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## The Use of Staselog Products in TOASNet

### Abstract

The TOASNet network is a metropolitan area network providing fixed internet connections to all Tampere Student Housing Foundation (TOAS) apartments. The network has over 5500 client hosts. The main uplink of TOASNet is controlled by a Staselog NE200 device. The device is used to reduce link congestion caused by heavy traffic and to measure the bandwidth usage of each individual network host. Additionally the NE200 is used to implement packet filtering to protect the network users from intrusions from the Internet. The filtering is customizable on a per-host basis.

### Background

TOASNet is an internet connection available in all the apartments of Tampere Student Housing Foundation (TOAS). TOAS has more than 7700 apartments for rent for students in Tampere, Finland. TOASNet connection is in use in over 5500 of these. University students (~5200) are connected to the Finnish University and Research Network (FUNET), and the internet uplink for other students (~300) is provided by Elisa.

TOASNet is managed by a combination of three part-time network administrators, a volunteer local administrator for each subnetwork, and an administration service provided by Elisa. The price of the network connection for users is 10 euros/month.

Most users connect to TOASNet by a standard 10/100 Ethernet. Some buildings do not have Ethernet wiring, and therefore they use HomePNA or WLAN connections. The network between the buildings is a metropolitan-area fiber network operated by Elisa.

### Bandwidth management

TOASNet connects to the FUNET network, which is a national network operator for universities and other research institutions in Finland. The connection is via a 100 Mbit/s full-duplex link. This uplink is controlled by a Staselog Network Equalizer 200 device in high-availability configuration.

The NE200 device is used to regulate the bandwidth available to each major subnet, according to (i) the actual link speed to the remote network, and (ii) the number of users in that subnet. Subnets in TOASNet are mostly equivalent to (groups of) buildings. Subnet sizes range between 20 and 600 users.

The congestion control has three main goals: (1) Prevent large subnets with many users and high-speed connections from hogging all the uplink bandwidth, (2) guarantee a certain amount of bandwidth for study-related traffic, i.e. traffic between students' homes and universities, and (3) distribute the available bandwidth fairly between active users within each subnet.

Additional functions of bandwidth management are: (4) Provide a possibility to restrict the bandwidth available for very heavy users. (5) Improve the round-trip latency of light interactive traffic over the main uplink.

The NE200 device satisfies all these goals. Uplink bandwidth is allocated in a controlled manner. The user management database provides a simple way to put user on a restricted bandwidth. The network latency

during peak usage hours is reduced roughly to half, and the latency variance (jitter) is very significantly reduced.

### **High-Resolution Traffic Measurement**

The uplink bandwidth utilization of each individual host in TOASNet is measured by the NE200 device. The usage statistics are used to detect excessive usage of network bandwidth. Usage statistics are automatically collected and summarized to a database, where it is easily accessible for administrators via a web browser.

### **Packet Filtering**

TOASNet implements simple packet filtering using the NE200 device. Connections originating from the Internet to users' computers are restricted. This restriction is easily configurable on a per-host basis via a user database.

### **Performance and Reliability**

The NE200 is used to manage a 100 Mbit/s full duplex Fast Ethernet link. The total throughput of this link routinely exceeds 160 Mbit/s, which causes no performance problems with ordinary packet size distribution. The long-term reliability of the NE200 has been found to be comparable to other core network devices, such as routers, switches and media converters.

### **Configuration and Interface to Network Management**

The routine management of the NE200 is done via a user management application. This application serves as the main user database of TOASNet. It is constantly updated by the local administrators. The configuration of the NE200 device is generated from this database by a custom script and updated to the device. The script queries an SQL database and generates an XML file to be uploaded into the device. This generation and update process is regular and completely automated and it causes no disruption to network traffic. Reconfiguring the QoS or packet filtering settings as users come and go requires no manual work other than updating the user database.

March 22, 2005

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