

Ramdump & Debugging

2022.04. | Samsung



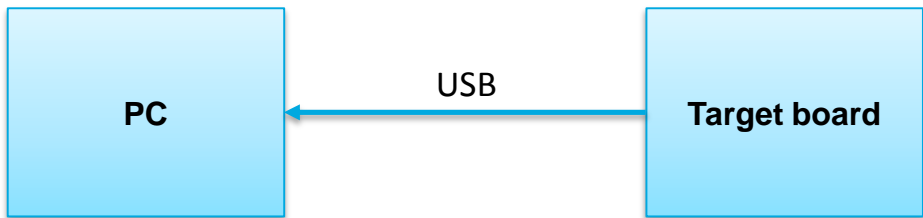
RAMDUMP

Exynos Auto V9 supports ramdump tool to dump entire DRAM area

```
ap_0x8c000000--0x8fffffff.lst
ap_0x9c000000--0x9fffffff.lst
ap_0x80000000--0xbfffffff.lst
ap_0x88000000--0x8bfffffff.lst
ap_0x90000000--0x93fffffff.lst
ap_0x94000000--0x97fffffff.lst
ap_0x98000000--0x9bfffffff.lst
ap_0xa0000000--0xa3fffffff.lst
ap_0xa4000000--0xa7fffffff.lst
ap_0xa8000000--0xabfffffff.lst
ap_0xac000000--0xaffffffff.lst
ap_0xb0000000--0xb3fffffff.lst
ap_0xb4000000--0xb7fffffff.lst
ap_0xb8000000--0xbbfffffff.lst
ap_0xbc000000--0xbffffffff.lst
ap_0xc0000000--0xf6fffffff.lst
ap_0xfb600000--0xffffffff.lst
BOOT_bootlog_0xe5c00000--0xe5cfffff.lst
HYP_DSS_0x9fa580000--0x9fa5fffff.lst
HYP_log1_0x9fa401000--0x9fa4fffff.lst
HYP_log2_0x9fa500000--0x9fa5fffff.lst
HYP_pram_0x9fa400000--0x9fa4fffff.lst
IVI_header_0xe3c00000--0xe3c0fffff.lst
IVI_kernel_0xe3c10000--0xe3e0fffff.lst
IVI_kevents_0xe4450000--0xe4a4fffff.lst
IVI_platform_0xe3e10000--0xe420fffff.lst
SFI_log1_0xfb800000--0xfb8fffff.lst
SFI_log2_0xfb900000--0xfbfbfffff.lst
SYS_arrrdump_0xe1a50000--0xe254fffff.lst
SYS_header_0xe0000000--0xe000fffff.lst
SYS_kernel_0xe0010000--0xe020fffff.lst
SYS_kevents_0xe2b50000--0xe314fffff.lst
SYS_platform_0xe0210000--0xe060fffff.lst
SYS_s2d_0xe0f10000--0xe470fffff.lst
```

```
C:\Windows\System32\cmd.exe - s:autodump.5.4.py
starting dump
-----
RECEIVED: 100 % read bytes! 0x00000000 [-----]
Dump success
Finished, total time: 0.957s
20220310-2016_Sirt_from_dram
fastboot -w:ramdump 0x00000000 0x00000000 -/20220310-2016_Sirt_from_dram/ap_0x00000000-0xbfffffff.lst...
/20220310-2016_Sirt_from_dram/ap_0x00000000-0xbfffffff.lst...
ramdump start address is [0x00000000]
ramdump size is [0x00000000]
starting dump
-----
RECEIVED: 100 % read bytes! 0x00000000 [-----]
Dump success
Finished, total time: 12.944s
fastboot -w:ramdump 0x00000000 0x70000000 -/20220310-2016_Sirt_from_dram/ap_0x00000000-0xbfffffff.lst...
/20220310-2016_Sirt_from_dram/ap_0x00000000-0xbfffffff.lst...
ramdump start address is [0x00000000]
ramdump size is [0x70000000]
starting dump
-----
RECEIVED: 013 % read bytes! 0x70000000 [-----]
```

