White Paper: Project Hurricane
or how to implement Blockchain Technology in German Real Estate Transactions

by: Prof. Dr. -Ing Katarina Adam, 2004.hurricane@gmail.com, katarina.adam@htw-berlin.de

Abstract:

Since the introduction of the blockchain concept in 2008 by the inventor of the digital currency Bitcoin a lot ideas of how to use this concept arose.

This paper depicts the use of the blockchain concept in real estate transaction in Germany. You cannot transfer real estate in Germany without a legally binding contract based on the regulation of the Bürgerlichen Gesetzbuch (BGB). This paper focuses on one specific aspect in the process.

When purchasing property in Germany you are confronted with several layers of interest. But there are some typical things set in stone: You need to go to a notary service to sign the contract, after signing a certified copy will be send amongst other to the land registry office of your town or parish. The whole process is stretched to ensure that the rights of both, seller and buyer are balanced. But, this stretching slows the speed of process - without a need. And, things can fail in the middle - also without a need.

In general, a brief overview of the typical procedure is presented below:
A buyer and a seller have agreed on the sale object and go to the notary service to fix the terms of purchase. After both parties signed the contract in front of the notary, the next step of the process starts: sending a duplication of the contract to the department in the land register including the application for a reservation note for the buyer in Abt. II (section II) of the German Grundbuch. It ensures the transfer of ownership, which, however, will take some time. Meanwhile, the notary will subsequently examine whether the conditions laid down in the purchase contract have been fulfilled for the sale, such as the cancellation of basic debts etc. If this is the case, the buyer will receive the payment request as buyer and have to transfer the purchase price to the seller. In the end the buyer will became the new owner, registered in section I and the reservation note from section II will be removed (blocking is no longer necessary).
The following approach is focus on the first step after signing: To register the buyer in the so called Abteilung II (section II). This is of utmost importance. This registration equals a blocking, which means, now the seller is not able to sell the property e.g. twice or to someone who offered a higher price etc. With his registration the buyer receives a security that the process of transference will be continued according to her / his declaration of intention.

Furthermore, this paper is not intended to be comprehensive nor to be a final design. Mechanismus will be added, refined and removed to community ideas and critique.

But, within the process of transference a lot of things can causes a lot of problems. So there are several demands in the market to
- make the process itself more transparent
- quicker which equals more efficient
- to protect owner rights as well as the rights of buyer (according to BGB ...§§)
- make sure ownership
- prevent fraudulent changes or manipulation from anybody

Therefore, it is worth to discuss the following:
1. Backstory:

Process of the transference of real estate rights in Germany:
Suppose there is seller and buyer and after some negotiations they stipulate the price for - let’s say - an apartment. Now they must go to a notary service to fix the contract. This is compulsory in Germany. Without signing the contract in front of the attesting notary it is impossible to transfer the property from seller to buyer.

German law and the transference of property is not that simple that after signing the contract the buyer is the owner of the property according to the common process of purchasing every day items. For property it exist a special feature that stretches the acquisition and therefore the whole process is fragmented in law of obligation and law of property. This exists because of some cardinal reasons:

- The seller is to ensure that he loses ownership of his property without receiving the purchase price.
- The purchaser is to be protected against the fact that he has already paid his purchase price to the seller and ultimately does not get ownership of the property.
- The seller’s old creditor bank must be protected against losing its right in Section III (basic debt) without receiving parts of the purchase price to compensate for the remaining loan.
- The buyer’s financing bank must be protected against the fact that it pays a loan amount to the buyer or vendor without being registered as security in Section III of the land register.

The purchase contract and its settlement are therefore a collection of small steps. The notary chooses the procedure to make each party take a small step, then the other party is on the move and then the third step takes place. This is particularly clear when securing between seller and buyer:

The first step after certification is done for the seller, in which he allows to make a reservation (to the term later) for the buyer in the land register register. After the remaining payment requirements are met, the buyer then takes the second step in which he pays the purchase price to the seller. The seller then goes to the third step of handing over the property and at the same time the fourth step of releasing the
property transfer to the buyer. In this step-by-step approach, of course, the notary’s right to secure the seller’s and buyer’s bankers’ rights, so that the whole thing becomes somewhat more complicated. All this must be regulated by the purchase contract.

