L-Università ta' Malta
Faculty of Information & Communication Technology

Assignment 1 Report

Manwel Bugeja

March 4, 2021

Contents

1 Problem 1

2 Flow of the Contract

The flow of the process is shown via a flowchart in figures 1 and 2.

2.1 Structures

The most fundamental part of the contract is a structure for loan requests, *LoanRequest*. This can be seen in listing 1. This structure contains the information required regarding the three persons included in the deal, i.e. the borrower, the guarantor and the loaner.

Listing 1: Loan Request Structure

```solidity
struct LoanRequest{
        uint    creationDate;

        address payable borrower;
        uint    amount;             // Amount to be
           borrowed
        uint    expiryTime;         // Max time (in
           seconds) the loan will be paid back
        uint    interestPaid;       // Amount (in
           wei) paid on loan payback

        address payable guarantor;
        uint    guarantorInterest;  // Amount (in
           wei) taken from interest by the guarantor

        address payable loaner;
        State   state;
}
```

The last field of the loan request structure is an enumeration called *State*, which can be seen in listing 2. This enumeration contains the information about what state the loan request resides in. The states are explained in table 2.1.

Listing 2: Loan Request Structure

```solidity
enum State {
        REQUESTED,
```

```
        PENDING ,
        GUARANTEED ,
        LOANED ,
        PAID ,
        TERMINATED
}
```

State	Description
REQUESTED	The borrower submitted a request
PENDING	The guarantor submitted a guarantee and is waiting for approval
GUARANTEED	The guarantee has been accepted by the borrower
LOANED	The loaner has loaned the money
PAID	The borrower paid the loaner back before the loan expired
TERMINATED	The loan expired and the loaner took the guarantee

These loan requests are all kept in a dynamic array, *LoanRequests[]*. Elements are added to this array from the functions. However, elements are never removed. This allows the system to keep a log of all requests ever made.

2.2 Functions

Functions in the contract are split into four sections, these being: general purpose, borrower, guarantor and loaner functions.

General purpose functions are mostly used to get information about the loan requests. This means that most of them include the *view* keyword.

Functions that act on a created loan request take the index as a parameter. Furthermore, the functions have the following flow: checks, followed by code that transfer balance, followed by updating the loan request states. The reason for this is explain in the section about security.

3 Problem 2

4 Problem 3

5 Problem 4

6 Problem 5

```
+------------------------+
|                        |
| BORROWER requests loan |
|                        |
+-----------+------------+
            |
+-----------v------------+
|   GUARANTORS pay and   |
|  specify interest they |
|       will keep        |
+-----------+------------+
            |
+-----------v------------+
|The money is stored in  |
|     the contract       |
|                        |
+-----------+------------+
            |
            |
            v
           / \
          /   \
         /     \
        /       \
       /         \                    +---------------------+
      /  BORROWER  \                  |    BORROWERS are     |
     |   accepts    |  --Yes-->       |  granted the money   |
      \ guarantee? /                  |                     |
       \         /                    +---------------------+
        \       /
         \     /
          \ /
           |
           |
          No
           |
+---------v---------+
|Money is returned |   4
| to the GUARANTOR |
|                  |
+------------------+
```

