

Autonomic Home Networks in the BMBF project AuthoNe

Georg Carle, Holger Kinkelin, Andreas Müller, Heiko Niedermayer, Marc-Oliver Pahl (TU München, Universität Tübingen), Alexander König, Thomas Luckenbach, Klaus Scholl, Mario Schuster, Lasse Thiem (Fraunhofer FOKUS), Leo Petrak, Markus Steinmetz (Hirschmann AC), Christoph Niedermeier, Jürgen Reichmann (Siemens CT)



AuthoNe [1] is a BMBF (German Federal Ministry of Education and Research) funded project that started in October 2007 with a planned duration of 36 months. Partners are Fraunhofer FOKUS, Hirschmann AC, Siemens CT, and TU Munich (at project start University of Tübingen). The project is being carried out as part of the CELTIC cluster within the EUREKA initiative.

The goal of AuthoNe is to advance in the field of autonomic networks for home areas. Today, social and technical barriers prevent most users from the successful interconnection of their mobile devices and other technical equipment. Furthermore, as most users are no experts in the field of networking, the introduction of autonomic behavior is an important step towards ubiquitous computing. AuthoNe supports this by introducing varying combinations of self-management and manual interaction that can be defined to adapt to the knowledge of users. The approach of AuthoNe is based on the concept of a knowledge plane [2] which collects and interprets a variety of network data and which uses the derived knowledge whenever a decision is needed. The available knowledge is then used to take the necessary actions to fulfill objectives defined by the user.

AuthoNe does not limit home networks to their current state. In fact, in AuthoNe we consider future home networks that comprise of the following components.

- A home gateway connected to the Internet or a service-provider network.
- Multimedia devices such as video, CD, and DVD players, TVs, amplifiers, speakers, etc.
- Computers and peripherals
- Communication devices
- Body area devices
- Home appliances like lighting, heating, oven, etc.
- Networked sensors (e.g. temperature, acoustic, optical) and actuators

AuthoNe supports

- User interaction with a variety of devices through a Multi Client System to be developed. The devices and the autonomic network react to user behavior.
- Autonomous self-configuration and operation in accordance with policies and defined objectives.
- Autonomous self-protection and self-healing
- Security according to user needs (incl. AAA, firewall)
- Local / remote access to the resources, including legitimate traversal of middleboxes (NAT, firewall)

Many industrial networks have a similar structure. The project also addresses such networks, thereby broadening the applicability of AuthoNe results.

AuthoNe deals with the requirement of autonomy by using control and management components that represent a knowledge plane. They acquire knowledge in a home network from information provided by its devices, and by network observation. Additional environmental information is exploited that originates from sensors in a sensor/actuator network. User interaction provides policies and further information.

Sensors are very practical and important for many use-cases in home automation. AuthoNe develops a service platform for such sensors to easily introduce new sensor applications in future home networks. Thus, a sensor network is a subnetwork of the overall home network.

In contrast to systems that are completely self-organizing, AuthoNe does not eliminate interaction possibilities of the user. The resulting control is a compromise between self-management and manual interaction, which can be adapted to the skills and preferences of the user. The user interface signals the network's actions in a high-level manner and the user input provides the objectives and additional knowledge. One concept for a high-level control interface is to adapt security needs from high to low, which may be signalled as green and red for non-expert users. The practical difference may affect remote access policies, e.g. allowing to stream data to the neighbor's TV for a video session.

The scenarios of AuthoNe range from eco scenarios (addressing ecological and environmental requirements) to classic multimedia scenarios. Eco scenarios are an example from building automation. The goal of these scenarios is to improve energy efficiency and to reduce overall power consumption. With respect to building automation the heating, lighting, and air conditioning are optimized to save energy. Similarly, in emergency scenarios sensors might detect fire and recognize vital signs of humans. This information will then be signalled to the rescue services. In the classic multimedia scenario the system uses the sensors to determine the location of a user and as a consequence selects the speakers and adapts the quality of the audio stream accordingly.

REFERENCES

- [1] AuthoNe, www.authone.de
- [2] David D. Clark, Craig Partridge, J. Christopher Ramming, John Wroclawski: A knowledge plane for the internet. SIGCOMM 2003.