UseNet
(ITEA 2 06004)

Juhani Latvakoski
VTT Technical Research Centre of Finland

Leading the way in ubiquitous machine-to-machine networking

The ITEA UseNet project focused on the specification of horizontal machine-to-machine (M2M) infrastructure in close interaction with domain-specific application experiments. The horizontal approach is expected to boost transfer from a highly fragmented vertical M2M market, working today mostly in separate silos, into the horizontal M2M market. The success of the project is driving global standardisation in this area and has already resulted in a range of experimental products and applications ready for commercialisation in the domestic, industrial, transport and well-being sectors.

Machine-to-machine systems connect the physical world to the information and communications technology (ICT) world, making use of ICT technologies to enable remote measurements and remote control of devices. This involves the assembly of sensor and actuator networks and the services that can be offered using such networks. Network activities include sending, receiving, storing and processing of information, and all kinds of actions needed for remote operations.

M2M services involve the collection, transmission and processing of the information, and the establishment of interactive systems with the remote devices that can ultimately be integrated within a managed M2M software system solution. Such a solution may or may not require human interaction.

ENABLING UBIQUITOUS USE
While M2M network applications have been developing rapidly, they have been limited to vendor or domain-specific closed systems. Developments costs have therefore been high because solutions had to be developed and implemented separately for each domain or even specific business case. This has led to the wheel being invented over and over again in different contexts.

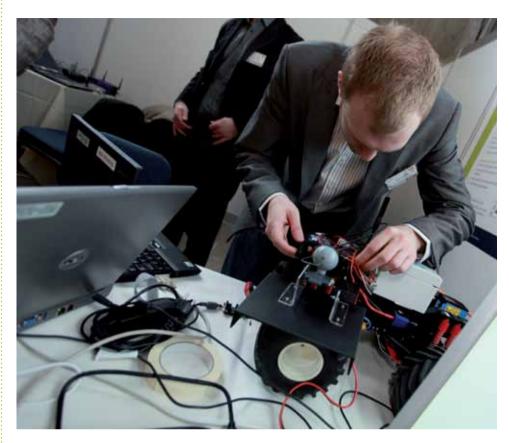UseNet set out to develop ubiquitous M2M service networks, where the infrastructure is able to connect and combine services produced in different domains. The overall objective was to develop a universally applicable M2M service infrastructure to enable interoperation between devices and applications in wired and wireless systems, regardless of the supplier.

The increasing availability of ever-cheaper sensor and actuator devices has led to a sharp growth in demand to monitor and control a fast-rising number of machines and devices from mobile communications to machine tools. UseNet aimed to enable ubiquitous use of M2M services provided by different kind of machines and devices that are connected to heterogeneous and extended IP communications networks. By making it possible for separate M2M solutions to work together, UseNet has made it possible for a wide range of business opportunities to be developed combining the services provided by such devices.

GENERIC SOLUTIONS, SPECIFIC APPLICATIONS
The technological focus of the ITEA project was the development of a common infrastructure, environments and network elements based on the use of service-oriented architecture to replace existing proprietary vertical applications. The resulting conceptual horizontal M2M infrastructure specification and corresponding solutions were then evaluated in a range of applications relevant to the project partners.

Partners joined the project to seek generic M2M solutions that they could use in their own markets. The consortium consisted of 13 industrial companies – both large corporations and small and medium-sized enterprises – and four research organisations. ITEA offered a good framework for the large-scale international co-operation including connections to standardisation bodies via project partners.

UseNet focused on M2M systems in applications domains such as: remote metering and control of built infrastructure; maintenance and control of mobile machines; ubiquitous mobile client for consumer devices; and wired and wireless mobile telematics systems.

The principal goals were to:
- Enable interoperable M2M applications for various stakeholders in the M2M service solution;
- Specify generic service infrastructures for M2M services to be applied and reused in different application domains;
- Enable communication over heterogeneous M2M networks such as all IP-converged public networks and ad hoc wireless networks – including 802.11.x wireless local area (LAN), ultra-wideband (UWB), radio-frequency identify (RFID) and near-field communications (NFC);
- Develop and apply advanced M2M endpoints such as devices, sensors – including sensor networks – and actuators, smart and electronic identity (eID) cards and RFID tags;
- Make use of M2M services smooth and convenient for mobile users;
- Provide end-user services for smart applications; and
- Clarify and enhance the roles of the different stakeholders in the M2M domain.

WIDENING BUSINESS POSSIBILITIES
The resulting M2M systems are already widening business possibilities and offering advantages for companies, especially when information systems controlling their core processes are using the real-time information produced by the M2M system. In consequence, a company can increase the quality of its services, reduce costs and increase customer satisfaction. This fundamental change is already bringing new opportunities.

Exploitation of results has started within many of the project partners, and commercial products are now coming into the market. Around 13 products have already been announced – such as the Ounet centralised remote-control system for building automation from Ouman and a range of wireless products including logging sensors, bridge detectors, ZigBee roaming sensors, M2M web services and a sensor gateway from Rmoni.

Project partner Fagor Electrodomesticos is using results in its domotic business unit to develop improved products, new services and new business opportunities, including monitoring domestic appliances in the home to enable better technical assistance. And computer giant Bull has created a specific offer for the transport industry to enable the tracking and geo-localisation of vehicles.

Many business segments in THALES are planning to exploit UseNet outcomes. These include use of M2M devices to collect data on incidents and fraud, and to track vehicles in public transport systems, to improve tramway management and control solutions. UseNet results are also being used to improve safety and security of critical infrastructure at airports and major events, as well as to increase border surveillance.

Belgian partner Alcatel-Lucent is making use of UseNet results to evolve M2M networking from information management systems to representational state transfer (REST) and web technologies – such as in its ALU 5580 Home Network Manager. It is also exploiting the results for its mobile wireless networks.

DRIVING GLOBAL STANDARDISATION
Standardisation played a key role in the project which has had a major impact on M2M standardisation internationally. While even the opening up of the application value chain required standardisation of the interfaces between the components of a M2M system, the major effort was concentrated on the M2M core architecture through the European Telecommunications Standards Institute (ETSI).

Alcatel-Lucent has been one of the steering members of the ETSI M2M work group. This has made extensive use of UseNet results on functional decomposition and role models in the core which acts as a bridge between heterogeneous device networks to enable communication between both devices and applications. ETSI has also drawn heavily on concepts defined by Usenet for multi-protocol interface bindings – REST, SOAP, etc. – and devices as web services.

Other standardisation activities included service life-cycle management of devices in OSGi; 3GPP work towards M2M features specifications; OMA Device Management in the Open Mobile Alliance (OMA) and an increasing number of devices using web-based standards from the W3C (SOAP, XML, …).

Overall, the UseNet project has been a major success, pioneering work on specification of horizontal M2M infrastructure, pushing Europe to the forefront of M2M standardisation worldwide, encouraging fast exploitation of results and opening up new research routes in complex and dynamic M2M asset networks and in the technical details of various layers in the system.

More information: http://usenet.erve.vtt.fi