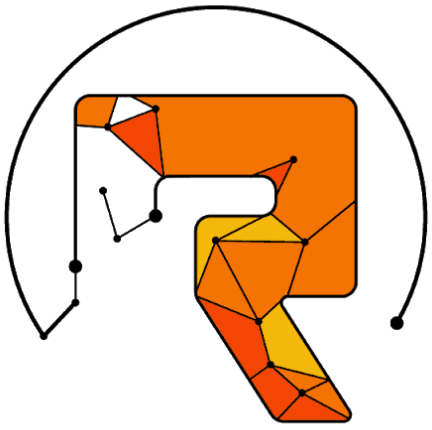

RESTA

resta.io

ABSTRACT:

This whitepaper describes a RESTA's hashgraph based permissioned decentralized ledger platform with the network of banks, to facilitate banks' cross-border transactions and enable investors and investment institutions to perform cross-border real estate investments with zero or close to zero transaction costs.

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1. *Real Estate Market*

Cross-border real estate transactions are increasing every year due to the growth in Chinese and Asian economies as well as the accelerated pace of globalization. Investors around the world are searching for new sources to increase their wealth and investment in property is all-time high as it provides a generous yield to investors in terms of capital appreciation and income generation.

Hence, investing in real estate overseas has been a thriving trend in recent years. International real estate transactions volume increased from $68 billion to $360 billion over the last 7 years. Especially, Chinese individual investors have invested around $150 billion due to the volatility of financial assets in China and increased awareness in overseas assets.

The reason for the increase in transactions is that land purchase remains a productive and solid venture of cash. For example, investment in land yields 40% return of the venture arrangement of wealthy people (with a net worth of $ 30 million). During the past 6 years, normal business land developments' returns yielded around 9% annually, exceeding the yields of securities and bonds. The growing number of capital from China and Hong Kong has poured into the acquisition of real estate in the Western World. In addition to that South Korean and Japanese investments flowed in that direction.

Key factors contributing to real estate spending:

1) massive urban migration
2) strong consumer purchasing power generated by dollar-earners (e.g overseas workers and business process outsourcing companies)
3) increased infrastructure spending by the current administration
4) resurgence in manufacturing
5) stronger consumer spending and the increased tourism.

Overseas real estate investment is on the rase and expected to grow at an accelerated rate.

2. The new Tech for Real Estate

To upgrade world's real estate market, we need to bring the new technologies which can improve and guarantee upgraded way of trading and investing. One of such technologies is Distributed Ledger Technology (DLT) which can disrupt and transform existing markets structures significantly. However, RESTA considers, in general, there are four major obstacles to replace the old systems in cross-border investments and many other fields before widespread adoption of distributed ledger technologies will take place. Here is the list of obstacles for DLTs to enter into the existing markets and how Hedera hashgraph solves these issues.

Performance - Due to the limitations in the number of transactions, current blockchain DLTs cannot handle demands of market operations. While Hashgraph can process hundreds of thousands of transactions per second in a single fragment (a fully-connected distributed network). The delay in the transmission of information and the achievement of a full consensus requires only a few seconds. At the moment, this speed is unparalleled by any technology in the market.

Security - If RESTA's platform is to facilitate the transfer of trillions of dollars of value between the border, we must expect attacks by hackers to steal funds from the network, and we must prepare for attacks in advance. To defend against attacks requires a consensus algorithm, with proven security properties, that provides the best security one can achieve.. Vectors of security vulnerabilities shouldn't be mitigated; they should be removed completely. Hedera hashgraph enables such security for RESTA's platform while other public DLT platforms are trading off decentralization (potential threats to security) for performance gains.

Stability - Hedera relies on both technical and legal controls to ensure the stability of the platform. The combination of technical and legal controls provide the governing body with the mechanisms needed to enable meaningful governance and to bring the stability that we think is required for broad-based adoption of RESTA DLT in the market.

Regulatory Compliance - With the increase of government's oversight of public ledgers with associated cryptocurrencies and tokens, a distributed public ledger must be capable of enabling appropriate Know Your Customer (KYC) and Anti Money Laundering (AML) checks. Hashgraph is capable of providing KYC and AML, which enables RESTA to compile with regulatory compliances.

