3. Remote Procedure Call

3.1. What is the definition of an RPC according to Nelson? Distinguish, on the basis of this definition, RPC from the following:

a) A local procedure call,
b) Communication via email,
c) Message exchange in a shared memory multiprocessor system.

3.2. The RPC is an essential communication mechanism in distributed systems.

a) Discuss the basic steps of an RPC!
b) What is the meaning of the terms “marshalling” and “unmarshalling”?
c) Explain the relation between RPC interface descriptions and stub components!

3.3. Binding is an important prerequisite for establishing an RPC-based communication.

a) What is the purpose of binding?
b) Sketch the binding process for the methods direct addressing, broadcast-request and directory service.
c) Discuss the advantages and disadvantages of the various methods of binding.

3.4. RPC systems have to handle different types of errors of the remote communication. The RPC error semantics defines what classes of errors can be handled.

- Which error classes are defined, which error types can be handled and what mechanisms have to be used for handling?
- What error class should be used for the following functionality of the online-shop:
  - User access of product catalog via Browser and HTTP
  - The submission of a product order
  - Money transfer for order payment
  - User request to order state
  - Removing a product from warehouse and adding it to a dispatch list

**Homework:** Fully implement the following scenario based on Java Standard Edition (Java SE) and Java RMI.

- An object for the management of the warehouse provides methods for listing products in the warehouse, requesting the amount of available items for a given product ID as well as to add and remove items with a given product ID and amount of items. A warehouse client binds to the warehouse and invokes the provided methods.