

# Introduction of OMAP4 Booting Sequence

Jiahe Jou, 2012/09/13

# Revisions

DATE	AUTHOR	DESCRIPTION
2012/09/13	Jiahe Jou	Draft.

# Outlines

- Booting Types
- Booting Overview
- Before Booting
- Peripheral Booting
- Memory Booting
- Memory Map
- Make A Bootable SD Card
- OMAP Bootloader Overview

# Booting Types

- To start a initialization software(bootstrap)
- Peripheral Booting
  - UART
  - USB
- Memory Booting
  - XIP(eXecution In Place)
    - NOR
  - Non-XIP
    - MMC(eMMC)
    - SD(eSD)
    - NAND

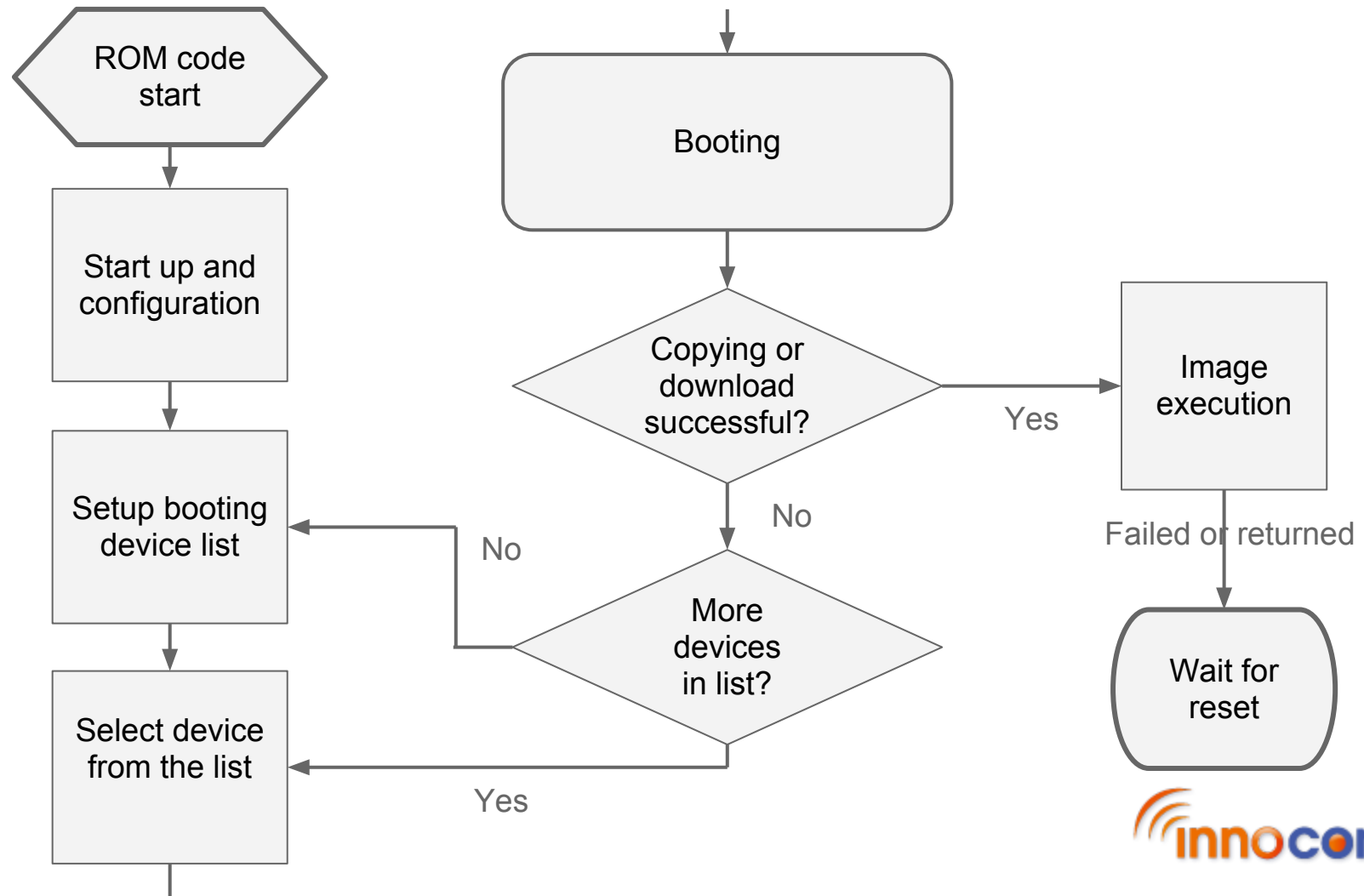
# Booting Types

- `sys_boot[5:0]`
- Peripheral Preferred Booting
  - *0b0xxxxx*
- Memory Preferred Booting
  - *0b1xxxxx*

