

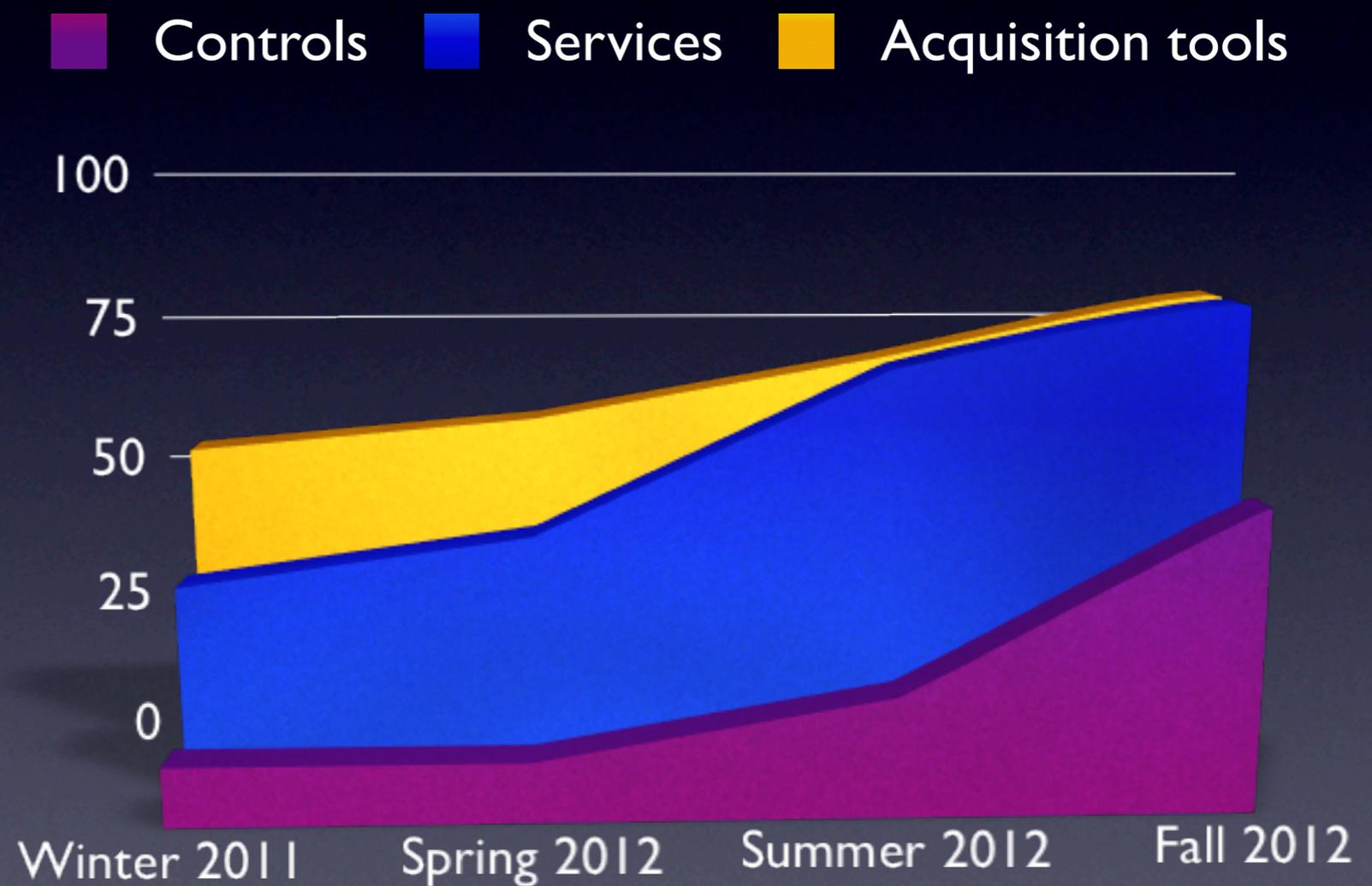
EPICS V4 Roadmap

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