3. *Why not Blockchain?*

The reasons why to use Hashgraph over Blockchain:

Cost - The Hashgraph is inexpensive, in the sense of avoiding proof-of-work. Individuals and organizations running Hashgraph nodes do not need to purchase expensive custom mining rigs. Instead, they can run readily available, cost-effective hardware. The Hashgraph is 100% efficient, wasting no resources on computations that slow it down.

Efficiency - The hashgraph is 100% efficient, as that term is used in the blockchain community. In blockchain, work is sometimes wasted mining a block that later is considered stale and is discarded by the community. In hashgraph, the equivalent of a “block” never becomes stale. Hashgraph is also efficient in its use of bandwidth. Whatever is the amount of bandwidth required merely to inform all the nodes of a given transaction (even without achieving consensus on a timestamp for that transaction), hashgraph adds only a very small overhead beyond that absolute minimum. Additionally, Hashgraph voting algorithm does not require any additional messages be sent in order for nodes to vote (or those votes to be counted) beyond those messages by which the community learned of the transaction itself.

Throughput - The hashgraph is fast. It is limited only by the bandwidth. If each member has enough bandwidth to download and upload a given number of transactions per second, the system as a whole can handle close to that many. Even a fast home internet connection could be fast enough to handle all of the transactions of the entire VISA card network, worldwide.

State efficiency - Once an event occurs, within seconds everyone in the community will know where it should be placed in history with 100% certainty. More importantly, everyone will know that everyone else knows this. At that point, they can just incorporate the effects of the transaction and, unless needed for future audit or compliance, then discard it. So in a minimal cryptocurrency system, each member would only need to store the current balance of each account that isn't empty. They wouldn't need to remember the full history of the transactions that resulted in those balances all the way back to ‘Genesis'.

Asynchronous Byzantine Fault Tolerance - The hashgraph is asynchronous Byzantine Fault Tolerant. This is a technical term meaning that no single member (or small group of members) can prevent the community from reaching a consensus. Nor can they change the consensus once it has been reached. Each member will eventually reach a point where they know for sure that they have reached consensus. Blockchain does not have a guarantee of Byzantine agreement, because a member never reaches certainty that agreement has been achieved (there's just a probability that rises over time). The blockchain is also non-Byzantine because it doesn't automatically deal with network partitions. If a group of miners is isolated from the rest of the internet, that can allow multiple chains to grow, which conflict with each other on the order of transactions. It is worth noting that the term "Byzantine Fault Tolerant" (BFT) is sometimes used in a weaker sense by other consensus algorithms. But here, it is used in its original, stronger sense that (1) every member eventually knows consensus has been reached, (2) attackers may collude, and (3) attackers even control the internet itself (with some limits).

Hashgraph is Byzantine, even by this stronger definition. There are different degrees of BFT, depending on the assumptions made about the network and transmission of messages. The strongest form of BFT is asynchronous BFT- meaning that it can achieve consensus even if malicious actors are able to control the network and delete or slow down messages of their choosing. The only assumptions made are that more than ⅔ are following the protocol correctly and that if messages are repeatedly sent from one node to another over the internet, eventually one will get through, and then eventually another will, and so on. Some systems are partially asynchronous, which are secure only if the attackers do not have too much power and do not manipulate the timing of messages too much. For instance, a partially asynchronous system could prove Byzantine under the assumption that messages get passed over the internet in ten seconds. This assumption ignores the reality of botnets, Distributed Denial of Service attacks, and malicious firewalls.