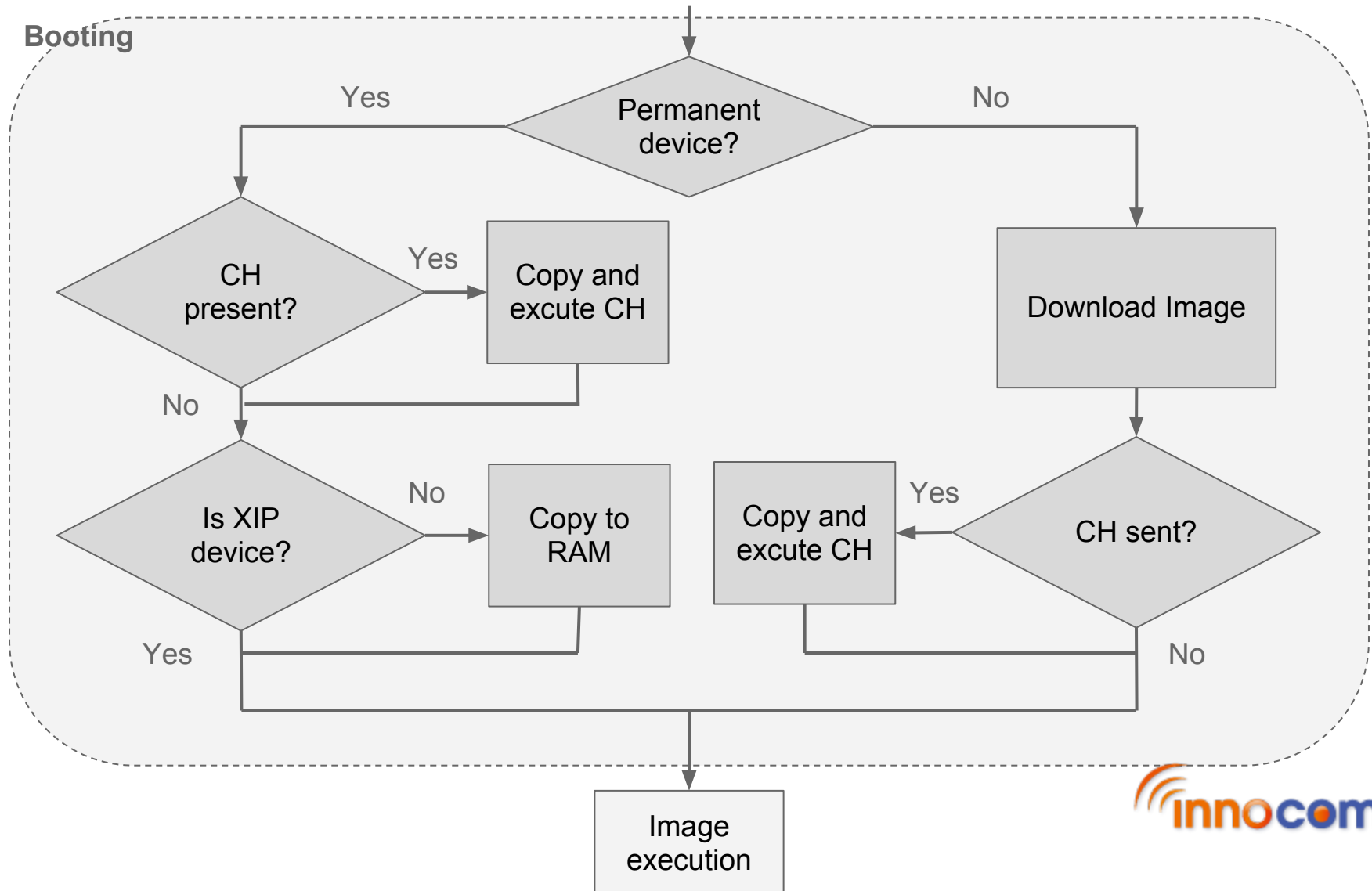
<b>sys_boot[5:0]</b>	<b>1st</b>	<b>2nd</b>	<b>3rd</b>	<b>4th</b>
0b010110	USB	UART	MMC1	<b>MMC2(1)</b>
0b110110	<b>MMC2(1)</b>	USB	UART	MMC1



