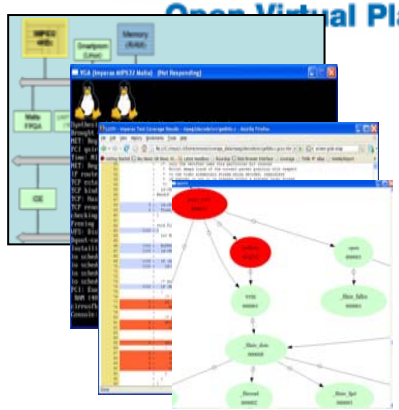
Software Development using Virtual Platforms

Simon Davidmann
Imperas CEO
OVP founder

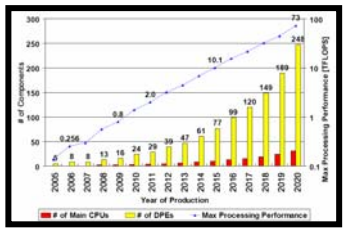
DAC VP09 Workshop, 29 July 2009

New Tools and Methodology Needed for Embedded Software Development

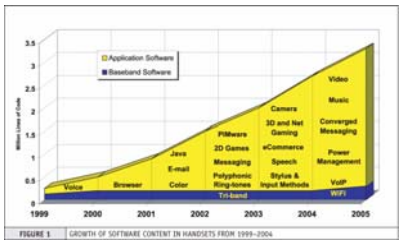


Adoption of new tools to produce higher quality embedded software

Move to Virtual Platforms for Software development



Multicore Proliferation



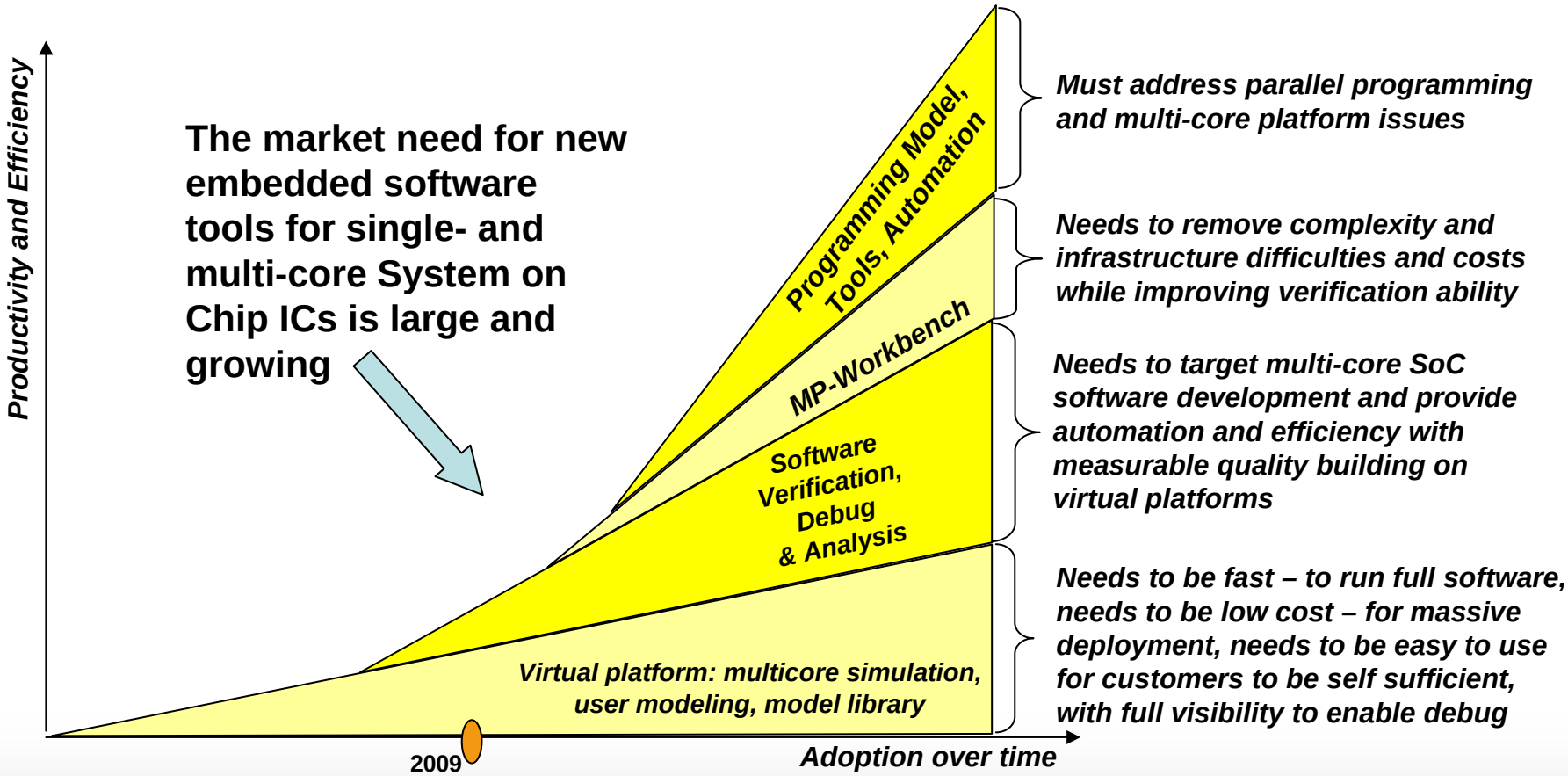
Software Complexity Explosion

Virtual Platforms Types

- Hardware Virtual Platforms
  - Timing / Cycle accurate
  - Used for architecture performance analysis, drivers, firmware
  - Models are very complex, slow, time consuming to build
  - SystemC etc
  - Main value is same performance as RTL, no Verilog license cost…
- Software Virtual Platforms
  - Instruction accurate
  - Used for OS, applications
  - Can be very fast, programmers views
  - Model only what is needed in peripherals
  - Complete system environment

