Remote control of MX experiments at the ESRF

Gordon Leonard
ESRF MX Group

José Gabadinho, David Hall, Xavier Thibault, Elspeth Gordon, Stéphanie Monaco, ESRF MX & BLISS Groups

Why do we need remote access?

- Those who come to BLs often inexperienced and onus falls on BL staff to do experiment. Would be better for all concerned if young researchers could have proper guidance from home lab
- Tendency to shorter experiments. Travel to/from SR sources takes more time than experiment. Better to have remote access for shorter periods more often?
- Screening / Routine data collections…
- Save money on travel budget(s). Could be invested in elsewhere

What sort of remote access?

– Different strategies:

- **Local control, Local decisions**
  - Based on 'diffraction plan' submitted *via* LIMS (i.e ISpyB)
  - BL staff control beam-lines & take decisions about data collection
  - Analogous to MXpress™ system currently in place
- **Local control, remote decisions**
  - Sample screening carried out by BL staff
  - Results returned to users *via* LIMS
  - Users submit (modified) 'diffraction plan'
  - BL staff then collect full datasets for users
- **Local control, remote decisions, local control**
  - Initial sample screening carried out by BL staff
  - Results returned to users *via* LIMS
  - Users come to BL at a later date to collect full datasets
- **Remote control, remote decisions**
  - BL staff optimise beam-line & mount samples in Sample Changer
  - External Users log in to beam-line control PC from home lab
  - External users control BL remotely as is they were actually at BL.
  - BL staff on-call in case of problems

What Happens at other Synchrotrons?

- NSLS:
  - 'Mail-in' Service: http://www.px.nsls.bnl.gov/Mailin.html
    - 'Collaboration only'?
    - (http://www.px.nsls.bnl.gov/publication_policy) *With increasing frequency, users are mailing their prepared specimens to our staff for screening, experimental design, data collection and reduction, and preliminary analysis. These users should consider that their obligation for conferring co-authorship is substantially greater than traditional beamline users.*

- SSRL:
  - <u>Full remote access</u> possible. 50% of users access beam-lines in this way

- APS:
 - SGX-CAT: Mail-in service analogous to ESRF MXpress™ system. Only mode of access to this BL.

What's needed for full remote access?

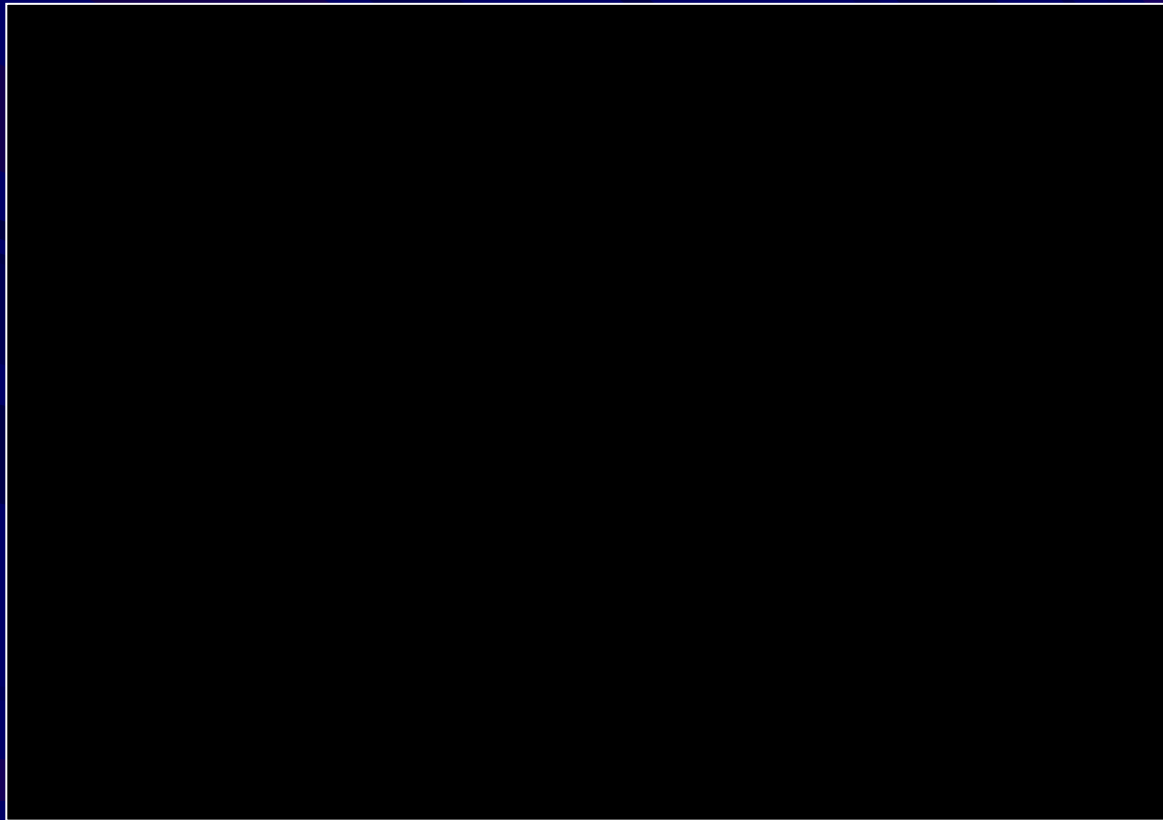|	SSRL	ESRF
NXServer	Yes	Yes
Sample Changer *	Yes	Yes
Control software	Yes	Yes
Screening via reliable DCP**	Yes	?
Safety addressed	Yes	?
LC setup for remote access	Yes	No
Firewall	No	Yes (not a problem)
Data confidentiality	Yes	Under test
Data backup	Yes (till disk full)	Yes (6 months)