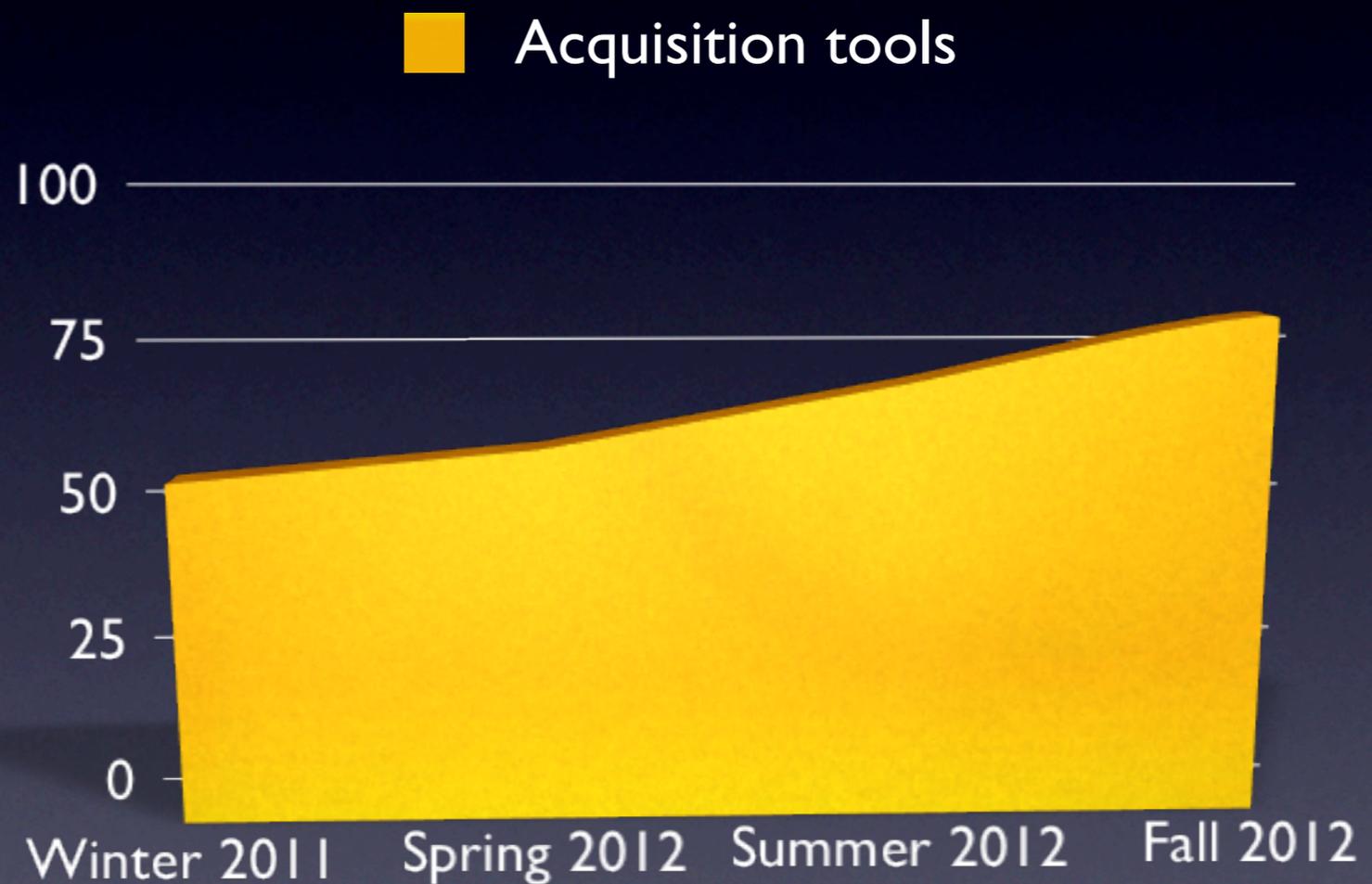
What's Ready to Use

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



