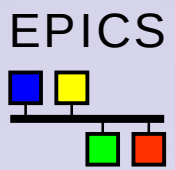

DIAMOND Control System to the EPICS Meeting at San Jose Dec 2001

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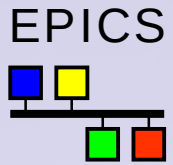
DIAMOND Control System
EPICS Meeting San Jose Dec 2001

What Is DIAMOND?



- DIAMOND is the new UK Synchrotron Radiation Source
- To be Located at the Rutherford Appleton Laboratory (RAL) Oxfordshire
- Medium energy source
- Complement ESRF
- Due online around 2007

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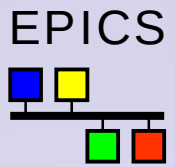
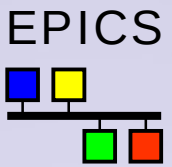
Programme Plan



- Prepare specification — June 00 to Mar 01
- Start formal design phase — Nov 2000
- Start procurement — April 2002
- Final installation — April 2006
- Commission beamlines — April to Sept 2006

- Seven ‘Day 1’ beamlines then 2 or 4 beamlines per year

Major Parameters



• Energy	3 GeV
• Beam current	300 mA
• Lattice	DBA 24cells
• Symmetry	6 fold
• Circumference	561 m
• Max length for ID's	18 x 5m
	6 x 8m
• Injection	100Mev Linac
	3GeV Booster

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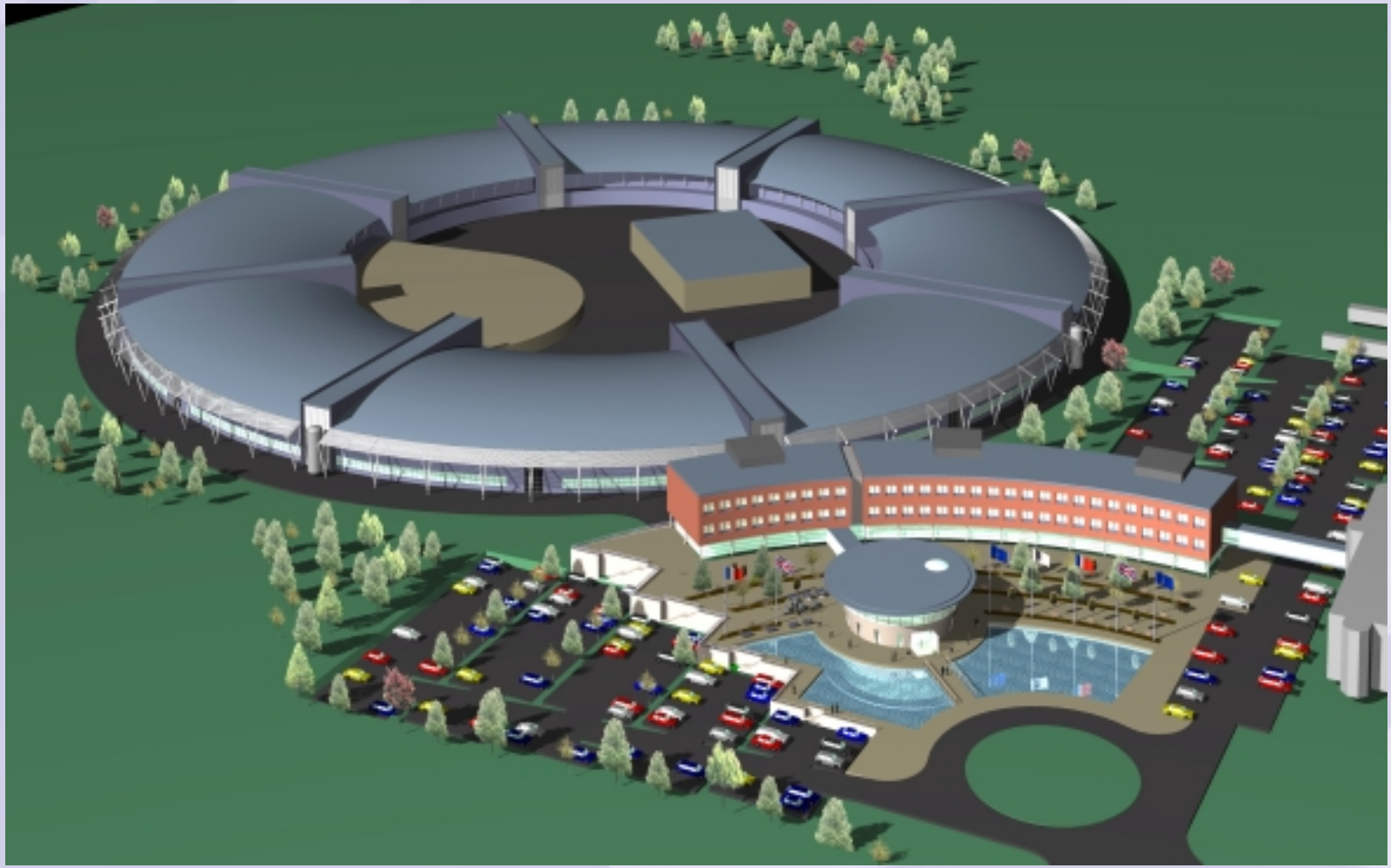
Artists Impression