Could we access the BLs remotely using the NX server/client?

- Controlling BLs remotely needed a modification of start-up scripts – O.K.

- Test from SSRL Guest-house (WiFi, laptop) - O.K.

- Find some users to test the system – Johan Turkenburg et al., York BAG

- They loved it! "*The connection speed is fine, there is little difference with being on the beamline.*"; "*VERY good day, amazing experience. Going home now.*"
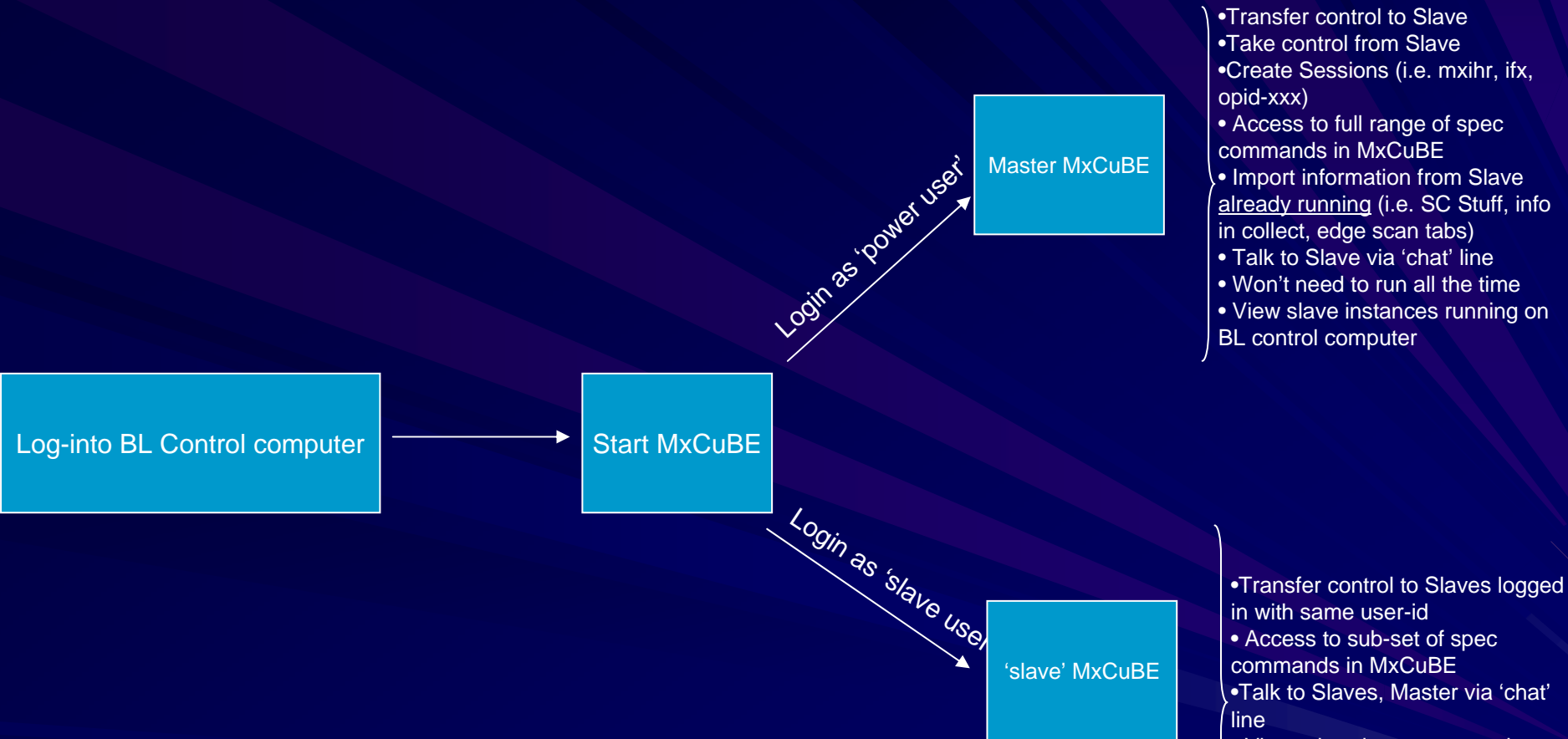
Remote Access (1ˢᵗ version) from users side
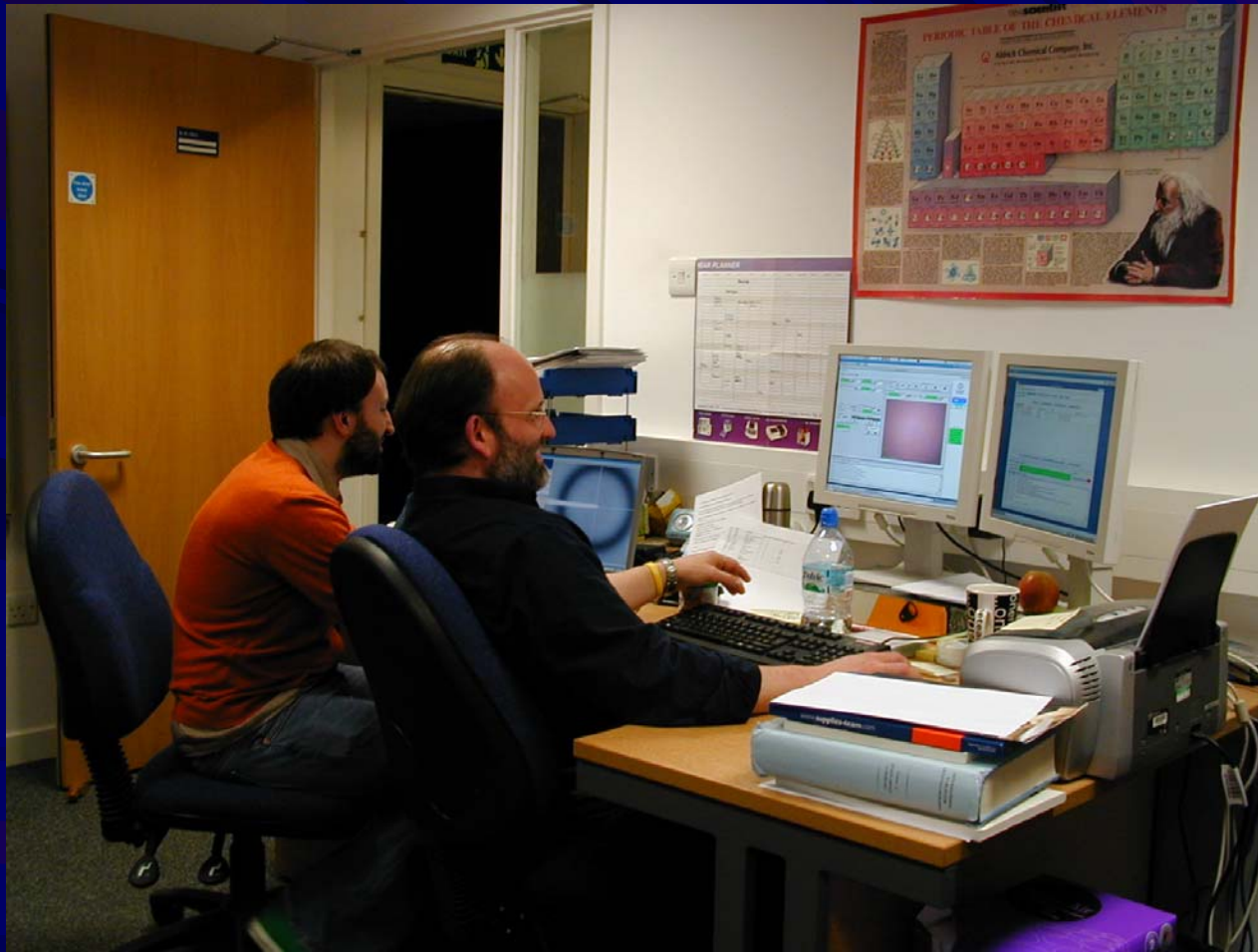
Remote Access (1ˢᵗ version) from ESRF side