# Booting Overview



# Booting Overview



# Before Booting

- Start up and configuration
  - Reading SYSBOOT pins
  - Software booting configuration
- Setup booting device list
  - `sys_boot[5:0]`
  - Redefined by software booting configuration
- Select device from list
  - Select a device to start booting procedure



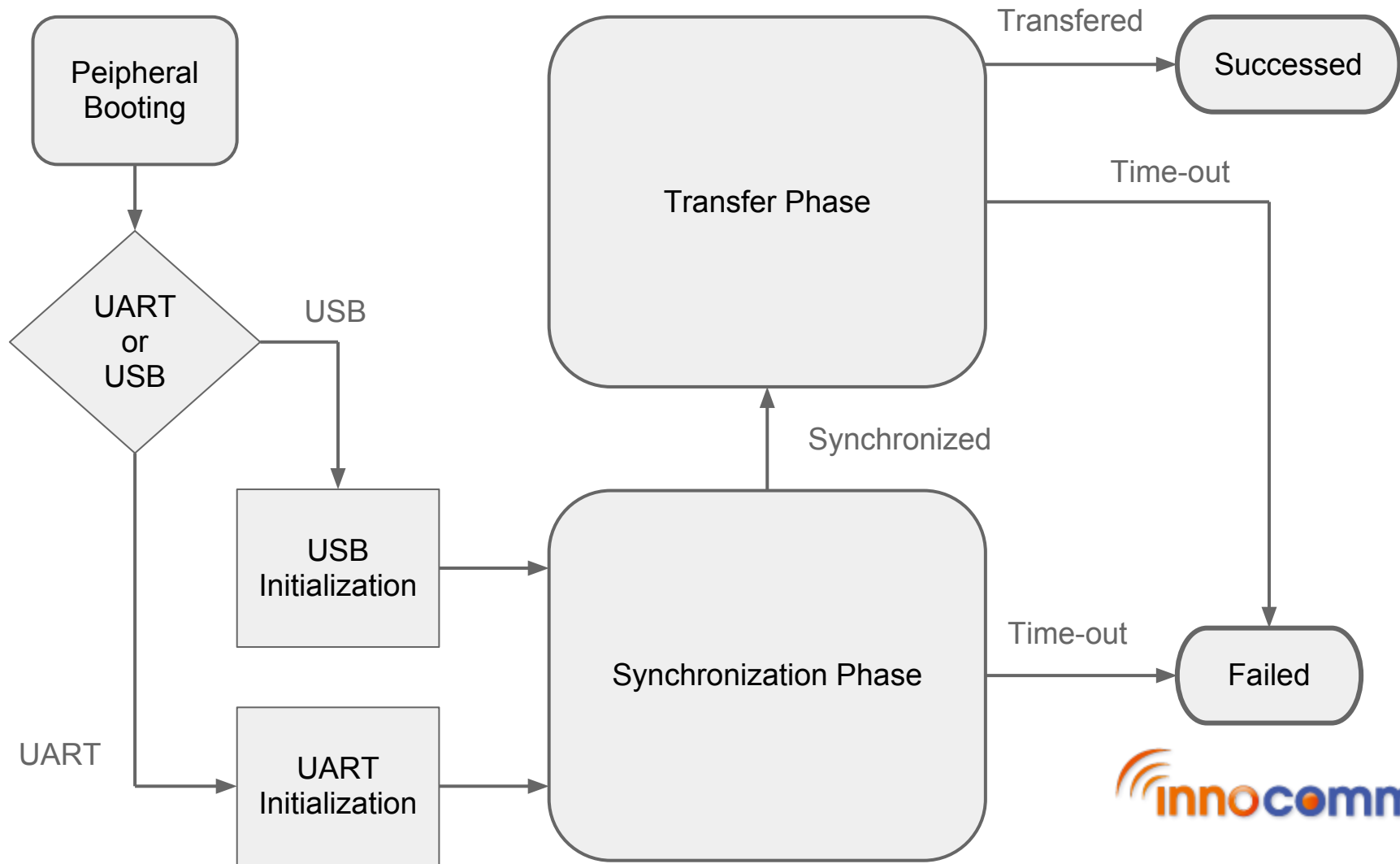
# Before Booting

- Software booting configuration structure
  - Store in SAR RAM memory
  - PUBLIC\_SW\_BOOT\_CFG\_ADDR(0x4A326A00)
    - Be 0 if cold reset
    - Address of configuration structure on else
- Software booting configuration
  - Device booting list
  - Clock setting
  - Time-out mechanism of peripheral booting

