

# TI Developer Conference

February 28-March 2, 2008 • Dallas, TX

## DSP/BIOS™ Link Foundation for GPP-DSP systems

**SEE THE FUTURE**  
**CREATE YOUR OWN**

 **TEXAS INSTRUMENTS**

Apurva Sharan  
Texas Instruments  
apurva@ti.com

SPRP511

Technology for Innovators™

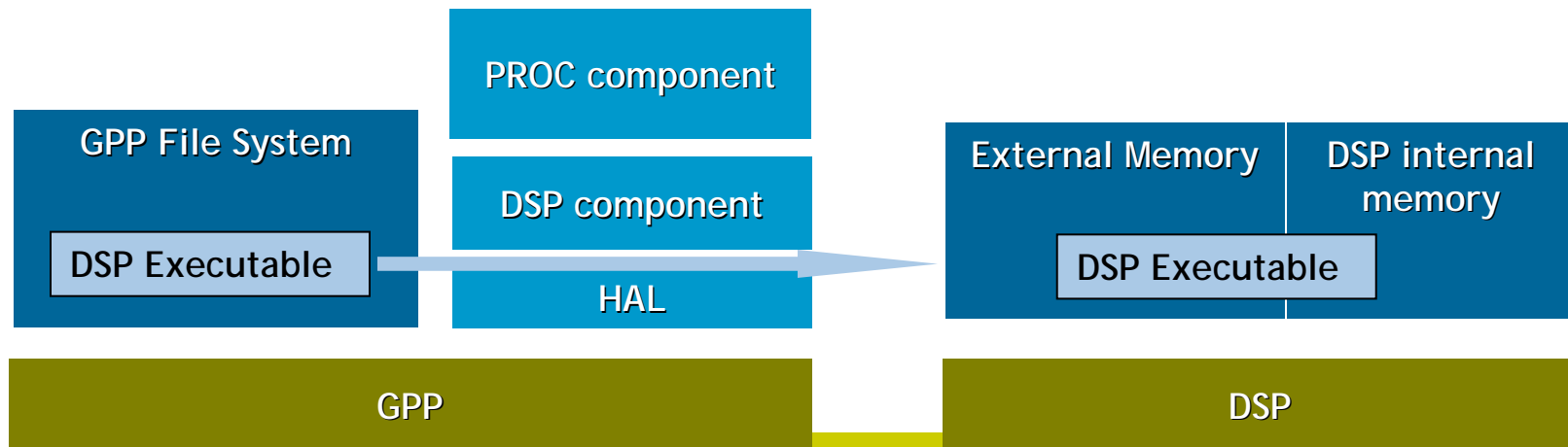
 **TEXAS INSTRUMENTS**

# Core Functions

- ◆ **DSP Boot-loading**
- ◆ **Messaging**
- ◆ **Data transfer**

# DSP Boot-loading

- ◆ DSP executable is present in a file system accessible from GPP
- ◆ The DSP execution is started at its entry point
- ◆ Boot-loading is performed using the interconnect available between GPP and DSP
- ◆ Some key APIs:
  - PROC\_Load (), PROC\_Start (), PROC\_Stop ()



