BTF Trace Framework on RTFParallella

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2.1 File List

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Chapter 3

Class Documentation

3.1 AmaltheaTask_t Struct Reference

`#include <AmaltheaConverter.h>`

Public Attributes

- unsigned int src_id
- unsigned int src_instance
- unsigned int task_id
- unsigned int task_instance
- void(* taskHandler)(int src_id, int src_instance)
- unsigned int executionTime
- unsigned int deadline
- unsigned int period
- void(* cInHandler)()
- void(* cOutHandler)()

3.1.1 Detailed Description

Structure to hold tasks according to amalthea model

3.1.2 Member Data Documentation

3.1.2.1 cInHandler

`void(* AmaltheaTask_t::cInHandler) ()`

cIn handler of the task

3.1.2.2 cOutHandler

```
void(* AmaltheaTask_t::cOutHandler) ()
```

cOut handler of the task

3.1.2.3 deadline

```
unsigned int AmaltheaTask_t::deadline
```

Deadline of the task

3.1.2.4 executionTime

```
unsigned int AmaltheaTask_t::executionTime
```

Worst case execution time

3.1.2.5 period

```
unsigned int AmaltheaTask_t::period
```

Period of the task

3.1.2.6 src_id

```
unsigned int AmaltheaTask_t::src_id
```

Source ID

3.1.2.7 src_instance

```
unsigned int AmaltheaTask_t::src_instance
```

Source Instance

3.1.2.8 task_id

```
unsigned int AmaltheaTask_t::task_id
```

Task ID

3.1.2.9 task_instance

```
unsigned int AmaltheaTask_t::task_instance
```

Task Instance

3.1.2.10 taskHandler

```
void(* AmaltheaTask_t::taskHandler) (int src_id, int src_instance)
```

Task handler

The documentation for this struct was generated from the following file:

- AmaltheaConverter.h

3.2 btf_trace_data_t Struct Reference

Public Attributes

- int32_t ticks
- int32_t srcId
- int32_t srcInstance
- int32_t eventTypeId
- int32_t taskId
- int32_t taskInstance
- int32_t eventState
- int32_t data

3.2.1 Member Data Documentation

3.2.1.1 data

```
int32_t btf_trace_data_t::data
```

Notes

3.2.1.2 eventState

```
int32_t btf_trace_data_t::eventState
```

State of the event

3.2.1.3 eventTypeId

```
int32_t btf_trace_data_t::eventTypeId
```

Type of event Runnable , Task etc..

3.2.1.4 srcId

```
int32_t btf_trace_data_t::srcId
```

Source Id

3.2.1.5 srcInstance

```
int32_t btf_trace_data_t::srcInstance
```

Instance of the source

3.2.1.6 taskId

```
int32_t btf_trace_data_t::taskId
```

Task Id

3.2.1.7 taskInstance

```
int32_t btf_trace_data_t::taskInstance
```

Instance of the task

3.2.1.8 ticks

```
int32_t btf_trace_data_t::ticks
```

Tick count

The documentation for this struct was generated from the following file:

- trace_utils_BTF.h

3.3 btf_trace_entity_entry_t Struct Reference

Public Attributes

- uint16_t entity_id
- int16_t instance
- btf_trace_event_name state
- btf_trace_event_type entity_type
- uint8_t entity_name [64]

3.3.1 Member Data Documentation

3.3.1.1 entity_id

```
uint16_t btf_trace_entity_entry_t::entity_id
```

Entity ID to get the entity name

3.3.1.2 entity_name

```
uint8_t btf_trace_entity_entry_t::entity_name[64]
```

Entity name

3.3.1.3 entity_type

```
btf_trace_event_type btf_trace_entity_entry_t::entity_type
```

Entity type to get the source

3.3.1.4 instance

```
int16_t btf_trace_entity_entry_t::instance
```

Current instance of the entity

3.3.1.5 state

```
btf_trace_event_name btf_trace_entity_entry_t::state
```

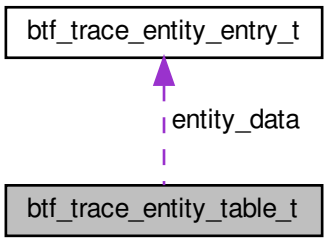
Current state of the entity

The documentation for this struct was generated from the following file:

- trace_utils_BTF.h

3.4 btf_trace_entity_table_t Struct Reference

Collaboration diagram for btf_trace_entity_table_t:



Public Attributes

- uint16_t is_occupied
- btf_trace_entity_entry entity_data

3.4.1 Member Data Documentation

3.4.1.1 entity_data

```
btf_trace_entity_entry btf_trace_entity_table_t::entity_data
```

Entity details

3.4.1.2 is_occupied

```
uint16_t btf_trace_entity_table_t::is_occupied
```

If 0, entry is available else not available

The documentation for this struct was generated from the following file:

- trace_utils_BTF.h

3.5 btf_trace_header_config_t Struct Reference

```
#include <trace_utils_BTF.h>
```

Public Attributes

- uint32_t timescale
- uint8_t creator [64]
- uint8_t modelfile [512]
- uint8_t timeunit [4]

3.5.1 Detailed Description

Structure to hold BTF Header

3.5.2 Member Data Documentation

3.5.2.1 creator

```
uint8_t btf_trace_header_config_t::creator[64]
```

Target device on which the trace is generated

3.5.2.2 modelfile

```
uint8_t btf_trace_header_config_t::modelfile[512]
```

Model file used to generate the trace

3.5.2.3 timescale

```
uint32_t btf_trace_header_config_t::timescale
```

This sets the scale of the time e.g 10, 100 etc..

3.5.2.4 timeunit

```
uint8_t btf_trace_header_config_t::timeunit[4]
```

Time unit e.g ns, ms, us, s..

The documentation for this struct was generated from the following file:

- trace_utils_BTF.h

3.6 btf_trace_info_t Struct Reference

`#include <RTFParallellaConfig.h>`

Public Attributes

- int length
- unsigned int offset
- unsigned int core_id
- unsigned int core_write

3.6.1 Detailed Description

Structure to ensure proper synchronization between host and epiphany cores and also within epiphany cores.

3.6.2 Member Data Documentation

3.6.2.1 core_id

`unsigned int btf_trace_info_t::core_id`

Epiphany core id

3.6.2.2 core_write

`unsigned int btf_trace_info_t::core_write`

Read write operation between epiphany core and host

3.6.2.3 length

`int btf_trace_info_t::length`

To define the length of BTF packets to be read

3.6.2.4 offset

`unsigned int btf_trace_info_t::offset`

Defines the offset location in memory area

The documentation for this struct was generated from the following file:

- RTFParallellaConfig.h

3.7 DSHM_section_t Struct Reference

`#include <c2c.h>`

Public Attributes

- unsigned row
- unsigned col
- unsigned int base_addr
- unsigned label_count
- TYPE sec_type

3.7.1 Detailed Description

defines a distributed shared memory section

3.7.2 Member Data Documentation

3.7.2.1 base_addr

`unsigned int DSHM_section_t::base_addr`

address of the first label in the section

3.7.2.2 col

`unsigned DSHM_section_t::col`

the column of target core on Epi chip

3.7.2.3 label_count

`unsigned DSHM_section_t::label_count`

number of labels in the section

3.7.2.4 row

`unsigned DSHM_section_t::row`

the row of target core on Epi chip

3.7.2.5 sec_type

```
TYPE DSHM_section_t::sec_type
```

data type of the section (size of labels in the section)

The documentation for this struct was generated from the following file:

