What is “Embedded”

- **Definition** - Intel embedded is a specialized computing platform for specific infrastructures, industry and communication applications, with differentiating performance and power efficiency, form factor, interfaces and mature software ecosystem.

- **Elaborative explanation** - Intel embedded is a platform level concept beyond “silicon level embedded” and not limited to “handheld kind of applications”. Intel embedded is aiming to provide computing and communication solutions to embedded nodes inside different level of industrial, infrastructure and communication systems.

What is “Embedded”

- **Intel embedded solutions consists of:**
  - Generic Intel Architecture for a “fit, feasible and affordable” computing and communication platform in different level of system nodes
  - Intel deep embedded Atom and SoC with small footprint, high performance and low power
  - Intel specific purpose embedded skus (stock keeping unit)/SoC with packet/content processing under embedded Internet environment.

What is “Embedded”

- **Target applications**
  - Traditional embedded applications: industrial automation, interactive clients, IP & Communication, networking/wireless/wired, retail, MAG (military, aerospace and government), medical, instruments, printing, storage, gaming, Kiosk, physical surveillance, infotainment, digital signage, ...
  - Emerging embedded applications: video analytics, digital car, interactive media, industrial portable, IP terminal, smart devices, robotics, smart building, WSN, ...
  - Smart enterprise: digital rail, smart grid, digital healthy, 3G, etc

A glimpse of Intel embedded skus development

- **PC/Server/Laptop like solutions in embedded**
  - Tolapai and QuickAssist
  - Atom and its next generation
Platform Overview

- The Dual-Core Intel® Xeon® processor LV with Intel® E7520 chipset development kit provides an excellent choice for developers of low-power communications and embedded applications such as storage area networks, routers, virtual private networks, and telecommunications servers.

FSB
- 667 MHz Front Side Bus

Memory
- Dual lock-step channel support
- DDR2-400
- 533MHz, 512Mb & 1Gb Device Support
- UP to 16GB Max Memory (Intel® Xeon® LV/ULV and Intel® Core™2 Duo Only)

Advanced IO
- 3 configurable x8 PCI-E Ports (0 controllers)
- Gen1 PCI-E

RASUM Features
- Patrol & demand scrub, Uncorrectable retries
- Single Device Data Correction (SDDC) for x4
- Memory sparing/mirroring

### Products and Specifications

<table>
<thead>
<tr>
<th>Product</th>
<th>Samples</th>
<th>ECG Launch</th>
<th>Power (TDP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel® Xeon® (Sossaman LV)</td>
<td>Now</td>
<td>Q4'06</td>
<td>31 W</td>
</tr>
<tr>
<td>Intel® Xeon® (Sossaman ULV)</td>
<td>Now</td>
<td>Q4'06</td>
<td>15 W</td>
</tr>
<tr>
<td>Intel® Celeron® (Sossaman Value)</td>
<td>Now</td>
<td>Q4'06</td>
<td>27 W</td>
</tr>
<tr>
<td>Intel® Core™2 Duo (Merom DC SV)</td>
<td>Q4'06</td>
<td>Q1'07</td>
<td>34 W</td>
</tr>
<tr>
<td>Intel® Core™2 Duo (Merom DC LV)</td>
<td>Q4'06</td>
<td>Q1'07</td>
<td>17 W</td>
</tr>
<tr>
<td>Intel® Core™2 Duo (Yonah DC SV)</td>
<td>Now</td>
<td>Q3'06</td>
<td>31 W</td>
</tr>
<tr>
<td>Intel® Core™2 Duo (Yonah DC LV)</td>
<td>Now</td>
<td>Q3'06</td>
<td>15 W</td>
</tr>
<tr>
<td>Intel® E7520 MCH</td>
<td>---</td>
<td>Launched</td>
<td>11W</td>
</tr>
<tr>
<td>Intel® 6300ESB</td>
<td>---</td>
<td>Launched</td>
<td>3W</td>
</tr>
</tbody>
</table>

Dev Kit: IPDXE7520ALDVKT (Intel® Xeon® Proc LV) – Avail Now

---

Platform Controller Hub (PCH)
- Two Display Streams supported in any combination of DisplayPort*, HDMI, DVI and VGA
- Additional USB, PCIe*, and SATA ports
- Enhanced Manageability features – Intel® Active Management Technology 6.0
- Enhanced Security features – Intel® Trusted Execution Technology
**Intel® Xeon® 5500 series processor platform Overview**

**Processor Core**
- Nehalem (45nm) [Next Intel TOCK]
- Integrated Memory Controller
- Turbo Technology
- Intel® QuickPath interconnect
- Intel® Hyper-Threading Technology (SMT)
- Lead and halogen free platform kit

