

BLOCKCHAIN IN E-MOBILITY MARKET

Research into possibilities and impact of Blockchain in the e-mobility market

ECISS DELIVERABLE 5.1

ECISS

From electric vehicle to smart society

allego

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1. Method of obtaining information

Blockchain is a commonly used term. There is enough information to be found online, but most of the information points to all kind of solutions that are not directly related to the e-mobility market. The working group defined four questions to direct the research done on Blockchain:

- Is Blockchain an alternative way to store CDRs safely?
- Can payments be automated with Blockchain?
- Is Blockchain a solution for Eichrecht?
- What is needed to get a Blockchain solution widely accepted in the e-mobility market?

Workshop

GreenFlux and NKL Nederland organised a workshop and invited all current members of eViolin and other companies or parties that were either interested in blockchain or are already working in some form with blockchain.

The following speakers gave a presentation on their experiences:

- Harm van den Brink (Elaad)
- Fardau van der Galiën (Vandebroen)
- Peter Willem Dekker (Quantos)
- Christopher Burgahn (Share & Charge)

The workshop gave new insights into the possibilities and limitations of Blockchain technology in the e-mobility market by answering these questions. The findings are available in Chapter 4 to 7.

A report on the Blockchain workshop is included in this position paper in Addendum II.

2. Presentations

Four speakers were selected to show the different ways blockchain is currently used within the E-mobility market. All four presentations were a great way to show existing research and experience at different sides of the market.

Harm van de Brink (Elaad) presented the research that was done by Elaad and what the results were to create a charging station based on blockchain. This gave a good insight into the current possibilities and also the impossibilities.

Fardau van der Galiën (vandebron) presented how vandebron is using blockchain to create a way to earn money by switching charging of a pool of Tesla cars off or on. Blockchain is used there to prove this has happened to the energy market.

Peter Willem Dekker (Quantoz) presented how Quantoz created their blockchain solution Quasar, and how they use this in their solution for charging and payments with Porsche. The presentation also gave a good insight into how blockchain can be used in other supply chain models and how it could be applied to the E-mobility market.

Christopher Burgahn (Share&Charge) presented how his company experienced all kind of issues when trying to implement a full blockchain solution for interoperability in the E-mobility market and what for them worked and what not.

3. Discussions

After the presentations we started a discussion on the different questions and some additional topics that were raised during the presentations.

Open vs private blockchain

An important difference within Blockchain solutions is whether they are open to all or private. There are different ways to do this.

Open blockchain

Everybody can see all transactions and the content of the transactions

Private blockchain

Only the connected partners of the blockchain can see the transactions. Partners in this private blockchain that operate as a node can see all transactions, but others can only see their own transactions.

Early conclusions

Blockchain is a technical solution to store

1. Trust. You want to use blockchain technology if you do not trust the senders
2. Unchangeable data. Data cannot be altered after it has been written on the blockchain
3. Independency of bigger companies like payment providers or hubs

We might have found no real solutions to the questions raised, however there were some other interesting discussions that have to be researched.

These could lie in the domain of roaming and interoperability.

4. Is Blockchain an alternative way to store CDRs safely?

This question was defined by the ECISS working group because of the current issues of sending and storing the information of a CDR (Charge Detail Record).

Current issues

CDRs are currently shared between roaming partners via excel sheets (shared by email), via P2P OCPI connections or via a connection to a hub like e-clearing, Gireve or Hubject.

There are a couple of problems with the current methods

- The partners create the Excel sheets but there is no way to guarantee that the creation of the CDRs based on the meter values is correct or not.
- There is no guarantee that the values in the CDRs are stored correctly without tampering in either code or during the creation of the Excel sheet.
- There is also a security issue with sharing this kind of information via email as the CDRs are seen as privacy sensitive information
- Sending information once every month limits the option to show the drivers real-time transactions.
- Sending the information via OCPI is better in terms of security and the information can be sent near real-time, but it is still not clear if the data is completely untampered within either the platform or the sending of the OCPI messages.

