BorderPay.io – Cross-Border Contractual Payments

IMPLEMENTATION PROJECT – MEDIUM

Remote working [Fiverr 2024; Turing 2024; Working 2024] is on the rise with many companies afforably delivering success [Remote-stats 2024]; working with completely remotely teams. *Discord* is a great example for this. Albiet, it's success it comes with operational overheads [taxation 2024] and typically lack trust between contractors and employees with the hiring company. Your team has pledged to solve this problem once and for all. You propose a blockchain-based digital infrastructure that makes contract enforcement, payroll handling, payments (both local and cross-border), compilance and trust-worthy onboarding an easy task for hiring companies around the globe. Although, the physical elements of daily meeting, one-to-one to interactions, office environment and banter can't be re-created in a remote working scenario as of now, however you plan to offer an end-to-end solution that atleast makes financial operations of human-resource management easy and managable for companies.

1 PROBLEM STATEMENT

Make a complete system that allows creation for financial contracts between a company and it's contractors/employees, have a progressive payroll system that automatically updates and calculates salaries of the contractors/employees on a timely basis and ensure payments are made as per the contract signed by both parties viz. the employer and employee be it local or cross-border. Your team is well connected with banks and legal authorities around the globe to deliver a prompt and seamless experience to all your customers. Deel [Deel 2024; Deel-startup 2024] is a good place to look for more features.

2 TECHNICAL DELIVERABLES

*Architecture (**5 marks**).* A complete overview of the technical architecture with different components of the system, including the interfaces that your customer uses to interact with the platform and backend details of how the company uses a blockchain based system to deliver good performance. It must also document the tech stack used from making the *user-interface* of the platform, technologies used in the backend and also the blockchain stack used.

This document must be shared with the TA within 20 days of the project commencement date.

*Functional Requirements (**5 marks**).* A complete list of features that you have implemented to solve the problem. Describe the fetaures you have implemented in brief and also mention why this feature is crucial for your platform.

This document must be shared with the TA within 15 days of the project commencement date.

*Non-Functional Requirements (**5 marks**).* A complete list of performance, storage, latency and scalability factors while making the application. Describe what kind of technologies you used to ensure high performance, low latency and moderate storage overhead.

This document must be shared with the TA within 15 days of the project commencement date.

*Implementation (**75 marks**).* The complete source code and the scripts to run your framework on a single stand-alone machine. Include instructions to run your implementation. We assume you would use a UNIX-based system. You will be required to present a demo of the key features of the platform after the submission deadline of the project.

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*Testing (**10 marks**).* Write tests to demonstrate that the functional requirements are implemented as intended. You will asked to run these tests live, before the final submission date of the project.

Each member of the team must implement atleast 2 or more feature on the blockchain stack.

*Deployment (**10 marks bonus**).* This is a bonus feature. Choose your favourite cloud based infrastructure provider and deploy your implementation on the cloud (**free-tier** only!) so that others can use it. There are multiple platforms [AWS 2024; Firebase 2024; SuperBase 2024; Vercel 2024] that allow you to do this.

3 FEATURES

You can add more advanced features if required, but thae same must be discussed with the TA or instructor apriori. Features cannot be dropped after 20 days of the commencement of the project. Features not implemented will attract penalty of upto 5 marks each.

Minimum Requirements

Features listed in § 3.1 and § 3.2 are the minimum requirements. Only half the marks for deployment, architecture or requirement docs will be provided if minimum requirements are not met. The requirements document must clearly describe where the blockchain is used, with list of data fields that are stored on the blockchain (on-chain) and those stored/updated outside the blockchain (in a database, off-chain). Choose *on-chain* requirements *judiciously*.

3.1 Payment Contract Agreement (10 marks)

Consider an employer, Bob and employee, Alice. Bob must first create a contract detailing the nature and duration of work that Alice performs in the company. Alice must then agree to the created contract and then fill in her financial details to recieve paymenets along with the type of currency that she prefers to recieve her payment in. The deal is finally signed and approved by Bob making the contract active. A contract can be revoked later by any of the parties. Both Bob and Alice need to create accounts on your platform with essential details like company name, tax compliance information and *confidential* financial information.

Scenario

Bob working with *toogle.com* and hires Alice as a *Technical Solutions Engineering* at a remote position for his *California* team and plans to use your platform to create a contract and manage her payment and advance request. Her CTC is computed to be $155,000 USD with a variable pay of $45,000 USD. Alice stays in *Switzerland* and wants her payment to be credited to *Union Bancaire Privée* bank with which she has an account. She wants to withdraw her money only when is requires it. She is credited salary on a monthly basis.

