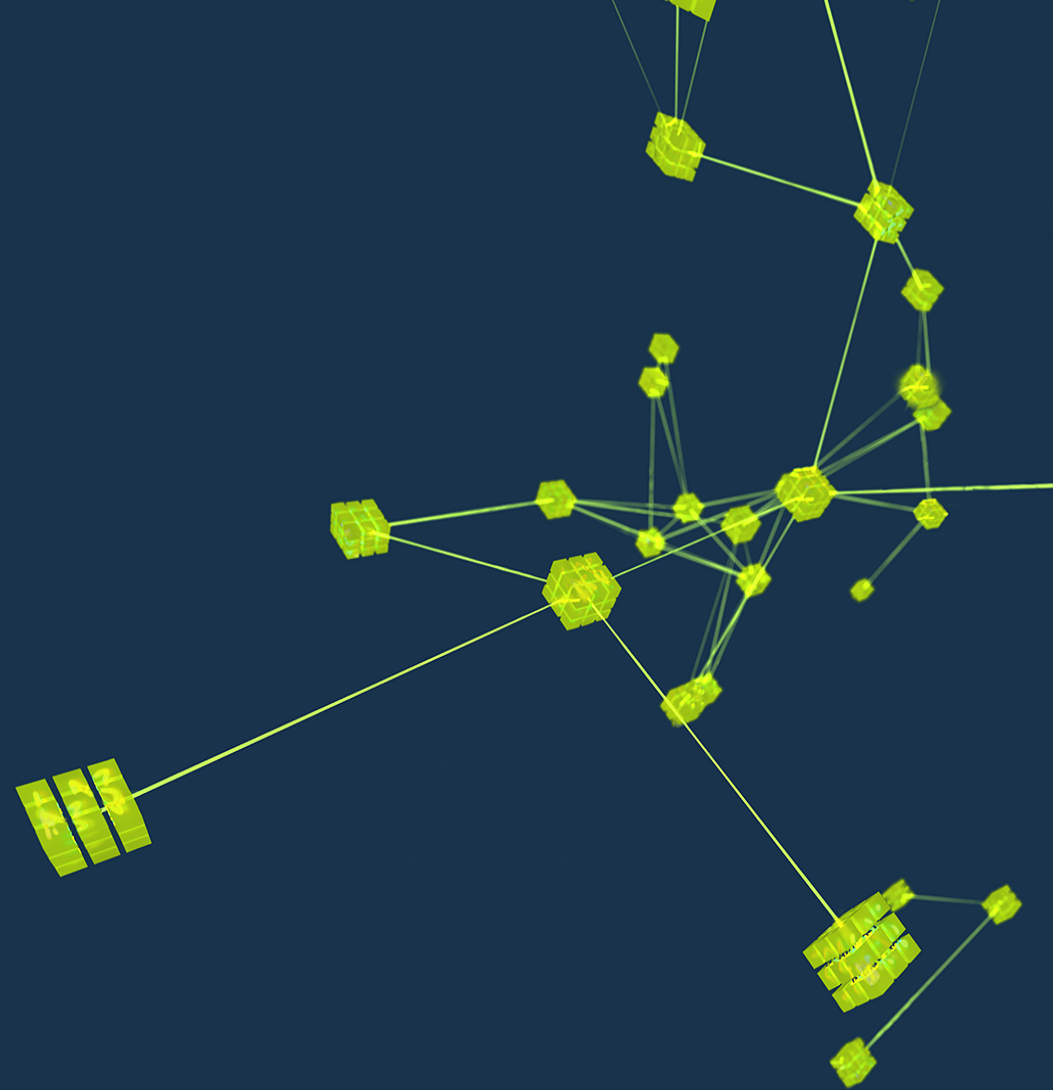
Ralph Lange

Outline

- Creation
 - Initial goals of the EPICS 7 project
 - The pvAccess protocol
- Evolution
 - Normative Types
 - Integration in the EPICS context
 - Use cases for the new protocol
 - Increased adoption in the community
- Plans
 - IPv6 support
 - TLS security on the network

CREATION

EPICS 7 AND ITS INITIAL GOALS



Initial Goals (2007)

Leave no lab behind

“EPICS V4” Group could not agree on basic design ideas for “perfect” IOC

New user-focused goals:

