OpenMAX™ Integration Layer Application Note

Version 1.1.2

AppNote IL#0318:

Interop component interactions in transitional states

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1. Outline

1.1. Scope

This document outlines implementation guidelines for OpenMAX-IL component and client developers. These guidelines avoid unexpected and unwilling behavior (also known as race-conditions) during component interactions in transitional states.

This application note should be read together with the OpenMAX-IL version 1 specification (see [1]), and clarifies some parts in the specification that could be misunderstood.

This document is restricted to OpenMAX-IL version 1.0 and 1.1, interop profile (see [1], paragraph 2.1.3.1) and for an execution model where the data processor, including callbacks, is handled in a thread(s) different than IL-Client's thread (see [1], Figure2-5).

1.2. Introduction

The OpenMAX-IL 1.1.x specification defines a clear state-model (see [1], Figure2-3), the valid component calls within a state (see [1], Table3-10), and the component state transitions (see [1], Figure3-1).

In interop profile, the OpenMAX-IL client is building an OpenMAX-IL network that consists of two (or more) 'peer' components, as shown in Figure 1-1 below. Furthermore the OpenMAX-IL client instructs the OpenMAX-IL components belonging to the network to transition to a next state. These instructions are on a per component basis and handled asynchronously by the OpenMAX-IL components.

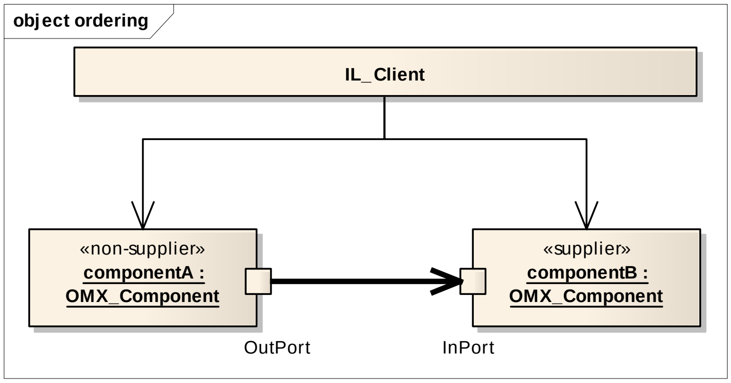


Figure 1-1: Object Ordening

The OpenMAX-IL interop components are in transitional states (neither visible to OpenMAX-IL client, nor to OpenMAX-IL peer component) when the OpenMAX-IL client has submitted the request, but the OpenMAX-IL component has not reached the new state yet.

To reach the new state, sometimes the OpenMAX-IL component is relying on the behaviour of the peer component. This behaviour is dependent on Buffer supplier negotiation results after OMX_SetupTunnel and (transitional) state of the peer component, hence it's important to clearly define the expected behaviour to endorse interoperability in the **interactions between multiple OpenMAX-IL interop components in transitional states**.

The execution time to bring peer IL_Components into the new state is dependent on:

- `Tclient` is the time between issuing both OMX_SendCommand operations (client dependent)
- `Tcomp` is the time to execute the actual command (platform dependent).

Both execution times are not specified. This execution time, and also the order of calls, could result in certain conditions that are not specified or even do not fully comply to the OpenMAX-IL specification.

The OpenMAX-IL specification shows a set of calling sequences (see [1], paragraph 3.4). These sequence diagrams assume a fast reactive system. Furthermore the sequence diagrams show transitioning a component first, while sometimes transitioning the 'other' component first could be of at least equal interest.
This application note describes a set of implementation guidelines such that the conditions are set to be interoperable and complements the sequence diagrams in the OpenMAX-IL specification (see [1], paragraph 3.4).

These guidelines are considered as "Should", according the definition in OpenMAX-IL specification (see [1] Table1-1). The OpenMAX-IL workgroup recommends the implementation of the proposed guidelines for both OpenMAX-IL client developers as well as OpenMAX-IL component developers.

The following topics are described:

- Allocate/Destroy buffers in transitional states
    - Loaded to Idle
    - Idle to Loaded
- Communicating buffers in transitional states
    - Idle to Executing
    - Executing to Idle
- Port Enable/Disable
- Complex graphs

The application note finishes with the guidelines:

- Recommendations for implementers

1.3. References

[1] OpenMAX-IL 1.1.2 specification, see www.khronos.org/openmax

2. Allocate/Destroy buffers in transitional states

This chapter describes the expected behaviour while transitioning between OMX_StateLoaded and OMX_StateIdle in both directions.

2.1.1. Loaded to Idle

The OpenMAX-IL specification describes that the OMX_UseBuffer macro shall be executed when the called component is in OMX_StateLoaded state and has already received a request for the state transition to OMX_StateIdle (see [1], Section 3.2.14).

The OMX_component that acts as buffer supplier calls OMX_UseBuffer on the tunnelled OMX_component to create the bufferheader. Both OMX_components are requested to transition from OMX_StateLoaded to OMX_StateIdle by the IL-client via two asynchronous calls.

As shown in the OpenMAX-IL specification (see [1], Figure 3-10), when the non-Supplier port is transitioned first, it waits for the Supplier port to call the non-supplier's OMX_UseBuffer method. So irrespectively of the component scheduling, the system behaves as expected.

However an erroneous condition can occur when the Supplier port is transitioned first. The supplier will issue an OMX_UseBuffer call while the non-Supplier has not received its request to transition to OMX_StateIdle yet:

- Non-supplier (in LOADED state, not transitioning) receives an OMX_UseBuffer call

Figure 2-1 illustrates the expected behaviour of each tunnelled component during the state transition when the Supplier port is transitioning first.

