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## BLOCKCHAIN INNOVATION

### CRYPTO VALLEY: WHY SWITZERLAND IS A WORLDLEADING LOCATION FOR BLOCKCHAIN COMPANIES

HEINZ TÄNNLER EXPLAINS WHY SWITZERLAND HAS BECOME ONE OF THE WORLD'S LEADING LOCATIONS FOR BLOCKCHAIN COMPANIES



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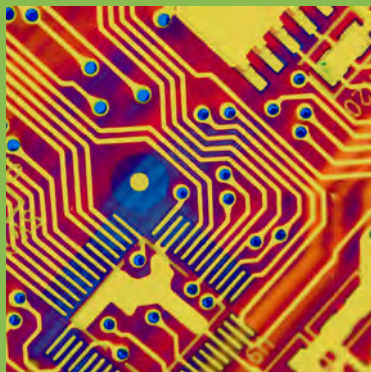
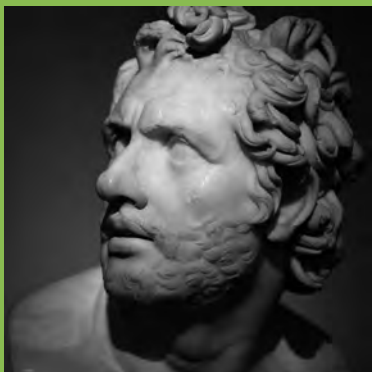
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## CONTACT

[editorial@openaccessgovernment.org](mailto:editorial@openaccessgovernment.org)

[www.openaccessgovernment.org](http://www.openaccessgovernment.org)

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**Jonathan Miles**  
Editor

**Production Coordinator**  
Emma Faulkner-Dunn

**Designers**  
Andrew Bosworth  
Ben Green

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DIGITAL POLITICS LIMITED

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Datum House  
Electra Way  
Crewe Business Park  
Crewe  
Cheshire CW1 6ZF

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# INTRODUCTION

A very warm welcome to the April 2019 Blockchain Innovation publication.

Heading up this edition, we welcome the thoughts of Heinz Tännler, President of the Swiss Blockchain Federation, Government Councillor and Finance Director of the Canton of Zug. In his article, he explains why Switzerland has become one of the world's leading locations for blockchain companies.

Additional insight comes from Riccardo Campione and Dr Alain Imboden, Associate Professors at Les Roches Global Hospitality Education in Switzerland, who discuss the top technology trends in hospitality for 2019: AI, IoT, blockchain and cryptocurrency.

Finally, Paul De Raeve, Secretary General of the European Federation of Nurses Associations, sheds lights on how blockchain interoperability is enabling sharing data across the care continuum.

I hope you find the insights in this issue insightful. Please do contact me if you would like to contribute an opinion piece in the future. ■

**Jonathan Miles**  
Editor



@Jonathan\_AdjDig

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# Crypto Valley: Why Switzerland is a world-leading location for blockchain companies

Heinz Tännler, President of the Swiss Blockchain Federation, Government Councillor and Finance Director of the Canton of Zug, explains why Switzerland has become one of the world's leading locations for blockchain companies

In recent years, Switzerland has become one of the world's leading locations for blockchain companies, enabling a variety of business models to be explored here. Crypto Valley, between Zurich and Zug, is home to numerous companies and organisations in the blockchain sector. Start-ups come to Switzerland primarily because of legal certainty, Switzerland's world-class infrastructure, and the Valley's increasingly strong ecosystem. Moreover, the willingness of political decision-makers to maintain and enhance Switzerland's attractiveness for new technologies and companies, as well as the Valley's proximity to universities has also contributed to the expansion of the sector in Switzerland. An example of this dynamism is the establishment of the "Swiss Blockchain Federation" last October, a public-private partnership for the strengthening of blockchain technology in Switzerland. The publication of the [Federal Council's report](#) on the optimisation of the legal basis for distributed ledger technology and blockchain in Switzerland at the end of 2018 also provided an important impetus.

## Legal certainty is of great importance

Companies are in need of legal certainty, as transactions and business activities based on blockchain technology cannot always be clearly supported by the existing legislation. In order to ensure the breakthrough of the blockchain technology and the success of the companies involved, it is critical that business operate on a long-term, secure legal basis.

The publication of the report by the Federal Council marks an important step in this direction and provides a detailed survey of the legal challenges that these new business models create. The report does not call for a separate blockchain law, preferring to amend existing

civil and financial market law. This reflects the objective of setting the framework conditions necessary so that Switzerland can strengthen and extend its leading position in blockchain.

