SUMMARY OF SESSION 5: CONTROLS AND TOOLS

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INTRODUCTION

This session focused on different aspects of the control system, reviewing past experiences, current state and bringing ideas for possible improvements in a short and long term.

List of presentations

1. **Using the LHC Control System – retrospective on 2016 and short term plans** by Guy Crockford
2. **Evolving expert tools into operational software** by Delphine Jacquet
3. **How to improve interactions with the Control System?** by Stephane Deghaye
4. **Testing and deployment strategies and their impact on accelerator performance** by Jean-Christophe Garnier
5. **Thinking outside the box – paradigm changes ahead?** by Mike Lamont

USING THE LHC CONTROL SYSTEM – RETROSPECTIVE ON 2016 AND SHORT TERM PLANS
G. Crockford

R. Schmidt commented that when it comes to human errors, one cannot blame individuals but instead a systematic approach is needed. He added that improving the situation requires looking at the managerial and organizational aspects.

S. Readelli asked about plans for the EYETS concerning luminosity and crossing angle leveling.

K. Fuchsberger answered that the goal is to be able to do leveling of ATLAS and CMS; the plan is to use for that a new server and remove the old application. The exact scope has not been decided yet.

B. Goddard made a remark that the operational paradigm should be challenged, adding, that the expertise of the OP crew should not be used to protect against operational errors. He also commented that the LHC is operated in a similar way as LEP was and he wondered whether starting with a fresh approach would lead to the same practices.

E. Bravin pointed out that during MDs it is hard to avoid all errors, as one cannot test everything in advance.

V. Kain commented on software development within OP, saying that it is not enough to put an OP software team in place. It would be necessary to change the structure to liberate time for the OP developers.

EVOLING EXPERT TOOLS INTO OPERATIONAL SOFTWARE
D. Jacquet

E. Hatziangeli referred to the collaborative development between CO and OP. She stated that a very good collaboration already existed on the LSA project and that CO is open to support such collaborations.

J. Wenninger commented that working together is a good model as, among other advantages, it addresses the maintenance problem. However, there are two issues related to that. The first is that today the team is mainly organized around the LHC OP. In addition OP developers have only 2-3 months per year to work together. The second is that at the moment even within LHC it is not easy to find an agreement on priorities and milestones. He concluded that finding a common agreement with other groups and sections might be even more difficult.

K. Fuchsberger confirmed that there is a commitment from CO to work together during EYETS and if that works well, the collaboration will be continued.

R. Steerenberg added that there are some duplications of efforts and there would be a clear gain working together.

H. Timko mentioned that in RF there are examples of duplicated software development. She explained also that expert tools are based on LabView and Matlab scripts that are difficult to maintain. These are being progressively migrated to Inspector. She also expressed concerns about *PyJAPC* library for which there is no long-term support from CO.

V. Baggiolini confirmed that CO is committed to collaborating, but agreeing with the statement of *J. Wenninger*, he reminded that it is important to define common priorities within OP, as they are often not clear for CO.

Q. King asked why OP develops software and whether CO should not get the necessary resources to develop all necessary tools using their expertise, especially in the situation when OP does not have enough time.

V. Kain responded that it would be difficult for CO to have all the necessary domain knowledge and insight. OP knows best what tools they need. She added that the optimal approach would be to have a collaborative development, involving OP and CO developers.

J. Wenninger commented that OP used to collaborate also with other groups but with progressively extended run periods such collaborations are disappearing.

S. Redaelli asked whether there is a clear list of requirements, allowing to better understand those systems, which OP considers as high priority. He underlined that discussions and agreement on that is very important.

Referring to the comment of *H. Timko*, *A. Masi* commented that he does not see LabView as a problem as there is a team ready to provide long-term support. He also would like to have discussions with all stakeholders to avoid duplications of efforts.

HOW TO IMPROVE INTERACTIONS WITH THE CONTROL SYSTEM
S. Deghaye

E. Bravin pointed out that documentation of libraries and tools provided by CO is often not sufficient or not easy to find, compared to tools provided by external companies. As an example, he gave the migration to RDA3 that would have been much simpler with a set of simple examples.

S. Deghaye responded that after LS1, CO has put in place an entry point on CO wikis, leading to the documentation of different products. Since then, there is an ongoing effort to improve the documentation and make it easier to find the necessary information.

V. Kain added that CO experts are always ready to help or point the appropriate documentation.

R. De Maria stated that until now CO did not collaborate on Python libraries used to access the control system. He asked if CO would join now the collaboration and participate in development. He remarked that non-CO developers are much less efficient writing bindings to CO libraries than CO experts would have been.

S. Deghaye answered that CO's intention is to collaborate but it all boils down to finding resources. The exact form of collaboration is being discussed now.

R. Steerenberg asked if CO has already a concrete strategy to hide different *islands* of the control system and make interfaces more coherent.

S. Deghaye responded that at the moment various ideas of achieving that are being discussed.

V. Kain suggested that collaboration between OP and ABP on Python development would facilitate implementation of algorithms that are used operationally, and not only during MDs.

R. Steerenberg agreed, adding that thanks to *G. Sterbini*, in PS, they have Jupiter that allows quick switching between MD and Operational context.

TESTING AND DEPLOYMENT STRATEGIES AND THEIR IMPACT ON ACCELERATOR PERFORMANCE
J.C. Garnier

M. Zerlauth asked about testability of controls software outside of the Technical Network, whether the technical obstacles to expose all controls services outside of the TN could be overcome.

S. Deghaye commented that instead of the TN we could have an accelerator network i.e. all laboratory computers would be inside, having access to all services.

K. Fuchsberger asked whether it means that all developments would be inside TN, questioning whether this is a good idea.

E. Hatziangeli answered that this was a proposal from the security team and the CNIC working group. The WG is now at the stage of quantifying the costs.

V. Kain commented that testing is the key and we are not doing enough in this area. She asked if there are plans to test the vertical slice as a part of the startup sequence.

J. Wenninger remarked that typically development and testing should not be done within the TN, to not access accidentally the operational devices. He underlined that he would rather move the development outside of the TN. He also reminded that RBAC rules are already very complex and basing safety of operational devices only on RBAC might not be the best way to go.

THINKING OUTSIDE THE BOX – PARADIGM CHANGES AHEAD?
M. Lamont

E. Bravin asked whether going to seven Beta* in one or several steps is actually possible.

B. Goddard pointed out that to achieve such goals it is not enough to have real-time tasks adjusting and driving settings. Many other components of the machine would have to be taken it into account. He summarized that such ideas would have to be discussed and applied across the whole accelerator complex.

J. Wenninger asked whether CO is part of huge projects such as LIU and whether CO ideas, requirements and constraints are taken there into account.

E. Hatziangeli assured him that CO is part of the LIU and other big projects.

J. Wenninger replied that CO participates in discussions on sub-packages, but this might be not sufficient to change paradigms.

V. Kain pointed out that making big steps in all machines is possible but high-level controls must be taken into account at all stages.

L. Arduini commented that Beta* leveling is a revolutionary idea and he asked whether this could be done incrementally.

M. Lamont answered that these are proposals and ideas to be explored.