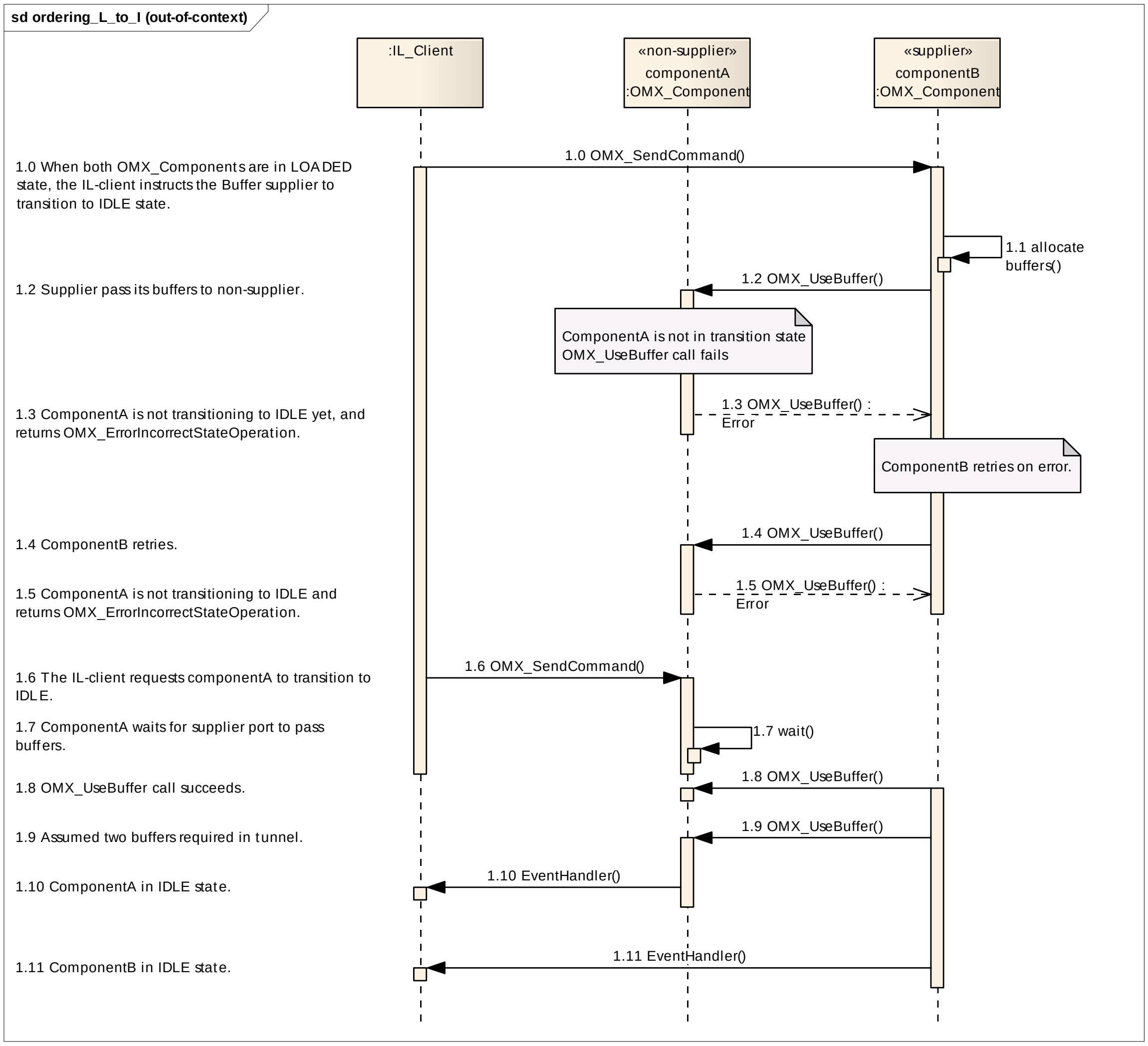

sd ordering_L_to_I (out-of-context)
:IL_Client
«non-supplier» componentA :OMX_Component
«supplier» componentB :OMX_Component
1.0 When both OMX_Components are in LOADED state, the IL-client instructs the Buffer supplier to transition to IDLE state.
1.0 OMX_SendCommand()
1.1 allocate buffers()
1.2 Supplier pass its buffers to non-supplier.
1.2 OMX_UseBuffer()
ComponentA is not in transition state OMX_UseBuffer call fails
1.3 ComponentA is not transitioning to IDLE yet, and returns OMX_ErrorIncorrectStateOperation.
1.3 OMX_UseBuffer() : Error
ComponentB retries on error.
1.4 ComponentB retries.
1.4 OMX_UseBuffer()
1.5 ComponentA is not transitioning to IDLE and returns OMX_ErrorIncorrectStateOperation.
1.5 OMX_UseBuffer() : Error
1.6 The IL-client requests componentA to transition to IDLE.
1.6 OMX_SendCommand()
1.7 ComponentA waits for supplier port to pass buffers.
1.7 wait()
1.8 OMX_UseBuffer call succeeds.
1.8 OMX_UseBuffer()
1.9 Assumed two buffers required in tunnel.
1.9 OMX_UseBuffer()
1.10 ComponentA in IDLE state.
1.10 EventHandler()
1.11 ComponentB in IDLE state.
1.11 EventHandler()

Figure 2-1: Transition to Idle while Supplier first

On reception by componentB of the command to transition to OMX_StateIdle, the supplier port shall pass its buffers to its peer non-supplier port via OMX_UseBuffer. Since componentA has not received the request to transition to OMX_StateIdle, the non-supplier port should reject the Buffer via returning OMX_ErrorInvalidStateOperation. Now the supplier port should retry (typically after a small delay) to pass its buffer again to its peer non-supplier port via OMX_UseBuffer and should keep trying until success (return OMX_ErrorNone). On success, the supplier shall further transfer all its buffers to the non-supplier via OMX_UseBuffer. Now both OMX-Components are transitioned to OMX_StateIdle.

It is assumed that the non-supplier port is transitioned to OMX_StateIdle during the period of retries. An IL-client may use a timer to guard the transition to happen within an expected time.