New SoC Embedded Software Development market

- Older approach was to use prototypes, breadboards, FPGA, previous generation – this fails to satisfy for next generation complexity



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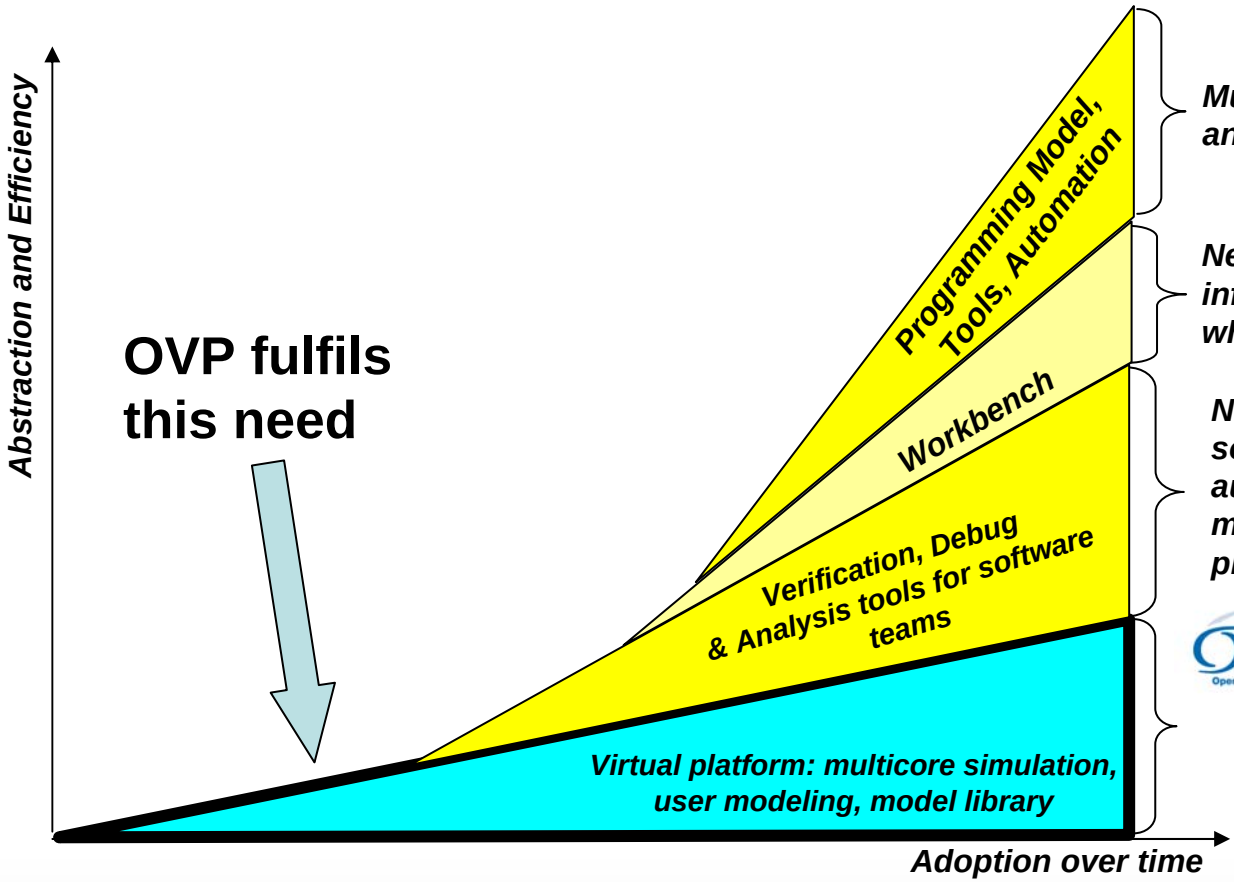
Virtual Platforms (OVP) are the foundation for the next generation of [embedded] software development environments – especially for multicore



Must address parallel programming and multi-core platform issues

Needs to remove complexity and infrastructure difficulties and costs while improving verification ability

