TÉCNICO LISBOA

1st Mini-Project: File Transfer

Reliable Data Transfer

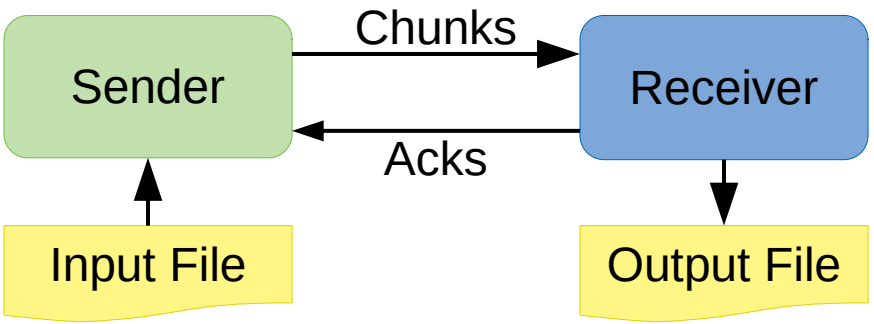
Overview

What you'll learn:

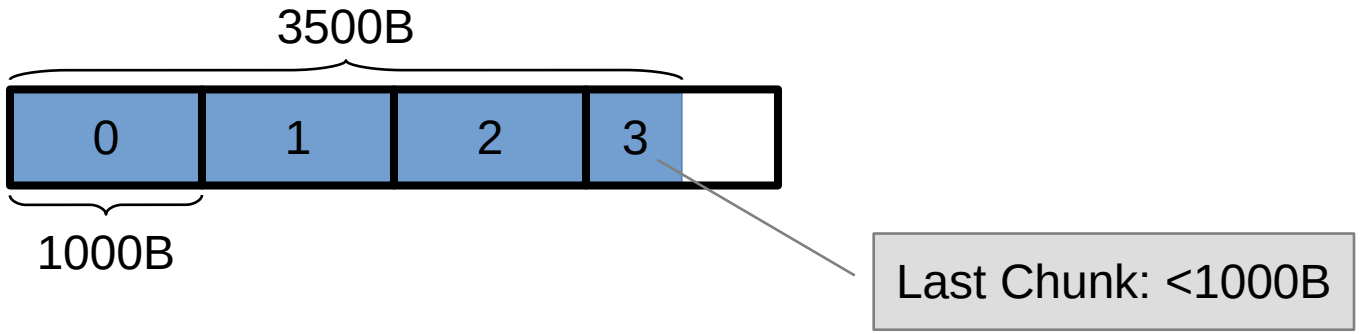
- Reliable data xfer
- UDP sockets

Create file transfer system

- **File Sender**
- **File Receiver**

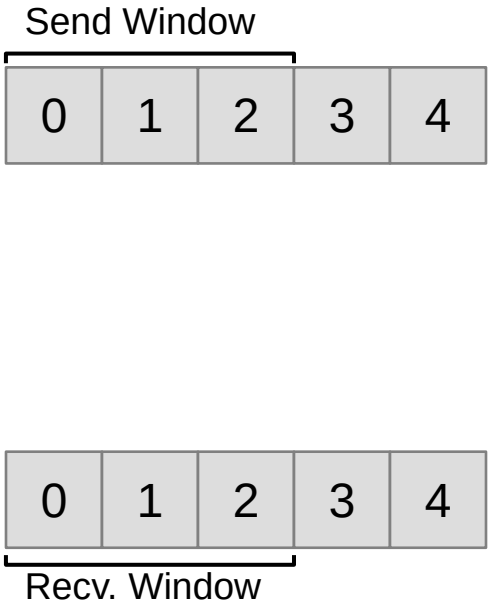


Overview: Files to Chunks

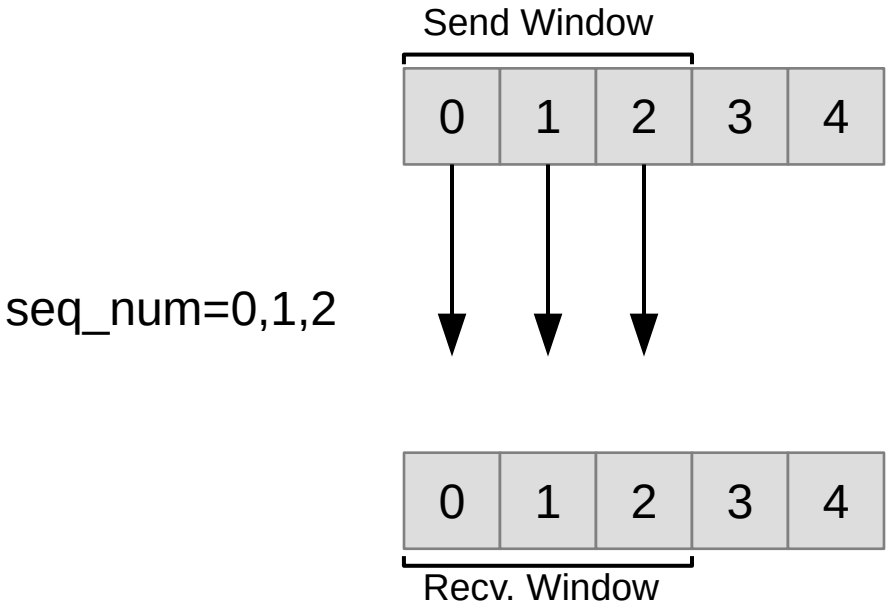



```
typedef struct __attribute__((__packed__)) data_pkt_t {
  uint32_t seq_num;
  char data[1000];
} data_pkt_t;

typedef struct __attribute__((__packed__)) ack_pkt_t {
  uint32_t seq_num;
  uint32_t selective_acks;
} ack_pkt_t;
```

