

### Techniques et protocoles de communication

Internet est de plus en plus omniprésent; il est maintenant inévitable dans les systèmes embarqués.

#### Main Courses

**STS1 - LwIP Implementation** This course explains the implementation of the LwIP stack on STM32 MCUs

#### Additional Courses

**IOT1 - Internet of Things (IOT) on Microcontrollers** Building low-power IOT devices using standard microcontrollers This course introduces the IoT ecosystem, describes the most used IoT Edge to Cloud Protocols (MQTT, MQTT-SN and CoAP), explores particularly heinous IoT focused attacks and security provisions at each level of stack (physical devices, communication systems and networks). This course explains how to configure the LwIP (with MQTT), FreeRTOS and MbedTLS for a microcontroller-based IoT application; it requires previous knowledge of FreeRTOS.

**N1 - Ethernet and switching** This course covers both IEEE802.3 (10, 100, 1000 Mbps) and IEEE802.1D/802.1Q

**N2 - IEEE1588 - Precise Time Protocol** This course describes the PTP protocol and provides implementation examples

**N3 - Ethernet 10 Gigabit** This course covers IEEE802.3 Ethernet 10 gigabit and SFP+

**STG - STM32 + FreeRTOS + LwIP** This course covers the STM32 ARM-based MCU family, the FreeRTOS Real Time OS, the LWIP TCP/IP Stack and/or the EmWin GUI Stack