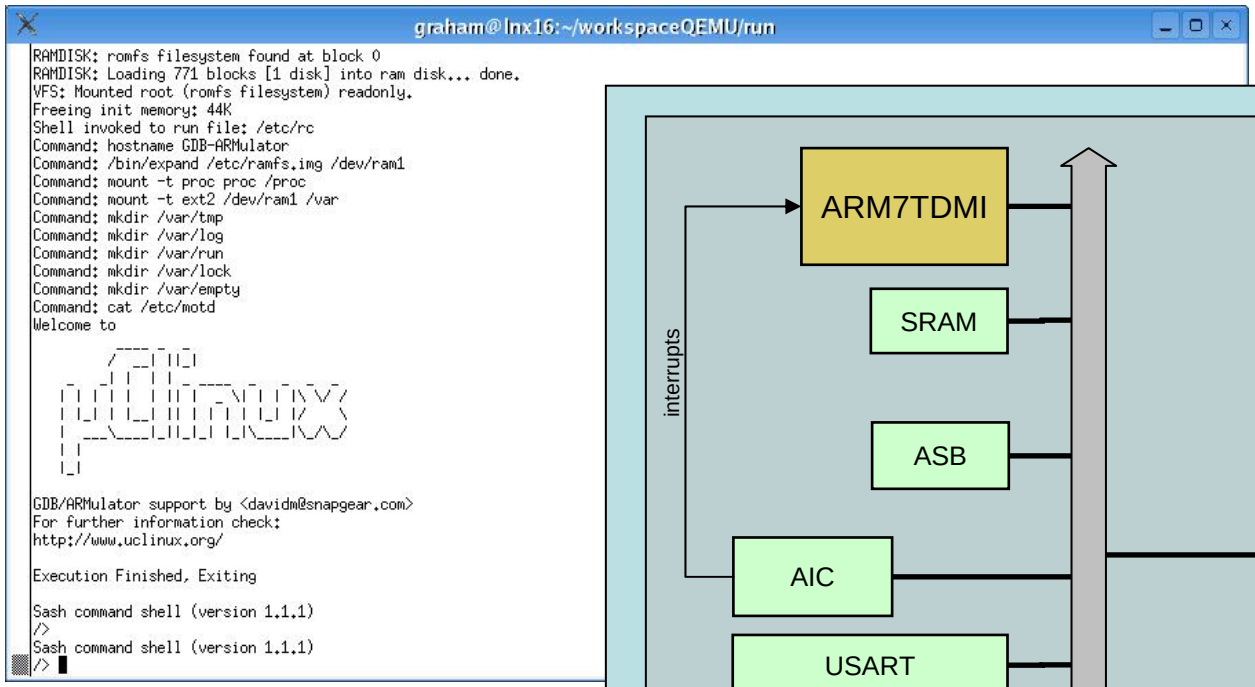
Needs to target multi-core SoC software development and provide automation and efficiency with measurable quality building on virtual platforms

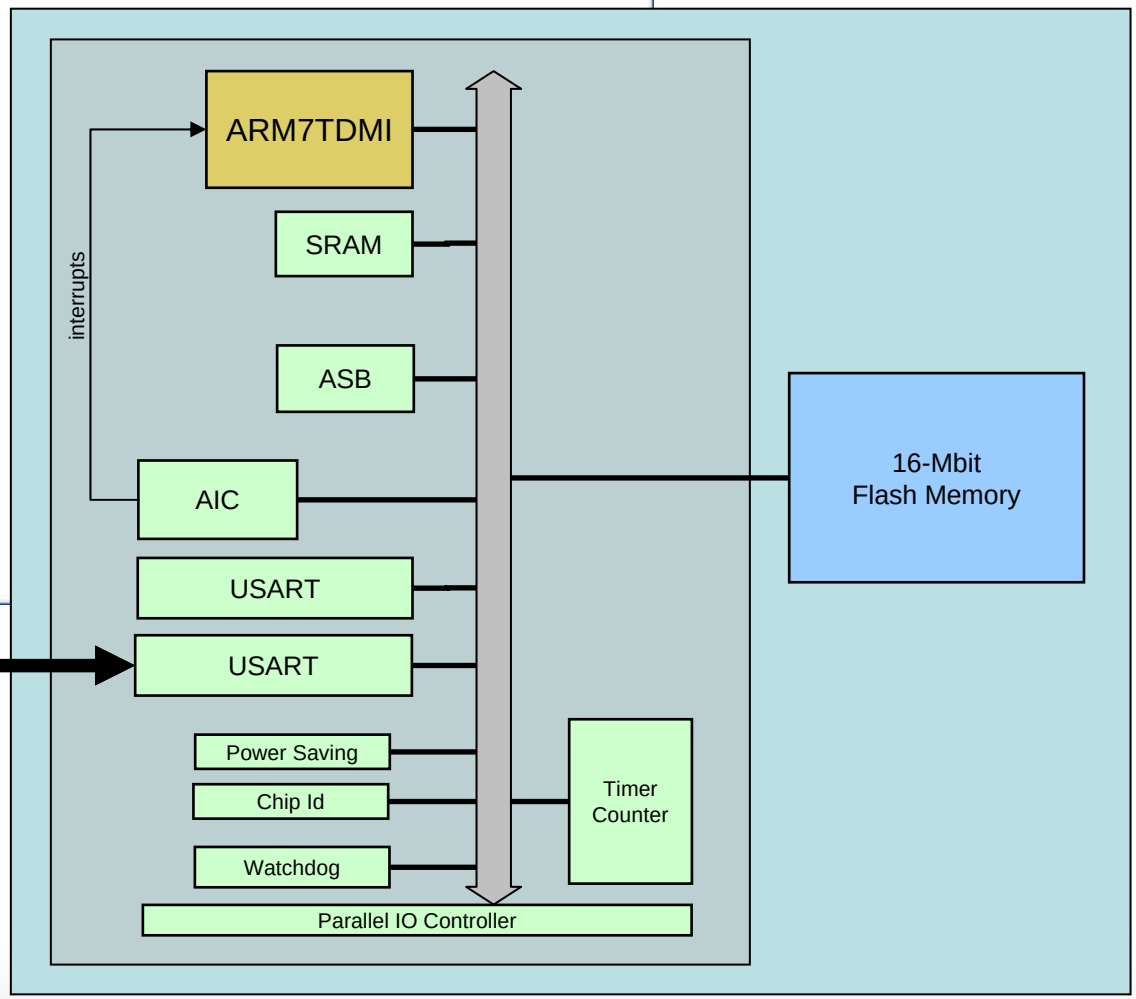
Open Virtual Platforms started March 2008,
28 partners
Today: 1400 registered users,
10,000 downloads,
200+ companies using

What is in OVP?