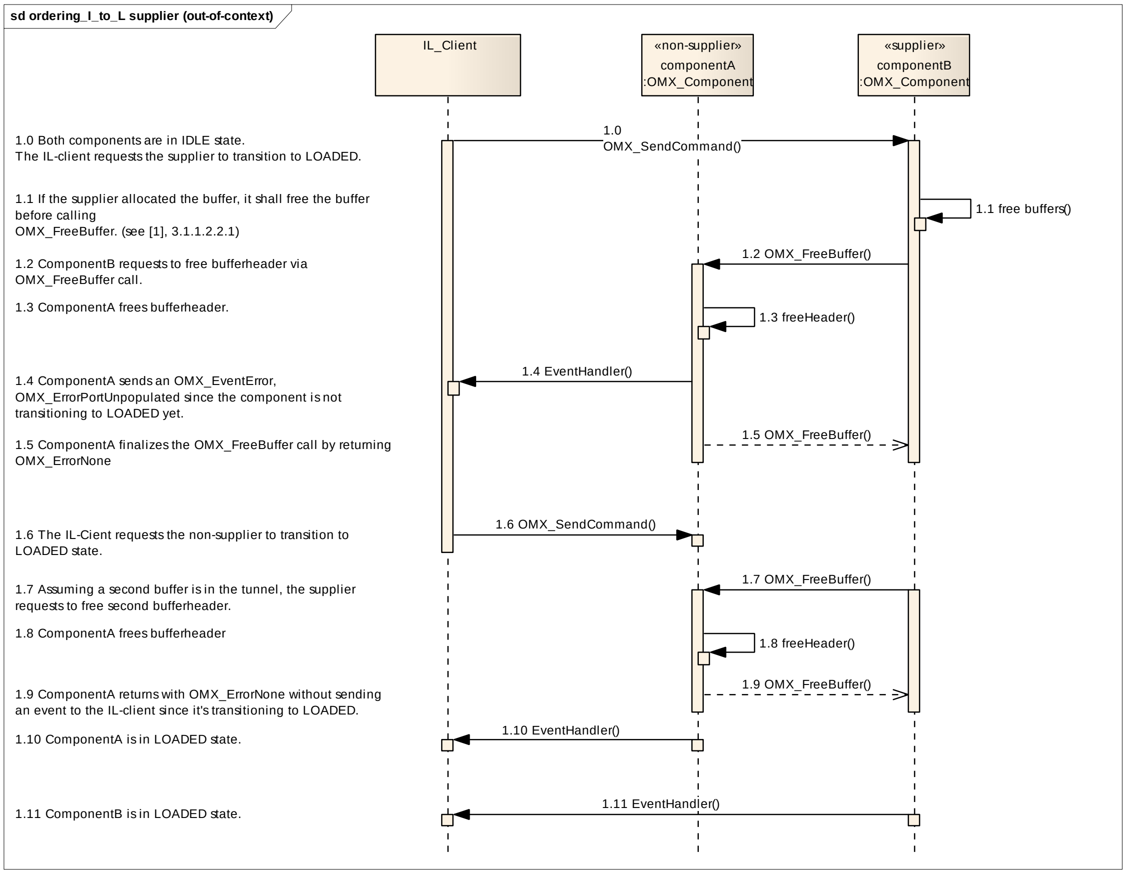
2.1.2. Idle to Loaded

The OMX_component that acts as buffer supplier holds all the buffers in OMX_StateIdle. During transitioning to OMX_StateLoaded, the buffer suppliers shall free their buffers and call OMX_FreeBuffer to tunnelled component (non-supplier) to free the bufferheader. Note that OMX_FreeBuffer is allowed in any state (see [1], Table 3-10).

When transitioning componentA (non-supplier port) first, it waits for the supplier port to send OMX_FreeBuffer. So irrespectively of the component scheduling, the system behaves as expected.

As shown in the OpenMAX-IL specification (see [1], Figure 3-15), if the component that holds the supplier port is transitioned first and the component holding the non-supplier port is already transitioning to OMX_StateLoaded, the system behaves as expected.

Figure 2-2 illustrates, if componentB (supplier port) is transitioned first while componentA (non-supplier port) is not transitioning yet.



sd ordering_I_to_L supplier (out-of-context)

1.0 Both components are in IDLE state.
The IL-client requests the supplier to transition to LOADED.

1.1 If the supplier allocated the buffer, it shall free the buffer before calling
OMX_FreeBuffer. (see [1], 3.1.1.2.2.1)

1.2 ComponentB requests to free bufferheader via OMX_FreeBuffer call.

1.3 ComponentA frees bufferheader.

1.4 ComponentA sends an OMX_EventError, OMX_ErrorPortUnpopulated since the component is not transitioning to LOADED yet.

1.5 ComponentA finalizes the OMX_FreeBuffer call by returning OMX_ErrorNone

1.6 The IL-Cient requests the non-supplier to transition to LOADED state.

1.7 Assuming a second buffer is in the tunnel, the supplier requests to free second bufferheader.

1.8 ComponentA frees bufferheader

1.9 ComponentA returns with OMX_ErrorNone without sending an event to the IL-client since it's transitioning to LOADED.

1.10 ComponentA is in LOADED state.

1.11 ComponentB is in LOADED state.

Figure 2-2: Transition to Loaded while Supplier first

As described (see [1], paragraph 3.2.2.16), the OMX_FreeBuffer call can be made any time, and may result in a port sending OMX_ErrorPortUnpopulated error event to the IL-client. This event error should be interpreted as a warning to the IL-client and can be ignored if the client is transitioning the OpenMAX-IL network to OMX_StateLoaded.

2.2. Communicating buffers in transitional states

This chapter describes the expected behaviour while transitioning between OMX_StateIdle and OMX_StateExecuting in both directions.

2.2.1. Idle to Executing

The OpenMAX-IL specification describes that buffers are transferred using OMX_EmptyThisBuffer/OMX_FillThisBuffer call sequences on connected OpenMAX-IL ports (see [1], Table 3-10). A component in OMX_StateIdle state has all resources and has not transferred any buffers or has not processed any data. The location of buffers is at Supplier only (see [1], Table 3-3). A component is transferring buffers and is processing data (if data is available) in OMX_StateExecuting state. The location of buffers is at Supplier or Non-Supplier (see [1], Table 3-3).

The OpenMAX-IL specification also defines that during transitional states from OMX_StateIdle to OMX_StateExecuting, the component shall begin transferring and processing data. Among tunnelling ports, any input port that is also a supplier shall transfer its empty buffers to the tunnelled output port via OMX_FillThisBuffer (see [1], paragraph 3.1.1.2.2.2).