- c2c.h

3.8 labelVisual_t Struct Reference

Public Attributes

- unsigned row
- unsigned col
- unsigned num_visible_labels

3.8.1 Member Data Documentation

3.8.1.1 col

```
unsigned labelVisual_t::col
```

Column ID of the hardware core

3.8.1.2 num_visible_labels

```
unsigned labelVisual_t::num_visible_labels
```

Number of visual labels

3.8.1.3 row

```
unsigned labelVisual_t::row
```

Row ID of the hardware core

The documentation for this struct was generated from the following file:

- host_utils.h

3.9 SHM_section_t Struct Reference

`#include <shared_comms.h>`

Public Attributes

- unsigned int base_addr
- unsigned label_count
- TYPE sec_type

3.9.1 Detailed Description

defines a shared memory section

3.9.2 Member Data Documentation

3.9.2.1 base_addr

```
unsigned int SHM_section_t::base_addr
```

address of the first label in the section

3.9.2.2 label_count

```
unsigned SHM_section_t::label_count
```

number of labels in the section

3.9.2.3 sec_type

```
TYPE SHM_section_t::sec_type
```

data type of the section (size of labels in the section)

The documentation for this struct was generated from the following file:

- shared_comms.h

Chapter 4

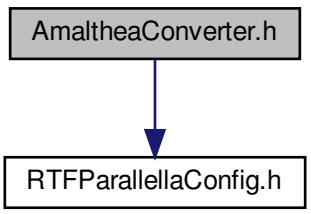
File Documentation

4.1 AmaltheaConverter.h File Reference

This file declares and implements function to generate Amalthea task model. The functions defined in this file are used to generate the Amalthea Task model and create a generalized RTOS task which executes periodically in infinite loop over FreeRTOS.

```
#include "RTFParallellaConfig.h"
```

Include dependency graph for AmaltheaConverter.h:



Classes

- struct AmaltheaTask_t

Macros

- #define PLATFORM_WORD_LENGTH 32
- #define numTasks 3

Typedefs

- typedef struct AmaltheaTask_t AmaltheaTask

Functions

- AmaltheaTask createAmaltheaTask (void ∗taskHandler, void ∗cInHandler, void ∗cOutHandler, unsigned int period, unsigned int deadline, unsigned int WCET, unsigned int src_id, unsigned int src_instance, unsigned int task_id, unsigned int task_instance)

  Generating Amalthea task model.
- void createRTOSTask (AmaltheaTask ∗task, int priority, int argCount,...)

  Create the RTOS task that represents a given Amalthea task.
- unsigned int calculateStackSize (int labelBitCount, int labelCount)

  This function returns the additional stack size (in words) needed for the task to handle its labels.
- void generalizedRTOSTask (AmaltheaTask task)

  This RTOS task invokes the task handlers and realizes periodic task execution according to Amalthea model.

4.1.1 Detailed Description

This file declares and implements function to generate Amalthea task model. The functions defined in this file are used to generate the Amalthea Task model and create a generalized RTOS task which executes periodically in infinite loop over FreeRTOS.

Author

Mahmoud Bazzal, Anand Prakash

Date

17 April 2020

4.1.2 Macro Definition Documentation

4.1.2.1 numTasks

```
#define numTasks 3
```

Defines number of tasks. Not is current use

4.1.2.2 PLATFORM_WORD_LENGTH

```
#define PLATFORM_WORD_LENGTH 32
```

Not is used in current implementation. Defines the platform word size

4.1.3 Typedef Documentation

4.1.3.1 AmaltheaTask

```
typedef struct AmaltheaTask_t AmaltheaTask
```

Structure to hold tasks according to amalthea model

4.1.4 Function Documentation

4.1.4.1 calculateStackSize()

```
unsigned int calculateStackSize (
            int labelBitCount,
            int labelCount )
```

This function returns the additional stack size (in words) needed for the task to handle its labels.

Parameters

in	*labelBitCount*	: label size in bits
in	*labelCount*	: number of labels

Returns

: stack size

This function returns the additional stack size (in words) needed for the task to handle its labels

4.1.4.2 createAmaltheaTask()

```
AmaltheaTask createAmaltheaTask (
            void * taskHandler,
            void * cInHandler,
            void * cOutHandler,
            unsigned int period,
            unsigned int deadline,
            unsigned int WCET,
            unsigned int src_id,
            unsigned int src_instance,
            unsigned int task_id,
            unsigned int task_instance )
```

Generating Amalthea task model.

The function takes the input arguments and generates the Amalthea task model which is used to create the RTOS tasks.

Arguments:

Parameters

in	*taskHandler*	: Amalthea task handler
in	*clnHandler*	: Amalthea cIn handler
in	*cOutHandler*	: Amalthea cOut handler
in	*period*	: Time period of the task
in	*deadline*	: Deadline of the task
in	*WCET*	: Worst case execution time of the task
in	*src_id*	: Source ID of the tasks
in	*src_instance*	: Source Instance of the task
in	*task_id*	: Task ID
in	*task_instance*	: Task Instance

Returns

: Amalthea task model

Generating Amalthea task model

4.1.4.3 createRTOSTask()

```
void createRTOSTask (
             AmaltheaTask * task,
             int priority,
             int argCount,
              ...  )
```

Create the RTOS task that represents a given Amalthea task.

This function can have multiple arguments for all label types used by the task and the number of labels of each type.

Parameters

in	*task*	: pointer to the AmaltheaTask struct
in	*priority*	: priority of the task (according to RMS, lowesrt perio has highest priority)
in	*argCount*	: number of different types of labels used by this task
in	*label_type_size*	: size (in bits) of label type.
in	*label_type_count*	number of labels associated with that type.

Returns

: void

Create the RTOS task that represents a given Amalthea task.

4.1.4.4 generalizedRTOSTask()

```
void generalizedRTOSTask (
             AmaltheaTask task )
```

This RTOS task invokes the task handlers and realizes periodic task execution according to Amalthea model.

Parameters

in	*task*	: instance of AmaltheaTask structure to be invoked

Returns

: void

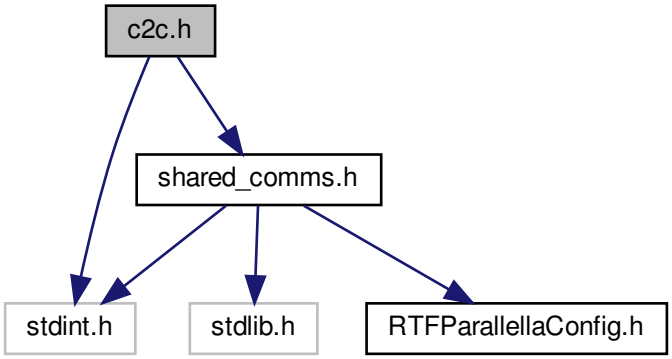
This RTOS task invokes the task handlers and realizes periodic task execution according to Amalthea model

4.2 c2c.h File Reference

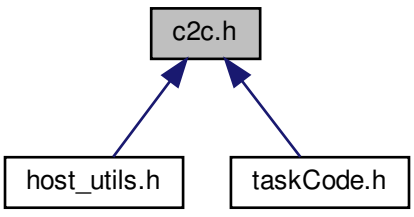
This file declares and implements function to communicate between epiphany cores. The functions defined in this file are used for reading from and writing data in the epiphany cores.

```
#include <stdint.h>
#include "shared_comms.h"
```

Include dependency graph for c2c.h:



This graph shows which files directly or indirectly include this file:



Classes

- struct DSHM_section_t

Macros

- #define **DSHM_SEC_LABEL_COUNT** 10

Typedefs

- typedef struct DSHM_section_t DSHM_section

Functions

- unsigned int * allocate_epiphany_memory (unsigned int offset)

  Provide the epiphany memory section based on the offset data.
- void shared_labels_init_core (void)

  Initiate the shared label section, this function will assign addresses to labels in a section, and initialize those labels to 0.
- void shared_label_write_core (unsigned row, unsigned col, int label_indx, int payload)

  Write a value to a label in a distributed shared memory section.
- unsigned int shared_label_read_core (unsigned row, unsigned col, int label_indx)

  Read a value of a label in a distributed shared memory section.
- unsigned int get_base_address_core (int row, int col)

  Get the absolute base memory address of a core.
- void DSHM_section_init (DSHM_section sec)

  Initialize the distributed shared label section.
- unsigned int read_DSHM_section (DSHM_section sec, int label_indx)

  Read data from a specific label in a distributed shared memory section.
- void write_DSHM_section (DSHM_section sec, int label_indx, int payload)

  Write data to a specific label in a distributed shared memory section.

