TRENDS IN SECURE MULTICORE EMBEDDED SYSTEMS

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A NEW POSITION OF STRENGTH

### Freescale

- **#1** Communications Processors
- **#1** RF Power Transistors
- **#1** Automotive Safety
- ✓ **50+** year history
- ✓ **17,300** employees
- ✓ **$4.59b** in revenue
- ✓ **$839m** in R&D

### NXP

- **#1** Secure Identification
- **#1** Secure Car Access
- **#1** Smart Card MCUs
- ✓ **50+** year history
- ✓ **28,000** employees
- ✓ **$6.03b** in revenue
- ✓ **$723m** in R&D

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**Note:**
1. All financial figures are based on trailing twelve month reported information; R&D expense are non-GAAP
ACCELERATING TECHNOLOGY TRENDS
DRIVE OPPORTUNITIES FOR NXP

Secure Connections for a Smarter World

Everything Connected
1B+ additional consumers online, 30B+ connected devices

Everything Smart
40B+ devices with intelligence shipped in 2020

Everything Secure
Potential savings to economy up to half trillion dollars

Source: Euromonitor; Gartner; ARM Holdings; UBS; Center for Strategic and International Studies; McAfee, NXP analysis, International Telecommunications Union
Celebrating Birthdays in September 2015!!!
Focus on Embedded Technologies

- **Technology leadership in Safety Certification for Multicore**
  - Founder of Multicore for Avionics (MCFA) working group
  - Trust Architecture Users Group (NXP led)
  - Secure, Trustworthy, Assured and Resilient Semiconductors and Systems (STARSS)

- **Product Longevity as a value**
  - Proven commitment to longevity and support
  - 15 year life for T series and Layerscape 28nm devices

- **Real embedded system design focus**
  - Deterministic interconnect for multicore SoCs
  - Focus on minimizing SER, FIT, AE rates for product quality
  - Large temperature ranges for embedded and industrial designs

- **Security, Security and even more Security**
  - Pervasive / Multifaceted
  - Balanced Need
TRENDS IN PROCESSING
Power & ARM: A Balanced Strategy for the Market

Continue to drive the “Core” - Power
1. #1 in wireless/wired networking
2. 30+ years of R&D leadership
3. Large 3rd Party ecosystem for networking and embedded

Broaden Market Reach – ARM Addition
1. First 64-bit ARM® Networking SoC
2. 10+ years as a proven ARM supplier
3. Innovation in Auto, IoT and embedded

NXP has infrastructure in place to support both Power® and ARM
Continuing the Leadership: Power-based SoC Solutions

- Scalability
- Performance
- Integration

The industry's most scalable pin compatible communication processor family

- Dual-Core up to 1.4GHz
- Integrated GE Switch

- Quad-Core up to 1.4GHz

- Eight Virtual Cores up to 1.8GHz

- 24 Virtual Cores up to 1.8GHz

- Scaling 1 to 8 cores
- Power <4W to <20W
- Performance 2 to 20Gbps
ARM provides balance of Architecture and Innovation

First to announce the highest performance 64-bit capable Cortex-A72 core in a networking processor
SECURITY EVERYWHERE
Examples of Security Hacks

Automobile
- Telematics (e.g., OnStar) hacked to:
  - Eavesdrop
  - Control ECU
  - Reflash ECU to trigger on TPMS values

Point of Sale
- Memory scraper installed on POS
- POS exfiltrates credit card info

Smart TV
- Exfiltration of user data
- Root access and program installation

Vulnerabilities Exploited
- Flawed Authentication
- Stack Overflow
- Promiscuous Communication
- Unsigned Code
- No ACL
- No Memory Protection
- No End-to-End Security
Security Is Multifaceted

**Confidentiality**

**Privacy**
- preventing eavesdropping
- **EXAMPLE** Encryption (System Load: HIGH)

**Authentication**
- guaranteeing identity
- **EXAMPLES** Passwords, PINs, Key exchange (System Load: MED)

**Access Control**
- limiting use and communication
- **EXAMPLE** Access control lists (System Load: MED)

**System Integrity and Availability**
- ensuring data and code accuracy
- preventing service theft and denial, cloning
- **EXAMPLES** Platform trust, Antivirus (System Load: LOW)

- **MEDSystem Load**
- **HIGHSystem Load**
- **LOWSystem Load**
Call to Action: We the Ecosystem Must Solve Security

- Be accountable to customers
- Specify and audit OEMs and SP

- Make security usable
- Specify and audit software, processor

- Design to be secure
- Apply processor resources

- Secure foundation
- Make security easy

NXP well positioned to lead Security Ecosystem for Embedded
EXCITING FUTURE
Many-core processor approach is not sustainable due to power, software complexity and integration costs

Need to provide right mix of high performance and programmability

DPAA2 – A New Architecture for a New Network

Advance Packet Processing

- Tightly coupled accelerators called as C functions
- H/W preloaded task state, headers, stack frame
- Customer programmable
- Run-to-completion model using standard C (C99)

MUST HAVE:

4-6x Performance over general-purpose cores in a lower power envelope
Fly by Wire transitions to Drive by Wire

- Driver Input
- Driver Monitoring
- Instrument Cluster / HUD / Synthetic Vision
- Navigation / Infotainment
- Instrument Cluster / HUD / Synthetic Vision
- Navigation / Infotainment
- Driver and Passenger Mobile Devices
- Human Machine Interface (HMI)
  - Driver Input
  - Driver Monitoring
  - Instrument Cluster / HUD / Synthetic Vision
  - Navigation / Infotainment
- Sensors
  - Radar/Cameras
  - Accelerometers
  - Vehicle Health
- 'Drive by wire' Actuation
- Vehicle Control
  - Powertrain ECUs
  - 'Drive by wire' Actuation
- Entertainment
  - Rear Seat Entertainment
  - Display
  - Audio
- Comms Gateway
- Automated Driving ‘Brain’
Summary, Questions, Comments, Cheers, Jeers or Rebuttals

• High-performance multicore solutions that transport, analyze and secure data from the edge of the network to the cloud

• Balanced architecture
  - Multicore processing optimized for scalability
  - High performance interfaces
  - Offload for key applications
  - Deterministic performance for real time embedded systems
  - Proven distributed security architecture
  - Longevity and trusted supplier