IPv6 macromobility simulation using OMNeT++ environment

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Nowadays there are two keywords in telecommunications: mobility and Internet. As the capacity and speed of small handheld devices and laptop-sized computers has increased dramatically in the past few years, the demand for mobile Internet access, telephony, videoconference, messaging, etc. while being away from home or moving also became significant. The current technology trends focus on implementing all these applications based on IP (All-IP technology).

The current version of IP – IPv4 – was created for wired networks and the mobility support was added only later. For this reason it can not provide efficient support for mobile devices. The next generation of IP – IPv6 – has built-in mobility support from the beginning with important new features like bigger address space, reduced administrative overhead, support for address renumbering, improved header processing and reasonable security.

We have developed a simulation to prove our concepts of Mobile IPv6 under OMNeT++. OMNeT++ (Objective Modular Network Testbed in C++) is a free, open-source discrete event simulation tool, similar to other tools like PARSEC, NS, or commercial products like OPNET. It allows easy development of complex simulations with its features like message passing, nested submodules, flexible model topologies, parallel execution, etc. Our Mobile IPv6 model can be freely downloaded along with many other models.

Our simulation deals with the IPv6 Mobility Extension, especially with the binding management methods. With our simulator we can easily build different network scenarios by providing a few simple parameters from which the simulator automatically constructs the network.

Every mobile device in IPv6 can always be addressed with its home address. When the mobile device isn´t attached to its home network, it obtains a temporary IP address – a care-of address – from the foreign network it is currently attached to. In order to be able to receive packages in this case the mobile always informs its home agent – a router in its home subnetwork – about its current care-of address. Correspondent nodes can send packages directly to the care-of address if they know it, otherwise they send them to the home address and the home agent forwards them to the mobile. The association between the home address and the care-of address is called binding. In IPv6 networks every node contains a so-called Binding Cache to store binding information about mobile devices.

With the limited capability of mobiles and network overhead caused by triangle routing the optimisation of the binding cache´s size and the binding entries´ lifetimes is very important. Our simulation demonstrates this issue in different network scenarios. We investigate different statistics like end-to-end delay time, rate of packets sent via triangle routing, rate of packet loss, handover frequency, etc.

References

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