When the contract is completely read, all problems solved and all questions answered, this is signed by the parties and the notary. The actual authentication has thus been carried out. What happens now is the buyer need to get the reservation, made in „Section II“ of the German land registry:

In current terms now as soon as possible, i.e., as a rule, on the day after the purchase contract has been signed, the notary will also apply for the transfer of ownership of the property to the land registry office. The reservation is the most important security of the buyer and no time gap should arise. After the application of the notary to the land registry for the purpose of registering the reservation, the protection effect has already been largely achieved since land register applications are processed according to the order in which they are received. Subsequent applications therefore do not interfere with the implementation of the land purchase contract.
2. The pain point

Here, the business idea of „Project Hurricane“ comes into the picture. Why should a buyer wait on average at least two weeks\textsuperscript{1} - or sometimes even more - to receive the important protection of blocking the land register of this specific property? Or, is this just a hypothetical question and there are no needs neither for customers nor the market itself to receive quicker and faster the reservation? The composer of this White Paper thinks this is a pain point for both, buyer and seller because the whole process of getting the reservation is intransparent, or let’s say „a blackbox“: As a participant, you don’t know at what stage the process is. It starts with the notary office. It is said that the notary office will submit the application for transferring the ownership the day after signing the contract. But neither sellers nor buyers have any proof. They are forced to trust. Continuing the next steps of the process you can quickly determine that there is no indication in which phase the process is. And, this a really a „black-box syndrome“.

Suppose, the notary has sent, as promised, the transcript the day after notarisation to the land registration. What happens now? The land registration processes applications after the respective date of receipt. Again, as a participant you need to trust. You need to trust that e.g. the seller hasn’t sold his property twice and the other notary was a bit quicker in submitting the transcript. You need to trust that the post is working correctly and your contract is not lost accidentally. You need to trust the staff in the land registry to stamp the incoming post correctly. Suppose, we always trust and nothing bad effects the process of transference. Furthermore let’s suppose the staff in the land registry office is not overloaded with work so they can confirm the reservation within - let’s say - two weeks, but why should you as a buyer wait such a long time? Is this nowadays really necessary? Purchasing property equals investing a huge amount of money. Why is the process of transference so intransparent? Why does it take such a long time?

\textsuperscript{1} this is the time-span the Bundesnotarkammer and the officer in charge of the Federal Ministry of Justice stated in an interview with the author
Figure 2: average time span of first sequence in transferring property in Germany

Figure 2 describes the stretched process of transference real estate in Germany. The main focus for „Project Hurricane“ is the time span between signing the contract in front if the attesting notary and receiving the reservation note/priority notice.
3. The solution

To overcome this black-box syndrome „Project Hurricane“ offers a blockchain based solution to ensure:
- transparency
- protection of buyer’s and seller’s rights
- prevent sale fraud
- malicious mischief
- and, as a side effect the implementation of „project hurricane“ allows the tax authority to collect the land purchase tax simultaneously or at least to receive the real time notification on the transaction details

Furthermore „Project Hurricane“ can:
- ensure that the transaction of transference the ownership is done correctly
- resolve disputes

As a result, information will be correctly stored - like today- but the whole process is much quicker and the maintenance of correctness and completeness is preserved and reliable. The whole process is transparent and the need to trust a third party not longer necessary.

Figure 3: Process of confirmation in Abt. II German Land Registry

\[\text{Blockchain}\]

Contract: Notary enters transaction on the blockchain
Send: Land registry accept transaction
Accept: Land registry sends priority notice of conveyance
Confirm: Unchanged physical paper-based deed

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This raises the issue of liability
Bundesnotarkammer, the Federal Ministry of Justice and several lawyers all state one big problem: „How is a so called smart contract\(^3\), based on blockchain technology able to deal with individual issues like ambiguous declarations of will, inheritance disputes etc.?”

The incumbents argue that this can only be done by the current way of going through the whole process. The so called “four-eye principle“ ensures that no legal error can be entered into the land register. The land register represents the current legal situation of a property, a dwelling, etc., and is intended to provide legally binding information about a property on the basis of the so-called "public faith“.

But, „Project Hurricane“ will not attack the public faith nor the „four-eye-principle“.
The only aim is to make the first steps of becoming owner of property quicker and much more transparent.

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\(^3\) Definition of smart contract according to Don and Alex Tapscott: Smart contracts are computer programs that secure, enforce, and execute settlement of recorded agreements between people and organisation, page 101 ff
4. The technical part of the solution

The digital currency Bitcoin is the first and best known decentralised public ledger platform and consists of protocol for sending, receiving, and recording value securely using cryptographic methods. Values can be transferred across the network with the help of an open-source software and protocol. In addition, an incentive scheme for obtaining rewards for human and machine efforts is proposed by the Bitcoin protocol. This system is framed by governance system for determining key operation principles for the platform.4

Project Hurricane is using this approach to create a platform for tracking property ownership.