- **Modeling APIs**
  - Publishing of C OVP APIs for Processor, Peripheral, and Platform modeling
  - Documentation & header files
- **Open Source library of models**
  - C source of models written to C OVP APIs
  - Processor models of ARM, ARC, MIPS, OpenRisc OR1K, x86, …
  - Peripheral models of standard embedded devices
  - Example embedded platforms in C, C++, SystemC, TLM2.0
    - Including full platforms that boot operating systems like Linux, Nucleus
- **OVP reference simulator, free for non-commercial use**
  - Runs processor models fast, 500 MIPS typical
  - Interfaces to GDB via RSP/socket
  - MP Capable, scalable and very efficient
  - Can encapsulate existing processor models (ISS)
  - Callable with C/C++/SystemC wrapper
- **Website community/portal**
- **Ecosystem growing for model and tool developers and users**

OVPsim booting uClinux on ARM Atmel AT91sam7



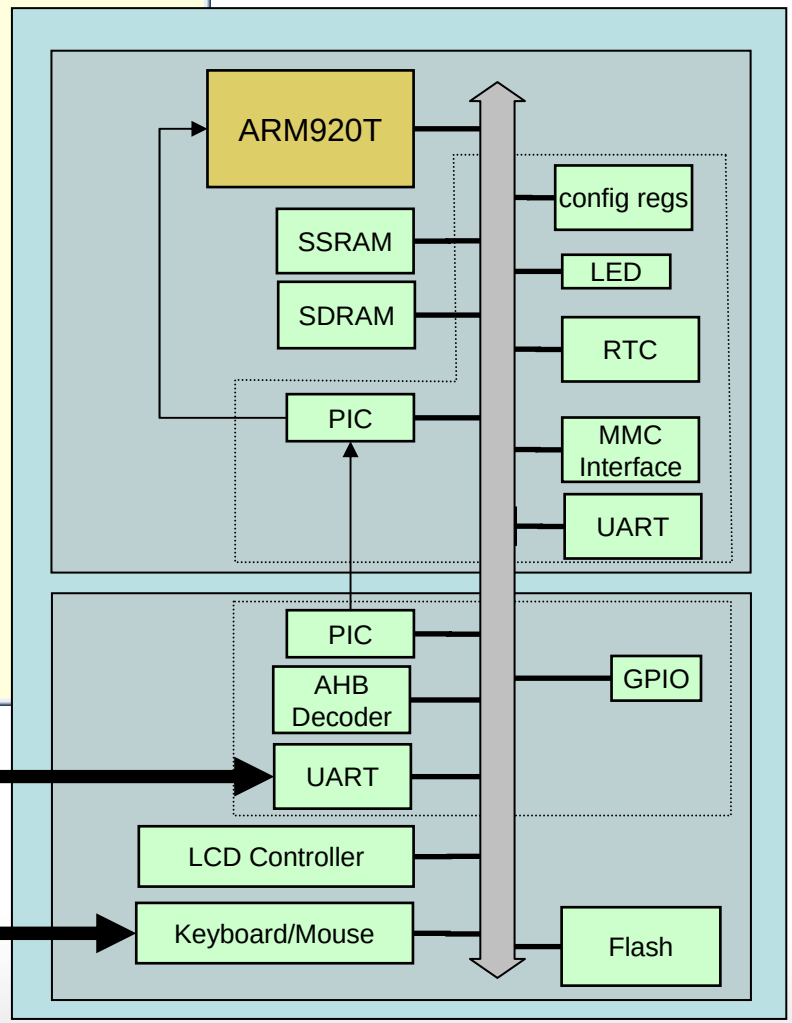


[Boot uClinux]

OVPsim booting Nucleus on ARM Integrator / ARM920

Open Virtual Platforms

```
graham@lnx16:~/workspaceArmIntegrator <3>

Task 5 Event Detections:          22

RX Buffer:


********************************************************************************
                      Nucleus PLUS 2.2 Demonstration
                   Build Timestamp - Jul 18 2009/02:18:52
********************************************************************************

Task 0 Time:                      24
Timer Interrupts:                 2400

Task 1 Messages Sent:             9503395

Task 2 Messages Received:         9503339
Task 2 Invalid Messages:          0

Task 3/4 Resource Owner:          Task 4

Task 5 Event Detections:          23

RX Buffer:
```

