Eric: Hi, this is Eric Hess with The Encrypted Economy. On today's episode, we had Matt Zand to help us through understanding what Hyperledger is and specifically how it integrates with smart contracts and public blockchains. Matt recently published a book on Hyperledger fabric version two, and I wasn't going to miss an opportunity to bring an expert on the podcast to talk to us about what it is.

He breaks down the different libraries. We talk about smart contract and public private blockchain integrations. While there's been a lot of attention on public blockchain, what is often covered less are private distributed ledger technologies and how they can integrate into the public blockchain.

For example, as we move towards a world with central bank, digital currencies, and the overlay of compliance tech on the public blockchain, inevitably the interdependency of private and public blockchains is going to become front-end. I have a lot to learn about Hyperledger, but from my vantage point, it has the advantage of being battled tested in enterprise environments.

I would anticipate that if you want to understand how medium to large non crypto companies are going to ultimately interact with the public blockchain, you might want to understand their existing Hyperledger implementation. It would also appear from the vantage point of supply chain management, hard to see how public blockchain can deliver on security, resiliency, and systems integration in a way that Hyperledger's implementations.

So, I was really excited to start this journey with Matt. I've got another Hyperledger focused episode in the hopper, and I hope that this podcast can continue to advance your understanding of this critical component of The Encrypted Economy. As a side note, the video in this episode is terrible. Particularly toward the end, I felt like the Cryptopunks NFTs had better pixilation than what we were getting.

Fortunately, the content more than made up for it. Although my video editor is going to have a fit as usual. If you like the podcast, share it with others. If you're connected with the Hyperledger community, make sure to share it there, too. So, I think you're really going to enjoy this podcast. And with that, I bring you Matt Zand, author of Hyperledger fabric to the book, and I think you're really going to get a lot of this.

Welcome to The Encrypted Economy, a weekly podcast, featuring discussions, exploring the business laws, regulation, security, and technologies relating to digital assets and data. I am Eric Hess, founder of Hess Legal Counsel. I've spent decades representing regulated exchanges, dealers, investment advisors, and all matter of FinTech companies for all things touching electronic trading, with a focus on new and developing technologies.

So, this is Eric Hess with The Encrypted Economy and today, we have Matt Zand on the podcast. Now, Matt just wrote a book on a Hyperledger fabric and the latest version. We covered a little bit of Hyperledger on this podcast when we had Jeanine Hightower-Sellitto and Corey Wendling from Atomyze.

And we also talked a little bit about private blockchains, which is what distributed ledger technologies with Wanchain, which focuses on crushing applications in the public private space. So, it's high time that we did a little deeper dive on Hyperledger and very excited to have Matt Zand today to help us through that.

Now Matt's done a lot. He's founded four companies. He's got that new book and I'm going to have to figure out how to summarize everything he does succinctly in my title byline, because it's going to be a challenge. Maybe I'll just use a huge acronym, but any rate without me endeavoring to do justice to your background, Matt, why don't you introduce yourself and tell us a bit about your background.

Matt: Yes. Thanks Eric for having me on your podcast. The thing is that I, my background in business. I graduate from University of Maryland College Park. I got my MBA and then I have been coding since high school. I started a technology company and then after that, a couple of brand we add to it. In 2013, we started web design company called DC Web Makers.

And then after that, the most, the mobile app development and around 2019, we did some stuff in blockchain, which called the hash fiddle. We also find out that it's very good to have a training longer and the application consulting and development. So, in 2015, we started a two brand of training, one for high school kids called High School Technology Services,

and another for adults called Coding Bootcamp. So that's where I'm coming from. Some mostly technology kind of the companies. Now, as you mentioned recently, like as 18 months I was engaged. In writing a book on Hyperledger fabric, which today we are going to talk more about that. That's where is my background is

Eric: Excellent. So Hyperledger, particularly, what drove you to focus your efforts on Hyperledger and to go ahead and write a book on it?

Matt: When I was studying doing this stuff in blockchain, believe me or not, we couldn't find a teacher in DC area that knew to teach the Hyperledger in 2019 and all of a sudden the resources for Hyperledger was such a scouting around. There was no, very single source of resource that you can rely on different version, different community people.

So, the lack of resources also trends in blockchain adoptions, as you notice, one of the early adoptions or in the use case of blocks in our supply chain. And when we look at okay, who's doing supply chain found out that Hyperledger is behind. And the case was that I liked the idea of enterprise because one of the things that grabbed my attention was the architecture of Hyperledger.