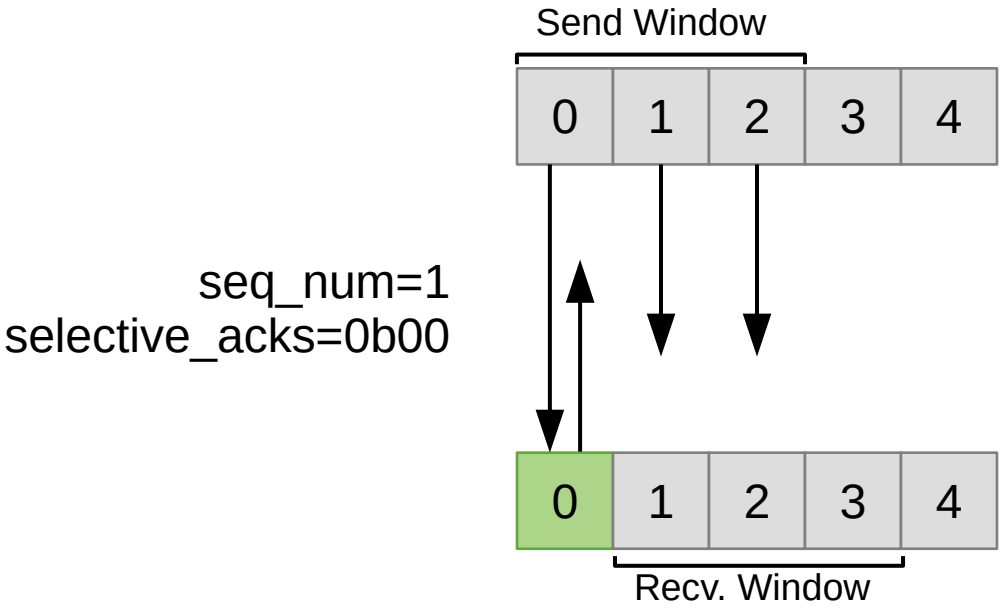
Overview: Reliable Data Transfer



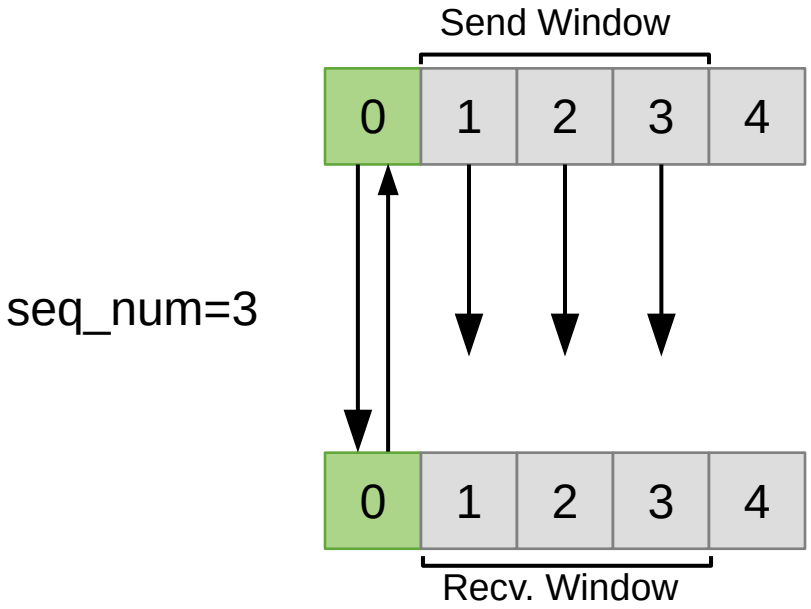
Overview: Reliable Data Transfer



Overview: Reliable Data Transfer

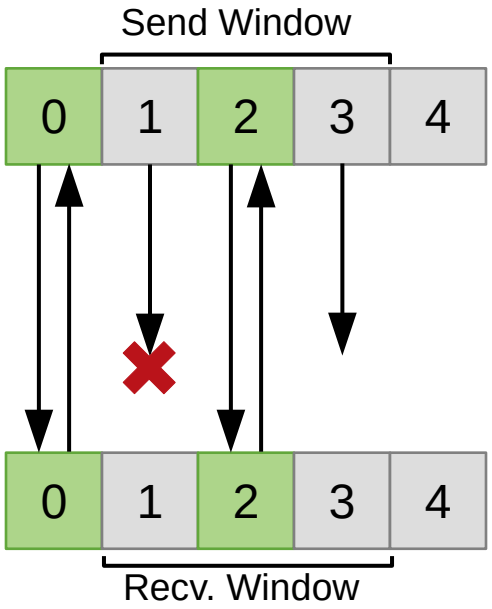


Overview: Reliable Data Transfer



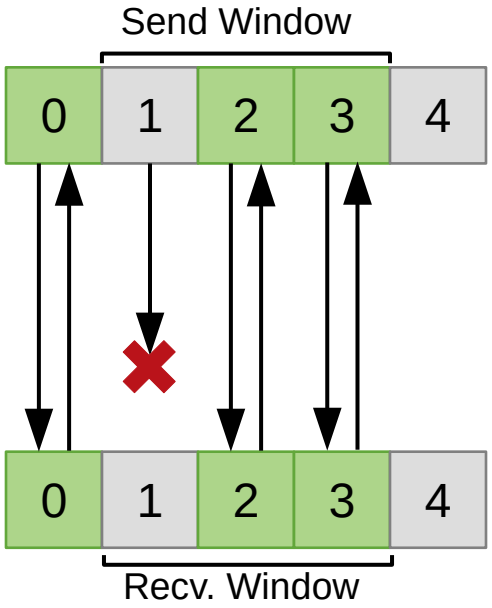
Overview: Reliable Data Transfer

seq_num=1
selective_acks=0b01



Overview: Reliable Data Transfer

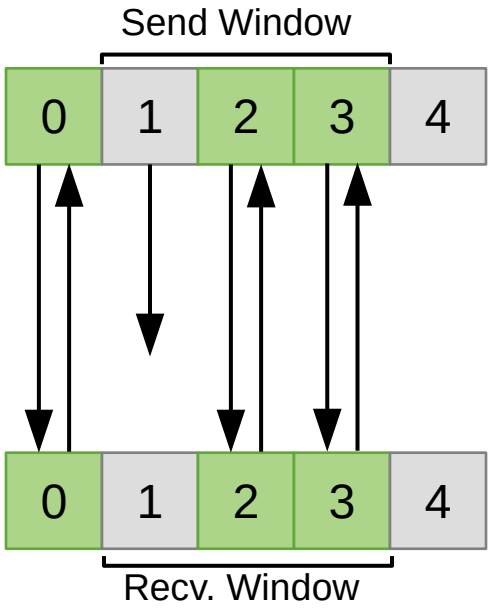