# Peripheral Booting

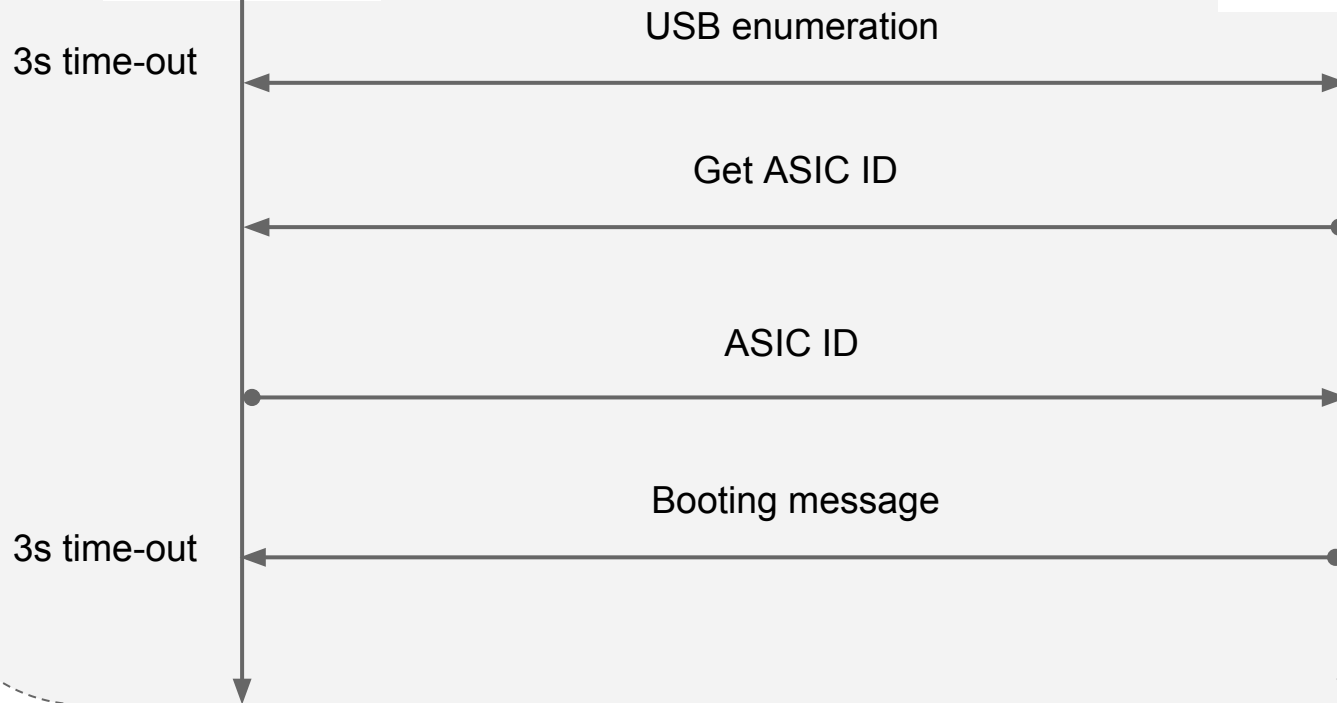
- Types
  - UART
  - USB
- Download a flash loader(Pre-flashing)
- Initial flash memories
- Update firmware