Source: Hedera: A Governing Council & Public Hashgraph Network

4. System Architecture

4.1. Smart contracts

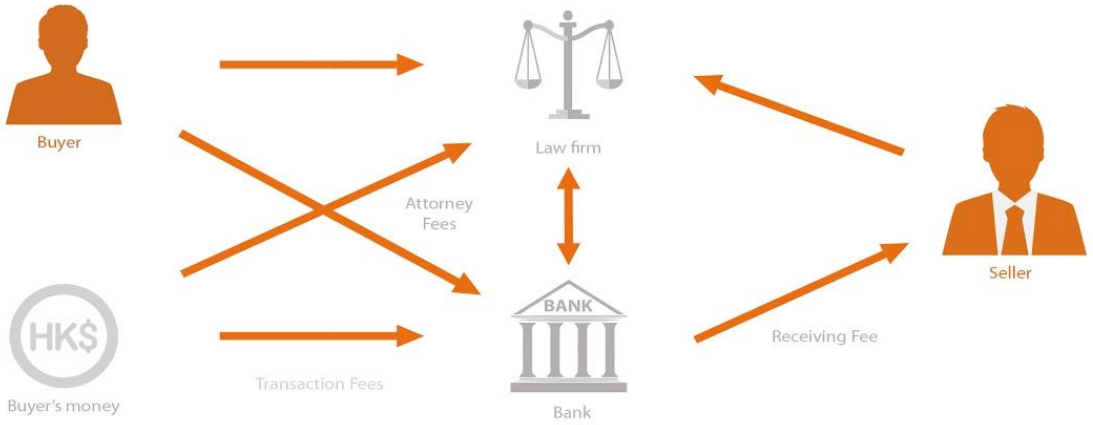
Smart contracts are self-executing electronic contracts with all terms of the agreement between buyer/investor and seller being directly translated into lines of code. The code and the agreements contained therein exist across a distributed, decentralized network of RESTA's platform. In other words, contracts could be converted to computer code, stored and replicated on the system and controlled and tracked by the network of banks and investors on RESTA's platform that runs these hashgraph based smart contracts.

These contracts function as "multi-signature" accounts, so funds are transferred and received only when people's consent is reached. This may include the transfer of money and ensuring that the goods or services are delivered and received by agreement. Smart contracts help you exchange property, shares or invest in real estate in a transparent, conflict-mitigated way while eliminating the need for a third party as an intermediary. Smart contracts not only define rules, conditions, and penalties of the agreement in the same way as it is done in the traditional contract but also can automatically ensure the fulfillment of obligations or ensure the execution of penalties in case if obligations are not fulfilled. Hashgraph technology, modernizing the real estate ecosystem, allowing people to exchange data and money safely and efficiently. This makes investments transparent and cuts down intermediaries and minimizes risks. A safer, faster, more reliable process of buying and selling real estate for each party involved in the deal.

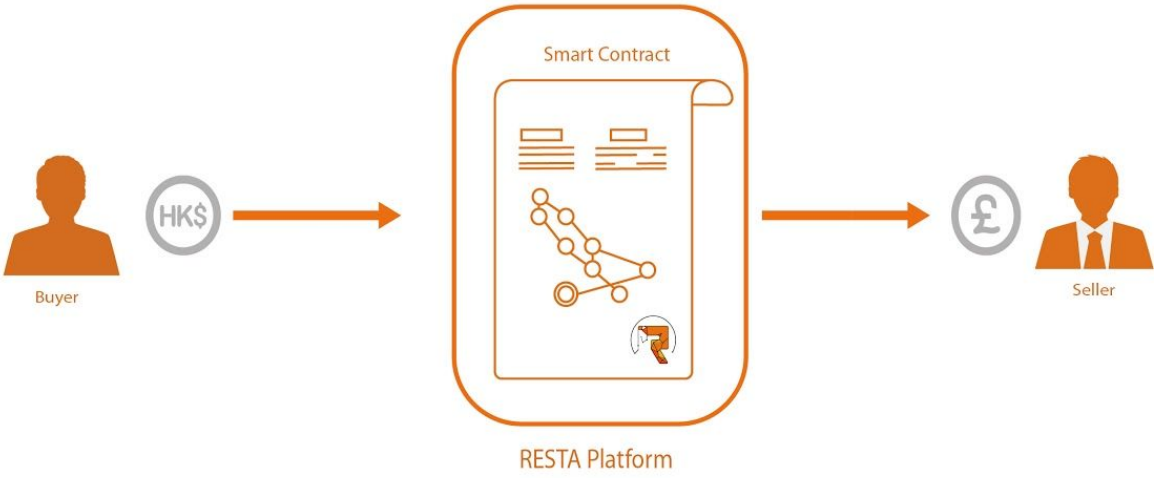
Since this protocol is the sole arbiter of a transaction, a transaction can be carried out transparently, without conflicts and without costly and time-consuming intermediaries or other verification processes. The capitalization of enterprises or the creation of investment pools, as well as the acquisition and purchase of shares in any such investments, are subject to development, often opaque, and it is especially difficult to conduct such operations in another country. The costs and delays associated with these lengthy processes become even more significant when the parties do not agree with contractual obligations. Smart contracts have already concluded contractual terms and enforcement functions. This functionality includes when, how and where this payment or refund is to be made. Smart contracts do both: once deployed to the hashgraph, a smart contract is given an immutable address, and the deployed contract cannot be altered. That makes smart contracts a direct, secure way of agreeing on the exchange of money and property. The Hedera Hashgraph, used by RESTA, is especially dedicated to the development and application of smart contracts.

