Diamond Light Source

what is EPICS?

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Harwell Software Engineering Community
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What is EPICS
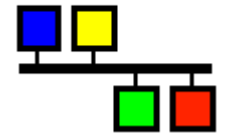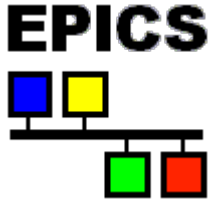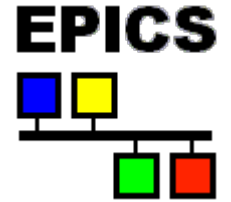
What is EPICS

Introduction – What is Diamond?

- UK's national synchrotron science facility on the Harwell Campus
- Electron storage ring with an energy of 3 GeV, 562m circumference
- Three accelerators:
    - 100 MeV Linac (including electron gun)
    - 100 MeV to 3 GeV Booster Synchrotron
    - 3 GeV Storage Ring
- Generates synchrotron light from Hard X-rays to far infrared
- > 30 operational beamlines

What is EPICS

What is EPICS?

- It's a SCADA* system
- It's a DCS**
- It's a User Front End
- It's a software toolkit
- It's a Collaboration

*Supervisory Control And Data Acquisition
**Distributed Control System

What is EPICS

What is the Problem it helps us solve?

Large science facilities are spread over a wide geographic area, Diamond has a 562m Storage Ring for instance.

It is necessary to control many remote systems and their associated instruments from one or more locations such as:
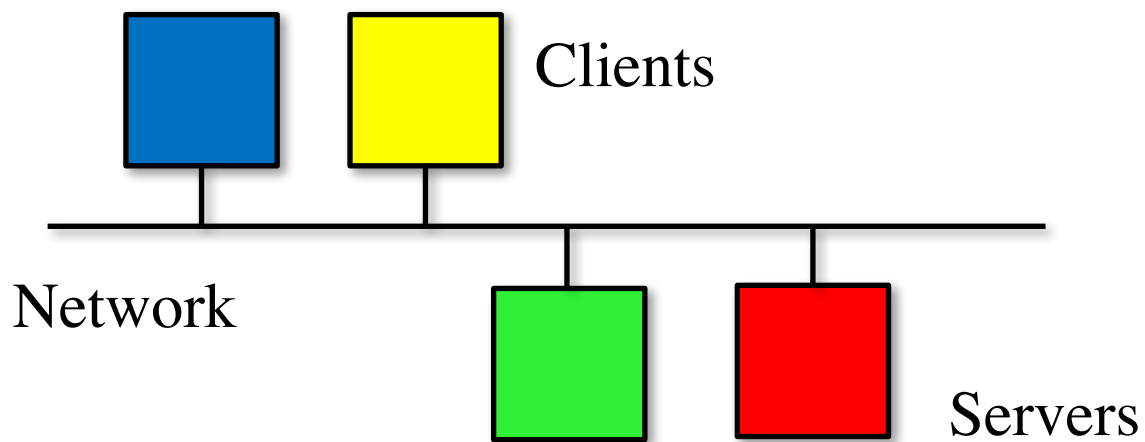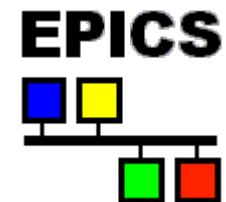
- Vacuum
- RF
- Front-ends
- Magnet power supplies
- Diagnostics
- Insertion Devices
- PSS (Personnel Safety System)
- MPS (Machine Protection System)
- Motion systems
- …

