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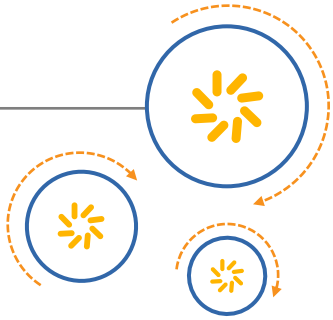

Reducing Memory for Low Cost Designs

Application Note

80-Y8950-78 Rev. B

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Revision history

Revision	Date	Description
A	April 2016	Initial release
B	June 2016	Updated sections: ▪ 1, Introduction ▪ 1.1, About this document Added sections: ▪ 3, DDR Memory Reduction ▪ 3.1, Disable crashdump

1 Introduction

This document provides guidelines for QSDK customers, who want to design products with lower flash and DDR size, on how to remove unwanted packages to reduce flash consumption and runtime DDR consumption.

1.1 About this document

This document caters to Qualcomm Atheros customers who are using QSDK and explains how to design minimal software which fits into lower flash size and reduce runtime DDR requirement.

1.2 Additional resources and dependency

This document assumes that the reader is familiar with the QSDK development environment, the hardware designs, and the reference guides listed:

- IPQ40xx QSDK Setup and User Guide
- IPQ40xx Release Notes

2 Developing minimal image

After re-assembling the code from Qualcomm ChipCode™ and The Linux Foundation, change the working directory to QSDK and use the following steps:

```
$./scripts/feeds update -a
$./scripts/feeds install -a -f
$ echo "CONFIG_TARGET_ipq806x=y" >.config;
$ echo "CONFIG_PACKAGE_kmod-qca-wifi-10.4-unified-profile=y" >>.config;
$ echo "CONFIG_PACKAGE_qca-wrapd-10.4=y" >>.config;
$ echo "CONFIG_PACKAGE_qca-wifi-fw-hw5-10.4-asic=y" >>.config;
$ echo "CONFIG_PACKAGE_qca-hostap-10.4=y" >>.config;
$ echo "CONFIG_PACKAGE_qca-hostapd-cli-10.4=y" >>.config;
$ echo "CONFIG_PACKAGE_qca-wpa-supplicant-10.4=y" >>.config;
$ echo "CONFIG_PACKAGE_qca-wpa-cli-10.4=y" >>.config;
$ echo "CONFIG_PACKAGE_kmod-qca-edma=y" >>.config;
$ echo "CONFIG_PACKAGE_kmod-qca-ssdk-nohnat=y" >>.config;
$ make defconfig
$ make V=s
```

This generates a minimal image, which works for AP.DK01/AP.DK04.

If further customization is required, use ‘make menuconfig’ to customize packages.

3 DDR Memory Reduction

Since low flash systems are almost always coupled with low DDR sizes also, the following steps are listed to shrink the DDR usage of our executable.

Configuration at compilation:

1. In "*.../qsdk/qca/src/qca-wifi-10.4/offload/hif/pci/linux/ath_pci.h"*file, modify CE_HTT_H2T_MSG_SRC_NENTRIES to 2048, to reduce Source CE ring buffers. This change has a marginal effect on the peak KPI for single station.
2. Reduce EDMA Rx ring buffer size from 512 to 256

- In *drivers/net/ethernet/qcom/essedma/edma.h* change the definition of EDMA_RX_RING_SIZE to 256.

This reduces memory consumption but is seen to marginally reduce the small packet KPI in WAN to LAN tests marginally.

3. In "*.../qsdk/qca/src/uboot-1.0/include/configs/ipq40xx_cdp.h*" file, remove the definition of the macro CONFIG_QCA_APPSBL_DLOAD to disable crashdump
4. Repeat the compilation again using *"make V=s"*

Configuration at runtime to reduce RAM usage:

1. Once image is loaded in the device and VAPs are up, issue the following commands to reduce the flow control buffers in Host. This is useful only for offload radios. Also note that this configuration has the side-effect of reducing the maximum number of clients that can get maximum KPI.

```
iwpriv wifi1 fc_buf_max 2048
iwpriv wifi1 fc_q_max 256
iwpriv wifi1 fc_q_min 16
iwpriv wifi0 fc_buf_max 2048
iwpriv wifi0 fc_q_max 256
iwpriv wifi0 fc_q_min 16
```

2. Reduce the memory of skbs lying idle in the recycler queues by using this command:

```
echo 1 >  /proc/net/skb_recycler/max_skbs
echo 1 > /proc/net/skb_recycler/max_spare_skbs
```

3.1 Disable crashdump

Reserve memory for crash dump usage (11 MBytes), which can be disabled in production builds.

Use the following procedure to disable crashdump:

1. In the *<qsdk>/qca/src/uboot-1.0/include/configs/ipq40xx_cdp.h* file, remove the definition of the macro CONFIG_QCA_APPSBL_DLOAD to disable crashdump.
2. To check if the crashdump is disabled successfully, enter the following command in kernel

   ```
   cat /proc/iomem
   ```

3. By default the memory is reserved as following:

   80000000-86ffffff : System RAM (for all system)

   80208000-807d55a3 : Kernel code

   80806000-8090e657 : Kernel data

   88000000-8fffffff : System RAM (additional for 256 MByte systems)

4. After the crashdump is disabled, ensure that memory is reserved as following:

   80000000-87afffff : System RAM

   80208000-807d55a3 : Kernel code

   80806000-8090e657 : Kernel data

   88000000-8fffffff : System RAM

   Inferred from the above, the memory reserved for crashdump 0x87000000 of size 0xB00000 is made free when the dump is disabled.