**Processor Options:**
- Nehalem-EP 4C/8T 1066/5.86/8M/80W 2.53GHz
- Nehalem EP 4C/4T 800/4.8/4M/80W 2GHz
- Nehalem EP 4C/4T 1066/5.86/8M 60W* 2.13GHz
- Nehalem EP 2C/4T 1066/5.86/8M 38W* 2.00GHz

*High Tcase of 85C no more than 360hrs/year

**Intel® Xeon® 5500 series processor platform Overview**

**Intel® Xeon® 5500 series processor platform Overview**

**Intel® Xeon® 5500 series processor platform Overview**

**Intel® Xeon® 5500 series processor platform Overview**

**Intel® Xeon® 5500 series processor platform Overview**

**Intel® Xeon® 5500 series processor platform Overview**

**A glimpse of Intel embedded skus development**

- **PC/Server/Laptop like solutions in embedded**
- **Tolapai and QuickAssist**
- **Atom and its next generation**
Intel’s First Integrated x86 SoC with QuickAssist Technology

Features:
- Single device, embedded IA-32 SoC
- Core based on Intel® Pentium® M architecture
- 1200/1066/600 MHz operation
- Power 13-21 Watts
- Integrated Memory and I/O controller hubs
- 256 K, 2-way L2 cache
- Support for DDR-2 400/533/667/800 (32/64b) with ECC (optional)
- 1,088-ball FCBGA (Pb free)
- 1.092 mm pitch 37.5 mm x 37.5 mm, Z max
- Multiple SKU options available for management, security, IP Tel, or packet services

Tolapai SoC and integrated QuickAssist

I/O Support:
- 3 GbE (RGMII or RMII)
- IEEE 1588 Time Synch
- 3x TDM (12 T1/E1)
- 1x MDIO
- 2x Controller Area Network (CAN)
- 1x Local Expansion Bus (16b)
- PCI Express® (1x8/2x4/2x1)
- 2x UART, 36x GPIO,
- 2x SMBus/I2C, LPC 1.1
- 2x USB 1.1/2.0, 2x SATA 1.0/2.0

Application Services:
Security Services
- Bulk: AES, 3DES, (A)RC4
- Hash: MD5, SHA-1, SHA-224-256-384-512, HMAC
- Public Key - RSA, DSA, DH + Internal TRNG + pCR

IP Telephony Services
- HSS TDM Drivers
- sRTP

Storage Accel
- Raid 5/6 – Q2 ’09

Workload Acceleration
- Cryptography required for secure communications
- Pattern Matching required for deep packet inspection to detect and filter attacks, viruses, spam, malware, data leakage, etc.
- Decompression required for bandwidth optimization and to perform deeper inspection of compressed objects
- RAID 5/6 (XOR and GF calculations) for RAID storage

• Power Optimized Performance
- General purpose computation done on one or more Intel® Architecture cores
- Workload specific processing performed on hardware accelerator or in software, as dictated by performance, power, footprint, cost, etc.
- Scalability: Software investment preserved by a common, industry-standard API

Tolapai SoC and integrated QuickAssist

EP80579 O/S Support:
- IP Telephony Services
- RH Linux
- Security Services
- RH Linux
- FreeBSD
- Linux

EP80579 D5 Support:
- Intel® QuickAssist Technology is designed to optimize the use and deployment of workload accelerators

Many applications require specific workload processing

Intel® QuickAssist Technology is designed to provide:
- Cryptography
- Pattern Matching
- Decompression
- RAID 5/6
- Power Optimized Performance
- Scalability: Software investment preserved by a common, industry-standard API
Intel® QuickAssist Integrated Accelerator

- Implements Cryptographic and RAID 5/6* acceleration
- Present today in SOC form factor in the Intel EP80579 Integrated Processor with Intel® QuickAssist technology (formerly codenamed Tolapai)

Intel® QuickAssist Integrated Accelerator 1.0

- Enhances Crypto and RAID services
- Adds Compression and Regular Expression Pattern Match acceleration
- To be present in SOC and chipset form factors
- See roadmap foils later for details

Intel® QuickAssist Integrated Accelerator 1.5

*RAID 5/6 acceleration not currently enabled in software on EP80579

A glimpse of Intel embedded skus development

- PC/Server/Laptop like solutions in embedded
- Tolapai and QuickAssist
  - Atom and its next generation

2008 Navy-Pier Platform

Intel® Atom™ Processor N270

- 45nm technology: 22x22mm package
- TDP ~ 2.5W
- Hyper-Threading technology, C4 low power state