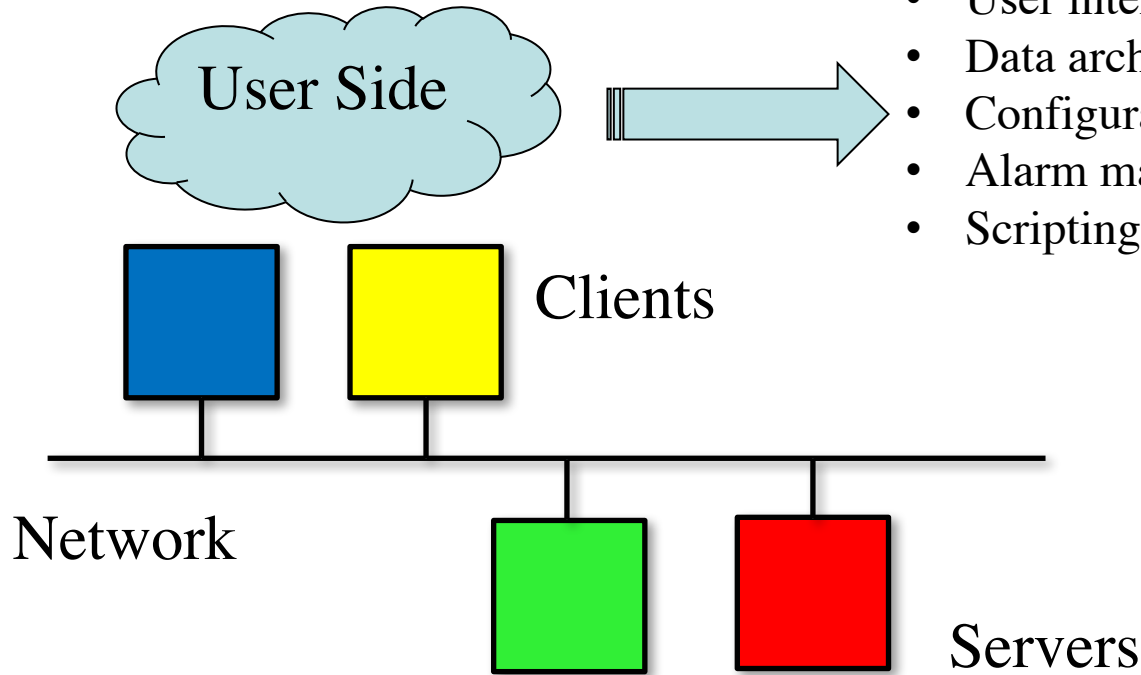It would be nice to have a single common interface to all of these.

What is EPICS

It's all about Clients and Servers

EPICS

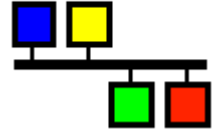Clients

Network
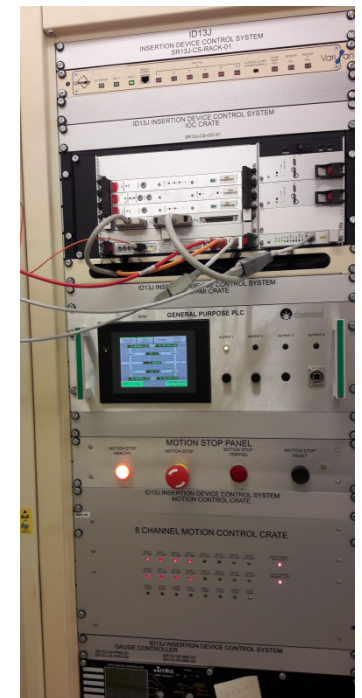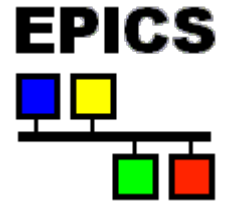
Servers