- Don't break the IOC (Input/Output Controller) software
- Extend the scope, allowing migration for existing installations
- Provide a migration path with minimal configuration
- Include user-level libraries for Java, C++, Python

$$3 + 4 = 7$$

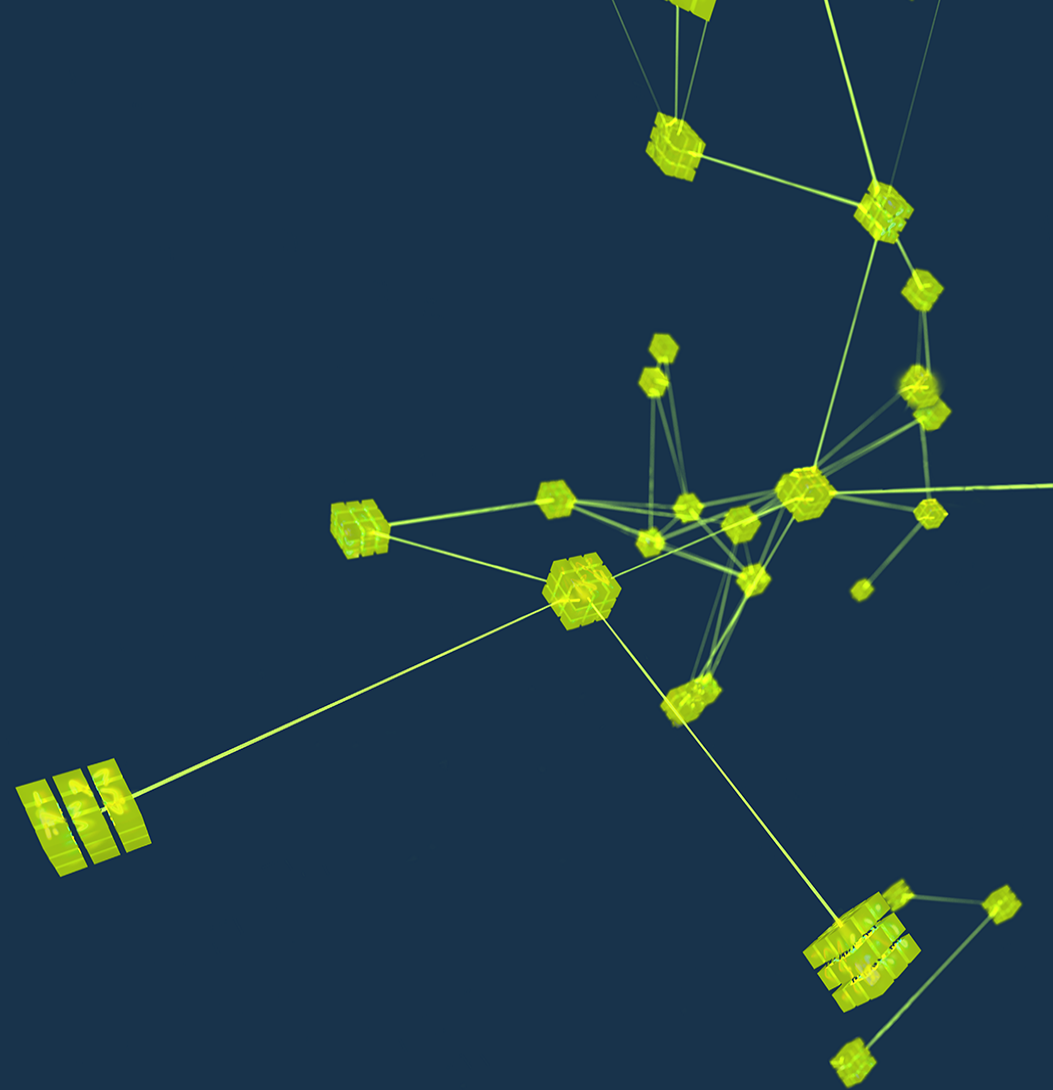
The pvAccess (PVA) Protocol

Transporting arbitrary structures efficiently

- Based on a reasonable set of standard types and arrays, plus structures of those, plus variants
- Similar to Channel Access in many aspects
 - Client needs to know the name, not the server
- Subscriptions are very efficient
 - On opening a subscription, the client gets a full structure copy
 - Any further updates only contain the elements that have changed
 - The client has a consistent full copy at any time
- New “RPC” Access method
 - “Argument” (structure) posted with the call
 - “Return value” (structure) may differ in type between calls

EVOLUTION

THE LAST YEARS



Normative Types (NT)

Arbitrary structures can be a bad idea

- Normative Types define standard structures for standard use cases
 - All fixed structure types of Channel Access are covered
 - Plus: 2D array, table, image (+ metadata), time series, channel collection, ...
- Generic clients (e.g., GUI, Archivers, services) understand NTs
- Specific types, however, are possible and common
 - Support by generic clients is very limited (often reduced to printing)
 - Applications become specific and non-portable