It's very organized, is a structure to scale it up. And the more you scale, the more application become complex, the more you appreciate the value of Hyperledger. Ethereum, and didn't know about this issue initially, but then later on, if you notice, because the Ethereum enterprise, private. Came to realize that, okay, they need to have those components, but they still are not as structured at Hyperledger because at his core, Hyperledger is enterprise oriented.

Eric: What motivated you to write a book on it? How'd you- that's a sort of an endeavor.

Matt: Yeah. So yeah, that was the endeavor some a little bit. So, I knew people in already media. So, I had some connection there and my company did some training for them. For me the challenging part. And it was to come up with a list of topics that's not going to be obsolete so early. Like you have to come up with a list of topics that are practical and it's going to stay around for a few years to come. So, for me to put it this way, the most, I was half of the challenge of the book that outline. And then to be honest, at that time I underestimate because lately the orderly told me that this book become number one in the market.

How do he know that? And blockchains changes very fast. Some of the things like asset tokenization wasn't that much hype at that time when I was, because once you submit the outline, you're not going to change. It is maybe a little bit difficult, or I need to accept them booking, and make changes to this.

So that was most challenging. And it's not as rewarding experience for me because it was one time, and it was so arduous task is just.

Eric: Yeah, it's a, it's certainly a labor of love the longer it gets. Uh, kudos to you for taking on that challenge. So before even diving into maybe breaking it, breaking down a Hyperledger a little bit, let's just talk a little bit about just public and private blockchain integration generally. Now I think most of the listeners understand that when you're talking about more of a private blockchain or DLT technology, they work particularly well in closed systems, obviously. And specific concerns that you're trying to address within a closed system, but the integration of private and public is intriguing and certainly a direction like everything can't be in Ethereum noted in you've noted, or was the Ethereum has provided for, I started to.

This notion of private blockchains, closed network and then facilitating the, that, blockchains on within a closed network. And then from that closed network or that private blockchain then integrating with the public with APIs or what have you as necessary. But, in certainly one thing we talked about with Wanchain we talked about this notion of a compliance blockchain.

That might exist within a closed network. We also talked a little bit about that with regards to any money laundering compliance with de Jevons of cipher trace, how you might have separate networks, just specifically for AML whitelisting and, KYC checks, et cetera, that would then integrate back into the public blockchain.

Maybe even adapt. But having said that, When we think in terms of private public blockchains, just broadly, what are the most compelling use cases for that integration?

Matt: Yeah, that's a good point. So, let's see at the very high level, when you talk about private and public as you mentioned, some of the things that you need to watch for like public, for example, cyber security is one of the issues that's more appealing to the public.

Because it's open to the public and, attackers can attack, but private one is just close, is more secure and generally speaking, right? And the gas price of this Ethereum was low. But now look at the competition, everyone interior to that, and then gas price goes up. So that's

another area. Now, coming back to the integration of the private to private, basically once you build that, the members of the network is already known.

They know others, we already have agreement. And then they start build that network. And any persons in that network is just part of the network. So, there's no outsider. Now on the public Ethereum, it's open to public now regarding the use cases, some of the use cases that is dealing with publics like for example, like asset tokenization, crowd funding, some of these cases that you need the public to come in and participate.

And you're not vacations, obviously it's your choice. Number one is called the public blockchain. On the other hand, when you're dealing with closed network or closed, and then you're dealing with like mostly business to business or some of this stuff that there is no participation of the public involved, then you would rather go to a private.

Now the ideal choice, sometimes it's become kind of. Because some of the application have both element of public and private, right? As you mentioned know your customers, anti-money laundry, like KYC, you can add a standalone application for that. We have done that for a bank where we build a standard on application for new customers, and then they have their own orders platform.

So, one example is like this. When you're dealing with architecture of the blockchain, right? So, then you might have a different like there is one master application that you might have kind of the, slip kind the, another layers application. And each one of this application might have a mummy maneuver publicly or privately.

If that's public, for example, then you're going to use the right platform it's Ethereum, or is it private? You want to use Hyperledger, but coming back. I think the most important part of the blockchain to me is architecture. So, the first thing you have to identify is the blockchain is the right solution.

