

On October 13, 2010, ISA-France organizes in Paris, 17 rue Hamelin, together with SEE, a technical day on cloud computing: "Cloud Computing: Buzzword or change of paradigm". Programme and registration form can be downloaded from www.isa-france.org or www.see.asso.fr

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On this occasion, Jean-Pierre HAUET, President ISA-France, gives us a vision of the possible evolution of control systems incorporating an increasing reliance on "cloud computing".

Cloud computing at a glance



Born a few years ago, Cloud Computing is for some a pioneering technology, for others a catch-all marketing hype. The concept of cloud computing is similar to the distribution of electric energy. The computing processing power and storage of information are relocated in facilities accessible thanks to high-speed networks and made available, possibly with appropriate applications, by specialized companies.

Cloud computing is a new form of use of the Internet which allows organizations to benefit from processing capacities and storage that would be impossible for the users to own and maintain. Beyond these services called IaaS (Infrastructure as a Service), cloud computing may also provide development platforms (PaaS: Platform as a Service) and applications, not acquired as licenses by the user but made available against payment of a fee based on their actual utilization (SaaS: Software as a Service).

Cloud computing is rapidly gaining ground in traditional computing applications. All the major players in the computing arena (HP, Microsoft, Google, Amazon) as well as new comers are now proposing cloud solutions including the management of a diversity of clouds.

What impact on control systems?

The issue addressed in this ISA Flash is the possible impact of these technologies on the industrial control systems. The industry is a conservative and cautious world: digital communication networks entered it very progressively; wireless and Internet technologies are still on the doorstep.

But our feeling is that cloud computing will strongly influence how the future design and operation of control systems will evolve. There are several reasons for this:

- The availability of generic computer hardware and software has taken a dominant place in the design and implementation of control systems (Ethernet, Windows operating systems),
- The problems of permanence of materials and maintenance of software are heavy constraints which industrial companies would be able to discard,
- Cloud computing will be an elegant way to achieve convergence between systems controlling various sites of the same company, offering the possibility to easily perform comparisons and syntheses and to liaise with upper levels of information systems,
- The performance of networks, whether supported by optical fibers or wireless links, will increase dramatically, progressively shrinking, as it used to be the case for the industrial Ethernet, the domain remaining specific to the hard real-time and critical time,
- The problems of availability, reliability and integrity of data transfer have received solutions, including, as for wireless links, those developed and validated in the ISA-100.11a standard,
- Cyber-security risks should not be ignored, but the cloud, with secure communications, may be a way of preventing them. Solutions for coping with these risks exist and the rules and recommendations contained in the ISA-99 standard would have prevented some recent attacks on control systems.

Already, certain key elements of future control system architectures appear on the market.

Instrumentation Clouds

Some companies offer solutions in which the sensors are equipped with some kinds of active RFID tags capable to transmitting over the Internet via access points, the results of their measurements. The corresponding data become available from any workstation connected to a platform such as Pachube, www.pachube.com, (Figure 1). Initial applications include power and lighting control, weather, sharing of scientific data, etc..

Other companies, such as Tag4M, www.tag4m.com, offer more professional and secure platforms, whose industrial applications are beginning to emerge (Figure 2).