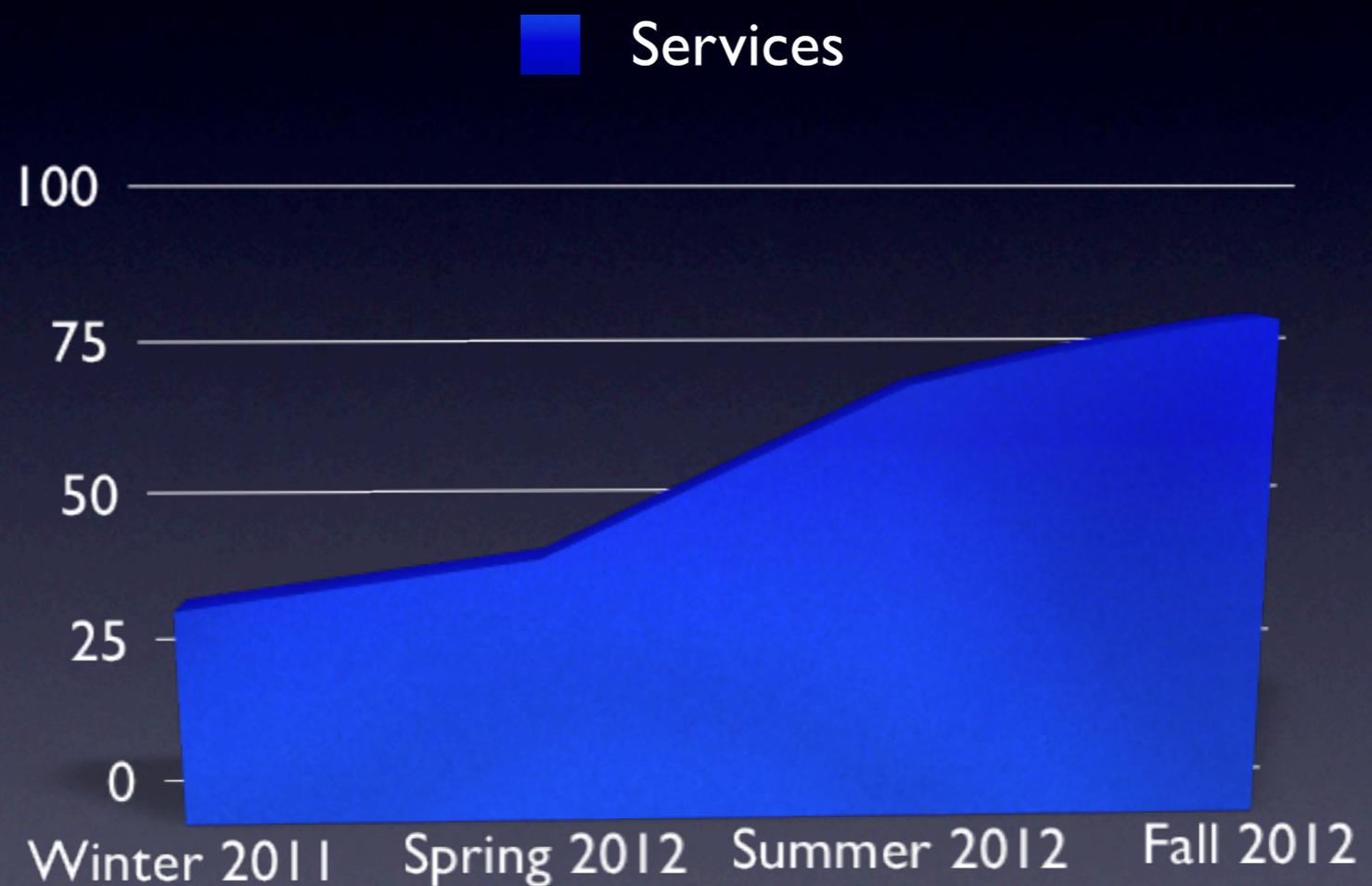
Acquisition Tools Mature

- 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.