4.2.1 Detailed Description

This file declares and implements function to communicate between epiphany cores. The functions defined in this file are used for reading from and writing data in the epiphany cores.

Author

Mahmoud Bazzal, Anand Prakash

Date

17 April 2020

4.2.2 Typedef Documentation

4.2.2.1 DSHM_section

```
typedef struct DSHM_section_t DSHM_section
```

defines a distributed shared memory section

4.2.3 Function Documentation

4.2.3.1 allocate_epiphany_memory()

```
unsigned int* allocate_epiphany_memory (
            unsigned int offset )
```

Provide the epiphany memory section based on the offset data.

The epiphany memory section is defined in data bank 3 of each core and start at address 0x7000. The address is returned based on the offset to 0x7000 of each core. This buffer is assigned to stored the RTF parallella legacy trace info. Data bank 3 is used to store the information on each epiphany core. It starts at 0x7000 offset on each epiphany core. Any change in this buffer addressing must be followed with the correct offset set in host application to get the correct values.

Parameters

in	*offset*	: Offset to the epiphany start memory of 0x7000

Returns

: Pointer to the Epiphany address.

Provide the epiphany memory section based on the offset data.

4.2.3.2 DSHM_section_init()

```
void DSHM_section_init (
            DSHM_section sec )
```

Initialize the distributed shared label section.

Initiate the distributed shared label section, this function will assign addresses to labels in a section, and initialize those labels to the value of 256

Parameters

in	*sec*	: structure of type DSHM_section containing details of the the distributed shared memory section to be initiated

Initialize the distributed shared label section.

4.2.3.3 get_base_address_core()

```
unsigned int get_base_address_core (
            int row,
            int col )
```

Get the absolute base memory address of a core.

Get he global memory address of the provided epiphany row id and column id.

Parameters

in	*row*	: absolute row number of the core
in	*col*	: absolute column number of the core

Returns

: Global memory address of the Epiphany core.

Get the absolute base memory address of a core.

4.2.3.4 read_DSHM_section()

```
unsigned int read_DSHM_section (
            DSHM_section sec,
            int label_indx )
```

Read data from a specific label in a distributed shared memory section.

This function will read one full label but the result will be cast into unsigned int (4 bytes on this platform) Segmentation fault will occur for addresses outside the shared_dram section of the system check RTFP documentation for details.

Parameters

in	*sec*	: struct of the section to be read
in	*label_indx*	: index of requested label

Returns

: value of requested label in a distributed shared memory section

Read data from a specific label in a distributed shared memory section

4.2.3.5 shared_label_read_core()

```
unsigned int shared_label_read_core (
            unsigned row,
            unsigned col,
            int label_indx )
```

Read a value of a label in a distributed shared memory section.

Parameters

in	*row*	: absolute row number of the core
in	*col*	: absolute column number of the core
in	*label_indx*	: index of the target shared label

Returns

: Shared label value at the provided label_indx

Read a value of a label in a distributed shared memory section.

4.2.3.6 shared_label_write_core()

```
void shared_label_write_core (
            unsigned row,
            unsigned col,
            int label_indx,
            int payload )
```

Write a value to a label in a distributed shared memory section.

Parameters

in	*row*	: absolute row number of the core
in	*col*	: absolute column number of the core
in	*label_indx*	: index of the target shared label
in	*payload*	: value to write

Returns

: void

Write a value to a label in a distributed shared memory section

4.2.3.7 shared_labels_init_core()

```
void shared_labels_init_core (
            void  )
```

Initiate the shared label section, this function will assign addresses to labels in a section, and initialize those labels to 0.

Returns

: void

Initiate the shared label section, this function will assign addresses to labels in a section, and initialize those labels to 0

4.2.3.8 write_DSHM_section()

```
void write_DSHM_section (
            DSHM_section sec,
            int label_indx,
            int payload )
```

Write data to a specific label in a distributed shared memory section.

This function will write one full label but the value will be given as int (4 bytes on this platform) to avoid overflow issues Segmentation fault will occur for addresses outside the shared_dram section of the system check RTFP documentation for details.

Parameters

in	*sec*	: struct of the section to be written to
in	*label_indx*	: index of requested label
in	*payload*	: value to be written (will be cast into data type of target label)

Returns

: void

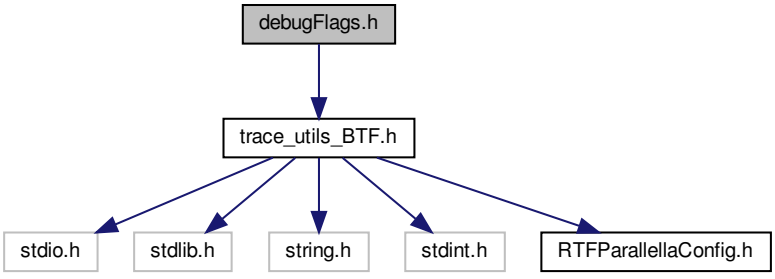
Write data to a specific label in a distributed shared memory section

4.3 debugFlags.h File Reference

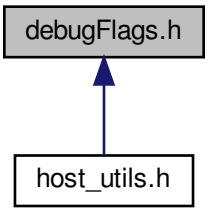
This file declares the debug trace of the application running on Epiphany core.The debug trace consists in two forms. One is the visual form which is the legacy RTFParallella trace and can be seen while executing the application on Adapteva Parallella. The other is the BTF trace dump which can be viewed on Eclipse Trace Compass.

```
#include "trace_utils_BTF.h"
```

Include dependency graph for debugFlags.h:



This graph shows which files directly or indirectly include this file:



Macros

- #define **cnt_address** 0x3000
- #define **TASK1_FLAG** 2
- #define **TASK2_FLAG** 0
- #define **TASK3_FLAG** 4
- #define **TASK4_FLAG** 0
- #define **TASK5_FLAG** 4
- #define **RUNNINGTASK_FLAG** 6
- #define **DEBUG_FLAG** 7
- #define **TICK_FLAG** 8
- #define **BTF_TRACE_BUFFER_SIZE** 8

Functions

- unsigned int get_time_scale_factor (void)

  Get the time scaling factor for tick count.
- void init_btf_mem_section (void)

  Initialize memory section for storing BTR trace data and metadata.
- void init_task_trace_buffer (void)

  Initialize output buffer in core memory.
- void traceRunningTask (unsigned taskNum)

  Write the index of the running task to output buffer.
- void traceTaskPasses (unsigned taskNum, int currentPasses)

  write the task instance (job) to output buffer
- void updateTick (void)

  Update RTOS tick value in output buffer.
- void updateDebugFlag (int debugMessage)

  Write a custom value to the output buffer for code coverage debugging.
- void signalHost (void)

  Signal the host core to read the memory.
- void traceTaskEvent (int srcID, int srcInstance, btf_trace_event_type type, int taskId, int taskInstance, btf_↩ trace_event_name event_name, int data)

  Write the BTF trace data.

