Interception

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CSE775 – Distributed Objects

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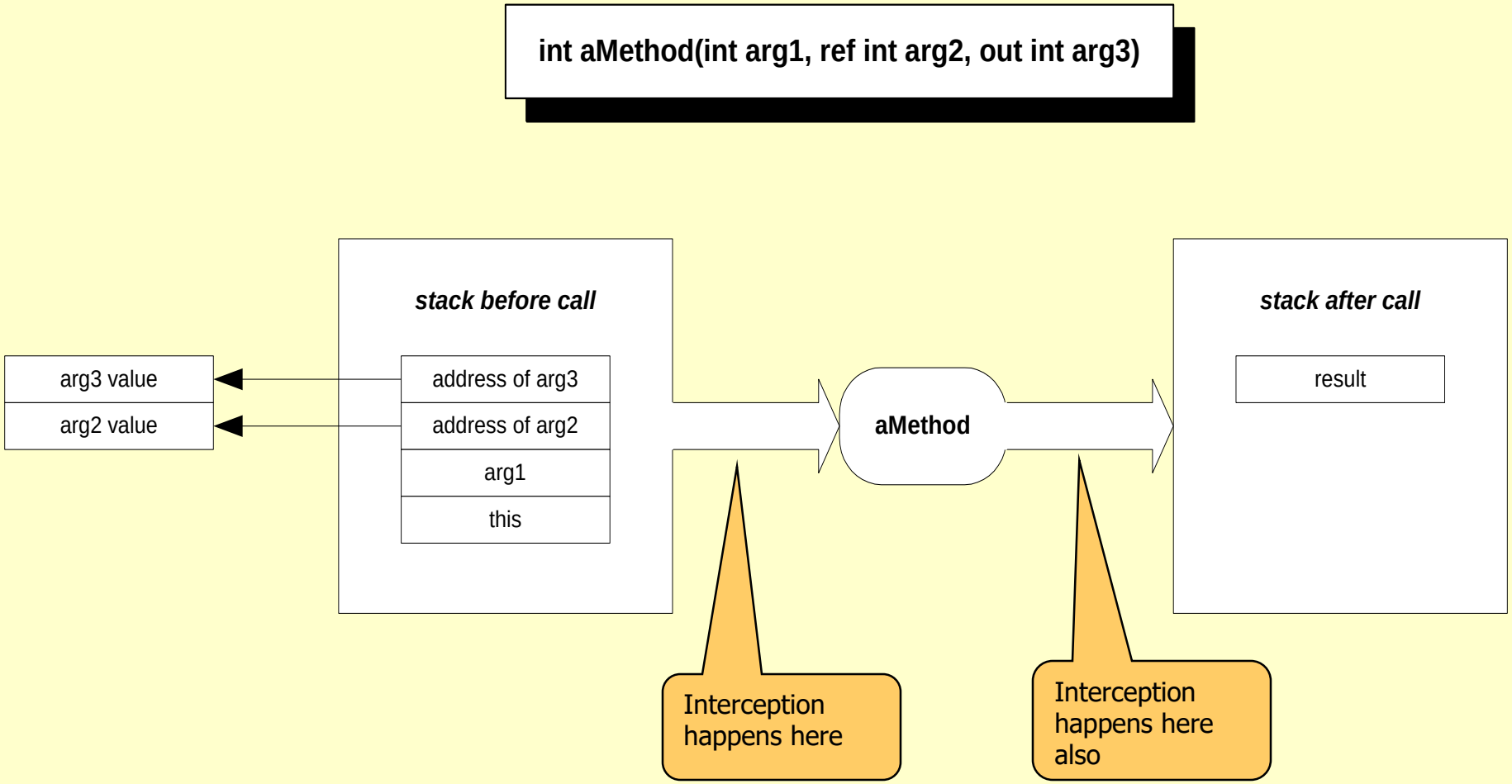
References

- Essential .Net, Volume 1, The Common Lanaguage Runtime, Don Box with Chris Sells, Addison-Wesley, 2003
- Aspect-Oriented Programming, Shukla, Fell, Sells, MSDN, March 2002
- Advanced .Net Remoting, Ingo Rammer, Apress, 2002
- Microsoft .Net Remoting, Scott McLean, James Naftel, Kim Williams, Microsoft Press, 2003

What is Interception?

