33rd Meeting of the Machine Availability and Reliability Panel (MARP)

Present: A. Apollonio [TE/MPE], T. Cartier-Michaud [TE/MPE], H. Gavela [ATS/DO], L. Serio [EN/ARP], R. Steerenberg [BE/OP], L. Sollis [ATS/DO], B. Todd [TE/EPC], J. Uythoven [TE/MPE], M. Zerlauth [ATS/DO]

Excused:

Indico link: https://indico.cern.ch/event/1015481/

Review of the previous meeting's minutes:

The previous MARP meeting was dedicated to the project 'Next Ion Medical Machine Study (NIMMS)', for which M. Vretenar would like to establish a work package dedicated to Machine Learning for failure prediction and predictive maintenance. He asked the MARP members for a contact person to coordinate the work package. MARP members agreed that the decision should be taken at the ATS level, when the organization of ML activities in ATS will be clarified.

Risk assessment for the HL-LHC project (H. Gavela, L. Solis)

H. Gavela and L. Solis gave an introduction to the HL-LHC Project risk assessment, describing the approach and the results of the last iteration with HL-LHC work packages. The process follows different steps: risk identification, risk analysis, risk evaluation, risk treatment, risk monitoring and review and finally risk communication. A Risk Intelligence map is used to provide an overview of the project risks. Since 2012, a methodology tailored to the CERN "special nature" as a scientific institution has been set up with the help of Deloitte. Starting in 2017, the methodology has been applied to HL-LHC and to each of its work packages (WPs), with a yearly periodicity. In dedicated meetings, each WP leader discusses with the HL-LHC Risk Officer an update of the relevant risk parameters, based on the evolution of the WP activities. This ultimately results in a report which is discussed with the HL-LHC Project Leader, where action plans are defined. Special attention is brought to risk items with a Potential Vulnerability (V) multiplied by a Potential Impact (I) above the threshold 9 (I*V>=9), for which a response to the risk is to be provided (Accept, mitigate/avoid, transfer or control). The scales of those two dimensions are defined in a Vulnerability Matrix and an Impact Matrix. MARP members asked about the process of evaluating both V and I for a given risk and how to ensure uniformity across so many different types of risks and work packages. H. Garcia Gavela explained that in some cases also project engineers participate in the assessment and that the overall risk assessment takes into account the risk assessment of the individual participants. This is nevertheless an open point which could be re-discussed.

The main outcomes from the last exercise performed in December 2020 were quickly presented and can be found in all detail here [1]. In particular the number of risks above the threshold I*V >=9 increased compared to the past. Overall, about 50 risks are above the threshold of 12. WP1 is more subject to managerial risks compared to technical risk for the others. WP3 and WP4 are mature, in full production mode with well-established collaborations. WP5 and WP8 have most of the LS3 hardware being provided from new collaborations. WP9 and WP17 have an important workload but no collaborations involved. The risks for WP2 and WP10 are mainly defined by manpower. The aim of these slides is to show the different risk perception depending on the different boundary conditions of each work package.

An attempt to quantify the impact on cost and schedule of the identified risks has been presented. The approach is based on a Monte Carlo algorithm where the previous scales of Impact (I) and Vulnerability (V) are translated into cost and probability of occurrence. MARP members remarked that the translation of the Vulnerability scale into probability of occurrence is quite pessimistic: the highest vulnerability being translated into a 100% probability of occurrence and the lowest vulnerability translated into a 50% of occurrence. This is compensated for low impact risk by choosing a modification of the budged in the interval [-10%, +10%] with a most likely value of 0%.

H. Gavela and L. Solis recalled in the conclusions that 50% of the HL-LHC budget is already engaged and many risks (e.g. risks associated to pricing and/or maturity level) are decreasing over time, as the production of studies and goods progresses. Still, time delays, non-detected design problems or production nonconformities could create extra costs and impact the project schedule. As an example, the restructuring of the CERN management has been identified as a potential source of risk, as well as the consequences of COVID-19.

J. Uythoven asked about how the 11T project was classified in the report of the previous years, as very technical and not financial issues could not be solved in that particular project. M. Zerlauth agreed and suggested reviewing the 11T case and possibly use it as a use case to improve the risk assessment process.

MARP members expressed their interest to follow the risk assessment of HL-LHC.

Outcome of discussions on reliable electronics design in ATS (B. Todd)

B. Todd and A. Apollonio reported on their discussion with A. Masi about the plans of the CEM group to invest in building competencies in the field of reliability for electronic systems. In order to coordinate the already existing efforts and discuss the possible synergies with other groups, A. Masi will be invited to the next MARP.

ACTION: A. Apollonio will invite A. Masi for a discussion in the next MARP.

[1] https://edms.cern.ch/document/2505691