seq_num=1
selective_acks=0b11



Overview: Reliable Data Transfer

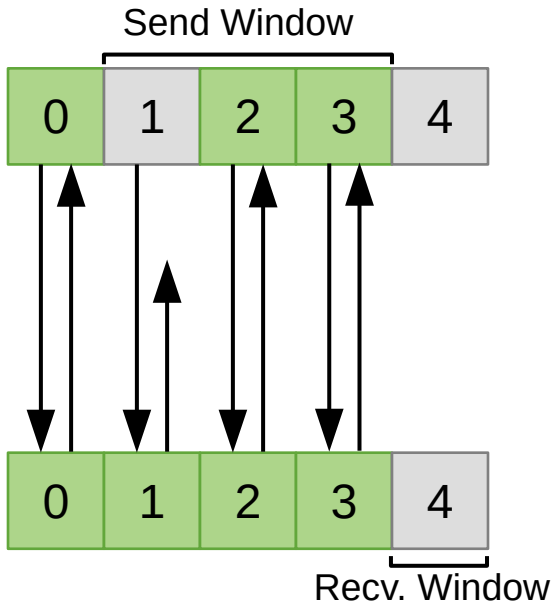
***** 1s Later *****

seq_num=1

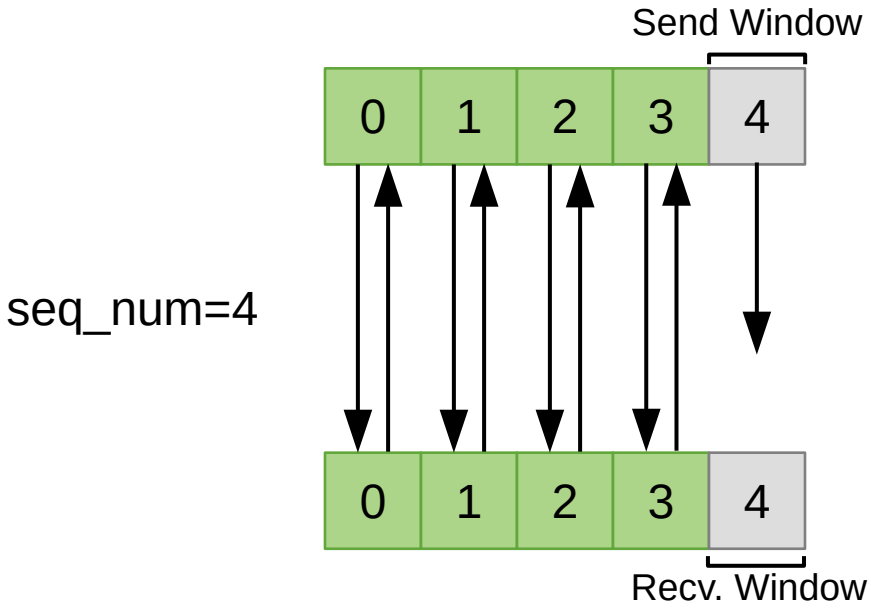


Overview: Reliable Data Transfer

seq_num=4
selective_acks=0b00

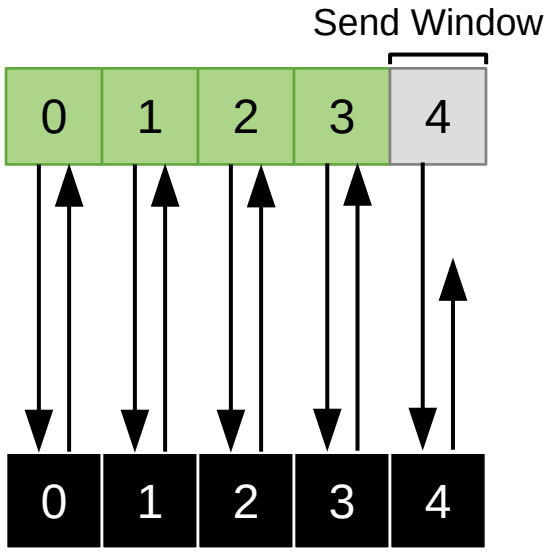


Overview: Reliable Data Transfer

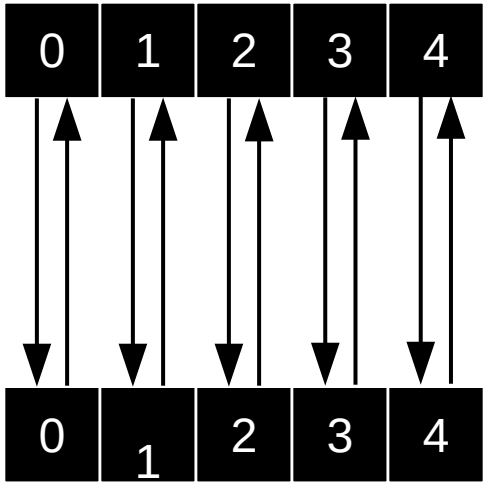


Overview: Reliable Data Transfer

seq_num=5
selective_acks=0b00



