

As the refrigerator said to the hi-fi...

January 4 2010

(PhysOrg.com) -- Networked sensors and devices have huge potential but how can we ensure that they can all talk to each other? The answer, according to a European consortium, is to link them seamlessly through a common 'middleware'.

In these energy conscious times, the old idea of home automation is being revived to give the householder finer control over the many devices in the home. Most proposals envisage devices (embedded systems) - such as the heating, lighting and ventilation systems - being able to communicate with each other in a wireless network.

How can different devices, using different technologies and made by different manufacturers at different times, communicate with one another? One way would be to insist that all devices conform to some agreed standard, but that would be complex and time-consuming to negotiate and would not apply to existing devices. It could also stifle innovation by putting constraints on future technologies not yet imagined.

A much better way has been adopted by the EU-funded Hydra project. “Hydra aims to reduce the complexity by developing a service-oriented middleware,” explains Markus Eisenhauer, the project coordinator, who works at the Fraunhofer Institute for Applied [Information Technology](#).

“It will help manufacturers, [software developers](#) and systems integrators to build devices that can be networked easily and flexibly via web services to create cost-effective, high-performance solutions.”

Internet of things

With Hydra, all manner of devices such as electricity meters, TV sets, refrigerators, stereos as well as heating and lighting systems, can be networked without having to know what goes on inside them.

"We have some prototypes and demonstrators running where we have used an ordinary [Playstation 3](#) as a home control centre," says Eisenhauer.

The middleware provides access to all sensors and embedded devices so a software developer does not have to think about what kinds of sensors are in the house.

"If you want to get a temperature value, you can just address the middleware semantically - 'I want to get the temperature from this room' - and Hydra will resolve it and provide access to the corresponding sensors," he explains.

In principle, any Hydra device can connect to any other, bringing the fabled 'internet of things' a step nearer.

Existing devices can be adapted to work with Hydra. "We are delivering a device development kit where you could integrate the middleware into the devices," Eisenhauer says, "but you can make use of it with existing devices and Hydra-enable them as long as they have a certain computing power."

Manufacturers could even put Hydra-enabled sensors within products such as washing machines so that problems could be diagnosed remotely, without a site visit.

Healthcare at home

But home automation is only one example of what Hydra can do.

Another major application is expected to be in healthcare, especially the monitoring of patients in their own homes. The partners have set up a demo using networked sensors measuring body weight, blood pressure, blood sugar and oxygen saturation. A muscle sensor gives warning of an epileptic fit.

"So we have different kinds of technologies - ZigBee, Bluetooth and others - all covered by our network manager within Hydra," says Eisenhauer. "And then just to show that we can also use off-the-shelf devices we have used a Wii balance board as a weight scale and have connected it to our Playstation 3."

The Playstation 3 games console can be found in many homes but can easily run the Hydra middleware while providing complete privacy for the patient's data. "It's not a fully fledged telemedicine system but it has all the necessary ingredients of such a system and is running with diverse and heterogeneous hardware at the moment."

Agriculture can also benefit from Hydra. In one trial, pigs were fitted with RFID tags so their movements around their enclosure could be tracked. "We can locate each pig in the shed or outside and we can use this to control the heating and ventilation system. If the shed gets too crowded the temperature rises and then the heating system responds to that."

The disappearing computer

In another trial, wireless ZigBee sensors measured soil humidity in the

field, to help farmers decide the best time to sow their crops.

The Hydra automated home demonstrator was runner up in the best demonstrator award at the ICT Mobile Summit in Stockholm in June 2008. And the project was voted one of the top 10 best projects at the ICT2008 fair in Lyon last November.

Eisenhauer detects a lot of interest from the networking community. “We have a lot of requests from other projects who want to take Hydra as their basic technology and to build upon that. We are developing the core components as open source and they will be published on Source Forge by the end of 2009.”

The partners are also discussing whether to market a commercial version of Hydra with more features.

For Eisenhauer, Hydra brings closer a world of ambient intelligence, or ubiquitous computing, where artificial intelligence becomes part of our everyday surroundings. “It is an enabler of the vision that Mark Weiser, the founder of ubiquitous computing, had of the ‘disappearing computer’. Hydra is an enabling technology that would make this dream come true.”

More information: Hydra project -- www.hydramiddleware.eu/

Provided by ICT Results

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