# Peripheral Booting



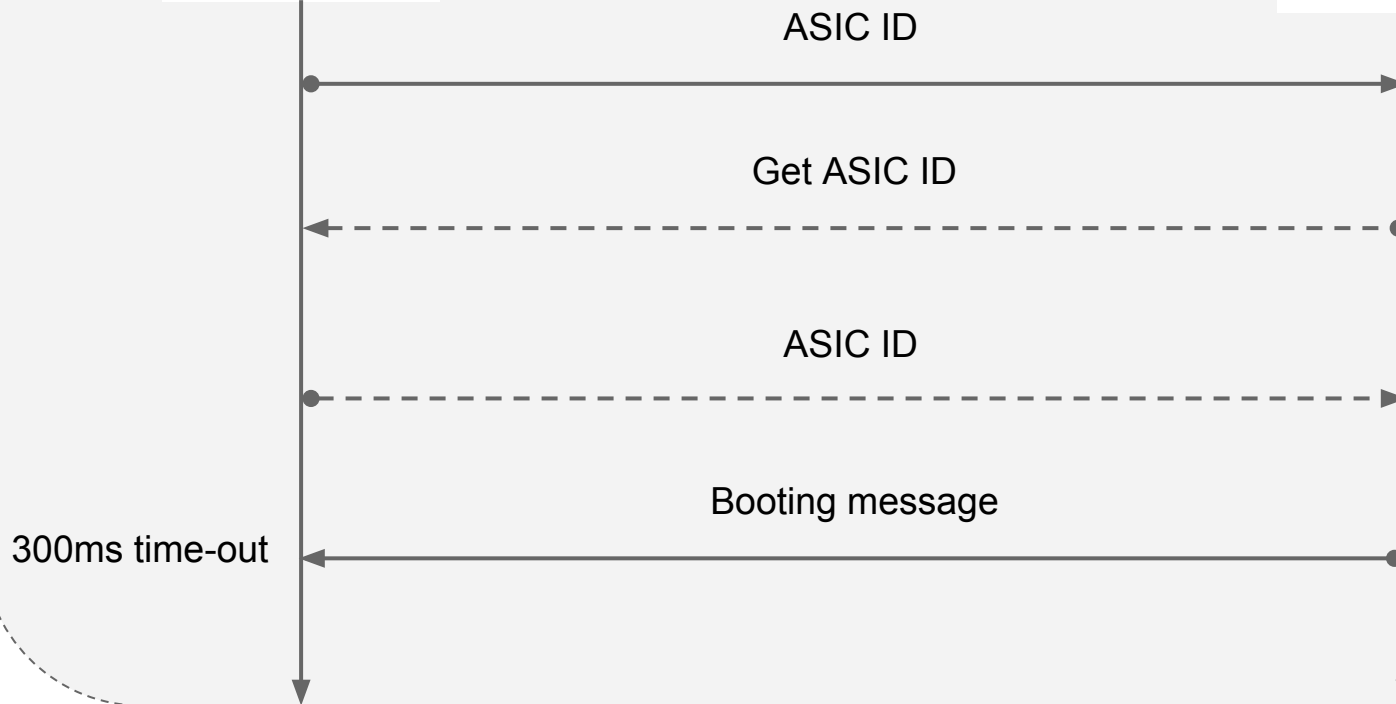
# Peripheral Booting

## Synchronization Phase of USB



# Peripheral Booting

## Synchronization Phase of UART



# Peripheral Booting

Transfer Phase



Image size

1min time-out

Image

1min time-out

# Peripheral Booting

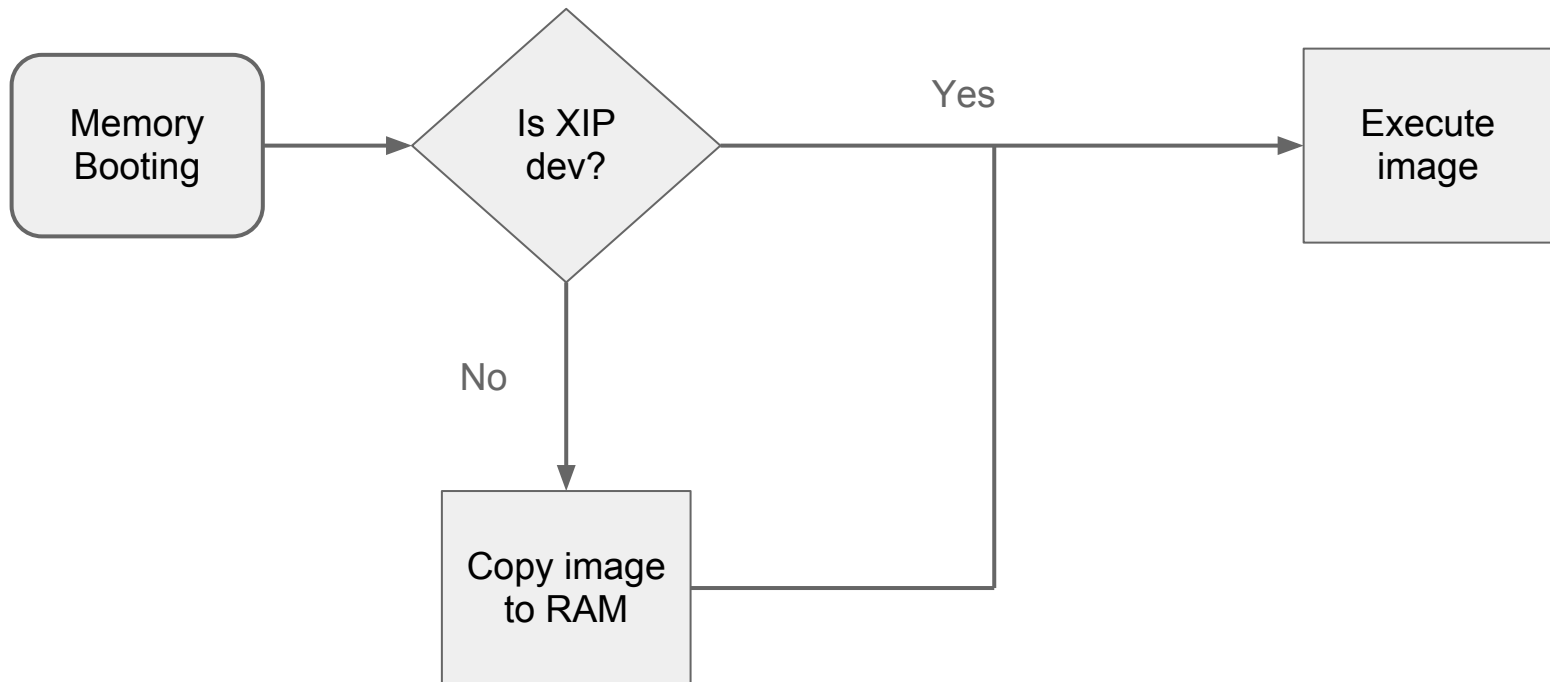
- ASIC ID structure
  - Items, *number of sub-blocks*
  - ID sub-block, *device identification*
