THE TECHNICAL SUPERVISION INTERFACE

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Abstract
The Technical Control Room (TCR) is currently using 30 different applications for the remote supervision of the technical infrastructure at CERN. These applications have all been developed with the CERN made Uniform Man Machine Interface (UMMI) tools built in 1990. However, the visualization technology has evolved phenomenally since 1990, the Technical Data Server (TDS) has radically changed our control system architecture, and the standardization and the maintenance of the UMMI applications have become important issues as their number increases. The Technical Supervision Interface is intended to replace the UMMI and solve the above problems. Using a standard WWW-browser for the display, it will be inherently multi-platform and hence available for control room operators, equipment specialists and on-call personnel.

1. INTRODUCTION

The *Uniform Man Machine Interface* built in 1990 has served the ST, SL and TIS Divisions for many of the technical supervision user interfaces ever since. The TCR alone is, today, using 30 different UMMI applications totalling some 700 mimic diagrams.

In the eight years of its life, the UMMI has been updated several times with new versions of the underlying graphics package for new releases of operating systems, etc., but the core of the tool has not changed at all. Many things have changed in the computer business though, and the advent of the World Wide Web has clearly set the direction for the future of visualization technology.

More recently, the TCR has introduced the TDS [1] as a common data source for the different types of data clients: alarm screens, data logging and mimic diagrams. The TDS may be seen as a real-time database containing equipment states to which the client may subscribe. This data acquisition method is known as the "*publish-subscribe*" mechanism and means that a client can ask the TDS for some data and get that data sent to it whenever it changes.

In the light of the above, the TCR Section decided to start a project to prepare a successor to the UMMI. A new tool should take advantage of recent visualization technology, implement an appropriate client to the publish-subscribe mechanism of the TDS, and take into account feedback on the previous tool. The Technical Supervision Interface project shall define the requirements on the tool of the future for the CERN technical infrastructure supervision.

This paper will show: first, a summary of user requirements that were collected in the first phase of the project, then, the results of the analysis work on the user requirements, and finally give some indication of a possible solution.

2. SPECIFICATIONS FOR A NEW TOOL

User interviews were conducted with most of the current users of the UMMI and with potential users of a new system in order to capture the user requirements for the TSI. The users were asked to give input on the requirements they would have on a new system and the problems they had encountered with the existing UMMI.

The user requirements [2] captured have been analyzed and the following concepts were seen as important features for a new system.

Object-oriented graphics and symbols. -- The TDS has structured all its data in an object-like way where each equipment state transported by the system is named in a way representing its system, subsystem, class, member and attributes. The new supervision tool must take advantage of this. We also want the objects created to be completely independent and to contain everything they need to run. In this way, we can produce standard objects that can be used by anyone that adheres to the TDS tag naming convention.

Standard Symbols. -- Much of the equipment supervised is of the same type (pumps, valves, ventilators, circuit breakers, etc.) appearing many times in many of our views. There is a real interest in standardizing these symbols largely. For the person building a view, it is easier to use an existing component rather than building it. For the operator, it is good if a symbol always looks and behaves the same. The TSI must permit the standardization and re-use of symbols throughout all views.

Flexible navigation. -- The tool should permit totally flexible navigation in the hypertext fashion. We can forget the notion of application if we can make hyperlinks between views. Each user may set up his own "application" by organizing a list of "bookmarks" to his views. Better still, the TSI may provide some sort of search engine that will furnish a list of hyperlinks to views that correspond to some search criteria given by the user.

Event driven data acquisition. -- Event driven here means that data should be sent to the mimic diagram only when the value of that data changes. The user should not need to ask for data anymore, but simply subscribe to get the data he needs when it changes. Event driven data acquisition is also an inherent feature of the TDS that the TSI must make use of.

Open architecture. -- Not all data come from the TDS. The TSI will define an open communications protocol that can be used by future data providers. By separating data visualization from data acquisition, we can make a generic, modular and scalable tool.

Platform independent user interface. -- Users want to access views from control rooms, offices, their homes, and from the road over a telephone modem.

Linking of an alarm from the alarm screen (CAS) directly to the corresponding view. -- The control room users would like to be able to click a CAS alarm and get a corresponding synoptic view.

Simplified view design. -- The creation of a view should not need any programming. Any user should be able to design his views simply by selecting the equipment he wants to supervise from a list and place them on a screen in the way of a graphics editor with predefined symbols.

View layering. -- As any professional computer aided design tool, the new supervision tool should support the use of different levels for different information. View layering could allow the drawing of very complex schemas including many systems on different layers in a single view.

View zooming. -- This would make it possible to create a super-drawing containing, for instance, the complete cooling water system for the SPS. A user could, from a global view, zoom into a part of the drawing of interest. The symbols displayed could change, depending on the current zoom, to show more or less detail.

