Xilinx Standalone Library Documentation

XilMailbox Library v1.2

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XILINX®

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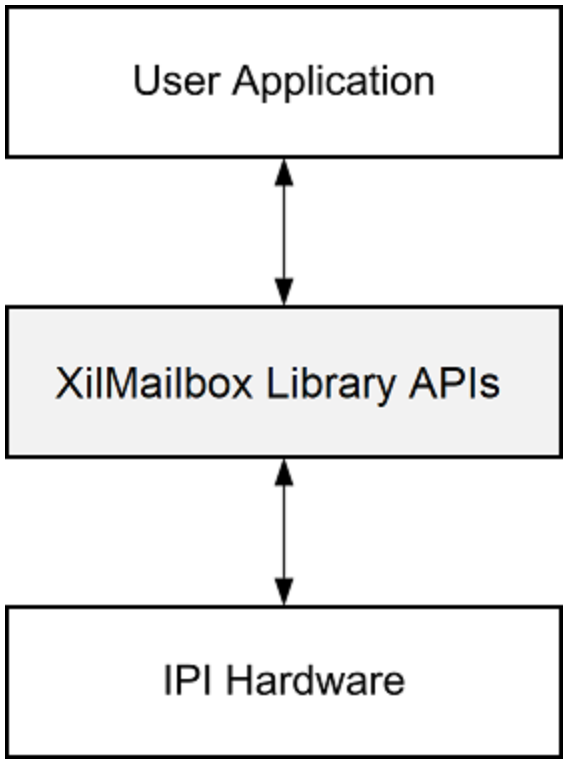
Overview

The XilMailbox library provides the top-level hooks for sending or receiving an inter-processor interrupt (IPI) message using the Zynq® UltraScale+ MPSoC IPI hardware.

Figure 1: **Overview**



For more details on the IPI interrupts, see the Zynq UltraScale+ MPSoC Technical Reference Manual (UG1085).

This library supports the following features:

- Triggering an IPI to a remote agent.
- Sending an IPI message to a remote agent.
- Callbacks for error and recv IPI events.
- Reading an IPI message.

Software Initialization

The following is a list of software initalization events for a given IPI channel:

1. `XMailbox_Initialize()` function initializes a library instance for the given IPI channel.
2. `XMailbox_Send()` function triggers an IPI to a remote agent.
3. `XMailbox_SendData()` function sends an IPI message to a remote agent, message type should be either XILMBOX_MSG_TYPE_REQ (OR) XILMBOX_MSG_TYPE_RESP.
4. `XMailbox_Recv()` function reads an IPI message from a specified source agent, message type should be either XILMBOX_MSG_TYPE_REQ (OR) XILMBOX_MSG_TYPE_RESP.
5. `XMailbox_SetCallBack()` using this function user can register call backs for receive and error events.

Table 1: **Quick Function Reference**

Type	Name	Arguments
u32	XMailbox_Send	`XMailbox` * InstancePtr u32 RemoteId u8 Is_Blocking
u32	XMailbox_SendData	`XMailbox` * InstancePtr u32 RemoteId void * BufferPtr u32 MsgLen u8 BufferType u8 Is_Blocking
u32	XMailbox_Recv	`XMailbox` * InstancePtr u32 SourceId void * BufferPtr u32 MsgLen u8 BufferType
s32	XMailbox_SetCallBack	`XMailbox` * InstancePtr `XMailbox_Handler` HandlerType CallBackFunc CallBackRef
u32	XMailbox_Initialize	`XMailbox` * InstancePtr u8 DeviceId
u32	XIpiPs_Init	`XMailbox` * InstancePtr u8 DeviceId

Table 1: **Quick Function Reference** *(cont'd)*

Type	Name	Arguments
u32	XIpiPs_Send	XMailbox * InstancePtr u8 Is_Blocking
u32	XIpiPs_SendData	XMailbox * InstancePtr void * MsgBufferPtr u32 MsgLen u8 BufferType u8 Is_Blocking
u32	XIpiPs_PollforDone	XMailbox * InstancePtr
u32	XIpiPs_RecvData	XMailbox * InstancePtr void * MsgBufferPtr u32 MsgLen u8 BufferType
XStatus	XIpiPs_RegisterIrq	void
void	XIpiPs_ErrorIntrHandler	void
void	XIpiPs_IntrHandler	void

Functions

XMailbox_Send

This function triggers an IPI to a destination CPU.

Prototype

```
u32 XMailbox_Send(XMailbox *InstancePtr, u32 RemoteId, u8 Is_Blocking);
```

Parameters

The following table lists the `XMailbox_Send` function arguments.

