INTERVIEW WITH TED TANNER, CO-FOUNDER, CTO OF POKITDOK AND A CREATOR OF DOKCHAIN, POKITDOK'S BLOCKCHAIN FOR HEALTHCARE

Ted has published articles in leading technical magazines and holds patents in the areas of blockchain, semantics, machine learning, signal processing and signal protection.

Jennifer Georgino interviewed him in April 2018 for Healthcare Blockchain Review.

Jennifer: Hi Ted, welcome! I understand you are just back from HIMSS 2018 annual meeting, where you appeared on a prestigious blockchain panel? (HIMSS 2018 Innovations arena: Blockchain – Seeing Through the Hype)

Ted: Yes, we announced our partnership in the Salesforce marketplace there. (Salesforce's AppExchange and Health Cloud with PokitDok's Eligibility solution enables users to integrate and automate medical benefits verification.) I was on a blockchain panel with David Houlding of Intel moderating. The folks from Change Healthcare, Hashed Health and Optum Health were also on the panel. There were people standing in the room, and out in the hall. Exciting! The room was too small for so many interested in the topic. We are well beyond Blockchain 101. Change announced their Hyperledger Fabric production (Enterprise-scale using blockchain in healthcare), Hashed Health announced their professional credentials exchange, and we talked about how far along we are. I think we're in great shape as we are seen as a reference for execution in the area.

Jennifer: Tell me, when you got deep on this panel, what were some of the takeaways?

Ted: I initially cleared up a few things i.e. Bitcoin is not blockchain and if you're looking for investment strategies, go somewhere else. Blockchain is not a panacea for your business problem. For example, if you want sub-milliseconds statistical arbitrage response times, like on the stock market for trading, then blockchain is not for you. However, if you tolerate 90-180 days of accounts receivable clearing, as most of the health industry does, and have a very secure environment, which healthcare needs, as well as resilient systems, which healthcare also needs, then blockchain is definitely for you to take a serious look at for your technology scale. I reviewed what we view as the main use cases. Something that I have been advocating for quite some time now is contextual relevant identity with consensus. That's a fancy way to say, true identity management, based on behavior versus matching, in a database that the health industry employs with EMPI (enterprise master patient index).

Jennifer: Can you share all of the four use cases with us you refer to?

Ted: Sure. The first one is “Identity by Consensus”. Literally, that's the overarching use case for blockchain at large, not simply healthcare, but definitely for health. The second use case is “Autonomous Auto-Adjudication”, the third use case is “Supply Chains” - pharmaceutical and medical devices and the fourth use case is “Pre-authorization”.

To explain these, let's go back to the beginning and contextualize relevant identity management. How is that different than other stuff? How we do it is we think in terms of a continuum and while I don't like this colloquial term I'll use it, from “womb to tomb”. You were born, and therefore in the US you have a social security number. Then as a teen you get a bank account to learn how to budget things like a

savings account. As you grow older, you get a health ID, then perhaps a brokerage account and other types of accounts. Sometime in the distant future, you get a death certificate. All these events are time-based, and it would be ideal if they were secure and immutable, meaning no one can change them and also, that it has context. Your life has extreme context - what you do is who you are. While that sounds kind of trite, that's how it actually appears online.

There's this acronym called GAFA - Google, Apple, Facebook, Amazon - these four companies categorize your behavior: you are their product. For example, if you come down to Charleston, you go on King Street and you want to be anonymous at 21 years of age with a credit card on a Saturday night. Say you're having a good time, alone, however something happens, you get sick and you go to the hospital. At that point you want the blockchain, the immutable ledger, to give that provider ALL the information, up to that point in your life about you, so your caregivers can make an educated guess on your diagnosis, prescriptions and outcome. These are two boundary cases.

We have the ability to compute as a function of various identity providers on DokChain, the ability to accurately give context to your identity as it spans across our network. That is a very useful way to compute identity over and above how health systems historically have functioned with just a match.

The other side of that is provider search, provider directories and updating provider directories as a subset of identity. Think about the licensure data - where doctors went to medical school, state licensure, etc. This gets really interesting because one of the companies I mentioned was Amazon. I would suggest that every single health provider in the US has Amazon Prime. PokitDok has a provider search API. One of the very first things we built was the ability to find what you're looking for, that is find a doctor. We have 4.3 million providers in our provider directory that have licensure data, and it's updated monthly.