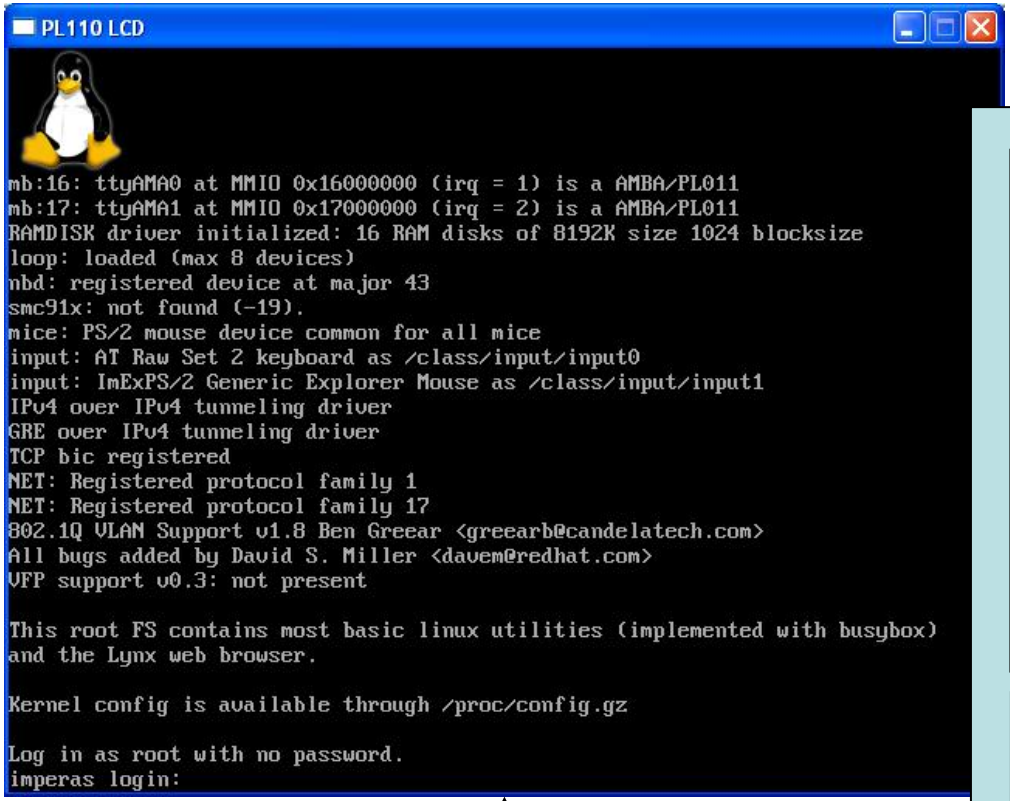


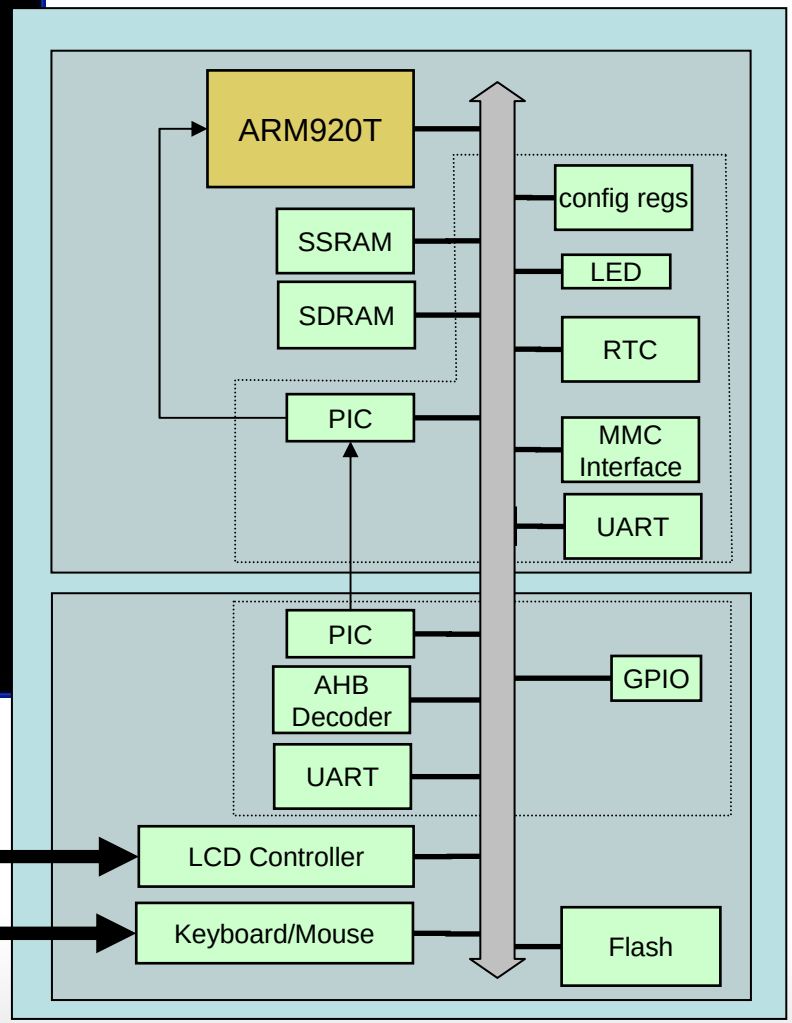
Easy to run

Keyboard

telnet localhost 9999

OVPsim booting Linux on ARM Integrator / ARM926

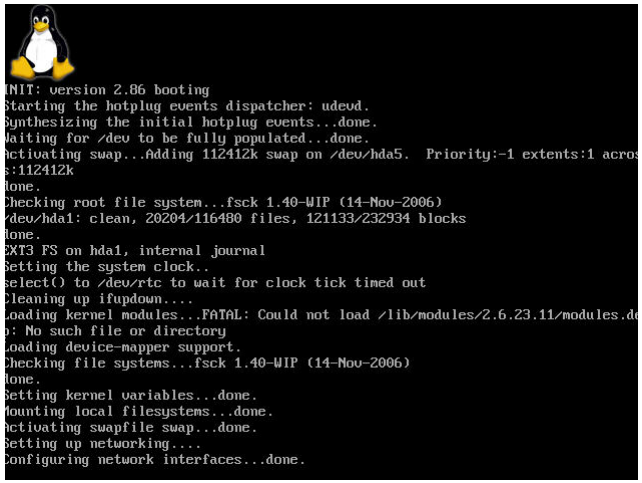


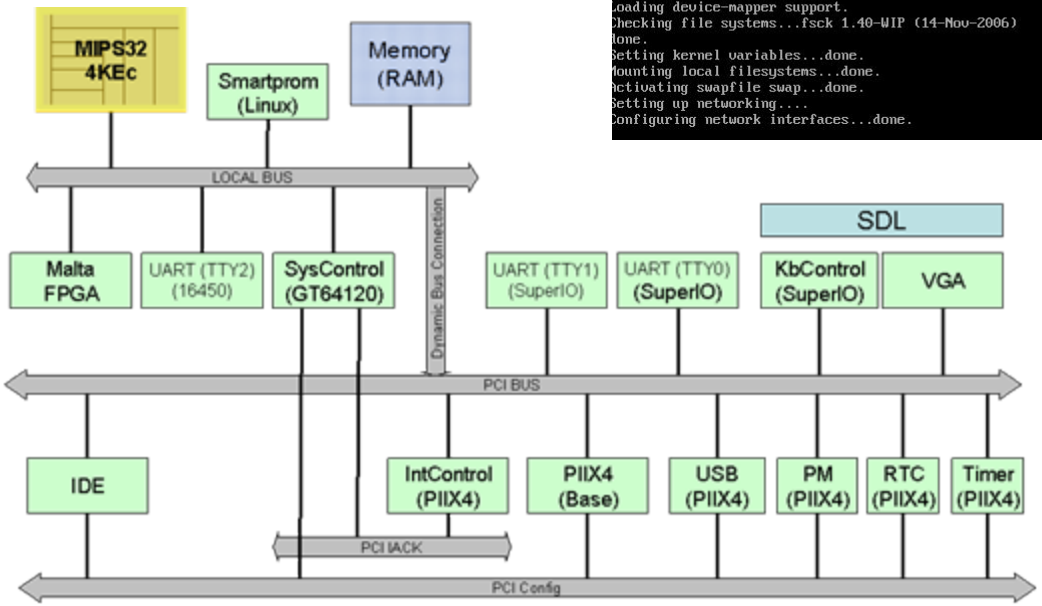


