

## SNTP/NTP

RFC 2030 **S**imple **N**etwork **T**ime **P**rotocol (SNTP), RFC 1305 **N**etwork **T**ime **P**rotocol (NTP) and P1588 are established protocols for time synchronised IP traffic. SNTP is a subset of NTP. The SNTP/NTP server handles the system clock, which in turn can be based on GPS or the internal clock. The time information is then distributed either through unicast or multicast.

1. Updating via unicast, updating is initiated by the client after which the server returns an answer. The time reference is added to all communication between the client and server; this is to be able to calculate maximum accuracy.
2. Updating via multicast, the time is sent from the server to the group of clients (multicast group) at defined intervals. It is not possible for the clients to calculate the delay in the network.

### Time stamping via applications

Most SNTP/NTP applications generate time stamping of data on the application layer; accuracy is then dependent on the delay/jitter through the entire IP-stack. Typical accuracy for this technique is one or two milliseconds.

### Time stamping using Ethernet drivers

Accuracy can be significantly improved when time stamping is done using the Ethernet Interrupt Service Routine, time stamping is then carried out when the data is sent between the server and client. The request is generated from the client, the accuracy is dependent in this case on the jitter in the interrupt handling on the server and client. Accuracy in this application varies from around 10  $\mu$ s to about 100  $\mu$ s.

### Time stamping on the physical layer

The delay through the IP-stack can be eliminated if time stamping is carried out on the physical layer, i.e. via hardware. In this case, time synchronisation can be extremely accurate, better than 1  $\mu$ s. This accuracy requires a direct connection between the server and client, as further equipment would add to the delay. For this reason the time server is integrated in the switch. In addition, there is the possibility to synchronise the switch from the reference clock via GPS or from the internal oscillator.