Switzerland is taking a pragmatic approach, which is in line with proven Swiss principles and is to be welcomed. The Federal Council report must now be quickly followed by its legislative implementation because Switzerland needs this certainty for the basis for further development. A [10-point programme](#) launched recently by the Swiss Blockchain Federation to strengthen blockchain technology in Switzerland also calls for a binding agenda from the regulator. The programme spells out the social policy, regulatory, and public interest issues that need to be settled if Switzerland is to be a successful blockchain location.

## Excellent starting position

In comparison to other countries on the international stage, Switzerland has "excellent cards because it has good prerequisites as well as entrepreneurs, developers, scientists and doers," said the Swiss Finance Minister Ueli Maurer on 3 December 2018 at the opening of the "Infrachain", the first blockchain conference for the public sector and infrastructure companies in Bern, the Swiss capital. "Blockchain applications will explode in the next few years, and Switzerland is one of the leading developers of blockchain technology and its applications," Maurer added. This should encourage start-ups to set up their business in Switzerland.

The number of blockchain companies in Crypto Valley is growing rapidly. In December 2018, [over 750 companies with over 3300 employees in Switzerland](#) were registered on CV Maps, an online directory of the



Image: © Christa Eder | Dreamstime.com

*The idyllic canton capital Zug on the lake of the same name*

Blockchain industry. Numerous sub-sectors of the blockchain industry are represented in Crypto Valley, from HealthTech to data analytics to e-government. The 50 largest blockchain companies had a market capitalisation of around \$20 billion as at the end of December 2018.

Public administrations are also using blockchain in Switzerland: The canton of Geneva is testing electronic identification and the use of digital signatures for its commercial register. Schaffhausen operates an e-government platform on blockchain in collaboration with a start-up company.

### **Too important not to be used**

In a [World Economic Forum analysis](#), six sources of value creation through blockchain have been identified: the simplification of internal operating procedures, more efficient interaction between regulators and supervised financial firms, the reduction of counterparty risks in transactions, time savings in the handling of financial transactions, better use of a company's

equity or liquid assets, and a greatly reduced risk of fraud. The Internet has changed the way we communicate, and blockchain is changing the way we trust each other.

The still young technology with its countless application opportunities will shape our future and is indispensable. Switzerland is determined to play a leading role as a location for successful companies. ■

**Heinz Tännler**

**President of the Swiss Blockchain Federation  
Government Councillor and Finance Director of  
the Canton of Zug**

Tel: +41 41 728 36 01

[Heinz.Taennler@zg.ch](mailto:Heinz.Taennler@zg.ch)

[www.blockchainfederation.ch](http://www.blockchainfederation.ch)

[www.twitter.com/BCFederationCH](https://twitter.com/BCFederationCH)

# World Bank blockchain pilot sows fresh narrative for Haiti's farmers

AgriLedger, an agricultural-focused blockchain systems provider, is working on a World Bank backed pilot that offers end-to-end full traceability through their platform to enable transparency along the value chain

As blockchains, distributed ledgers and smart contracts get put through their paces in food supply chains around the world, this fledgling technology market is expected to grow to over \$360 billion by 2026 and surge to more than \$3.1 trillion by 2030. Driven by a thriving community of active entrepreneurs and developers who are keen to create transparency, reduce operational costs and improve global food safety, the next generation of software architecture is cropping up in provenance and payment systems for daily fare like orange juice in Holland, organic oats in Australia, free-range beef in the United States and chickens in China.

While most of these blockchain pilots and applications in agriculture have commercial gain and significant savings as common goals, a few leaders are going one step further by setting farmer empowerment at the heart of their efforts toward global food security. Genevieve Leveille, CEO of AgriLedger and Mission Chief of a World Bank-backed blockchain pilot underway among Haiti fruit farmers, is one such unsung hero. Born in Haiti, Genevieve is excited about the opportunity to give back to the country of her birth. AgriLedger has joined forces with SourceTrace, and local Haitian partner Ecole Supérieure d'Infotronique d'Haïti (ESIH) to forge a new narrative for Haiti's rural communities.