3.2 Payroll System (15 marks)

This is a system that automatically calculates the payment that Alice must recieve at regular intervals (as per the contract made). Alice can raise an advance request and recieve an advance payment if Bob approves it. Bob can choose to deposit the whoel amount at once, in this case the payroll system must calcuate the denominations to pay to Alice or he may deposit at regular intervals. The payroll system must ensure that Alice is only paid once during an interval unless it's an advance payment. It must also ensure that Bob deposits the amount in a manner that Alice never has a due of over 2 intervals in her account. Alice has the flexibility to withdraw her payment monthly or on

a *need-to-need* basis. Alice cannot withdraw more that what has been credited to her account. The payroll system also provide the functionality to withdraw money automatically to her designated account once she is credited her salary. The payroll system is also liable for taxation.

Scenario

The payroll system must pay Alice on a *month-to-month* basis. The interval is *variable* and depends on the last date (payments msut be made on the last working day or a previous one if the last day is a holiday). You can make *resonable assumptions* about her taxations. *These don't need to exactly as per any country norms for the sake of this project.* She is not paid any LTA or HRA by *toogle.com*.

3.3 Transaction Settlement (50 marks)

Since Alice can choose to work from anywhere in the world, the payee bank and the payer bank may not be in the same country or continent. This makes cross-border payment facility crucial. There are two methods how settlement is covered one for local and the other for cross-border payments. Your architecture must allow creation of all these *nuiances*, so that your partner banks use your technology to settle payments quickly. Your partner bank will *mandatorily* use the blockchain for any payment settlement.

Local Settlement. Local settlement refers to payments made within the country. Party "A" deposits "X" currency amount in bank "C". Party "B" has an account with bank "D". Bank "C" transfers the money from party A to Bank "D" with $Y\%$ transaction fees (charged by Bank "D"). Bank "C" notifies party "B" that their account has been credited "X" amount. Both banks "C" and "D" have branches all around the globe and inside the country. There is no currency conversion or cross-border transaction fees involved. Banks "C" and "D" may or may not be part of the blockchain. Non-member banks receive payment from a member bank via a designated routing bank.

Scenario

Routing bank "E" and bank "C" (a.k.a member banks) are part of the blockchain but bank "D" is not (non-member bank). In this case the amount is first routed from bank "C" to "E" and then from "E" to "D" and not directly. Each money transfer is a blockchain transaction which recorded for non-repudiation. Only member banks can access the blockchain and see the status of the transaction. *A transaction fee is only charge in the case where there is a transfer from member bank to non-member bank and vice-versa.*

Cross-Border Settlement. These are typically international transactions [Border 2023] similar to *wire* transfer [wire transfer 2024] or *swift* [Swift 2023]. The payer makes the payment to bank "A" (payer bank). Since it's an international payment, the payment is first recieved by the central bank "C" of which bank "A" is a part of (both are on the same blockchain), it approves the transaction and requests a conversion of currency from the partner forex bank "B". Once the conversion is successful, the converted amount is send to the central back of the other nation where the payee requested payment. This central bank then transfer the money to a routing bank or a member bank depending on what the bank type of the payee is.

In summary there must be 4 types of banks with 3 being a part of the permissioned blockchain.

- *Sponsor Bank (Central Banks).* These are responsible for handling cross-border payments. They charge a low *international-transfers fees*.

- *Member Banks.* All participating banks in the permissioned blockchain.
  - *Routing Bank.* To make settlements to non-member banks. They charge a low *inter-bank transaction fee.*
  - *Forex Bank.* To provide for accurate conversion support from currency "A" to "B" at *up-to-date* market rates. They charge a low *conversions fees.*
- *Non-member Banks.* All other banks not a part of the permissioned blockchain.

4 DISCLAIMER

Before doing anything "extra" (which might fetch bonus marks), first, complete the basic expectations from your implementation.

Software tools are expected to display their results in a user-friendly manner; a user would never like to use a tool that simply spits out a bunch of numbers. So, display the results from your tool suitably possibly in a good web-based UI or the terminal in verbose user-friendly manner.

Discussion is healthy, copying is not. You are encouraged to discuss the projects with your peers, but you must implement the projects by yourself. If any two groups are found with "similar" pieces of code, both of them will be failed (with no concern as to who was the source). Copying from internet sources or open-source github repositories must be refrained from.

TAs may conduct a code-review after every milestone is reached or 15 days (which ever is earlier) so please be careful about plagiarism.

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