Table 2: **XMailbox_Send Arguments**

Type	Name	Description
XMailbox *	InstancePtr	Pointer to the XMailbox instance
u32	RemoteId	is the Mask of the CPU to which IPI is to be triggered
u8	Is_Blocking	if set trigger the notification in blocking mode

Returns

- XST_SUCCESS if successful
- XST_FAILURE if unsuccessful

XMailbox_SendData

This function sends an IPI message to a destination CPU.

Prototype

```
u32 XMailbox_SendData(XMailbox *InstancePtr, u32 RemoteId, void *BufferPtr,
u32 MsgLen, u8 BufferType, u8 Is_Blocking);
```

Parameters

The following table lists the `XMailbox_SendData` function arguments.

Table 3: **XMailbox_SendData Arguments**

Type	Name	Description
XMailbox *	InstancePtr	Pointer to the XMailbox instance
u32	RemoteId	is the Mask of the CPU to which IPI is to be triggered
void *	BufferPtr	is the pointer to Buffer which contains the message to be sent
u32	MsgLen	is the length of the buffer/message
u8	BufferType	is the type of buffer (XILMBOX_MSG_TYPE_REQ (OR) XILMBOX_MSG_TYPE_RESP)
u8	Is_Blocking	if set trigger the notification in blocking mode

Returns

- XST_SUCCESS if successful
- XST_FAILURE if unsuccessful

XMailbox_Recv

This function reads an IPI message.

Prototype

```
u32 XMailbox_Recv(XMailbox *InstancePtr, u32 SourceId, void *BufferPtr, u32
MsgLen, u8 BufferType);
```

Parameters

The following table lists the `XMailbox_Recv` function arguments.

Table 4: **XMailbox_Recv Arguments**

Type	Name	Description
`XMailbox` *	InstancePtr	Pointer to the `XMailbox` instance
u32	SourceId	is the Mask for the CPU which has sent the message
void *	BufferPtr	is the pointer to Buffer to which the read message needs to be stored
u32	MsgLen	is the length of the buffer/message
u8	BufferType	is the type of buffer (XILMBOX_MSG_TYPE_REQ or XILMBOX_MSG_TYPE_RESP)

Returns

- XST_SUCCESS if successful
- XST_FAILURE if unsuccessful

XMailbox_SetCallBack

This routine installs an asynchronous callback function for the given HandlerType.

***Note*:** Invoking this function for a handler that already has been installed replaces it with the new handler.

Prototype

```
s32 XMailbox_SetCallBack(XMailbox *InstancePtr, XMailbox_Handler
HandlerType, void *CallBackFuncPtr, void *CallBackRefPtr);
```

Parameters

The following table lists the `XMailbox_SetCallBack` function arguments.

Table 5: **XMailbox_SetCallBack Arguments**

Type	Name	Description
`XMailbox` *	InstancePtr	is a pointer to the `XMailbox` instance.
`XMailbox_Handler`	HandlerType	specifies which callback is to be attached.

Table 5: **XMailbox_SetCallBack Arguments** *(cont'd)*

Type	Name	Description
Commented parameter CallBackFunc does not exist in function XMailbox_SetCallBack.	CallBackFunc	is the address of the callback function.
Commented parameter CallBackRef does not exist in function XMailbox_SetCallBack.	CallBackRef	is a user data item that will be passed to the callback function when it is invoked.

Returns

- XST_SUCCESS when handler is installed.
- XST_INVALID_PARAM when HandlerType is invalid.

XMailbox_Initialize

Initialize the `XMailbox` Instance.

Prototype

```
u32 XMailbox_Initialize(XMailbox *InstancePtr, u8 DeviceId);
```

Parameters

The following table lists the `XMailbox_Initialize` function arguments.

Table 6: **XMailbox_Initialize Arguments**

Type	Name	Description
`XMailbox` *	InstancePtr	is a pointer to the instance to be worked on
u8	DeviceId	is the IPI Instance to be worked on

Returns

XST_SUCCESS if initialization was successful XST_FAILURE in case of failure

XIpiPs_Init

Initialize the ZynqMP Mailbox Instance.

Prototype

```
u32 XIpiPs_Init(XMailbox *InstancePtr, u8 DeviceId);
```

Parameters

The following table lists the `XIpiPs_Init` function arguments.

Table 7: **XIpiPs_Init Arguments**

Type	Name	Description
`XMailbox` *	InstancePtr	is a pointer to the instance to be worked on
u8	DeviceId	is the IPI Instance to be worked on

Returns

XST_SUCCESS if initialization was successful XST_FAILURE in case of failure

XIpiPs_Send

This function triggers an IPI to a destnation CPU.

Prototype

```
u32 XIpiPs_Send(XMailbox *InstancePtr, u8 Is_Blocking);
```

Parameters

The following table lists the `XIpiPs_Send` function arguments.

