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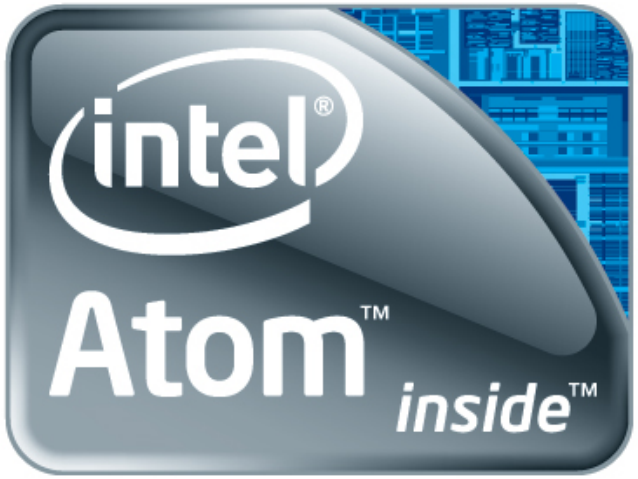
Embedded Design and ATOM



Overview

- Part I: Embedded Design and ATOM
- Part II: ATOM Interface Capabilities
- Part III: Using Atom

Overview Part I

- What is Embedded Design?
- What are the major areas of Embedded Design?
- Example uC and uP
- How does ATOM compare to most Embedded Processors

What is Embedded Design?

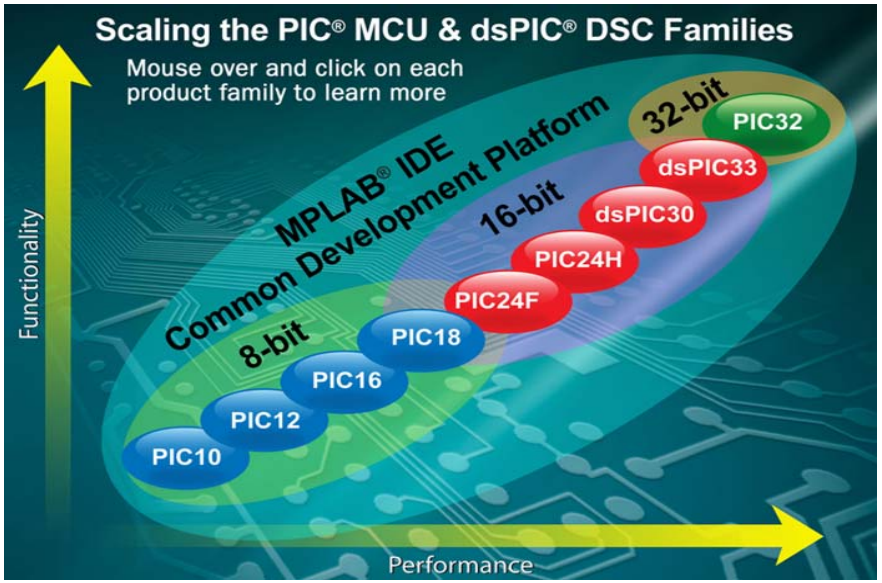
- An **embedded system** is a computer system designed to do one or a few dedicated functions often with real-time computing constraints.
- It is considered *embedded* since it is part of a complete device often including all hardware and mechanical parts.
- By contrast, a general-purpose computer, such as a personal computer (PC), is designed to be flexible and to meet a wide range of end-user needs.

What are the major areas of Embedded Design?

- Cloud Computing
- Security
- In Vehicle Infotainment
- Set top box
- Biotechnology
- Consumer Electronics
- Defense Industry
- Robotics

Example uC and uP

- ATOM (Intel) (32bit)
- A4 (Cortex-A8) (32bit)
- M3 (32bit)
- PIC 24 (16bit)
- PIC 16 (8bit)



How does ATOM compare to most Embedded Processors

- ATOM is significantly larger than most embedded processors
- ATOM has significantly higher power consumption than most embedded processors
- ATOM is significantly more powerful than most embedded processors

Overview Part II

- Interfacing with ATOM VS other MCU
- Board Capabilities and Peripherals
- How do we get ATOM to do stuff?

