



Embedded TINE

on ARM-9 uController

Introduction: why ARM-based uController?

- ARM architecture is very popular in embedded electronics:
 - Widely used in mobile phones, PDAs, digital media devices, game electronics, computer peripherals (hard drives, routers etc.) 98% of mobile phones use at least one ARM processor, 90% of all embedded 32-bit RISC processors (Wikipedia)
 - Many suppliers: Atmel, Freescale, NXP, STMicroelectronics, TI, Samsung....
- Many of modern ARM processors:
 - are enhanced by the DSP instruction set
 - implement the Jazelle technology (Java Byte code executed directly in the ARM architecture)
- A lot of operating systems are available for the ARM architecture:
 - real time: VxWorks, QNX, Symbian OS, Windows CE, FreeRTOS...
 - Unix-like: Linux, BSD, Solaris, Android...

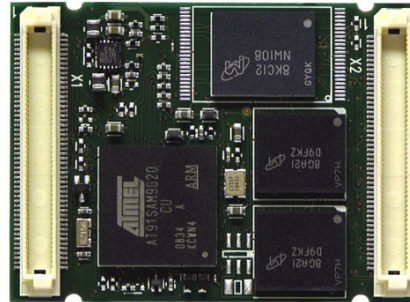
Taskit STAMP9G20

CPU

- Atmel® AT91SAM9G20 (ARM926EJ-S core)
- DSP Instruction Extensions
- 32 kB Data Cache
- 32 kB Instruction Cache
- 2 x 16 kB internal SRAM
- "Jazelle" Embedded Java Accelerator
- MMU (Memory Management Unit)
- 400 MHz CPU Clock

Interfaces

- 10/100 Ethernet MAC
- USB 2.0 Full Speed (12 Mbit/s) ,2 x USB Host , 1 x USB Device
- Up to 7 Serial Interfaces (USART / UART)
- 1 x SSC
- 2 x SPI
- TWI (I²C compatible)
- Up to 80 Digital I/O Ports
- 16-bit Parallel Bus
- JTAG
- 4-channel 10-bit ADC
- Image Sensor Interface (ISI)
- Micro SD-Card Slot
- External SD-Card Interface
- **No CAN interface**



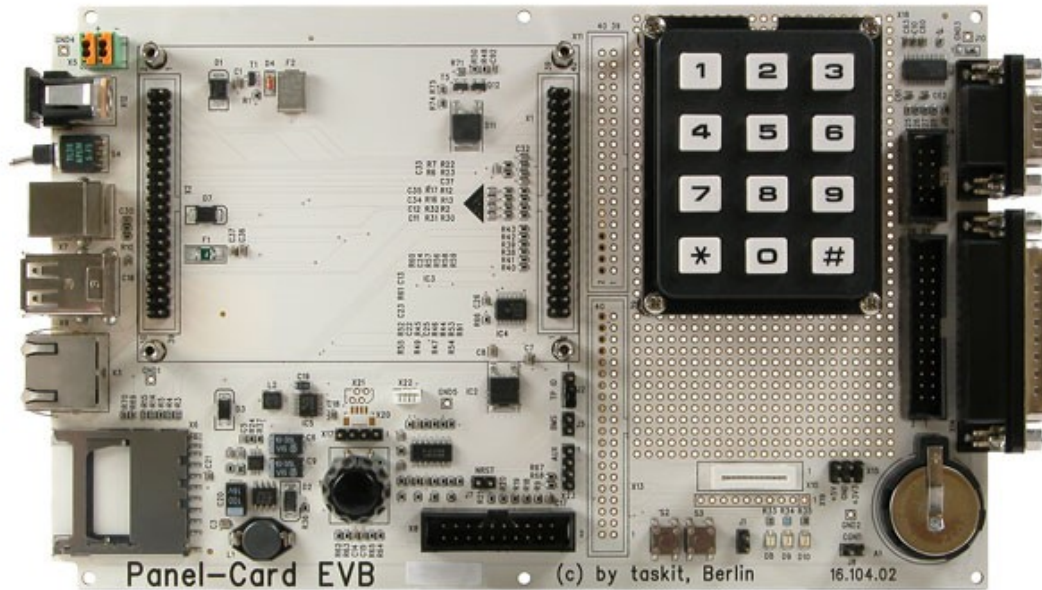
Memory

- 64 MB SDRAM (optional up to 128 MB)
- 128 MB NAND Flash (optional up to 512 MB)
- 128 Byte EEPROM

