**SYSC3303 Project:**

Full Project Presentation

**05/06/17**

**Group #1 (1000000):**

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**Responsibilities for each Iteration**

**Iteration 1:**

* **Ben Croskery**: Provided base code, util classes, FileRead/Writer Classes, Test Classes, Client Read/Write
* **Ben Earle:** Server main, control, read and write threads, command line interfaces, formatting
* **Dillon Verhaeghe:** Client side support, verbose mode, test mode, conforming to TFTP protocol
* **Patrick Perron:** Writing threads for server, debugging read/write transfers, Main ErrorSimulator code
* **Shane Corrigan:** UMC Diagrams, Server main user interface, documentation

**Iteration 2:**

* **Ben Croskery:** unit testing, terminate incomplete files in bad transfers, testing of packet checking
* **Ben Earle:** UML Sequence diagrams, UDP helper class and replacing all old UDP code, client code
* **Dillon Verhaeghe:** Created packet checking methods for various packet types, fixed bugs
* **Patrick Perron:** Error Sim interface, sabotaging packets with Error Sim, Debugging
* **Shane Corrigan:** Updated client to use UDPHelper, UML class, client debugging

**Iteration 3:**

* **Ben Croskery:** Testing and utility scripts.
* **Ben Earle:** Typed for group programing for err code 1, 2, and 3
* **Dillon Verhaeghe:** Research and design for err code 1, 2, and 3
* **Patrick Perron:** Research and design for err code 1, 2, and 3
* **Shane Corrigan:** Research and design for err code 1, 2, and 3

**Iteration 4:**

* **Ben Croskery:** Fixing bugs, diagrams, verification testing
* **Ben Earle:** Fixing bugs, diagrams, verification testing
* **Dillon Verhaeghe:** Fixing bugs, diagrams, verification testing
* **Patrick Perron:** Error Sim Interface, Duplication, Loss, Delay, etc.
* **Shane Corrigan:** fixing bugs, diagrams, verification testing

**Iteration 5:**

* **Ben Croskery:** Final Testing and Debugging
* **Ben Earle:** Final Testing and Debugging
* **Dillon Verhaeghe:** Implemented Changes, Final Testing and Debugging
* **Patrick Perron:** Final Testing and Debugging
* **Shane Corrigan:** Final Testing and Debugging

**Assumptions made for conditions not specified by TFTP**

* We chose to delete files if there was an error in the transfer. We did not want half complete files to exist on the client or server.
* We chose to NOT allow the client and server to overwrite files. This means that our TFTP client and Server will be sending error code 6 if a file already exists on the server in a WRQ.
* The client and server each try resend packets up to 3 times if no response is received. Quits after the 3rd retransmission.
* If running on different computers, the error simulator runs on the same computer as the server.
* The timeout when receiving packets is 1s, when the client or server timeout during a transfer they will try resending the packet 3 times.
* The Error Simulator will be running on the same computer as the Server.

**Java Files**

**Main Classes:**

* **Server.java:** Code for Server User Interface, launches ControlThread
* **Client.java:** Code for Client that will send Read/Write requests
* **ErrorSimulator.java:** Code for Error simulator that forward messages back and forth between client and server. Sabotages packets to test errors if desired
* **DelayedSendThread.java:** Thread for the Error Simulator to send a packet to the server or client after a delay specified in ms
* **ReadThread.java:** Server Thread for handling read request from server
* **WriteThread.java:** Server Thread for handling write request from server
* **ControlThread.java:** Server Thread for listening for requests from clients and creating threads to handle them
* **ClientResponseThread.java:** Abstract class with shared code for read/write threads

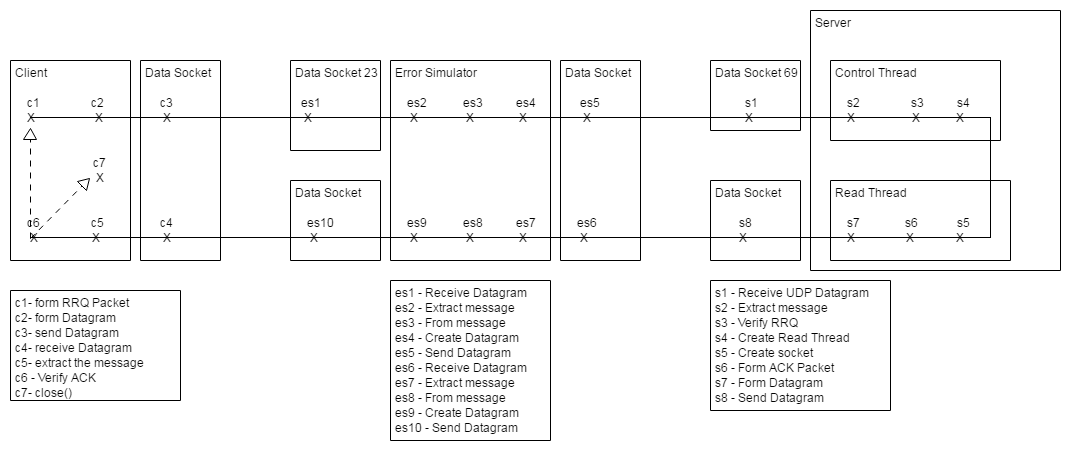
**Utility Classes:**

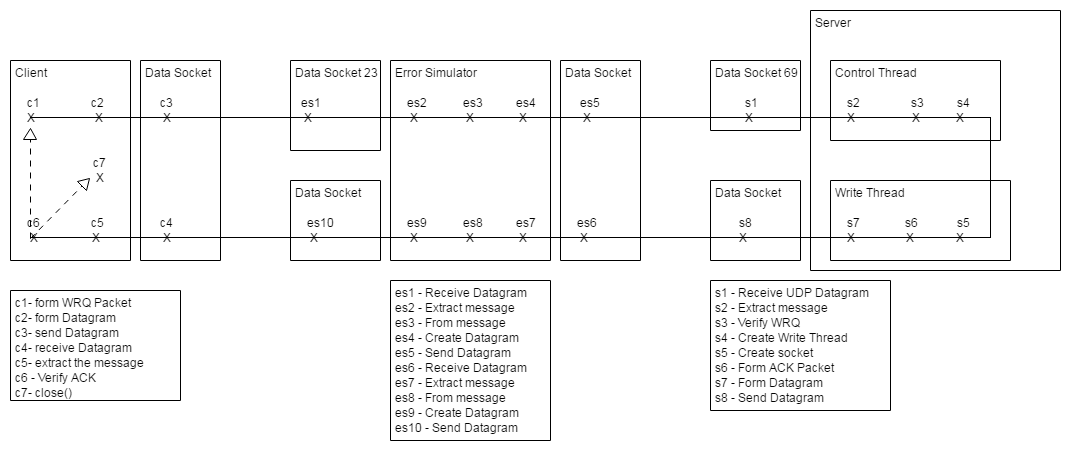
* **util/ErrorScenario.java:** Describes an error case to test for ErrorSimulator
* **util/Var.java:** Contains shared Constants
* **util/Log.java:** Contains methods for controlling logging to console
* **util/FileReader.java:** Class to handle writing bytes to a file
* **util/FileWriter.java:** Class to handle reading bytes from a file
* **util/TFTPErrorHelper.java:** Static class that checks packets for specific errors
* **util/UDPHelper.java:** Class to facilitate UDP send and receive operations