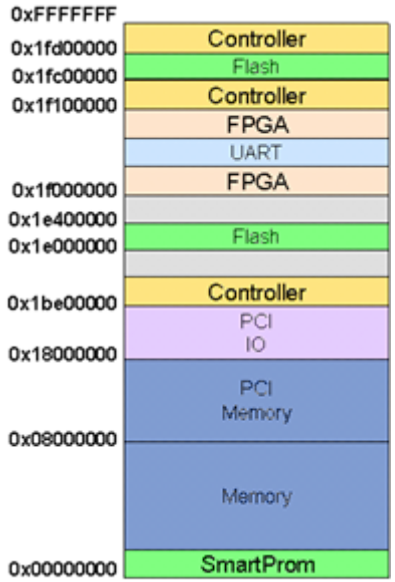
Keyboard / Mouse

[Boot Linux]

OVPsim MIPS Linux platform



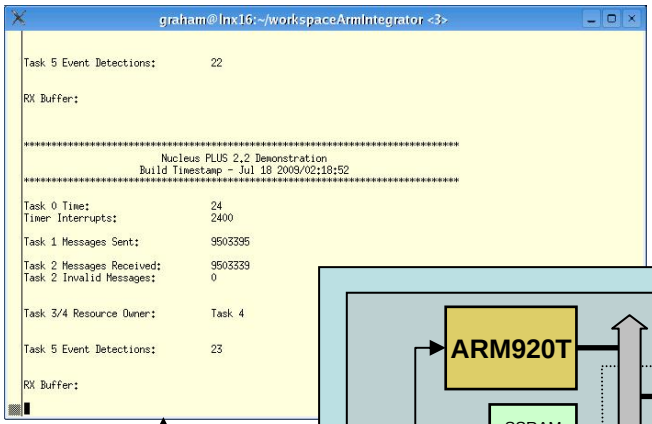




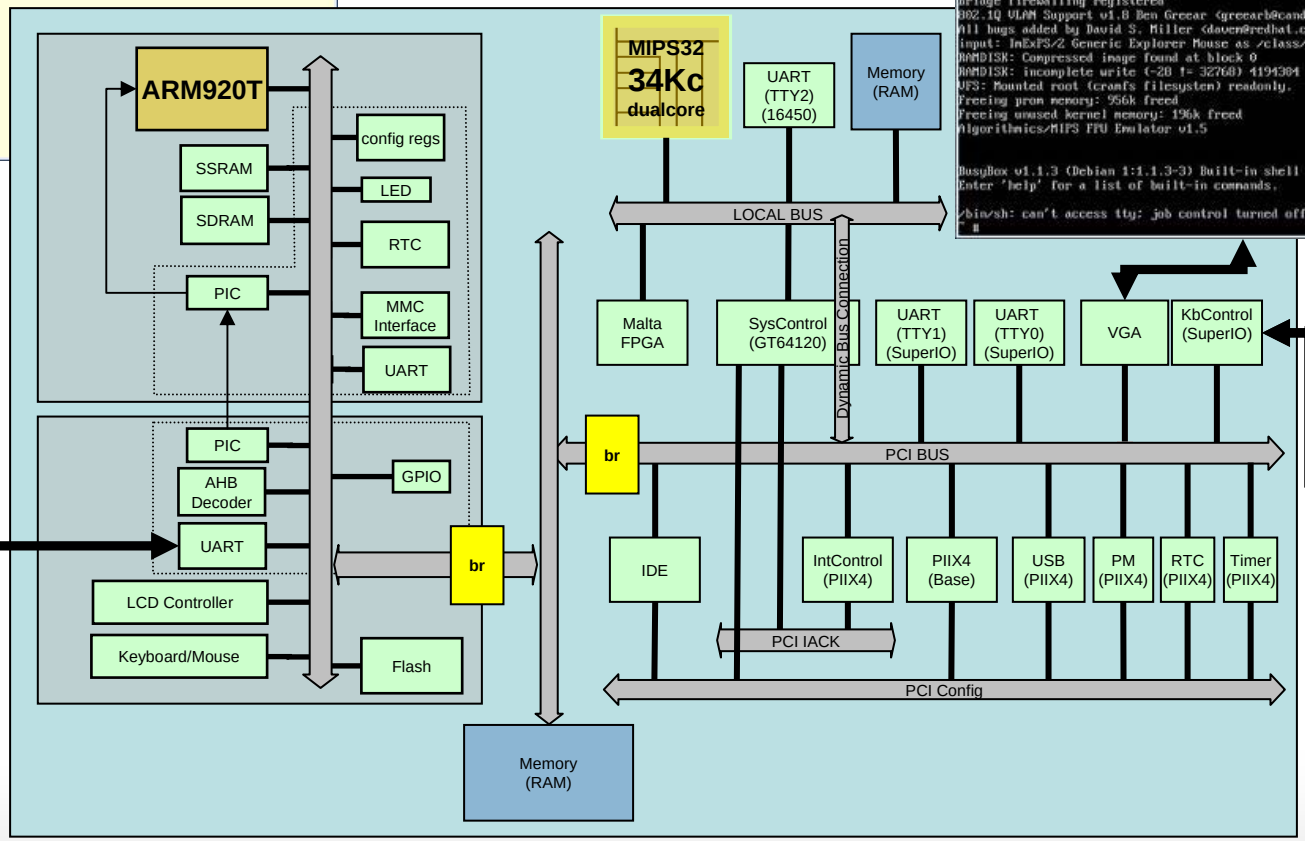
- Boot Linux on Windows PC…
- Easy to run: platform .exe vmlinux