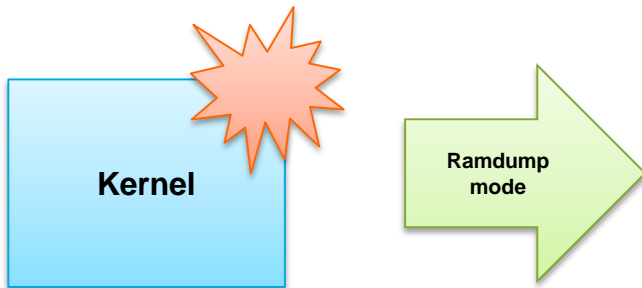
```
COM18 - Tera Term V1
[ESC] 5.046607[ARMC] 1.476189] is trying to start dump (RAM) !!!
[ESC] 5.048851[ARMC] 1.482466] If you want to skip ramdump, please press Ctrl + c within 5 sec!!!
[ESC] 6.076661[ARMC] 3.322897] User stop ramdump add!!
[ESC] 6.081837[ARMC] 3.323534] disable redirection DRAM Dump Mode
[ESC] 6.086871[ARMC] 3.330616] This is do_fastboot
DISABLE D0ACME
[ESC] 6.090587[ARMC] 3.337845] fastboot_init success!!
Initialization success
Got ramdump command
Downloading: Download size is 32 bytes
downloading of 32 bytes finished
ramdump start address is [0x00000000]
ramdump size is [0x00000000]
version is [0x2]
[ESC] 32.062009[ARMC] 49.402382] Not Redirection Dump Mode
Finished ramdump!
Got ramdump command
Downloading: Download size is 32 bytes
downloading of 32 bytes finished
ramdump start address is [0x00000000]
ramdump size is [0x00000000]
version is [0x2]
[ESC] 36.072733[ARMC] 58.513843] Not Redirection Dump Mode
Finished ramdump!
Got ramdump command
Downloading: Download size is 32 bytes
downloading of 32 bytes finished
ramdump start address is [0x00000000]
ramdump size is [0x00000000]
version is [0x2]
[ESC] 35.116129[ARMC] 51.556896] Not Redirection Dump Mode
```