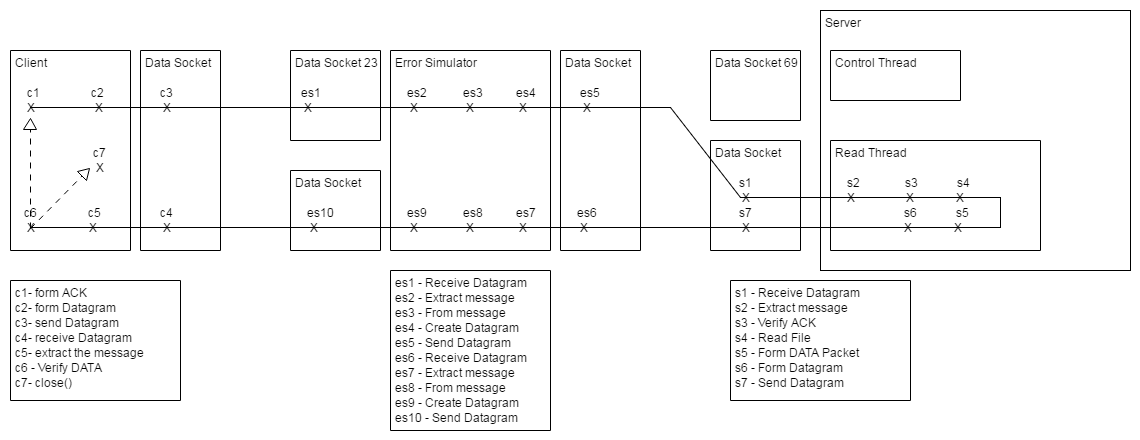
**Diagrams**

**Use Case Maps (Iteration 1):**

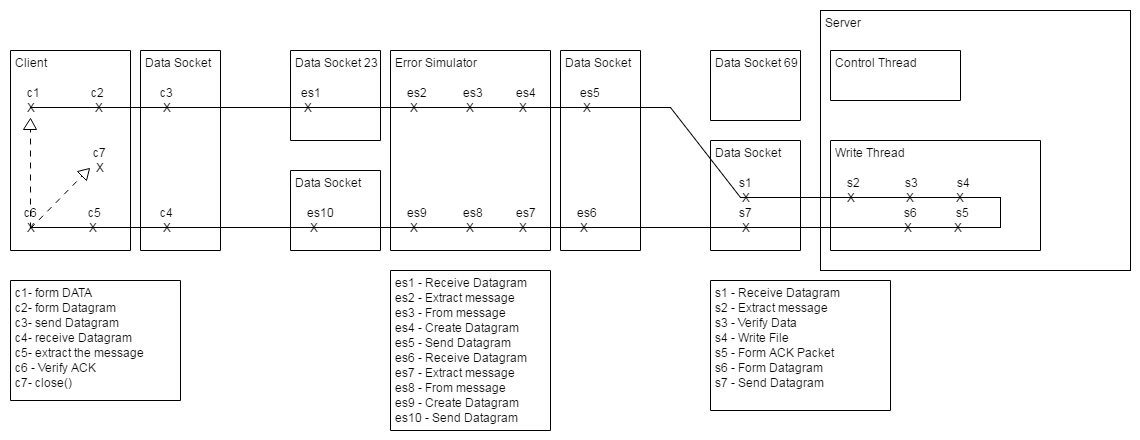
* **Diagrams/Iteration1/IT1 RRQ Connection.png:**