Overview: Reliable Data Transfer



Overview: Reliable Data Transfer

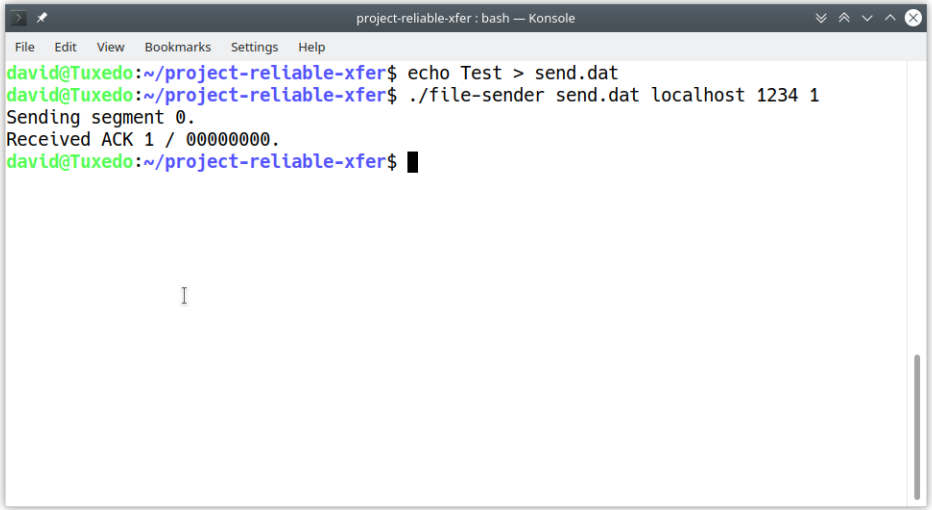
Notes

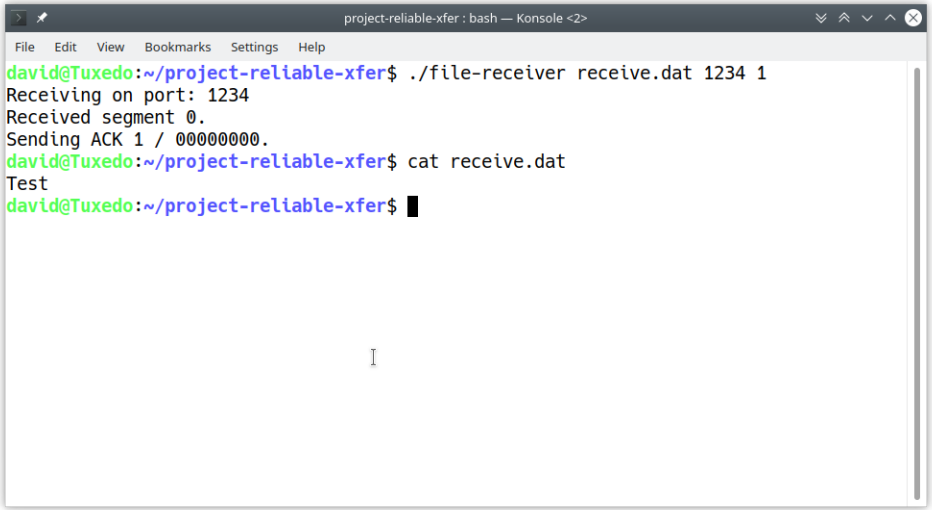
- Chunks start at 0
- Fields in network order
  - Use htonl(), ntohl()
- Ack = recv. window
  - seq_num = base
  - selective_acks skips first (will always be 0)

RDT Modes and Window Size

- Stop-and-Wait
  - Send = 1, Receive = 1
- Go-Back-N
  - Send = N, Receive = 1
- Selective Repeat