OVPsim Heterogeneous Platform
ARM Nucleus / MIPS Linux

Open Virtual Platforms

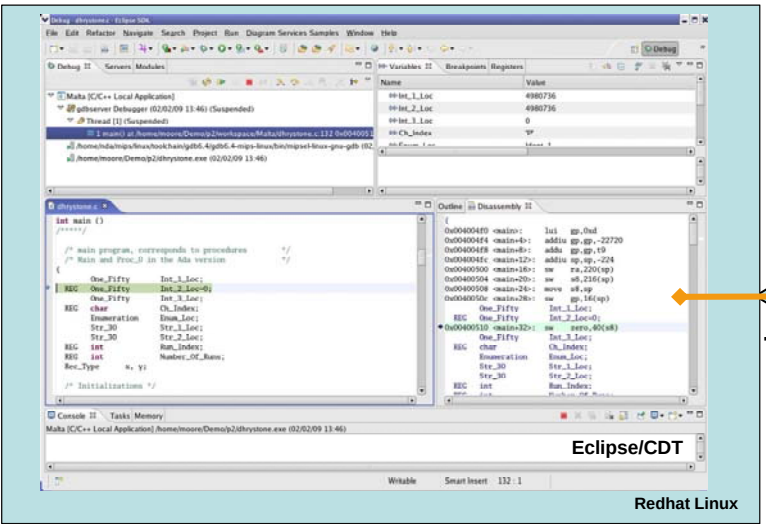


Run Platform



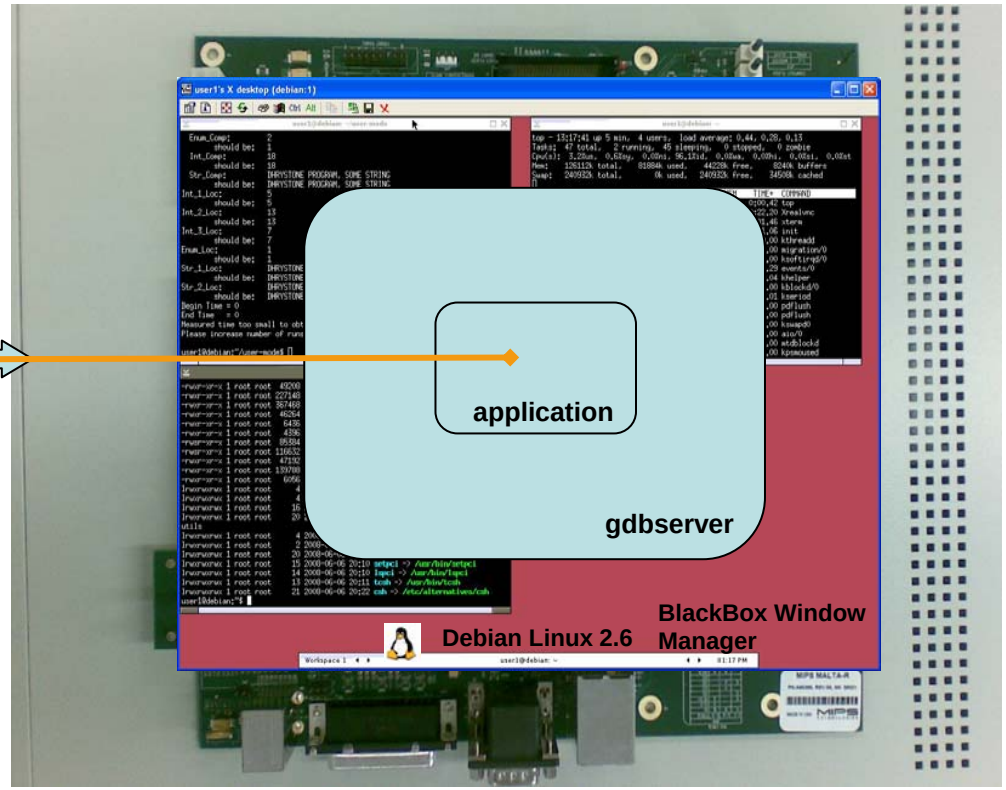
telnet localhost 9999

Software debug on prototype: Run gdbserver on target and Eclipse on host to debug application on target