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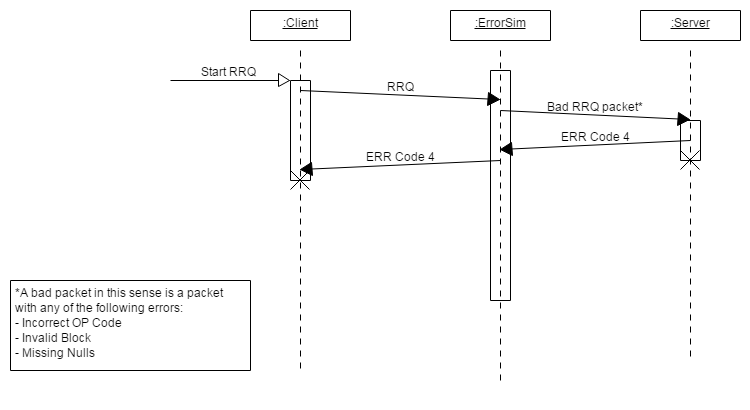
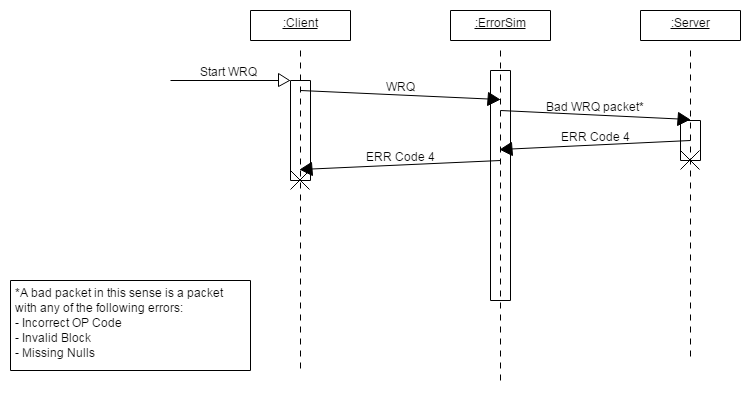
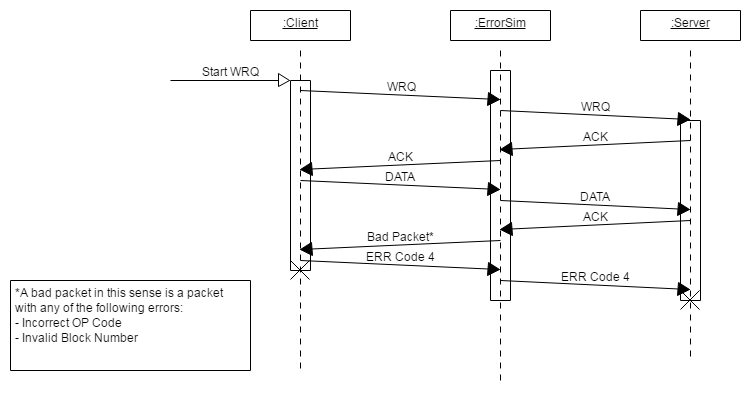
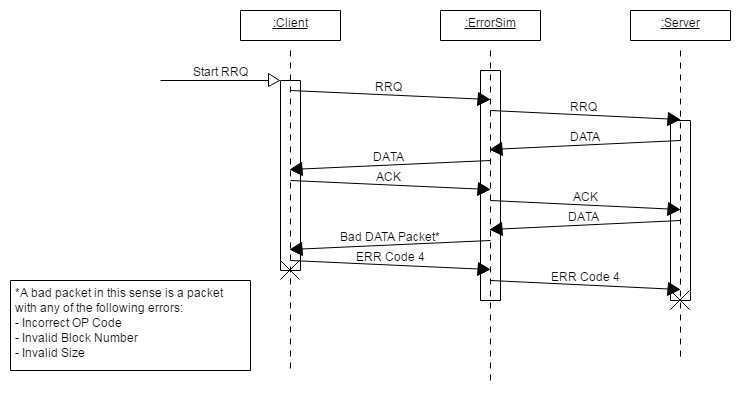
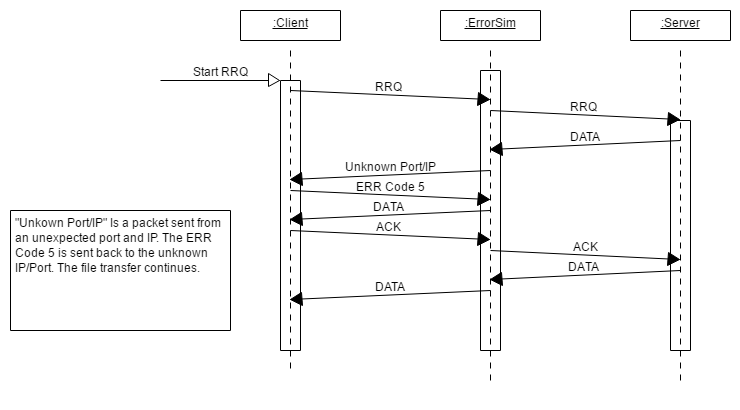
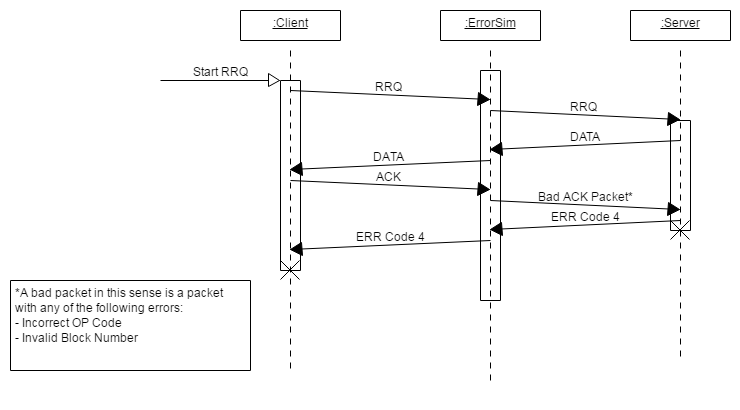
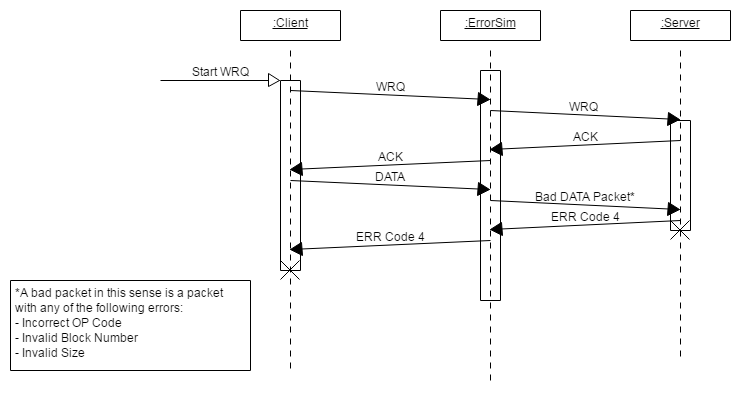
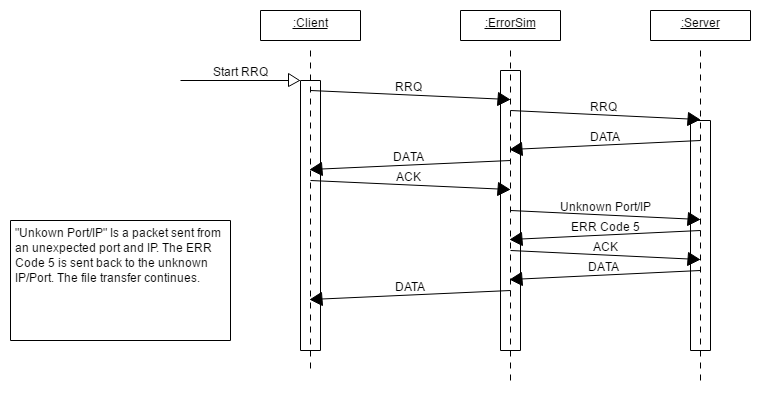
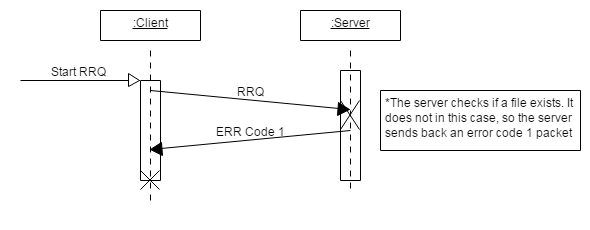
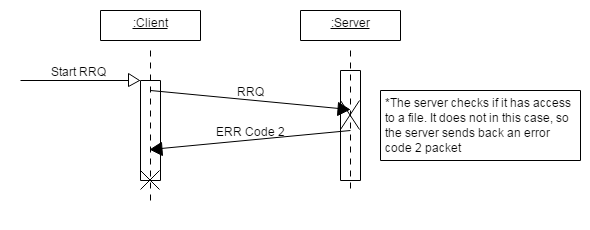
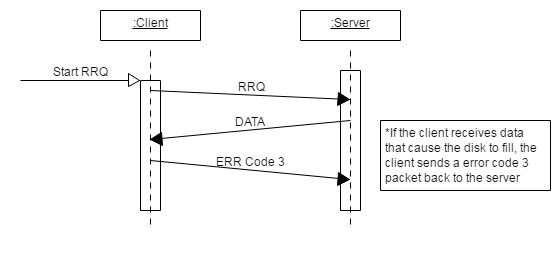
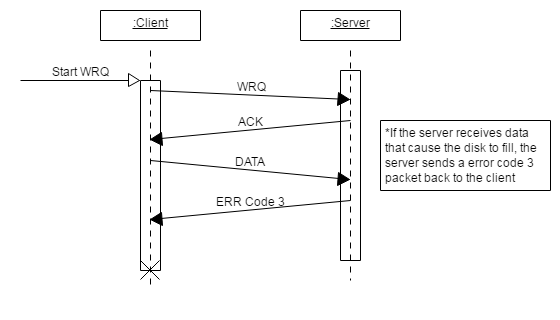
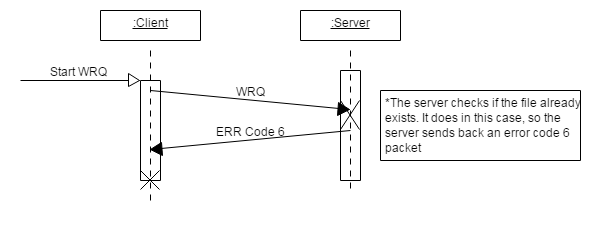