  - Send = N, Receive = M <= N

File Transfer in Action





Submission

- Develop your code on: https://git.rnl.tecnico.ulisboa.pt/
- Include:
  - Code
  - Makefile in base folder
  - No build artifacts
- Tag submission as project1-submission:

```
:~$ git tag project1-submission
:~$ git push origin project1-submission
```

- Must build with **`make`**
  - Generate file-sender & file-receiver

```
:~$ git clone <repo URL> .
:~$ git checkout project1-submission
:~$ ls
Makefile file-receiver.c file-sender.c
:~$ make
:~$ ls
Makefile file-receiver.c file-receiver
file-sender.c file-sender
```

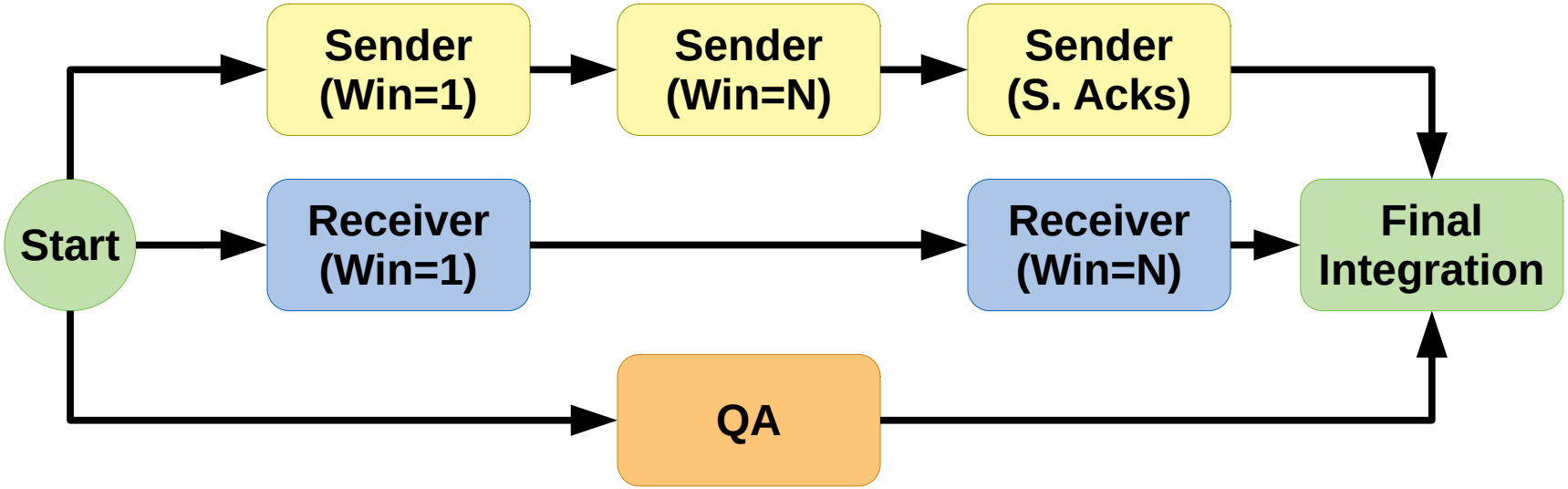
Nightly Builds

- Coming soon to a repo near you…
- Runs nightly
  - Simple tests – does not preclude running your own
  - Runs on master branch and generates build-report.md
    - Don’t forget to pull
  - On request: must delete and push to rerun next time

