CS855 ATM Server Documentation

Release 1.0

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This is a programming assignment for CS855 Distributed Operating Systems class.

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DESIGN DOCUMENT

This document will discuss the ATM RPC design.

1.1 How it Works

The ATM is designed using the python XMLRPC library.

In my design, the `ATMClient` directly connects to the server. In this case, the `ATMClient` must know the Server's address. Full documentation of the Client's operation is documented on the *Client Documentation*.

The Server exports an instance of the `ATMServer` object. This is done with the code:

```
from SimpleXMLRPCServer import SimpleXMLRPCServer

server = SimpleXMLRPCServer(('', 9000), logRequests=True, allow_none=True)
server.register_introspection_functions()
server.register_multicall_functions()
server.register_instance(ATMServer())
try:
    print 'Use Control-C to exit'
    server.serve_forever()
except KeyboardInterrupt:
    print 'Exiting'
```

Each public function (funciton not starting with an underscore) in the `ATMServer` is then available to be called. Additionally, state is kept between calls since it's all one instance.

The `ATMServer` starts with only 1 account. Since there is only 1 account, responses are only give for 1 account. All requests for other accounts will cause an error.

The RPC functions all return a special data structure, a *Status Dictionary*, which will return the status of the request, as well as a failure reason or a request response. This is transferred with a dictionary, which is then serialized by the underlying XML RPC library.

1.2 Design Trade-offs

he XML-RPC library provided by Python greatly simplifies the RPC aspect of the communication. This is because the Python XMLRPC:

- Does not require interface definition
- Does not require a registrer

- Performs simple XML HTTP requests in order to perform RPC.

Because of these advantages over more complex RPC systems, such as Java's RMI, it is much simplier to create a RPC server in Python.

Since the requests are all done over HTTP, it is very easy and well known how to secure the communication (HTTPS) and how to load balance requests (Linux Virtual Server).

1.3 Improvements and Extensions

The design of the `ATMServer` is very simple. It could be improved by:

- Secure Account Storage - Since we are running on Amazon EC2, this could easily be done with on of many database systems available on EC2 such as Dynamo and RDS.
- Load Balanced Servers - Many more clients can be handled with load balanced HTTP requests.
- Authenticated Requests - It is well known how to handle authorize HTTP requests, digest or SSL Certs.

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SERVER DOCUMENTATION

2.1 Status Dictionary

All public functions return a status `dict` with the following elements:

status (str) Either `OK` or `ERROR` indicating success or failure, respectibly

reason (str) If status is `ERROR`, then reason is the error string describing the issue.

result (str) If the function requires sending back information, it will be stored in the result

2.2 Operation

This is the main ATMServer that should be executed.

It can be executed with the command:

```
$ python ATMServer.py
```

By default, it will run on port 9000 of the local server, and will listen to traffic from all sources (insecure!)

2.3 ATMServer Technical Document

class `ATMServer.`**`ATMServer`**

The Main ATMServer that should be used to export.

`deposit`(*account*, *amount*)

Deposit money into the account.

Parameters

- **account** (*int*) – Account number to deposit money into
- **amount** (*float*) – value to be added to the account

Return type status dict, see: *Status Dictionary*

This function will fail if the account does not exist.

`inquiry`(*account*)

Inquire the account amount

Parameters **account** (*int*) – Account number to deposit money into

Return type status dict, see: *Status Dictionary*

withdraw(*account*, *amount*)

Withdraw money from the account

Parameters

- **account** (*int*) – Account number to deposit money into
- **amount** (*float*) – value to be added to the account

Return type status dict, see: *Status Dictionary*

This function will fail if the account does not have sufficient funds to make the withdraw.

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THREE

CLIENT DOCUMENTATION

The ATM Client can be used for example by issueing the command:

```
$ python ATMClient.py <server> <port> <operation> <account> [<amount>]
```

server The server that the ATM client should connect to.

port Port that the client should use to connect to the ATM Server

operation One of:

- inquiry - Check the status of an account
- deposit - Deposit money into the account
- withdraw - Withdraw money from an account

account This is the numeric account number. Must be an integer

amount Amount of money to either deposit or withdraw

CHAPTER

FOUR

EC2 EXECUTION

EC2 Execution is done by submitting jobs to HTCondor that start EC2 Spot Instances.

4.1 Preparing Submission

Submission is done with HTCondor. An EC2 Submission file was created:

```
universe = grid
grid_resource = ec2 https://ec2.amazonaws.com/
executable = /bin/true

# Amazon Linux AMI
ec2_ami_id = ami-04cf5c6d

ec2_access_key_id = access_key
ec2_secret_access_key = secret_key
ec2_keypair_file = keyfile.$(CLUSTER)
ec2_security_groups = bosco
ec2_instance_type = m1.small
ec2_spot_price = 0.04
ec2_user_data_file = ami-run.sh
ec2_tag_concat = true
periodic_remove = JobStatus == 2 && (time() - EnteredCurrentStatus) > 60*120
log = ec2.log
queue
```

As you can see, `ec2_user_data_file` is set to ami-run.sh. This ami-run.sh contains the script that will be executed at the first start of the instance:

```
#!/bin/sh

rpm -Uvh http://download.fedoraproject.org/pub/epel/6/i386/epel-release-6-8.noarch.rpm
yum -y install yum-priorities git

# Checkout the project
git clone git://github.com/djw8605/CS855PA1.git

# Start the server
cd CS855PA1
python src/ATMServer.py
```

Each instance will run this script since the Amazon Linux AMI contains CloudInit.

Addionally, the submit file has a `periodic_remove` statement that will kill the instance after 2 hours of execution.

4.2 Testing Execution

Testing was done by SSHing into the EC2 instance and running the Client against anther EC2 instance:

```
$ python ATMClient.py  ec2-54-234-213-102.compute-1.amazonaws.com 9000 inquiry 100
Current value of account 100 is $1000.00
$ python ATMClient.py  ec2-54-234-213-102.compute-1.amazonaws.com 9000 deposit 100 1001
Successful deposit of $1001.00 to account 100
$ python ATMClient.py  ec2-54-234-213-102.compute-1.amazonaws.com 9000 inquiry 100
Current value of account 100 is $2001.00
$ python ATMClient.py  ec2-54-234-213-102.compute-1.amazonaws.com 9000 withdraw 100 392
Successful withdraw of $392.00 to account 100
$ python ATMClient.py  ec2-54-234-213-102.compute-1.amazonaws.com 9000 inquiry 100
Current value of account 100 is $1609.00
```

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