EPICS V4 Roadmap

Greg White, for Gabriele Carassi, Bob Dalesio, Michael Davidsaver, Timo Korhonen, Marty Kramer, Ralph Lange, Nikolay Malitsky, James Roland, Matej Sekornaja, Guobao Shen, Kunal Shroff

Autumn 2011 EPICS meeting, PSI
What’s Ready to Use

- Different Maturities
- Acquisition tools mature
- EPICS V3 interop mature
- V4 Record processing, Not ready
Acquisition Tools Mature

- pvManager
- channelFinder
- Gather Framework
- pvAccess connects to V3 IOC
Services Maturity

- Remote-Procedure Call is ready
- Services being developed
- Relational DB service
- Model Service
- Framework coming.
Controls Record
Processing is pre-alpha

- No record types
- No drivers
- Other than that ready to use :-) 
- Opportunity for growth.

[Bar chart showing growth from Winter 2011 to Fall 2012 with 'Controls' indicated by purple]
Implementation scope

- All core (pvAccess, pvData, pvIOPC, pvService) have both Java and C++ bindings
- Python wrappers to user APIs
- Unix and Windows clients and servers
EPICS Version 4

This is the homepage of EPICS Version 4, a software toolkit for writing the control system and online scientific services of large experimental facilities.

EPICS is a set of Open Source software tools, libraries and applications developed collaboratively and used worldwide to create distributed soft real-time control systems for scientific instruments such as a particle accelerators, telescopes and other large scientific experiments.

What is EPICS Version 4?

EPICS Version 4 (V4) brings support for managed distributed data acquisition, service oriented architecture, and complex data structures to EPICS.

EPICS V4 is composed of a number of core standards and APIs, reference implementations of those standards in C++ and Java, plus associated other components and tools. The intention is for the standards and APIs to go through a public review process, leading to published protocols and APIs that may be independently implemented.
**FAQ**

**EPICS V4 FAQ**

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8. What relevance does this have to controls?
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11. Can I use EPICS V4 in a mixed environment with EPICS V3?
12. How does the pvAccess Server (PVAS) interface to an IOC?
13. What's the performance?

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1. **What is EPICS V4?**
   The components of EPICS V4 are pvData, pvAccess, pvIOC and pvServices. pvData is an object model and introspection API for memory-resident structured data with a defined serialization format. pvAccess is a network protocol transporting pvData and supporting put, get, publish-subscribe, and remote procedure call. pvIOC is database of records, where a record is a pvData object plus associated processing, and records can be linked together to support data-driven processing. A pvService is any service implemented using the pvAccess protocol, typically using the RPC method.

2. **What is the goal of the project?**
   The intention of version 4 was to create a new version of EPICS that allowed us to extend the data types on the wire and to create hierarchical records to better support devices and physics data constructs, in the distributed, robust, and high performance environment. The usefulness of hierarchical records became less clear, as over this period, the composite records such as EVG, EVR, and BPM in version 3 were not reused. Moreover, active work was done to remove the EVG and EVR records and use the basic record
EPICS v4 Working Group

EPICS v4 Working Group Home Page

EPICS v4 Working Group

This is the group home page of the EPICS v4 Working Group.

EPICS v4 is a set of computer communications protocols, and a software framework, for high performance distributed control, message passing, and high level software services, as may be used in large scientific instruments and industrial plants. EPICS v4 was previously called "PvData", hence the name of the sourceforge project.

The EPICS v4 working group is a collaborative effort of members invited by Brookhaven Lab, to bring EPICS v4 to its full potential. BNL and PSI support is subject to the EPICS v4 Charter.

Working Group Activity Status

Present Work

As of Status 6-Oct-2011 present work is concentrating on:

- Normative types. Definitions and binding implementations of the so called, normative types. These are the data types that it is expected all general purpose clients will understand, and it is encouraged that services and IOC applications should supply.
- First services, writing and deployment. In particular, a general relational database access service, and lattice modelling services are being actively developed
EPICS V4 Development Process

- EPICS version 4 Working Group
- Specifications and reference implementations
- Specification before code (if sensible)
- Developed in public
- Iteratively defined.
Iterative Refinement

1. Editor’s draft / prototypes
2. First Public Working Draft / beta
3. Other working drafts..., and eventually...
4. Last Call
5. Specification Standard & Reference Implementation
pvAccess (EPICS V4 CA)

- Specification at First Public Working Draft

- Implementation Status:
  - usable
  - largely conforming.
EPICS V4 Charter

Charter of the EPICS V4 Working Group

EPICS V4 Working Group, 15-Sep-2011

This version:  charter_15092011.html
Latest version: charter.html
Editors: Greg White, SLAC, PSI
Bob Dalesio, Brookhaven Lab

Abstract

EPICS V4 is a set of computer communications protocols, and a software framework, for high performance distributed control, message passing, and high level software services, as may be used in large scientific instruments and industrial plants. The EPICS V4 working group is a collaborative effort of members invited by Brookhaven Lab, to bring EPICS V4 to its full potential.

This Charter is a statement of the basis for the work of the of the EPICS V4 working group, the intended outcomes for that work, its deliverables and success criteria. It also outlines some administrative matters of the organization of the group, and its working practices.

