SAM4S Boot Strategies
&
Programming solutions

SAM4S Boot Strategies

Boot Strategies

SAM4S provides 2 booting solutions:

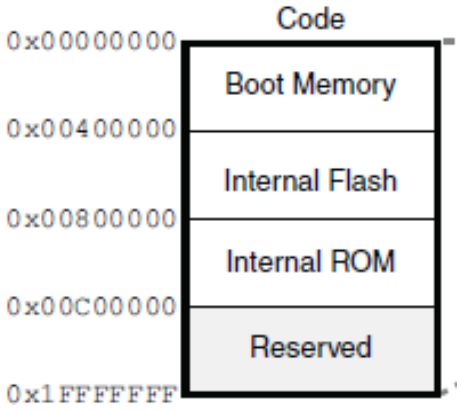
- Boot from the embedded ROM (**SAM-BA Boot**)
- Boot from the embedded Flash (**User application**)

Boot mode selection is made by setting/clearing GPNVM bit 1

- GPNVM bit 1 = 0: boot from ROM
- GPNVM bit 1 = 1: boot from Flash

Embedded ROM contains:

- SAM-BA Boot
- In Application Programming function (IAP)
- Fast Flash Programming Interface (FFPI)



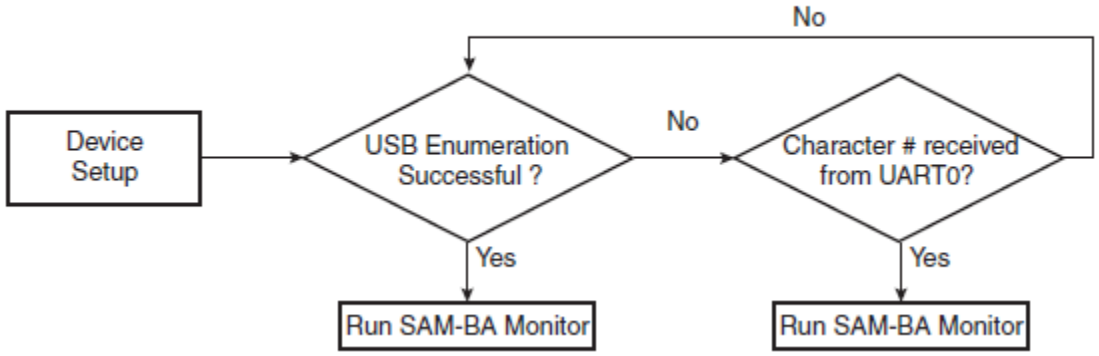
SAM4S memory mapping

SAM-BA Boot

GPNVM bit 1 = 0

- SAM-BA Boot is a default Boot Program which provides an easy way to program in-situ the on-chip Flash memory.
- SAM-BA Boot supports serial communication via the UART and USB.
- SAM-BA Boot provides an interface with SAM-BA Graphic User Interface (GUI).

Figure 22-1. Boot Program Algorithm Flow Diagram



SAM-BA Boot: Hardware & Software constraints

- SAM-BA Boot uses the first 2048 bytes of the SRAM for variables and stacks. The remaining available size can be used for user's code.
- USB requirements: external crystal or external clock with frequency of:
  - 11,289 MHz
  - 12,000 MHz
  - 16,000 MHz
  - 18,432 MHz
- UART0 requirements: None
  - URXD0 (PA9) and UTXD0 (PA10) are driven during execution
- External clock must be a 1.2V square wave signal

IAP - In Application Programming Function

- IAP feature is a function located in ROM
  - Can be called at any time
- When called, this function sends the desired FLASH command to the EEFC and waits for the Flash to be ready
- Allows flash programming while the code is running out of flash
  - No need to have programming routines in SRAM
- This function takes one argument in parameter: the command to be sent to the EEFC
- The IAP function entry point is retrieved by reading the NMI vector in ROM (0x00800008).