ENTERING RAMDUMP MODE

□ LK enters ramdump mode when

- Warm Reset
- Watchdog Reset
- Reset after Kernel Panic

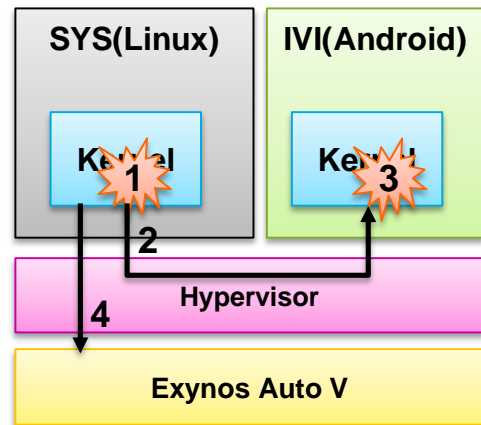
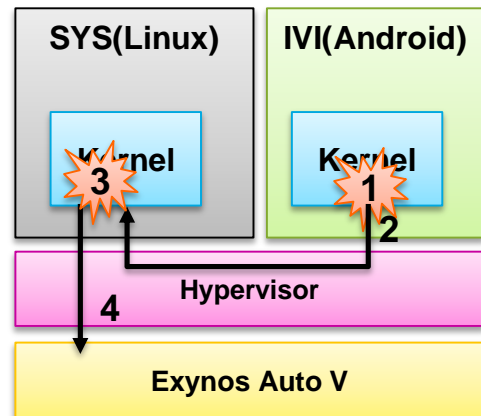


```
COM18 - Tera Term VT
RTCI: 7.518554][ARCH: 1.37106] Watchdog PMU setting complete
RTCI: 7.524414][ARCH: 1.377443] Watchdog cluster 0 stop done, uTCM = 15:20
RTCI: 7.533738][ARCH: 1.384796] Watchdog cluster 0 start, uTCM = 15:39
RTCI: 7.539862][ARCH: 1.391799] LLC is not enabled!! skip LLC flush (0x200000000, 0)
RTCI: 7.546872][ARCH: 1.399832] LLC init state clear!! (0x00000000)
RTCI: 7.553718][ARCH: 1.406489] LLC is not enabled!! skip LLC flush (0x200000000, 0)
RTCI: 7.561523][ARCH: 1.414529] LLC init state clear!! (0x00000000)
RTCI: 7.570613][ARCH: 1.431243] timeout LLC power down ready
RTCI: 7.584472][ARCH: 1.437419] Core0: Initial policy - Cache Flush Level 2
RTCI: 7.593796][ARCH: 1.444768] Core1: Initial policy - Cache Flush Level 2
RTCI: 7.599121][ARCH: 1.452117] Core2: Initial policy - Cache Flush Level 2
RTCI: 7.606445][ARCH: 1.459465] Core3: Initial policy - Cache Flush Level 2
RTCI: 7.613769][ARCH: 1.466814] Core4: Initial policy - Cache Flush Level 2
RTCI: 7.621582][ARCH: 1.474163] Core5: Initial policy - Cache Flush Level 2
RTCI: 7.628986][ARCH: 1.481511] Core6: Initial policy - Cache Flush Level 2
RTCI: 7.636298][ARCH: 1.488860] Core7: Initial policy - Cache Flush Level 2
RTCI: 7.643554][ARCH: 1.496208] Core3: Cache Flush Level changed => 3
RTCI: 7.650598][ARCH: 1.503657] Core7: Cache Flush Level changed => 3
RTCI: 7.757324][ARCH: 1.618813] Try to get arraydump of power on cores - [RTCI: 12.837482][ARCH: 6.698023] Finish(buf)!
RTCI: 12.841796][ARCH: 6.694725] Core0: finished Cache Flush level12 (0x1)
RTCI: 12.852539][ARCH: 6.705493] Core1: finished Cache Flush level12 (0x3)
RTCI: 12.863281][ARCH: 6.716188] Core2: finished Cache Flush level12 (0x7)
RTCI: 12.874468][ARCH: 6.749933] Core3: finished Cache Flush level13 (0x7)
RTCI: 12.887714][ARCH: 6.760624] Core4: finished Cache Flush level12 (0x1F)
RTCI: 12.918457][ARCH: 6.771482] Core5: finished Cache Flush level12 (0x3F)
RTCI: 12.929687][ARCH: 6.782188] Core6: finished Cache Flush level12 (0x7F)
RTCI: 12.961807][ARCH: 6.816451] Core7: finished Cache Flush level13 (0x7F)
RTCI: 12.978703][ARCH: 6.823524] Watchdog PMU setting complete
RTCI: 12.978946][ARCH: 6.829663] Watchdog cluster 0 stop done, uTCM = 15:38
RTCI: 12.984375][ARCH: 6.837218] -----
RTCI: 12.993164][ARCH: 6.845718] ramdump mode is entire-dram !!!
RTCI: 12.999862][ARCH: 6.851863] Let's trying to start dump DRAM !!!
RTCI: 13.008599][ARCH: 6.858329] If you want to skip ramdump, please press Ctrl + c within 5 sec!!!
RTCI: 14.908889][ARCH: 8.818718] User stop ramdump mode !!!
RTCI: 14.969725][ARCH: 8.822463] disable redirection DRAM Dump Mode
RTCI: 14.976562][ARCH: 8.829832] This is do_fastboot
RTCI: 14.983388][ARCH: 8.835981] fastboot_init success!!
enumeration success
```