Use Normative Types whenever possible and reasonable

Integration

Fitting in with the others

In the IOC (QSRV):

- PVA server allows access to all records.fields using Normative Types
- Multiple record.fields can be configured into an arbitrary structure

In clients, like GUI frameworks and archivers:

- In Phoebus, channel names are prefixed with “ca://” or “pva://” with a configurable default
- The Archiver Appliance always searches on both protocols to provide consistent archive data across migration

Use Cases

Things that were not possible before

- Images:
An image Normative Type contains image and metadata in a single structure; clients always have a consistent set
- Middle-layer services:
The RPC-type method (request/response with changing payload) allows wrapping database, model or directory service calls
- Transactional configuration:
Using the RPC type method, a client can write configuration for a complete subsystem in a single structure

Adoption

Important new and upgrade projects have selected EPICS 7

- New installations can start using pvAccess
- There's a smooth migration path for existing installations

User-level libraries:

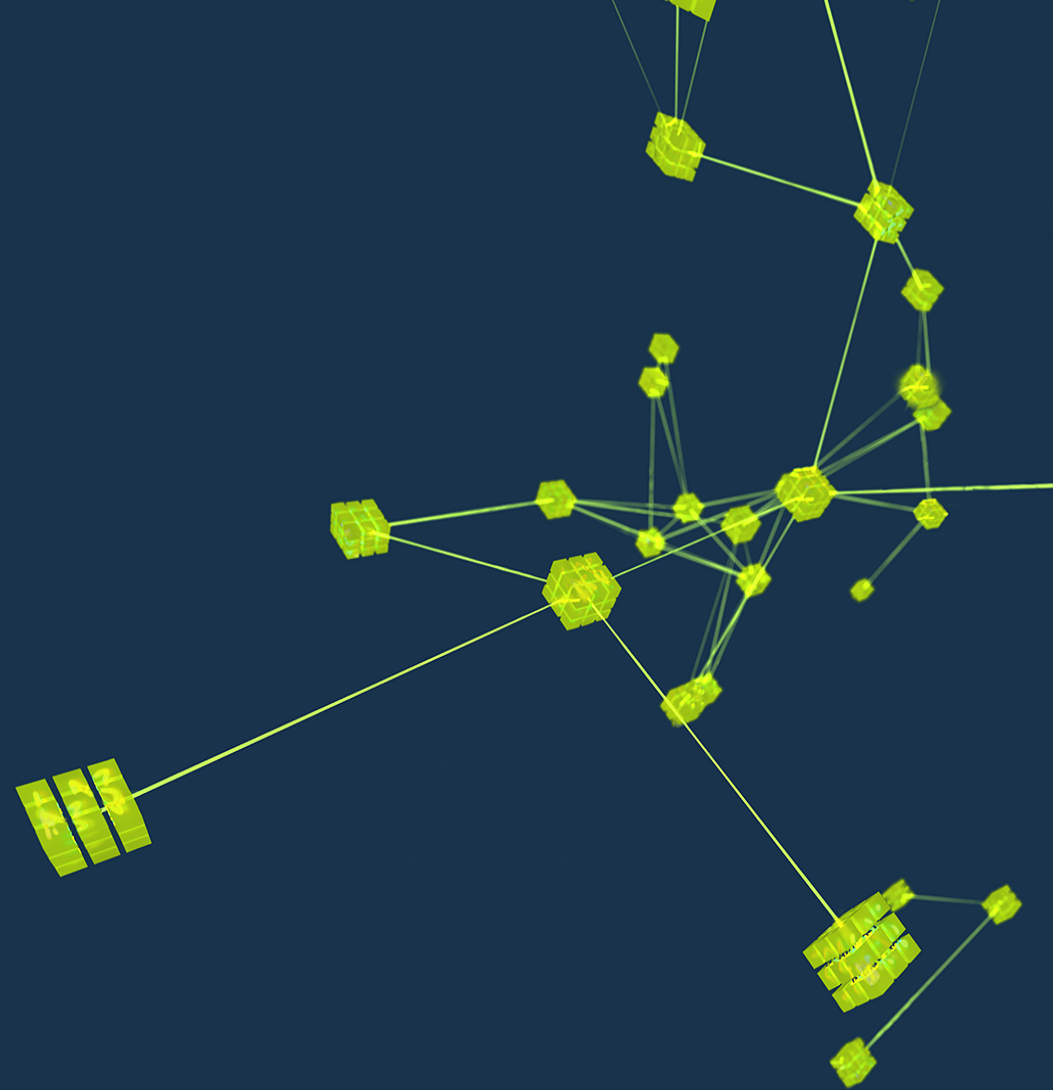
- Second generation libraries make better use of language specifics
core-pva (Java), PVXS (C++)