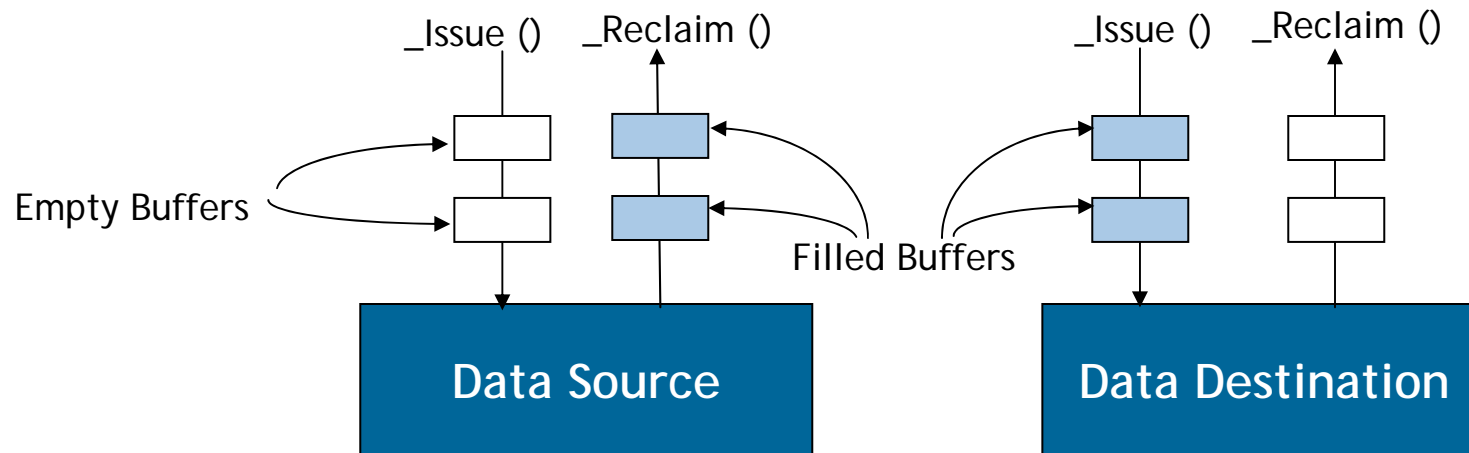
# Messaging

- ◆ Messaging provides logical connectivity between GPP and DSP threads and enables users to send variable size messages
- ◆ Messages are sent at a higher priority than data buffers
- ◆ Message Queues have unique system-wide names. Senders locate the Message Queue using this name.
- ◆ Every message has a fixed 20 byte header used and must be allocated through `MSGQ_Alloc ()`
- ◆ Some key APIs:
  - `MSGQ_Open ()/_Close ()`, `MSGQ_Locate ()/_Release ()`
  - `MSGQ_Alloc ()/_Free ()`, `MSGQ_Put ()/_Get ()`,



# Data Transfer

- ◆ Data Channel is a uni-directional virtual entity providing interface to send / receive data buffers over a physical connection.
- ◆ They use the issue/ reclaim model followed by SIO.
- ◆ Buffers must be allocated through CHNL\_AllocateBuffer ()
- ◆ Some key APIs:
  - CHNL\_Create ()/ \_Delete ()
  - CHNL\_AllocateBuffer/\_FreeBuffer ()
  - CHNL\_Issue ()/ \_Reclaim ()