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Architecture

- **Two Layer Model**

  Primary interface to CS through VME System

- **No field bus to third layer**

  There will be FBs to instruments and some PLCs

- **Interlocking and some sequencing in PLCs**

  Enable easier soft restarting of IOCs without loss of beam

Hardware

- **Consoles**
  - Either PCs Running Linux or Workstations
    - Evaluating both, decision 2003/2004
  - Will support NT
- **IOCs**
  - VME64X
  - PPC Processor boards
    - Select processor 2002/2003
  - Will use IP carrier and modules
  - Primarily 7 slot crates

Initial Assessment of IOCs

IOCs	Linac	Tx Paths	Booster	SR	BLs (7)
Main Magnets		1	1	25	
Steering Magnets		1	1	24	
RF	1		2	5*	
Vacuum	1	2	4	48	7
Diagnostics	1	2	4	25	
Pulsed PSUs			1	1	
Personnel Safety	1**			2	2
Vessel Prot + Loss Mons				24	
Rad. Monitors	1**			2	2
IDs or Motors				7	7
Misc				5	2
TOTALS	5	6	13	168	20

* LL RF, Cavites, Amplifiers, PSUs and Cryo plant

** Linac, Booster and Tx Paths

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Interface

- **Options for IF to Technical systems**

  Quads and Sext : Serial or SNS Power Supply Controller

  Steerer : DAC, ADC, DIO

  Vac and most instrumentation: Serial

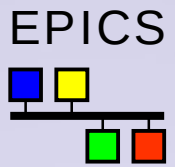
  PLCS : field bus (undecided)

  EBPMs : VME backplane or ADCs and DIO

  Sub Systems: OPC or field bus

- **The break down gives around 2000 serial interfaces**

Serial Interfaces



- **Need to support Serial Interfaces to equipment**
- **Advantages are**
  - Increased functionality per connection
  - Minimises calibration errors from control system ADCs
  - Widely accepted use of RS232,422 etc
  - Integration of systems
  - Faster commissioning
- **Disadvantages are**
  - High processor load
  - Development to support vendor protocols
  - Also need hardwire analogue for fast logging and digital signals for Interlocks

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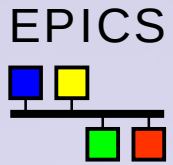
Evaluating Serial Options