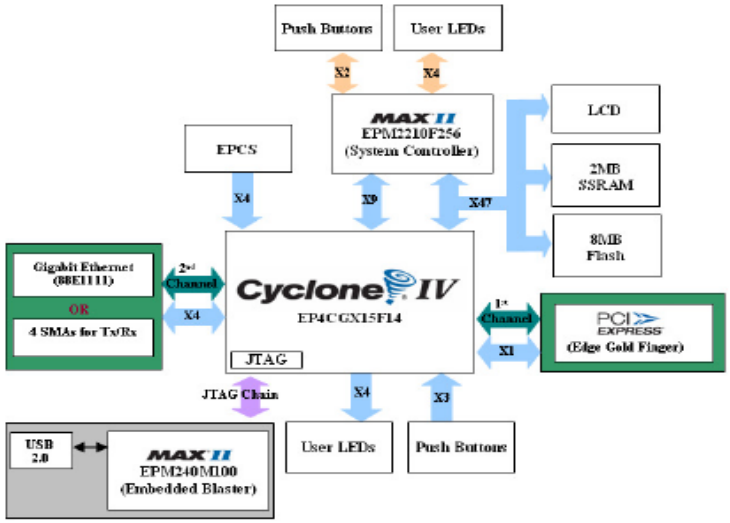
Interfacing with ATOM VS other MCU

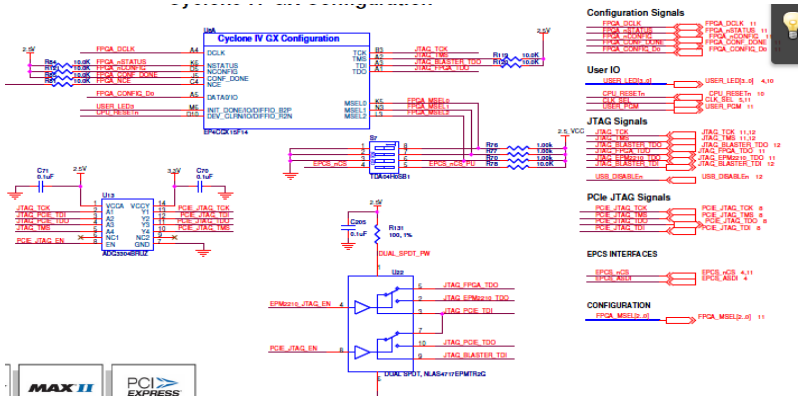
- Most development kits(Dev Kits) for processors have detailed board schematics, that include I/O mapping information
- Most Dev kits are designed by a company to help designers/developers to understand capabilities of MCU before they design an embedded device around it

Interfacing with ATOM VS other MCU

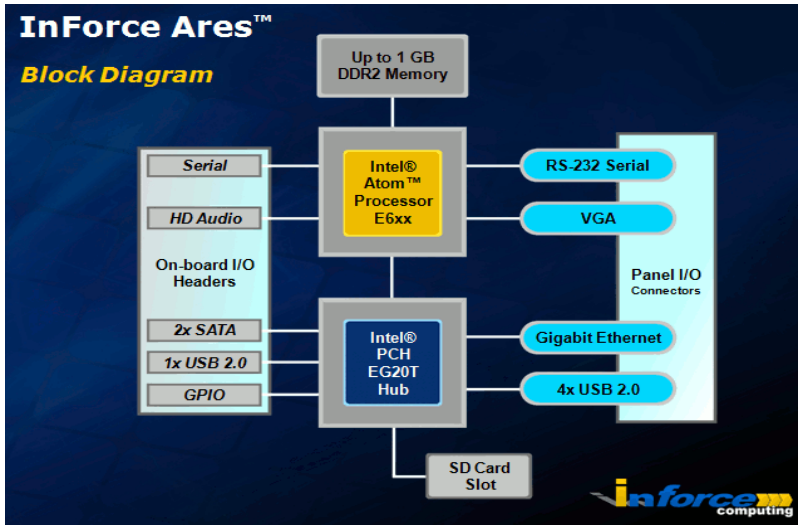
- Dev kits designed around the ATOM seem to have another motivation which is rather than build around the processor to build around the kit or pay kit designer to build a board
- In short most design documentation is proprietary