When the non-Supplier port is transitioned first, it waits for the Supplier port to send buffers for processing (OMX_FillThisBuffer if input port is supplier). So irrespectively of the component scheduling, the system behaves as expected.

However an erroneous condition can occur when the Supplier port is transitioned first. The supplier will issue an OMX_EmptyThisBuffer/OMX_FillThisBuffer call while the non-Supplier has not received its request to transition to OMX_StateExecuting yet:

- Non-supplier (in IDLE state, not transitioning) receives an OMX_EmptyThisBuffer/OMX_FillThisBuffer call

Figure 2-3 illustrates the expected behaviour of each tunnelled component during the state transition when the Supplier port is transitioning first.

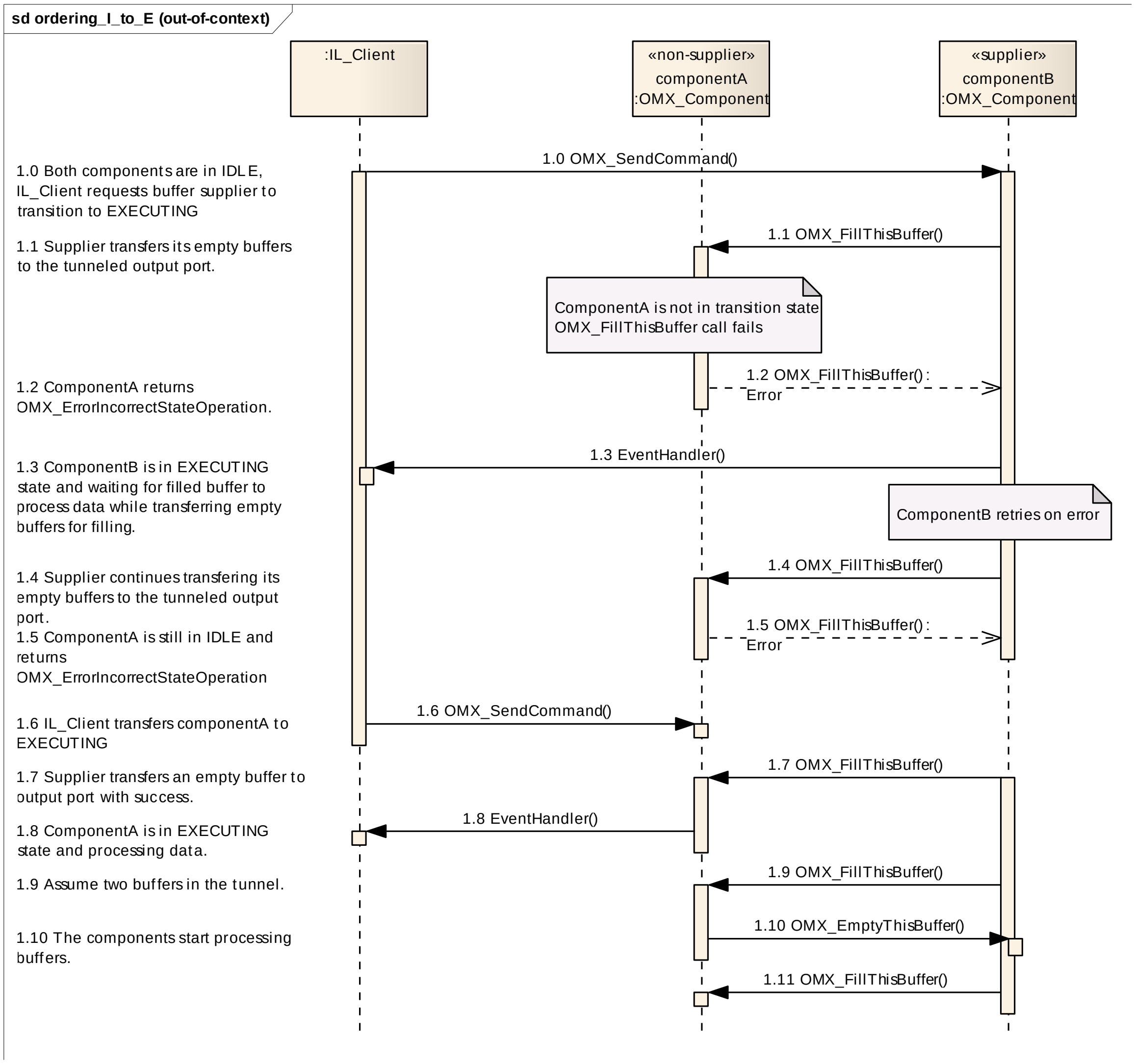

sd ordering_I_to_E (out-of-context)
:IL_Client
«non-supplier» componentA :OMX_Component
«supplier» componentB :OMX_Component
1.0 Both components are in IDLE, IL_Client requests buffer supplier to transition to EXECUTING
1.1 Supplier transfers its empty buffers to the tunneled output port.
1.2 ComponentA returns OMX_ErrorIncorrectStateOperation.
1.3 ComponentB is in EXECUTING state and waiting for filled buffer to process data while transferring empty buffers for filling.
1.4 Supplier continues transfering its empty buffers to the tunneled output port.
1.5 ComponentA is still in IDLE and returns OMX_ErrorIncorrectStateOperation
1.6 IL_Client transfers componentA to EXECUTING
1.7 Supplier transfers an empty buffer to output port with success.
1.8 ComponentA is in EXECUTING state and processing data.
1.9 Assume two buffers in the tunnel.
1.10 The components start processing buffers.
1.0 OMX_SendCommand()
1.1 OMX_FillThisBuffer()
ComponentA is not in transition state OMX_FillThisBuffer call fails
1.2 OMX_FillThisBuffer() : Error
1.3 EventHandler()
ComponentB retries on error
1.4 OMX_FillThisBuffer()
1.5 OMX_FillThisBuffer() : Error
1.6 OMX_SendCommand()
1.7 OMX_FillThisBuffer()
1.8 EventHandler()
1.9 OMX_FillThisBuffer()
1.10 OMX_EmptyThisBuffer()
1.11 OMX_FillThisBuffer()

Figure 2-3: Transition to Executing while Supplier first

On reception by componentB of the command to transition to OMX_StateExecuting, the supplier port shall pass its buffers to its peer non-supplier port via OMX_FillThisBuffer. Since componentA has not received the request to transition to OMX_StateExecuting, the non-supplier port should reject the Buffer via returning OMX_ErrorInvalidStateOperation. Since componentB is ready for processing, it reports to the IL-client it has reached OMX_StateExecuting.