## The heart of rural Haiti

As soon as you mention Haiti, images that often come to mind is a nation deemed one of the poorest. Haiti's history of colonisation, slavery, foreign exploitation of resources, revolt, independence tied to debt, foreign occupation, deforestation, the earthquakes and aftershocks of 2010, Hurricane Mathew in 2016, a reliance on imports, little infrastructure and inadequate education are, after all, the tales told in worldwide headlines. It just might look as though Haiti is a nation on its knees until one takes a moment to notice the resilient core of the Haitian people. It's easier to see the effects of the Haitian community spirit in places like the Artibonite Valley, where thousands of trees are planted every day and the forests are returning.

There is, if you will, a tangible sense among the rural people of Haiti of taking care of their natural resources and of each other. In the cities, this is echoed in communities of tech entrepreneurs and advocates like Banj and Consortium partner ESIH who are back stronger now with more resilient systems than before. Beneficiaries of the Blockchain/DLT Pilot underway the first quarter of 2019 are the Haitian fruit farmers, their customers and families who can look forward to this year's harvest and to reaping the benefits of market inclusion and improved food security. Binding agriculture to digital technology by tagging fresh produce

from farm to table broadens the interaction of communities.

## Access to efficient markets

Perhaps no one understands better the effects of untold losses and hardships than the farmers and their families. Yet their focus on the future, with a 'Transparent Trade Ledger' places the hard-earned high-quality produce of Haiti's smallholder producers into a system that will see any intermediaries not adding value disappear unless they provide a much-needed service at a reasonable cost. Margins that were arbitrated by local exporters will revert back to producers and their families. The Blockchain/DLT solution enables farmers to sell in more efficient markets where the spot price for their produce is determined by supply and demand rather than by the power of negotiation.

To help accomplish this, AgriLedger together with SourceTrace and ESIH are supporting the formation of businesses as platforms based on Blockchain/DLT. A custom-built platform for fresh produce chains in Haiti allow buyers to scan a mango's QR code and see whose tree the mango comes from, how the mango was packaged and transported, and what costs were involved at each step from the moment a mango was picked from a tree to the moment it's paid for by a buyer. The cold-chain logistics data including registration, certifica-





tion, transport and sale documents collected along the path are made immutable and visible in friendly formats on the web and a smartphone.

## Reducing risks in the chain

Starting this year, the Consortium's Blockchain/DLT solution will progress from its beta version to full commercial operation within the fruit value chains in Haiti and to other commodities. In many ways, the Haitian farmers of mangoes, avocados and pineapples will see more robust protection against the many risks they face in bringing their fruits to harvest and offering their produce up for trade. The payment system makes transaction data available to all participants in real time, with only the vetted endorsers able to validate transactions, while keeping track of how much is owed to those on the value chain.

As Genevieve Leveille explains: "Maintaining security at each step in the chain is a priority because we're setting

out to benefit the farmers by increasing their livelihoods and those of their families. By consulting with and training community members in the use of the Blockchain/DLT solution, we hope to see long-lasting improvements within the farming culture of Haiti with sustainable finance mechanisms to ensure the longevity of the project. With responsibility for security distributed across the chain through a SecOps approach, we're encouraging collaboration and transparency. Ecole Supérieure d'Infotronique d'Haiti (ESIH) students will participate in the community training sessions and cross-functional team activities so that local preferences and norms are embedded within the solution."

## Stronger together

In collaboration with the World Bank, the Consortium plans beyond this pilot, to extend its Blockchain/DLT solution in Haiti to include other value chains. This will see the mango, avocado and pineapple farmers move closer to broader market inclusion

and improved food security soon followed by the producers of coffee and cocoa. It's easy to see why this pilot underway in Haiti has a lot going for it, with Mission Chief Genevieve Leveille originating in Haiti and home-grown technology students involved in its development, along with deep local partners in place.



AGRILEDGER

### Genevieve Leveille

AgriLedger Ltd.  
hello@agriledger.co  
www.agriledger.io  
www.twitter.com/Agriledger

# Forming HEdpAY Alliance Group for adoption of crypto banking

Founder and CEO of HEdpAY explains how the creation of alliances in various sectors of business can provide financial services solution within the crypto banking ecosystem

Both traditional banks and crypto banks have their place, and, with the current mood of distrust, they need each other. There is a bridge that needs to be built to align both." Future banking operators like HEdpAY are building a platform that connects crypto with fiat currencies and supports decentralised control.

First tests and business adoptions start by using HEdpAY systems to overcome these challenges and bring crypto use to the mass market, starting with SMEs, funding them and financing their projects with HEdpAY.