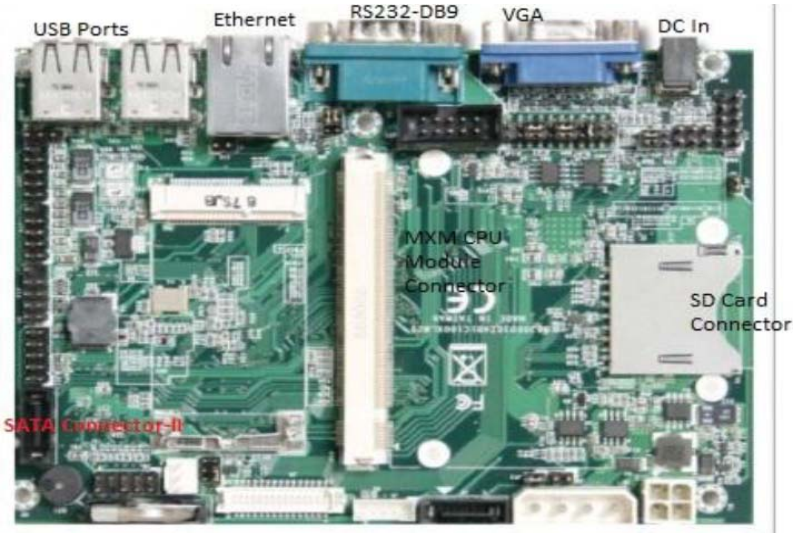
Example of Information Expected





Type of Information Received





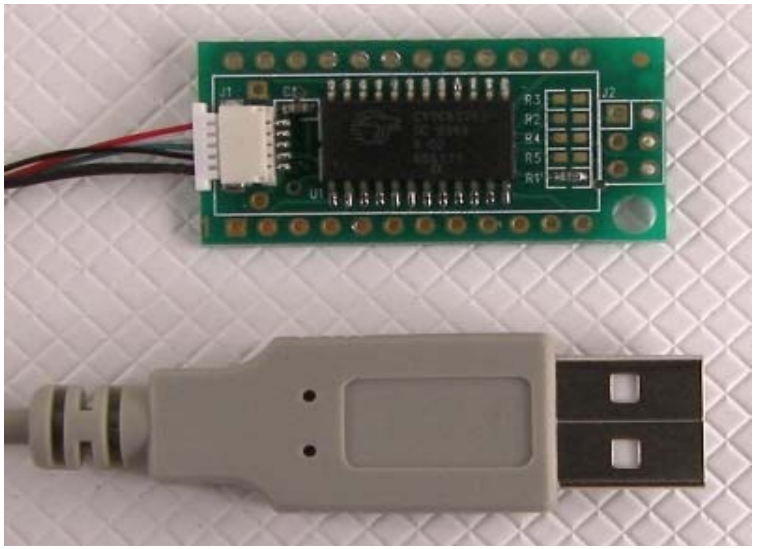
Board Capabilities and Peripherals

- USB and RS-232 Will be main modes of communication
- Only a small amount of GPIO’s seem to be free on the board
- Issues with getting access to GPIO’s