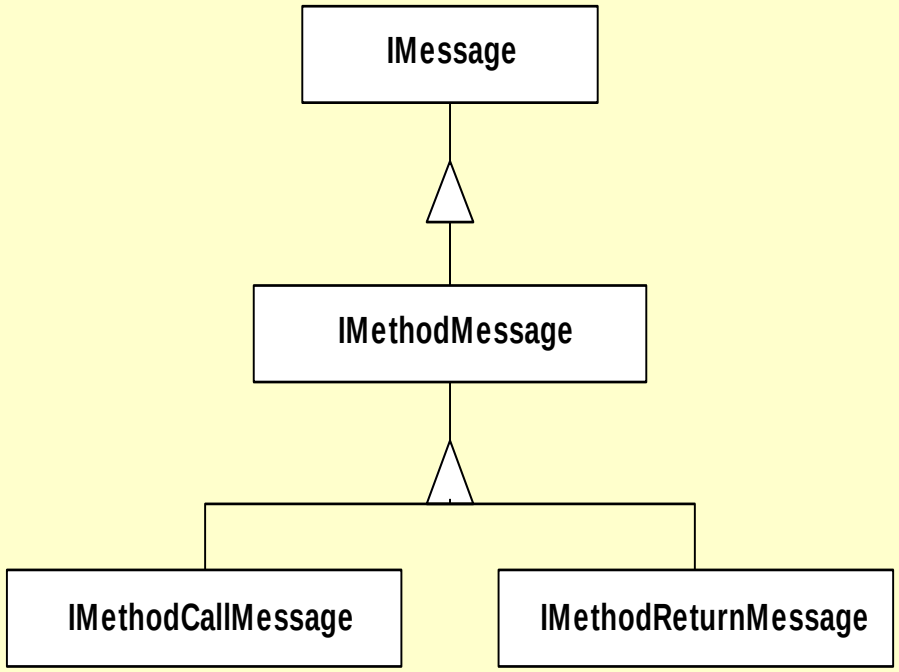
- Interception is the process of inserting processing:
  - When marshaling calls between application domains
    - after a client call, but before the method executes
    - after method execution, but before the thread of exectution returns to the client
- This processing, in .Net, is usually specified by an attribute:
  - [Serializable]
  - [OneWay]
- One use of interception is to attempt to separate solution domain processing from problem domain processing.

Invoking a Method



Invocation Message Model

- The CLR makes method call-stack transformation accessible via the IMessage interface.
- IMethodMessage provides access to method arguments, return value, and to the metadata for the method via a MethodBase property.
- This provides access to stack frame contents without requiring knowledge of the stack layout.