- **Use Octal232, DRVIPAC for interface**
- **Three options evaluated**

  Dev/DrvAscii, Stream Device and MPF Serial
- **All worked**

  Dev/DrvAscii, Stream Device had limitations with some protocols ie checksums

  MPF very powerful but high development overhead
- **Further work**

  ORNL Serial Software
- **Thanks to EPICS community support**

  Allan Honey, Dirk Zimoch, Mohan Ramanathan and others

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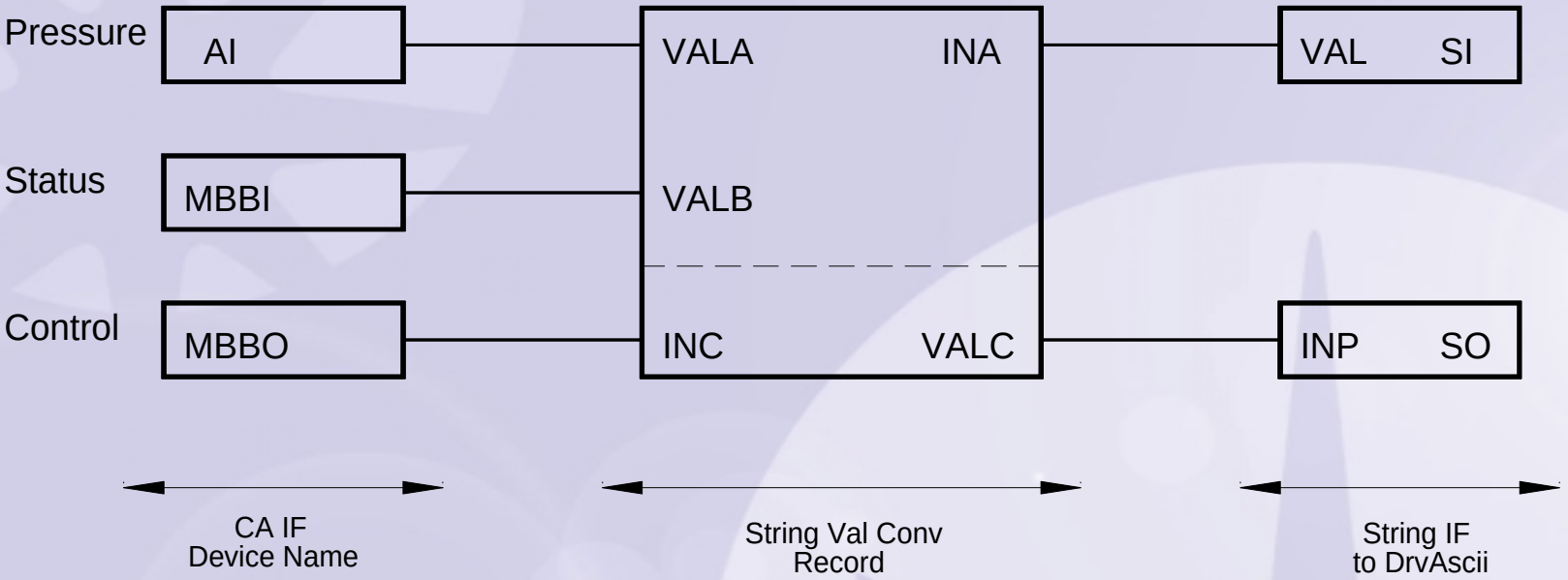
One Possible Serial Solution



- **Use a customer record (Gensub)to generate and process strings to communicate with Instrument.**
- **Use drvAscii to handle string communication.**
- **Use separate AI and MBBI and MBBO soft records as the interface if needed.**

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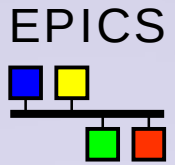
Applications



- **Principal application requirements can be met through standard EPICS tools**

  Control panels: Medm
  Alarm management: ALH,
  Archiving: Channel Archiver
  Rapid app development : scripting languages

- **Develop standard app for viewing and controlling channels in tabular form and an application for sequencing the accelerators from one state to another ie start up and shutdown**

- **Need to integrate seamlessly other sources of information at the application level**

  RDB, Acc model and ????

Relational Database

- **DIAMOND control system *MUST* have a relational database**

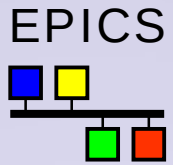
  Contain as Minimum the IOC DBs, Device names, and ???

- **Review other EPICS uses of RDB from June 2001**

  BESSY II, SLS, SNS

- **Define database, tools and processes for producing IOC DBs and importing exporting data to and from RDB**

Network



- **Network to 48 Control Instrumentation Areas (CIAs)**

  Single and multi mode fibres

- **Two physical computer networks**

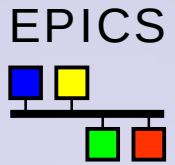
  Control system and other computers around the accelerator

- **Tree architecture**

  Central switch in control computer room with local switched in CIAs and Boot Servers for IOCs

- **Fibres also used for IOC crate monitor, Timing, Beam Position FB and Global interlocking**

Equipment Protection Policy



- **The control system will manage protection of equipment where required**
- **Give consistency of behaviour**
- **Three levels of protection determined by assessment of damage/cost caused by failure**

  High Integrity : provided in hardware

  Routine Interlocking : provided by PLCs

  Prudent Operational Limits : provided by IOC DBs

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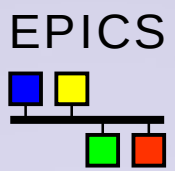

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