Reliable UDP (RUDP) with Flow Control
Reliable UDP

- The User Datagram Protocol (UDP) is an unreliable connection-less protocol of the Internet protocol suite
  - Sent datagrams are not guaranteed to be received at the destination
  - Datagrams are not guaranteed to be received in order and that only one copy will be received
  - No mechanism exists to be informed about which packets have been lost
- Simple stateless protocol without connection establishment
  - Used in real-time, streaming, multicasting and gaming applications
Reliable UDP

- **UDP** is often too primitive for specific applications because guaranteed-order **packet** delivery is desirable, but **TCP** adds too much complexity/overhead
  - Session management
  - Congestion control
  - ...  

- Implement an Automatic Repeat Request (ARQ) mechanisms for UDP which solves the following problems
  - Acknowledgment of received packets
  - Retransmission of lost packets
  - Windowing and flow control
Reliable UDP

- Take a look at the **Sliding Window** algorithm and its application and at the slides of End-to-end protocols

- There exists a draft version for RUDP from the IETF which should also be studied
  - [http://www.ietf.org/proceedings/44/I-D/draft-ietf-sigtran-reliable-udp-00.txt](http://www.ietf.org/proceedings/44/I-D/draft-ietf-sigtran-reliable-udp-00.txt)

- Implement your protocol in the JNS and perform tests with a client application which simulates packet loss, out of order delivery and duplication
Application for RUDP

- Implement a simple File Transfer Server and Client which uses your RUDP implementation
- Should allow to list and download files
  - See FTP for hints
- Must be able to demonstrate the issues discussed in flow control
  - Server and client should have different processing speeds and thus can read and send data differently
  - Implement Nagle‘s algorithm to prevent silly window syndrome and to send data efficiently