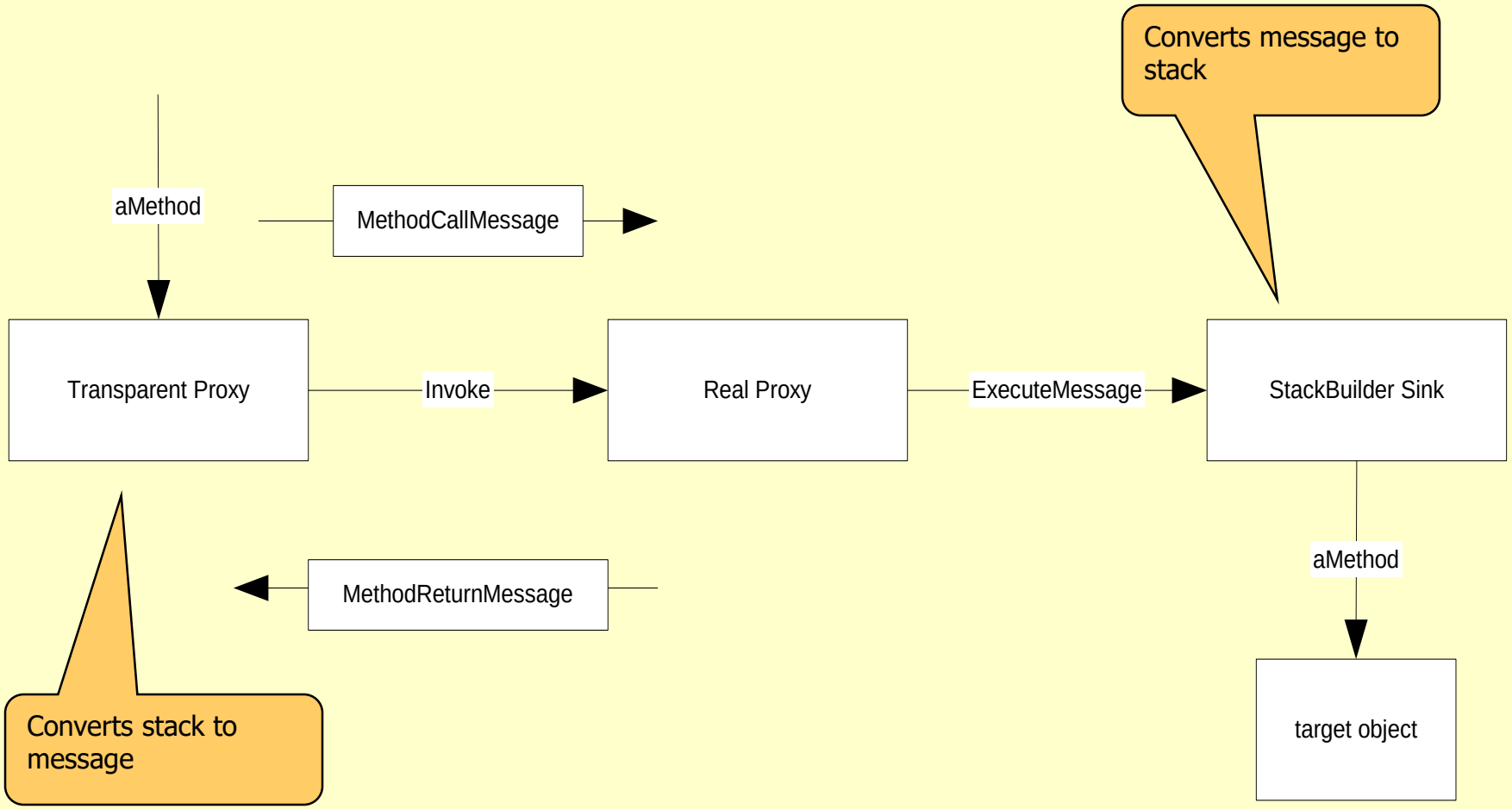
Creation of Messages

- A transparent proxy, created by the CLR, is used to translate method calls into messages.

- The transparent proxy is always associated with a real proxy, responsible for transforming a MethodCallMessage into a MethodReturnMessage.

  The transparent proxy then uses the MethodReturnMessage to transform the call stack into the result stack configuration.

