

Systemes embarqués: un ensemble de compétences en technologies avancées

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Let us try to answer these questions...

- What kind of **embedded system** are we talking about in our Institute?
- What are we doing at REDS in this area?
- What are the key points towards success stories?

What does embedded system mean?

Embedded **OS, RTOS**

Linux, Windows CE

Realtime OS (RTAI/Xenomai), VxWorks, threadX, etc.



Embedded **Cores**

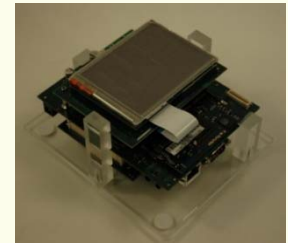
32 bits microcontroller (ARM9-based, Freescale i.MX, XScale PXA, etc.)

FPGA for System-On-Chip (Altera, Xilinx, etc. with Nios, *UbiChip*, etc.)

Embedded **Interfaces and Bus**

Classical interfaces (miniPCI, USB, Serial UART, etc.)

Wishbone, AHB, AMBA, etc.

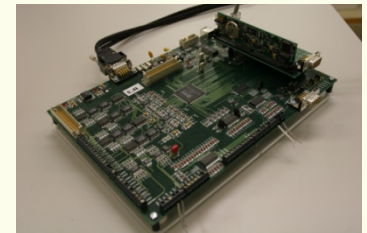


Embedded **Devices**

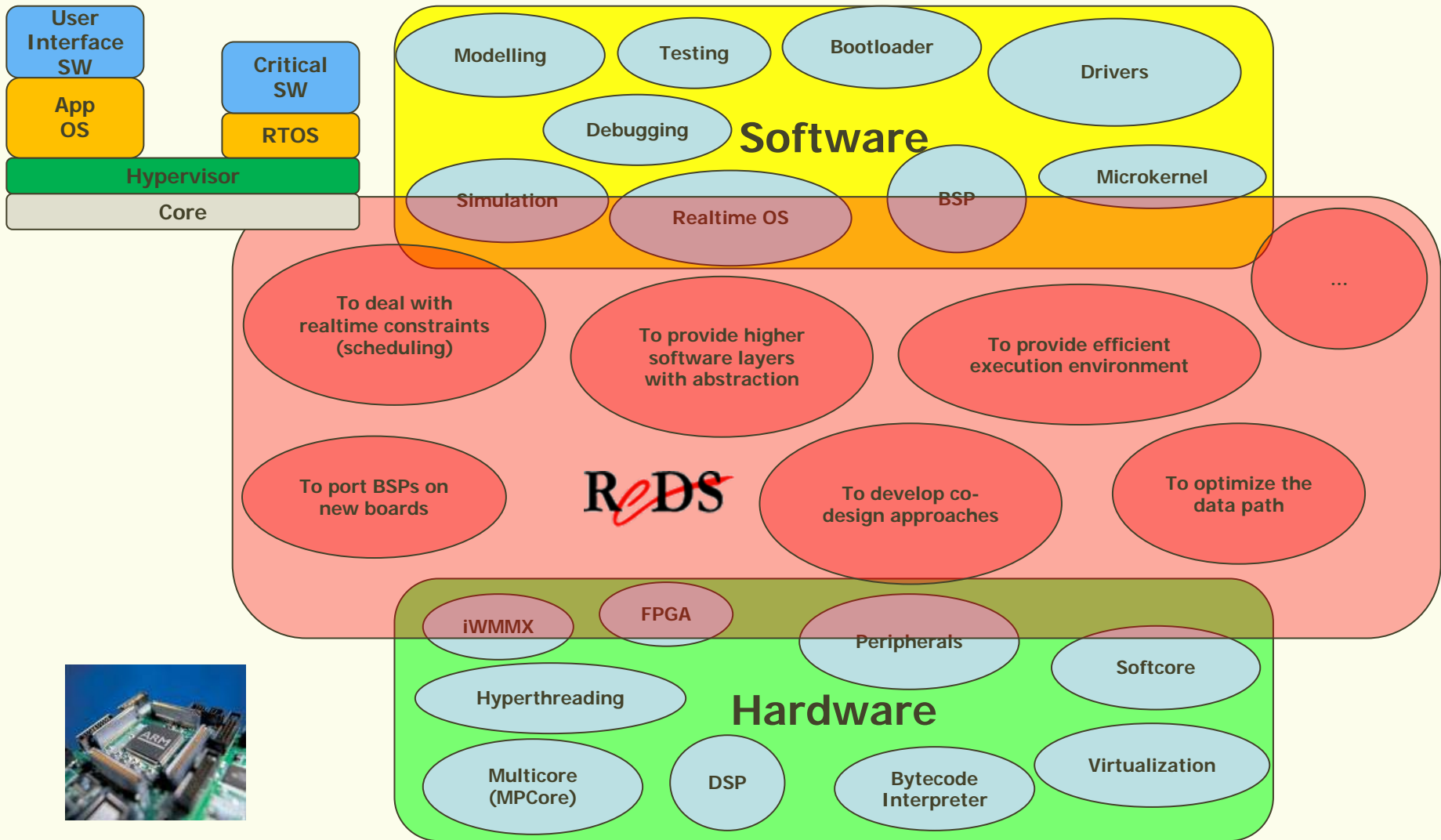
Communication modules (GPS, WiFi, ZigBee, etc.)