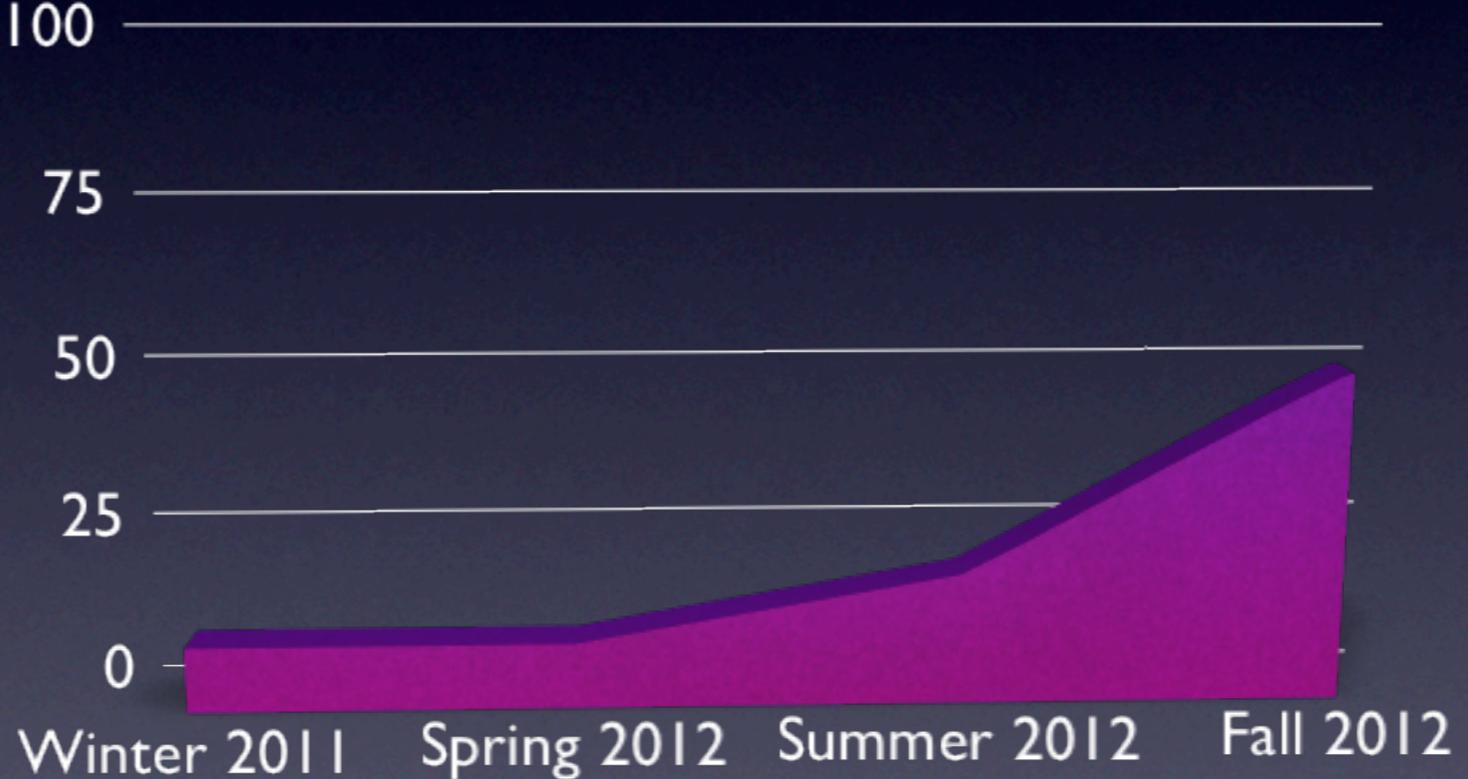


Controls Record

Processing is pre-alpha

■ Controls

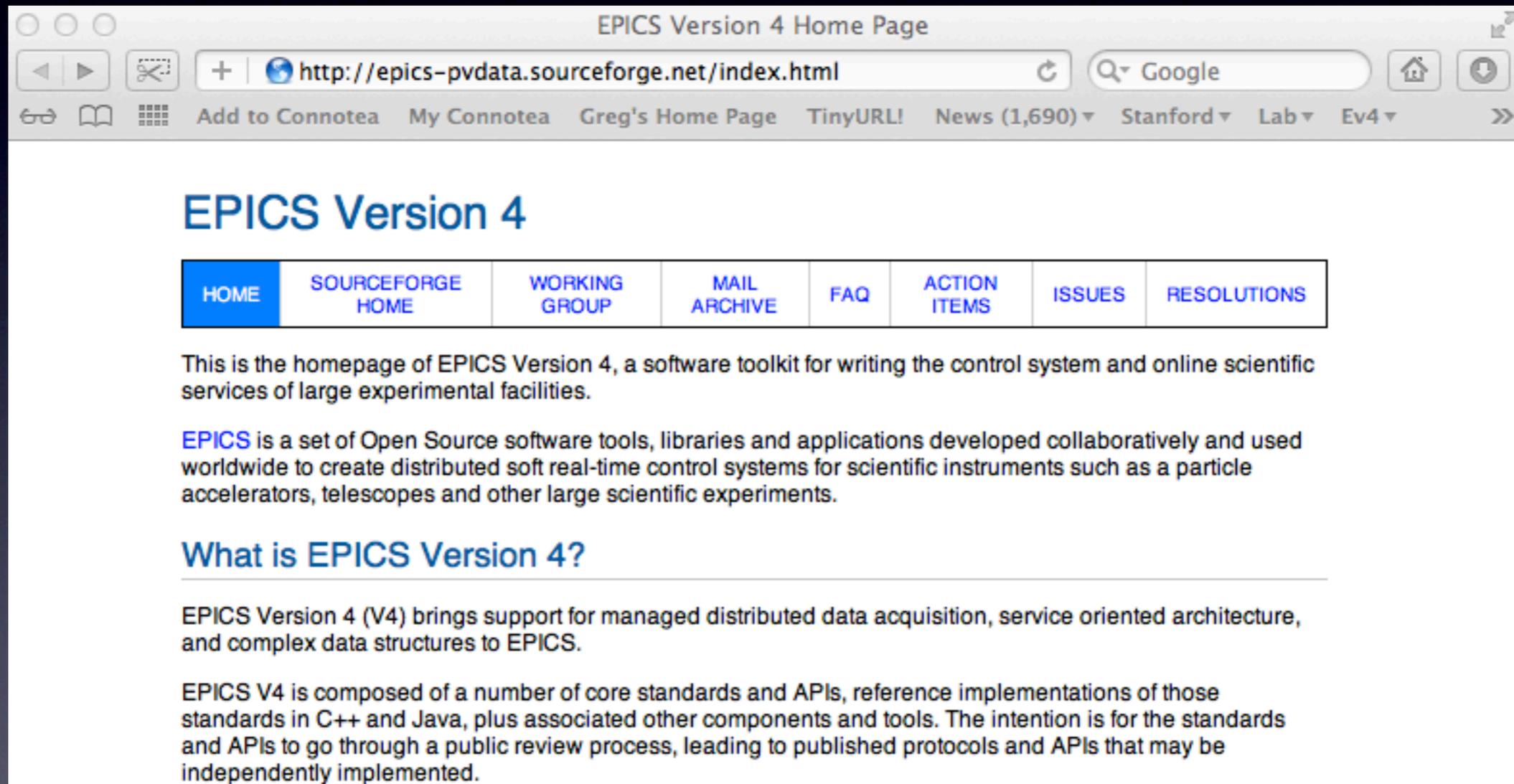
- No record types¹⁰⁰
- No drivers
- Other than that ready to use :-)
- Opportunity for growth.



Implementation scope

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

Home



The image shows a screenshot of a web browser displaying the EPICS Version 4 Home Page. The browser's address bar shows the URL <http://epics-pvdata.sourceforge.net/index.html>. The page title is "EPICS Version 4 Home Page". Below the browser window, the page content includes a navigation menu with links for HOME, SOURCEFORGE HOME, WORKING GROUP, MAIL ARCHIVE, FAQ, ACTION ITEMS, ISSUES, and RESOLUTIONS. The main content area contains a paragraph describing EPICS Version 4 as a software toolkit for writing control systems and online scientific services. It also includes a section titled "What is EPICS Version 4?" which explains that EPICS V4 supports managed distributed data acquisition, service-oriented architecture, and complex data structures, and is composed of core standards and APIs in C++ and Java.