For more information about the EPICS, please refer to the home page of the Experimental Physics and Industrial...
6. Deliverables and Duration

The outputs of the working group will be delivered as a system of documented standards, plus reference implementation source code where relevant. These documents and source codes will all be available from the EPICS V4 website, http://epics-pvdata.sourceforge.net/.

6.1 Deliverables

The group is expected to produce the following normative deliverables:

1. A normative document of the pvAccess protocol
2. A normative document of the pvData protocol. The data in pvData will be represented as a programmer creates data objects for the wire, and extracts them on the other side
3. A normative document of the EPICS V4 IOC processing pipeline
4. A reference implementation of pvAccess in each of C++ and Java language bindings
5. A reference implementation of pvData in each of C++ and Java language bindings
6. A reference implementation of the EPICS V4 IOC in each of C++ and Java language bindings. The Java version has high priority
7. A normative document of the EPICS V4 interoperable services. The services must be understood by every client and service which claims EPICS V4 compatibility. This deliverable must be distinct from the pvData document deliverable, since pvData can encode any type, this deliverable recommends the confined set of data objects that will be used by EPICS V4 interoperable services
8. A directory service accessible through the EPICS V4 API itself, from which can be found at least PV and entity names, and associated service names
9. A normative document of the EPICS V4 services API. This defines the form for encoding parameters and status descriptions between clients and services and back
10. A report of interoperability of the EPICS V4 IOC with EPICS v3 record processing
11. A performance report, comparing EPICS v3 to EPICS V4 for some common EPICS v3 control and read tasks, plus report of the expected performance of EPICS V4 service support. For instance, round trip time for network encoding/deserialization of results of 4 or 5 common service queries such as archive data, orbit data, whole beamtime model etc. Comparisons to at least 2 other common high performance data interconnects should be made, eg ICE, ASN.1, EXI Web Service.
12. A "Getting Started" document for EPICS V4 Service developers
14. A Programmers Guide for EPICS V4 protocol implementers (for developing implementations of pvAccess, pvData or pvIOC)
15. A command line tool similar to caget (call it say pvget), which understands all the interoperable data types above, and conforms to the EPICS V4 services API above.
## Membership

The EPICS v4 Working group presently has the following members:

<table>
<thead>
<tr>
<th>Name</th>
<th>Member Organisation</th>
<th>Status</th>
<th>Interests</th>
<th>Charter Deliverables</th>
<th>Scribe date</th>
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<tbody>
<tr>
<td>Gabriele Cerassi</td>
<td>BNL</td>
<td>Participant</td>
<td>General purpose services, client tools and their interoperability, such as PvManager, BOY, ChannelFinder, and data types</td>
<td>Directory Service specification, Directory Service implementation and pvlist tool, Interoperable Data Types specification, pvget, pvput, pvmonitor command line tools, pvManager</td>
<td>7/Sep/2011</td>
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<tr>
<td>Daron Chabot</td>
<td>BNL</td>
<td>Observer</td>
<td></td>
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<tr>
<td>Bob Dalesio</td>
<td>BNL</td>
<td>Participant, co-chair</td>
<td>Core architecture for control, administration</td>
<td>Money</td>
<td>14/Sep/2011, 22/Sep/2011</td>
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<tr>
<td>Michael Davidsaver</td>
<td>BNL</td>
<td>Observer</td>
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<tr>
<td>Timo Komonen</td>
<td>PSI</td>
<td>Observer</td>
<td>Services for physics.</td>
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<tr>
<td>Ralph Lange</td>
<td>HZB</td>
<td>Observer</td>
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<tr>
<td>Nikolay Malitsky</td>
<td>BNL</td>
<td>Participant</td>
<td>Archiver, IOC, physics, physics.</td>
<td>pvIOC Implementations, Archive service</td>
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<tr>
<td>James Roland</td>
<td>Diamond</td>
<td>Participant</td>
<td>CSS/BOY client side for EPICS v4.</td>
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<tr>
<td>Matej Sekomaja</td>
<td>Cosylab</td>
<td>Participant</td>
<td>Core architecture, protocol standards and C/C++ implementations of standards.</td>
<td>pvAccess Specification, pvAccess implementations, pvData implementations, pvIOC implementations</td>
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<tr>
<td>Guobao Shen</td>
<td>BNL</td>
<td>Participant</td>
<td>Services for physics.</td>
<td>Performance Report</td>
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<tr>
<td>Kunal Shroff</td>
<td>BNL</td>
<td>Participant</td>
<td>General purpose services, client tools and their interoperability, such as PvManager, ChannelFinder, data types.</td>
<td>Directory Service specification, Directory Service implementation and pvlist tool</td>
<td></td>
</tr>
<tr>
<td>Greg White</td>
<td>PSI, SLAC</td>
<td>Participant, co-chair</td>
<td>Core architecture for services, Services architecture, model service</td>
<td>Interoperable Data Types specification, Services API Specification, Getting Started documentation</td>
<td></td>
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<tr>
<td>Ernest Williams</td>
<td>SLAC</td>
<td>Observer</td>
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Useful things

- Help code for full implementations
- HTTPXMLRequest object - AJAX
- Compression
- CA Client side
- Write Services!
- Implement Normative Type helper classes
- ...
Conclusions

- I think it’s real
- Different parts are at different maturities
- Large coordinated acquisition is ready
- Services support is ready
- Brilliant people
- Barriers being removed
- Collaboration Process => Indicates success
- PSI SwissFEL should use it
- AIDA should be reimplemented.