Figure 1 – Source : Pachube

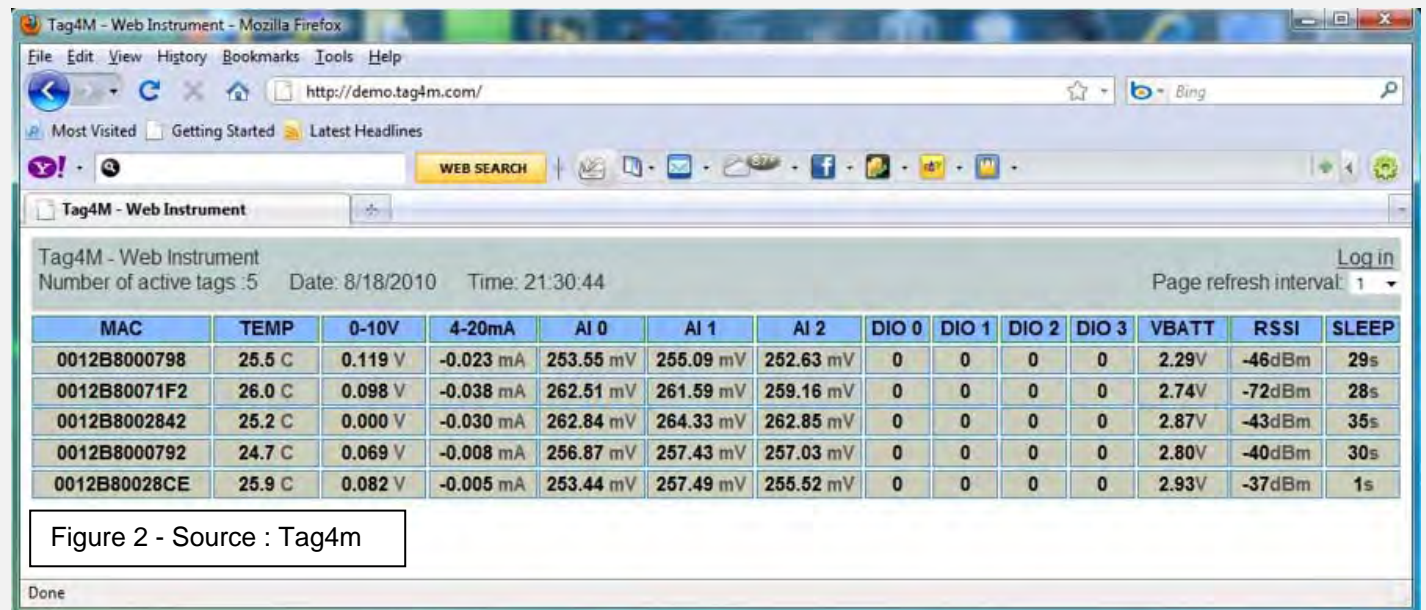


Figure 2 - Source : Tag4m

HMIs in the cloud

A following step is naturally to make certain treatments in the cloud such as alarms detection, optimization calculations, archiving or viewing the status of processes and alarming the operation staff.

The screens are refreshed in the cloud and accessible from any browser granted with the required access rights. Status Online using Microsoft Silverlight technology, is thus an under development cloud version of the Status Vision software from MobiForm (Figure 3).

Figure 3 – Source : Mobiform



In conclusion

We believe that cloud computing will lead to revisiting of the structure and the operational mode of the hierarchical pyramidal control systems which we have been familiar with for 30 years. The monitoring and control will be organized at the level of the enterprise or of a group of sites developing similar activities. They will be based on:

- Islands of automation, collecting data and transmitting them to a cloud via an access point. The collection of data from the sensors to the access point and then the return of information to the actuators may be hard wired or based on a radio system such as ISA-100. These islands will keep, when necessary, the local processing capabilities necessary to meet the dynamics of very fast processes. The detection, signal analysis will remain in the island of automation as well as the implementation of Grafset machines. The security applications will also continue to receive a specific treatment.

- The clouds will be offered by traditional suppliers of control systems but also probably by new suppliers. They will provide storage and processing of data. The functionalities related to operation support (detection and interpretation of alarms, situation analysis) who are "computer intensive", will be good candidates for the cloud. Certain standardized applications will be made available by some clouds. As for others, they will be developed by the users on the basis of development platforms provided by the clouds. Systems engineering will rely heavily on this type of platform.

- The control and supervision of facilities will be achieved thanks to Web browsers connected to the cloud, through fast Internet accesses or through wireless links such as HSPA (3G) or better LTE (4G), or, within a given site, from IEEE 802.11n (Wi-Fi) relays or 802.16 (WiMAX) where the frequency will be allowed for free. Advanced PDAs or iPad, ruggedized when necessary, can then become valuable tools.

Things will not happen overnight and it will be necessary to reach a balance between local and remote. In the world of electricity, we observe the opposite trend. Many people are asking for more decentralized sources of energy as they like to believe that small is beautiful. But what benefit in terms of availability and reliability do distributed energy sources actually provide?

After the Stuxnet virus attacks, it is becoming obvious that control systems are subject to cyber-vulnerabilities, and the limits of decentralized installations are perceivable. Meanwhile, the industrial world is now used to using professional, secure and high speed Internet connections. SaaS is requested by more and more users who do not want to hear about updates for software and maintenance of hardware and software etc. It is doubtful that remote infrastructure, well protected and managed by professionals, will be less safe or less available than local facilities.

Of course there will be reluctance in the industry, as is used to be the case for Ethernet and for off the shelf hardware and software products. But evolution takes place and a lot of data processing and archiving will be transferred to a cloud or to several clouds.

Nothing can be taken for sure. What we wanted to do, through this paper and through the technical day of October 13 in Paris (France), to open a debate in which there are still few contributions. We would welcome any input from our colleagues from ISA.

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