Smart Contracts

Traditional way of buying a real estate property



Buying a real estate property through RESTA's Platform



Advantages of a smart contract buying a real estate

1. Autonomy
There is no need to rely on a broker or lawyer

2. Trust
Your doucuments are encrypted on a shared ledger

3. Saving
Smart contracts save you money since they knockout the presence of an intermediary

4. Fast
Contract excutes itself when the conditions are met

4.2. International Transactions

Our aim is to enable cross-border property investments with zero transaction costs and provide a wide range of smart contracts for investors to facilitate their international property investments while enabling banks with a distributed ledger system for carrying out transactions within a country and between countries.

4.2.1. Problems in Global Real Estate World

Property investment institutions and individual investors worldwide need a better access to real estate projects in different countries, as there is no a reliable channel to validate developers, projects, and transactions overseas. There are also severe restrictions on investing and acquiring properties in most countries around the world. Overseas property prices are often higher for foreign buyers as there are often extra fees charged for broker and sales agent commissions (up to 8%) and third-party marketing channels that can add an additional 15-20% markup and plus to that exchange fees, which occur on currency conversion.

With the current system, an investor or a buyer who wants to purchase foreign real estate often relies on his network to contact with local brokers, who in turn work with international brokers to connect with local brokers in the interested country, where investments will go. This process is time-consuming, involves many intermediaries, and the cost to the buyer and investor could raise up to 30% more than the market price of the property in that country. The core of the problem is the lack of a comprehensively available platform for validating buyers, property developers and implement cross-border transactions that would provide a direct and frictionless bridge between investors, property developers, and buyers as well as banks.

RESTA platform aims to enable investors to pay the zero transaction cost for cross-border investments while providing banks cross-border transactions similar to the SWIFT system but with much more upgraded technology which can actually record all the transactions on the decentralized network of banks.

4.3. Fund Escrow

There is always a problem of a lack of trust when big sum cross-border transactions occur between unknown parties. A considerable amount of time and money is required to resolve this problem until parties fully know each other and all the agreements are fulfilled. Investor or buyer of property always runs the risk of losing his invested sum, while the seller may face the problems of not receiving full sum of payment for the property as the background of the investor or buyer is not verified before the transaction.