VM CASE

□ Hypervisor supports “Panic Propagation” to enter ramdump mode

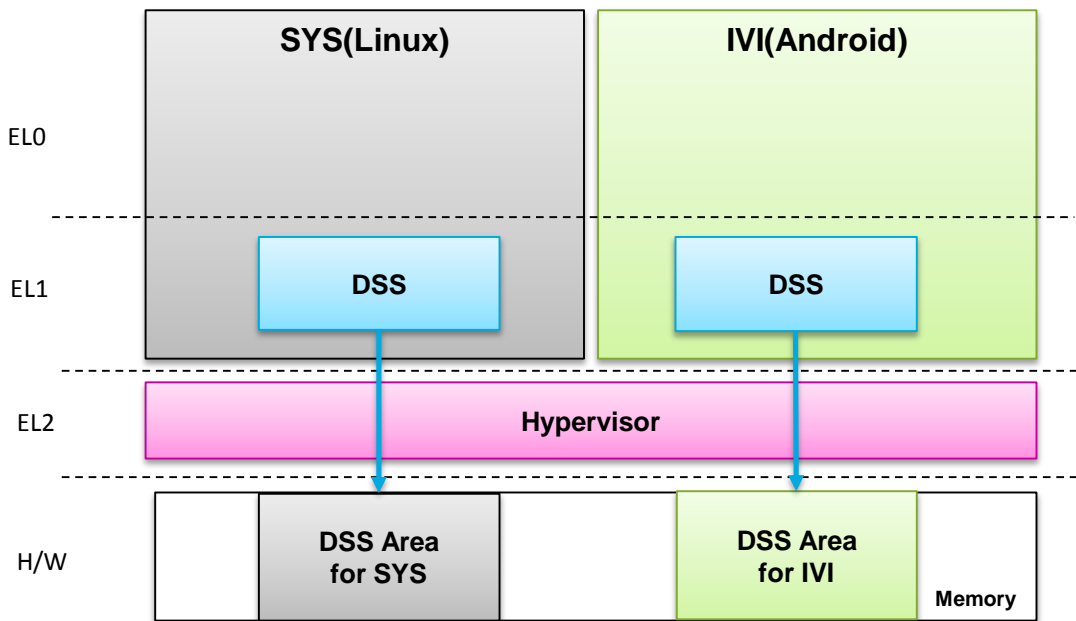
- When IVI domain panic,
 - Hypervisor propagates panic to IVI domain
 - After SYS domain gets “Panic propagation”, SYS domain panic and reset whole system to enter ramdump mode
- When SYS domain panic,
 - Hypervisor propagates panic to IVI domain, and SYS domain waits for IVI domain panic
 - After IVI domain panic, SYS domain resets whole system to enter ramdump mode