One of the major alliances and partners to start the HEdpAY Future Banking Solution is "LIKER" Liker world Ltd in the education sector. Education is the power of modern society and builds the future generations, therefore, HEdpAY with Liker has created a

possibility to study anywhere and anytime you want.

Liker is an educational blockchain-based content platform. Users not only get access to all educational materials and activities but also get rewarded as they study. With the help of the HEdpAY LIKER application, users can learn, get rewards, and grant their funds to educational projects for their future within the network.

HEdpAY signed an alliance partnership agreement with LIKERWORLD, as e-banking solution company based in London, the home of Fintech, and completed a \$500,000 mutual investment. With the 2020 Tokyo Olympics in sight, Alliances plan to utilise the e-banking system, a superior blockchain of Hedpay Ltd, to support real-time transactions through POS, ATM devices and crypto prepaid cards.

To this end, Solomon Capital Japan, which obtained permission to transfer money from Japan's Financial Services Administration, joined the Alliance Group. The company is already in business with a company that has acquired BitLicense in New York, leveraging Hedpay Ltd. technology in the UK, Japan, New York, Asia, Russia and European markets.

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**"Education for future generations will bring crypto to the mass market adoption".**

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HEdpAY is one of the first projects connecting traditional bank and the crypto world, and one of the first to be creating investment funds in crypto, with the alliance group globally, in order to maximise profits and minimise losses," explains Vicken. It has been created to be the first and most authoritative financial institution enabling users to transfer their fiat currency in crypto quickly, safely and compliantly, using the following services: current account, debit card and exchange.

HEdpAY also gives investors exclusive funding opportunities: creating their own blockchain, helping entrepreneurs and SMEs developing new projects following detailed compliant protocols, and then by selecting the best projects and evaluating their currencies that already included in the market, to finance them and fund their future plans.







The company's goal is to showcase how its futuristic solution between crypto and traditional banking to revolutionise a financial system, that is still anchored to old banking standards," in the words of Vicken. He believes that the real opportunity is the benefits blockchain can bring to the financial services industry.

"While the crypto market has witnessed saturation over the past few months, the real opportunity is more about the benefits that blockchain can bring to financial services and crypto banking. The major industries are primed for the integration of blockchain technologies. Other opportunities can be seen in education, medication, genetic analytics, voting, forecasting, government, crowdfunding, retail and real estate. I think the possibilities are endless".

**"...Educate the future generation to revolutionise traditional old systems in finance and all other possibilities"**

Despite the perceived negativity around cryptocurrencies in regard to the puzzle of jurisdictional risk and regu-

lation, Vicken is positive about the future of crypto and blockchain, whilst establishing and cultivating compliant relationships with the regulatory bodies, global financial, educational, medical institutions and businesses.

"HEDPAY's purpose is to provide the services of the modern traditional bank whilst implementing the prospects of a bank for cryptocurrencies, and at the same time ensuring better regulation of the cryptocurrency market and its use, said Vicken."

In the past year HEDPAY has reached some significant milestones, most recently the company announced its Partnerships and Alliance groups for the creation of biggest fund in crypto banking system. The company offers a pallet of project finance by its Hdp.φ Tokens

A residential property development in Italy, named "Green Park", environmentally friendly and fully green ecosystem, budgeted the equivalent of 40 Million Euros in Hdp.φ, will be built and financed by HEDPAY banking system on blockchain.

An educational system joined with LikerWorld Ltd. For the future generation have the full capacity and means to be educated, where ever they are and however their situation be,

Medical cosmetic research and development, product production for anti-ageing using biotechnologies and eco-friendly products, financed and supported by HEDPAY systems on blockchain.

"Hdp.φ tokens will be used within the HEDPAY project's ecosystem to ensure the success of the future banking solution and the development work on our revolutionary platform ongoing with various projects and plans toward the future, added Vicken."

Going forward, the company's ambition remains undimmed. "HEDPAY has an exciting future ahead in terms of the completion of our targeted goal, the future launch of the HEDPAY Alliance Group Fund and our full set of banking services," says Kaprelian. "In a year's time, we would like to see the crypto banking mass adopted, thanks to our pilot projects and for the wider benefits that can be realised through blockchain technology."