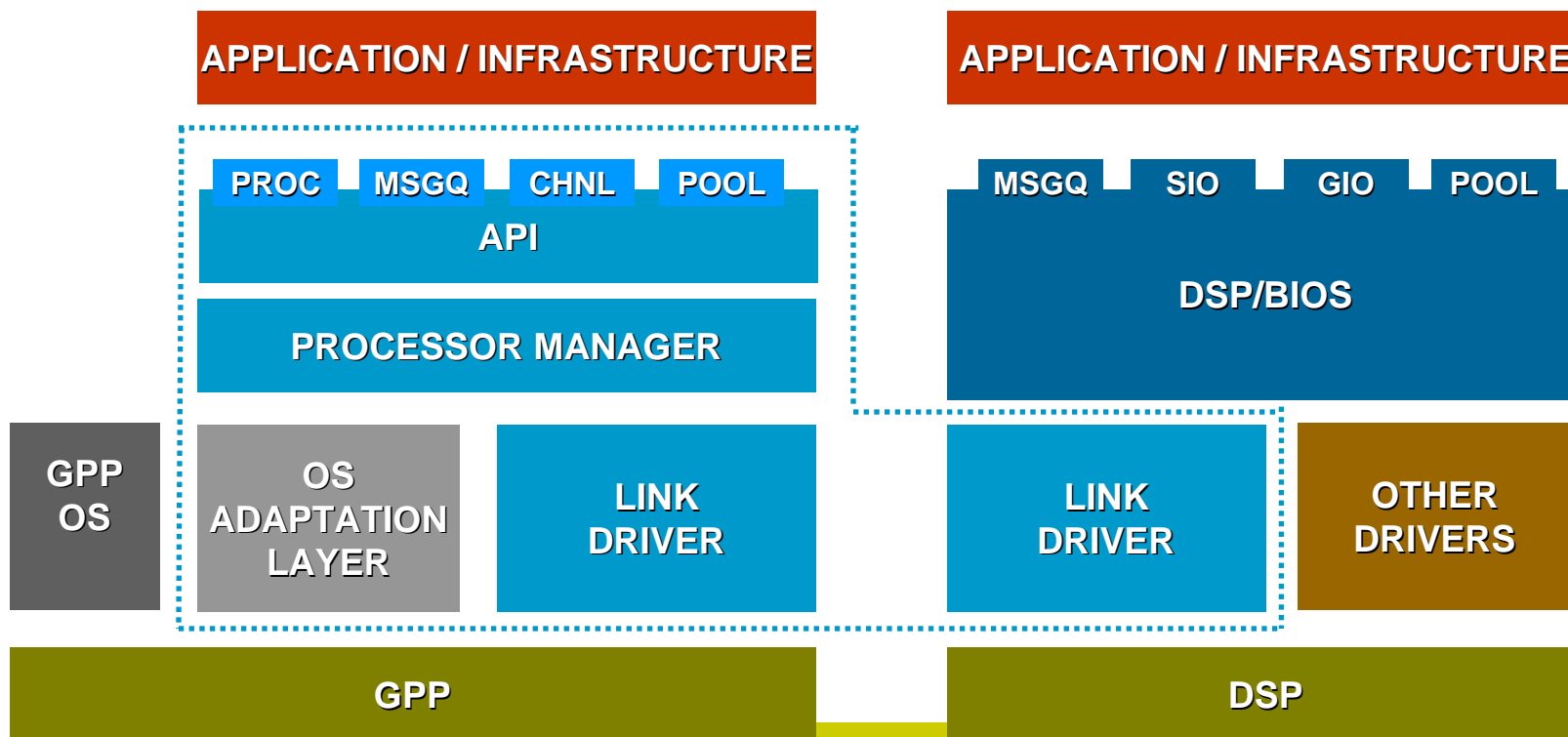


# Performance

- ◆ **Platform:**
  - Davinci: ARM ~225 MHz, DSP ~450 MHz
  - ARM OS: TI Davinci PSP Linux 0.4.2
  - DSP OS: DSP/BIOS v5.21
- ◆ **Messaging :**
  - GPP → DSP : Approx 30000 messages / sec
  - DSP → GPP : Approx 60000 messages / sec
- ◆ **Synchronous Data Streaming :**
  - GPP → DSP : Approx 5000 data buffers / sec
  - DSP → GPP : Approx 5000 data buffers / sec
- ◆ **Asynchronous Data Streaming :**
  - GPP → DSP : Approx 8000 data buffers / sec
  - DSP → GPP : Approx 8000 data buffers / sec

**NOTE:** Since the transfer is zero-copy based, increase in the size of messages / data buffer does not effect the performance number significantly.

# DSP/BIOS™ Link Software Architecture



# Portability

- ◆ **Designed for portability**
- ◆ **Reference port(s) available for**
  - SoCs with shared memory connectivity between GPP  $\leftrightarrow$  DSP
  - Discrete GPP  $\leftrightarrow$  DSP connectivity
- ◆ **Release package contains source code and design documents to facilitate porting**
- ◆ **Different porting scenarios possible:**
  - To a new GPP OS
    - GPP OS has no user / kernel memory map separation: PrKernel
    - GPP OS has user and kernel memory separation: Linux
  - To a new platform
  - To a new physical link



# References / Resources

- ◆ **Product Page:**  
[https://www-a.ti.com/downloads/sds\\_support/targetcontent/link/index.html](https://www-a.ti.com/downloads/sds_support/targetcontent/link/index.html)
- ◆ **Software Support e-mail ID:**  
[softwaresupport@ti.com](mailto:softwaresupport@ti.com)
- ◆ **App-note on DSP Instruction Cache Performance on the OMAP5912**  
<http://focus.ti.com/docs/apps/catalog/resources/appnoteabstract.jhtml?abstractName=spraa81>