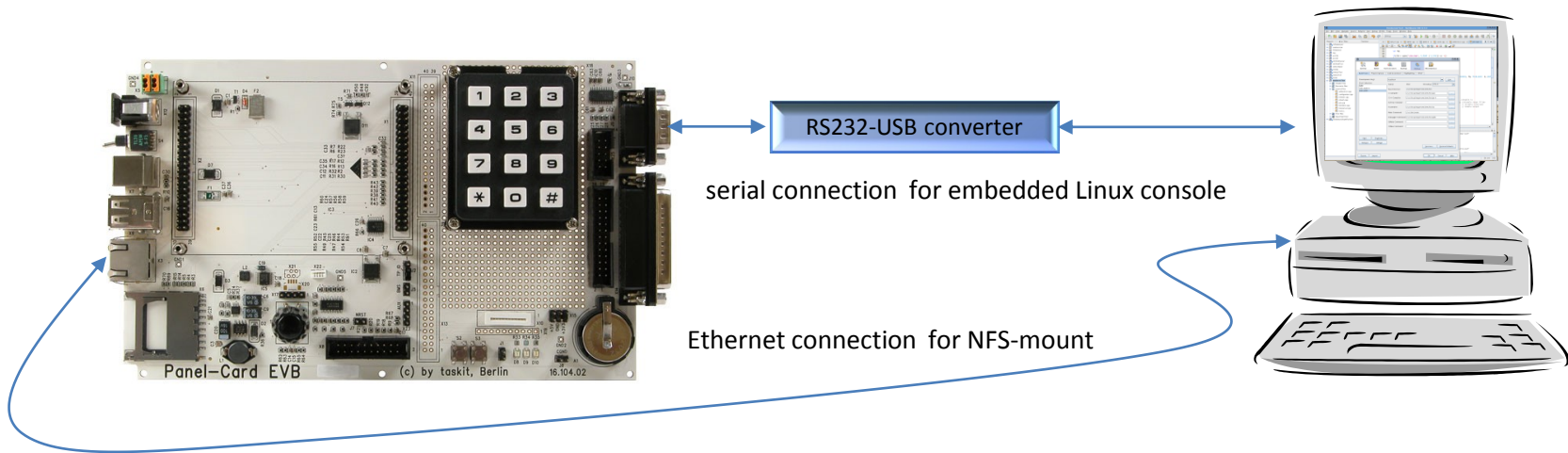
Operating system

- Bootloader "U-Boot"
- Linux 2.6.x (Ångström distribution)
- "JamVM" Java Virtual Machine, using the "GNU Classpath" Java Class Library
- Windows Embedded CE (no support)
- ECOS (no support)