HEDPAY Limited  
27-28 EastCastle Street, London, W1W  
Tel +44 (0)208 123 0060  
info@hedpay.com  
www.hedpay.com



# The top technology trends in hospitality for 2019

Riccardo Campione and Dr Alain Imboden, Associate Professors at Les Roches Global Hospitality Education in Switzerland, discuss the top technology trends in hospitality for 2019: AI, IoT, blockchain and cryptocurrency

Technology is transforming the way travellers interact with brands before, during and after their journey. Far from pulling hospitality away from its soul as a people-centric industry, the adoption of new technologies allows businesses to deliver greater personalisation and better service. With the help of artificial intelligence (AI), the Internet of Things (IoT) connectivity and other new technologies, businesses can offer a more engaging brand experience while meeting and even anticipating guest needs.

## Artificial intelligence (AI)

From chatbots and robots to machine learning, AI is already present across the hospitality industry. But the technology has the potential to evolve much further, bringing customers a convenient on-demand service, greater personalisation and closer engagement with brands.

Over the last few years, travellers have been meeting robot butlers and concierges in hotels like Hilton's Connie, powered by IBM Watson AI technology. Able to answer guest questions, handle check-ins and deliver discreet room service, these helpful robots can lessen the burden on human staff, enabling them to spend more time with guests who seek personal interaction. Customer service robots have also been appearing in retail stores and airports; SoftBank Robotics' Pepper, a humanoid robot developed with IBM Watson, has been introduced at Munich Airport and Václav Havel Airport Prague, where the robot informs and entertains passengers by dancing and offering to take selfies.

Gartner predicts that 85% of customer interactions will be managed without a human by 2020. On Airbnb, travellers receive customised search results based on

their browsing and booking history thanks to powerful machine learning algorithms. And chatbots, already in use by leading travel brands such as KLM, Kayak and Booking.com, provide customers with useful information, personalised recommendations and rapid response times. But AI also offers businesses an opportunity to further reflect their personality and develop brand loyalty.

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**“Offering transparency, security and control, blockchain technology has the potential to change business models across industries. It can revitalise loyalty programmes by ensuring that points are kept securely and can be exchanged across multiple platforms; Japanese e-commerce platform Rakuten has announced plans to transition its loyalty points into Rakuten Coins, its own digital currency.”**

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At The Cosmopolitan of Las Vegas, guests are invited to text Rose, the hotel's “resident mischief-maker” and chatbot, for VIP access to clubs and other insider tips, as well as room service requests. In addition to serving as a virtual concierge, Rose answers guests with humour; tells the bot, “I love you,” and Rose replies with a diamond ring emoji and the message, “Back that up with some hardware and we’ll talk.” Guests who interact with Rose are said to spend 30% more in the hotel than those who do not, and are 33% happier when they leave.

## Facial recognition and voice technology

While technology is not a replacement for human interaction, lifelike features can make technology more appealing to users. Intuitive attributes, such as facial recognition and voice activation can offer users a faster service and better customer experience.

At Intercontinental Shanghai Wonderland, face scanners enable guests to verify their identity at check-in, pick up a digital room key and gain access to the dining room at breakfast. The hotel has partnered with Chinese messaging and mobile payment app WeChat to offer travellers a seamlessly connected experience.

Ebookers, a travel site owned by Expedia, has introduced SenseSational, an online tool which uses real-time facial recognition software to track users' faces as they look at certain images and sounds on screen. The tool then reveals the user's identity as one of four "tribes" – The Adventurer, Culture Collector, Sun Seeker and Bon Vivant – and suggests destinations and activities that match the tribe's travel preferences. Beyond the screen, facial recognition could have other practical uses soon, such as enabling swift check-in at meetings and events, and quick access to public transportation systems.

Many hotels have added in-room smart speakers and voice assistants that let guests simply say what they need, but this technology is also still in its early stages. Besides enhancing the guest experience, voice technology can improve back-of-house efficiency as well. Two Roads Hospitality has partnered with Amazon and Volara to develop a customised Alexa for Hospitality platform that facilitates daily tasks for staff, such as identifying maintenance problems or signalling that a room is ready for check-in.

### **The Internet of Things (IoT)**

A guest unlocks the door with her smartphone, walks into her room, and based on past preferences, finds that the air temperature, lighting and music are set to just the right levels. Such are the possibilities of IoT technology, which offers guests a growing range of options to personalise their environment using an in-room tablet, smart speaker or their own smartphone.

Luxury hotels like The Plaza New York, Aria in Las Vegas, The Torch Doha in Qatar and GHM Hotels have all introduced high-tech smart rooms. Meanwhile, Hilton has developed its own proprietary IoT platform, and Marriott has partnered with Legrand's IoT programme and Samsung's ARTIK cloud-based IoT platform, with both hotel chains aiming to roll out IoT connectivity across their properties.