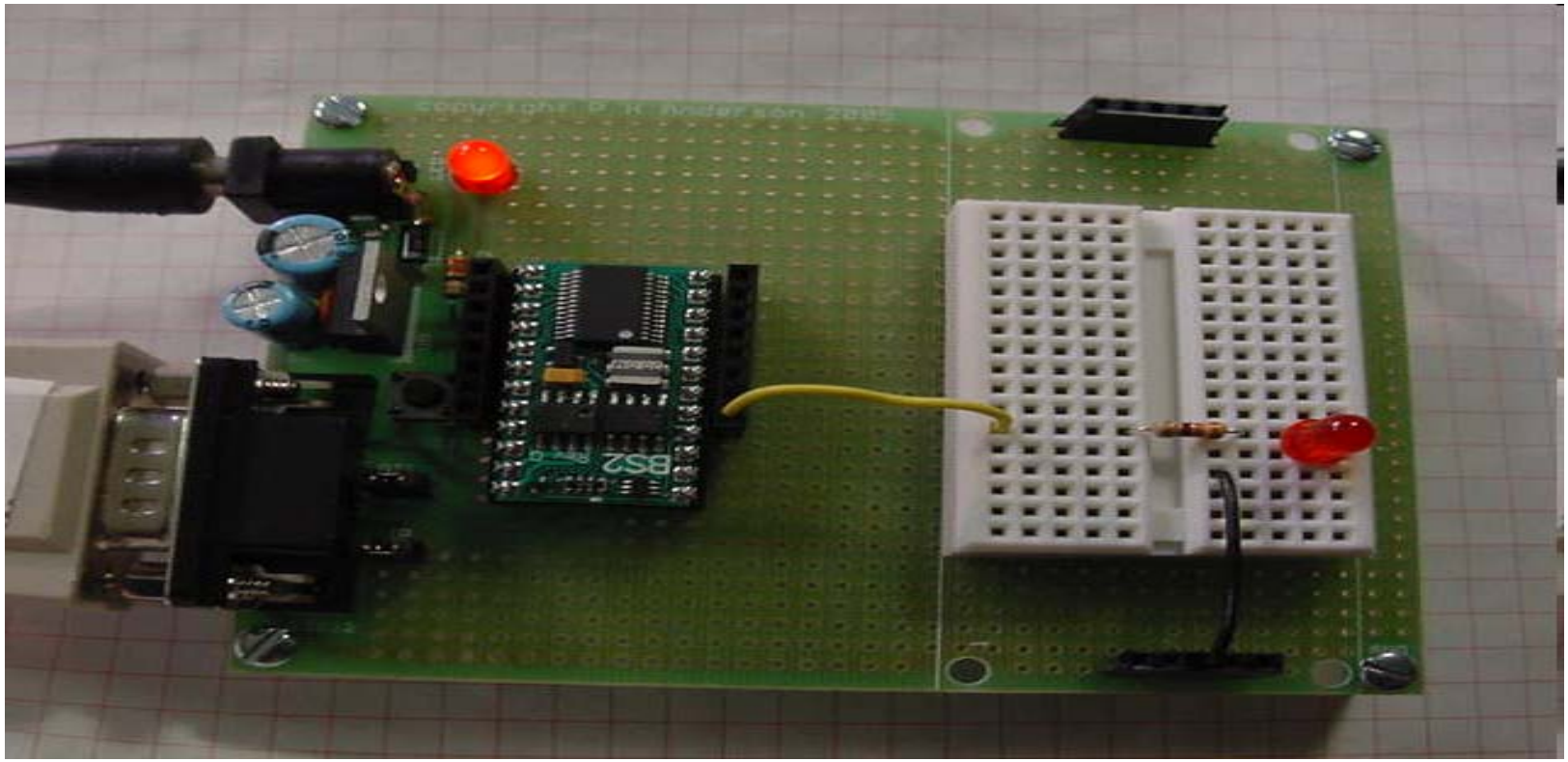
```
root@overo# echo 146 > /sys/class/gpio/export
root@overo:/sys/class/gpio# cat gpio146/direction
in
root@overo# echo out > /sys/class/gpio/gpio146/direction
root@overo:/sys/class/gpio# cat gpio146/direction
out
root@overo# cat /sys/class/gpio/gpio146/value
0
root@overo# echo 1 > /sys/class/gpio/gpio146/value
root@overo# cat /sys/class/gpio/gpio146/value
1
```

How do we get ATOM to do stuff?

- Connect peripherals like USB controllers and small MCU's to do any pin control required
- Write high level code for complex algorithms (Ex: C)



How do we get ATOM to do stuff?



How do we get ATOM to do stuff?

