Technical University of Denmark

Popular science summary of the PhD thesis

PhD student	ELEFTHERIOS KYRIAKAKIS
Title of the PhD thesis	Time-predictable End-system Design for Real-Time Communication
PhD school/Department	DTU Compute

Science summary

* Please give a short popular summary in English (approximately half a page) suited for the publication of the title, main content, results and innovations of the PhD thesis, also including prospective utilizations hereof:

Today's digital world relies heavily on computing systems to input, output, process, and store data and information. Over the years, computing systems have evolved from information processing devices to distributed microcontrollers embedded in control systems. Embedded systems are commonly found in everyday appliances, industry and vehicles. A prominent example of this trend is the automotive industry, with manufacturers like BMW and Audi motors having triplicated the number of electronic control units in their vehicles since 1995. Moreover, the avionics industry has recently introduced Ethernet-based communication protocols for distributed integrated avionic modules in modern aircraft.

Embedded systems are physically distributed and directly interact with the physical environment, such as sensors, valves, motors, and pumps. These distributed embedded systems often operate in safety-critical application domains in the industrial, aerospace, and automotive areas. These application domains require bounded temporal behaviour to guarantee safe and correct functionality. The distribution of cyber-physical systems is increasing the challenge to guarantee both time-predictable task execution and bounded end-to-end communication latency.

This thesis explores and develops software and hardware solutions that extend a computing platform with mechanisms to provide precise and fault-tolerant clock synchronization, network-synchronous task execution and minimal end-to-end communication latency. The proposed hardware/software components potentially increase the system's time-predictability and compose an overall time-triggered architecture for distributed safety-critical systems.

Please email the summary to the PhD secretary at the department