Jennifer: Please tell us more about interoperability and your APIs.

Ted: When we founded the company in 2011, as part of building what I call “an operating system for the business of health”, we looked at all of the inefficiencies to enable a one-click environment purchase for a health service, and also the ability to build applications on top of us. Much like, an AWS, or Twilio is another great example.

Jennifer: Are you referring to platform as a service (PaaS)?

Ted: Yes. A lot of people loosely say that, but we are a true platform. We have the highest certified clearinghouse in the nation! The terminology is CAQH level 4. (CAQH is a non-profit alliance of health plans and related associations working together to achieve the shared goal of streamlining the business of healthcare.) Other clearinghouses have been unable to get that certification. They created a new level

for us – it includes the eligibility, claims, referrals and pre-authorization. Then we have another API that has the top 50 bundled health services, with cash prices across 50 urban areas. We know the market price for health services, and we have the out-of-pocket price down to the procedure code for every zip code. With regard to interoperability, we've integrated 55 EMRs under one API. We have an identity management API, and we have a complete payment backbone that runs under Apple Pay and PayPal. And we have over 600+ applications in production now on top of us, with well over 93% coverage in the United States.

Jennifer: Just to clarify for non-technical folks, the 55 EMRs you refer to, how do they work? These are your APIs running on their EMR platforms?

Ted: We take their stuff and ball it up under our API. We've done a ton of heavy lifting – creating a common interoperable model for real time read write so it works altogether. And given the fact that we have an amazing diversity of applications from several telehealth companies - Doctor on Demand, Pager, Ascension Health, Trinity, Dignity, Evidation Health, PillPack to name a few - we have diverse types of applications built on top of us. The record to production where somebody signed up for our platform and went to production is **3 hours** for eligibility and claims.

Jennifer: What???

Ted: Yes! We have 93% payer coverage, and we have business associate agreements (BAAs) with all of those payers - 700+ payers. So, we have the data rights to most of that data. With our experience in machine learning and AI, we started building one of our first data products, which computes the ability for the consumer to pay for the service, basically determining the “propensity to pay”.

Jennifer: Tell me more about AI and the application of machine learning with blockchain at PokitDok.

Ted: Yes, we can predict the probability that the provider gets paid from the payer. We've been very methodical regarding all the things that I am addressing with you, and very determined to get it to scale. We knew that blockchain was going to be our DNA in 2011, but the timing wasn't right. By timing it right, as we have done, all of those APIs are now smart contracts!

Jennifer: Is this a consortium or alliance you are referring to with regard to all the providers in your API network?

Ted: We put together an alliance, the DokChain Alliance, for distribution that has grown over the past two years to about 54 companies. It has large BPOs (Business Processing Outsourcing), large providers and payers. It has large banks because banks love to pay credits down at a discount.

Jennifer: Simple.

Ted: Yes, given all this, the autonomous adjudication closes the accounts receivable window down to a day or less. We can add all radiological services online, and users converted to same day self–pay, even with insurance presented: 80% conversion same day self-pay, with a 45% discount.

Jennifer: Please explain that further?

Ted: The deductible is the issue! You're like, "I'm never going to hit this thing."! If you can get a discount of 45% in order to get my EMR for $200 bucks at midnight, OR it's going to cost you $500 out of pocket…you are going to go at midnight and only spend the $200.

Jennifer: That's amazing. You can't get that kind of turnaround when you just go to the bank and deposit a check with the time it takes to reconcile. You essentially are resolving this whole issue of scalability?

Ted: You got it! - collapsing the AR window down to a day, and we're not finished yet. In addition, similar to our medical clearinghouse concept, last year we bought a pharmacy - EMPI. Now, we're doing pharmacy transparency pricing and non-adherence.

Jennifer: Please explain how non-adherence works.

Ted: The ability to determine whether someone really took their medication and if they're following the rules on the prescription or not. Jennifer: How are you able to track this?

Ted: That's part of our clearinghouse mechanics on the pharmacy side.

Jennifer: Could this help with the current opioid epidemic in the US?

Ted: Yes! Here's the kicker --- if they never fill it because it was too expensive, which happens a lot, then in the future you're going to be able to shop around for prices just like we want to do, and should be able to do, for medical services. I'm trying to bring true transparency and an arbitrage to medical services, utilizing blockchain technology and API's.