EPICS Version 4

HOME	SOURCEFORGE HOME	WORKING GROUP	MAIL ARCHIVE	FAQ	ACTION ITEMS	ISSUES	RESOLUTIONS
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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

http://epics-pvdata.sourceforge.net/faq.html#entry11

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EPICS V4 FAQ

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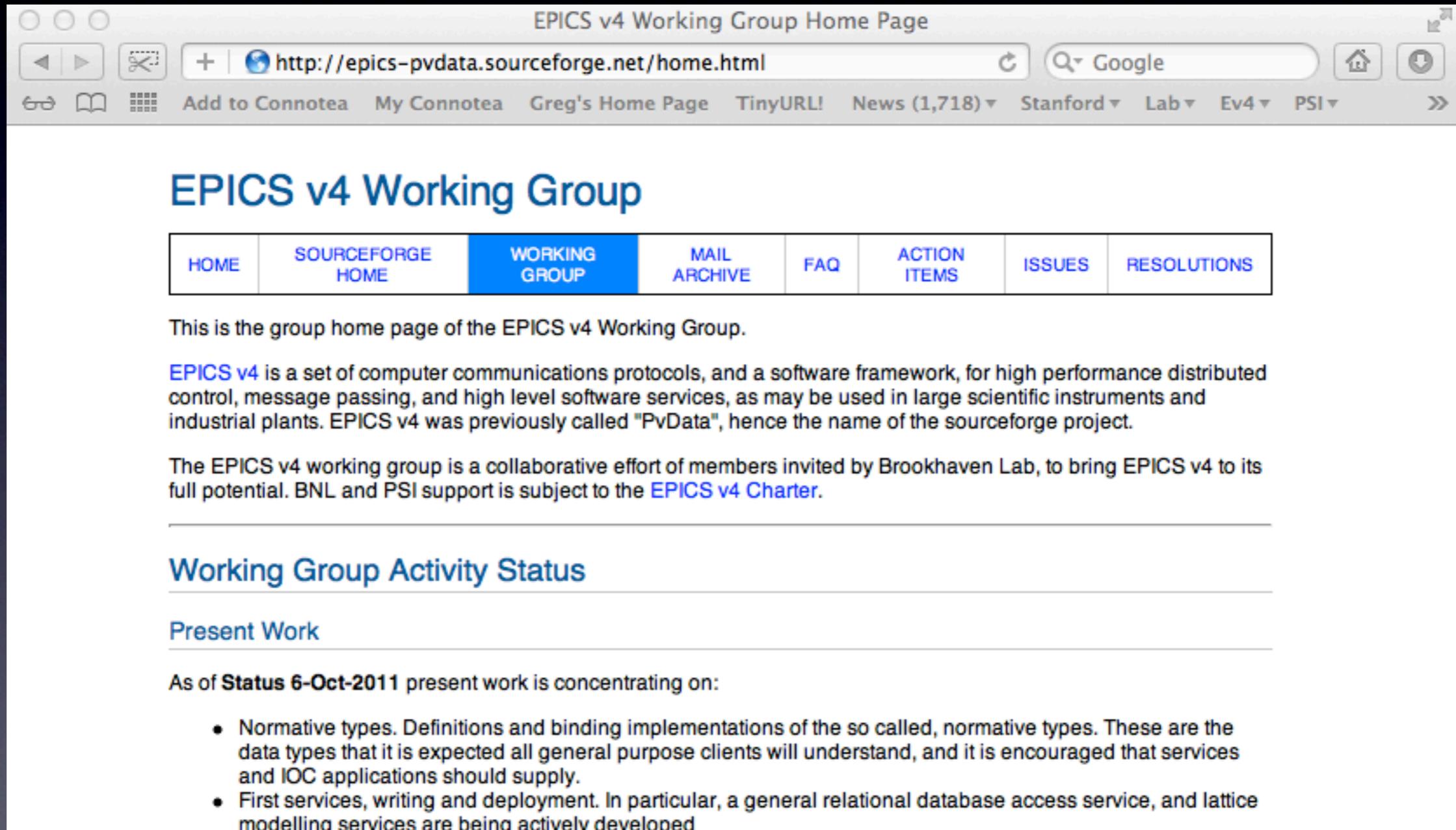
- [1. What is EPICS V4?](#)
- [2. What is the goal of the project?](#)
- [3. What is the implementation language?](#)
- [4. What platforms are supported?](#)
- [5. What is the top to bottom architecture of an EPICS V4 system?](#)
- [6. What's going to be different from EPICS V3?](#)
- [7. Do I have to re-write drivers?](#)
- [8. What relevance does this have to controls?](#)
- [9. How does it work with the EPICS display tools, DM, EDM, CSS etc?](#)
- [10. What's the relationship of EPICS V4 to channel access?](#)
- [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?](#)