- Code can Be written in high level Object Oriented Code like C
- Custom Drivers may need to be written to interface with lower level uC / uP
  - Drivers usually written in C

Other Potential Uses

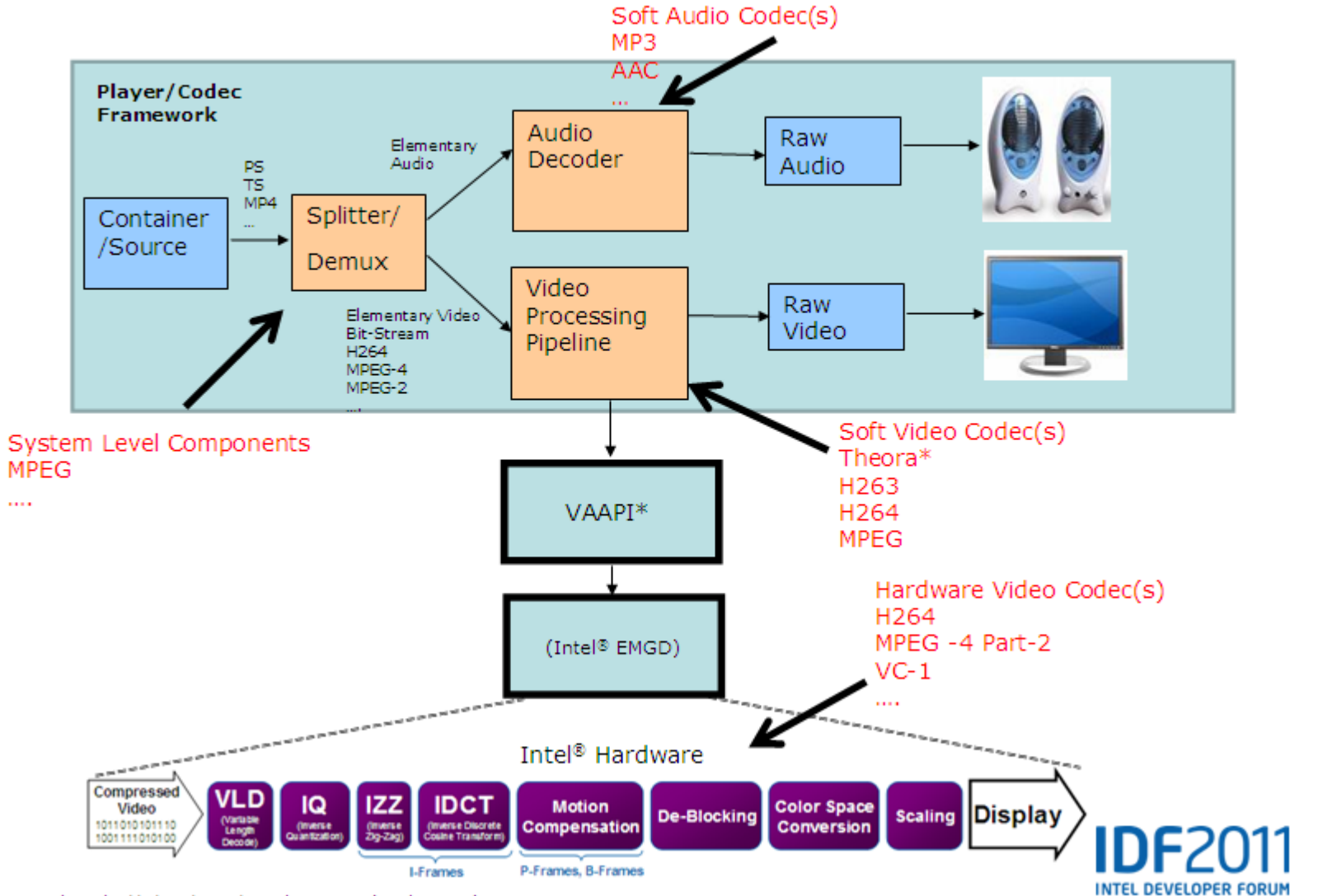
- Media Device
  - Example LAB:
  - **Video Encoding**
    - Check CPU Utilization by System Monitor
    - Record Video From Camera (HW Accelerated)
    - Encode video from file (SW Accelerated)
    - Encode Video From file (HW Accelerated)