Jennifer: David (David Houlding-Intel) advocates this as well - reducing current healthcare exorbitant costs and giving the patient the best service and the best quality of care. It's a consistent conversation.

Ted: Then there is the pharma supply chain – provenance i.e. where it's shipped to, who writes the prescription, where does the prescription go, as well as addressing the medical device supply chain. GE Healthcare and Siemens Healthcare are getting on top of this. Where's the manufacturer? Where is it

delivered? Who signs for it? Who takes the MRI? Where's the MRI distributed? Who reads them? Where they're referred to? and tracking follow-ups. A company called eviCore processes 100% pre-ops. Meaning, wouldn't it be great if you automatically knew you're authorized and eligible for a service, and how much it will cost you, even before you went for it?

Jennifer: Yes.

Ted: That's the fourth use case.

Jennifer: Where is all this data stored, running? Do you have a large data center or is Pokitdot not holding all the data? Is it in the cloud? Tell us how that works.

Ted: The AWS, Microsoft and the IBM Bluemix's of the world love us, as we're a cloud environment. Remember, we have the rights for data re-use. Most companies are legacy companies in this space, and do not have the data for reuse, so they can't do machine learning and AI. They can only guess. We have the rights to the raw data, most of it.

Jennifer: I see, I was confused re the right of “re-use” with Pokitdot.

Ted: Yes. I'm also big on the Hyperledger team. As I stated at the annual HIMSS blockchain panel, we are with Hyperledger and we run on Fabric - the one that seems most logical right now of the two, Sawtooth or Fabric.

Jennifer: And with regard to the chip, and your partnership with Intel?

Ted: The Intel Sawtooth chip has Secure Enclave that secures the transaction at the chip level, so hacking would be really hard to do. I refer to HIMSS data that up to 40% of all health data is unencrypted, therefore, any encryption that we do in the security space is helpful. We made what's called a “crypto asset framework” on top of the chip. With our 600+ applications on our platform, a company can do an ICO in a secure fashion, with all of our APIs too! However, we built Dokchain to run on any secure enclave chip architecture and in fact have executed smart contracts on Ethereum, Fabric and Sawtooth. We see Hyperledger as being the main environment for the enterprise.

Jennifer: This is great news. Indeed, there are many startups, as well as established companies, trying to create their own platform, whether it's open source or not.

Ted: We did it specifically because we know the health space, and we know the different incentive models. We even made different pluggable minting models. You can have different plugin minting models, such as whether you want the user to share their data, or if you want different companies to share your data, or to be able to incent you with providing you a token or coin at the time of

engagement. We built that on top of our platform and it works. It's called ERC- 20 compliant (a technical standard used for smart contracts on the Ethereum blockchain for implementing tokens), meaning that you can trade it across multiple ICOs and tokens. That allows you, immediately out of the box, to get the identity by consensus with the APIS, which tells you contextually who Jane Doe is, and you get the crypto asset framework all in one shot.

Jennifer: Well, I am sold, as a commentator, writer and researcher in the space, as well as a consumer, which we all are!

Ted: We all must remember that the healthcare industry is a last legacy industry to go down the digital pipe, and it did not accept this adoption without the federal government's mandate.

Jennifer: I remind people of this all the time.

Ted: I personally believe that bitcoin is similar to the evolution of PayPal. If you think about the first time you used PayPal, it took $billions of dollars out of the market. But look how $trillions came back in. They ran through the same problem with the banking industry - gnashing of teeth and wringing of hands: "Please, don't take my 90 to 180 days business model." The payers alone in 2015 wasted $375B in paper. We compute the efficiency because everything PokitDok is about is kicking inefficiency out of the market. We guesstimate $175B a year will be saved; the alliance computed $650B in savings, and they said it was a conservative estimate.

Jennifer: So PokitDok is pushing the envelope, maybe even ruffling some established feathers?

Ted: Our own clearinghouse is a Trojan horse. What is the largest impediment to a one-click transaction? It is the eligibility claim/ER cauldron. We want to disintermediate ourselves. We want to push the EMR out to a node and get rid of the entire concept of a clearinghouse, because we can. For example, one of the largest companies is Change Health. All they do is claims. And all the EMR companies do the same. They all create a record, a data vector. I think the companies; Google, Apple, Facebook, and Amazon create data vectors of Jane Doe, every single day, in a much more accurate fashion. There's not much difference. Do you really need an EMR?

Jennifer: Interesting.

