NEC Electronics (Europe) GmbH

As part of the world-wide NEC Electroncis Corporation, we have been responsible for the development and sales of semiconductors in Europe since 1973. Our Automotive Business Unit in Düsseldorf is looking for a student, who has already passed the intermediate exam in electronic engineering or information sciences. Good knowledge regarding the programming languages C is necessary for the

Master Thesis:

Evaluation of a real-time Ethernet Communication Protocol for Automotive Networking

Subject:

Residential Ethernet (ResE) is a new standardization activity in IEEE 802 that is considering extensions to Ethernet to allow the transport of time-sensitive traffic. Applications that ResE is expected to carry will include Audio/Video (A/V), as well as traditional non-time-sensitive traffic (e.g., data traffic). One goal of ResE is to allow a single network infrastructure in the residence to carry both time-sensitive and non-time-sensitive applications.

NEC is currently investigation the possibilities to use this future ResE standard within in-vehicle networks (CarE). The Audio/Video (A/V) applications for CarE have tight jitter and wander requirements; in addition, applications where A/V content is delivered to multiple locations have tight time synchronization requirements. To meet the jitter, wander, and time synchronization requirements for the applications, time synchronization must be provided to the CarE endpoints.

Within the thesis an approach for providing protocol based time synchronization for CarE should be evaluated. The jitter and wander performance and delivered time accuracy of the synchronization protocol will depend on the rate of phase and, if appropriate, frequency adjustments, bandwidth and gain-peaking of the various filters and/or PLLs, quality of the node clocks, Ethernet frame size and size of the network. Overall CarE network performance should be evaluated within the thesis based on a hardware prototype.

Detailed tasks:

- Adjustment to basic specifications (e.g. IEEE 802.3, IEEE 1588 Synchronization Protocol for Networks, IEEE Residential Ethernet White Paper)
- Get first experience with NEC hardware and software parts
- Develop a concept for synchronization of clocks between Ethernet endpoints in a small network. Include failure scenarios regarding crystal jitter, inaccurate clocks, etc.
- Implementation of the synchronization protocol on NECs Universal Gateway Board. Program software part which take care of the synchronization and manage access to Ethernet bus according to network global time
- Evaluate the real-time network. Compare theoretical results and measured result regarding network behavior, suggest possible improvements
- Summarize the work in a report

Start date of the master thesis work should be March 2006, Duration 6 months

If you are interested you are kindly invited to send us your CV and earliest start date to: Daniel.Mayer@eu.necel.com

NEC Electronics (Europe) GmbH
Human Resources – Daniel Mayer
Arcadiastr. 10, 40472 Düsseldorf

For further information please call Daniel Mayer telephone: +49(0)211 6503-1465.

www.eu.necel.com