

# *Perspectives on Automation and Beamline Control at ESRF*

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## BL Control and H.R.:

### TBS / Experiments Division

BLISS / Software development and support

15.5

C.E. / Electronics development and support

8

SciSoft / Scientific Software

6

### Computing Services

Digital Electronics

6

System Admin and Networks

3

17

Software Engineering Group

2

8.5

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## BLISS

- 1 engineer time ( rough aprox.)
  - 2 Beamlines + specialist work
  - 50% development / 50% support
  - Standby service

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## BL Control System (current):

### ❖ Hardware

- ❖ VME (mainly) / Solaris+HP workstations

### ❖ Software

- ❖ Middleware (TACO)
- ❖ SPEC
- ❖ Graphical

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## Modernization

### ■ Keys:

- Rational distributed computing
- Linux
- Configure
- Automation



## Rational Distributed Computing

- ❖ Distribute more the non-critical components
  - ❖ WAGO, new motor driver
- ❖ Distribute less
  - ❖ Main Linux system with direct access to PCI, cPCI or VME

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## Modernization:

- Linux
  - cost-effective
  - full control on development
- Software
  - Configure don't program
  - Database / web services

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## Automation:

- ❖ Scripting ( at the control level )
- ❖ Integration ( database within control system design )
- ❖ Hardware choices are important ( fast scans, sample changer...)
- ❖ Intelligent algorithms and expert systems (ABA)
  - ❖ Need access to information
  - ❖ Diagnostics and alarms must be integrated in the control system
- ❖ State of the art user interfaces ( both graphical and web )



## Automation

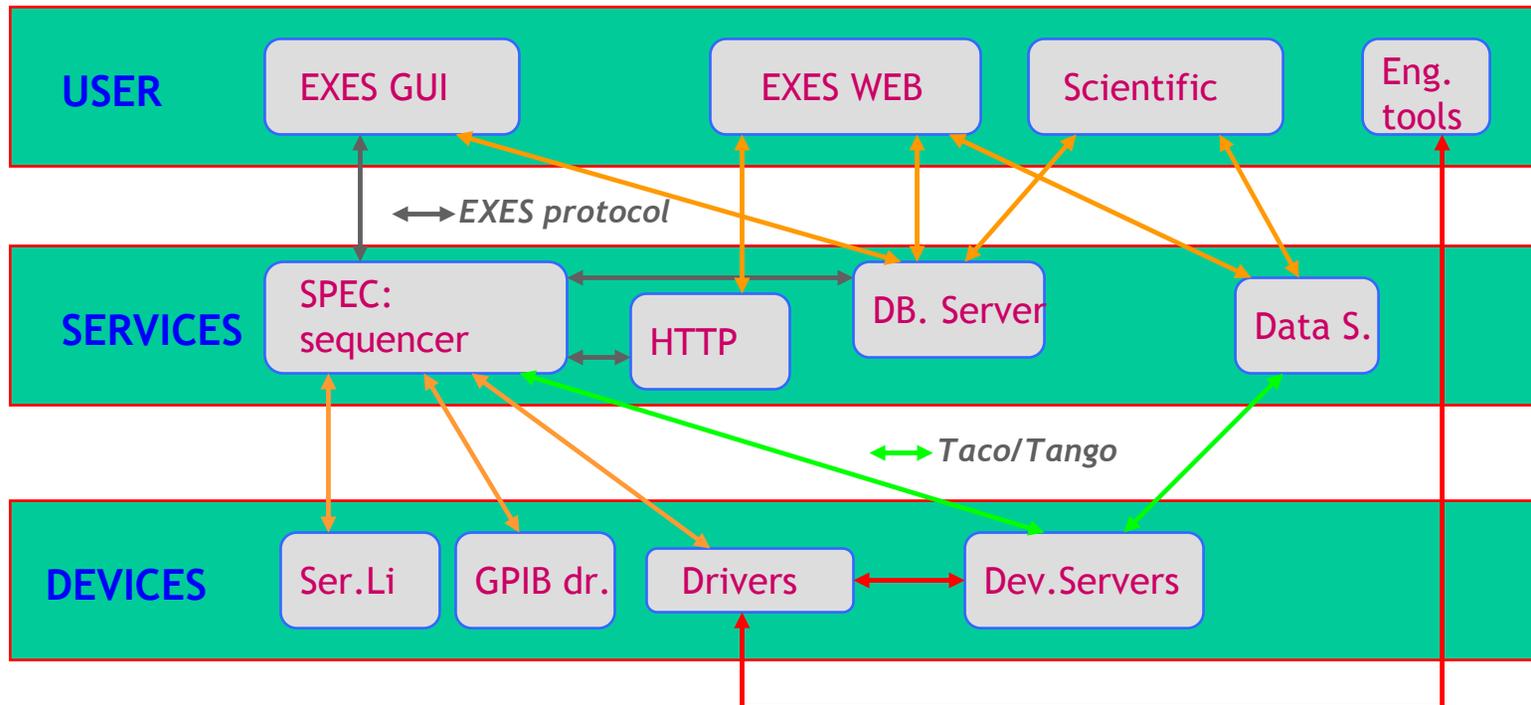
- ❖ Medical beamline (reliable)
- ❖ Industrial beamline (medea)
  - ❖ silicon wafer quality test ( operator driven)
- ❖ High-throughput protein crystallography
  - ❖ Automation at its best