And if yes, what is the best architecture for me for this when I'm building and without any it's. Okay. You know what? I know this, I know that. Potassium comes at the very technical yeah. As the architecture, you need to realize what your, what is the best, most efficient way for me. And it's, you might call it my business requirement, like business school.

And once you do all of that, then you can come up and say, okay, you know what? Now I have this, what is the next available cruise for me? Or a better platform?

Eric: And, and so just to double click on that a little bit in contemplating the architecture and again, trying to break it at, break it out at a high level, what are the primary considerations within contemplating the architecture to make that?

Matt: Yeah.

See, one of the key consideration is a data flow, right? So, where the data originate and where the data goes and who need to see the data at what the scope, they need to see the data, right? The right data go to wrong hand, it's just going to, is not good. So basically, that's as a data is a very good starting point to see how the data flows in your model.

And then also to see how many how many kind of people involved, how many kind of nodes are people, parties involved in that? And to what extent their roles. And then obviously in any product that you have, if the public involved, the public is, it's not as so obvious, look, black and white, if you have some element of customers in public, you know that, okay, they are there, and you cannot just discriminate.

If you say public is private property. You know if there is an element of public involved. So, my suggestion is just look at your data. If this data going to be available to public, Ethereum is okay. But if it's not, there are some certain, if there's a mixture of public and private, then you need to have a hybrid, right?

So, this is a good starting form for the developers. And also, again, look at your customers on client. If it's public customers like combine the crowdfunding, or it's just not as safe. People that trade finance that they can.

Eric: And just to weave a thread through a lot of our past podcast episodes and focus key to it is also encryption and the ability to implement encryption, whether it's zero knowledge proofs, which arguably could be done on a public blockchain.

But then if you must start moving to encryption technologies, such as a multi-party computation, arguably could be done public, you might find that certain implementations would suggest that you'd be better off on a private. And certainly, when you start to move into things like fully homomorphic encryption, or somewhat homomorphic encryption, that could be within a private blockchain and then integrate.

Via the public blockchain, Zika P might be a prime way to integrate the two. So yeah, a lot of different puzzle pieces there. Yes,

Matt: exactly. Yes. So many variations. Let me so many very able there to take into consideration. As you mentioned again, the cyber security is one aspect goes, I was spoken to as one of the guys he does cyber security is especially, he has a book on cyber security.

Then he told me that. Now many old version of theories are under the attack, but this is not the case with Hyperledger, because again, it's close knit for is relatively more secure. So basically, many developers who does Ethereum and they underestimate the importance of the security and.

We'll cross the bridge when we come to you, but sometimes it's too risky, especially for ICO offering, so things like that. And I have seen some projects that people really underestimate this, but it's just that one of the things that Syria is changing because as the proof of a stick is coming up right now, there are so many concerns, Ethereum community regarding the environmental effect that they have because of the.

So, their consensus is going to be updated later this year, proof of stake, which is going to help a lot in terms of the resources that they are going to utilize to, At the time it's action today, Netflix,

Eric: For sure. Interesting. Cause the, the cybersecurity component really underscores the important of third-party independent audit of code and obviously security being one component and bounties to encourage people to try to find those breaks.

You just had, was it the poly network that had that massive $600 million hack and then. Basically, I think I read just the other day that everything, all the monies have been returned, but, and it was done to largely exposed, but things like that are important to underscore the vulnerability on the public.

A lot of the public blockchain developments. The same can exist on any private blockchain. No, so I'll hold it. I came on to talk about Hyperledger fabric, too. He's jumping off on all these different topics. Let's get back to the, let's get back to it, but it's all it all kind of factors. Certainly I, one thing it appears, and maybe you can validate that Hyperledger because there's less pardon the pun, but maybe not really part of it, because of it doesn't have the same hype that, a lot of, like public blockchain protocols have.

So, it, because it's enterprise, a lot of that cybersecurity focus is, is sort of inherited maybe from the enterprise implementation. Level, larger enterprises use it. They have their own CSOs and cybersecurity that run through it as part of their implementation for the project. So, you're not dealing with startups, you're dealing with, enterprise grade and it forces that greater attention on the security of the DLT from the start.

So, with that said to bring us back, to Hyperledger. So, there are a number of distributed ledger technologies. Within the Hyperledger family, I guess is one way to call it. Could you give us a brief sketch of what they are?

