La progettazione di dispositivi embedded in STMicroelectronics e la loro applicazione all’Internet of Things

Politecnico di Torino – ICT Days – June 3, 2014

Fabio Osnato, Fabien Castanier, Fulvio Corazzo
Who We Are

A world leader in providing the semiconductor solutions that make a positive contribution to people’s lives, both today and in the future

• A global semiconductor leader
• The largest European semiconductor company
• 2013 revenues of $8.08B
• Approx. 45,000 employees worldwide
• Approx. 9,000 people working in R&D
• 12 manufacturing sites
• Listed on New York Stock Exchange, Euronext Paris and Borsa Italiana, Milano;
• Created as SGS-THOMSON Microelectronics in June 1987, from merger of SGS Microelettronica (Italy) and Thomson Semiconducteurs (France);
• Renamed STMicroelectronics in May 1998
Where you find us

Our automotive products are making driving safer, greener and more entertaining.

Our MEMS & Sensors are augmenting the consumer experience.

Our smart power products are allowing our mobile products to operate longer and making more of our energy resources.

Our Microcontrollers are everywhere making everything smarter and more secure.

Our digital consumer products are powering the augmented digital lifestyle.
Advanced research and development centers around the globe
16,000 patents; ~9,000 patent families; 598 new filings (in 2013)
~ 9,000 people working in R&D and product design
ST Italy - Presence

- **ST ITALY:** 9,465
  - **CONTINENTAL ITALY:** 5,532
    - AGRATE: 4,186
    - CASTELLETTO: 977
    - ARZANO: 96
    - MARCIANISE: 255
    - LECCE: 18
  - **SICILY:** 3,933
    - CATANIA: 3,890
    - PALERMO: 43

(As of December 31, 2013)

- DORA: 53
- STM SERVICE: 20
- ST POLITO: 3
Our People

Present in over 35 countries

- Manufacturing: ~65%
- Research & Development: ~20%
- Marketing & Sales, Divisional Functions, Administration & General services: ~15%

...working everyday to increase the quality and experience of life for all

As of December 31, 2013
Job functions at ST (1/3)

- **Design Architecture**
  - System specification
  - System modeling and simulation
  - Definition of system architecture
  - Performance study

- **Design H/W**
  - Digital design
  - Analog design
  - Testing
  - Documentation

Example: Wi-Fi PHY BaseBand IP Model

Example: Wi-Fi Transceiver SoC Architecture
Job functions at ST (2/3)

• **Layout**
  • Physical realization of project layout guaranteeing quality standards, time to market and costs

• **Product and Test Engineering**
  • Ensuring new device industrialization and achieving the highest possible production standard

Ex.: SoC Layout

Example: SPWF01FA WiFi Module
Job functions at ST (3/3)

- **Design S/W**
  - Study of requirements
  - Embedded software development
  - Software testing

- **Application Development**
  - Application reference software development
  - Demo tools and lab solutions

```c
#include <stdio.h>
#include <stdlib.h>
#include <sys/types.h>
#include <arpa/inet.h>

void server1(portServ ports) {
    int socketServ1, socketServ2, socketClient;
    struct sockaddr_in monAddr, addrClient, addrServ2;
    socklen_t lenAddrClient;
    if ((socketServ1 = socket(AF_INET, SOCK_STREAM, 0)) == -1) {
        perror("Erreur socket");
        exit(1);
    }
    if ((socketServ2 = socket(AF_INET, SOCK_STREAM, 0)) == -1) {
        perror("Erreur socket");
        exit(1);
    }
    bzero(&monAddr, sizeof(monAddr));
    monAddr.sin_family = AF_INET;
    monAddr.sin_port = htons(ports.port1);
    monAddr.sin_addr.s_addr = INADDR_ANY;
    bzero(&addrServ2, sizeof(addrServ2));
}```
The Internet of Things

“Things that leverage the internet to make them smarter…”
Existing Things Augmented
(Making Things Smarter)

- **Watch**
  - It used to tell you the time
  - Now it tells you what to do

- **Outlet**
  - It used to just provide power
  - Now it talks to your machines and tells how much they are consuming

- **Bracelet**
  - It used to remind you of someone close to your heart
  - Now it reminds you to take care of your heart

- **Sunglasses**
  - They used to help you see clearly
  - Now they help you to see more
New Things to Augment Life

**Smart City**
- Reduce traffic congestion
- Better use of resources
- Improve security

**Smart Car**
- Reduce emissions
- Increase safety
- Save fuel

**Smart Home**
- Make entertainment more interactive and immersive
- Increase comfort
- Save energy

**Smart Me Healthcare**
- Empower patients
- Help physicians monitor and diagnose remotely

**Smart Me Fitness & Wellness**
- Help to lead healthier lives
- Optimize sports performance
- Early warning of illness
The Building Blocks of the IoT

- **Sensors & Actuators**
  - Motion MEMS
  - Environmental Sensors
  - MEMS microphones
  - Touch Sensor
  - Micro-actuators
  - Proximity sensor
  - Image sensors

- **Brain**
  - Low-power brain
  - Sensor fusion

- **Communication**
  - Ultra-low power connectivity

- **Interfaces**
  - Analog
An example of IoT E2E scenario

Implement security requirements from application to SW, FW and HW requirement considering who and when will be able to access your data.
Thank you!

ST stands for life.augmented