All the above methods show that partners within the e-mobility domain should have absolute trust in each other's actions and information. Only out-of-the-ordinary CDRs and possible customer complaints detect any incorrectness or tampering of the data.

Bilateral contracts protect and arrange the trust between e-mobility partners, but it is very difficult to see if these contracts are adhered to.

Conclusion of the discussion during the Blockchain workshop

You can store the information from the CDRs in a blockchain. There is no technical hindrance to be able to do so. However, there is a difference of opinion within the members of the workshop, whether the writing of CDRs in a Blockchain solution is needed or even desired to do so.

Pros of using Blockchain for CDRs

- After writing it in the blockchain, data cannot be altered in the following processes
- Trust is set between partners for the process after writing it in the blockchain
- Data is immediately available for other partners

Cons of using Blockchain for CDRs

- There is still no guarantee that the data that is added to the blockchain is correct. Data tampering could happen before this.
- CDRs in a public blockchain can be seen by everyone who has access, that is not desirable as everyone can determine all actions on all stations and thus calculate turnover or make predictions
- CDRs in a private blockchain can still be seen by parties that own a node in this private blockchain

The fact that CDR data in a public or private blockchain is visible for any other roaming partners is for most parties unacceptable. This visibility could be solved if a separate non-commercial entity (like for instance eViolin) would manage and host the Blockchain on private servers (either themselves or via a third party) and

would act on the interest of all parties. The fact that such a construction is needed to overcome the acceptance of such a system, raised some doubt on whether this is viable or not.

Finally, some people doubted that the benefits of starting up a new Blockchain system and integrating or developing software together with all partners would not outweigh the costs needed for development and maintenance. Most members of eViolin are now working on an OCPI integration where the exchange of CDRs is already one of the key features.

Two opinions after the workshop:

1. CDR exchange does not need blockchain
Many parties are now working on exchange of CDRs via OCPI. The created trust that the process will not alter the CDR information during this exchange does not outweigh all the effort that is needed to create a new system, especially when the experience of OCPI implementation showed that the costs are high.
2. Private blockchain by 3rd party
E-mobility partners could join a private blockchain that is maintained by a 3rd independent party. Although the creating of the data is not guaranteed without Eichrecht-like solutions, the data is then trustworthy.

5. Can payments be automated with Blockchain?

The question was defined by the ECISS workgroup because Blockchain has clear connections with cryptocurrencies like Bitcoin and because the solutions are used within Supply Chain Management where automatic transactions are already used.

Current issues

At the moment the payments for transactions is often a bilateral agreement between two parties. Payments are predominantly performed via traditional payment methods. The risk for the CPOs is that the e-mobility providers can reject invoices or single transactions. The final billing to end-users is at the risk of the e-mobility service providers.

Payments are mostly done on a monthly basis and not directly after the charging session.

The biggest issue is that there are costs attached to the current payments. Ad hoc payments are mostly charged by credit card companies that ask heavy fees for the service. Also, other payment services ask for fees for each transaction. These costs are low, but the value of the charging transactions are often also very low.

Conclusion of discussions

Investigated was if we should start to use cryptocurrencies. The majority of people is not convinced that adding Bitcoin, Ethereum or any other cryptocurrency would offer a solution. These cryptocurrencies itself are too insecure as we don't know where the majority of servers/nodes are, the volatile currency swings and the fact that it always has to be reverted to euros are the main issues why nobody saw this a viable solution.

Secondly, we discussed whether Blockchain could create some system where payments could automatically be triggered by CDRs being transferred to each other. All the pros and cons for transferring CDRs as defined in the previous question came back again and many people concluded that there is no real benefit from changing to OCPI and the currently supported payment methods.