Intel® Atom™ Processor E6XX Series – HD Video Capable

Format	Profile	Levels	Max Resolution	Max Frame Rate	Max Bit Rate (Mbps)
H.264	Baseline Profile	L1,L1.2,L1.3,L2,L2.2,L3 [1]	480p	30 fps	
H.264	Main Profile	L1,L1.2,L1.3,L2,L2.2,L3,L3.1,L3.2, L4.1	1080p 720p	30 fps 60 fps	
H.264	High Profile	L1,L1.2,L1.3,L2,L2.2,L3,L3.1 L3.2L, L4.1	1080 MLM13	30 fps	45
MPEG-4	Simple Profile	L0,L1,L2,L3	480p	30 fps	
MPEG-4		DivX HD [3]	720p	30 fps	
MPEG-4	Advanced Simple Profile	L0,L1,L2,L3,L5 [2]	720p	30 fps	8
VC-1	Simple Profile	LL,ML	CIF		
VC-1	Main Profile	LL,ML,HL	1080p	30 fps	
VC-1	Advanced Profile	L0,L1,L2,L3	1080p	30 fps	40
WMV9	Simple Profile	LL,ML			
WMV9	Main Profile	LL,ML,HL	1080p	30 fps	20
MPEG-2	Simple Profile	Main Level			
MPEG-2	Main Profile	Low, Main, High1440, High Level	1080p	30 fps	80

[1]L3.1 may be supported where the toolset use is those common to both Baseline and Main Profile.
[2]At L5 resolution, only Simple Profile Toolset is supported.
[3]DivX is based on MPEG4 ASP but ignores the levels defined by MPEG4. There are two variants of DivX. The "certified" version does not require GMC or quarter pixel motion compensation prediction. The "non-certified" does support these features.