Further integration of the IoT within hospitality could prove especially attractive among mobile-savvy Millennial and Gen Z travellers. Notably, such technology may also help hotel groups set themselves apart from tough competitors like Airbnb and HomeAway. A seamlessly customised experience is challenging for private residences or boutique hotels to offer, even if they have some smart technology on the premises.

### **Blockchain and cryptocurrency**

Offering transparency, security and control, blockchain technology has the potential to change business models across industries. It can revitalise loyalty programmes by ensuring that points are kept securely and can be exchanged across multiple platforms; Japanese e-commerce platform Rakuten has announced plans to transition its loyalty points into Rakuten Coins, its own digital currency.

Blockchain transactions also eliminate the need for third-party mediators. LockTrip (LOC), blockchain-based hotels and vacation rentals marketplace, enables hotels to manage bookings and guests to make reservations without a commission being taken from either side. Travellers can browse hotel listings with prices given in LOC, a cryptocurrency whose exchange rate is shown in real time. To book, users pay the equivalent amount in euros, pounds or dollars, which is converted to LOC. The amount in LOC is released to the hotel once the guest checks out, and the hotel can then convert the cryptocurrency into their preferred currency. By eliminating the need for a middleman, this technology enables hotels to offer prices that are 20% lower without affecting profits. ■

**Riccardo Campione**  
Associate Professor

**Dr Alain Imboden**  
Associate Professor

Les Roches Global Hospitality Education, Switzerland  
Tel: +41 (0)27 485 9600  
info@lesroches.edu  
www.lesroches.edu  
www.twitter.com/LesRochesNews

# Blockchain interoperability: Sharing data across the care continuum

Paul De Raeve, Secretary General of the European Federation of Nurses Associations (EFN) sheds lights on how blockchain interoperability is enabling sharing data across the care continuum

The interoperability of electronic health records (EHR) in Europe is key, especially now the European Commission plans to publish a recommendation on the technical specifications for an EHR exchange format. Although the EHR exchange format is part of a bigger plan of the digital transformation of the health and social care in the Digital Single Market, the EU financing of two H2020 projects, 'Smart4Health' and 'InteropEHRate' can lead to large-scale interoperable designs, especially at a time when a variety of government agencies are moving their infrastructure on to new technologies offering optimum security and data privacy. The policy outcome, adopting an EHR exchange format at EU level, could end the endless and costly interoperability discussion we have had for the last two decades. Despite some advancements towards more seamless interoperability in the healthcare sector, frontline deployment of continuity of care, based on data sharing in clinical care pathways, could benefit more from new IT developments.

Although called 'disruptive', we recognise these new systems compete for market shares struggling to make a business case for sharing the data they've gathered, sorted, collected, aggregated and secured. Therefore, it becomes key that the IT industry, the EHR vendors become connected to the frontline practitioner so products become co-designed, fit-for-purpose, reduce the endless hours nurses spend on data entry, leading to a general malaise towards software solutions that were supposed to help, but it really just means more work for the frontline. So, it becomes high time to get interoperability right!

## Co-designing interoperable solutions

A favourable ecosystem of trust and political support to use blockchain as a way to tackle interoperability is

not the main challenge, but what we miss are the practical use cases showing blockchain works better for the frontline due to solving the interoperability challenges we currently have in the healthcare ecosystem.

It is argued that blockchain makes it possible to exchange data from different sources, in different formats, among the end-users, at their fingertips to plan and provide frontline healthcare. Within this context, nurses have an opportunity to co-design an EU interoperable EHR as end-users, respecting the existing national EHR developments. Therefore, EFN partnership in the H2020 granted EU projects focusses on co-designing a fit-for-purpose interoperable EHR, aiming to prototype:

- A citizen-centred implementation of a platform that can be integrated with a federated platform structure, easy-to-use and secure, constantly accessible and portable within any other Member States of the EU and;
- A data-driven platform to help the scientific community to benefit from the user-generated data (health, care, and health-related) going beyond the currently established interoperability level.

Nurses are in the unique and privileged position in co-designing interoperable solutions as they have direct access to the daily care needs of people and have an in-depth knowledge of the patients' experiences and contextual environments in which the continuity of care takes place. As nurses are central in empowering citizens/patients to have access to health and social services, they play a significant role in addressing trust and ensure the appropriate allocation of nursing data in the EHR to facilitate continuity of care and as such, to ensure better health outcomes.