Advice: Debugging

- Standard output/error will be ignored during grading
  - `printf(…)`
- Debug tools also available
  - **log-packets.c**: Packet logging & fault injection
  - **generate-msc.sh**: Log analysis & MSC generation (uses mscgen package)
- Testing
  - Look into **run.sh** for ideas.

Advice: Task Breakdown



Advice: MSC Generation

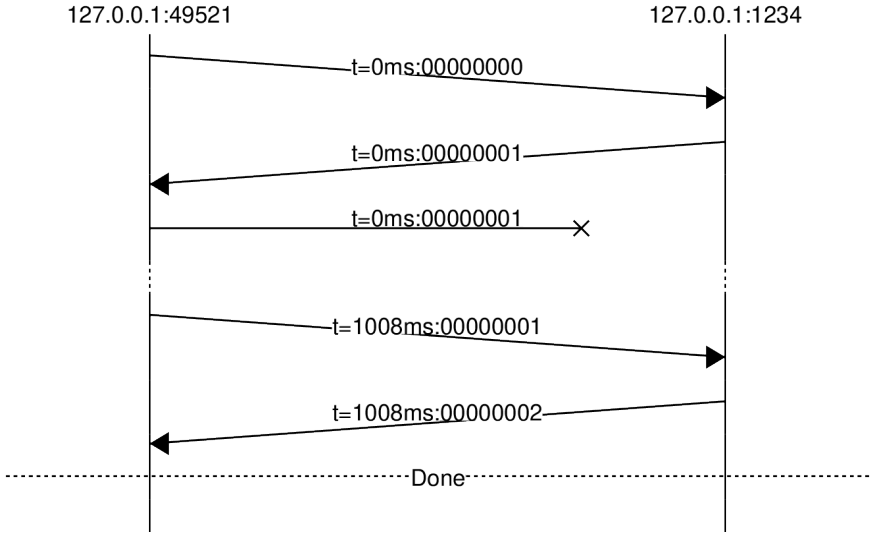
```
gcc -shared -fPIC -Wall -O0 -g \
    -o log-packets.so log-packets.c -ldl

LD_PRELOAD = "./log-packets.so" \
    SEND_DELAY="500" \
    DROP_PATTERN="01" \
    PACKET_LOG="sender.log" \
    ./file-sender …

./generate-msc.sh msc.eps sender.log receiver.log
```