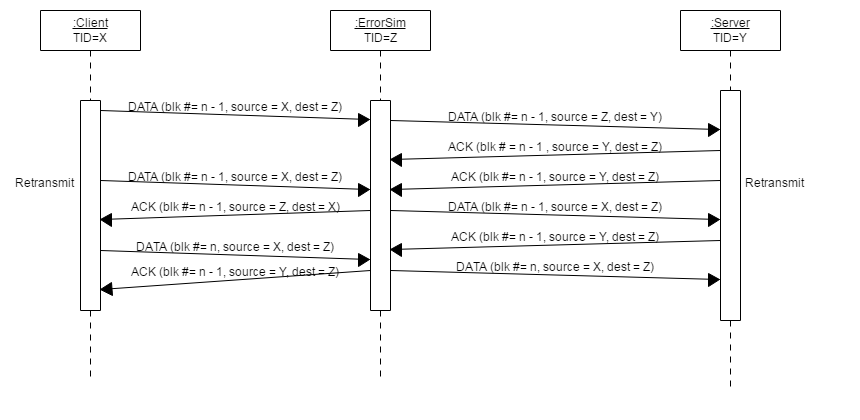
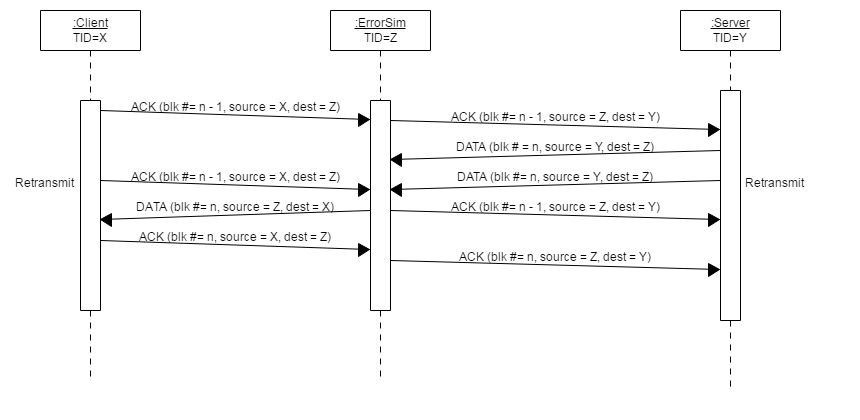
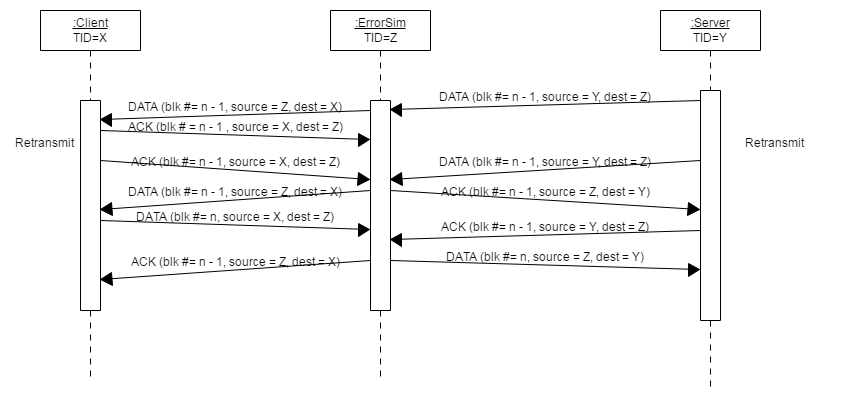
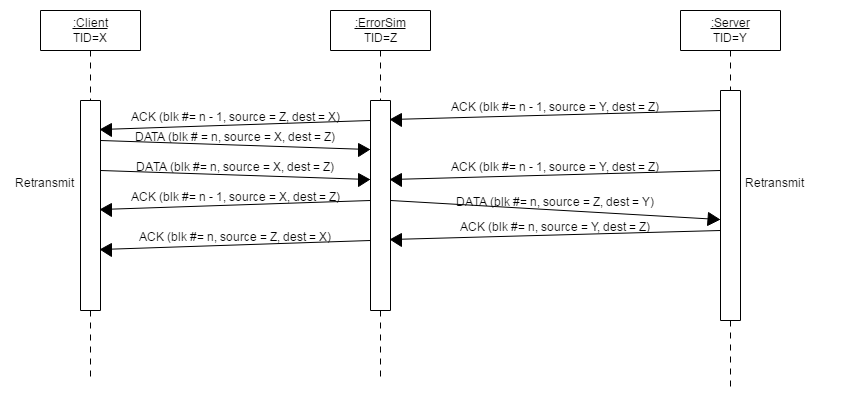
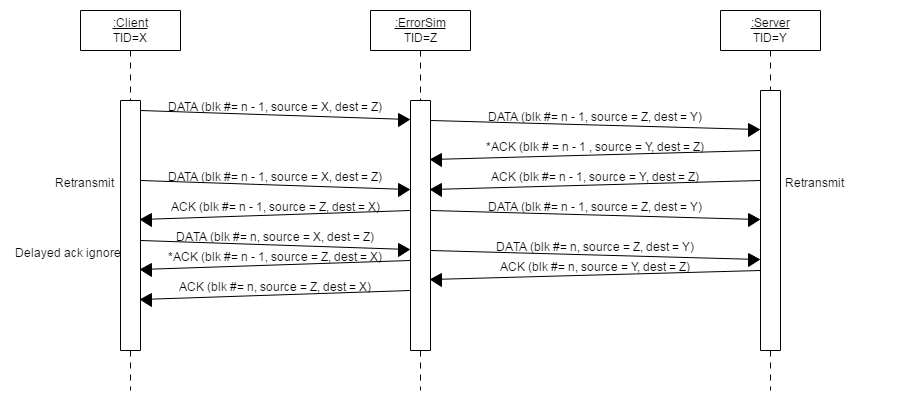
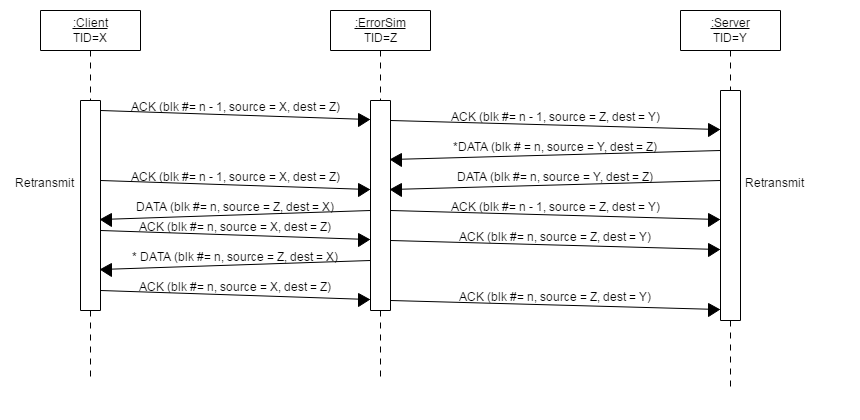
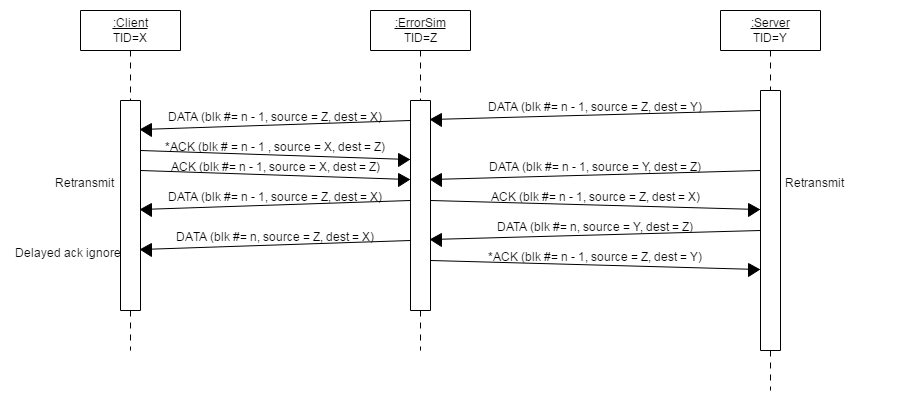
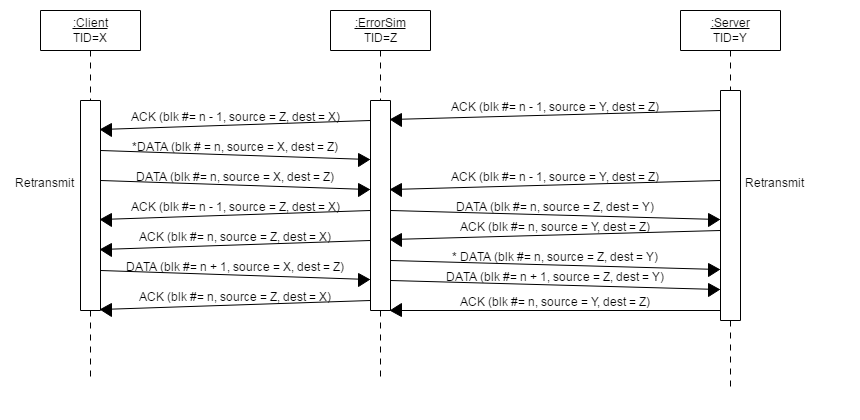
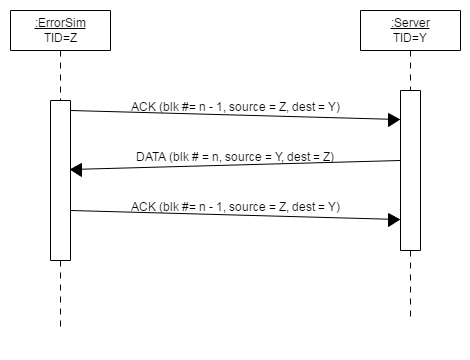
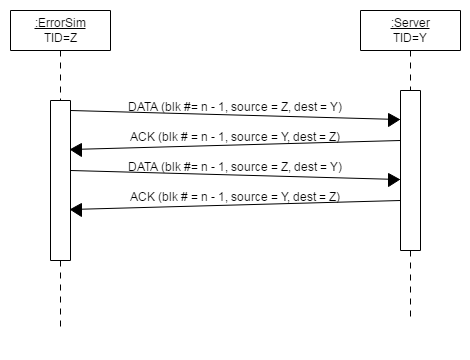
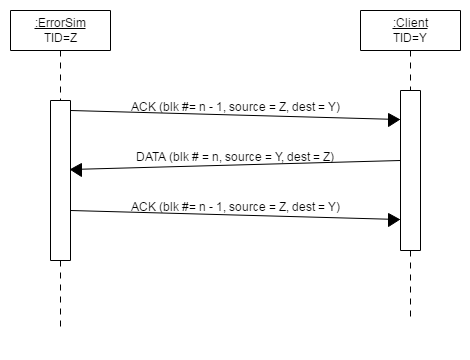
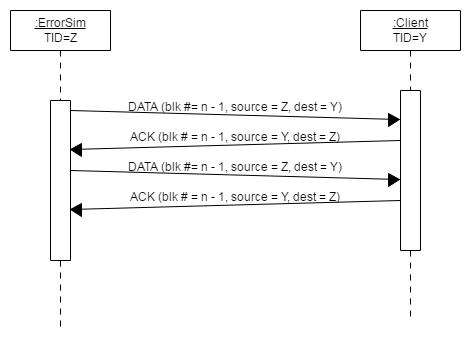
* **Diagrams/Iteration1/IT1 WRQ Connection.png:**
* **Diagrams/Iteration1/IT1 RRQ Data Transfer.png:**