4.3.1 Detailed Description

This file declares the debug trace of the application running on Epiphany core.The debug trace consists in two forms. One is the visual form which is the legacy RTFParallella trace and can be seen while executing the application on Adapteva Parallella. The other is the BTF trace dump which can be viewed on Eclipse Trace Compass.

Author

Mahmoud Bazzal, Anand Prakash

Date

10 April 2020

4.3.2 Function Documentation

4.3.2.1 get_time_scale_factor()

```
unsigned int get_time_scale_factor (
            void  )
```

Get the time scaling factor for tick count.

Returns

: Scale factor

4.3.2.2 init_btf_mem_section()

```
void init_btf_mem_section (
            void  )
```

Initialize memory section for storing BTR trace data and metadata.

The function does not take any arguments. It initializes the BTF memory section from the shared memory area.

Returns

: void

4.3.2.3 init_task_trace_buffer()

```
void init_task_trace_buffer (
            void  )
```

Initialize output buffer in core memory.

The function initializes the epiphany core memory section for dumping the legacy RTParallella trace.

Returns

: void

4.3.2.4 signalHost()

```
void signalHost (
            void  )
```

Signal the host core to read the memory.

The function locks the shared memory address using the epiphany mutex implementation. It waits until wait the host core processor has read the data. It then dumps the BTF trace metadata to the shared memory and and unlock the mutex. DMA channel 1 is used to dump the trace metadata.

Returns

: void

Signal the host to read the BTF trace metadata

4.3.2.5 traceRunningTask()

```
void traceRunningTask (
            unsigned taskNum )
```

Write the index of the running task to output buffer.

The function writes the ID of the current task in execution to the Epiphany core memory

Parameters

in	*taskNum*	: index of the task

Returns

: void

4.3.2.6 traceTaskEvent()

```
void traceTaskEvent (
            int srcID,
            int srcInstance,
            btf_trace_event_type type,
            int taskId,
            int taskInstance,
            btf_trace_event_name event_name,
            int data )
```

Write the BTF trace data.

The function dumps the BTF trace data to the shared memory.. DMA channel 1 is used to dump the trace data.

Parameters

in	*srcID*	: Source ID of the task.
in	*srcInstance*	: Source instance of the task.
in	*type*	: Event type.
in	*taskId*	: Task Id.
in	*taskInstance*	: Task instance.
in	*event_name*	: Name of the event.
in	*data*	: Notes or shared label value

Returns

: void

4.3.2.7 traceTaskPasses()

```
void traceTaskPasses (
            unsigned taskNum,
            int currentPasses )
```

write the task instance (job) to output buffer

The function writes the task instance number of the current task in execution to the Epiphany core memory.

Parameters

in	*taskNum*	: index of the task
in	*currentPasses*	: instance of task (job number)

4.3.2.8 updateDebugFlag()

```
void updateDebugFlag (
```

```
            int debugMessage )
```

Write a custom value to the output buffer for code coverage debugging.

Parameters

in	*debugMessage*	: message to be written

Returns

: void

4.3.2.9 updateTick()

```
void updateTick (
            void  )
```

Update RTOS tick value in output buffer.

Returns

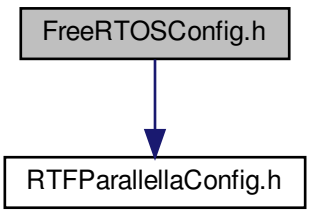
: void

4.4 FreeRTOSConfig.h File Reference

This file declares the macros and structures used on FreeRTOS Configuration.

```
#include "RTFParallellaConfig.h"
```

Include dependency graph for FreeRTOSConfig.h:



Macros

- #define **configCALL_STACK_SIZE** 0x50
- #define **configUSE_PREEMPTION** 1
- #define **configUSE_TIME_SLICING** 0
- #define **configUSE_IDLE_HOOK** 0
- #define **configUSE_TICK_HOOK** 0
- #define **configCPU_CLOCK_HZ** ((unsigned long) 700000000)
- #define **configTICK_RATE_HZ** ((TickType_t) execution_time_scale)
- #define **configMAX_PRIORITIES** (5)
- #define **configMINIMAL_STACK_SIZE** ((unsigned short) 112)
- #define **configTOTAL_HEAP_SIZE** ((size_t) (10240))
- #define **configMAX_TASK_NAME_LEN** (48)
- #define **configUSE_TRACE_FACILITY** 0
- #define **configUSE_16_BIT_TICKS** 1
- #define **configIDLE_SHOULD_YIELD** 0
- #define **configUSE_ALTERNATIVE_API** 0
- #define **configUSE_CO_ROUTINES** 0
- #define **configMAX_CO_ROUTINE_PRIORITIES** (2)
- #define **INCLUDE_vTaskPrioritySet** 0
- #define **INCLUDE_uxTaskPriorityGet** 0
- #define **INCLUDE_vTaskDelete** 0
- #define **INCLUDE_vTaskCleanUpResources** 0
- #define **INCLUDE_vTaskSuspend** 1
- #define **INCLUDE_vTaskDelayUntil** 1
- #define **INCLUDE_vTaskDelay** 1
- #define **INCLUDE_xTaskGetCurrentTaskHandle** 1
- #define **INCLUDE_pcTaskGetTaskName** 1
- #define **C2C_MSG_TYPE** int

4.4.1 Detailed Description

This file declares the macros and structures used on FreeRTOS Configuration.

Author

Mahmoud Bazzal, Anand Prakash

Date

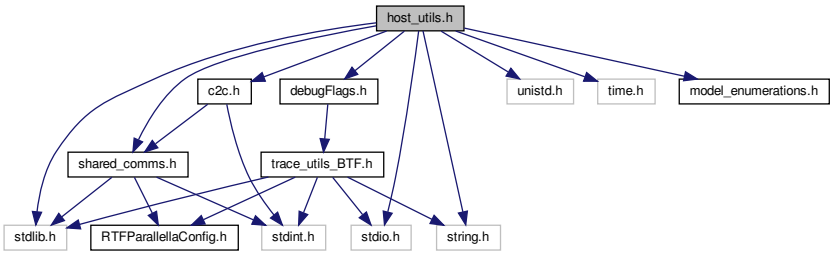
15 April, 2020

4.5 host_utils.h File Reference

This file is used to define the utility functions for the host core application.

```
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include <unistd.h>
#include <time.h>
#include "c2c.h"
#include "debugFlags.h"
#include "shared_comms.h"
#include "model_enumerations.h"
```

Include dependency graph for host_utils.h:



Classes

- struct labelVisual_t

Macros

- #define **READ_PRECISION_US** 1000
- #define **MEM_TYPE_SHM** 0
- #define **MEM_TYPE_DSHM** 1

Typedefs

- typedef struct labelVisual_t **LabelVisual**

Functions

- void **array_init** (unsigned array[ ], unsigned array_size)
- void **user_config_print_legend** (LabelVisual core_config, unsigned array[ ])
- void **user_config_print_values** (LabelVisual core_config, unsigned array[ ], unsigned int values_array[ ], unsigned int prv_val_array[ ])
- LabelVisual **get_user_input** (unsigned indices[ ])
- void **user_config_print_legend_auto** (unsigned array_length, unsigned array[ ])
- void **user_config_print_values_auto** (unsigned visible_label_count, unsigned array[ ], unsigned int values_array[ ], unsigned int prv_val_array[ ])
- unsigned **get_user_input_DRAM** (unsigned indices[ ])
- void **print_legend_enum** (unsigned label_count, unsigned label_positions[ ], unsigned memory_type)
- int **nsleep** (long miliseconds)

4.5.1 Detailed Description

This file is used to define the utility functions for the host core application.