- 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



The image is a screenshot of a web browser displaying the EPICS v4 Working Group Home Page. The browser's address bar shows the URL <http://epics-pvdata.sourceforge.net/home.html>. The page title is "EPICS v4 Working Group Home Page". The browser's search bar contains "Google". The browser's bookmark bar includes "Add to Connotea", "My Connotea", "Greg's Home Page", "TinyURL!", "News (1,718)", "Stanford", "Lab", "Ev4", and "PSI".

EPICS v4 Working Group

HOME	SOURCEFORGE HOME	WORKING GROUP	MAIL ARCHIVE	FAQ	ACTION ITEMS	ISSUES	RESOLUTIONS
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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.

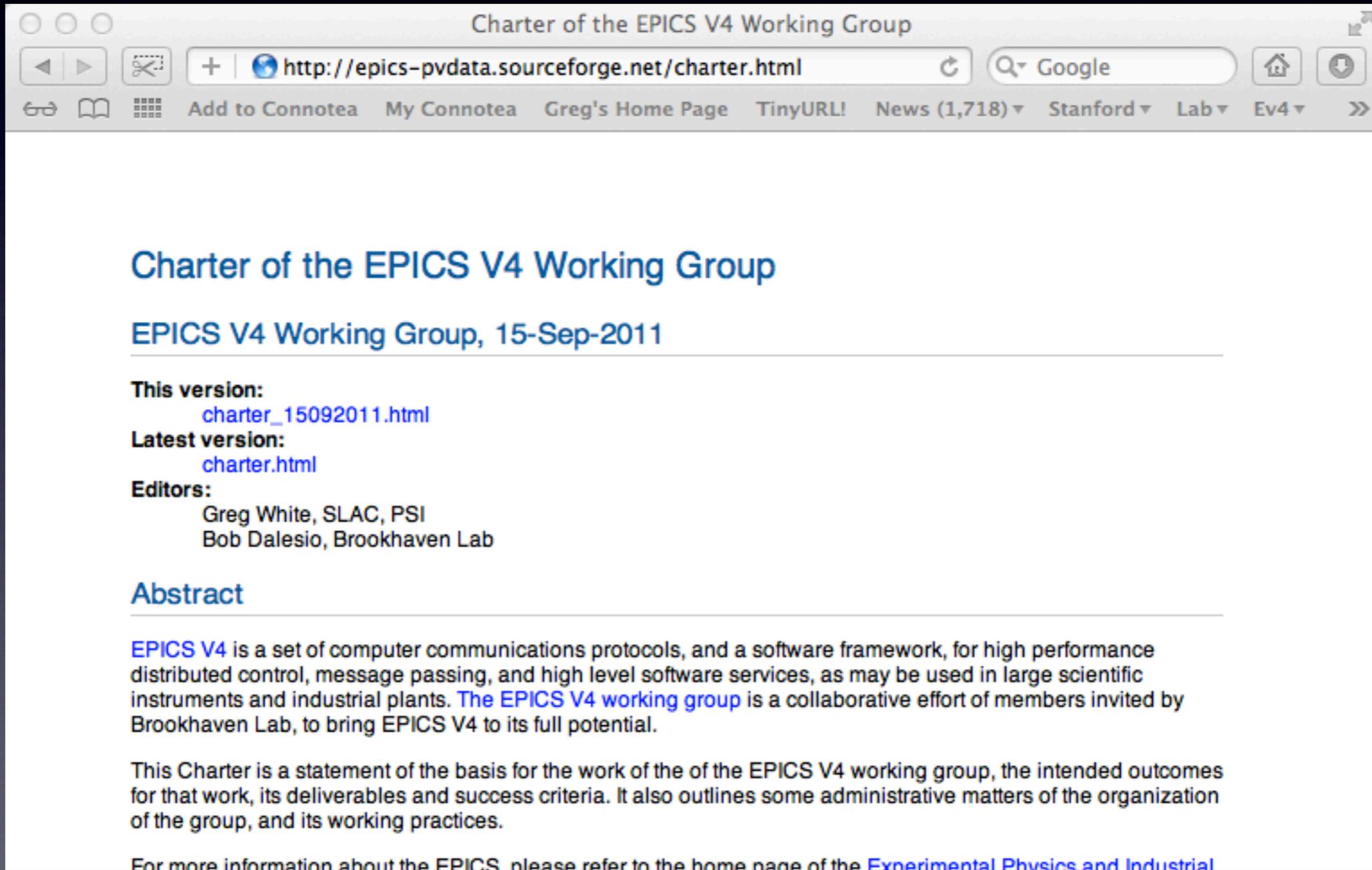
Iterative Refinement

1. Editor's draft / protoypes
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
- http://epics-pvdata.sourceforge.net/pvAccess_Protocol_Specification.html
- Implementation Status:
 - usable
 - largely conforming.

EPICS V4 Charter



The image is a screenshot of a web browser window. The title bar reads "Charter of the EPICS V4 Working Group". The address bar shows the URL "http://epics-pvdata.sourceforge.net/charter.html". The browser's toolbar includes navigation buttons (back, forward, home, refresh), a search box with "Google" text, and a menu bar with items like "Add to Connotea", "My Connotea", "Greg's Home Page", "TinyURL!", "News (1,718)", "Stanford", "Lab", and "Ev4".

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 web site, <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 document must include the user API, how 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 data types. These data types must be universally understood by every client and service which claims EPICS V4 compatibility. The requirement for this deliverable is 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 beamline 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
13. A User Guide for EPICS V4 IOC control application 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.
16. A normative document of the EPICS V4 Directory Service function, API, and unix command line tool.
17. A reference implementation of the EPICS V4 Directory Service.