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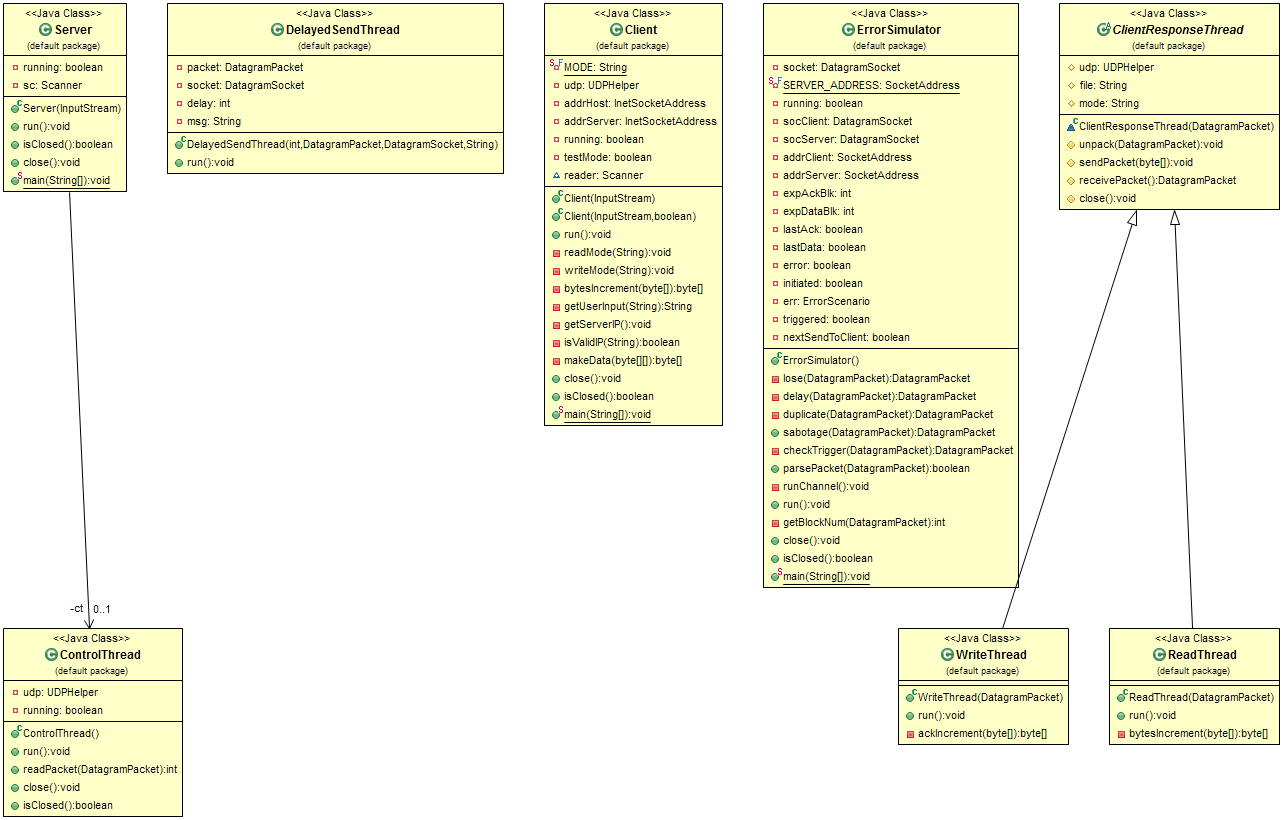
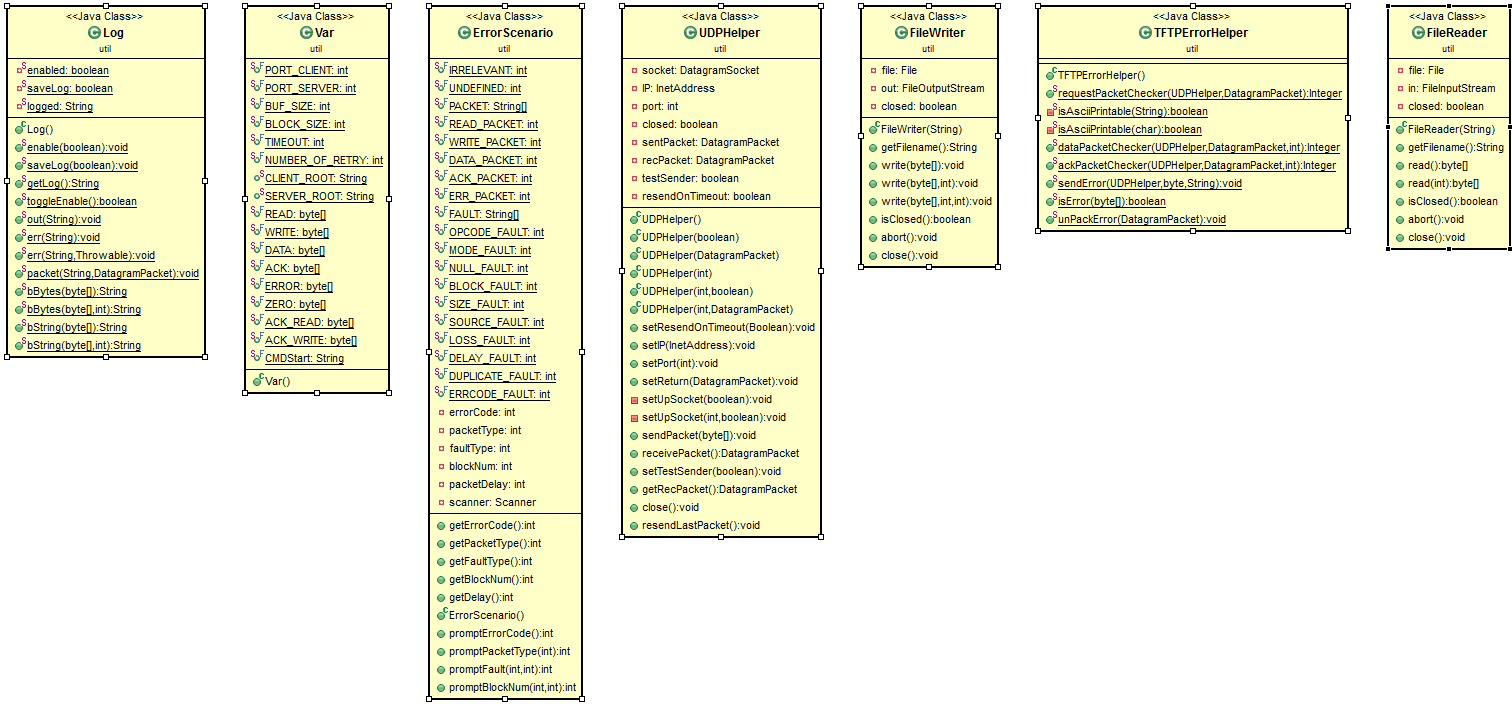
* **Diagrams/Iteration1/IT1 WRQ Data Transfer.png:**