The reasons to use the Bitcoin blockchain are simple:
- transparent
- immutable
- data consistency validation
- cryptography enabled
- distributed
- atomic transactions are possible

A key component is the distributed ledger - or blockchain - on which each transaction is securely recorded. Already Haber and Stornetta in 1991 uttered a method for secure time stamping of digital documents.5 With this time stamping it is now possible to expose when a document comes into existence. Furthermore, it is also possible - and much more important - time stamping will reflect the order of creation of documents and can’t be changed or manipulated after. Components, which are important to track high-value property.

To anticipate it at once, the often mentioned limitation of transaction per second will not disturb or harm the project idea. This becomes visible while looking at the sales cases e.g. in Berlin. Berlins Gutachterausschuss (which is in charge to document all real estate transactions) stated for 2015 a total number of sales cases about 35.244

4 see White Paper by Satoshi Nakamoto
5 see https://link.springer.com/article/10.1007/BF00196791
transactions. In comparison, the very first Blockchain realization which is Bitcoin can perform ~ 3 transaction per second (tps). To sum it up, you’ll have the chance to verify 259,200 transaction (60x60x24x3) per day. It is obvious that there is no need for so many transactions per day, even if you would sum up all transaction across Germany in one day. Furthermore, with the advance of the new generation Blockchain frameworks like e.g. Litecoin can perform 8 tps, Dogecoin 20 tps, Ripple up to 1,000 tps. There are already Blockchain designs out that get up to 100,000 tps. The only need is to optimize the design for the very specific features. Then the throughput in tps can be extremely high.

So for this, the Blockchain appeared to be a very good tool to use it as an working and well proven technology. The Blockchain architecture requires synchronous consensus mechanism for the safety of the transaction.

### 4.1 Carryover the approach

Like a recipe we now combine the backbone of Bitcoin equals blockchain and the transference of property to receive the reservation note from the Grundbuchamt to block the land registry for a specific property.

Before we start to build up the scenario one additional information seems to be important. In Germany the land registry itself is going to be more and more digitised. Even we have 16 Bundesländer and 639 district courts which are in general responsible as land registry for the land located in their district there are only two software packages in charge. More or less they all use or will use in future the so called „EDV-Grundbuch“ which replaces the conventional paper land register. Is this first step done, it allows especially notaries and credit institutions online access to accelerate the land register procedure. In an interview made by the author with the Federal Ministry of Justice the institution claimed the process from signing the contract to block the

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6 see Immobilienmarktbericht Berlin 2015 / 2016, S 74


8 the Federal Ministry of Justice and the Bundesnotarkammer just mentioned „two software packages“, but not exactly which one. If the Federal Ministry of Justice would allow the implementation of a prototype build up with Project Hurricane, then it is easy to implement these two packages.
property with the reservation note will take approximately two weeks - when all land registries are working with the digitised version. Comparing this statement with the current average of 8 - 12 weeks!

Beside this statement exists a huge advantage: Each property is then digitised. That means for Project Hurricane the first step to create a private key for property is almost done. It is possible to create unambiguously indicators to each property like address, size, cadastral data such as land, corridor etc..

Suppose, Project Hurricane has the access to the data of - let’s say at the beginning for all properties in Berlin - then it is possible to generate the genesis entry on the blockchain-based system. Now, with this entry and the including indicators like mentioned above each owner of a property now receives the confirmation that his or her property is registered on a blockchain. Using now the typical ingredients of blockchain, we’ll see the use of cryptography amongst others. In Germany, the willingness to provide or make known personal data is rather weak. Therefore, we recommend to use the private / public key approach. When Bitcoin protocol is advanced with colored coins technology and minebox / storj decentralised cloud storage solution a good data granularity and it access control can be fine-tuned by the private key holders. To make it more clear, let’s check the typical Bitcoin transaction process:

A Bitcoin transaction encompasses

- A set of inputs, each of which contains the transaction hash plus the output index of one of the outputs of a previous transaction. In addition a digital signature provides the cryptographic proof that the recipient of the previous transaction output authorises this transaction.

- "A set of outputs, each of which contains the value (in this case the amount of BTC) going to the output, and a script, which determines the conditions under which the output can be spent."  

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9 see e.g. https://minebox.io or https://storj.io
10 see e.g. colored coins white paper, p.4
11 see e.g. colored coins white paper, p.4
The output script now serves as a public key. The corresponding private key is originated through the standard cryptographic digital signature. With this elements the output script fits to a unique address - in this example Bitcoin address.

This means for Project Hurricane that the transference of property now can be done anonymously, as long as the private key ownership is not linked to a particular person. So the participants in this blockchain system can’t uncover the identity of an owner but they can see the necessary data to valid a transaction. This will provide the acceptance in Germany of this approach. The requirements to safely store and handle private keys of this Blockchain solution become very important. There is indeed a need for a simple to use and yet secure way for ordinary not-technical people to handle their private keys.