What is EPICS

It's all about Clients and Servers

EPICS

User Side
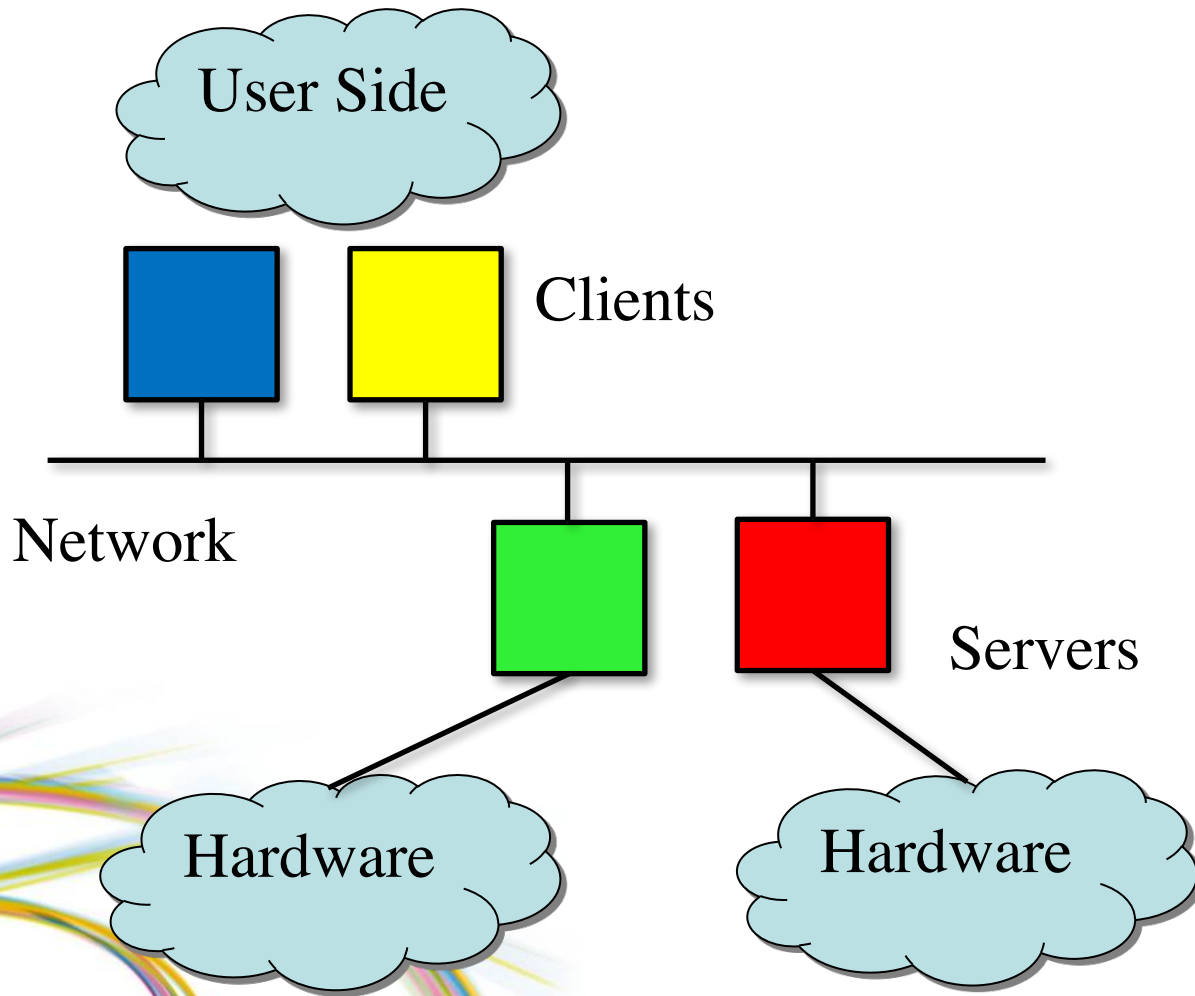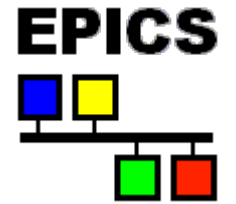
- User interfaces ~ GUIs
- Data archiving
- Configuration control
- Alarm management
- Scripting & Automation