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**Timing Diagrams for Error Cases (Iterations 2, 3, 4):**

* **Diagrams/Iteration2/IT2\_Bad\_RRQ.png:**
* **Diagrams/Iteration2/IT2\_Bad\_WRQ.png:**
* **Diagrams/Iteration2/IT2\_Client\_Receives\_Bad\_ACK.png:**
* **Diagrams/Iteration2/IT2\_Client\_Receives\_Bad\_Data.png:**
* **Diagrams/Iteration2/IT2\_Client\_Receives\_Packet\_From\_Unkown\_Sender.png:**
* **Diagrams/Iteration2/IT2\_Server\_Receives\_Bad\_ACK.png:**
* **Diagrams/Iteration2/IT2\_Server\_Receives\_Bad\_DATA.png:**
* **Diagrams/Iteration2/IT2\_Server\_Receives\_Packet\_From\_Unkown\_Sender.png:**
* **Diagrams/Iteration3/IT3\_RRQ\_Code1:**
* **Diagrams/Iteration3/IT3\_RRQ\_Code2:**
* **Diagrams/Iteration3/IT3\_RRQ\_Code3:**
* **Diagrams/Iteration3/IT3\_WRQ\_Code3:**
* **Diagrams/Iteration3/IT3\_WRQ\_Code6:**
* **Diagrams/Iteration4/IT4\_LostACKFromServer.png:**
* **Diagrams/Iteration4/IT4\_LostDataFromServer.png:**
* **Diagrams/Iteration4/IT4\_LostACKFromClient.png:**
* **Diagrams/Iteration4/IT4\_LostDataFromClient.png:**
* **Diagrams/Iteration4/IT4\_DelayedACKFromServer.png:**
* **Diagrams/Iteration4/IT4\_DelayedDataFromServer.png:**
* **Diagrams/Iteration4/IT4\_DelayedACKFromClient.png:**
* **Diagrams/Iteration4/IT4\_DelayedDataFromClient.png:**
* **Diagrams/Iteration4/IT4\_DuplicatedACKToServer.png:**
* **Diagrams/Iteration4/IT4\_DuplicatedDataToServer.png:**
* **Diagrams/Iteration4/IT4\_DuplicatedACKToClient:**
* **Diagrams/Iteration4/IT4\_DuplicatedDataToClient:**