The upcoming question may be which kind of blockchain should be used. There are many solutions in the market available. Project Hurricane will adopt an existing blockchain. It’s good to know that the idea for a blockchain-based system for storing a registry of who owns what property has a long history. In 1998, Nick Szabo published his concept of „secure property titles with owner authority“. But only with the publication of Bitcoin and the concept behind a number of alternative applications came into picture:

- Hyperledger: an emerging protocol designed for business-to-business and business-to-customer transactions. Hosted by the Linux Foundation the Hyperledger has a focus on identity and auditability, private transactions and confidential contracts as well as modular consensus all are essential features for the Project Hurricane.
- Multichain: aims to remove perceived problems associated with bitcoin by limiting the visibility of the ledger to certain participants, allowing institutions to set controls on transactions permitted and by forgoing distributed mining. Multichain allows users to set a list of permitted users that can act as nodes that refer information on the network and 'miners' that verify transactions, including a method by which nodes can verify whether other nodes have been approved.

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13 see http://www.the-blockchain.com/docs/Hyperledger%20Whitepaper.pdf
14 see: http://www.multichain.com/download/MultiChain-White-Paper.pdf
5. Conclusion

Using Project Hurricane blockchain will allow that the process from signing the purchase contract to receive the reservation note only takes some few minutes instead of at least two weeks. In addition, the contracts now can implement services for the tax authority so that the land purchase tax can be collected simultaneously.

Even this approach is only for the first step in the whole process, but it is a very important one for all participants. With an application all participants are able to check how far the process progressed. The former stretched process gains efficiency which is beneficial for all. Cost will be reduced as well as potential errors or frauds. Transparency is in the process. And, a buyer knows that no one else now can disturb the process. You, as the confirmed buyer, now can trigger the second step in the process immediately and your bank can instruct the agreed purchase. In this case both the confirmed buyer and the seller benefits. Furthermore, the land registry can send their cost note for this first step also automatically. Also, Notary offices will not lose a source of income. They still offer more service to their clients. ...

You, as a confirmed advised buyer, can now trigger the second step in the process immediately and your bank can instruct the agreed purchase price.

Sounds great -doesn’t it?

The implementation of Project Hurricane can solve problems. But on the other side, new questions arise. In using the Blockchain Technology cryptography is one important ingredient. This includes that every user receives a public key - a unique jumble of letters and numbers - and a corresponding private key, which is supposed to be know only by the user. These two keys are mathematically related in a way that only the user with the private key is able to unlock messages sent to users public key as well as the user only can sign off on messages associated with the public key. Complicated mathematical equations support the specific relationship between each public and private key in a way that one with only a particular public key would ever be able to work backward to figure out the corresponding private key.

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15 In this step, lawyers will complain because there is a need to check several rights and obligations which might belong to the property so that it can’t be full field immediately. The steps after receiving the reservation note must be intensively discussed to digitise these next steps.
According to this systematic it is of utmost importance to keep ones private key safe! Anyone with a private key from someone else can spend e.g. the digital currency which belongs to that address or transfer proprietary content.

Therefore, the storage of this private key is a neuralgic point which is today in 2017 not solved. If someone loses her / his private key, she or he will lose the access to the assets in this wallet\textsuperscript{16} including all other complications.

In addition it should be emphasise that the Blockchain in Project Hurricane is designed in the way that the parties are able to lookup the process - writing rights are only based on the notary services. Only they can append new records. This could provoke new worries like what will happen if the notary misapply his writing rights. In Germany there is a strong trust and believe, that notaries will not commit crimes - because as a consequence they would lose their permission of being a notary.

To conclude we can say that the implementation of Blockchain Technology will support the rights of sellers ans buyers. But it is also important to notice that this powerful tool includes some consequences the public needs to accept and understand.

Are we, as the public ready for this change?

\textsuperscript{16} Wallet: “A wallet is software that holds all your addresses. Use it to send bitcoins and manage your keys.” Definition according to Antonopoulos,
Bibliograph:
Hyper Ledger: http://www.the-blockchain.com/docs/Hyperledger%20Whitepaper.pdf, eingesehen am 28.03.2017 um 14:55
Multi Chain: http://www.multichain.com/download/MultiChain-White-Paper.pdf, eingesehen am 28.03.2017 um 15:30
Mine box: https://minebox.io, eingesehen am 29.03.2017 um 15:07
Namecoin: https://namecoin.org, eingesehen am 26.02.2017 um 22:05
storj: https://storj.io, eingesehen am 29.03.2017 um 15:25
Tapscott, Don; Tapscott Alex: (2016): Blockchain Revolution, How the technology behind Bitcoin is changing money, business, and the world, Portfolio / Penguin Random House LLC, New York