Author

Mahmoud Bazzal, Anand Prakash

Date

24 May 2020

4.6 label_man_core0.h File Reference

This file is used to define the functions for implementing the cIn and cOut handler and reading and writing of shared and distributed labels and signals.

Macros

- #define **num_unique_sections** 1

Functions

- void **init_mem_sections** (void)
- void **init_DSHM_sections** (void)
- void **cIn5ms** ()
- void **cIn10ms** ()
- void **cIn20ms** ()
- void **cIn10msCore2** ()
- void **cIn20msCore2** ()
- void **cOut5ms** ()
- void **cOut10ms** ()
- void **cOut20ms** ()
- void **cOut10msCore2** ()
- void **cOut20msCore2** ()

4.6.1 Detailed Description

This file is used to define the functions for implementing the cIn and cOut handler and reading and writing of shared and distributed labels and signals.

Author

Mahmoud Bazzal, Anand Prakash

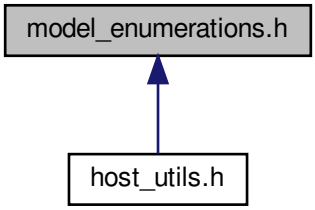
Date

24 May 2020

4.7 model_enumerations.h File Reference

This file declares and implements the entity table for BTF trace generation. It consists of functions used to store the entities in the tracing framework which is used to generate the BTF trace.

This graph shows which files directly or indirectly include this file:



Macros

- #define **SHM_LABEL_COUNT** 10
- #define **DSHM_LABEL_COUNT** 10
- #define **LABEL_STRLEN** 32
- #define **EXEC_TASK_COUNT** 5
- #define **EXEC_CORE_COUNT** 2
- #define **SHM_VISIBLE_LABEL_COUNT** 2
- #define **DSHM_VISIBLE_LABEL_COUNT** 2

Functions

- void get_SHM_label_name (int index, char ∗str)

  Get the string name of DRAM shared label.
- void get_DSHM_label_name (int index, char ∗str)

  Get the string name of distributed shared label (on a core)
- void get_task_name (int index, char ∗str)

  Get the string name of the task being run.
- void get_visible_label_index (unsigned array[ ], unsigned mem_type)

  Get the indices of required labels to show in either shared memory or distributed shared memory.
- void generate_task_entity_table (void)

  Generate the BTF trace entity entry for all the tasks.
- void generate_runnable_entity_table (void)

  Generate the BTF trace entity entry for all the runnables.
- void generate_signal_entity_table (void)

  Generate the BTF trace entity entry for all the label/signal entities.
- void generate_hw_entity_table (void)

  Generate the BTF trace entity entry for all the hardware entities.

4.7.1 Detailed Description

This file declares and implements the entity table for BTF trace generation. It consists of functions used to store the entities in the tracing framework which is used to generate the BTF trace.

Author

Mahmoud Bazzal, Anand Prakash

Date

20 May 2020

4.7.2 Function Documentation

4.7.2.1 generate_hw_entity_table()

```
void generate_hw_entity_table (
             void  )
```

Generate the BTF trace entity entry for all the hardware entities.

The function is used to store all the hardware entities used in the tasks execution on a heterogeneous platform which is used to generate the BTF header and data section.

Returns

: void

Generate the BTF trace entity entry for all the hardware entities

4.7.2.2 generate_runnable_entity_table()

```
void generate_runnable_entity_table (
             void  )
```

Generate the BTF trace entity entry for all the runnables.

The function is used to store all the runnable entities used in the tasks execution on a heterogeneous platform which is used to generate the BTF header and data section.

Returns

: void

Generate the BTF trace entity entry for all the runnables

4.7.2.3 generate_signal_entity_table()

```
void generate_signal_entity_table (
            void  )
```

Generate the BTF trace entity entry for all the label/signal entities.

The function is used to store all the shared and distributed label entities used in the tasks execution on a heterogeneous platform which is used to generate the BTF header and data section.

Returns

: void

Generate the BTF trace entity entry for all the label/signal entities

4.7.2.4 generate_task_entity_table()

```
void generate_task_entity_table (
            void  )
```

Generate the BTF trace entity entry for all the tasks.

The function is used to store all the tasks entities used in the tasks execution on a heterogeneous platform which is used to generate the BTF header and data section.

Returns

: void

Generate the BTF trace entity entry for all the tasks

4.7.2.5 get_DSHM_label_name()

```
void get_DSHM_label_name (
            int index,
            char * str )
```

Get the string name of distributed shared label (on a core)

Parameters

in	*index*	: shared label index in the memory section
in,out	∗*str*	: pointer to buffer string that holds the name

Returns

: void

4.7.2.6 get_SHM_label_name()

```
void get_SHM_label_name (
            int index,
            char * str )
```

Get the string name of DRAM shared label.

Parameters

in	*index*	: shared label index in the shared memory section
in,out	∗*str*	: pointer to buffer string that holds the name

Returns

: void

4.7.2.7 get_task_name()

```
void get_task_name (
            int index,
            char * str )
```

Get the string name of the task being run.

Parameters

in	*index*	: task index in the task_enum array
in,out	∗*str*	: pointer to buffer string that holds the name

Returns

: void

Get the string name of the task being run

4.7.2.8 get_visible_label_index()

```
void get_visible_label_index (
            unsigned array[],
            unsigned mem_type )
```

Get the indices of required labels to show in either shared memory or distributed shared memory.

Parameters

in,out	*array*	: array buffer that holds the indices
in	*mem_type*	: the memory type of indices requested (MEM_TYPE_SHM or MEM_TYPE_DSHM)

Returns

: void

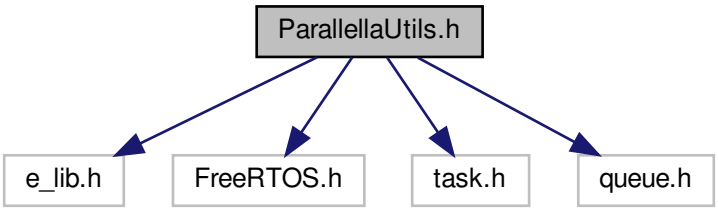
Get the indices of required labels to show in either shared memory or distributed shared memory

4.8 ParallellaUtils.h File Reference

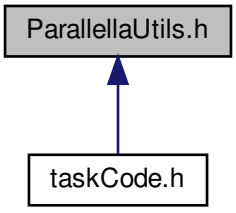
This file declares the sleep timer function to simulate the time taken by each task to complete its processing on the hardware core.

```
#include "e_lib.h"
#include "FreeRTOS.h"
#include "task.h"
#include "queue.h"
```

Include dependency graph for ParallellaUtils.h:



This graph shows which files directly or indirectly include this file:



Macros

- #define **_1MS** 700000
- #define **_1US** 700

Functions

- void sleepTimerMs (int ticks, int taskNum)

  Sleep for a multiple of milliseconds.