Real-time for legacy VME:

- RTEMS is well supported in EPICS 7

PLANS

CURRENT PROJECTS



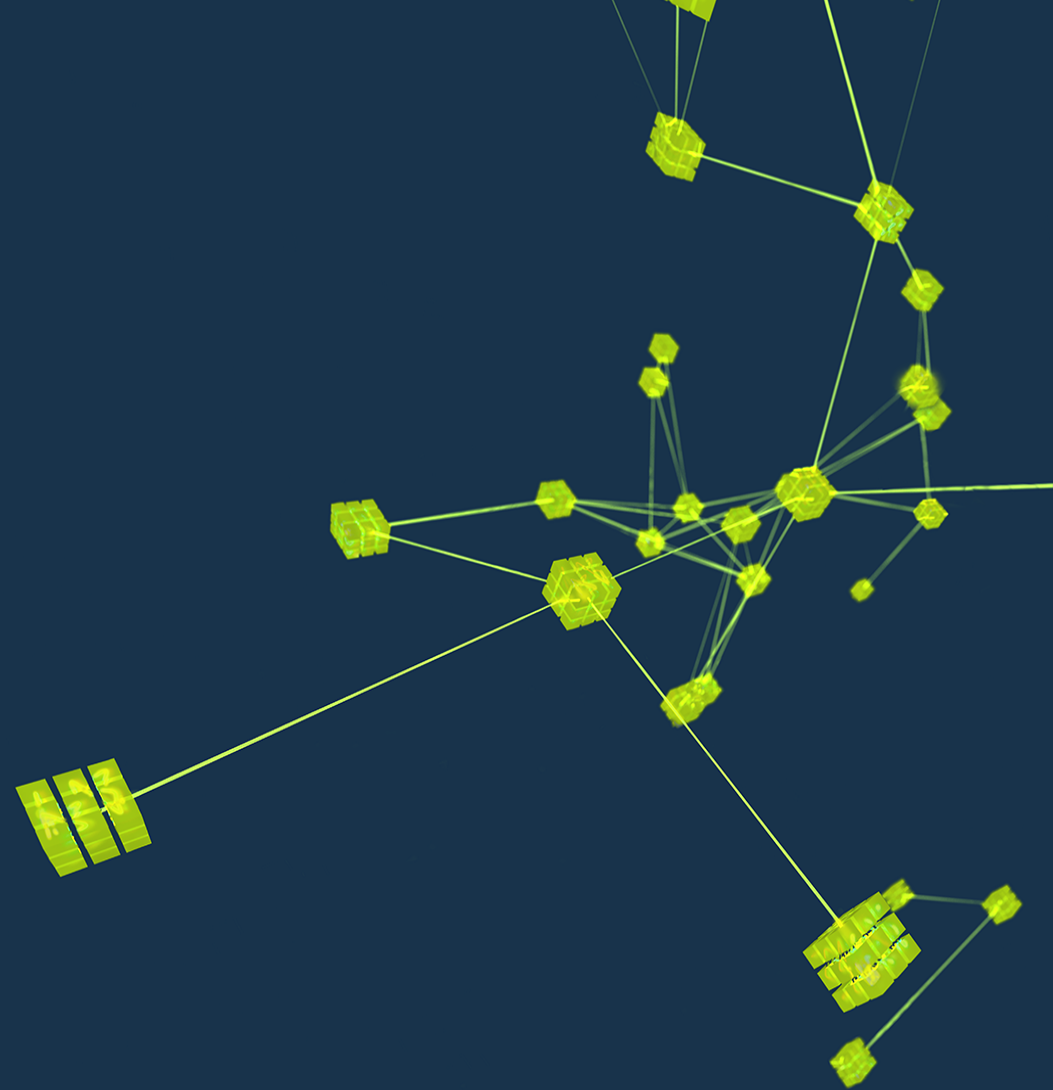
IPv6

- The second generation user-level libraries support IPv6

Security

- At SLAC, a multi-year project has started that will add industrial-level security TLS-style security to the pvAccess protocol
- The hard part, i.e. key management, is still in early design phase

CONCLUSIONS



Conclusions

- All initial goals of the development have been met
- The migration path works: we see increasing adoption and use
- Users are beginning to explore the new possibilities
- Future challenges are being addressed
- Of course, there is still room for improvement

Questions?