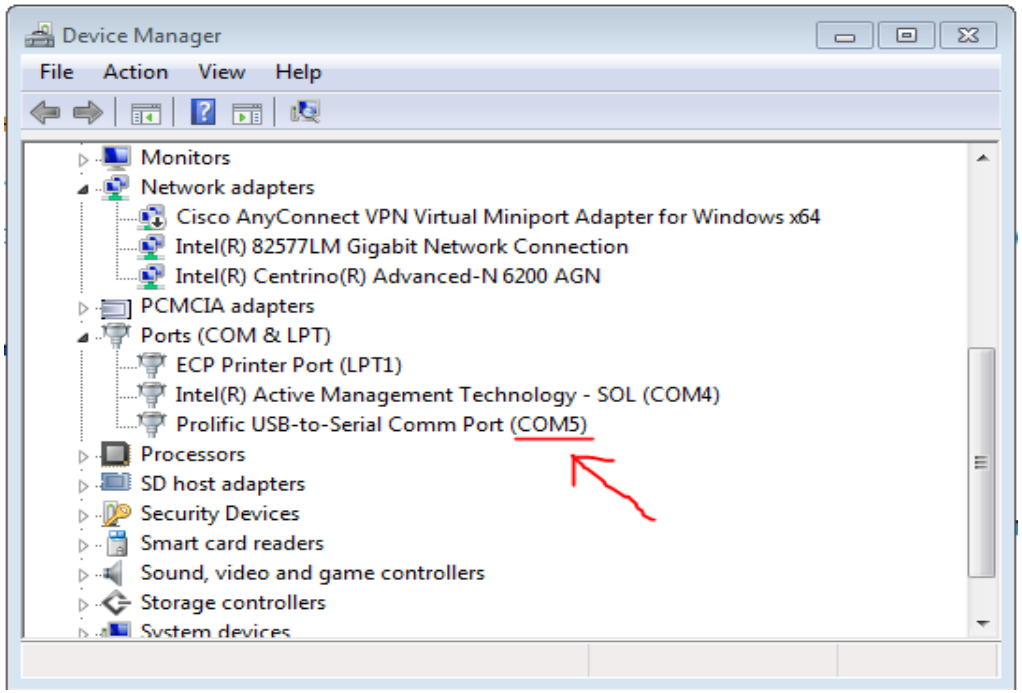
Fedora* Video Decode SW Stack

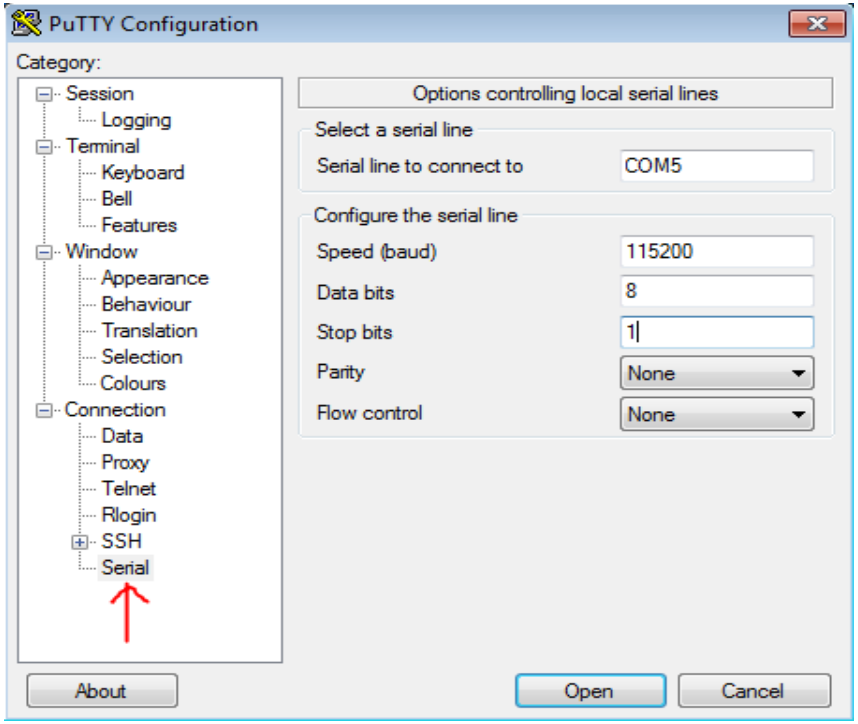


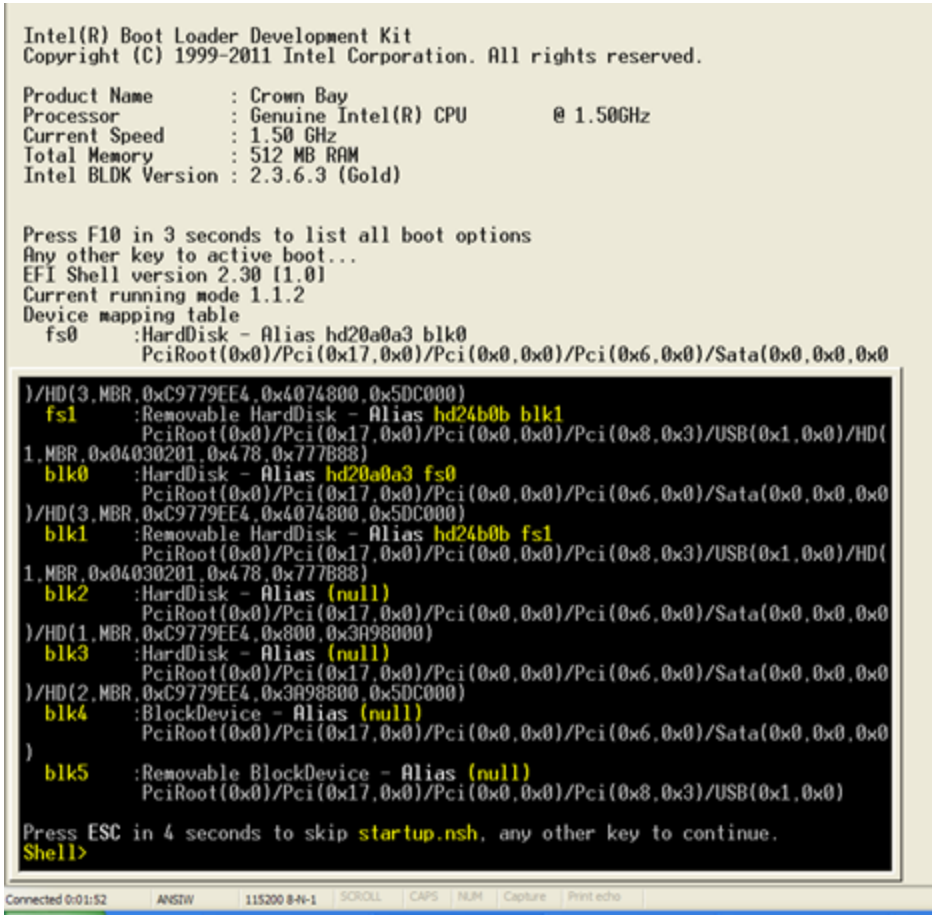
Ways to Connect to ATOM Board

- Stand alone (Local)
  - Own mouse, keyboard, and monitor
- Connected via com Port (Local)
  - Uses another PC to interface with the board
  - No graphical interface command line only
- Network Login (Remote)
  - No graphical interface command line only
- Remote Desktop (VPN/KVN) (Remote)
  - Graphical interface

How to connect via Com Port




PuTTY Configuration
Category:
Session
Logging
Terminal
Keyboard
Bell
Features
Window
Appearance
Behaviour
Translation
Selection
Colours
Connection
Data
Proxy
Telnet
Rlogin
SSH
Serial
Options controlling local serial lines
Select a serial line
Serial line to connect to
COM5
Configure the serial line
Speed (baud)
115200
Data bits
8
Stop bits
1
Parity
None
Flow control
None
About
Open
Cancel


Intel(R) Boot Loader Development Kit
Copyright (C) 1999-2011 Intel Corporation. All rights reserved.
Product Name : Crown Bay
Processor : Genuine Intel(R) CPU @ 1.50GHz
Current Speed : 1.50 GHz
Total Memory : 512 MB RAM
Intel BLDK Version : 2.3.6.3 (Gold)
Press F10 in 3 seconds to list all boot options
Any other key to active boot...