4.8.1 Detailed Description

This file declares the sleep timer function to simulate the time taken by each task to complete its processing on the hardware core.

Author

Mahmoud Bazzal, Anand Prakash

Date

20 May 2020

4.8.2 Function Documentation

4.8.2.1 sleepTimerMs()

```
void sleepTimerMs (
            int ticks,
            int taskNum )
```

Sleep for a multiple of milliseconds.

It makes the task to sleep for the provided millisecond. This is used to simulate the computation time taken by the task in a real scenario.

Parameters

in	*ticks*	: number of milliseconds to sleep
in	*taskNum*	: index of task invoking this function (used for tracing during sleep)

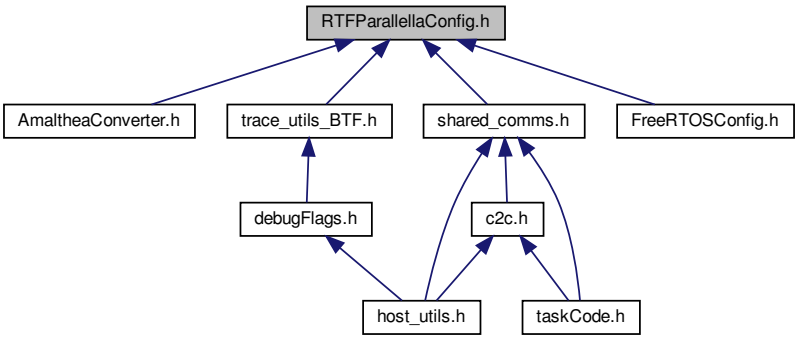
Returns

: void

4.9 RTFParallellaConfig.h File Reference

This file declares the macros and structures used on Epiphany core to get the trace information,.

This graph shows which files directly or indirectly include this file:



Classes

- struct btf_trace_info_t

Macros

- #define **SHARED_DRAM_START_ADDRESS** 0x8E000000
- #define **SHARED_DRAM_START_OFFSET** 0x01000000
- #define **SHARED_DRAM_SECTION** (SHARED_DRAM_START_ADDRESS + SHARED_DRAM_START↩ _OFFSET)
- #define **SHARED_DRAM_SIZE** 0x00002000
- #define **RTF_DEBUG_TRACE_COUNT** 10
- #define **INPUT_TIMESCALE_OFFSET** 20
- #define **SHARED_BTF_DATA_OFFSET** (INPUT_TIMESCALE_OFFSET + 4)
- #define **SHARED_LABEL_OFFSET** 0x1000
- #define **BTF_TRACE_BUFFER_SIZE** 8
- #define **GLOBAL_SHARED_LABEL_OFFSET** sizeof(btf_trace_info)
- #define **SHM_LABEL_COUNT** 10
- #define **DSHM_LABEL_CORE_OFFSET** 10
- #define **ECORE_RTF_BUFFER_ADDR** 0x7000
- #define **DSHM_LABEL_EPI_CORE_OFFSET** 0x7040
- #define **MUTEX_ROW** 1
- #define **MUTEX_COL** 0
- #define **RING_BUFFER_SIZE** 6

Typedefs

- typedef struct btf_trace_info_t btf_trace_info
- typedef enum entity_id_t **entity_id**

Enumerations

- enum **entity_id_t** {
  IDLE_TASK_ID = 0, **TASK5MS0_ID**, **TASK10MS0_ID**, **TASK20MS0_ID**,
  TASK10MS1_ID, **TASK20MS1_ID**, **RUNNABLE_HANDLER5MS0_ID** = 16, **RUNNABLE_HANDLER10↩MS0_ID**,
  RUNNABLE_HANDLER20MS0_ID, **RUNNABLE_HANDLER10MS1_ID**, **RUNNABLE_HANDLER20MS1↩_ID**, **SH_LABEL_A_ID** = 64,
  SH_LABEL_B_ID, **DSH_LABEL_A_ID**, **DSH_LABEL_B_ID**, **HW_CORE0_ID** = 256,
  HW_CORE1_ID }
- enum TYPE { UINT_8, UINT_16, UINT_32 }

Variables

- unsigned int execution_time_scale

4.9.1 Detailed Description

This file declares the macros and structures used on Epiphany core to get the trace information,.

Author

Anand Prakash

Date

19 June 2020

4.9.2 Typedef Documentation

4.9.2.1 btf_trace_info

```
typedef struct btf_trace_info_t btf_trace_info
```

Structure to ensure proper synchronization between host and epiphany cores and also within epiphany cores.

4.9.3 Enumeration Type Documentation

4.9.3.1 TYPE

```
enum TYPE
```

Enumerator

UINT_8	unsigned char type
UINT_16	unsigned short type
UINT_32	unsigned int type

4.9.4 Variable Documentation

4.9.4.1 execution_time_scale

```
unsigned int execution_time_scale
```

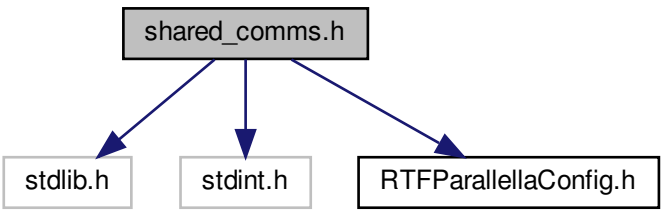
Time scale factor per tick

4.10 shared_comms.h File Reference

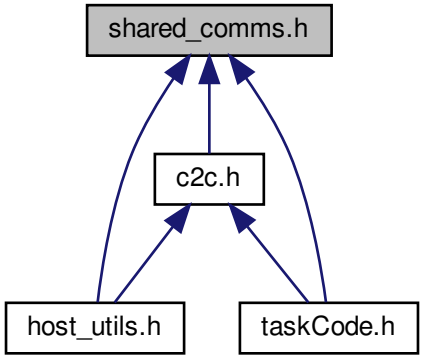
This file declares and implements function to read and write data to shared memory. The functions defined in this file are used for reading from and writing data in the shared memory which can be used by host core or epiphany cores.

```
#include <stdlib.h>
#include <stdint.h>
#include "RTFParallellaConfig.h"
```

Include dependency graph for shared_comms.h:



This graph shows which files directly or indirectly include this file:



Classes

- struct SHM_section_t

Macros

- #define **shared_mem_section** 0x01001000
- #define **shared_mem_section_2** 0x01001000
- #define **shared_mem_section1_label_count** 10
- #define **SHM_DEFINED_SPACE** 256

Typedefs

- typedef struct SHM_section_t SHM_section

Functions

- unsigned int * allocate_shared_memory (unsigned int offset)

  The function provides the pointer to the global address to the shared DRAM memory.
- void * shm_section_init (SHM_section sec)

  Function to initialize the shared memory area.
- int read_shm_section (unsigned int *x, unsigned indx)

  Read data from a specific label in a shared memory section.
- void write_shm_section (unsigned int *x, unsigned indx, int payload)

  Write data to a specific label in a shared memory section.
- unsigned int shm_section_init_read (SHM_section sec, int index)

  This function is obsolete. Use "read_shm_section" for reading shared memory area.

4.10.1 Detailed Description

This file declares and implements function to read and write data to shared memory. The functions defined in this file are used for reading from and writing data in the shared memory which can be used by host core or epiphany cores.

