

■ Children going safely to school

The Shiojiri child tracking project

Shiojiri city in central Nagano, Japan, is facing up to the challenge of protecting its citizens, especially children and elderly people. The hub of this effort is the Shiojiri Incubation Plaza, which acts as the engine of socio-economic development based on information and communication technologies (ICT).

Along with stimulating regional industry, the Incubation Plaza is a focal point for research and development. An ambitious strategic plan has been drawn up to build sensor systems to track and protect children, to monitor river water level and debris flow, to watch out for dangerous birds and beasts, and to monitor the public bus transport system. The child tracking system described here is the first to be up and running.

Child tracking system

At the end of the ancient "salt route" from the Sea of Japan, Shiojiri spans an area of some 290 square kilometres. The leafy urban area contains 25 555 households and ten primary schools.

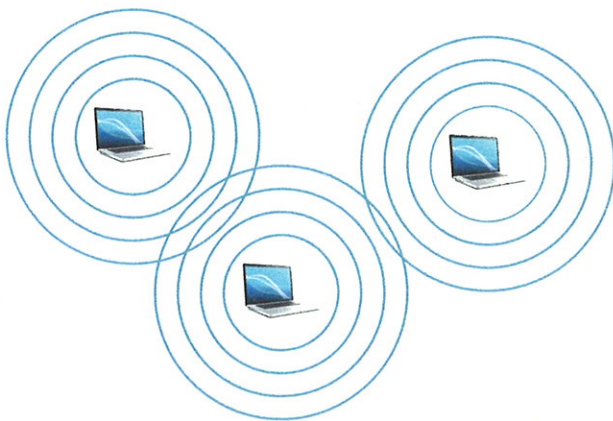
In 2005, the city authorities agreed on a basic plan to maintain the safety of children going to primary school and returning home. The housing density is high in the heart of the urban area, which makes it easier for the tracking system to provide full coverage.



Mobile phones in an ad hoc network

The system uses an ad hoc communication network. This is a wireless local area network (WLAN) based on a cellular architecture. There is no need for any pre-existing infrastructure to allow communication between the network's radio stations. The various radio stations interconnected by the wireless network operate autonomously. Each station must be located within the transmission range of its partners (see Figure).

Ad hoc network configuration



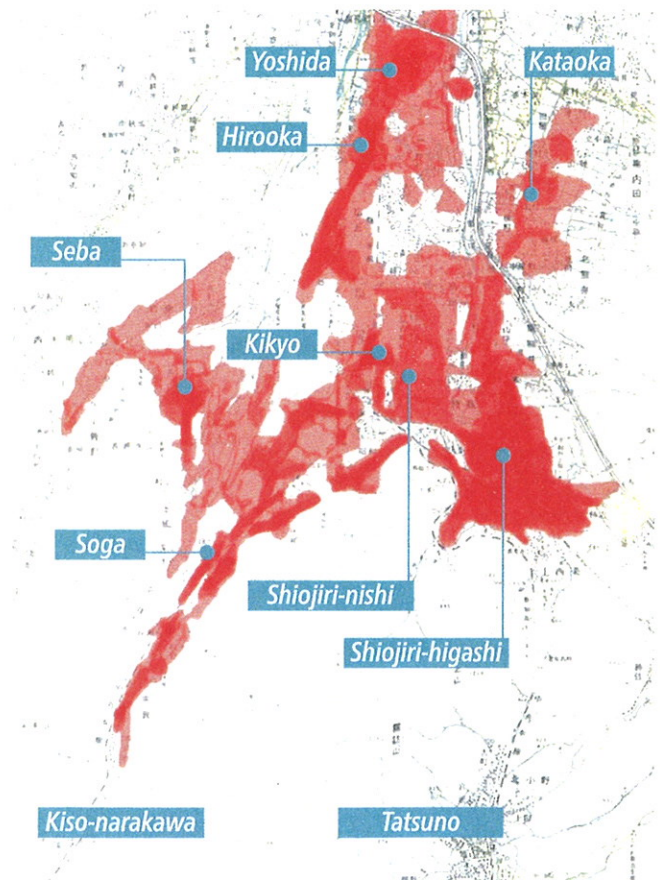
If the radio stations are equipped with suitable routing software, node-to-node communication is possible and all stations within the coverage area can be reached.

The viability of the system depends on the 130 kilometres of optical fibre that the city laid in the year 2000, together with the 640 radio stations that have been installed and connected to the network.

Successful pilot test

The Shiojiri Incubation Plaza worked with Shinshu University to test the coverage of an emergency signal broadcast from a mobile phone. The test, which successfully took place in June 2008, covered the neighbourhoods of Shiojiri's ten primary schools (see map).

Map showing the location of Shiojiri's ten primary schools and the coverage of the test emergency signal





How the child tracking system works

Each child carries a cordless handset. If children are within wireless station coverage, their location can be identified. While a child is walking, the radio signal is emitted every three minutes. When the child stops, the signal is emitted just once per hour, to save battery power.

A child who feels in danger must pull the strap of the cordless handset. This causes a buzzer to sound, and an emergency radio signal is emitted. The emergency signal has priority over other signals received at the server in the information centre. An emergency e-mail message is then sent to the child's parents reporting the location of the emergency site, with map references. Information on the child's movements is maintained for a week.

Parents can also register a particular radio station on the city website. They are then notified when the child passes by that station, giving them an indication of when the child returns from school.

Future plans

The Shiojiri authorities intend to build up the city's basic communication infrastructure and develop a series of e-applications.

The data collected from the ICT sensing system, which now covers the whole city area, will be saved in the management centre housed in the Shiojiri Information Plaza. This information will be collated with demographic data and used not only for administrative purposes, but also to improve the safety of inhabitants and to protect the environment.