pv* Specifications and Implementations

Normative Types

Membership

The EPICS v4 Working group presently has the following members:

Name	Member Organisation	Status	Interests	Charter Deliverables	Scribe date
Gabriele Carassi	BNL	Participant	General purpose services, client tools and their interoperability, such as PvManager, BOY, ChannelFinder, and data types	Directory Service specification , Directory Service implementation and pvlist tool , Interoperable Data Types specification , pvget , pvput , pvmonitor command line tools, PvManager	7/Sep/2011
Daron Chabot	BNL	Observer			
Bob Dalesio	BNL	Participant, co-chair	Core architecture for control, administration	Money	14/Sep/2011, 22/Sep/2011
Michael Davidsaver	BNL	Observer			
Timo Korhonen	PSI	Observer	Services for physics.		
Marty Kramer	BNL	Participant	Core architecture, protocol standards and Java implementations of standards.	pvData Specification , IOC Pipeline Specification , pvAccess Implementations , pvData Implementations , pvIOC Implementations , EPICS v3 to EPICS v4 Interoperability report , Controls Application Developers Guide , Protocol Developers Guide	
Ralph Lange	HZB	Observer			
Nikolay Malitsky	BNL	Participant	Archiver, IOC, physics	pvIOC Implementations , Archive service	
James Roland	Diamond	Participant	CSS/BOY client side for EPICS v4.		
Matej Sekomaja	Cosylab	Participant	Core architecture, protocol standards and C/C++ implementations of standards.	pvAccess Specification , pvAccess implementations , pvData implementations , pvIOC implementations	
Guobao Shen	BNL	Participant	Services for physics.	Performance Report	
Kunal Shroff	BNL	Participant	General purpose services, client tools and their interoperability, such as PvManager, ChannelFinder, data types.	Directory Service specification , Directory Service implementation and pvlist tool	
Greg White	PSI , SLAC	Participant, co-chair	Core architecture for services, Services architecture, model service	Interoperable Data Types specification , Services API Specification , Getting Started documentation	
Ernest Williams	SLAC	Observer			

Useful things

- Help code for full implementations
- XMLHttpRequest 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.**