  - Checksum sub-block, *CRC(not for UART)*
  - 3 reserved sub-blocks
- Booting message
  - Peripheral booting, *0xF0030002*
  - Change device, *0xF003xx06*
  - Next device, *0xFFFFFFFF*
  - Memory booting, *Others*
    - Get ASIC ID, *0xF003 0003*

# Memory Booting

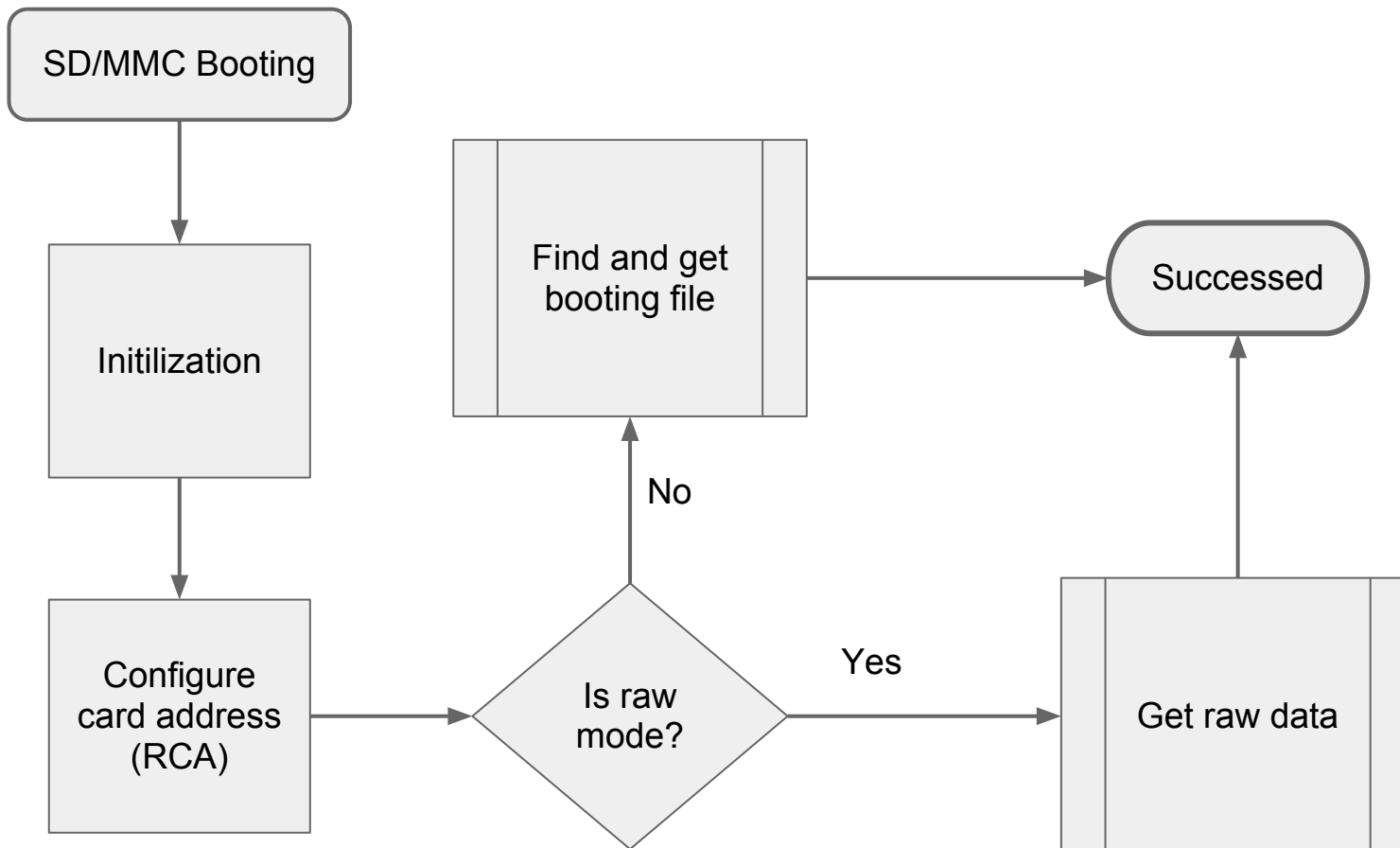
- Types
  - XIP(eXecution In Place)
    - NOR
  - Non-XIP
    - MMC(eMMC)
    - SD(eSD)
- Code shadowing for Non-XIP
  - Copying code to RAM