See: run.sh

Advice: MSCs

Stop-and-Wait

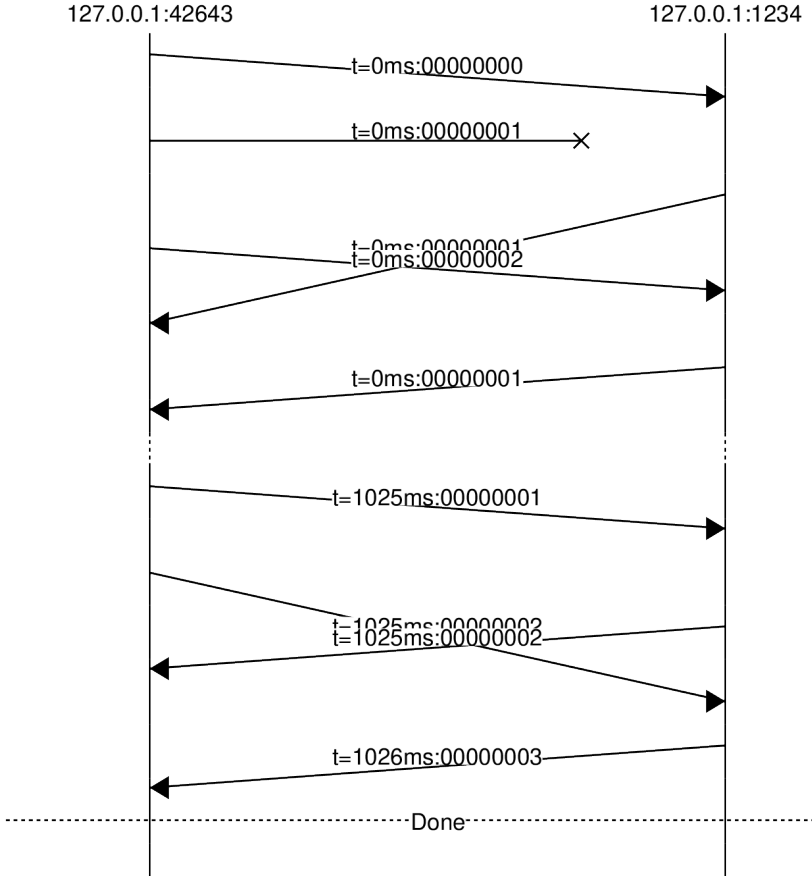
- 2 Chunks
- Sender
  - DROP_PATTERN="01"
  - Send Window = 1
- Receiver
  - DROP_PATTERN=""
  - Receive Window = 1



Advice: MSCs

Go-Back-N

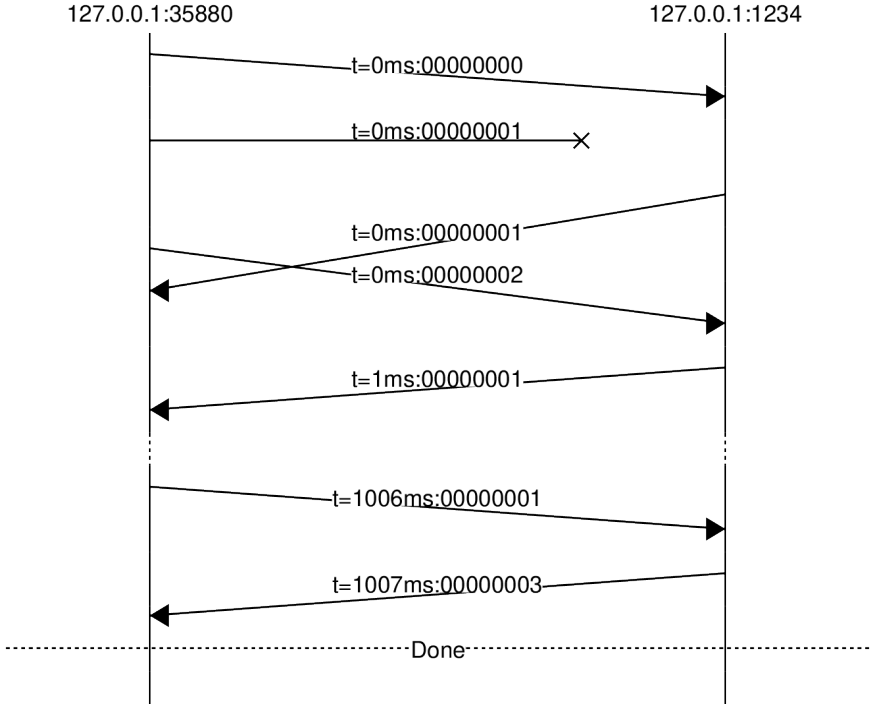
- 3 Chunks
- Sender
  - DROP_PATTERN="01"
  - Send Window = 3
- Receiver
  - DROP_PATTERN=""
  - Receive Window = 1



Advice: MSCs

Selective-Repeat

- 3 Chunks
- Sender
  - DROP_PATTERN="01"
  - Send Window = 3
- Receiver
  - DROP_PATTERN=""
  - Receive Window = 3



Advice: MSCs

Improv

- How Many Chunks?
- Sender
  - DROP_PATTERN="?"
  - Send Window = ?
- Receiver
  - DROP_PATTERN="?"
  - Receive Window = ?