Improving remote access - I

Master MxCuBE

- Transfer control to Slave
- Take control from Slave
- Create Sessions (i.e. mxihr, ifx, opid-xxx)
- Access to full range of spec commands in MxCuBE
- Import information from Slave already running (i.e. SC Stuff, info in collect, edge scan tabs)
- Talk to Slave via 'chat' line
- Won't need to run all the time
- View slave instances running on BL control computer

Log-into BL Control computer → Start MxCuBE

Login as 'power user'

Login as 'slave user'

'slave' MxCuBE

- Transfer control to Slaves logged in with same user-id
- Access to sub-set of spec commands in MxCuBE
- Talk to Slaves, Master via 'chat' line
- View other instances running on BL control computer

Both Master & Slave can be run on same computer at same time. Power user login at start of experiment to formally give control to slave, then this MxCuBE can be stopped and restarted as and when necessary.

Improving remote access - II

```
Log-into BL Control computer → Start MxCuBE → Master MxCuBE
```

- Transfer control to Slave
- Take control from Slave
- Create Sessions (i.e. mxihr, ifx, opid-xxx)
- Access to full range of spec commands in MxCuBE
- Import information from any Slaves running on remote access computer (i.e. SC Stuff, info in collect, edge scan tabs)
- Talk to Slave via 'chat' line
- View slave instances running on 'Remote Access' computer

```
Log-into Remote Access computer → Start MxCuBE → 'slave' MxCuBE
```

- Transfer control to Slaves logged in with same user-id
- Access to sub-set of spec commands in MxCuBE
- Talk to Slaves, master via 'chat' line
- View other instances running on BL control computer

Remote Access (2nd version) is much better from ESRF side

Can now run *several* instances of mxCuBE, only one (that displayed on BL control computer) allows full control. Full control (delegating/retaking control, creating sessions, following experiments, full panoply of spec commands) only to super-users.

Slaves – can only <u>ask</u> for control (master can set time-out if nobody at BL), can't use MxCuBe commands until logged in & control given, limited availability of spec commands (reconfig etc., etc…). Can't login if no session available

Still needs sort of refinement that comes with use……

Remote Access (2ⁿᵈ version) from ESRF side

Possible consequences of remote data collection

- Different strategies:
  - **Local control, Local decisions**
    - Labour intensive for BL staff
    - Fully functioning DCP an essential prerequisite.
    - What if data not up to users' expectations/hopes?
  - **Local control, Remote decisions**
    - Scheduling: What to do with time between sending screening results & receiving modified diffraction plan?
    - Fully functioning DCP an essential prerequisite.
    - BL staff just button pushers?
  - **Local control, remote decisions, local control**
    - Scheduling: What to do with time between screening & collection
    - Fully functioning DCP an essential prerequisite.
  - **Remote control, remote decisions**
    - Ensuring that users don't over-run allocated time/ Synchronisation of experiments
    - LCing more onerous? Would have to intervene even for minor problems. Who/when to load SCs? Should we be employing BL Operators (c.f. NSLS) as well as BL Scientists?
    - DEWARS!!!

What's needed for full remote access?

	SSRL	ESRF
NXServer	Yes	Yes
Sample Changer *	Yes	Yes
Control software	Yes	Yes
Screening via reliable DCP**	Yes	Yes
Safety addressed	Yes	Yes
LC setup for remote access	Yes	?
Firewall	No	Yes (not a problem)
Data backup	Yes (till disk full)	Yes (6 months)

Where to find out more…..

http://www.esrf.fr/UsersAndScience/Experiments/MX/How_to_use_our_beamlines/remote-access

Scheduling: Elspeth Gordon (gordon@esrf.fr) & Stéphanie Monaco (monaco@esrf.fr)