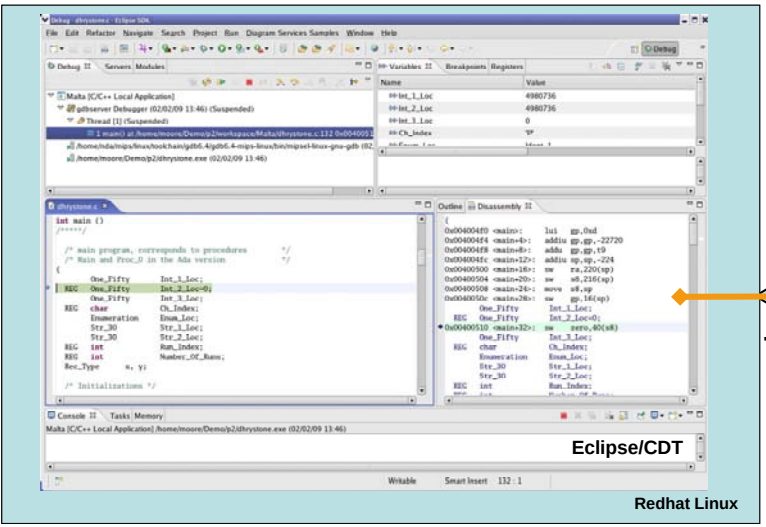
TCP/IP

Host



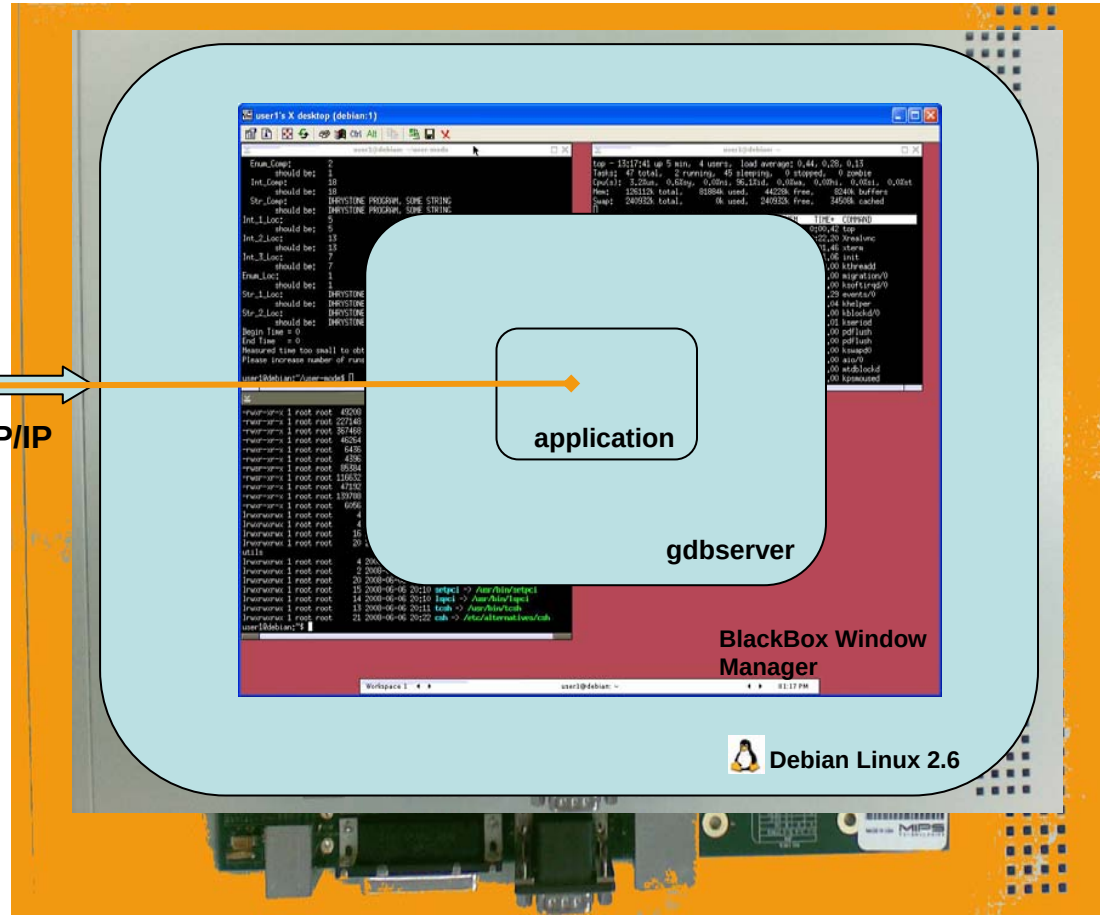
Remote Target

Using a Virtual Platform from OVP provides exactly the same environment



Host

TCP/IP



Virtual Platform as Remote Target

Demo: Developing Software on Virtual Platforms

- Virtual Platforms are replacing hardware prototypes for software development
  - It's a new world, with familiar tools
  - Virtual Platforms provide significant benefits
  - Software development uses standard tools
    - Eclipse, GDB, gdbserver

Benefits of Virtual Platforms for software development

Easier to deploy, more reliable, deterministic

Often much faster

Easier to use for regression testing, improving quality

Available much sooner (developing SoC takes 2 years of delay…)

With OVP, the models are free, fast, and easy to use…

- Thank you

- For more information visit www.OVPworld.org