28 Aug 2019

EUROPEAN SPALLATION SOURCE

Lesson Learned from Commissioning of the Ion Source and LEBT

Software and Machine Studies, ICS perspective

Emanuele Laface

ICS and commissioning.

- Porting of Catania's IOCs to our systems
- Deployment of the Timing system.
- Network and data infrastructure
- Control System Studio
- Online Model simulator and its applications
- Archiver
- Logbook
- Python environment
- Alarms
- Save and restore

ICS and commissioning.

- Porting of Catania's IOCs to our systems

The IOC are not E3, we will have to change again.
The naming convention was not respected in several case.
The configurations of the devices were not ready for a production usage, for example no strategy for arrays decimation, no strategy for data synchronization.
The infrastructure for creation and deployment (CCDB and naming) was only partially used to create the IOCs. The list of PVs for example is in a git repository manually updated.
Only a very limited number of people worked on it (at the beginning only one) with an overload of requests.

- Deployment of the Timing system.

The timing system is not the final one, the trigger sends only the timestamp and this makes more complicate the data synchronization.

- Network and data infrastructure

Several issues with the various EPICS gateway that were fixed removing them when possible. The strategy to store long term data is not yet defined. We have a NextCloud system but it is for temporary storage and sharing and it is not always performing well.

ICS and commissioning.

- ## Control System Studio

It conflicted with the video cards of the computers used in the LCR.
It was generally slow because it runs in Eclipse.
It was specifically slow on many OPIs because the OPIs were quickly ported from the Catania's one without a proper test program and they generate thousands of errors in the console that slow down everything.
There is nobody responsible of the OPIs, so the bugs are not fixed, moreover the tickets for the bugs are addressed to ICS that does not have the responsibility of the OPIs.

- ## Online Model simulator and its applications

The creation of new application requires some training time and people prefer to use Python instead. The scan application is a clear case of this issue.
The passage from Swing to JavaFX was painful especially for the graphic library that is still under development.

- ## Archiver

It cannot handle big dataset because it becomes too slow.
Many commissioning activities require to store large PVs for further analysis and Archiver cannot be used for this task.
To keep track of what is archived is not possible, everyone can add or remove PVs from the list.

ICS and commissioning.

- Logbook

It is not the final one and it will be replaced with a new system.

- Python environment

Several issues in terms of stability and usability during the commissioning, with many upgrades done during the commissioning phase.
Some configuration (for example the git credentials) is lost at each restart of the environment.
Bandwidth issues when used to store large PVs as well as disk usage.
The EPICS library in Python is not stable (can crash with segmentation fault).

- Alarms

The alarm system is in place and it may work but almost no IOC has the alarms set.
Not clear if we will keep the current system in the future or we will change it.

- Save and restore

So heavy that it is almost unusable.
Not the final one, it will be replaced.

Issue number 1

Time schedule

Issue number 1
Time schedule

A large part of these issue is due to the fact that we were not ready, the systems were not tested in the production setup, many tools were missing and we didn't know what to expect from the hardware.

In other words we didn't have a proper plan for ICS activities, probably because the plan of Accelerator was not clear and also because we underestimated the effort that we had to do to have everything in place for a prime-time.

The schedules were always confused, from the day of delivery of source and LEBT, until the last day of commissioning. Even during the commissioning time we had shift of the beam time weeks.

Many devices were debugged and tested (from the point of view of the hardware) during the beam time.

Issue number 1

Time schedule

Possible mitigation

Make a detailed plan, share with everyone, inform people immediately when a change is made.
Find answers to questions like "when this component will be delivered?". It is not acceptable the answer "nobody knows". If nobody knows, the management should appoint a person that goes to the in-kind or contact the supplier and identify the issues doing a time estimation.

Follow the plan strictly and inform everyone that can have an overlapping with the commissioning activities that there is a schedule to respect.

Make people aware of the fact that their work is critical to stay in the construction and commissioning plan.
My impression, for example, is that many people do not consider that a delay in their job has an impact. A missing cable can stop the tests of precious weeks but maybe how is procuring the cable things that it is "just a cable".

Issue number 2

Communication

Issue number 2
Communication

This issue is very well known in the software business because people thinks that software "just works".
We had many requests (an overload of requests) altogether in the few weeks of commissioning due to the fact that who was operating the various devices discovered that needed something from ICS/software.

Personally I wrote 59 Python scripts just to solve some of the most urgent issues, but many other issues remains. For example the issue about how to archive and browse big data is still there.

These issues are due to a lack of communication. Very little requirements arrived to the software group about the tools to have in the LCR for the commissioning phase, and nobody was considering to have a proper dry run before starting the machine. We were not invited in Catania during their tests, so we were not able to see what to prepare here.

Issue number 2

Communication

Possible mitigation

If there is something to control in a device, ICS should be at least contacted.
If something has to be controlled from the control room, probably there is the need of some application and some other utility, so ICS should be involved.

The communication should also be more proactive from our point of view. If we think that a system will need some intervention from ICS we should say and not wait for the last minute.

Issue number 3

Responsibilities

Issue number 3
Responsibilities

The case of Control System Studio shows the kind of issues produced by the absence of a responsible.

The original idea for the OPIs was that there were so easy to design in CSS that everyone was able to do and maintain them. Specifically the operators should do it (in the original plan). Today we do not have operators and we have orphan OPIs that are heavily bugged without any owner.

A major issue was that the control system arrived directly from Catania in their own computers without anyone from ICS responsible for this system. The naïve idea was that everything worked "out of the box", the reality was very different. This issue is also somehow connected to the communication problem.

Issue number 3

Responsibilities

Possible mitigation

Every system (I speak for the software but I think it should apply also to the hardware) should have a clear responsible that take cares of that component from the beginning (end of manufacturing) till the end of the commissioning, that ends when the device is in a stable state for production with no major issues to operate.

Issue number 4

Priorities

Issue number 4
Priorities

We all know that we are not many people compared to the scale of the project and we do our best, but the management has to clarify if to have the running beam is a top priority for ESS and if so, it should prioritize the tasks according to this scope.

This issue seems overlapping with the Issue number 1 (Time schedule) but the time schedule is much more a clear plan to follow, this is related to the fact that if the beam is a high priority the managers should plan resources according to it.

For example the beam was stopped for several weeks more than expected to clean the water pipes.
We lost half a day to find someone that restored the electricity in the LCR because of the trip of a circuit breaker.

The lack of importance that seems to have the beam commissioning phase is reflected at any level.
The communication never announced our first beam in September.
HR was largely unprepared to the night shifts and "solved" the situation with a patch that was sub-optimal.
People that were supposed to make a device working were leaving the LCR in the middle of a debugging process to attend meetings.

Issue number 4

Priorities

Possible mitigation

The management should first clarify what is the importance of the commissioning and once it is clear to them they should communicate with the groups the priorities related to this activity.

What worked well

The part that worked better during this commissioning phase was the collaboration among the people involved in the LCR activities. We were committed to have the machine running and we tried to solve/circumvent/ ignore problems that were not related to the beam.

It is due to the great work of these people (especially the de-facto coordination of Ryoichi) if today we have some data to analyze.

We could have done much better without the issues reported here. If we do not solve them we risk to demotivate the team and break the spirit that was able to commissioning the source.