Author

Mahmoud Bazzal, Anand Prakash

Date

13 April 2020

4.10.2 Typedef Documentation

4.10.2.1 SHM_section

```
typedef struct SHM_section_t SHM_section
```

defines a shared memory section

4.10.3 Function Documentation

4.10.3.1 allocate_shared_memory()

```
unsigned int* allocate_shared_memory (
            unsigned int offset )
```

The function provides the pointer to the global address to the shared DRAM memory.

The shared DRAM memory offset starts at 0x8F000018. This address space is accessible by the Epiphany cores as well as Host. The actual DRAM starts at 0x8F000000. The first 20 bytes are reserved by the FreeRTOS. The next 4 bytes is used to store the time scale. The next 44 bytes will be used to store the BTF trace information. The rest of the memory can be used for storing the shared labels.

Parameters

in	*offset*	: The offset from the shared dram start address.

Returns

: Pointer to the shared DRAM memory.

The function provides the pointer to the global address to the shared DRAM memory.

4.10.3.2 read_shm_section()

```
int read_shm_section (
            unsigned int * x,
            unsigned indx )
```

Read data from a specific label in a shared memory section.

This function will read one full label but the result will be cast into int (4 bytes on this platform)

Segmentation fault will occur for addresses outside the shared_dram section of the system check RTFP documentation for details.

Parameters

in	*x*	: pointer to the section to be read
in	*indx*	: index of requested label

Returns

: value of requested label in a shared memory section

Read data from a specific label in a shared memory section.

4.10.3.3 shm_section_init()

```
void* shm_section_init (
            SHM_section sec )
```

Function to initialize the shared memory area.

Initiate the shared label section, this function will assign addresses to labels in a section, and initialize those labels to the value of 256 If the requested section does not fit in the system's shared_dram, a null pointer will be returned

Parameters

in	*sec*	: structure of type SHM_section containing details of the the shared memory section to be initiated

Returns

: pointer to the initiated shared memory label

Function to initialize the shared memory area.

4.10.3.4 shm_section_init_read()

```
unsigned int shm_section_init_read (
            SHM_section sec,
            int index )
```

This function is obsolete. Use "read_shm_section" for reading shared memory area.

TODO use e_write/ e_read functions and DMA to constrain contention from different cores.

4.10.3.5 write_shm_section()

```
void write_shm_section (
            unsigned int * x,
            unsigned indx,
            int payload )
```

Write data to a specific label in a shared memory section.

This function will write one full label but the value will be given as int (4 bytes on this platform) to avoid overflow issues

Segmentation fault will occur for addresses outside the shared_dram section of the system check RTFP documentation for details.

Parameters

in	*x*	: pointer to the section to be written to
in	*indx*	: index of requested label
in	*payload*	: value to be written (will be cast into data type of target label)

Returns

: void

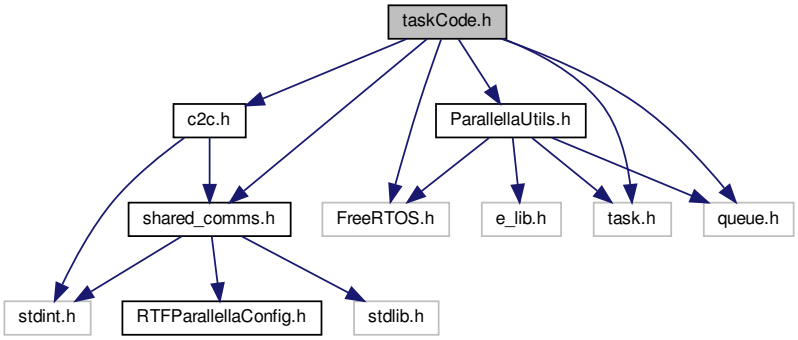
Write data to a specific label in a shared memory section.

4.11 taskCode.h File Reference

This file is used to define the functions for implementing tasks handlers.

```
#include "c2c.h"
#include "ParallellaUtils.h"
#include "shared_comms.h"
#include "FreeRTOS.h"
#include "task.h"
#include "queue.h"
```

Include dependency graph for taskCode.h:



Functions

- void **handler5ms** (int src_id, int src_instance)
- void **handler10ms** (int src_id, int src_instance)
- void **handler20ms** (int src_id, int src_instance)
- void **handler10msCore2** (int src_id, int src_instance)
- void **handler20msCore2** (int src_id, int src_instance)

4.11.1 Detailed Description

This file is used to define the functions for implementing tasks handlers.

Author

Mahmoud Bazzal, Anand Prakash

Date

24 May 2020

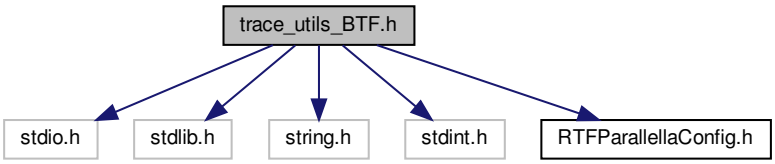
4.12 trace_utils_BTF.h File Reference

This file declares and implement the BTF trace framework. It consists of functions used to generate the trace information of the tasks, runnables shared label access and hardware info in the BTF trace format.

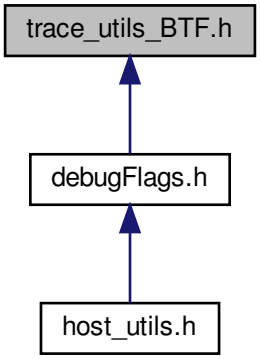
```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <stdint.h>
```

```
#include "RTFParallellaConfig.h"
```

Include dependency graph for trace_utils_BTF.h:



This graph shows which files directly or indirectly include this file:



Classes

- struct btf_trace_header_config_t
- struct btf_trace_entity_entry_t
- struct btf_trace_data_t
- struct btf_trace_entity_table_t

Macros

- #define **RFTP_GENERATE_BTF_TRACE** 0x01
- #define **BTF_TRACE_TRUE** 0x01
- #define **BTF_TRACE_FALSE** 0x00
- #define **BTF_TRACE_BUFFER_SIZE** 8
- #define **TIME_FLAG** 0
- #define **SOURCE_FLAG** 1
- #define **SOURCE_INSTANCE_FLAG** 2
- #define **EVENT_TYPE_FLAG** 3
- #define **TARGET_FLAG** 4
- #define **TARGET_INSTANCE_FLAG** 5
- #define **EVENT_FLAG** 6
- #define **DATA_FLAG** 7

Typedefs

- typedef enum btf_trace_event_type_t **btf_trace_event_type**
- typedef enum btf_trace_event_name_t **btf_trace_event_name**
- typedef struct btf_trace_header_config_t btf_trace_header_config_t
- typedef struct btf_trace_entity_entry_t **btf_trace_entity_entry**
- typedef struct btf_trace_data_t **btf_trace_data**
- typedef struct btf_trace_entity_table_t **btf_trace_entity_table**

Enumerations

- enum btf_trace_event_type_t {
  TASK_EVENT, INT_SERVICE_ROUTINE_EVENT, RUNNABLE_EVENT, INS_BLOCK_EVENT,
  STIMULUS_EVENT, ECU_EVENT, PROCESSOR_EVENT, CORE_EVENT,
  SCHEDULER_EVENT, SIGNAL_EVENT, SEMAPHORE_EVENT, SIMULATION_EVENT }
- enum btf_trace_event_name_t {
  INIT = -1, PROCESS_START, PROCESS_TERMINATE, PROCESS_PREEMPT,
  PROCESS_SUSPEND, PROCESS_RESUME, SIGNAL_READ, SIGNAL_WRITE }

Functions

- void get_btf_trace_file_path (char *trace_file_path)

  Function to get the file name of the trace file along with the absolute path.
- int parse_btf_trace_arguments (int argc, char **argv)

  Parse the command line arguments for generating the BTF trace file.
- void write_btf_trace_header_config (FILE *stream)

  This function is responsible for writing the BTF trace header information.
- void write_btf_trace_header_entity_type (FILE *stream, btf_trace_event_type type)

  This function to write entity type in BTF header data.
- void write_btf_trace_header_entity_table (FILE *stream)

  Function to write entity type in BTF header data.
- void write_btf_trace_header_entity_type_table (FILE *stream)

  This function writes the entity type table in the BTF header.
- void store_entity_entry (entity_id typeId, btf_trace_event_type type, const char *name)

  This function is used to store the entity information of all the tasks, runnables and labels.
- void write_btf_trace_data (FILE *stream, uint8_t core_id, unsigned int *data_buffer)

  Function to write the data section of the BTF.