3. A NEW SUPERVISION ARCHITECTURE

The careful analysis of the requirements indicated the type of solution we should look into. The following is a list of conclusions drawn from the requirements:

Multi-platform requirements tend to suggest that the ***Java programming language*** be used. However, *Java* is still very young and the availability of commercial products is limited to this date, but the major players in the computing industry all have invested in *Java*, so it is only a question of time before the necessary products are available.

Navigation requirements stated by the users would be met by using a ***standard www-browser*** with its possibilities for navigation back, forward, to bookmarks and home.

In fact, the analysis of the user requirements showed that the notion of an application (a set of views compiled and used together) could be abandoned if we use some form of hyperlinks between views.

Other facts would also seem to favour the use of a www-browser: the possibility of having a common interface for different types of applications used by the same client (mimic diagrams and data logging, documentation, etc.).

View development requirements show the need for an ***interface to a reference database***: to have direct access to the available equipment descriptions, to standardize the view symbols, and to keep the views coherent.

Event driven data acquisition is clearly an objective of the system. ***De-coupling the data acquisition and the data display*** will open the system to any data source, yet keeping the event driven concept for optimal performance of the user interface. Minimizing the data flow over the network makes it possible to use a TSI view over a telephone modem.

To validate the use of a www-browser and the *Java* programming language as an interface to the TDS, we have built a prototype application view. In order to achieve real event driven data acquisition, we implemented a fourth-generation web solution where a TSI client connects to a real-time TDS data acquisition module for its data. Figure 1 below shows the prototype architecture for the TSI:

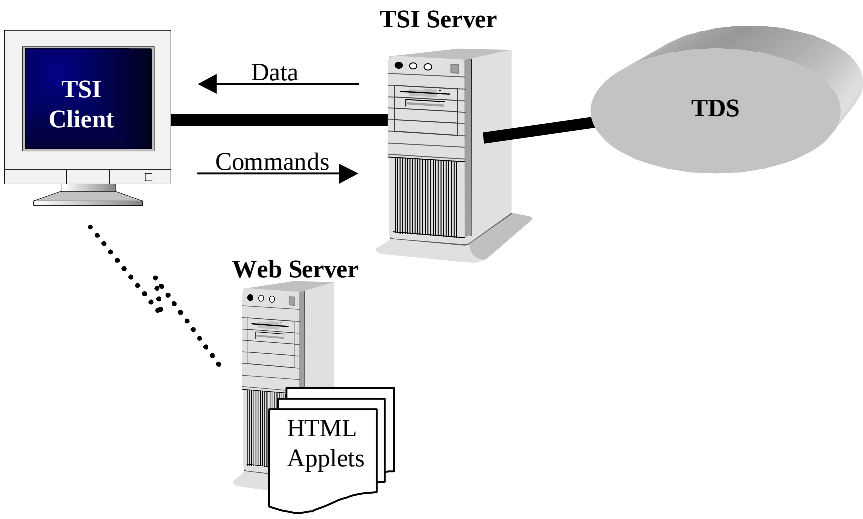

Figure 1: TSI prototype architecture.

4. PROJECT STATUS AND OUTLOOK

The TSI project is now reaching the end of the requirements analysis stage. The user requirements have been analyzed, a preliminary design exists, and a prototype system has been designed to validate requirements [3].

Other groups at CERN have shown interest in the project and we have come to the conclusion that it would be of interest to everybody if we could join our forces and produce a tool that could be used by people external to the ST/MC Group. The output of the requirements analysis phase, the *Software Requirements Document*, will be a base for discussions on the possible inter-divisional collaboration to make a common product.

Next, we will look for commercial products fulfilling the software requirements identified in the analysis stage. Candidate products will then be evaluated and possibly selected for the production phase.

We plan to have the TSI ready for view production in 1999. All new views developed for the technical supervision in the Technical Control Room should then use the TSI which would be ready for use by other people choosing a supervision product for the future LHC equipment.

5. CONCLUSION

With the experience gained over the eight years of UMMI operation, the requirements on a new supervision tool are well understood. By implementing these requirements, the TSI will overcome the present problems of the UMMI and give a new dimension to the supervision possibilities by:

1. Distributing the supervision tools over the internet to any client;
2. Using a "standard" web browser for the user interface, making it platform independent;
3. Using the event driven data acquisition method inherent to the TDS and allowing for any future data source conforming to the TSI protocol.

The possible implementation using the Java programming language and web technologies might seem premature, but is really the only alternative if we want supervision interfaces that are commonly available and platform independent. The current trend in the computing industry also suggests that Java and WWW are here to stay. We have been looking for candidate products for the TSI, but not yet found a tool which we are happy with. However, many companies start to understand the need for a real supervision tool on the web, and products that would satisfy the TSI are bound to appear in the near future.

It is clear that the TSI will be the supervision tool for CERN's technical infrastructure through the LHC period, and with the collaboration of other divisions, it has the potential to become the common supervision interface at CERN.

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