Defining the end-user requirements and scenarios to be supported by the new EHR interoperability, co-designing a set of services fulfilling the end-user requirements for realising the incremental cross-border interoperability, could become key for successful blockchain case studies at EU level.

### Moving beyond interoperability

Understanding the potential of blockchain in the health and social care sector and how to realistically implement it in cross 'border' care (could also mean across the street!) is not always clear to the end-user. Often, when addressing audiences, and they pick up the word blockchain as a possible solution, participants often react by asking, "What do you mean by blockchain?" and some react as, "It is just a hype, just forget it!"

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**"A favourable ecosystem of trust and political support to use blockchain as a way to tackle interoperability is not the main challenge, but what we miss are the practical use cases showing blockchain works better for the frontline due to solving the interoperability challenges we currently have in the healthcare ecosystem."**

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However, when co-designing with nurses, key criteria such as transparency, trust, and smart contracts will come immediately on the design table. One of the most significant ways blockchain can potentially help the health and social care sector is by empowering patients/citizens, therefore, allowing each individual/provider access to the chain of data relevant to deliver care. As blockchain is based on a smart contract within the peer-to-peer (P2P) network, empowering the patient/citizen in a people-centred healthcare ecosystem, the concept of gatekeeper in the healthcare system disappears.

As the P2P network records transactional data, each maintaining its own copy of the ledger, with all ledgers being kept in a historical and synchronised way, this constitutes the single source of data needed within nursing care pathways (scenarios). For nurses, it is key to have access to real-time health and social data eliminating the need for reconciliation. This native features of blockchain allow patients/citizens and multiple health and social providers to share anything of value across the system in a more transparent, efficient, and secure way.



Paul De Raeve

### Conclusion

Interoperability is required to provide person-centred, proactive and well-coordinated care in the EU, even cross-border. A P2P chain, without any gatekeeper, can decrease the continuity of care frustrations and high costs, by simplifying processes, reducing delays for the patient/citizens, and more important, reducing the administrative workload of frontline nurses. Within the Digital Single Market Strategy for Europe, it is key to prioritise the EU EHR for citizen empowerment and person-centred care deployment, taking into account the views of the end-users to make solutions fit-for-purpose. One field where blockchain technology has tremendous potential is health and social care, due to the need for a more people-centric approach, connecting existing national electronic healthcare records (EHRs). ■

### Paul De Raeve Secretary General

European Federation of Nurses Associations (EFN)

[efn@efn.be](mailto:efn@efn.be)

[www.efnweb.eu](http://www.efnweb.eu)

Tel: +32 2 512 74 19

[www.twitter.com/EFNBrussels](https://www.twitter.com/EFNBrussels)

# Decentralising security for mobile devices: Is blockchain the viable solution?

Steven Sprague, Cofounder and CEO of Rivetz reveals a viable solution when it comes to decentralising security. He argues that there is great promise for creating mobile device security with blockchain technology

The world was introduced to the first commercial mobile phone in 1983 with the launch of the Motorola DynaTAC 800x, which stood at a height of 13 inches, weighed 1.75 pounds and took 10 hours to recharge. In the early days of the mobile phone industry, it was incredibly simple for attackers to clone a phone's identity and run up all sorts of charges on your account.

Over the last few decades, mobile has experienced quite a metamorphosis from the "brick" of the 1980s to the compact, feature-packed smartphone of today. Now, mobile is king – people across the globe use their mobile devices not only to communicate but also to read the news, get directions, stream music, check bank accounts, store assets and so much more.

As we increasingly rely on our mobile devices, new avenues of attack continue to emerge. So much of our sensitive personal information and digital assets – such as corporate data and bank account and credit card numbers – are accessible via our mobile devices. They have become treasure troves for attackers.

## Blockchain and mobile device security

There is great promise for creating mobile device security by combining secure enclaves – also known as 'roots

of trust' – with blockchain technology. Blockchain is a distributed ledger technology that protects a digital transaction through complex mathematical algorithms. Because of the strength of this math, the transaction can only be created by those who hold a valid private key.

Private keys were developed as a means of protecting our digital transactions. A private key is a piece of cryptographic code that allows a user to prove who he or she is – in other words, it's a digital signature that says the user is, in fact, the one who is executing a digital transaction.