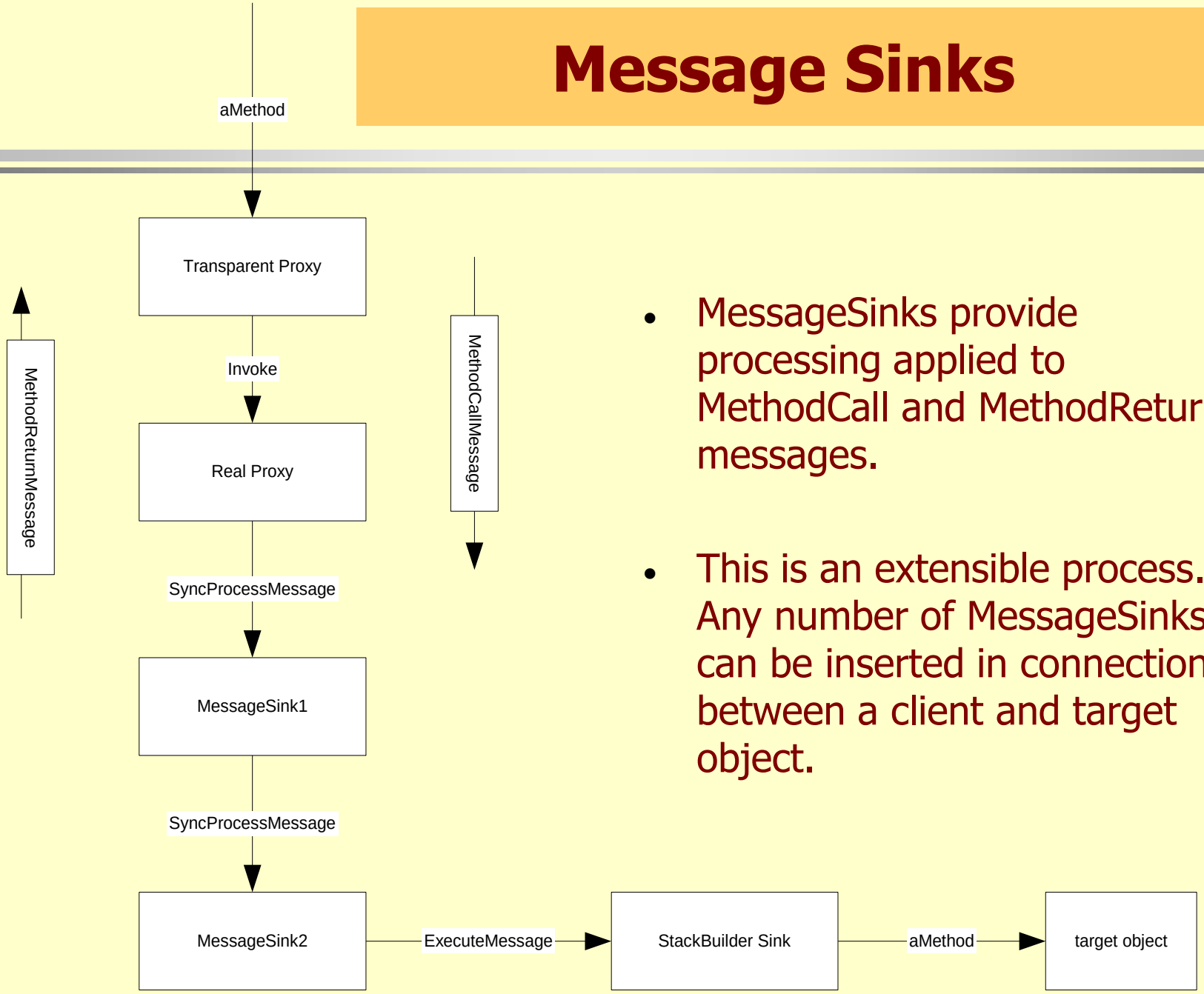
Stack to Message to Stack



ContextBound Objects

- Deriving a class from System.ContextBoundObject ensures that every access to an object is through a transparent proxy.
- A context represents services required by the bound object.
- The whole purpose of interception is to automatically provide pre and post processing of method calls.
- This is done with MessageSinks.
- The context specifies what MessageSink process will be applied to a context bound object.

Message Sinks



- MessageSinks provide processing applied to MethodCall and MethodReturn messages.
- This is an extensible process. Any number of MessageSinks can be inserted in connection between a client and target object.

Installing Message Sinks

- The CLR gives context attribute objects the chance to install context properties as the context is being created.
- It also gives context property objects the opportunity to put MessageSinks between a proxy and ContextBound object when the proxy is created.

Afterword

- These notes summarize material provided in Chapter 7 of Don Box's Essential .Net, Volume 1.
  - In that chapter the author provides a small example that shows code fragments illustrating how to build the interception apparatus.
- Ingo Rammer in his Advanced .Net Remoting, provides examples of how channels work and how to build custom Message Sinks, in chapters 7, 8, and 9.
- Scott McLean, et. al., also provide examples of how to build interception in chapters 5, 6, and 7.

End of Presentation