Clients

Network

Servers

diamond

What is EPICS

It's all about Clients and Servers

EPICS

User Side

Clients

Network

Servers

Hardware

Hardware

diamond

What is EPICS

It's all about Clients and Servers

EPICS

User Side
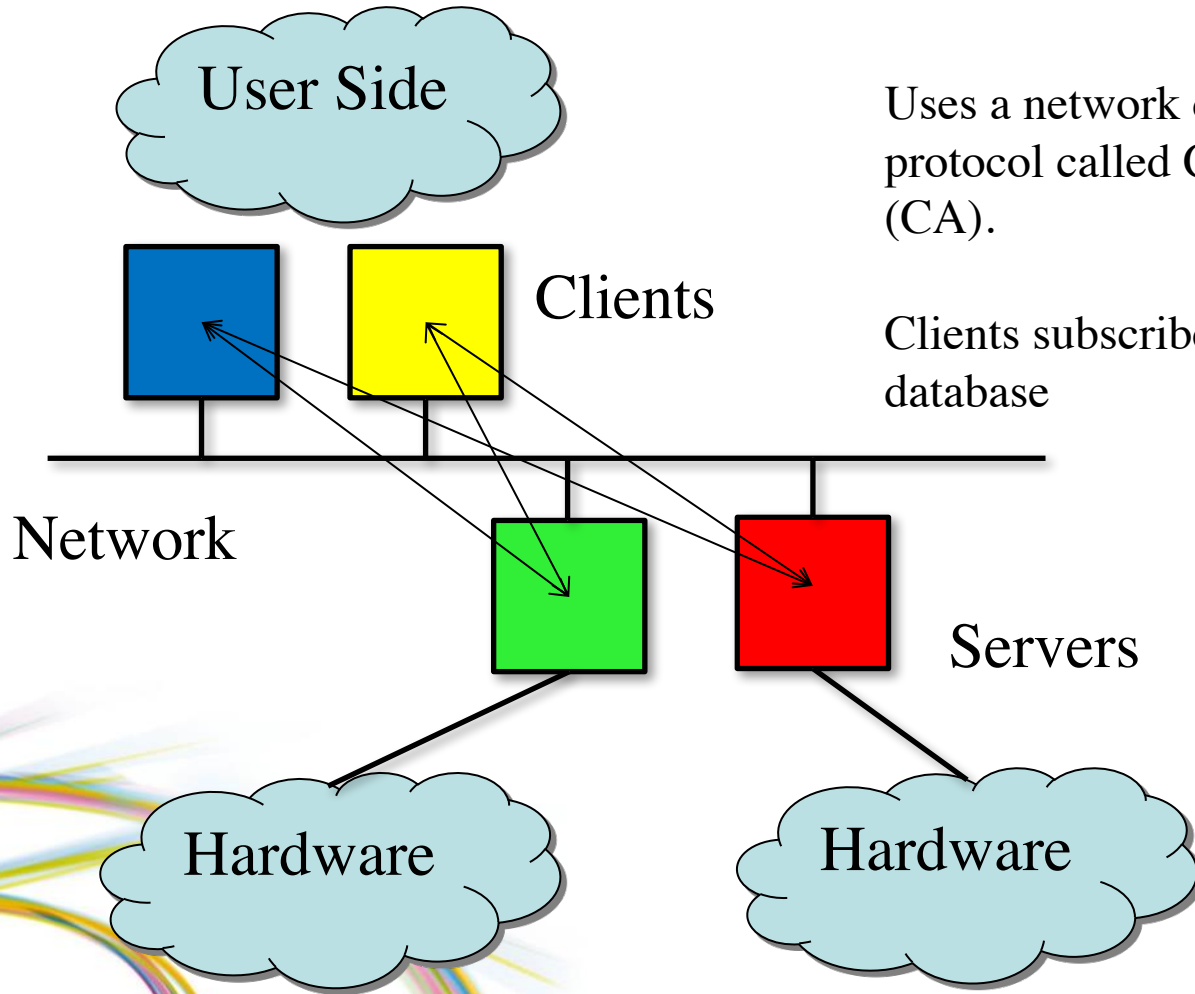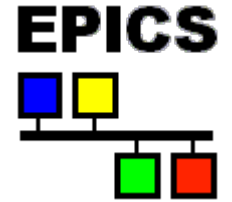
Clients

Uses a network communication protocol called Channel Access (CA).