LCD, **touchscreen**, RFID,

Sensors, actuators, etc.



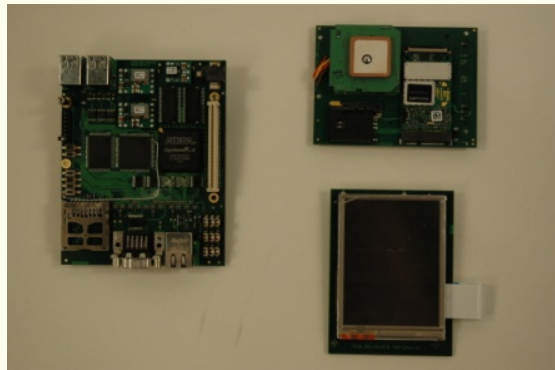
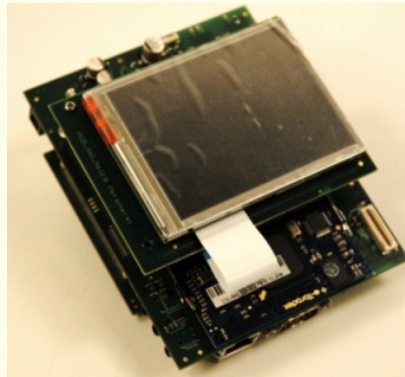
Embedded systems is evolving fast... (Applied Research)



Back to daily business... (Development)

- *Example of Project at REDS*
- Project *HCB (Heterogeneous Communication Box)*
 - CTI/KTI Project - **Industrial Collaboration**
 - To develop a universal multi-communication embedded system which can act as user **terminal** or **gateway**.
 - To support all popular **communication standards** (GPRS, GSM, UMTS, EDGE, HSDPA, WiFi) including GPS and other devices...
 - **Hardware cryptographic** support
 - **Modular** architecture