A more far fetched idea was raised where an independent party would host a Blockchain system (like eViolin) with its own internal virtual cryptocurrency. With this solution we could transfer the CDRs to each other, make instant payments without additional costs and then create I-owe-you's to each other based on the calculations made in the system. In this way we could also deduct the income and costs and end up with less money that has to flow through regular payment channels. This solution could seriously limit the cost of transactions via the regular channels as only a handful of transactions remains.

This last solution would have many questions that still need to be answered. First questions would be to determine if it is worth to start all the hassle of setting this system up, compared to current systems with OCPI and existing payment methods. Also, many questions regarding regulations and laws have to be researched further.

If needed a further investigation of such an idea could be part of research done by a workgroup under eViolin.

6. Is Blockchain a solution for Eichrecht?

This question about Eichrecht was defined by the ECISS workgroup because of the ongoing development within this domain in Germany and the solutions that are on the market now.

Blockchain could store data without it being changed in the system. And that is one of the major requirements for an Eichrecht compliant system.

Current issues

The German authority has concluded from EU laws that the charging stations need to be calibrated correctly and that the values coming from the charge stations should be processed without any altering throughout the system. Both CPOs and EMSPs should have a closed-looped system where the end-user could always question the amount charged and whether that amount is correct.

Current systems are not that sturdy as many charging stations are not calibrated, not protected and the system that generates the CDRs are not validated. Data is transferred via excel sheets via the mail or via OCPI. Both solutions are not Eichrecht approved.

Conclusion of discussions

The first presentation of the day, by Harm van den Brink of Elaad, already answered this question as some research was done by Elaad in the recent past.

The answer was clear. Blockchain in itself is not a solution for Eichrecht.

The problem is that the data that goes into blockchain needs to be completely correct and delivered by calibrated meters in the charge stations. Without this, and without a calibrated and safe connection to the blockchain, any values that are stored in the blockchain are not to be trusted.

Within the blockchain itself, the data can not be tampered with, but that is of no use if you cannot trust the data itself.

There are also some solutions available that can encrypt the data with a key. By using this key, anyone in the process could see if there was anything changed in the data of the particular CDR. The majority of the participants saw that as a more viable solution than using a full Blockchain system.

7. What is needed to get a Blockchain solution widely accepted in the market?

When the questions were defined by the ECISS workgroup, we also wanted to know that if there is a viable solution with the blockchain domain, what the effort for all players the market would be to accept the solutions.

Current issues

At the moment we have hundreds of different entities in the European e-mobility market. It is very difficult to get those connected. At the moment partners have to rely either on a Peer-2-Peer OCPI connection or use one of the three hubs (e-clearing, Gireve, Hubject) to set up the connection and to start invoicing each other.

Conclusion of the discussions

Especially the presentation by Quantoz and Share & Charge proved that there possibilities, but also many issues to connect different parties to a blockchain solution.

The discussions defined that there might be serious issues for some parties if a public blockchain would be used. The transactions (CDRs) cannot be shared with 3rd parties. Also, the fact that it is very unclear who is joining with hardware and where that hardware resides. There are risks attached to not knowing who is processing where.

A private blockchain could also be set up. However, everybody with a node on the blockchain would still be able to see all transactions flowing through the system. This again is a no-go for all partners. The only way that could be solved is by setting up a separate independent entity that could maintain a system like this.

The biggest problem that arose is that a serious amount of work has to be done to have Blockchain supported by a critical mass of e-mobility service providers and charge point operators. Many of which are now investing a lot of time in OCPI adaptation.

ADDENDUM I: ORIGINAL WORK PACKAGE ASSIGNMENT

Werkpakket 5:	Verkenning nieuwe functies
WP leider:	Greenflux
Partners:	NKL, TNO, Allego, ENECO, Jedlix

Taak 5.1 Block Chain

Block Chain is een totaal nieuwe manier van de uitwisseling van data, via een decentraal netwerk en opslagmethode. Belangrijk voordeel is dat eenmaal verstuurd data nooit eenzijdig aangepast kan worden en herkomst bekend is. Deze ontwikkeling wordt als veelbelovend gezien voor o.a. de energiemarkt, in deze eerste fase van verkenning worden de mogelijkheden verder onderzocht.