EFI Shell version 2.30 [1.0]
Current running mode 1.1.2
Device mapping table
fs0 :HardDisk - Alias hd20a0a3 blk0
PciRoot(0x0)/Pci(0x17,0x0)/Pci(0x0,0x0)/Pci(0x6,0x0)/Sata(0x0,0x0,0x0
)/HD(3,MBR,0xC9779EE4,0x4074800,0x5DC000)
fs1 :Removable HardDisk - Alias hd24b0b blk1
PciRoot(0x0)/Pci(0x17,0x0)/Pci(0x0,0x0)/Pci(0x8,0x3)/USB(0x1,0x0)/HD(
1,MBR,0x04030201,0x478,0x777B88)
blk0 :HardDisk - Alias hd20a0a3 fs0
PciRoot(0x0)/Pci(0x17,0x0)/Pci(0x0,0x0)/Pci(0x6,0x0)/Sata(0x0,0x0,0x0
)/HD(3,MBR,0xC9779EE4,0x4074800,0x5DC000)
blk1 :Removable HardDisk - Alias hd24b0b fs1
PciRoot(0x0)/Pci(0x17,0x0)/Pci(0x0,0x0)/Pci(0x8,0x3)/USB(0x1,0x0)/HD(
1,MBR,0x04030201,0x478,0x777B88)
blk2 :HardDisk - Alias (null)
PciRoot(0x0)/Pci(0x17,0x0)/Pci(0x0,0x0)/Pci(0x6,0x0)/Sata(0x0,0x0,0x0
)/HD(1,MBR,0xC9779EE4,0x800,0x3A98000)
blk3 :HardDisk - Alias (null)
PciRoot(0x0)/Pci(0x17,0x0)/Pci(0x0,0x0)/Pci(0x6,0x0)/Sata(0x0,0x0,0x0
)/HD(2,MBR,0xC9779EE4,0x3A98800,0x5DC000)
blk4 :BlockDevice - Alias (null)
PciRoot(0x0)/Pci(0x17,0x0)/Pci(0x0,0x0)/Pci(0x6,0x0)/Sata(0x0,0x0,0x0
)
blk5 :Removable BlockDevice - Alias (null)
PciRoot(0x0)/Pci(0x17,0x0)/Pci(0x0,0x0)/Pci(0x8,0x3)/USB(0x1,0x0)
Press ESC in 4 seconds to skip startup.nsh, any other key to continue.
Shell>