Microcontrollers, Memories, Secure Solutions

Claude Dardanne
General Manager, Microcontrollers, Memories & Secure Solutions Group (MMS)

MMS at a Glance

- EEPROM memories
  - #1 Worldwide supplier
  - 31% share Q409*

- Microcontrollers
  - #8 Worldwide supplier
  - 5.8% share 2009*
    - # 3 Secure MCUs
    - # 8 GP MCUs

MMS 2009 Business by Activities

Source: iSuppli & WSTS

MCU TAM CAGR 2010-14*
+6.4%
→ Key opportunity for growth
MCUs Market Drivers

- **General Purpose MCUs**
  - Industrial market
  - Energy management: metering...
  - Consumer: user interface
  - Healthcare: glucose meter...
  - Automotive: car body, safety...

- **Secure MCUs**
  - Smartcards: SIM...
  - Pay TV
  - Brand protection
  - IT: Trusted platform...

- **Dedicated Automotive MCUs**
  (Focus from ST dedicated Automotive Products Group)

Source: WSTS

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Dynamics → General Purpose MCUs

- **$8B business opportunity in 2011**
  - Multi-segments market
  - Steady growth foreseen in the next 5 years
  - Well established and profitable business model
  - Migration to 32bit CPU based on advanced e-NVM technology

- **Customers**
  - Tens of thousands of customers worldwide
  - Broad, multi-applications and fragmented business
  - Customer investment in software ensures higher business stability and strong commitment to a family of products

- **Complementary to ST’s advanced analog portfolio**
Dynamics → Secure MCUs

- $2B business opportunity in 2011
  - Smartcard applications driven (SIM, Banking, Government, ID, Transport)
  - Global shift to digital electronics requires more and more embedded security functions
  - Migration to Flash based e-NVM technology embedding advanced security features

- Customers
  - In addition to key Smartcard suppliers, other customers are recognizing the value of embedded security functions
  - Strong commitment to a family of products due to software investment, better business stability

- Technology driver for microcontrollers products

MCUs Shared Platforms
Shared Platforms Key Features

- State-of-the-art embedded NVM technologies
  - e-Flash
  - E-EEPROM

- High-performance CPU cores
  - 8-bit
  - 32-bit

- System know-how
  - General purpose
  - Security

State-of-the-Art e-NVM Technology

<table>
<thead>
<tr>
<th></th>
<th>2008-09</th>
<th>2010-11</th>
<th>2012-13</th>
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<tbody>
<tr>
<td>e-Flash</td>
<td>90nm</td>
<td>80nm</td>
<td>55nm</td>
</tr>
<tr>
<td>e-EEPROM</td>
<td>130nm</td>
<td>90nm</td>
<td></td>
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→ High speed
→ Ultra low power
→ Advanced Analog functions
High Performance CPU Platforms

- 32-bit ARM Cortex Family
  - 32-bit High-End Cortex - M4
  - 32-bit SC300 Secure-M3 ST33
  - 32-bit Light Cortex - M0
  - 32-bit SC000 Secure-M0 ST30

8-bit Proprietary
- STM8
- Secure ST23

2008-2009 2010-2011 2012-2013

From Enablers to Markets

- Markets
  - Microcontrollers General Purpose Applications
  - Security Specific applications
  - Memories General Purpose Applications

- IP Portfolio
  - Embedded software
  - Embedded Software
  - RF
  - Dedicated blocks
  - Dedicated blocks
  - General Purpose & Advanced Analog
  - Cryptography & Secure Peripherals
  - EEPROM Memory Array

- Enablers
  - Advanced CPU (8 & 32-bit Platforms)
  - Pure EEPROM Technology
  - e-NVM Technology (Standard and Low Power)
From Societal Needs to Solutions

System & product know-how

- Integrated Controllers
  - Ultra-low-power
  - A/D converter
  - Connectivity

- Secured solutions
  - Trusted processing
  - Tamper resistance
  - Cryptography

- Contactless & RF
  - ZigBee & RF4CE
  - NFC solutions
  - Contactless cards

Needs

- Energy efficiency
- Aging & Health care
- Communication/Entertainment
- Transportation

Solutions

- Smart metering
- Appliance control
- Sensors network
- Home monitoring
- Therapy control
- Drug traceability
- Pay TV, touch control
- Brand protection
- M2M, NFC & SIM
- Fare collection
- e-Passport
- Real-time monitoring

MMS Growth Strategy
ST’s Microcontrollers Key Strengths

- **General purpose MCU strengths**
  - Leadership position on the 32-bit market based on STM32 (ARM Cortex) platform
  - Advanced e-NVM roadmap (ultra-low-power & RF focus)
  - Advanced Analog capabilities

- **Secure MCU strengths**
  - Market acceptance of ST23 & ST33 platforms
  - Advanced e-NVM roadmap
  - Advanced security features know-how
  - 20% market share with limited participation to the SIM market

