

# Tutorial Proposal Form for IEEE CCNC 2013

## A Tutorial Title

*Advances in Home Networking Standardization and related research opportunities*

## B Instructor

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## C Abstract

Sometimes, the worlds of standardization and academic research seem far apart. However, home networking scientists and developers need to understand in which context their technology is expected to operate, in order to optimize the chance that their products will co-exist and interoperate with other systems in the consumer space. The focus of the tutorial will be on the role of standardization in the home networking field, how it works, what the main forces are, and why it is so opaque and complex. This will be illustrated in the light of current trends: the introduction of ICT from new domains (energy, health, ...) and the need for convergence and interoperability with ICT from established domains (telecom, consumer electronics, Internet). The second part of the tutorial will discuss the current status in home networking standardization: "official" bodies such as IEEE, ETSI, ISO/IEC, CENELEC, ITU, but also industry initiatives such as IETF, HGI, DLNA, UPnP Forum, Broadband Forum, Continua, PUCC, ATIS, DVB, Enocean Alliance, OSGi, CECED, DLMS, Zigbee Alliance, etc. The emphasis will be on the standards that are relevant today, with a focus on new developments, such as IEEE-802.11ac and -1905.1, DLNA CVP, UPnP-HEMS, -DMS, and -EHS, DECT ULE, and G.hnem and G.phnt. The final hour will be spend on related research questions: architectures for convergence, co-existence issues, migration and scalability studies, etc.

## D Scope

This may at first sight sound like a survey of several topics, but it is not: this is an in-depth study of the properties of the communication technology ecosystem in the home, and the research topics that follow from it.

## E Intended Audience

Applied scientists and R&D engineers who need to optimize the chance that their products and technologies will co-exist and interoperate with other systems in the consumer space, but who lack the necessary overview of the related standardization world. It may also be

interesting for consumer networking scientist looking for new fields and new research questions.

## **F Motivation**

The tutorial presenter has observed that the worlds of standardization and academic research are often fairly disconnected. But for successful consumer networking, researchers need to understand more and more in which context their technology is going to operate, in order to optimize the chance that their products will co-exist and interoperate with other systems in the consumer space. Effective consumer networking is thus ever more becoming systems research. For this, many researchers often lack the necessary industrial and commercial experience, and the overview of the related standardization world. At none of the universities that the tutorial presenter has taught, this was part of the standard curriculum.

The topic is quite specific for consumer communications and networking, and thus for CCNC. It concerns the tracks “Wireless Communications”, “Multimedia Networking, Services and Applications”, “Smart Spaces and Sensor Networks”, and “Green Communications”. Most of the examples dealt with are from the field of home networking, but analogies with other fields of consumer networking and communications will be made.

## **G Objective**

The attendants will understand how standardization works in general, and how this materializes for home networks in particular, given the current trends in consumer communications, such as convergence of once domain-specific systems. They will learn about the resulting interoperability issues that are more and more prevail in consumer networking, and the research questions that follow from it.

## **H Prior History**

If selected, this will be the second time that this tutorial is given in the context of an international IEEE conference: it will be an update of the “Consumer Networking Standardization: trends and research opportunities” tutorial of IEEE CCNC 2011. The 2011 tutorial, though it was not well advertised, attracted 10 attendants on the spot and numerous people on-line, given the amount of positive feedback I received from non-attendants. This was probably fuelled by the fact that the 2011 tutorial was offered by ComSoc as a free webinar tutorial for 3 months afterwards. The 2011 tutorial will be updated for ~50%: the first part, about the fundamental working of standardization has not changed during the past two years, of course.

## **I Outline**

Please give an overview of the planned content and include rough time allocations:

- First hour:
  - Trends in home networking: convergence
  - The need for standardization
  - How standardization works: use cases, functional requirements, technical specifications, patent calling, voting, maintenance, etc.
  - Industrial standardization consortia, official standard development organizations, and de facto standards (Apple, Microsoft, ...).

- ❑ The main bodies relevant for home networking: “official” bodies such as IEEE, ETSI, ISO/IEC, CENELEC, ITU, but also industry initiatives such as IETF, HGI, DLNA, UPnP Forum, Broadband Forum, Continua, PUCC, ATIS, DVB, Enocean Alliance, OSGi, CECED, DLMS, Zigbee Alliance, etc.
- ❑ Second hour:
  - ❑ Overview of the relevant standards for home networking, including IEEE 802 standards, ITU-T G.hn-series, DECT, KNX, DLNA, HGI, MoCa, TR-069, etc., with a focus on new developments, such as IEEE-802.11ac and -1905.1, DLNA CVP, UPnP-HEMS, -DMS, and -EHS, DECT ULE and G.hnem and G.phnt.
  - ❑ Classification of standards: understanding their mutual relationship. Results from CENELE SmartHouse Roadmap [1].
  - ❑ The main interoperability issues, following from the trends as discussed before
- ❑ Third hour:
  - ❑ Research questions: architectures for convergence, co-existence issues, migration and scalability studies
  - ❑ Examples from the literature. A particular focus will be on the relationship between home networking standardization and the technical papers and demonstrators presented at IEEE CCNC 2013.
  - ❑ Discussion.

## J Biographical Sketch

Frank den Hartog’s field of research can be summarized by “Everything related to interoperability in and with private networks”. This includes architectures, business models, business requirements, user requirements, standardization (and its economic impact), protocol design, and application design. He is particularly challenged by trying to bridge the worlds of research, standardization and valorization in this field.

After obtaining a PhD in optics from Leiden University in 1998, he pioneered the home networking field at the Dutch incumbent operator KPN, by investigating the suitability of the DECT protocol for wireless data transfer and local area networking. After 2001 his research mainly focused on performance of wireless short-range technologies in realistic indoor environments, remote CPE-, home-network, and service management in multi-service multi-provider environments, interoperability of home networking protocols and the role of standardization.

In 2003 he became a senior scientist at the Dutch Center of Applied Research TNO, and many results have since been published and/or implemented by various customers of TNO. Some have been brought into standardization at the worldwide HGI, where Frank is currently the Chair of the Technical Working Group. He authored a significant part of HGI Release 1 standard, the HGI Release 2 Residential Profile standard, and the HGI Release 3 Requirements for Multiple Session Support standard [2]. The results also led to a Best Paper Award at the international FITCE conference, invitations for keynote speeches at business conferences, and becoming the lead editor in the 2009/2010 CENELEC SmartHouse Roadmap project [1]. He wrote nearly seventy technical articles, reports, and patents, and over forty contributions to standardization (in particular to HGI, Broadband Forum, OMA, and ITU-T SG 16 FS-VDSL) [3]. He is very active in organizing and program committees of technical conferences organized by IEEE, ACM, and others.

Frank is often and repeatedly invited for guest lectures by the universities of Eindhoven, Leiden, Delft, and Limburg (Belgium). He supervised 3 PhD students and 8 master students on a daily base. His talks at the 1<sup>st</sup> and 2<sup>nd</sup> International TNO Broadband Home seminar [4] was rated first by the audience.

## K Major References

- [1] <ftp://ftp.cencenelec.eu/CENELEC/SmartHouse/SmartHouseRoadmap.pdf>
- [2] <http://www.homegateway.org/documents/publications.asp>
- [3] <http://sites.google.com/site/frankdenhartog/list-of-publications>
- [4] [http://www.tno.nl/downloads/Program\\_Broadband\\_Home\\_seminar\\_v1.13.pdf](http://www.tno.nl/downloads/Program_Broadband_Home_seminar_v1.13.pdf),  
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