**UML Class Diagrams (Iteration 5):**

* **Diagrams/Iteration5/UML Class - Default.png:**
* **Diagrams/Iteration4/UML Class - Util.png:**

**Test Files**

* **c\_0.txt, s\_0.txt:** Empty file
* **c\_512.txt, s\_512.txt:** File with 512 bytes of ASCII characters
* **c\_1221.txt, s\_1221.txt:** File with 1221 bytes of ASCII characters
* **c\_bee.png, s\_bee.png:** Picture of bee in png format
* **c\_bee.txt, s\_bee.txt:** Script to "Bee Movie" stored as ASCII characters
* **c\_jpg.jpg, s\_jpg.jpg:** Basic jpg file stored as binary
* **50mb.zip:** Large file to test wraparound of block numbers
* **65536p.zip:** This file will involve sending exactly 64k packets.
* **65536p++.zip:** This file will involve sending a bit more than 64k packets.
* **1000p.zip:** This transfer will have 1000 packets.
* **129p.zip:** This will send 129 packets.
* **128p++.zip:** This will send 129 packets, the last will only have 1 byte.

***\*note: s\_\* and c\_\* convention for test files is used to indicate if file originally existed in client root folder or server root folder. Client files in /src/testFile/, Server files in /src/testFile/server/.***

**Instructions for running**

**Setup:**

1. Compile and run Server.java

* For VERBOSE mode: enter 'v' or 'verbose' to toggle verbose after startup, OR pass 'v' as an initial argument

1. (OPTIONAL) Compile and run ErrorSimulator.java

* Select desired error(1, 2, 3, 4, 5) or no error (0) mode. Follow instructions to set up scenario.

1. Compile and run Client.java

* For VERBOSE mode: enter 'v' or 'verbose' to toggle verbose after startup, OR pass 'v' as an initial argument
* For ERROR SIM mode: enter 't' or 'test' to toggle test mode after startup, OR pass 't' as an initial argument
* If server and error simulator are on a different computer, enter ‘i’ to set up new address. Then enter the IP address of the server and error simulator
* To set the path of the server directory, enter ‘cd’. Then enter the new desired path for the server directory

**Write Request:**

1. Enter 'w' on client console
2. Enter a file name found in the client root from Test Files mentioned above.

* File should be written as c\_\* to indicate it is in client root (i.e. c\_512.txt, c\_bee.txt)

1. In /src/testFile/server/, an identical copy of file should be found

**Read Request:**

1. Enter 'r' on client console

* Enter a file name found in the server root from Test Files mentioned above.