4.12.1 Detailed Description

This file declares and implement the BTF trace framework. It consists of functions used to generate the trace information of the tasks, runnables shared label access and hardware info in the BTF trace format.

Author

Anand Prakash

Date

23 May 2020

See also

https://wiki.eclipse.org/images/e/e6/TA_BTF_Specification_2.1.3_Eclipse↩
_Auto_IWG.pdf

4.12.2 Typedef Documentation

4.12.2.1 btf_trace_header_config_t

```
typedef struct btf_trace_header_config_t btf_trace_header_config_t
```

Structure to hold BTF Header

4.12.3 Enumeration Type Documentation

4.12.3.1 btf_trace_event_name_t

```
enum btf_trace_event_name_t
```

Enumerator

INIT	Dummy Init Event name
PROCESS_START	Starting a process/task/runnable
PROCESS_TERMINATE	Terminating a process/task/runnable
PROCESS_PREEMPT	Preempt a process/task
PROCESS_SUSPEND	Suspend a runnable event
PROCESS_RESUME	Resume a process/task/runnable
SIGNAL_READ	Read event for signal/label
SIGNAL_WRITE	Write signal for signal/label

4.12.3.2 btf_trace_event_type_t

```
enum btf_trace_event_type_t
```

Enumerator

TASK_EVENT	BTF Task Event
INT_SERVICE_ROUTINE_EVENT	BTF ISR Event
RUNNABLE_EVENT	BTF Runnable Event
INS_BLOCK_EVENT	BTF INS Block Event
STIMULUS_EVENT	BTF Stimulus Event
ECU_EVENT	BTF ECU Event
PROCESSOR_EVENT	BTF Processor Event
CORE_EVENT	BTF Hardware Core Event
SCHEDULER_EVENT	BTF Scheduler Event

Enumerator

SIGNAL_EVENT	BTF Signal Event for reading/writing labels
SEMAPHORE_EVENT	BTF Semaphore Event
SIMULATION_EVENT	BTF Simulation Event

4.12.4 Function Documentation

4.12.4.1 get_btf_trace_file_path()

```
void get_btf_trace_file_path (
            char * trace_file_path )
```

Function to get the file name of the trace file along with the absolute path.

Arguments:

Parameters

in,out	*trace_file_path*	: Pointer to the buffer where the BTF trace file path is stored.

Returns

: void

Function to get the file name of the trace file along with the absolute path.

4.12.4.2 parse_btf_trace_arguments()

```
int parse_btf_trace_arguments (
            int argc,
            char ** argv )
```

Parse the command line arguments for generating the BTF trace file.

The provided parameters are used to configure the trace file required to be generated. For example the trace file path, model file used to generate the trace, device name and time scale.

Arguments:

Parameters

in	*argc*	: The count for the number of arguments passed
in	*argv*	: Pointer to the list of arguments

Returns

: The integer value of the timescale used for the task execution.

Parse the command line arguments for generating the BTF trace file

4.12.4.3 store_entity_entry()

```
void store_entity_entry (
            entity_id typeId,
            btf_trace_event_type type,
            const char * name )
```

This function is used to store the entity information of all the tasks, runnables and labels.

Store the entity metadata which can be used to generate the entity type and entity type table. Also this table entry is used to decode the tasks and runnables information received from the Parallella framework.

Arguments:

Parameters

in	*typeId*	: Unique entity type ID
in	*type*	: Entity type..e.g TASK, RUNNABLE etc..
in	*name*	: Entity name

Returns

: void

This function is used to store the entity information of all the tasks, runnables and labels.

4.12.4.4 write_btf_trace_data()

```
void write_btf_trace_data (
            FILE * stream,
            uint8_t core_id,
            unsigned int * data_buffer )
```

Function to write the data section of the BTF.

The function is responsible for writing the BTF trace data section in CSV format which can be interpreted by the trace visualizing tools such as Eclipse trace compass. Currently the support is provided for only two cores. However, this can be extended further for multiple cores.

Arguments:

Parameters

in	*stream*	: File pointer to the stream where the data has to be written.
in	*core_id*	: Core ID on which the task operations are performed
in	*data_buffer*	: Data buffer containing the BTF trace information.

Returns

: void

Function to write the data section of the BTF

4.12.4.5 write_btf_trace_header_config()

```
void write_btf_trace_header_config (
            FILE * stream )
```

This function is responsible for writing the BTF trace header information.

Function to write BTF header data to the trace file. It writes the version, creator, input model file, time scale and timestamp section of the header file. It also writes the entity table, type table and entity type table used in the task model.

Arguments:

Parameters

in	*stream*	: File pointer to the stream where the data has to be written.

Returns

: void

This function is responsible for writing the BTF trace header information.

4.12.4.6 write_btf_trace_header_entity_table()

```
void write_btf_trace_header_entity_table (
            FILE * stream )
```

Function to write entity type in BTF header data.

The function writes the list of tasks, runnables, shared labels, cores in a tabular format. It combines the entity type and entity type table. Refer to below link for more details: https://wiki.eclipse.org/images/e/e6/TA_BTF_Specification_2.1.3_Eclipse_Auto_IWG.pdf

Arguments:

Parameters

in	*stream*	: File pointer to the stream where the data has to be written.

Returns

: void

Function to write entity type in BTF header data

4.12.4.7 write_btf_trace_header_entity_type()

```
void write_btf_trace_header_entity_type (
            FILE * stream,
            btf_trace_event_type type )
```

This function to write entity type in BTF header data.

The function defines what kinds of entities are supported in the BTF trace generated. It consists of entity type such as Tasks, Signals, Runnables along with their IDs. Refer to below link for more details: https://wiki.eclipse.org/images/e/e6/TA_BTF_Specification_2.1.3_Eclipse_Auto_IWG.pdf

Arguments:

Parameters

in	*stream*	: File pointer to the stream where the data has to be written.
in	*type*	: Type of the entity i.e. TASK, RUNNABLE, STIMULUS etc..

Returns

: void

This function to write entity type in BTF header data.

4.12.4.8 write_btf_trace_header_entity_type_table()

```
void write_btf_trace_header_entity_type_table (
            FILE * stream )
```

This function writes the entity type table in the BTF header.

The function writes the list of tasks, runnables, shared labels, cores in a tabular format. It consists of the tasks, runnables and shared labels executed on the specified cores along with their IDs. Refer to below link for more details: https://wiki.eclipse.org/images/e/e6/TA_BTF_Specification_2.1.3_Eclipse_Auto_IWG.pdf

Arguments:

Parameters

in	*stream*	: File pointer to the stream where the data has to be written.

Returns

: void

This function writes the entity type table in the BTF header.

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