Stamp9G20 Development Kit

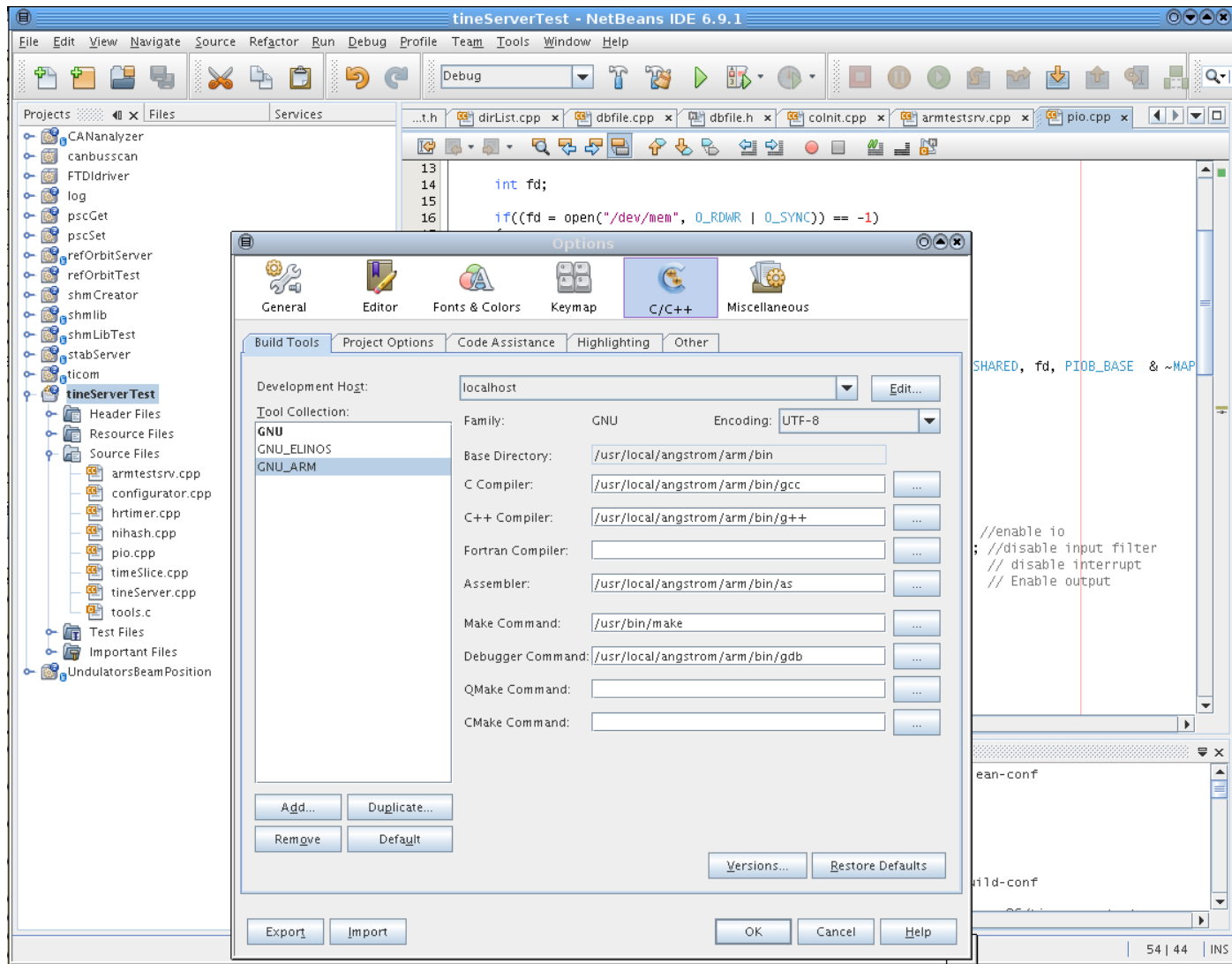


Development Environment



- No special cabling needed
(if the PC has an RS232port)
- No additional tools needed (like eprom or flash programmers)
Application can be copied to the embedded system using the NFS-mount
- Desktop PC running Debian Linux.
- No commercial software needed
 - GNU tool-chain provided
- Debugging and console: virtual terminal (minicom)
- IDE: Netbeans

Cross compiling for ARM



TINE Test Server

- Porting TINE library: no problem with cross-compiling (same header files as for Debian)
- Very simple server, switches LEDs on the board
 - no drivers needed in order to access the I/O ports (mmap() used)
- No problem with server run
- Multithreading not tested yet