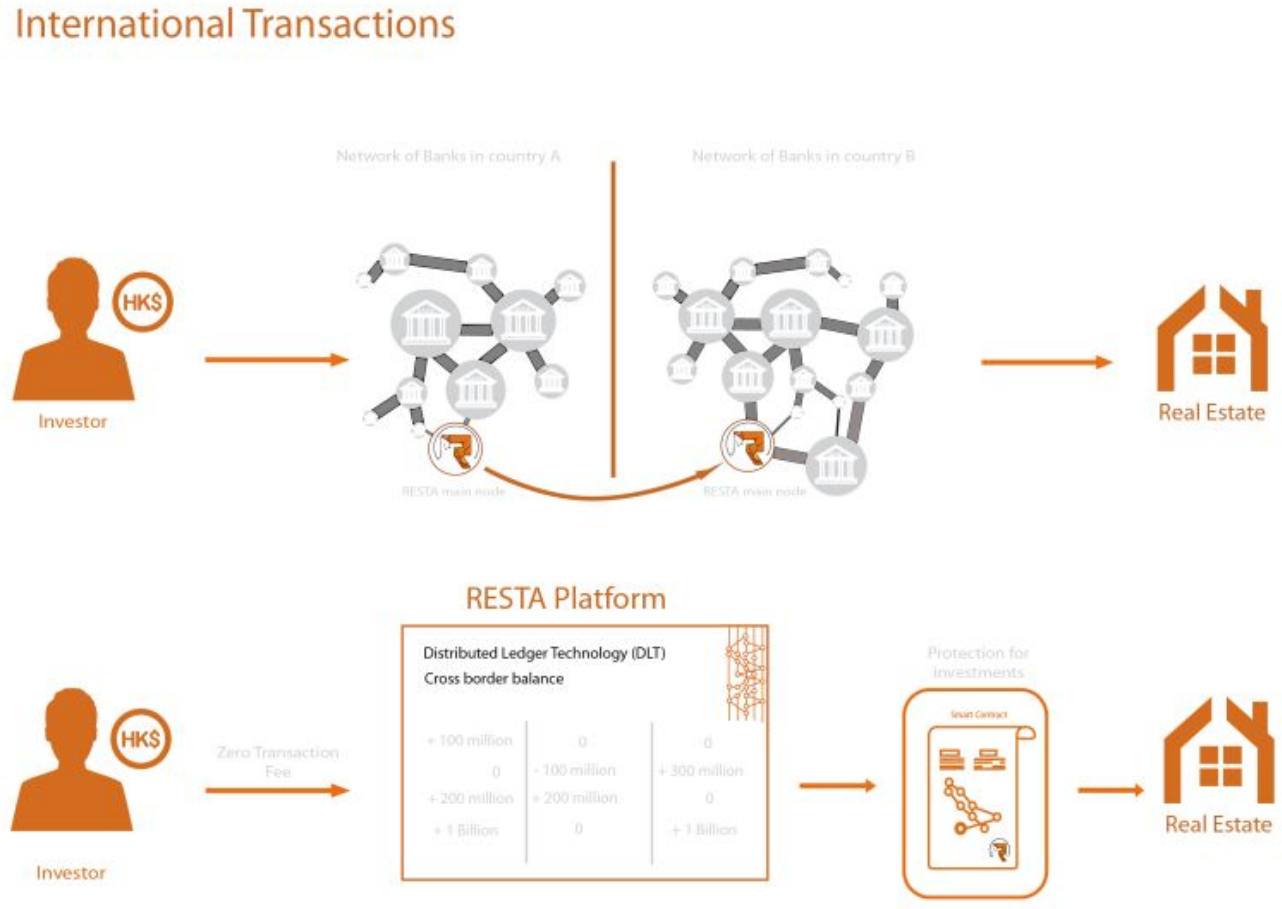
RESTA' platform offers escrow system to eliminate this problem. Buyer or Investor of property puts his money into RESTA's fund on the platform, which functions as a fund escrow account, and selects the special type of smart contract with all the defined rules, conditions and penalties of the agreement. From that time, the smart contract is activated and works as a storage of the fund until all the requirements set by the investor are fulfilled by the seller of a property. This resolves the problem of the trust between unknown parties, saving the time of the investor and seller before the purchase of investment happens and ensuring the safety of the fund.

With the help of RESTA platform's smart contracts and fund escrow as well as zero transaction costs, amount of cross-border investments will increase which in turn stimulate the growth of wealth in real estate field all around the world.

5. *How RESTA' zero transaction cost platform works*

RESTA's platform is built on hedera hashgraph in order to keep the record of cross-border transactions on the immutable decentralized ledger, and all fiat money in transactions will be deposited to RESTA's fund, which will be in one or in several banks of RESTA's network of banks on the selected countries.