Now the supplier port should retry (typically after a small delay) to pass its buffer again to its peer non-supplier port via OMX_FillThisBuffer and should keep trying until success (return OMX_ErrorNone). On success, the supplier shall further transfer all its buffers to the non-supplier via OMX_FillThisBuffer. The non-supplier is transferred to OMX_StateExecuting after reception of the OMX_SendCommand and further processing can happen as shown in ([1], Figure 3-12).

It is assumed that the non-supplier port is transitioned to OMX_StateExecuting during the period of retries. An IL-client may use a timer to guard the transition to happen within an expected time.

2.2.2. Executing to Idle

On transitioning from OMX_StateExecuting to OMX_StateIdle, the components shall return all buffers to their respective suppliers and receive all buffers belonging to its supplier ports before completing the transition (see [1], paragraph 3.1.1.2.3.1).

When the supplier port is transitioned first, it waits for the non-supplier port to return buffers for processing (OMX_EmptyThisBuffer if input port is supplier and OMX_FillThisBuffer if output port is supplier). So irrespectively of the component scheduling, the system behaves as expected (see [1], Figure 3-15).

However an erroneous condition can occur when the non-supplier port is transitioned first. The non-supplier will return all buffers via OMX_EmptyThisBuffer/ OMX_FillThisBuffer calls. While the supplier has not received a request to transition to OMX_StateIdle, the supplier will continue to call OMX_FillThisBuffer/ OMX_EmptyThisBuffer respectively:

- Non-supplier (in IDLE state already, not transitioning) receives an OMX_EmptyThisBuffer/OMX_FillThisBuffer call

Figure 2-4 illustrates the expected behaviour of each tunnelled component during the state transition when the non-supplier port is transitioning first.