Table 8: **XIpiPs_Send Arguments**

Type	Name	Description
`XMailbox` *	InstancePtr	Pointer to the `XMailbox` instance.
u8	Is_Blocking	if set trigger the notification in blocking mode

Returns

XST_SUCCESS in case of success XST_FAILURE in case of failure

XIpiPs_SendData

This function sends an IPI message to a destnation CPU.

Prototype

```
u32 XIpiPs_SendData(XMailbox *InstancePtr, void *MsgBufferPtr, u32 MsgLen,
u8 BufferType, u8 Is_Blocking);
```

Parameters

The following table lists the `XIpiPs_SendData` function arguments.

Table 9: **XIpiPs_SendData Arguments**

Type	Name	Description
`XMailbox` *	InstancePtr	Pointer to the `XMailbox` instance
void *	MsgBufferPtr	is the pointer to Buffer which contains the message to be sent
u32	MsgLen	is the length of the buffer/message
u8	BufferType	is the type of buffer
u8	Is_Blocking	if set trigger the notification in blocking mode

Returns

XST_SUCCESS in case of success XST_FAILURE in case of failure

XIpiPs_PollforDone

Poll for an acknowledgement using Observation Register.

Prototype

```
u32 XIpiPs_PollforDone(XMailbox *InstancePtr);
```

Parameters

The following table lists the `XIpiPs_PollforDone` function arguments.

Table 10: **XIpiPs_PollforDone Arguments**

Type	Name	Description
`XMailbox` *	InstancePtr	Pointer to the `XMailbox` instance

Returns

XST_SUCCESS in case of success XST_FAILURE in case of failure

XIpiPs_RecvData

This function reads an IPI message.

Prototype

```
u32 XIpiPs_RecvData(XMailbox *InstancePtr, void *MsgBufferPtr, u32 MsgLen,
u8 BufferType);
```

Parameters

The following table lists the `XIpiPs_RecvData` function arguments.

Table 11: **XIpiPs_RecvData Arguments**

Type	Name	Description
`XMailbox` *	InstancePtr	Pointer to the `XMailbox` instance
void *	MsgBufferPtr	is the pointer to Buffer to which the read message needs to be stored
u32	MsgLen	is the length of the buffer/message
u8	BufferType	is the type of buffer

Returns

- XST_SUCCESS if successful
- XST_FAILURE if unsuccessful

XIpiPs_RegisterIrq

Prototype

```
XStatus XIpiPs_RegisterIrq(XScuGic *IntcInstancePtr, XMailbox *InstancePtr,
u32 IpiIntrId);
```

XIpiPs_ErrorIntrHandler

Prototype

```
void XIpiPs_ErrorIntrHandler(void *XMailboxPtr);
```

XIpiPs_IntrHandler

Prototype

```
void XIpiPs_IntrHandler(void *XMailboxPtr);
```

Enumerations

Enumeration XMailbox_Handler

Contains XMAILBOX Handler Types.

Table 12: **Enumeration XMailbox_Handler Values**

Value	Description
XMAILBOX_RECV_HANDLER	For Recv Handler.
XMAILBOX_ERROR_HANDLER	For Error Handler.

Data Structure Index

The following is a list of data structures:

XMailbox

Holds the function pointers for the operations that can be performed.

Declaration

```
typedef struct
{
  u32(* XMbox_IPI_Send)(struct XMboxTag *InstancePtr, u8 Is_Blocking),
  u32(* XMbox_IPI_SendData)(struct XMboxTag *InstancePtr, void *BufferPtr,
u32 MsgLen, u8 BufferType, u8 Is_Blocking),
  u32(* XMbox_IPI_Recv)(struct XMboxTag *InstancePtr, void *BufferPtr, u32
MsgLen, u8 BufferType),
  XMailbox_RecvHandler RecvHandler,
  XMailbox_ErrorHandler ErrorHandler,
  void * ErrorRefPtr,
  void * RecvRefPtr,
  XMailbox_Agent Agent
} XMailbox;
```

Table 13: **Structure XMailbox member description**

Member	Description
XMbox_IPI_Send	Triggers an IPI to a destination CPU.
XMbox_IPI_SendData	Sends an IPI message to a destination CPU.
XMbox_IPI_Recv	Reads an IPI message.
RecvHandler	Callback for rx IPI event.
ErrorHandler	Callback for error event.
ErrorRefPtr	To be passed to the error interrupt callback.
RecvRefPtr	To be passed to the receive interrupt callback.
Agent	Used to store IPI Channel information.

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Appendix A

Additional Resources and Legal Notices

Xilinx Resources

For support resources such as Answers, Documentation, Downloads, and Forums, see Xilinx Support.

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- From the Vivado® IDE, select **Help → Documentation and Tutorials**.
- On Windows, select **Start → All Programs → Xilinx Design Tools → DocNav**.
- At the Linux command prompt, enter `docnav`.

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- In DocNav, click the **Design Hubs View** tab.
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