Ted: This is why people may say, "None of this is ever going to work." Yet, on the backside, they're signing up for APIs and testing them and saying, "Wow, this really does work."

Jennifer: What do the "elephants in the room" - Cerner and Epic - say about this?

Ted: I don't know. I know that Cerner put their EMR up on AWS, which shows you where they are headed.

Jennifer: Point taken.

Ted: Most companies are moving to self-insured. So, where does that leave the payers? Some people say, "There's no use cases for blockchain." What about “identity by consensus”? I have the best and brightest minds in health and tech in a room, and they're telling me about identity by consensus and closing the AR window down to a day, so think about the use cases across industries. This is the first time in history where we have multiple industries - whether it be supply chain management, whether it be health, whether it be banking, whether it be food processing, whether it be fiat currency - where everybody's speaking the same lingua franca of computation. It is the computational governance of the enterprise. That is what's blowing everybody's mind.

Jennifer: Speaking of governance, is the issue of regulatory bodies affecting your industry or your business model at all? Is that a concern? Are there rules and regulations that you've had to confront, or are confronting?

Ted: Yes, and it scares me to death, because in a past life I did technical policy for Microsoft on capitol hill. At HIMSS I said to these CMSs, etc., "You’ve GOT to go get your compliance." That gives everybody a common ground. You got to get your HITRUST and your SOC 2, and your HIPAA compliance, though HIPAA needs to be rewritten in present day security standards. I read recently, with regard to SHA256 hashing or mining on a blockchain, that it would take 74 trillion guesses, which amounts to something like 1400 trillion years in time to break the hashing function. So, when people ask, "But is it secure?" It is more secure than the 35% - 40% of unencrypted data that is currently in most hospital systems.

Jennifer: ...and if you add all the breaches currently in a hospital setting ...

Ted: ...Or the fact that the nominal identity accuracy is about 75%, 80% at best. The denial mechanism is so strong here, these people have worked in this industry 30-40 years, and nobody wants to change, it is homeostasis.

Jennifer: I totally agree with you. When I attended Becker's Hospital conference in Chicago last fall, I was taken back a bit. There were many traditional major hospitals in attendance, metro and rural, having no idea what blockchain is, nor what it could do for the healthcare industry, albeit a few CIOs and CISOs had heard of it.

Ted: Of course.

Jennifer: Many there repeatedly asked, "Is Bitcoin blockchain, or is blockchain Bitcoin?", and they were still typically dealing with a recent huge EHR implementation. Blockchain is yet another disruption for their legacy systems, or their enterprise, and they don't want to hear of it. They are still lamenting the last EHR implementation or upgrade. I think the term "denial" is legitimate, but for affiliated innovation centers.

Ted: As I stated, PokitDok is going to disintermediate clearinghouses and EMRs are going to be at the edge of the network because it makes sense. A distributed network, an immutable ledger has no business connecting to the center of an EMR. It defeats the entire purpose.

Jennifer: Being a "legal beagle", I would not be surprised if the large EMRs push back on PokitDok for pushing the envelope with technology on the cutting edge that will disrupt their world.

Ted: We have all the compliance. Other companies didn't get HITRUST SOC 2 compliance, CAQH, INNAC, etc. We spent tons of money to get the compliances. And on the pharmacy side, we have pharmacy benefit management. We also have our own NPI, National Physicians Identifier. As we own a bricks-and-mortar pharmacy where we issue prescriptions, we can show market pricing. Let me explain it this way, in the music industry, analog tape no longer exists. The first startup I worked at was a company called Digidesign, which made it impossible to do digital audio editing on the computer and we launched APIs that other companies could build on top of it. Sound familiar? Now, there's no more tape and there are about 1,500 third-party audio companies.

Jennifer: So, you've worked before on the "cutting-edge", pushing the envelope and disrupting existing legacy systems?

Ted: Yes. I was a CPU Software Engineer at Apple for the audio and graphics on OS10. And I also worked at Microsoft for seven years in the trustworthy computing group and other places. Apple got the PHR record, AWS is working with Berkshire Hathaway – this is the self-insurance model.

Jennifer: I was going to ask you about that. What do you think about the big announcement?

Ted: They applied for an insurance tag. Now they're going after the banking industry. They've already put generic drugs on the shelves of Whole Foods.

Jennifer: These are very exciting times indeed. Thank you, Ted, for your time, and your thought leadership in the industry.