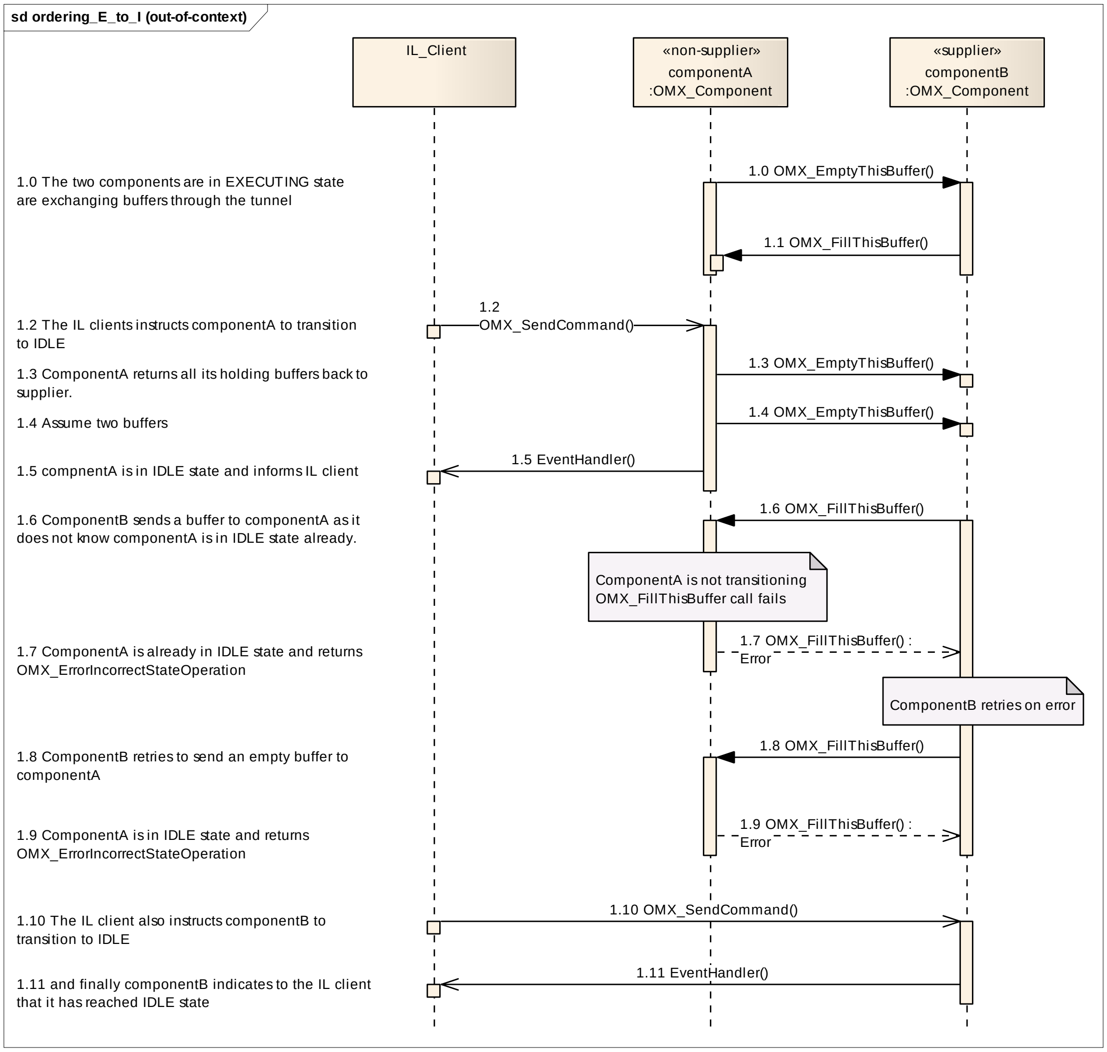

sd ordering_E_to_I (out-of-context)
IL_Client
«non-supplier» componentA :OMX_Component
«supplier» componentB :OMX_Component
1.0 The two components are in EXECUTING state are exchanging buffers through the tunnel
1.0 OMX_EmptyThisBuffer()
1.1 OMX_FillThisBuffer()
1.2 The IL clients instructs componentA to transition to IDLE
1.2 OMX_SendCommand()
1.3 ComponentA returns all its holding buffers back to supplier.
1.3 OMX_EmptyThisBuffer()
1.4 Assume two buffers
1.4 OMX_EmptyThisBuffer()
1.5 compnentA is in IDLE state and informs IL client
1.5 EventHandler()
1.6 ComponentB sends a buffer to componentA as it does not know componentA is in IDLE state already.
1.6 OMX_FillThisBuffer()
ComponentA is not transitioning OMX_FillThisBuffer call fails
1.7 ComponentA is already in IDLE state and returns OMX_ErrorIncorrectStateOperation
1.7 OMX_FillThisBuffer() : Error
ComponentB retries on error
1.8 ComponentB retries to send an empty buffer to componentA
1.8 OMX_FillThisBuffer()
1.9 ComponentA is in IDLE state and returns OMX_ErrorIncorrectStateOperation
1.9 OMX_FillThisBuffer() : Error
1.10 The IL client also instructs componentB to transition to IDLE
1.10 OMX_SendCommand()
1.11 and finally componentB indicates to the IL client that it has reached IDLE state
1.11 EventHandler()

Figure 2-4: Transition to Idle while non-Supplier first

On reception by componentA of the command to transition to OMX_StateIdle, it returns buffers to the supplier port via OMX_EmptyThisBuffer before finishing the transition to OMX_StateIdle. ComponentB is not aware of its peer component state and while remaining in OMX_StateExecuting, it requests componentA to fill a new buffer again via OMX_FillThisBuffer.

Since componentA is already in OMX_StateIdle, the non-supplier port should reject the buffer via returning OMX_ErrorInvalidStateOperation.
Now the supplier port should retry (typically after a small delay) to pass its buffer again to its peer non-supplier port via OMX_FillThisBuffer and should keep trying until success (return OMX_ErrorNone).

On reception of the OMX_SendCommand to transition to OMX_StateIdle, componentB stops sending buffers to componentA. Since componentB has all buffers in its queue, it can finish the transition to OMX_StateIdle and report this to the IL-client.

It is assumed that the supplier port is transitioned to OMX_StateIdle during the period of retries. An IL-client may use a timer to guard the transition to happen within an expected time.

3. Port Enable/Disable

The OpenMAX-IL specification defines an operation to enable or disable an individual port using OMX_CommandPortDisable and OMX_CommandPortEnable (see [1], paragraph 3.2.2.5 and 3.2.2.6)

When an application is using port disablement and enablement in interop profile, it executes a ‘pair’ of transition operations on the tunnel, one to each (non-sharing) port (see [1], paragraph 3.4.4).

As described in previous sections, the behaviour of the system can be dependent on the time between subsequent transitions on ‘peer’ OpenMAX_IL components, or ports as explained in this section.

3.1. Transition to Port Disabled

On transitioning the non-supplier first using OMX_CommandPortDisable, the non-supplier returns all buffers to the supplier and waits for OMX_FreeBuffer calls to finalize the transition. The supplier continues sending OMX_EmptyThisBuffer/ OMX_FillThisBuffer while not transitioning to port DISABLE yet:

- A non-supplier port transitioning from ENABLE to DISABLE should return an error (OMX_ErrorIncorrectStateOperation) on reception of OMX_EmptyThisBuffer/ OMX_FillThisBuffer
- An ENABLED port, from a component in OMX_StateExecuting, should continue retrying to send OMX_EmptyThisBuffer/OMX_FillThisBuffer on reception of the error.

On transitioning the supplier first using OMX_CommandPortDisable, the supplier frees buffers and calls OMX_FreeBuffer on its peer. The non-supplier should accept the call and free the bufferheader, and if not transitioning to port DISABLE yet may report an OMX_PortUnpopulated event to the IL-client.

3.2. Transition to Port Enabled

On transitioning the non-supplier first using OMX_CommandPortEnable, it waits for OMX_UseBuffer calls from the supplier. The supplier provides the buffers once it receives the command to enable its port. So the system reacts as expected.

On transitioning the supplier first using OMX_CommandPortEnable, the supplier calls OMX_UseBuffer on its non-supplier peer:

- A DISABLED port should return an error (OMX_IncorrectStateOperation) on reception of OMX_UseBuffer.
- A port transitioning from DISABLE to ENABLE should continue retrying to send OMX_UseBuffer on reception of the error.

4. Complex graphs

The previous sections have described a simple 2 component graph model, although a graph can exist out of more components tunnelled together and even multiple subgraphs ‘mixed’ together. For the sake of simplicity, let’s consider a three components graph as an example of a complex graph. The three components tunnelled together can be either loosely coupled tunnels or tightly coupled tunnels. Loosely coupled tunnels consist of tunnels that work ‘rather’ independent, while tightly coupled tunnels use Buffer Sharing Relationships (see [1], fig2-6).

4.1. Loosely coupled graphs

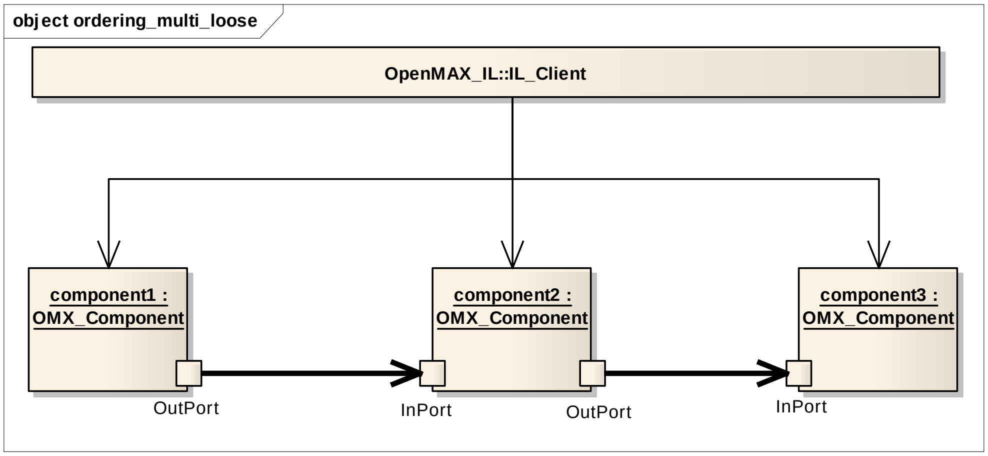

object ordering_multi_loose
OpenMAX_IL::IL_Client
component1 : OMX_Component
component2 : OMX_Component
component3 : OMX_Component
OutPort
InPort
OutPort
InPort