# Memory Booting



# Memory Booting



# Memory Booting

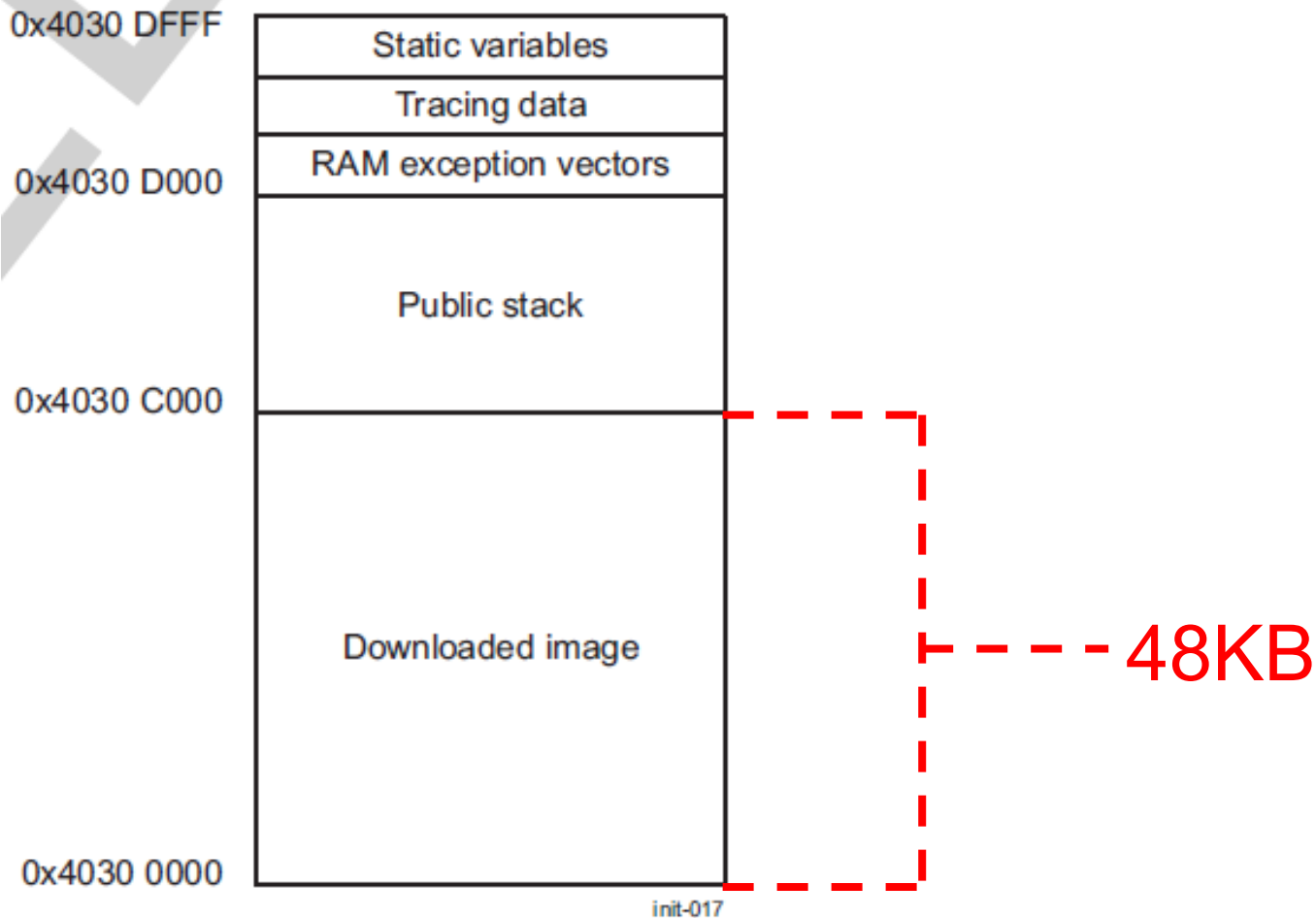
- SDMMCx interfaces
  - SDMMC1(SDCard)
    - Raw
    - File system
  - SDMMC2(eMMC)
    - Raw
- Avoid boot time penalty