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## Control System flow (ID23):



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## Results:

- ❖ Higher performance
  - ❖ from 3ms to 50 $\mu$ s or 150 $\mu$ s
  - ❖ zapscan with 10000 points/sec and 3 $\mu$ s
- ❖ New PCI and cPCI cards while preserving the financial investment on VME
- ❖ Better user and higher reliability of existing hardware.

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## Software developments:

- ❑ SPEC developments
  - ❑ Server and new pseudo.
- ❑ TANGO and TACO
  - ❑ full library redesign
  - ❑ linux device servers
  - ❑ tools
- ❑ Python Tools
  - ❑ Config, framework, synoptic
- ❑ EXES protocol
  - ❑ for GUI and web
- ❑ Data model / DBs
  - ❑ HDB, db model
- ❑ European projects
  - ❑ DNA, HTPX
- ❑ PxWEB and EXES web
- ❑ Low level and engineers tools
- ❑ Applications
  - ❑ PyDIS, newplot, bliss-installer

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## Graphical interface: ID23 exes

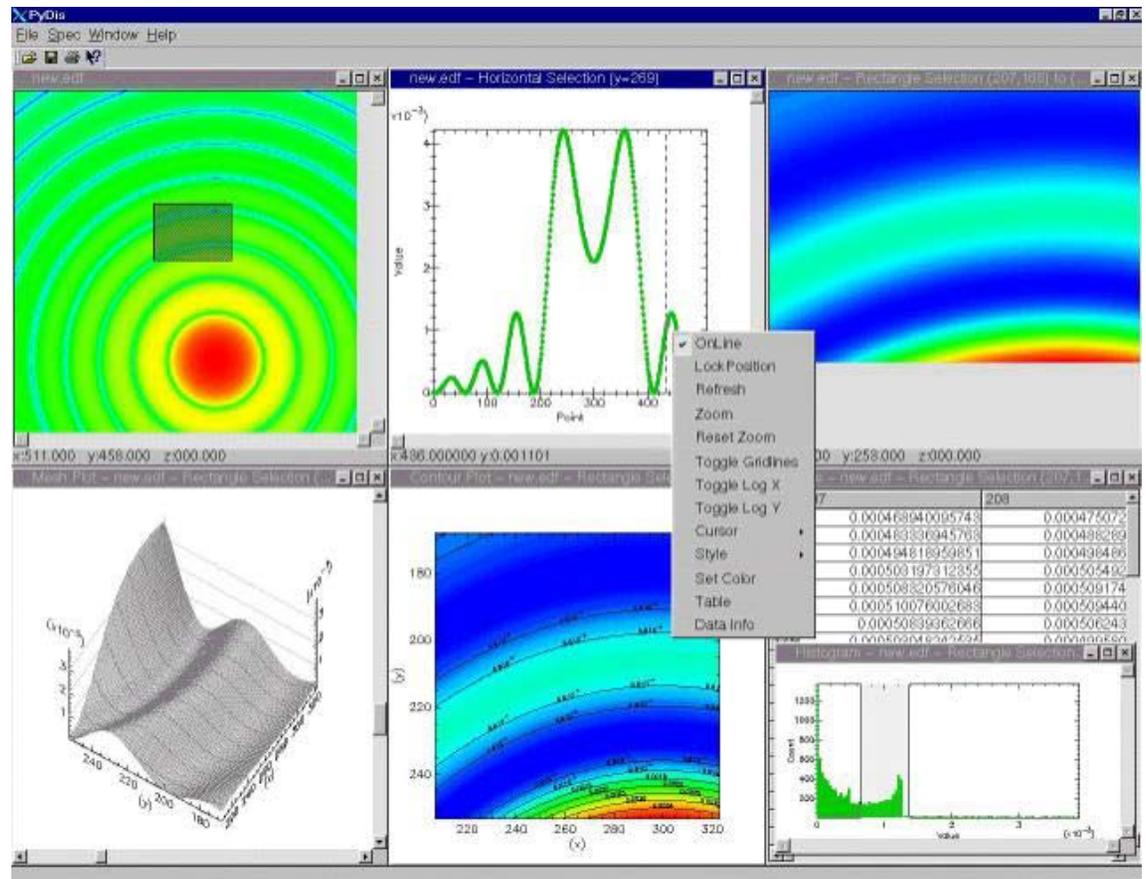
```
reg on root: /bliss/users/reg
File Edit Settings Help
sshho
User
High 180.0000
Current 2.2000
Low -180.0000
Dial
High 180.0000
Current 2.2000
Low -180.0000
374.VICENTE> wa
Current Positions (user, dial)
Leg Back1 Leg Back2 Leg Front Height X Tilt Y Tilt P
  lb1 lb2 lf hgt xti yti
-0.6075 4.4895 4.4000 3.1705 -0.7950 -0.2980 3.
-0.6075 4.4895 4.4000 3.1705 -0.7950 -0.2980 3.
PS left PS right PS Hor Of PS Hor Ga PS Ver Of PS Ver Ga Slit
psl psr psho pshg psvo psvg
-2.1600 1.8400 2.0000 -0.3200 -0.1915 7.5625 0.
1.3400 5.3400 2.0000 -0.3200 -0.1915 7.5625 0.
Slit Hor Slit Hor Slit Up Slit Down Slit Left Slit Right Pseud
sshg ssho ssu ssd ssl ssr
-16.0000 2.2000 -14.9000 17.1000 0.0000 0.0000 8.
-16.0000 2.2000 -14.9000 17.1000 0.0000 0.0000 8.
375.VICENTE>
```