DSS

□ Debug Snapshot stores debug information to reserved DRAM Area

- Kernel log
- Platform log
- AARCH64 GPRs
 - X0~31, SP, PC
- MMU Regs



- You can get the kernel & platform logs from RAMDUMP



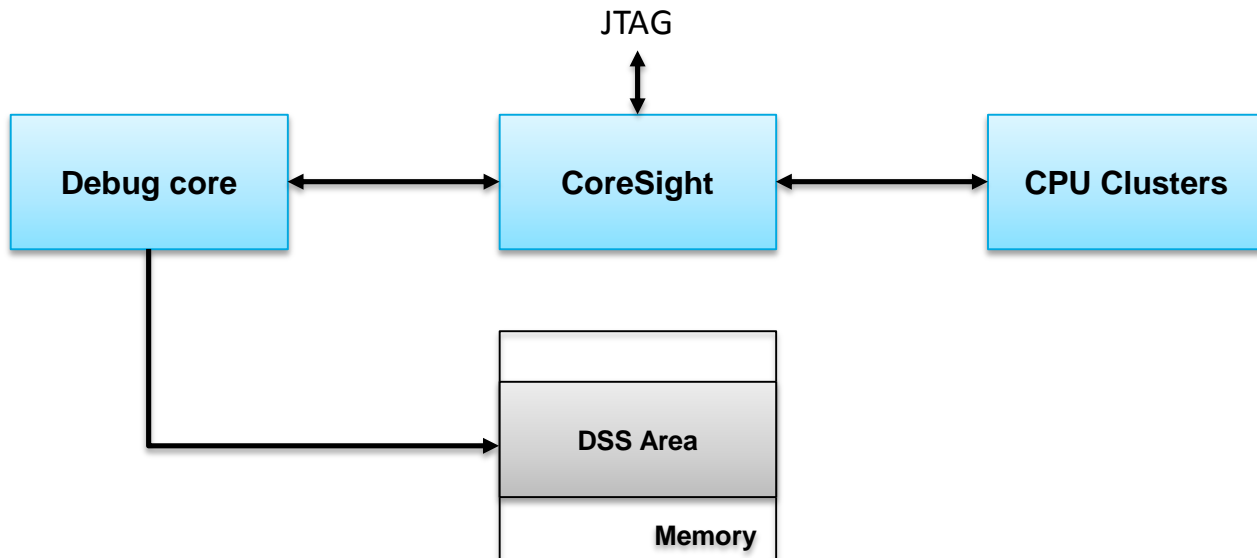
Android Kernel Log



- **AARCH64 GPRs and MMU Regs is used for iTSP RAMDUMP Simulation**

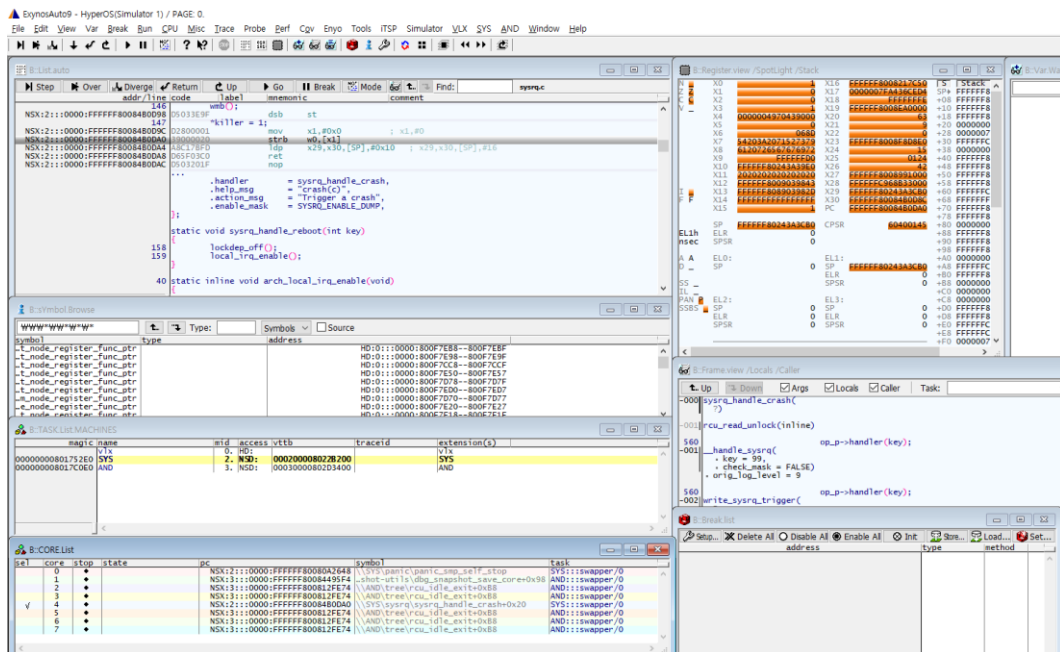
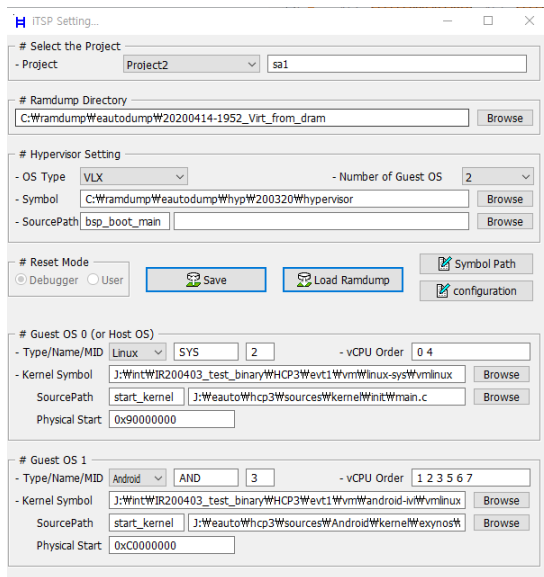
DEBUG CORE

- **CoreSight technology enables on-chip debug and trace complex multi-SoCs**
 - with JTAG debugger (Ex. Trace32)
- **Debug Core**
 - can access CPU Clusters through CoreSight like JTAG interface
 - dumps each cores GPRs in each CPU Clusters except panicked cores to analyze lockup issues



RAMDUMP SIMULATION

- You can simulate the situation of panic or lockup through iTSP simulator and Trace32
 - You can get support iTSP for Exynos Auto V9 from “Hancm-MDS”



Q&A