SUMMARY TECHNOLOGY SEMINAR "Embedded Connectivity for the Internet of Things: the necessity of IPv6?"- 19TH NOVEMBER 2013

For this third technology seminar, VeroTech decided to organize the event in cooperation with DSP Valley. DSP Valley is a European cluster of excellence in smart systems and embedded technology solutions, they are mainly active in Belgium and the Netherlands. The goal of this seminar was to take a closer look at IPv6 and to answer a wide variety of questions. In the first place, what is IPv6 and why do we need it? Secondly how it is used per today and how will it be used in the future? But also what are the biggest problems switching over to IPv6 and how can we overcome these obstacles?

After a short welcome and introduction by Melissa Gorduyn, business manager at VeroTech, the afternoon seminar was ready for kick-off. This kick-off was given by Jan Paesmans, senior consultant at VeroTech. He described that IPv6 can and will contribute to the network connectivity in the future. This future network will be much faster and will include much more devices (computers, tablets, smart phones, gaming consoles, servers…) than there are already today. Even other unusual devices such as refrigerators, washing machines, light switches and so on will become part of it and all of those devices will have machine to machine (end-to-end) communication. This is what is called 'the Internet of Things' and therefore IPv6 is absolutely necessary. The conclusion stated by a quote: "IPv6 is a means to an end, but it is not the end in itself".

Next up was Wouter Cloetens (Architect SoftatHome), talking about the basics of IPv6. In the first place he answered the question what is actually wrong with IPv4, the network protocol mainly used today? Well, it's 2013 and there are about 7 billion people controlling about 10 billion devices and in the future both will only increase. We already came at a time that we almost ran out of IPv4 addresses, so it's time to switch over to a new protocol. While IPv4 has 2^{32} addresses, IPv6 has 2^{128}, an almost inexhaustible supply. In addition to the much larger address range, IPv6 also has some other improvements such as NAT (Network Address and Port Translation) becoming unnecessary. Basically NAT breaks the end-to-end design of the Internet, but this end-to-end design is what we actually want. Other improvements are better routing, better network auto configuration and data protection at IP level. But IPv6 also brings some new complexities along that we have to take into account: multiple routes can coexist and multiple addresses on the host are possible.

Phillipe Paeps, Co-Founder of NixSys, his presentation was about the implementation specifics of IPv6. IPv6 offers new strategies and ways to implement it in the software, especially in terms of SLAAC (Stateless address auto configuration) and privacy extension. Phillipe talked about what to do and what not to do when implementing IPv6. Some do's he mentioned: generate new address at reasonable intervals, properly deprecate old addresses, check for reserved and reused addresses. Also some don'ts: don't use the same randomly generated addresses for ever and don't throw away old addresses. About mobile IPv6 he stated that there is a lot of research going on to allow persistent

connections for things on the move using IPv6, but that there is no complete implementation available yet for the moment.

After a refreshing break, Luc Perneel the founder of Luperco came to talk about the Quality of Service (QoS). QoS is the overall performance of a network seen by the users of the network. This includes bandwidth, latency, error rates, jitter, availability etc. In the early days IPv4-based network used a Type of Service (TOS) byte field set at application level, causing the network to rely on the fairness of applications to make a
difference between data that is time sensitive, such as streaming audio or video, and data that isn't time-sensitive, such as file transfer. Due to this, data that is time sensitive experiences a lot of problems, for example Voice over IP.
With the introduction of IPv6 the usage of the TOS byte in IPv4 was redefined and harmonized with IPv6: now it is used as DiffServ (differentiated services) field. The DiffServ field is done at Network level, where the type of an arriving network packet is analyzed and the DiffServ field is set accordingly. This makes it possible to handle packets in a more sophisticated way and make a difference between the importance of packets. Data which is time sensitive is recognized and gets priority, causing (almost) none of the data to be dropped, data which is less important will be more likely to lose a packets.

As last speaker, Mario Vermeir (Field Application Engineer, EBV Elektronik) demonstrated a solution to run IPv6 on a micro-controller. He talked about the hardware requirements of the microcontroller needed to be able to run IPv6 and about the used software: Freescale MQX. This is a solution to integrate/embed software in the the microcontroller. At the end of his presentation he demonstrated the micro-controller running IPv6.

To end the seminar there was a short panel discussion with all speakers involved and with the possibility to ask questions or start a small discussion about some topics that were brought up during the seminar. Finally, to close the afternoon with a complete satisfied feeling in every way, there was a networking reception with some food and drinks.