

# Real-Time Communications: from Fieldbuses and Industrial Automation to Wireless and Vehicular Applications

**Prof. José A. Fonseca**

Universidade de Aveiro, Instituto de Telecomunicações, Micro I/O

Embedded systems have evolved from centralized to distributed architectures, with communications playing a fundamental role. This trend has begun in avionics, followed by industrial and building automation and automotive applications. Distributed Embedded Systems (DES) are, in consequence, often deployed over resource-constrained devices and subject to real-time and dependability constraints. Special purpose communication protocols, called fieldbuses, have been developed.

This talk will firstly review several research results concerning solutions to achieve dependable behavior and real-time communication in fieldbuses operating in dynamic environments. Particularly, it will be reported the work with CAN (Controller Area Network) which is still now the dominant standard in embedded automotive electronics.

Recent evolutions in this field led to the use of Ethernet as a fieldbus. A short discussion on this, together with some research results that inherited the knowledge from CAN, will also be presented. Even if cabled communications are still widely used, the evolution of wireless communications opens the doors for their use in dependable DES. However, wireless systems operate, in general, in open environments, posing new challenges to safety critical applications. The talk will also address some recent results concerning the design of deterministic communications in open environments, namely for the 802.11 and 802.15.4 standards in the 2.4GHz ISM band.

Finally a report on recent developments at the Instituto de Telecomunicações related with the emerging WAVE (Wireless Access to Vehicular Environments) standard will be presented which include transceivers for the 5.9GHz 802.11p standard and the building up of safety services on top of that standard.

## Biography



José Alberto Fonseca is Associate Professor in the Electronics, Telecommunications and Informatics Department of the University of Aveiro, and head of the Embedded Systems Group at the Telecommunications Institute in Aveiro. Since 2010 he is also managing the R&D at Micro I/O, a spin-off company of University of Aveiro, market leader in Portugal for School Management Systems with more than 500,000 users.

His current research interests are embedded systems, distributed systems, and industrial communications with emphasis in real-time applications for automotive, avionics, vehicular and assistive technologies. He has worked with fieldbuses, in particular with CAN (he has been a member of the ISO/TC 22/SC 3/WG 1/TF6 responsible for ISO-11898-4 TTCAN - Time-Triggered CAN standard), with Ethernet and currently, with wireless communications based in standard protocols, namely 802.11 and 802.15.4.

He holds four patents in the fields of communications, and he has been awarded in Portugal in 2007 the Jaime Filipe Prize, concerning rehabilitation engineering. He is an Associate Editor of IEEE Transactions on Industrial Informatics.