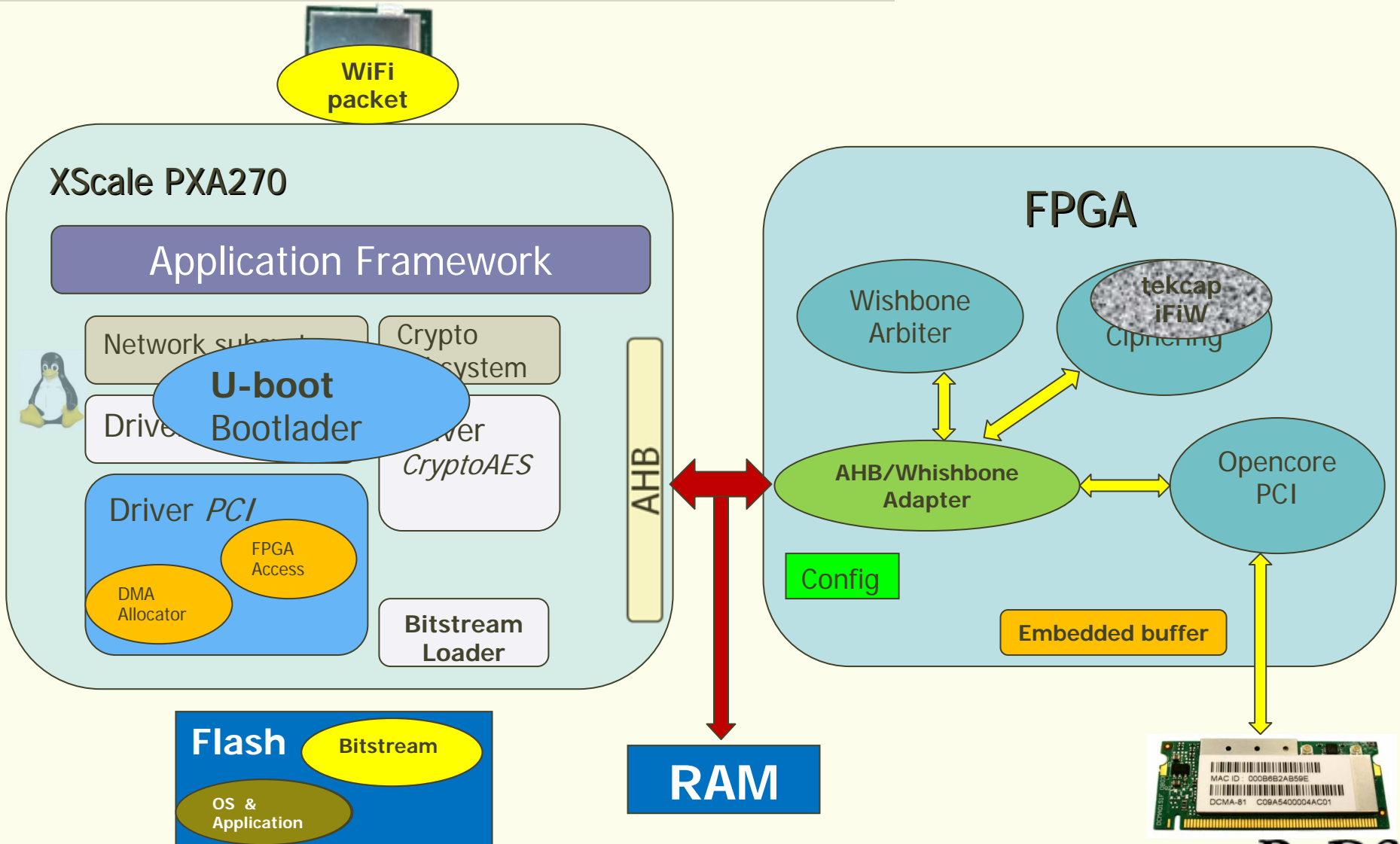
Heterogeneous Communication Platform



- 3 boards architecture
- GPS
- 2xWiFi, Option 5-in-1
- uC + FPGA

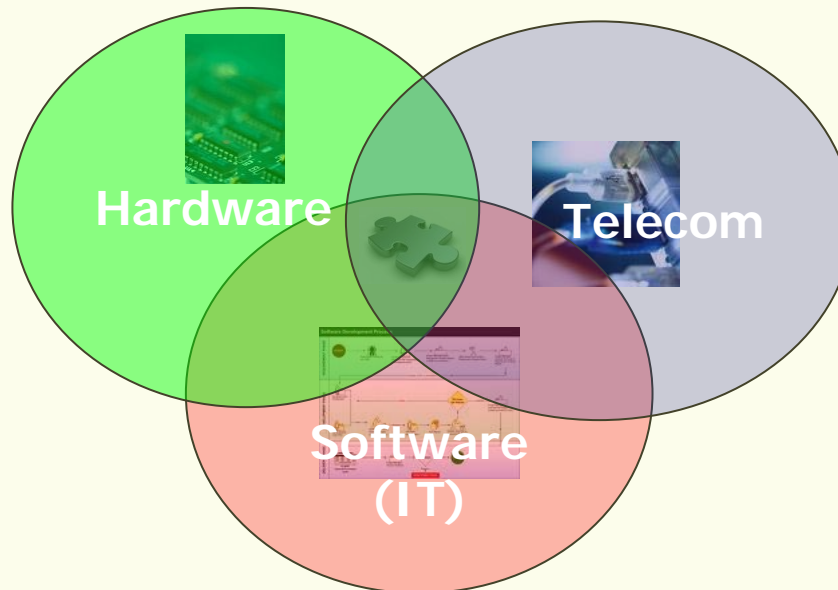


Configuring and sending a WiFi packet...



What are the issues?

- A success story for this kind of project can only be possible if there is a **strong collaboration** between people issued from different backgrounds. In this context, the collaboration between our Institutes plays a fundamental role.
 - Finding a common language to express requirements (**functionalities**), interactions between software and hardware (**compatibility**), and chipset capabilities (**constraints**)
- In the future, Embedded Systems Engineers will have to have deep knowledge in three areas: **IT, Hardware and Communication**



Can we answer the initial questions?

- *What kind of **embedded system** are we talking about in our Institute?*
 - 32-bits **microcontrollers** and **FPGA** systems
 - Embedded systems dealing with **rich features chipsets** and **communication** modules
 - Multimedia application, **realtime** control, etc.
- *What are we doing at REDS in this area?*
 - **Research** in the field of convergence of software and hardware
 - **Design** of boards - including **FPGA design** - integrating existing components
 - **Software development** for dealing with hardware (OS kernels, drivers, realtime applications, *adaptive* applications)
- *What are the key points towards success stories?*
 - Managing efficiently a dynamic team with **multiple competences** is a key point!
 - Make sure that software guys **understand** hardware guys and vice-versa...
 - **Collaboration** between Institutes is crucial! Competences are here, lets use them!

Thank You...

- REDS is a member of the Open Source Automation Development Lab

- <http://www.osadl.org>



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