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Check against delivery - Seul le prononcé fait foi

Debate on "Smart cities and cybersecurity"

Strasbourg, France, 30 October 2019

Dear Chair,
Dear Members of Congress,
Dear Ladies and Gentlemen,

I was asked to share some thoughts on two key elements of the smart city, the role of artificial intelligence and 5G networks. Before we can do that, I believe it is instructive to review the main developments in ICT over the past 20, 25 years. In my view, we have seen four major developments all of them affecting the smart city.

The first major development is a massive decrease in sensor prices. Statistics show that typical, average sensors that were about 20 – 30 dollars in the 1990-ies are now 10-20 cents apiece. This enabled machine and vehicle manufacturers to literally plaster their products and production environments with sensors. We see the same development in infrastructures for the smart city – from the monitoring of street lights to parking lots.

Another development is cloud computing. Technically, this refers to the usage of standardized web services that enable to easily and flexibly assemble applications. You may use external software offered as a service and plug it into your in-house enterprise software. You may for instance contract an external travel management software as a service and plug it into your accounting and workflow system for approval and settlement of travel activities. This enables companies to quickly assemble application landscapes for new business models.

Thirdly, we see the pervasive usage of mobile computing. Applications are increasingly being developed "mobile first", meaning that the mobile interface is not an afterthought but the primary user interface. This particularly can be seen in eGovernment – or rather mGovernment – applications. Mobile networks are also a driver of the Internet of Things connecting sensors to central applications. Sensors and Internet of Things between them create what may be referred to as living infrastructure.

The most recent development is in-memory computing, whereby terabyte-sized databases are not maintained on disk but in main memory. One may say – so what? Well, the access time on disk is measured in milliseconds, that in main memory in nanoseconds. The difference is 10 to the power of 6. A schematic example: A data reading task that took 11 days on disk takes one second in main memory. 11 days – 1 second.

I've been teaching business analytics since 2001. Anything that had to be used in a real-time dialogue needed aggregate data as a basis for reporting and analysis – an analysis of the individual records simply took too long in case of large data stores.

These days are gone. Business analytics can now access the individual transaction records in real time or near real time – even if there are hundreds of billions of them. This enables machine learning and artificial intelligence applications in real time. This also includes the analysis of voice clips, stills and videos.

Let me recount a case study my students have to build and implement today as an illustrative example:

Envisage a mobile phone company storing its customer interactions: Contract concluded, contract terminated, helpdesk called etc. Further envisage voice clips of these helpdesk calls. These clips are run through a voice recognition and are decomposed into elementary statements. Then these elementary statements are assigned to topics, meaning what the customer is talking about, such as price, service quality or product quality. These topics are recognized by defined keywords. Then the elementary statements are analysed for sentiment – satisfaction, anger etc. So you know when a customer for instance talked about pricing in a negative sentiment.

Then the system recognizes patterns of communication in the call that lead to the termination of the mobile phone contract. Once that is established, the customer calls are sent through a voice recognition in real-time – when the customer speaks – and if that pattern for instance is recognized, the helpdesk agent gets a warning on screen combined with a proposal how to keep the customer based on his mobile phone usage pattern.

It is important to understand that artificial intelligence is not the terminator trudging through the landscape. It is the logical next step after creating living physical systems and infrastructures with sensors and the Internet of Things, assembling flexible applications via cloud services and of being able to analyse very large amounts of transaction records in real time. Artificial intelligence is hence the organic continuation of the evolution of ICT over the past two decades. And it is a main element of our competitiveness. It makes our products and our services, also our production environments, smarter and more competitive.

You want to stop artificial intelligence – you want to stop the competitiveness of your industry.

The same technologies will be applied to the smart city, whether in traffic management, smart maintenance or autonomous driving. Healthcare will be another huge field of application supporting for instance diagnosis. These applications will largely use the same technologies as the private sector and we will see the merger of classical – mainly statistical – analytics, machine learning and artificial intelligence.
This takes me to the role of 5G networks. In this regard it is important to understand two things. Firstly, smart infrastructures, smart products and smart services need to communicate with one another – reliably, with substantial amounts of data and in real time. That is what 5G is there for. 5G will hence become a core infrastructure element in our societies. It should be treated as such.

Secondly, 5G is not just another mobile phone generation. In contrast to earlier mobile phone generations, which were largely hardware-based, it is a mainly software-driven system. Much like operating systems. It will need regular patches and updates – much like operating systems. Ex-ante certification will therefore quickly reach its limits. One therefore has to install good business practices and a certified operational framework with service providers and infrastructure equipment manufacturers. A non-compliant actor would find it easy to install back doors in a patch of the network operating system – and move it to a new location in the software with the next patch a week later. These backdoors could for instance be camouflaged as service interfaces. Any attempt of a certification authority to keep up with this is doomed. It is the literal needle in a haystack.

So we have a core infrastructure element that is extremely vulnerable to suppliers not acting by the book.

I would therefore recommend to be extremely reluctant to employ 5G systems provided by manufacturers from authoritarian regimes. There is no such thing as "free entrepreneurship" under an authoritarian regime. The regime has access to everything and everybody. If it wants a backdoor in a 5G infrastructure product built in its country, it will get it.

To procure such vital and vulnerable infrastructures as 5G from a vendor subject to an authoritarian regime is not a very smart idea. I would therefore not recommend it. And certification will not be a solution for the technical reasons I outlined before. In this sensitive field, we should rely on infrastructure products from free market economies – particularly from our European producers.

I hope I was able to contribute to the discussion and would like to thank you for your attention.