IAP - In Application Programming Function

```
(unsigned int) (*IAP_Function)(unsigned long);

void main (void){
unsigned long FlashSectorNum = 200; //
unsigned long flash_cmd = 0;
unsigned long flash_status = 0;
unsigned long EFCIndex = 0; // 0:EEFC0, 1: EEFC1

/* Initialize the function pointer (retrieve function address from NMI
vector) */
IAP_Function = ((unsigned long) (*)(unsigned long)) 0x00800008;

/* Send your data to the sector here */
/* build the command to send to EEFC */
flash_cmd = (0x5A << 24) | (FlashSectorNum << 8) | AT91C_MC_FCMD_EWP;

/* Call the IAP function with appropriate command */
flash_status = IAP_Function (EFCIndex, flash_cmd);
}
```

SAM4S Programming Solutions

Programing solutions

- Development Tools such as IAR, Keil integrate their own flash loaders utility to flash the application during debug phase.

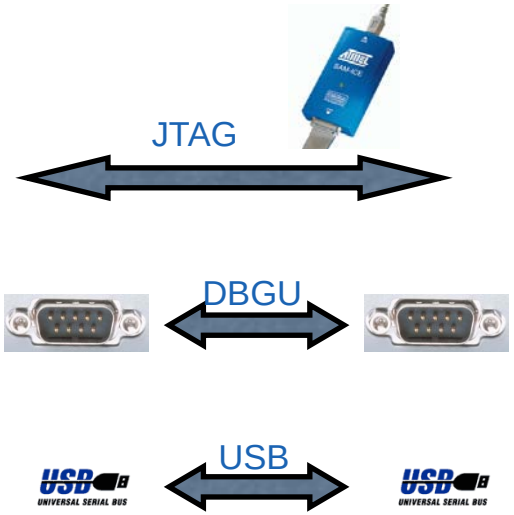
- J-Flash from Segger can be used to program the on-chip flash memory

- SAMBA_DLL.dll: Atmel's Free solution for customers to create their own GUI Interfaces

- Gang Programmers: support for our whole flash-based microcontroller thanks to our FFPI.

SAM-BA GUI

- SAM-BA UI provides In-System Programming solutions for on-chip and/or on-board memories
- Support many communication channels
  - USB, Serial (DBGU/UART) with SAM-BA Boot running out of the target
  - JTAG ICE Port (no need for SAM-BA boot)
- Customizable
  - Other ISP solution can use SAMBA_DLL (Custom GUI)
  - Add support for custom boards or memories



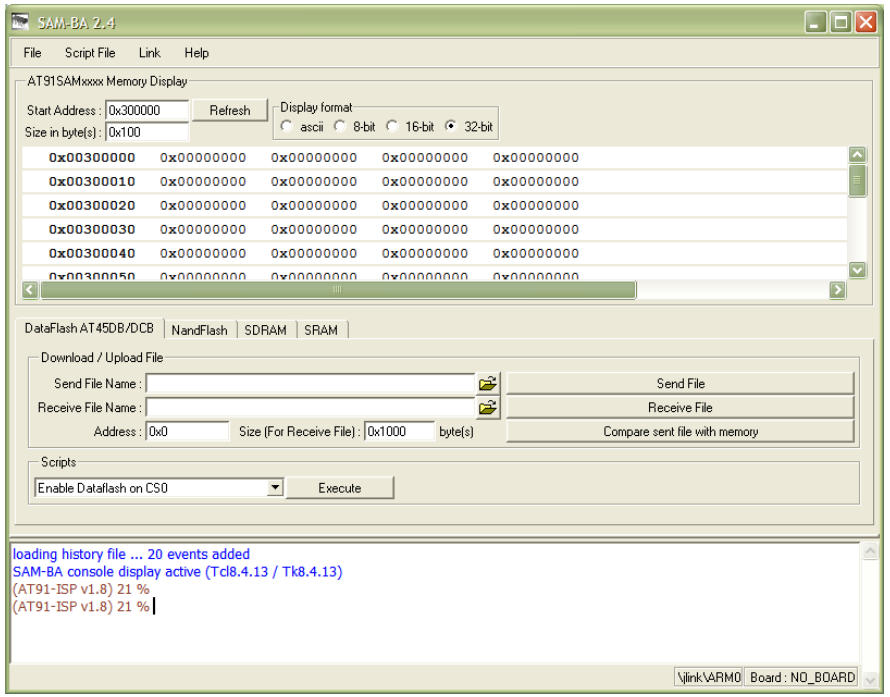
SAM-BA GUI

- Customizing SAM-BA is possible by adding or modifying TCL scripts files

Create your own board

Add memory modules

Modify Memory Algorithms



- Command Line Mode: allows memory programming without any GUI interaction