# Testbeds to breed next-generation systems

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(PhysOrg.com) -- The systems that let you zap a photo to a friend, or an astronomer to control a telescope continents away, require intensive simulation and testing. Research has now made those key steps far easier.

Two years ago, the European research programme UNITE took on the challenge of creating a virtual testbed that IT developers across Europe could use easily and effectively to fine-tune new devices and services, and make sure that they will interact smoothly with existing systems.

Without an improved testing and simulation infrastructure, it will be extremely difficult to achieve the "network of wireless networks" that communications researchers envision and hope to create.

The goal the UNITE researchers set for themselves was to build an online platform that would let groups across Europe share existing test equipment and protocols, easily add new capabilities, and use the platform to optimise new communications products and store and share results.

"Until now, when a research group wanted to test something, they often had to 're-invent the wheel,'" says Georgios Kormentzas, UNITE's technical manager. That might mean modifying an existing simulator or writing a new one, running extensive tests, and then laboriously searching the literature for comparable results.

Making matters worse, researchers often kept their results, and the

simulation and testing tools they developed, to themselves.

"One research team might develop a new simulator," says Kormentzas, "but this more or less remained hidden from the rest of the community."

Inspired by the spirit of open-source software, the UNITE team wanted to accelerate progress within and across technologies, such as cellular, wireless, and digital video broadcasting, by encouraging researchers and developers to share and add to one another's work.

"This is the most important thing," says Kormentzas. "If you give your testing tool to the research community, you gain access to the tools of the other teams."

## Finding the common thread

When the EU-funded UNITE project took a close look at the testing and simulation tools already being used by their ten academic and industrial partners, they were struck by their diversity.

"There were software tools, hardware tools, single-layer simulators, system simulation tools, traffic generators - a heterogeneity of tools," says Kormentzas.

The team had to identify the common features that would allow all these tools to interface. And, says Kormentzas, they had to look to the future so they could easily incorporate new tools in the UNITE platform.

## Building the testbed

The UNITE platform, which was featured at the 4th IEEE/IFIP International Week on Management of Networks and Services, in

Samos, Greece, consists of three main components.

The first is the visual display terminal (VDT), or graphical user interface, through which users communicate with the virtual testbed. "It lets them have access to the entire functionality of the system," says Kormentzas.

The VDT links users to the UNITE controllers, which offer access to all of the testing and simulation tools that are connected to and supported by the system.

The controllers also define and designate UNITE time slots for specific actions, such as testing a specified communications protocol.

"For a simulator, for example, one time slot may have an actual duration of one hour, while for a hardware device that might mean just milliseconds," says Kormentzas. "But it's all synchronised according to the UNITE time slots."

The UNITE controllers also maintain a database of prior simulations that can be accessed through the VDT. The team recognised the importance of easy access to the database and intuitive ways to view results.

"We had to find a way to navigate through thousands of results from hundreds of algorithms and be able to illustrate those results in a friendly way," says Kormentzas.

The controllers also manage the stand-alone simulators that perform the actual tests and simulations. Right now, UNITE links researchers to seven different simulators scattered across Europe. Its generic design ensures that new tools can readily be added to the system.

"The tools are distributed all around Europe," Kormentzas says, "but in

terms of your access to the virtual testbed, you feel that you have everything in your own lab."

## Up and running

With UNITE up and running, Kormentzas now hopes to get more communications companies and researchers to link to the platform.

"We have to convince the research community that it is to their advantage to share their tools and findings," says Kormentzas. "The more UNITE is recognised, accepted and used, the more tools and results it will offer and the more effective it will be."

UNITE received funding from the ICT strand of the Sixth Framework Programme for research, and hopes to expand the platform's capabilities and reach more users under a subsequent European grant.

UNITE project: [www.ist-unite.org/](www.ist-unite.org/)

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