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Remote Online Monitoring and Remote Shifts for ATLAS

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1. Introduction

Given the geographical spread of the ATLAS Collaboration, monitoring the online performance of the experiment from remote is a natural undertaking.* Having many eyes watch the experiment will much benefit the collaboration in terms of the quality of the data, and increase the speed with which problems can be detected and addressed. The tools used for remote monitoring must (i) provide best possible access to the information required to assess the operational status of ATLAS, (ii) adequately deal with the expected number of remote users, and (iii) be conform to the ATLAS security rules. Due to partially conflicting requirements, it is necessary to distinguish the methods employed for the various kinds of use cases, which range from expert interventions with operational control to more informative browsing of online status data. Three different areas are identified and outlined in the following, one of which can be mapped to the requirements of remote shifts.

2. Remote access to online information and tools

Three types of remote access to online information and tools can be identified:

1. **Expert access** with control functions is explicitly foreseen by the TDAQ role-based access system[i] to Point-1 (P1). Experts submit access requests to the shift leader, who issues a token of limited duration, during which the expert has full access to the P1 network. The number of concurrent connections of this type is limited by the gateway access to the P1 network and the resources inside the P1 network itself. The limit is coarsely expected to be of the order of a few tens of connections, but depends strongly on the applications used by the expert.

2. **Expert monitoring** allows accessing the same or similar tools as online, but does not require access to the P1 network and by consequence does not include control functions. All relevant data is secure copied to offline mirror servers (installed within or outside the P1 network), which are accessed by computers on which all the P1 monitoring tools are installed, and to which remote sites have access. The latency is required to be on the order of a few seconds. In case of bandwidth limitations, fast access to the most significant information is preferred over slow access to all information present in the online system. The resources provided for mirroring limit the number of concurrent

* The list of the available online monitoring information in P1 includes slow control (DCS), data quality histograms, event displays, the data acquisition status, trigger configuration and rates, LHC conditions, shift protocols, etc.

connections of this type. With one mirror copy the limit is coarsely expected to be of the order of a few tens of connections, but depends strongly on applications used by the expert.

Note: Monitoring information from the detector control system (DCS) represents a special case, because the complete FSM of the experiment cannot be easily mirrored. Currently foreseen is extensive use of web-based displays of DCS panels in form of screenshots,[ii] complemented by direct access to the offline copy of the DCS Oracle DB. The low-level information therein must be visualized by dedicated viewer applications, and is useful mostly for history plots of DCS data points.

3. **ATLAS wide monitoring.** No access to the P1 network and no control functions are provided. The tools proposed differ in general from those used at P1, even though the information content offered should be as close as possible to the P1 one. No special expert status is required to access the tools. This type of monitoring is web-based and relies on the CERN web infrastructure to allow concurrent access for any ATLAS member. The latency is expected to be of the order of a minute.[†]

   Note: Screenshots of online event displays[‡] are also published via web pages, providing the latest as well as the recent history of events displayed at P1. The displayed events may be separated according to predefined trigger signatures.

3. Remote monitoring shifts

For security reasons, remote access to the P1 network and to control functions is limited to experts. On the other hand a remote shift role will benefit from using as much as possible the same tools as used at P1, as this eases the communication with experts and P1 shifters. This naturally identifies the above type 2 [expert monitoring] as the primary approach to carry out remote shifts. All information of type 3 [ATLAS wide monitoring] is of course also available to a remote shifter.

Remote expert monitoring is useful to complement onsite system shifts. If and when ATLAS is introducing the concept of a remote monitoring *shift*, and how this is accounted in the context of OTSMOU,[§] is beyond the scope of this document.

4. Final remark

It is understood that the tools and methods provided will have to prove their usefulness during beam operation. They should be continuously improved (as far as possible without disturbing data taking), and be reviewed frequently to decide if further improvements are necessary and/or if new solutions have to be found.

[†] Web-based remote monitoring information should be in sync with the tools at P1. The synchronisation should be transparent to the monitoring content as much as possible, to minimise manual intervention in case of monitoring configuration changes at P1.

[‡] Event data files (XML and event store dumps) of the displayed events are also exported for use by remote client viewers.

[§] Operation Task Sharing and Maintenance & Operation Update (OTSMOU)

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[i] G. Lehmann Miotto, *Computer Access at P1*, ATLAS week, Feb 2008, http://indico.cern.ch/getFile.py/access?contribId=26&sessionId=8&resId=1&materialId=slides&confId=20499

[ii] S. Schlenker, *DCS web access*: http://pcatdwww.cern.ch/atlas-point1/dcs/status_pages.html