Clients subscribe to the Server database

Network

Servers

Hardware

Hardware

diamond

What is EPICS

It's all about Clients and Servers

EPICS

User Side

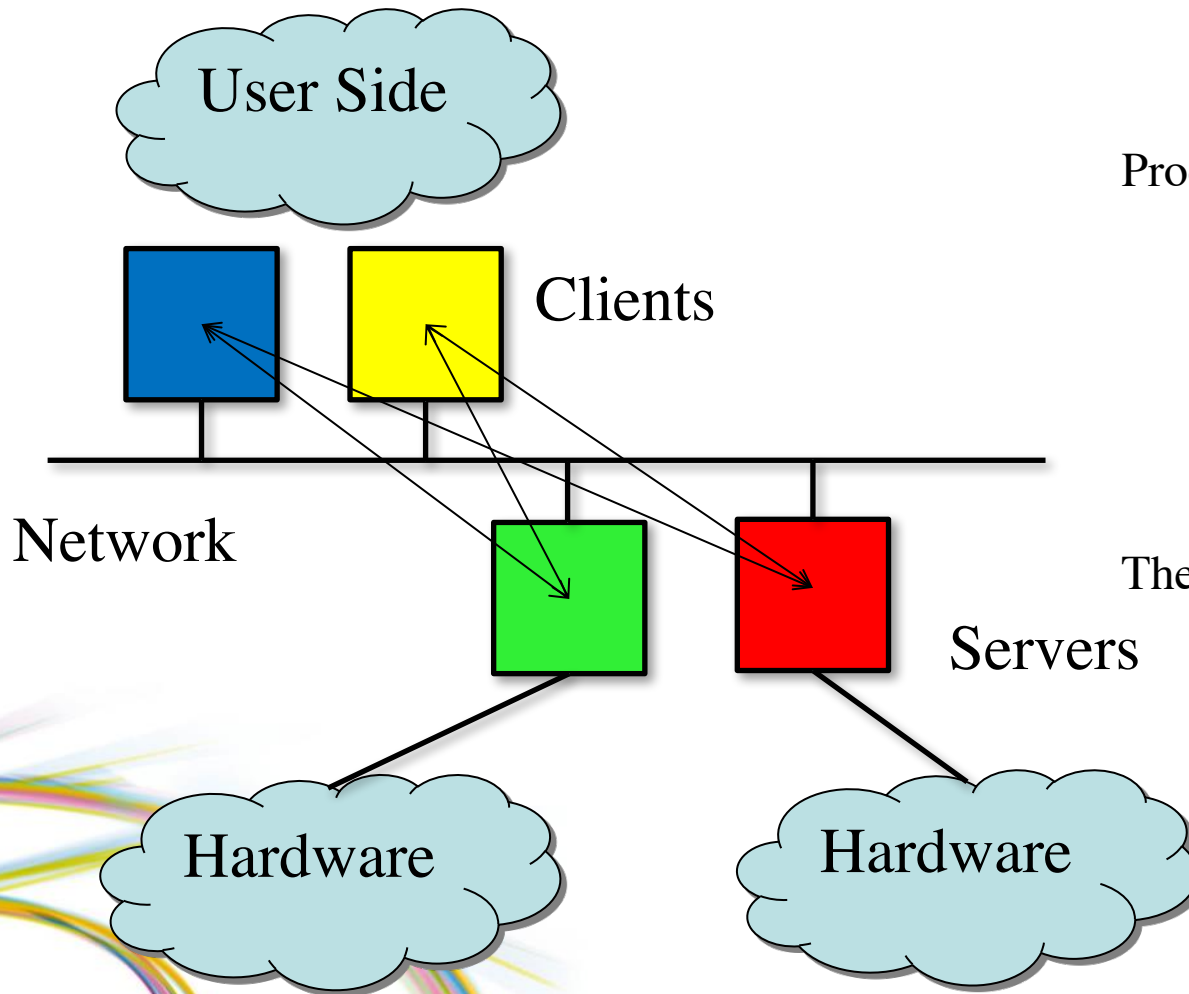Clients

Network

Servers

Hardware

Hardware
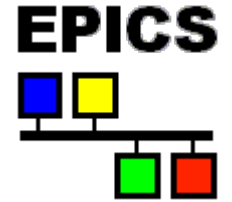
Process Variables (PVs) contain:
    Value
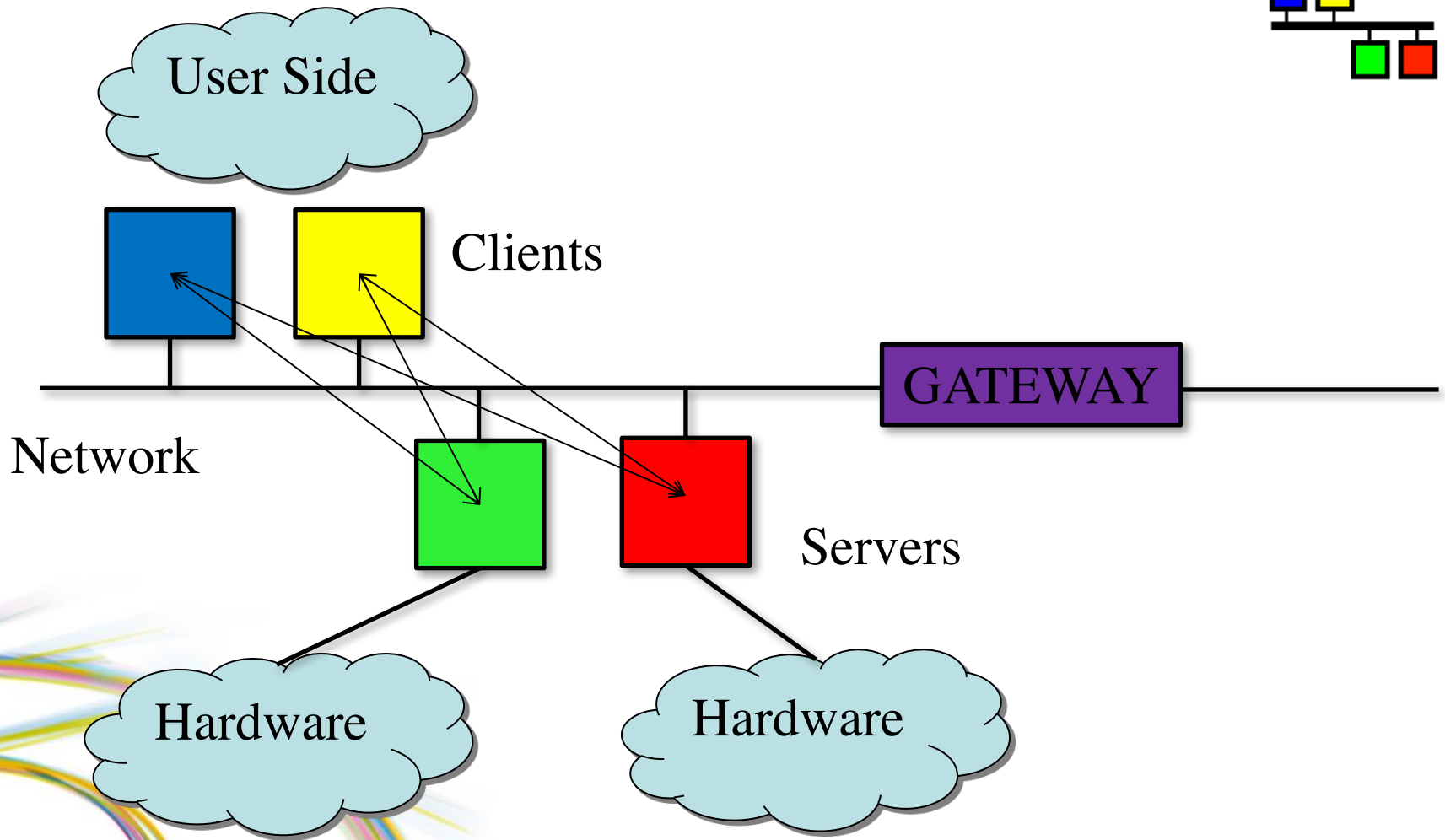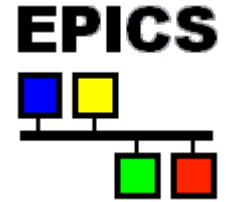   Units
    Alarm Values
    Limits
    …

There are different types of PVs:
    Analog in/out
    Digital in/out
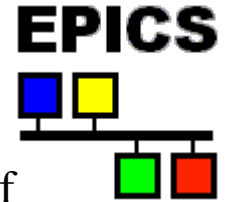   More complex types

diamond

What is EPICS

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EPICS

User Side

Clients

Network

GATEWAY

Servers

Hardware

Hardware

diamond

What is EPICS

Why is it a Software toolkit?

- Embed processing within the server to interface to specific types of field equipment / hardware / instruments

- Also implement logic within the server to automatically process data coming from the field equipment or from client (user) interface requests

- Can write client software (python scripts for instance) that can use CA to access process variables

What hardware can I use?

- Windows and Linux based Client and Servers
- VME Servers

- Drivers already available to interface to a vast collection of instruments

What is EPICS
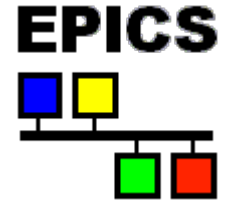
Summary:

- It's a SCADA system
- It's a DCS
- It's a User Front End
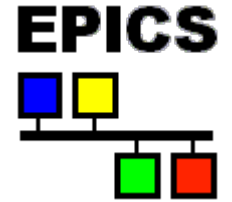- It's a software toolkit
- It's a Collaboration

- It uses a client-server architecture using a Channel Access protocol for communicating across a network.

- It allows programming at the client and server level.

- It works reliably and is in use at many scientific facilities around the world.

- It is supported by a strong collaboration

Thank you for listening.

Here are some links:

https://epics.anl.gov/index.php

https://epics.anl.gov/docs/AES2013/01-Intro.pdf

https://confluence.aps.anl.gov/display/SSG/EPICS+Training+2014

https://confluence.aps.anl.gov/display/SSG/EPICS+Training+2015