1. File should be written as s\_\* to indicate it is in server root (i.e. s\_0.txt, s\_jpg.jpg)
2. In /src/testFile/, an identical copy of file should be found

**Change Directory:**

1. Enter ‘cd’ on either the client or the server.
2. Enter the directory you would like to be working out of.

**Quitting:**

1. Enter 's' on client console
2. Type 's' on server console
3. (OPTIONAL) Enter Ctrl+C on Error Simulator console

**Instructions for Sample Test Cases**

1. **Lost Packet:**
2. Start server and client in verbose and test modes
3. Start Error Simulator. Setup desired lost packet error scenario using error simulator interface
4. Chose Error Category 1
5. Chose desired packet type to lose (READ, WRITE, DATA, ACK, ERROR)
6. If DATA or ACK, chose packet number to trigger the fault
7. Start the required Read or Write operation to trigger the lost packet.
   * To simulate a lost RRQ packet, start read request
   * To simulate a lost WRQ packet, start write request
   * To simulate a lost DATA or ACK packet, start read or write request
   * To simulate a lost ERR packet, start read request with a file that does not exist in the server dir
8. In /src/testFile/, an identical copy of file should be found
9. In the logs of each of the 3 programs, the system behavior for a missing packet is shown
10. **Delayed Packet:**
11. Start server and client in verbose and test modes
12. Start Error Simulator. Setup desired lost packet error scenario using error simulator interface
    1. Chose Error Category 2
    2. Chose Desired packet type to delay (READ, WRITE, DATA, ACK, ERROR)
    3. Chose a time in ms to delay packet by
    * Socket Timeout time is 1000 ms.
    * If delay is less than 1000 ms, transfer is not affected except for small delay
    * If delay is more than 1000 ms, client/server will resend packets in place to continue the transfer
    * If delay is too large, the delayed packet will be received after the end of the transfer.
    * Try to keep delays less than 1050 ms, (i.e. 1010 - 1050 ms), to ensure the packet is retransmitted during the transfer.
    1. If DATA or ACK, chose packet number to trigger the fault

* If timeout is more than 1000 ms, use a lower ack packet number (i.e. 2, 3, 4), or the delayed packet will be received after the end of the transfer.

1. Start the required Read or Write operation to trigger the lost packet.

* To simulate a delayed RRQ packet, start read request
* To simulate a delayed WRQ packet, start write request
* To simulate a delayed DATA or ACK packet, start read or write request
* To simulate a delayed ERR packet, start read request with a file that does not exist in the server dir

1. In /src/testFile/, an identical copy of file should be found
2. In the logs of each of the 3 programs, the system behavior for a delayed packet is shown
3. **Duplicate Packet:**
4. Start server and client in verbose and test modes
5. Start Error Simulator. Setup desired lost packet error scenario using error simulator interface
   1. Chose Error Category 3
   2. Chose Desired packet type to duplicate (READ, WRITE, DATA, ACK, ERROR)
   3. Chose a time in ms between duplicate packets
   * If delay is too large, the duplicated packet will be received after the end of the transfer.
   * Try to keep delays less than 50 ms, (i.e. 10 - 50 ms), to ensure the packet is retransmitted during the transfer.
   1. If DATA or ACK, chose packet number to trigger the fault
6. Use a lower ack packet number (i.e. 2, 3, 4), or the duplicated packet will be received after the end of the transfer.
7. Start the required Read or Write operation to trigger the lost packet.

* To simulate a duplicate RRQ packet, start read request
* To simulate a duplicate WRQ packet, start write request
* To simulate a duplicate DATA or ACK packet, start read or write request
* To simulate a duplicate ERR packet, start read request with a file that does not exist in the server dir

1. In /src/testFile/, an identical copy of file should be found
2. In the logs of each of the 3 programs, the system behavior for a duplicate packet is shown
3. **Illegal TFTP Operation:**
4. Start server and client in verbose and test modes
5. Start Error Simulator. Setup desired lost packet error scenario using error simulator interface
6. Chose Error Category 4
7. Chose desired packet type to lose (READ, WRITE, DATA, ACK, ERROR)
8. Chose type of specific fault type for packet (i.e. opcode, mode, block number, size, etc.)
9. If DATA or ACK, chose packet number to trigger the fault
10. Start the required Read or Write operation to trigger the lost packet.
    * To simulate an illegal RRQ packet, start read request
    * To simulate an illegal WRQ packet, start write request
    * To simulate an illegal DATA or ACK packet, start read or write request. Ensure file is large enough for block number specified
    * To simulate an illegal ERR packet, start read request with a file that does not exist in the server dir
11. In the logs of each of the 3 programs, the system behavior for the illegal packet is shown
12. **Unknown Transfer ID:**
13. Start server and client in verbose and test modes
14. Start Error Simulator. Setup desired lost packet error scenario using error simulator interface
15. Chose Error Category 5
16. Chose desired packet type to lose (DATA or ACK)
17. Chose packet number to trigger the fault
18. Start the required Read or Write operation to trigger the lost packet.
    * Ensure file is large enough for block number specified
19. In /src/testFile/, an identical copy of file should be found
20. In the logs of each of the 3 programs, the system behavior for the invalid packet is shown
21. **File not Found:**
22. Start server and client in verbose mode
23. Start the required Read or Write operation to trigger the lost packet.
    * Ensure file does not exist in the location being written from (server or client)
24. In the logs of each of the 2 programs, the system behavior is shown
25. **Access Violation:**
26. Start server and client in verbose mode
27. Create a file with invalid permissions( i.e. read/write ) in the location being written from
28. Start the required Read or Write operation to trigger the lost packet.
29. In the logs of each of the 2 programs, the system behavior is shown
30. **Disk Full or Allocation Exceeded:**
31. Start server and client in verbose and test modes
32. Using the
33. Start the required Read or Write operation to trigger the lost packet.
    * Ensure file is large enough for block number specified
34. In /src/testFile/, an identical copy of file should be found
35. **File that already exists:**
36. Start server and client in verbose and test modes
37. Start the required Read or Write operation to trigger the lost packet.
    * Ensure file already exists in directory being written to
38. In the logs of each of the 2 programs, the system behavior is shown

**GitHub Source Link**

*https://github.com/BenEarle/SYSC3303-Project*

***\*Note: GitHub project is private - if you would like access, please let us know.***