Private keys are used to secure a variety of transactions on mobile, including messaging, cryptocurrency and more. Here's the downside: if an attacker steals your private key, they can impersonate you, and then access and abuse your data and digital assets. The prevalence of mobile devices has made them some of the largest repositories for private keys.

The biggest challenge in decentralised cybersecurity is that we cannot prove the transaction was intended. If an attacker steals your private key and transfers \$5,000 to a third person, there is no way to prove that the attacker – and not you – performed the transaction. Rivetz ensures an intended transaction by establishing

that it occurs from a known device, in a known condition, with an authorised user, under the required conditions. Rivetz performs "device attestation" to ensure a user's devices are in a "known" condition by executing regular health checks to ensure the device integrity. Each device's integrity is recorded on the blockchain so future health checks can be compared with the baseline, establishing that those devices are in a condition the user intended.

As the rise of the internet brought digital fraud and attacks on identity, innovative industry leaders banded together to fight that fraud and formed organisations such as the Trusted Computing Group (TCG). TCG developed specifications that have become standard for securing devices, as well as the data and identity on those devices, such as personal computers and laptops.

Trusted computing uses hardware to protect users. It ensures a device will consistently behave in the expected ways, protected by a secure enclave or a 'root of trust' embedded within the device's hardware. A root of trust is isolated from the device's software operating system (OS), allowing it to execute code that cannot be seen by the OS. One such root of trust developed by Global Platform is the Trusted Execution Environment (TEE), which



enables trusted computing technology for mobile devices. The TEE already is built into the hardware of more than 1 billion mobile devices. Today, most private keys are generated within software, which is much more susceptible to attack than hardware. The TEE is capable of protecting a user's private key within the device hardware, a method that is far more secure than performing these operations in standard software.

A single system of security may not be enough to protect against the variety of cyber-attacks possible today. It is more pressing than ever to provide multi-layered protection of digital assets across two or more security domains. That way, even if an attacker were to breach one point of security, the other(s) still would need to be compromised, offering an extra layer of protection for important digital assets – whether that's your personal information or your hard-earned money.

One of the most ubiquitous roots of trust is the subscriber identity module, or SIM card. The SIM is a protected hardware environment and was created to combat mobile fraud and to protect the device identity. With the pervasiveness of both the TEE and the SIM, Rivetz saw an innovative opportunity to use these isolated roots of trust to work together to protect mobile users. In conjunction

with ElevenPaths, the cybersecurity unit of Telefónica, the world's third-largest mobile carrier with more than 300 million subscribers, Rivetz uses both the TEE and SIM to protect our private keys – introducing the Dual Roots of Trust.

The solution leverages the TEE along with the SIMs deployed by Telefónica. With Dual Roots of Trust, Rivetz-enabled apps generate private keys in hardware, then cryptographically distribute those private keys between the TEE and the SIM. This delivers built-in security from both the mobile carrier and the device manufacturers, to create decentralised key protection.

By distributing a private key across these two roots of trust, attackers would have to breach both secure systems in order to steal a single private key. As an added security feature, two different entities – or independent control planes – aid the user in controlling their private keys. Through a special application authorised to perform activities inside the TEE, the user remains in control of the secrets stored in the TEE. If your mobile device is lost or stolen, a simple interaction with your mobile carrier can disable the SIM, permanently or temporarily until the device is found. So even if a thief has your device, you remain in control and your private keys are still safe.

The Rivetz solution has an unlimited number of use cases, such as sensitive work apps, mobile wallets, social media accounts and mobile banking. One of the most unique applications of Dual Roots of Trust is the ability to provably control specific applications on a device. This feature is especially useful for enterprises. Let's say a company has its own proprietary Rivetz-enabled app that employees use for work on their personal devices. If an employee is terminated or leaves, the company has the ability to revoke access to that app on the former employee's personal device with Dual Roots of Trust.

As our mobile devices have become more important to our everyday lives and contain so much of our personal and private data, we need better ways to protect ourselves. The solution lies in the roots of trust that already exist on millions of mobile platforms: the SIM and the TEE are two of the most common secure enclaves. Dual Roots of Trust is the next step in ensuring our assets stay safe.



**Steven Sprague**  
**Cofounder and CEO**

Rivetz

[sales@rivetz.com](mailto:sales@rivetz.com)

<https://rivetz.com>

[www.twitter.com/rivetzcorp](https://twitter.com/rivetzcorp)



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