

UCG Report on the TDR for the Upgrade of the ALICE Online-Offline (O2) Computing System¹

C. Diaconu, A.J.S. Smith, T. Ullrich

Observations:

- One of the main goals of the ALICE upgrade program is the triggerless data taking in order to focus on the rare triggers at high luminosity. The project is complex, addresses heterogeneous data acquisition systems which are adapted for a trigger-less readout, together with new systems designed within the ALICE Upgrade program (TPC and ITS).
- The system clearly benefits from technology advances and expertise available within the collaboration. Basic data reduction and treatment are imported close to the front-end by using powerful calculations in FPGAs and GPUs, while keeping in the same time a fluid interface to the offline last stage processing
- The key technology choices are based on solid experience and the performance gains as demonstrated in several key cases. The extrapolations on future performance are based on a thorough market survey.
- The total cost of the project is estimated to be 9,470 KCHF, of which 2,991 KCHF originates from M&O funds (the TPC contribution of 1 MCHF for EPN's is included in the TPC TDR)

Comments:

- **Person power and expertise:** The project involves large amounts of person power, most of which is devoted to high level tasks in online and offline computing. In addition, a strong link to physics is needed, for instance in what concerns the monitoring of the physics performance of the implemented algorithms. Given this high level of specialization, the qualification of the human resources participating to the project is a critical parameter.
- **Project Organization and Management:** The working plan is addressed with sufficient granularity and includes a milestone schedule correlated amongst various subprojects. Operational responsibilities are delegated to the subgroup convenors while the overall supervision is ensured by a group of three people.
- **Costs.** The costs estimates are in general well detailed, and the calculation of the necessary resources is aligned with the announced goals. The assumptions are reasonable, given the notorious difficulty of predicting the price for computing at long term. It is noted that the power consumption represents a 20% increase of the overall ALICE power consumption, and that the assumption is that these costs will be covered by the usual M&O mechanisms. Increased power consumption by the O2 facility is partially mitigated by ALICE reducing its pp data taking in Run 3 from 6 to 2 months.
- **Offline computing.** The system assumes an optimized overall offline computing system, largely based on the present grid computing model but proposing a redistribution of the computing load between T0/1/2. The load of the offline computing is significantly supported by the offline section of the O2 farm. The offline computing redistribution includes the proposal for a new type of computing center devoted to the analysis (Analysis Facility). The AF will be configured in close cooperation with the WLCG centers, either as an extension of an existing T1 or on a new site. This re-organization, presented as essential to the O2 project, is assumed to be implemented as a part of the computing costs and is not expected to give rise to special expenses beyond the preliminary evaluations of the computing needs in Run 3. The offline computing, including the AF facility, should be scrutinized in the usual process for experimental computing needs.

Recommendations:

- The cost and manpower estimates are found to be reasonable and should receive LHCC approval.

Notes: In making this recommendation we are assuming ALICE will secure the funds asserted in the TDR and that the O2 computing arrangements are acceptable to the WLCG. Also, the implementation of O2 involves several CERN support groups and hence might require additional personnel, infrastructure and/or costs not covered in the TDR budget. A clear agreement on the division of these responsibilities between ALICE and CERN should be reached prior to the actual implementation of the project.

¹ [CERN-LHCC-2015-006 ; ALICE-TDR-019](#)