

SPS Applications Software issues - startup in 2006 and legacy problems

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- Introduction – control issues @ SPS
- Settings management SW
- Measurements SW
- Interlocking
- Logging

Scope

This presentation covers SPS controls related to equipment covering the beam 'path'

- from
 - the TT10 injection line
- to :
 - the targets (North Area & CNGS)
 - the injection region of the LHC.

Controls issues of secondary beam lines are covered by L. Gagnon.

Control issues for the SPS

In the future we will have

- More complex cycles & LHC filling
- More operational beams
- New beams and new transfer lines
- Transition from SPS- to PS-style timing system
- FESA framework for front-ends system
- New hardware interlock systems

Many issues are highly entangled - changes in one place can lead to domino effects on the entire control system !

The highly publicized problem of fast SPS cycling is for me a side-issue compared to the other problems...

SPS Machine Settings

In 2004 the SPS complex was driven by a heterogeneous controls suite :

- Main ring elements controlled by dedicated legacy SW.
Settings stored in a CTREE DB.
- Ring orbit controlled by dedicated SW.
Settings in files.
- 'Old' transfer lines and extraction areas handled by TZ software.
Settings in TZ ORACLE DB.
- 'New' transfer lines and extraction areas handled by LSA software.
Settings in LSA ORACLE DB.
- RF settings handled by a dedicated RF application.
Settings in specialized files.
- Kicker settings handled by dedicated applications.
Settings mostly stored on WEB pages.
- ...

SPS Settings : the Future

The heterogeneous structure is the heritage of history, delays in new SW, lack of resources and should be cleaned up.

In the future all SPS settings should be managed by the LSA system.
This will bring us :

- A homogenous control system.
- Simplified cycle changes.
- Complete and consistent settings archival.
- Easier maintenance, reduced number of applications.
- ...

The key question is : **when and how can we achieve this goal, taking into account that LHC is a priority and resources are limited ?**

FESA Issues

- FESA is one of the main boundary conditions that we have, since in the future SPS front-end systems will be migrate to the FESA framework.
- This migration is important in order to profit from the power of the PS-style timing system that will arrive in the SPS soon.
- Consequences of a migration to FESA on legacy SW :
 - SL-EQUIP is not supported for communication, CMW is the new standard.
 - 'kills' all legacy SW, unless a 'bridge' is provided.
 - ideal solution for applications : migration to LSA.
 - FESA is relying on a PS-style timing system.
 - 'problematic' for legacy SW.

We must synchronize FE migration to FESA (equipment groups) and high(er) level application migration to FESA (OP & CO).

(My) Migration Plans /1

CTREE-based system & ring orbit

- Migration to LSA foreseen for 2006, independently of FESA constraints.
- Both systems have been tested in 2004. No major problems are expected, except usual commissioning hiccups.
- There is no fallback for the ring steering– the old system is DEAD.

Standalone BDI instrument applications

- Migrations have little / no consequences on other SW – no domino effect.
Examples : BCTs, Q-meter...
- Migration to FESA is coordinated between BDI & OP on a system by system basis, based on available OP resources.
- It is likely that we CANNOT migrate everything for 2006 !
- OP has to take over SW work for some systems that were previously taken care by BDI – makes things worse !

(My) Migration Plans /2

TZ software

- TZ is a huge piece of SW, migration requires a lot of resources.
- Presently I assume that TZ runs in 2006, at least parts of it :
 - The SEM (Sec. Emission Mon., BDI) and ROCS (PCs) systems must remain compatible with SL_EQUIP communication & APIs.
 - The same statement applies to wire-scanners...
 - Either : No migration to FESA for those systems.
 - Or : Bridge for the TZ legacy software (CO).
 - Also : TZ requires some bits of the CTREE system to remain alive.
- Depending on the evolution of the situations we may revise our plans, but it is too early to decide now...

(My) Migration Plans /3

RF applications

- Major revolution : TG3s → CTRxx modules.
- RF settings applications : should survive, taken care by the RF group.
- On the long term → LSA.

Miscellaneous stuff

- Kicker applications are ~ under control.
- Handled on a case by case basis.

Migration Responsibilities

- Equipment groups are responsible for FESA migrations.
- SPS-OP provides applications.
- CO-AP provides support :
 - DBs.
 - Middle- and other-tiers.
 - Various software services (dataviewer, CVS, JAPC....).
 - Some of the applications.

Hardware Interlocks

- New 'LHC-like' hardware interlock systems are growing in size at the SPS.
New components in 2006 :
 - CNGS transfer line & target.
 - TT60 transfer line and LSS6 extraction.
 - SPS ring interlock system (partial, ~ 50%)
 - complete replacement of the present SPS emergency interlock system is presently foreseen for the startup in 2007.
- The new systems do not directly affect other SW.
- Responsibility :
 - HW and supervision applications are provided by CO.
 - A post-mortem diagnostics tool for the fast extractions will be provided by OP.

Software Interlock System : SSIS

- SSIS is a critical part of the SPS interlocking system,

The SPS cannot run safely without SSIS !

- SSIS is not adapted to the future multi-user environment.
 - We plan to replace SSIS in 2006/2007 with new LSA-style SW which should also satisfy LHC needs.
- A first version of the new SW is foreseen to appear in 2006, with emphasis on the new transfer lines (TI8, CNGS, TI2) :
 - It is VERY likely that we still need SSIS in 2006.
 - SSIS has a number of important interlocks related to PCs (ROCS)
 - must maintain SL_EQUIP access.
- Responsibility :
 - The core system is provided by CO.
 - Individual interlocks (and there will be many more in the future) : ?

SSIS Issues

SSIS uses special hardware, a dedicated PC with interface to :

- Four 'console switches' – OP buttons to stop the beam.
- 2 dedicated HW links to MCR to communicate with the timing system.
- A link to the SPS emergency dump system.
 - someone has to take care of this hardware and adapt to the CCC environment – or else SSIS is dead !

For the new SW interlock system we will get rid of / modify this HW (discussion with timing team have started), but in the meantime we need it !

Logging for Statistics

- The present SPS logging system cannot handle more than a single operational beam in a given cycle.
- This was already a problem in 2004 for the CNGS beam (no statistics !)
 - A new logging system MUST be put in place for 2006.
- The new logging system :
 - Intensities must be logged for each cycle and for each beam, with clear identification of the beam.
 - The cycle/beam data must be stored for a complete run (year).
 - The system will profit from the migration to FESA of BDI equipment because it takes advantage of the new logging tools in the context of LSA.

Other Logging...

- The shot-by-shot logging used in 2004 must be maintained and improved :
 - new equipment.
 - new transfer lines.
- Data logging for MD – still open and under discussion...
- Responsibility :
 - Essentially everything is in CO hands.
 - OP will provide new statistics tools.

Summary

- The controls effort for the SPS in the coming years is very large !
 - The situation is quite tricky, because nobody has a full overview of all the links between various bits of SW : we must be prepared for surprises...
 - We must be careful before taking any irreversible decision.
- For settings and measurements I'm trying to keep various people in synchrony:
 - So far I provided some *lightweight* coordination, for the coming months a small OP-CO-DBI team should provide coordination & crisis management.
 - Since the end of the 2004 run, the SPS-OP section has spent most of its resources on magnet measurements, LHC and LEIR – very little was done for SPS : I need those people now for the SPS !
- Hw interlocks and logging are more or less on track.
- The SW interlock system is one of the delicate and critical items :
 - We must restore the SSIS HW in the CCC, at least for 2006.
 - In case of problems we need an emergency plan.