Matt: Um, regarding the distributed ledger technology or DLT under the hyper ledger, there is a hybrid, it's a fabric as you know. Hyperledger Sawtooth. And then Indy and Iroha, Besu, Grid so very briefly, like maybe one sentence about each. So, you can't remember what it is. So, fabric, we talk about fabric today, so that's, I'll just skip that one. There. Hyperledger Sawtooth is originated by Intel companies, very efficient resources wise use utilizes those resources very wisely, like hardware soft.

The Intel, the processors of the computer and it's undecided too. So, you can use both permission and permission. Quality network. That's the flexibility that it has also saw twos in each node, in the saltiness. You can, each node on the saltiness can be ordered. Okay. If you are familiar with blog, Hyperledger fabric, you know that it's fantastic.

That means performance because in Hyperledger fabric, there's only one or act for the whole network as ordered, but in the saltiest each note can act on that. So that's make it more efficient performance now, Hyperledger Indy, and both of them for identity manager. And for encrypting, identity management of the, uh, and then, Hyperledger grit is a specific distributed ledger technology, which is still at the incubation stage for supply chain management, Hyperledger purpose.

Um, uh, one of the key features incubation is support menace, consensus, algorithm, proof of work, proof of stakes. It's just as that have been lately and Hyperledger business also. The open source Ethereum clients. So that's why I'm saying, for example, whenever you want to

do the hybrid fabric and this, the like twins, they come together because fabric is a private business, create the bridge between that and Ethereum,

Eric: circling back to Sawtooth.

Cause we saw two, you talked about permission and permission less and you talked about there being the potential for more than one node validator.

Matt: Yes. And then is it under saw twos? You can structure the Sawtooth as being completely permissionless, like the exterior or it can be permissioned like a Hyperledger.

So, it has that

Eric: flexibility. So how does differ from fabric? So, fabric is. Permission based two is permission less and Sawtooth is theoretically, both of my sisters.

Matt: Yeah. So, this fabric is a private, right? So, it can be private or public. So, it has that flexibility. Now on the fabric, there is one order.

Or ordering service for all the transaction, but on the side too, is each node has the ability to become ordered on its own without going to the central authority. So, make it more efficient in terms of getting resources,

Eric: right? So, it could be somewhat similar to just validators on an Ethereum network or Bitcoin or whatever.

So, you've got multiple nodes validating. It is the reason that people wouldn't go to Sawtooth exclusively because of its flexibility, that fabric and base who just have more functionality within.

Matt: The people go to fabric because there's so many resources available then. And then also there's community, but a fabric put us you see, for example, like IBM and all these cloud provider specific managed services.

For fabric on there, on the blockchain now for the Sawtooth uni it's the initial idea was for Saul to suppose that like resource efficient, hardware, the, you know, the CPU because of that architecture at the same time, not every project needs that kind of efficiency because at the same time, again, the pros and cons is that how you have to work for all the validators, it's just that it's pros and cons and also a support from community. All so good. This way, the project that go to the south too, they know what they're doing. So, they are really looking for something very resource efficient. But in general, when you're talking about general project fabric, there was not the demand.

This is not a priority. This is not the first objective of project.

Eric: Cause generally the private networks aren't going to be as active as let's say the public networks, in terms of traffic and resource efficiency, et cetera. Excellent. So then let's double click on Hyperledger fabric where the resources are and where most in the audience would be focused on.

In at least initially. So, what are the key components? We talked about one which is that it's permission. But what are the key components of Hyperledger fabric? Yeah,

Matt: So, the Hyperledger G component are like, as I said, border, and then it can be you know, a membership service provider and SP and it can also be kind of the peers and then it can also be uh, private data.

Or those are something features, and I could have just fabric too called private data collection. I'm going to have to talk about that and then chain code and then a channel and policies. So, if I can put it. Chain code means a small contract. So, the fabric allows multiple small contract to be chained together under the same umbrella.

So, it gives him that gives you a structure of the very high performance network. So, you can have a hundred, five 50 small contract under the same umbrella and they sing to each other on the chain. And then so there's a chain code. There is an order. So, membership service provider. MSP or membership service provider is jobs to manage how the identities of the people participating like access control list who have access to what, where and what.

And then of course there is something called the policies, define the members of this network, who can do what? And like define all these policies that regulate the participant in the network. And then. The things are that peers are the one that, you know at the point that they are actually having the ledger on them.