New MCU Platforms Deployment

![Bar chart showing revenues for different MCU platforms: STM8xx, STM32xx, and ST23xx. The chart indicates significant growth from 2007 to 2009, with some platforms exceeding 10x growth, 3x growth, and 5x growth respectively.](image-url)
MMS’ Growth Strategy

- **General Purpose Microcontrollers**
  - Capitalize on solid market acceptance of the STM32 platform
  - Broaden STM32 microcontrollers portfolio to ensure huge pervasion and improve market coverage
    - 16-bit market coverage with ARM M0 32-bit light Cortex
    - High end 32-bit market coverage with ARM M4
  - Increase x5…x10 the number of customers using STM32 platform

- **Secure Microcontrollers**
  - Expand ST23 & ST33 secure platforms to new applications
  - Trusted computing...
  - Maintain leadership position in advanced security features

- **EEPROM**
  - Long-term commitment to stand alone EEPROM products
    - >2B units shipped per year, up to 2Mb density
  - Create a new market standard with dual mode EEPROM (RF + contact)

MMS Product Highlights
STM32 for Appliance (Motor) Control

- Environment friendly
  - Energy efficiency
  - Noise reduction
- Key features in STM32
  - High-performance CPU
  - Embedded Flash memory
  - ADC, MC timer
  - Control software libraries
  - Cost effective

- Key Technologies for evolution: Advanced DSP, design optimization

STM32L for Health Applications

Key features in STM32
- High-performance CPU
- Extended portfolio
- Ultra-low-power STM32L

Glucose Meter

Test Strip Chemistry

Analog switches or sensor

STM32
- 256/512K FLASH
- ADC 12-bit
- DAC 2 x Opamps
- SPI
- FSMC / SPI

RTC
SDIO / SPI
USB
Power management

Display
OLED / TFT

32KHz
NVM / E²PROM
Connectivity

2 / 3 x AAA batteries
Coin cell or Super cap in backup
STM32W for Wireless Sensor Networks

Security
Shock sensor, anti-theft, anti-intrusion

Infrastructural monitoring
Buildings, bridges

Energy management
Smart metering

Healthcare/assisted living
Rehabilitation, balance control

Sport & Wellness
Sport monitoring, pedometer, fall detection

Games & remote
Consumer control

Industrial
Vibration & tilt remote measurement

“In-network” distributed computation
Reduced data transmission
Increased network lifetime

STM32 for Smart Electricity Metering

- **Energy efficiency**
  - Global trend to SmartGrid
  - Smart meter as central element

- **Key features in STM32**
  - High performance CPU
  - Low power & Real Time Clock
  - Embedded Flash memory
  - Extended portfolio

- **Key Technologies for evolution**: Power line, RF connectivity, ADC, Tamper resistance
ST33F1M for High-end Secure SIM Card

- **Pay with your SIM**
  - Visa & Mastercard payment applications
  - Banking security level

- **Travel with your SIM**
  - Mifare, Felica, Calypso applications
  - "Over The Air" reloading & management

- **Multimedia on your SIM**
  - Integrated webserver
  - Enriched content & applications on the SIM

ST21NFCA & ST33F1M for NFC solutions

- Bring contactless capability to a handset

[Diagram showing ST21NFCA and ST33F1M integrated into a phone with Bluetooth pairing and NFC capability.]
**ST33ZP24 SoC for Trusted Platform**

- Leading-edge secure 32-bit CPU
- State-of-the-art 90nm e-EEPROM technology
- Embedding in-house TPM Firmware
- Supporting multiple hardware interfaces
  - LPC for PC platforms
  - SPI, I2C for embedded platforms

**ST23YR for Contactless Solutions**

- ST23YR designed for advanced security and high-speed contactless solutions
  - ST23YR80: biometric passport transaction < 3 seconds
  - ST23YR18: EMV Paypass DDA transaction < 300ms
  - ST23ZR08: secure transport solution
AuKey Solution for Brand Protection

- Turnkey solution based on highly secure operating system running on ST23 platform

- AuKey to authenticate securely:
  - Printer cartridges
  - Game peripherals
  - Docking station
  - Network accessories

Dual Interface Serial EEPROM

- Application parameters are accessible from the inside (I²C) & the outside (RF) of electronic equipment
- Passive (ISO15693) RF interface
- 32-bit password protection

Parameters such as settings, traceability, maintenance logs, firmware… can be read and updated:
- Anywhere in the supply chain
- At no on-board power cost
- During the entire product lifetime (manufacturing, shipping, maintenance …)
- Even when the device is turned off or in its shipping box

Allows extra flexibility for supply chain management
Conclusion

Microcontrollers Opportunities

- General purpose microcontrollers market
  - Very large and well established market
  - Market migration to 32-bit well synchronized with STM32 platform introduction
  - Early success of the STM32 ramp-up
  - New business opportunities allow for increased market share

- Secure microcontrollers
  - Electronics market moving to digital
  - Early success of ST23 & ST33 ramp-up

Great business opportunities for ST