One main point is that, in reality, there is no money transfer from one country to another. Only the RESTA's ledger system records and stores the numbers(which is equal to the transaction amount of money from one country to another) and keeps numbers updated according to the transactions. Instead of transferring money from one country to another, RESTA, with the help of the established network of banks from both countries where the transaction occurs (money sender and receiver countries), updates balances in respective banks. For example, RESTA has funds in Hong Kong's bank as well as in London's Bank, when investor from Hong Kong sends $100M from Hong Kong to U.K. he puts that money in RESTA's fund in Hong Kong Bank and balance in Hong Kong Bank updated by +$100M, while balance in London bank updated by -$100M and RESTA's fund in London bank transfers $100M, from its own fund to the Real Estate project on the behalf of the investor from Hong Kong. When the next transaction occurs on the opposite direction, from U.K. to Hong Kong, the investor from London can send money using RESTA's system and numbers will update and banks will perform the similar activity in the opposite direction and London's bank may update its negative balance and Hong Kong's bank can update its positive balance.



The pair of banks from cross-border countries, with frequent amount of transactions at each other's direction and almost equal volumes of transactions, will be selected and matched in the RESTA's platform so that clearing balance between each countries' will eventually be close to zero and thus no money transfer is required. With the help of the RESTA's network of banks, each bank in the permissioned network can see and track money transactions of other banks and can select the cross-border banks to match its transactions against theirs' and can be selected as a pair bank with them.

There will be a settled date when all balances in all banks of RESTA's network are cleared, in case of positive balance banks may transfer exceeding amount to RESTA's fund or provide some properties they own under RESTA's possessions, deducting their commission fees and service fees for supporting RESTA's investment transactions throughout the year. In case of negative balance, if the investor agrees to sell the overseas properties he or she invested, banks may take possession of those properties, after evaluating the market value of the property. If still, a negative balance remains, then it will be cleared by RESTA's fund in that country. Or RESTA may fully clear the negative balance from the beginning without transferring property to the banks.

Hedera hashgraph consensus protocol used in transactions enables RESTA to create an immutable decentralized, distributed common ledger system with banks from cross-border countries and each bank will represent a node in the network. While RESTA will be the main node, representing investors and investment institutions, to record and store all the cross-border investment transactions and share data with all the banks and investors in the permissioned network of the RESTA's platform.

6. What are the incentives for banks to join RESTA's permissioned distributed network?

Banks systems such as MT103, backed by the SWIFT, which allows banks securely to exchange electronic messages with each other, is getting outdated.
It is used to instruct another bank to credit the account of one of their customers, debiting the account held by the sending institution with the receiving bank to balance everything out in cross-border/international transfers. SWIFT does not facilitate funds transfer, it only sends payment orders, these orders must be settled by correspondent accounts that the institutions have with each other. The system's cross-border payments are getting slower, expensive and nontransparent

That's why it was challenged by Ripple the cross-border payments, which utilizes a blockchain technology. Ripple uses the consensual hashes to transmit the messages across the Ripple network but does not hold the ledger. Ripple network is Inter Ledger Protocol (ILP) and it is in the public domain. ILP allows Ripple to bridge existing bank ledgers with lower barriers to entry. In return, banks use the Ripple network, instead of SWIFT network.

Due to the competition from Ripple, SWIFT has started their Global Payments Innovation Initiative (GPII). GPII, the combination of the current SWIFT messaging and correspondent banking, is a set of rules to commit banks to behave more reasonably in cross-border payments, tracks payment and monitors adherence to these new rules. If ripple is challenging the current GPII system, even though ripple has some severe limitations in its technology, what would happen to the current SWIFT system when RESTA starts offering its services to the banks and investors?

First, the correlation between blockchain based cryptocurrencies makes ripple's system vulnerable to the crypto market's frequent fluctuations and implementing such a system to the banks' network carries a huge risk to banks, which are also under the constant pressure of hedging against currency movements between countries in their cross-border transactions. For the beginning, RESTA uses numbers in its network instead of tokens that will correspond to dollar values of transactions and it is not correlated with any cryptocurrencies.

Second, the technology itself is based on blockchain to achieve its consensus and in "*Why not Blockchain?*" part of the white paper we clearly stated why hashgraph is better protocol to achieve consensus and can handle up to 250,000 transactions per seconds, while ripple reaches 50,000 transactions per seconds, and even be run on the smartphone, so users of RESTA's platform, bankers and investors can run the system anywhere.

RESTA's platform is offering better solutions and services to current existing networks of banks as well as leveraging this network, RESTA is providing a platform for zero cost cross-border real estate investments transactions.