Intel® 945 GSE

- 27x27mm package
- TDP >= 3.5 W (depends on config.)
- LVDS, VGA, SDVO
- Intel Generation 3.5 Integrated GFX Core (133 MHz)
- Single Channel DDR2 400/533 – 1 SO-DIMM + Memory Down – B/W:5.3 GB/s (1 Ch)

Intel® ICH7

- 31x31mm package
- TDP ~1.5W
- 4 PCIe, 4 PCI
- 2 SATA, 1 PATA
- Intel® High Definition Audio
- 10/100 LAN controller
- 8 USB 2 ports

Supported Processors

- 1.6 GHz:533MHz/2W/512K
- 1.33 GHz:533MHz/2W/512K
- 1.1 GHz:400MHz/2W/512K
- Single chip SCH (GMCH + ICH)

Memory
- Single Channel
- DDR2 400/533
- 2GB Max Memory

Graphics
- Low Power Graphics Core
- Dual Independent Displays

Internal LVDS
2008 Platform – Menlow for Embedded Platform

Video
- HW HD/SD Video Decode
- SDVO is the 2nd Display Port
- IO Support
  - 2-(x8) 1-(x4) - SDIO / MMC
  - 1 PATA (Master / Slave)
  - 8 USB (1 client)
- Intel® High Definition Audio

O/S Support
- Microsoft Windows: WinCE, WinXP, WinXPe, WEPOS
- WindRiver Linux, VxWorks
- Red Flag Linux
- Red Hat Linux
- MontaVista Pro
- QNX Neutrino

2010 Luna-Pier Refresh Platform
(Pineview-D SC/DC Processor, ICH8M)

Pineview-D** Processor
- Single and Dual core SKUs
- Fan less design capability for both SKUs
- 400Mhz graphics engine
- 45nm technology
- 512Kb L2 cache
- Kit TDP: ~13W (SC) / ~17W (DC)
- 64bit DDR2 667 - 2GB Max
- Single Memory Channel
- Intel® 64, HT, XD Bit

** Internal code names, subject to change

2010 Queensbay** Platform Solution
(Atom SoC)

Tunnel Creek** Processor
- 22x22x2.5 0.8mm bp package
- TDP 2.5~3.5W depending on SKU
- 512KB cache
- Up to 1GB max, single Channel 32-bit DDR2 667/800, memory down
- Integrated Graphics Controller and Video Encode and Decode Accelerator
- Intel® High Definition Audio
- 4 PCIe x1 ports

*** IOHs for different applications are available from 3rd party

*Other names and brands may be claimed as the property of others
** Internal code names, subject to change

Intel® ICH8-M
- GBE (10/100/1000) MAC
- USB Port Disable
- Intel® High Definition Audio
- 3 SATA Ports
- 6 x1 PCIe Express Ports
- 10 USB Ports
- Enhanced SPI Interface
- Faster SMBUS
- Internal VR

2010 Queensbay** Platform Solution
(Atom SoC)
2010 Queensbay** Platform Solution (Atom SoC)

Topcliff** IOH
- 23x23x2.23 1mm bp PBGA package
- TDP 1/2W
- 1 PCIe x1 port
- 2 SATA
- 10/100/1000 Ethernet MAC
- 6 USB 2.0 Host ports, 1 USB 2.0 device port
- 2 SD/SDIO/MMC ports
- 1 CAN, I2C, SPI ports
- 8 GPIO
- IEE1588

*** IOHs for different applications are available from 3rd party

Topcliff** IOH
- SDVO
- LVDS
- Intel® High Definition Audio
- DDR2 (up to 800MTs mem down)
- 14 GPIO
- SPI Flash
- SIO
- LPC
- PCIe 3x1
- 1 CAN
- 1 I2C
- 1 SPI
- 8 GPIO
- PCIe 1 x1
- Tunnel Creek**
- SDRI2 (up to 800MTs mem down)
- 1 Gig Ethernet
- 2 SATA II
- 2 SD/SDIO/MMC
- 2 UART
- 6 USB2.0 host
- 1 USB2.0 client
- 8 GPIO

O/S Support
- Windows XP, XPe, WEPOS, WinCE
- Fedora Core 10/11
- Moblin 2.0
- QNX Neutrino

Trends:
- BIOS/Bootloader; embedded OS/RTOS;
- Graphics:
  - More update from Intel SSG and ECG

Hot embedded applications
- Video Analytics and pave the way to real adoption of visual computing
- Front-end and edge Processing under the environment of embedded internet and cloud computing/storage
- Smart enterprise and smart home: richer control and management applications
- Interactive media
- Industrial Portable and WSN
- Consumer
- Virtualization, Robotics and Intelligence