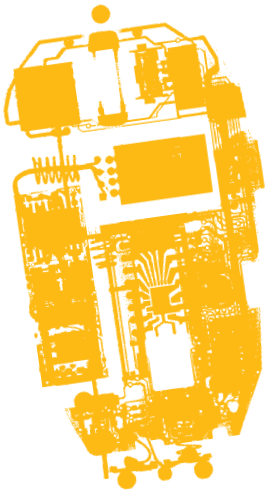# SHELOB

MULTIFUNCTION EMBEDDED SYSTEM

Shelob is an open, customisable, multifunction embedded system which is designed to manage wireless network infrastructures and deliver added value services. It contains four different software programmes to manage network infrastructure and deliver multimedia services, characterised by a hardware platform, Alix, with wireless interfaces based on chipset atheros® and a common operating system (OpenWRT).

Alix is a board produced by Pc Engines – www.pcengines.ch – based on an energy-saving AMD Geode LX800 processor, which consumes less than 10W, and comes in a small format, 100 x 160mm. The hardware platform in question can be customised for the development of vertical applications for specific contexts. The Shelob system is composed of various applications based on the same hardware/software platform, which enables the development of vertical applications, for:

- lcreating self-configuring wireless mesh networks;
- managing network topologies for communications between moving vehicles and between vehicle and infrastructure;
- maintaining application sessions in the transition between hot-spots run by different operators;
- broadcasting streaming multimedia content customised according to the location of the individual hot-spot.

Shelob is an open, configurable system which can be adapted to different application contexts, enabling various operative functions to be developed, adding new onboard services to a network node and simplifying the creation of complex networks. This is advantageous for network device manufacturers, for example, as it reduces the cost of creating highly complex wireless infrastructures.

The hardware: the Alix board

APPLICATIONS

The vertical applications implemented and trialled on the Shelob system take in various contexts, specifically:

Self-configuring networks

This onboard configuration of the embedded system contains a software module that implements a protocol for mesh networks developed by CSP, simplifying the creation of wireless networks with a high number of nodes, with a mechanism for self-configuring the nodes themselves.

This type of network presents specific requirements, both in terms of the high number of nodes to install, which may exceed 1,000 wireless access points, and when it comes to connecting the nodes to a high bitrate backbone.

One of the main problems to tackle in creating this kind of network is the need to make each node, once installed, capable of self-configuring automatically, according to a limited number of parameters and adapting to the conditions encountered.

The issue with the automatic configuration of wireless connections regards which connections between nodes to use and what frequencies to select for the single connections in order to keep interferences to a minimum, using an active distribution algorithm on all nodes in the network. The system is designed for nodes with several independent wireless interfaces.

C2X Car-to-car & Car-to-infrastructure communications

The configuration includes a software module onboard the embedded system that handles the topology of a wireless network composed of fixed and mobile nodes.

This permits both communication between vehicles, and vehicle - infrastructure communication. The solution is based on the use of radio interfaces that comply with the 802.11h standard, and the optimisation of protocols for ad hoc networking, with the aim of maintaining an up-to-date network topology despite the fact that the nodes are mobile, being located on cars.

Maintaining application sessions

Onboard the embedded system there is a software module that, as transparently as possible, keeps users' connections active during the transition from one hot-spot to another. The solution is based on the use of tunnels between the mobile terminal and a service centre to minimise delays due to switching between networks run by different operators. Indeed delays can cause packet loss, and an interruption to service of 30-60 seconds.

The mobile terminal uses two separate radio interfaces managed by a software module that controls the association and disassociation from the single networks.

TRANSPARENT TECHNOLOGY