Figure 1: Submitting a Loan Request

```
+----------------------+
|                      |
|LENDER provides a loan|
|                      |
+-----------+----------+
            |
            |
            |
+-----------v----------+
|LENDER sends Ether and|
|id of the loan request|
|                      |
+-----------+----------+
            |
            |
            |
            v
           / \
          /   \
         /     \
        /       \
       /         \                +----------------------+        +----------------------+
      /           \               | GUARANTORS' funds +  |        | LENDER receives full |
+------>   Is loan    ---Yes--->  | interest are sent to +-------->   amount + interest   |
|     \   payed?    /             |    the GUARANTOR     |        |                      |
|      \           /              +----------------------+        +----------------------+
|       \         /
|        \       /
|         \     /
|          \   /
|           \ /
|            |
No           No
|            |
|            |
|            v
|           / \
|          /   \
|         /     \
|        /       \
|       /         \               +----------------------+
|      /           \              | LENDER can withdraw  |
+------  Is loan date   --Yes--->     the guarantee     |
       \   exceeded?  /            |                      |
        \           /             +----------------------+
         \         /
          \       /
           \     /
            \   /
             \ /
              V
```
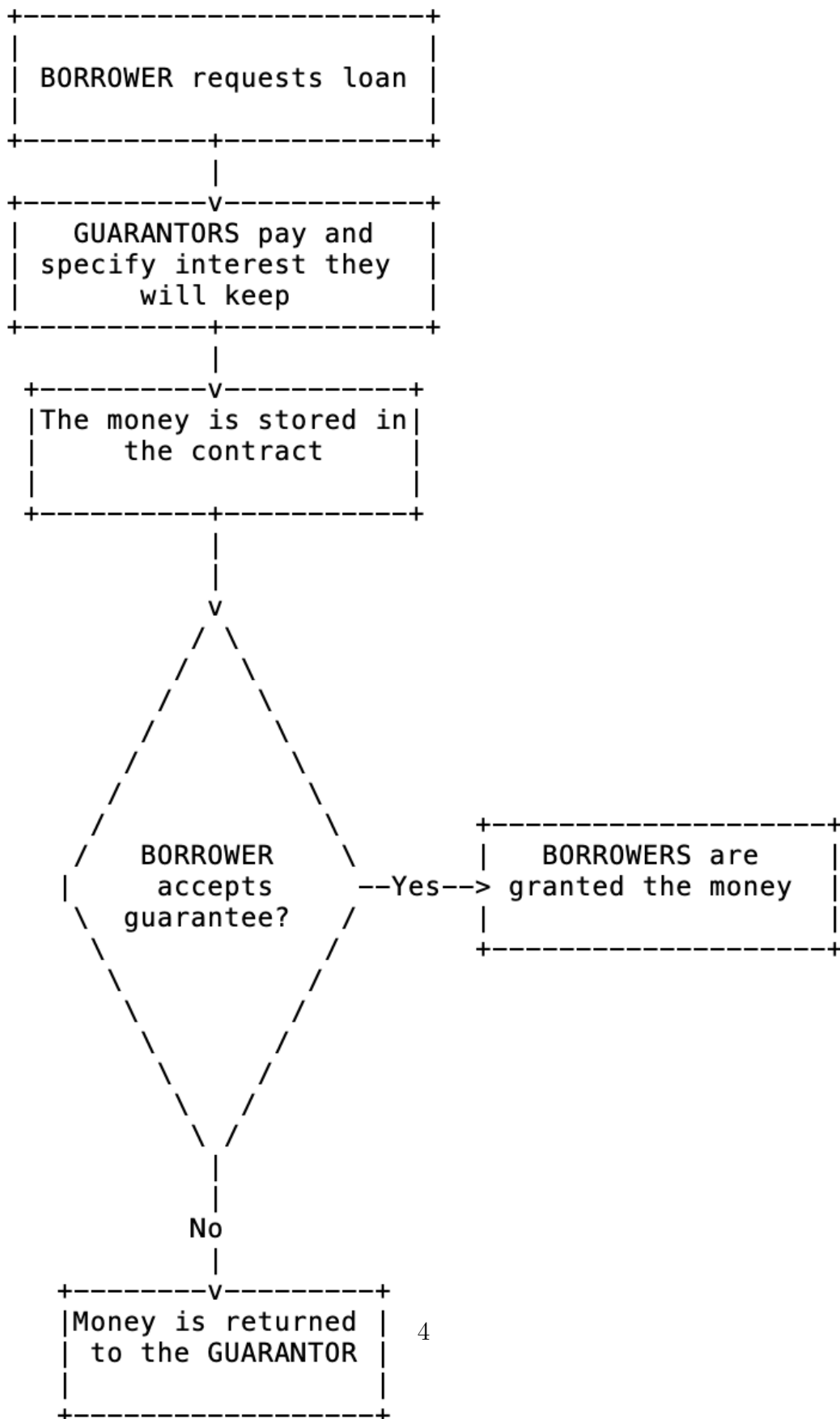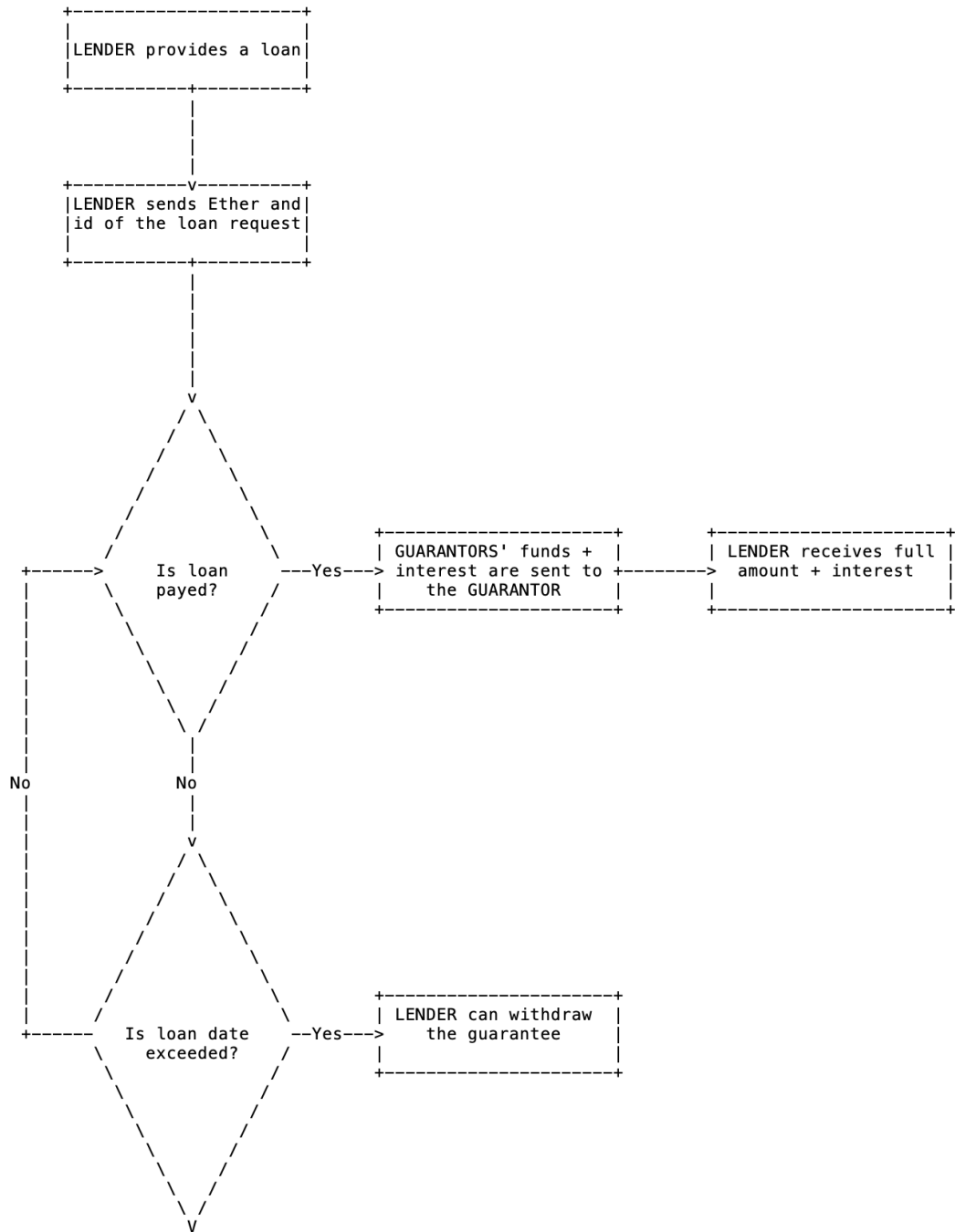
Figure 2: Submitting a Loan