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## Applications: PyDIS



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EXES online

User: BLOM

CURRENT EXPERIMENT

Dewars  
 Schedule  
 Status  
 Admin  
 Help  
 Logout  
 ID23 home  
 ESRF home

Sample

- L5 atd456\_100\_p7
- L5 atd456\_100\_p8
- L3 GLYRNA\_111\_1
- L3 GLYRNA\_111\_2
- L3 GLYRNA\_111\_3
- L3 keto3\_100\_p1
- L0 TM1733\_210\_p
- L5 atd456\_100\_p8
- L5 atd456\_100\_p9

Sequence

N-acetyl-gamma-glutam.  Mount next crystal

User : Samples Collection Map

px > In house research > Deware sent on 13-Sep-02

Submission: 13-Sep-02

- Add a new sample
- Samples overview/edit
- Close the submission
- Overview (PDF)
- Overview (HTML)

Deware submission

- New submission
- Previous submissions list

Available submissions:

- 13-Sep-02
- 16-Sep-02

Crystal information

- Crystals overview
- HTML crystals overview
- PDF crystals overview

Status: Running  
Sample: 90/156  
End time(est.): 13:42

keto3\_100\_p1

## web and database services

ESRF EMBL

Logout

\*\*\* inhouse logged in \*\*\*

6  
5  
4  
3  
2  
1

### Samples overview for deware sent on : 13-Sep-02

As long as the deware submission has not been closed, you may edit the samples parameters by clicking on "edit" at the end of the table.  
Once you have closed the submission, these parameters are no more editable and the submission is validated to be used by ESRF staff.

Courier company fedex  
Sending number 2  
Submission status closed --> you are not allowed to edit these samples any more

Comments  
Test for Solange  
Save

Cane	Position	Sample ID	Group	a	b	c	alpha	beta	gama	Res prev	Res req	Remarks
A	1	aal-001	P6x22	84.48	84.48	244.87	90.0	90.0	120.0	1.4	1.0	
A	2	Dolph-001	P21	74.74	133.65	101.81	90.0	104.43	90.0	1.6	1.0	to be done first
A	3	Dolph-002	P21	74.74	133.65	101.81	90.0	104.43	90.0	1.6	1.0	Only if -001 not good
B	1	HPA-005	P6322	61.6	61.6	104.9	90.0	90.0	120.0	2.6	1.0	To be retested
C	1	tricolorineA-001	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Space group to be checked



## Sharing developments

- ❑ Electronic cards ( i.e. cPCI counter card )
- ❑ Specialized electronics ( i.e. moco, opiom )
- ❑ TACO/TANGO middleware
- ❑ SPEC macros ( pseudo motors, procedures )
- ❑ Display tools ( CCD's, MCA, scans...)
- ❑ GUI framework / SPEC server mode
- ❑ online/offline analysis software
- ❑ automation tools
- ❑ ...

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## Conclusion:

- Modern control system
  - to profit of improvements in hardware and software technology
  - to anticipate and respond to new demands from beamline scientists
  - to respond to growing needs for beamline automation