Deliverable: position paper van de mogelijkheden en impact van Block Chain in de EV wereld en gerelateerde energiemarkt.

Taak 5.2 Overige ontwikkelingen

Deze taak richt zich op een verkenning van nieuwe ontwikkelingen naast Block Chain die betrekking hebben op energie, elektrisch vervoer en de data-uitwisseling middels protocollen.

Deliverable: Verkenning van overige ontwikkelingen, met de mogelijkheden en globale impact voor de markt.

ADDENDUM II: REPORT OF BLOCKCHAIN WORKSHOP

Report for Blockchain workshop at GreenFlux – 11 July 2019

How can blockchain give additional value to the electric mobility chain and what is the added value or the impact for the OCPI protocol? These were the main questions during the blockchain workshop that was organised as part of the ECISS project by GreenFlux and NKL.

Participants from the following companies were present during the day: Alfen, APPM, Collectric, Elaad, E-mobility Consulting, GreenFlux, NKL Nederland, Quantoz, Share&Charge, TNO, Travelcard, Vandebron and XXIImo.

The meeting started with an introduction by Hans de Boer (CEO GreenFlux) and Frank ten Wolde for ECISS. After that, Peter van Zuylen started the event by defining the agenda and setting the baseline by showing a Blockchain for dummies video to get all participants on the same level. This video can be found on this location: <https://www.youtube.com/watch?v=u2t4G9pAb2g>

Four speakers were selected to show the different ways blockchain is used within the E-mobility market.

Harm van de Brink (Elaad) presented the research that was done by Elaad on what the results were to create a charging station based on blockchain. This gave a good insight into the current possibilities and also the impossibilities.

Fardau van der Galiën (vandebron) presented how vandebron is using blockchain to create a way to earn money by switching charging of a pool of Tesla cars off or on. Blockchain is used there to prove this has happened to the energy market.

Peter Willem Dekker (Quantoz) presented how Quantoz created their blockchain solution Quasar, and how this is used in their solution for charging and payments with Porsche. The presentation also gave a good insight into how blockchain can be used in other supply chain models and how it could be applied to the E-mobility market.

Christopher Burgahn (Share&Charge) presented how his company experienced all kind of issues when trying to implement a full blockchain solution for interoperability in the E-mobility market and what for them worked and whatnot.

After these presentations, many discussions arose around whether blockchain could be an immediate solution to the problems we are facing today within the market. The following benefits of blockchain as technology became clear during these discussions:

1. Trust. You want to use blockchain technology if you do not trust the senders
2. Unchangeable data. Data cannot be altered after it has been written on the blockchain
3. Independency of bigger companies like payment providers or hubs

The discussions also showed some uncertainties or even problems that have to be researched further. In open blockchain systems transparency (where all members of the blockchain can see all the other data) and not knowing where the servers are and who owns these servers, can be a big issue in our domain. Furthermore, the dependency on one single blockchain system can make it a lock-in for future participants as moving to another blockchain platform is not easily done.

The final questions that were raised within the ECISS project meetings need to be answered within a final paper in the coming months.

The following questions need to be answered in that paper:

1. Is Blockchain an alternative way to store CDRs safely?
2. Can payments be automated with Blockchain?
3. Is Blockchain a solution for Eichrecht?
4. What is needed to get a Blockchain solution widely accepted in the market?

Although we all came to some conclusions in the end regarding these questions, it is too early to give a final conclusion. All participants in the workshop agreed that we might have to organize additional workshops to find out how we could test such a system. Quantoz and Share&Charge both offered to help to support such a test in the future.

The majority of the participants had a positive experience and some mentioned that it was the first discussion they had with people that were knowledgeable on the subject. Most people defined that we should continue this discussion soon to find out if some issues can really be solved with a form of blockchain technology.