

Evolution of the Building Management System in the INFN CNAF Tier-1 datacenter facility

Monday 10 October 2016 14:30 (15 minutes)

The INFN CNAF Tier-1 computing center is composed by 2 different main rooms containing IT resources and 4 additional locations that hosts the necessary technology infrastructures providing the electrical power and refrigeration to the facility. The power supply and continuity are ensured by a dedicated room with three 15,000 to 400 V transformers in a separate part of the principal building and 2 redundant 1.4MW diesel rotary uninterruptible power supplies. The cooling is provided by six free cooling chillers of 320 kW each with a N+2 redundancy configuration. Clearly, considering the complex physical distribution of the technical plants, a detailed Building Management System (BMS) was designed and implemented as part of the original project in order to monitor and collect all the necessary information and for providing alarms in case of malfunctions or major failures. After almost 10 years of service, a revision of the BMS system was somewhat necessary. In addition, the increasing cost of electrical power is nowadays a strong motivation for improving the energy efficiency of the infrastructure. Therefore the exact calculation of the power usage effectiveness (PUE) metric has become one of the most important factors when aiming for the optimization of a modern data center. For these reasons, an evolution of the BMS system was designed using the Schneider StruxureWare infrastructure hardware and software products. This solution demonstrates to be a natural and flexible development of the previous TAC Vista software with advantages in the ease of use and the possibility to customize the data collection and the graphical interfaces display. Moreover, the addition of protocols like open standard Web services gives the possibility to communicate with the BMS from custom user application and permits the exchange of data and information through the Web between different third-party systems. Specific Web services SOAP requests has been implemented in our Tier-1 monitoring system in order to collect historical trends of power demands and calculate the partial PUE (pPUE) of specific area of the infrastructure. This would help in the identification of “spots” that may need optimization in the power usage. The StruxureWare system maintains compatibility with standard protocols like Modbus as well as native LonWorks, making possible reusing the existing network between physical locations as well as a considerable number of programmable controller and I/O modules that interact with the facility. The high increase in detailed statistical information of power consumption and the HVAC (heat, ventilation and air conditioning) parameters could prove to be a very valuable strategic choice for improving the overall PUE. This will bring remarkable benefits for the overall management costs, despite the limits in the actual location of the facility, and it will help the process of building a more energy efficient data center that embraces the concept of green IT.

Tertiary Keyword (Optional)

Monitoring

Secondary Keyword (Optional)

Computing facilities

Primary Keyword (Mandatory)

Control systems

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Session Classification: Track 6: Infrastructures

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