Figure 4-1: Loosely coupled complex graph

When transitioning states (including Port-Disable/Port-Enable), there could be some loose coupled dependencies between the tunnels. Following configurations are possible in the figure above:

	Component1 OutPort	Component2 InPort	Component2 OutPort	Component3 InPort
Config1	*Non-supplier*	*Supplier*	*Supplier*	*Non-supplier*
Config2	*Supplier*	*Non-supplier*	*Non-supplier*	*Supplier*
Config3	*Supplier*	*Non-Supplier*	*Supplier*	*Non-supplier*
Config4	*Non-supplier*	*Supplier*	*Non-supplier*	*Supplier*

The behaviour as described in previous sections holds also for these loosely coupled graphs:

- An OMX_UseBuffer call can be received by a component in OMX_StateLoaded and should be rejected
- An OMX_EmptyThisBuffer/OMX_FillThisBuffer call can be received on a component in OMX_StateIdle and should be rejected

- Report an OMX_ErrorPortUnpopulated event on reception of an OMX_FreeBuffer call while not transitioning from OMX_StateIdle to OMX_StateLoaded

Next to this known behaviour, there is no additional unexpected behaviour in loosely coupled graphs.

4.2. Tightly coupled graphs

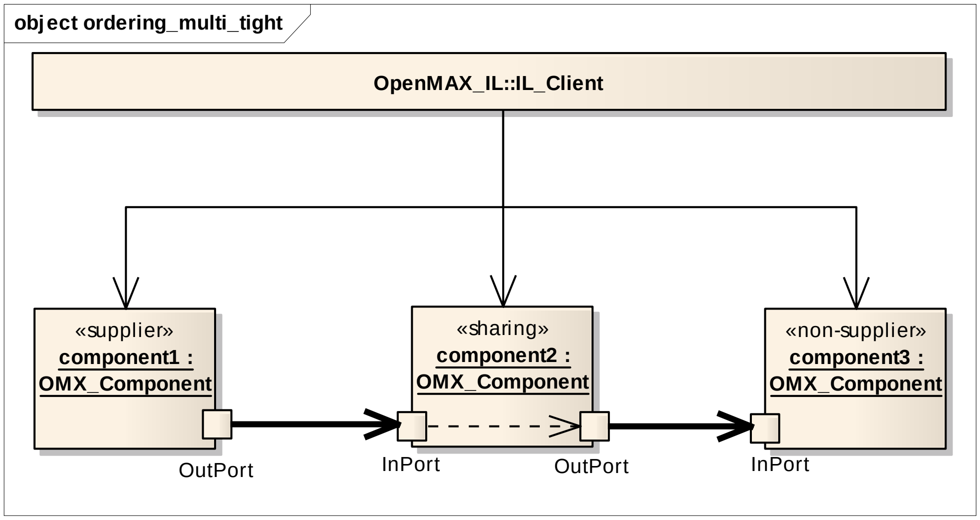
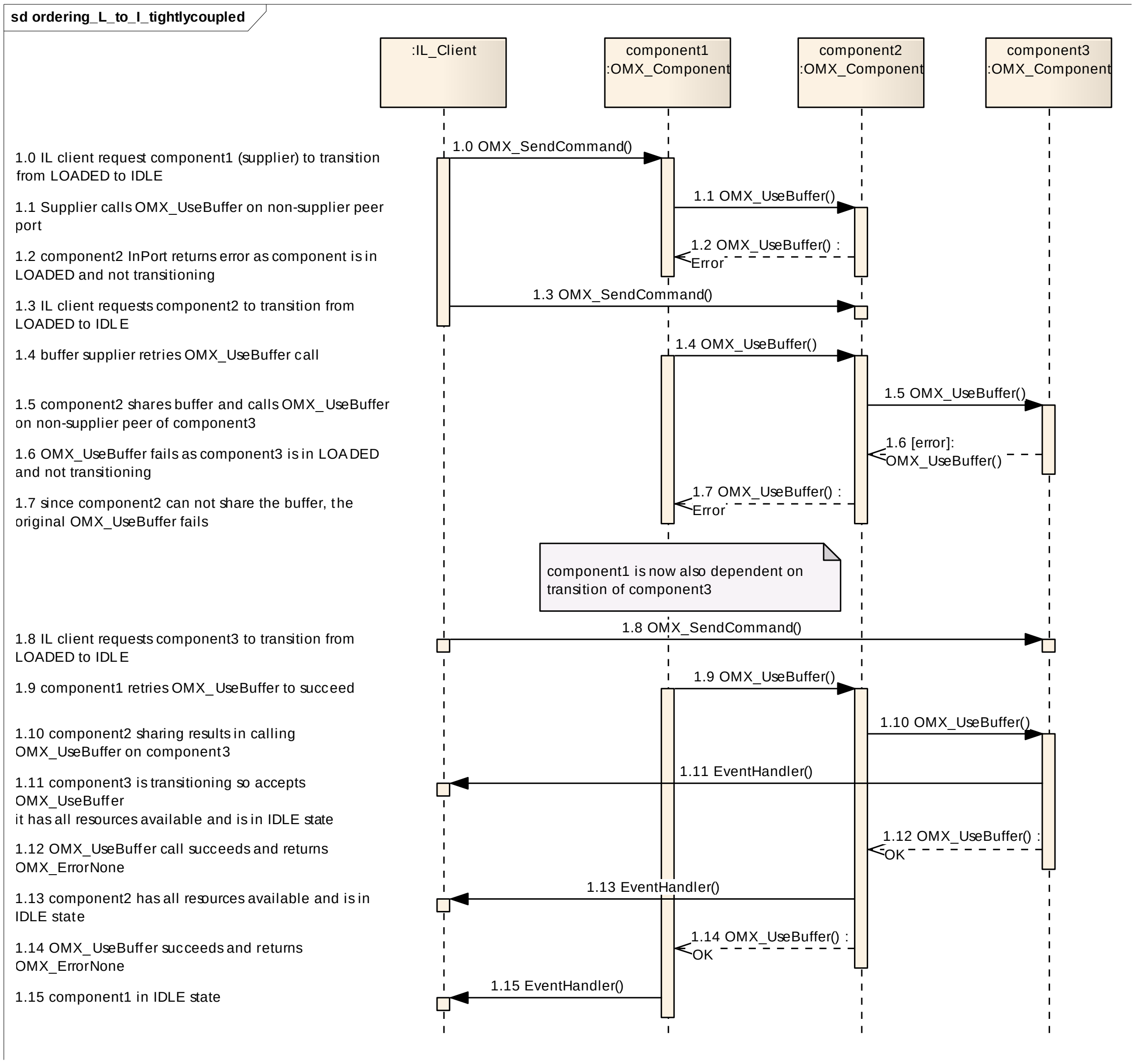