# Memory Booting

- Raw
  - Read image directly from sectors
  - Four consecutive location, offset 128KB
    - 0x00000(bytes)
    - 0x20000
    - 0x40000
    - 0x60000
- File system(FAT16, FAT32)
  - Read image from a booting file
  - SDMMC1 only
  - File name must be "MLO"

# Memory Map

Figure 28-7. RAM Memory Map

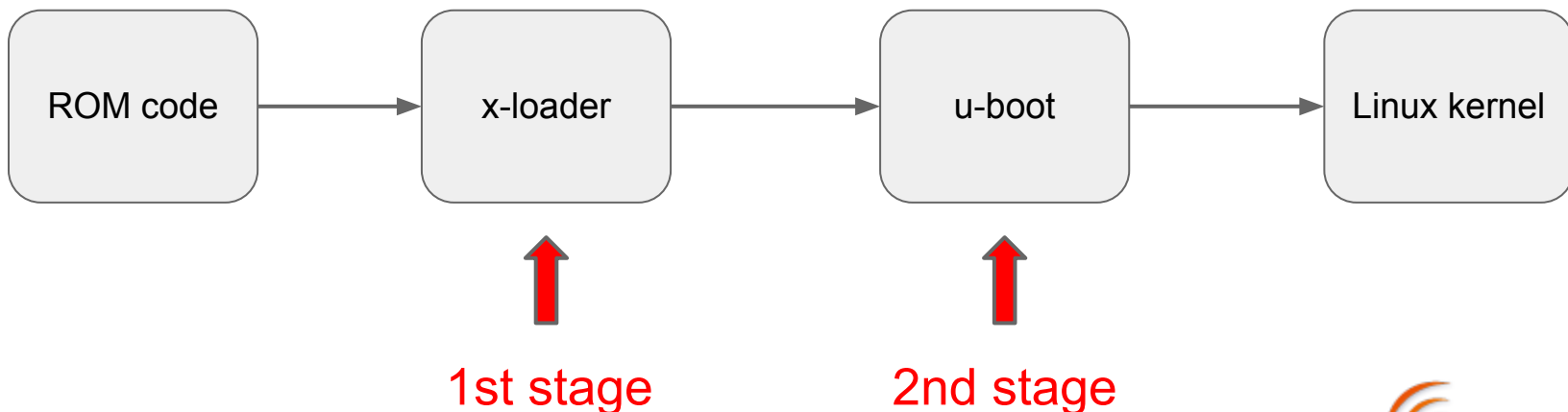


# Make A Bootable SD Card

- <http://code.google.com/p/beagleboard/wiki/LinuxBootDiskFormat>
- Tool
  - fdisk
  - mkfs
- Procedure
  - Step 1. Prepre a SD card
  - Step 2. Delete all partitions
  - Step 3. Configure SD card
    - Heads, sectors, cylinders
  - Step 4. Create a FAT32 partition
  - Step 5. Mark it as bootable
  - Step 6. Format the partition

# OMAP Bootloader Overview

- [http://omappedia.org/wiki/Bootloader\\_Project](http://omappedia.org/wiki/Bootloader_Project)
- Two stages
  - x-loader
  - u-boot



**End**