

T1. Meeting Household Expectations of a Future Intelligent Home

More and more devices at homes and in the offices are combined into networks. This is being done to further deploy ubiquitous computing in our daily life and make it easier. But what do people anticipate from such networking environments? What researchers and manufacturers should take into account while modeling the products and services for home networks? The aim of this research is to bring up the key issues that concern developing of the home network which would satisfy users at most.

- **Types of products**
 - ✓ What the family members may benefit from while networking together their household appliances?
 - ✓ How, in your opinion, an intelligent home should look like?
- **User interface**
 - ✓ Easy installation, maintenance and use (consider different user experience and background; people of different age, with varying level of knowledge)
 - ✓ A technology must simplify users life, not stress them
- **Compatibility**
 - ✓ Devices from different manufacturers. Old and new models. Standardized solutions
 - ✓ Wiring the devices
- **Customizable products**
 - ✓ Different needs of services by user, country, culture, year season, time of the day etc.
- **Smartness of the network and its robustness**
 - ✓ context-aware networks, applications which require almost no user input
 - ✓ multi-function but robust devices
- **Smooth integration**
 - ✓ How to fit harmoniously into people's life?
 - ✓ Positive impact on family member's relationship
 - ✓ Making life convenient but not to be excessive
 - ✓ Privacy is important
- ...

Who this topic may suit to?

Anyone interested in this research area or a certain subsection may choose this topic. If the topic appears to be too extensive it might be divided to subtopics depending on students interest. The topic is closely related to the areas of applications and services, user interfaces for the home, user experience, usability of the networked devices.

Literature:

1. Grinter, R. E.; Ducheneaut, N.; Edwards, W. K.; Newman, M. The work to make a home network work. In Gellersen, H.; Schmidt, K.; Beaudouin-Lafon, M.; Mackay, W. (Eds.), Proceedings of the Ninth European Conference on Computer-Supported Cooperative Work, 18-22 September 2005, Paris, France.
<http://www2.parc.com/csl/members/nicolas/documents/ECSCW05.pdf>
2. Carsten Röcker, Maddy D. Janse, Nathalie Portolan & Norbert Streitz. User requirements for Intelligent Home Environments: A Scenario-Driven Approach and Empirical Cross-Cultural Study, October 2005, SOC-EUSAI 2005.
http://www.hitech-projects.com/euprojects/amigo/publications/roecker_et_al.pdf

T2. Wiring Devices and Technologies in a Home Environment

Building networks in a home environment might be very challenging. Using, for example, Ethernet cables is often not a desirable solution due to their initial absence in the infrastructure of most homes. Fortunately, there is a certain amount of “no-new-wires” solutions being developed such as built-in home cables and wireless technologies which might serve as the communication channels. At the same time, installation of the wireless access points, for instance, might not be affordable to many users. A large number of other factors is also weighty when we choose between alternative technologies. The examples of such factors are maximum data rate, compatibility and interoperability between different appliances, standardization status, security, reliability, range limit and power consumption (i.e. for bluetooth, wifi devices) and many others.

The objective of this work would be to study the existing technologies such as Ethernet, WLAN, MoCA, PLC, HPNA etc, find out the advantages and the disadvantages they give to consumers and possibly suggest some solutions to the open research questions.

Suitability:

Apparently, the topic is suitable for everybody keen on alternative methods to interconnect devices in the home networks. Previous experience is not mandatory. However, the familiarity with the above mentioned technologies would be an advantage.

Literature:

1. Vaxevanakis, K., Zahariadis, T., and Vogiatzis, N. 2003. A review on wireless home network technologies. *SIGMOBILE Mob. Comput. Commun. Rev.* 7, 2 (Apr. 2003), 59-68. DOI=<http://doi.acm.org/10.1145/950391.950400>
2. Rose, B. Home networks: a standards perspective. *IEEE Communication Magazine. Rev.* 39, 12 (Dec 2001), 78-85. DOI=10.1109/35.968816

T3. Multi-Layered Mobility Management in Next Generation Wireless Networks

The purpose of this research would be investigating a possibility of integrating different layer protocols for supporting mobility in next generation wireless networks. Among a few recently proposed approaches SIP+HIP and SIP+MIP schemes are especially of interest. Host Identity Protocol and Mobile IP are two alternative network layer protocols for handling mobility events. Session Initiation Protocol can be used for mobility management in the application layer. When used separately from each other, a number of factors such as robustness, network overhead, latency may become a concern. A combination of these protocols, however, is expected to meet those challenges and reasonably improve the performance.

Suitability:

The topic would better suit advanced students whose areas of interest include the next generation Internet protocols supporting mobility, 4G all-IP systems etc.

Literature:

1. So, J.Y.H.; Jidong Wang; Jones, D.; SHIP mobility management hybrid SIP-HIP scheme. Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing, 2005 and First ACIS International Workshop on Self-Assembling Wireless Networks. SNPD/SAWN 2005. Sixth International Conference, May 2005 Page(s): 226 – 230. Digital Object Identifier 10.1109/SNPD-SAWN.2005.68
2. Jung, J.-W.; Mudumbai, R.; Montgomery, D.; Hyun-Kook Kahng. Performance evaluation of two layered mobility management using mobile IP and session initiation protocol. Global Telecommunications Conference, 2003. GLOBECOM '03. IEEE Vol. 3, Page(s): 1190 – 1194, Dec. 2003. Digital Object Identifier 10.1109/GLOCOM.2003.1258427
3. SIP, HIP and Mobile IP RFC and Internet-drafts

T4. Network Architectures for the Home

Most of the small and medium-sized home networks today are built on the top of peer-to-peer technology. Being easier to set up, lower at cost, simpler to use with “no-new-wires” interconnection methods, P2P model has become a rather preferable choice for controlling home networks. However, under certain circumstances using peer to peer architecture is not a favorable solution. For example, when a network grows in the amount of entities, one may prefer to switch to Client-Server model for a better control and use.

The aim of this research is to analyze the key properties and decisive factors of a few alternative architectures such as P2P, Client-Server etc. for building home networks.

Literature:

1. Michael Wolf. Home Networking: What Type Is Best? Sample chapter of the book. Speed!: Understanding and Installing Home Networks. ISBN-10: 0-672-32186-6; ISBN-13: 978-0-672-32186-3; Published: Oct 18, 2001; Copyright 2002; Dimensions 7-3/8" x 9-1/8"; Pages: 408; Edition: 1st. <http://www.sampublishing.com/articles/article.asp?p=26437&rl=1>
2. TBA