Figure 4-2: Tightly coupled complex graph

When buffer sharing is used, the coupling between tunnels is tightened. As an example Figure 4-3 below illustrates the dependency of component1 on the transition request of component3 when State Transition from Loaded to Idle (Config3).


sd ordering_L_to_I_tightlycoupled
:IL_Client
component1 :OMX_Component
component2 :OMX_Component
component3 :OMX_Component
1.0 OMX_SendCommand()
1.1 OMX_UseBuffer()
1.2 OMX_UseBuffer() : Error
1.3 OMX_SendCommand()
1.4 OMX_UseBuffer()
1.5 OMX_UseBuffer()
1.6 [error]: OMX_UseBuffer()
1.7 OMX_UseBuffer() : Error
component1 is now also dependent on transition of component3
1.8 OMX_SendCommand()
1.9 OMX_UseBuffer()
1.10 OMX_UseBuffer()
1.11 EventHandler()
1.12 OMX_UseBuffer() : OK
1.13 EventHandler()
1.14 OMX_UseBuffer() : OK
1.15 EventHandler()

1.0 IL client request component1 (supplier) to transition from LOADED to IDLE

1.1 Supplier calls OMX_UseBuffer on non-supplier peer port

1.2 component2 InPort returns error as component is in LOADED and not transitioning

1.3 IL client requests component2 to transition from LOADED to IDLE

1.4 buffer supplier retries OMX_UseBuffer call

1.5 component2 shares buffer and calls OMX_UseBuffer on non-supplier peer of component3

1.6 OMX_UseBuffer fails as component3 is in LOADED and not transitioning

1.7 since component2 can not share the buffer, the original OMX_UseBuffer fails

1.8 IL client requests component3 to transition from LOADED to IDLE

1.9 component1 retries OMX_UseBuffer to succeed

1.10 component2 sharing results in calling OMX_UseBuffer on component3

1.11 component3 is transitioning so accepts OMX_UseBuffer
it has all resources available and is in IDLE state

1.12 OMX_UseBuffer call succeeds and returns OMX_ErrorNone

1.13 component2 has all resources available and is in IDLE state

1.14 OMX_UseBuffer succeeds and returns OMX_ErrorNone

1.15 component1 in IDLE state

Figure 4-3: Transition to Idle in tightly coupled complex graph

An IL-client should instruct all components belonging to a tightened graph to transition to the new state as a set of OMX_SendCommand calls closely together.

5. Recommendations for implementers

Guidelines for IL-Components

1. Components should handle a command as fast as possible.
2. Components (in LOADED state and not transitioning) or (with DISABLED port and not transitioning), should not accept OMX_UseBuffer and return an error (OMX_ErrorIncorrectStateOperation) to their tunnelled component.
3. Components in transition (from LOADED to IDLE state) or (from DISABLED port to ENABLED port) should continue retrying to send OMX_UseBuffer to their tunnelled component on reception of OMX_ErrorIncorrectStateOperation.
4. Components (in IDLE state and not transitioning) or (with DISABLED ports and not transitioning) shall not call OMX_EmptyThisBuffer /OMX_FillThisBuffer on tunnelled component.
5. Components (in IDLE state and not transitioning to EXECUTING) or (with DISABLED port and not transitioning), should not accept OMX_EmptyThisBuffer /OMX_FillThisBuffer and return an error (OMX_ErrorIncorrectStateOperation) to their tunnelled component.
6. Components (in EXECUTING state and not transitioning to IDLE) or (with ENABLED port), should continue retrying to send OMX_EmptyThisBuffer/OMX_FillThisBuffer to their tunnelled component on reception of OMX_ErrorIncorrectStateOperation.
7. Components (in IDLE state) or (with ENABLED port) shall accept OMX_FreeBuffer, and if (in IDLE and not transitioning to LOADED) or (with ENABLED port and not transitioning) may report an error (OMX_ErrorPortUnpopulated) to the IL-client.

Guidelines for IL-clients

8. The IL-client should keep the time between all related OMX_SendCommand calls as small as possible.
9. The IL-client should ignore an OMX_ErrorPortUnpopulated event when transitioning components from IDLE to LOADED.
10. The IL-client may retrieve buffer parameters after tunnel setup via OMX_PARAM_BUFFERSUPPLIERTYPE and transition the *non-suppliers* first in backward state transitions (i.e. Executing to Idle and Idle to Loaded)
11. The IL-client may retrieve buffer parameters after tunnel setup via OMX_PARAM_BUFFERSUPPLIERTYPE and transition the *suppliers* first in forward state transitions (i.e. Loaded to Idle and Idle to Executing)
12. The IL-client may guard (e.g. with a timer) the transition to happen within a specific time (implementation specific), and on overflow of the guard inverse the order of transitioning.