And then when the ledger, as uh, like Ethereum is on the ledger data, the couch DB database and then after ledger data. And then there is the one Hyperledger libraries that facilitate the chain data processing situation. And they can, you can hook up. That's

Eric: interesting. And going back to the, was it the on chain smart contracts is, or the link smart contracts?

What was it called again? I'm sorry. Chain quote. So does that have the ability to both run, to integrate linked, smart contracts with, within the front. Network. And then in the public network and then in the private network, in other words, can it weave its way by integrating more public smart contracts into the

Matt: no.

See the chain code is only for fabric and it's only for private and is only for those small contact on there again. And again, if you want to see the fabric, there is there's a library in the fabric that you can use. To make the small content agnostic to platform and runs by itself regarding the platform.

So, if you want to you do that, then you just use that to connect to the fabrics. They can turn as they do contact the platform agnostic, but then sending the fabric itself to chain code is only for private is only for people. And you deploy the chain code on a specific note that required to be deployed.

Right? Another fascinating part of the fabric. That's good to mention a channel channels allow the certain part is internet for it to have a certain communication without affecting the

operation. So that's why it's meant for with enterprise. So, let's say the pharmaceutical software supply chain. For manufacturers to supplies and Stuart is a certain operation that they need to communicate like a private channel.

They can create a private channel and then they can start doing that communication without affecting other operations.

Eric: Now, would that be similar to how an Oracle might integrate with a smart contract?

Matt: Yes. Similar again, one thing is that at the same time, there's some little bit differences, but the names signify the channel is there is a way there's channel where certain parts.

So basically, admin in the Hyperledger fabric assigns. Okay. This is a channel between these certain members that they can communicate under that channel and against channels. I was very good. And then policy is very good. A massive service providers is very elegant in managing the older members of the IDs of the participant in the network.

Obviously you understand all of this when you are, as I said, skilled it up to the consultant. When you scale up the consulting, you realize that it gets so many members and you have to have some policies among them because they cannot, because there are different companies, right? How we can have five different private companies, you have to establish a policy amount them.

And that's how the Walmart is doing one more set the policies to their suppliers and they just follow them

Eric: and going back to the smart contract and integration, like weather channels, but also talking a little bit about. Oracle's right. So, there's a company API three Dow. We had salsa millage on the podcast to talk about it.

They provide like an open API framework to different Oracles and that can be integrated off chain and on chain could a company that does this, like API three Dow or also like a chain link. Can they? Yeah. BV Oracle provider to the smart contracts on Hyperledger fabric, or do they have to, is that just an API or does it, do they have to become part, become a member of that fabric and is that simpler than it’s? actually somehow

So

Matt: I think, um, I think what's the difference between the small contract deployment on the note that in vocation expand contract, right? Because when you're invoking a smart connect, it's just. Like you go to a website, you search something, that's a query, right? So that's one. Yes. You don't need to even worry about that.

You can, articles can access and invoke like a public, like right now, for example, you can run a query from something API, you just call the API, get the fish, the data. So that is just a quick. And obviously that court is possible. If that private company allowed the quality of fishing up to data or vocation is possible.

However, the deployment, no, you don't need to deploy them because as you mentioned, they are doing stuff between on and off to change, the data, because you're not going to put so much stuff on the chain. So, this is stuff. And then if you want to invoke something from the, on the chain, then you can do that.

No problem, but you don't need to deploy. So that's difference between deployment of the smart contract to be on the node. Versus the invoking. So, in case that you are talking right now is invoking, there is no problem in the photo calls and others cannot vote.

Eric: Excellent. Uh, I know that's probably simple question for you, but just something I wanted to cover off just because w the way it's one of the key components there.

So, fiber Hyperledger fabric, we talked a little bit about their use cases. What would be, if you want it to give, let's say the top three. Actual industry use cases for Hyperledger fabric were, they they're having meaningful, impactful sort of a no brainer deployment.

Matt: Yeah, I think um, so the first and foremost is supply chain management as, as know, And then second, the second importance is identity management.

As I mentioned, you can use Hyperledger fabric, Indy, Iroha, all this is in the library that you can use for identity management. So that's the second one. And after that, so you know that there's so many use cases of blockchain, so many. So, after that, I think the most popular would be anything that deals with private B2B.

I would say anything private B2B. Like trade finance or anything that like as a tokenization between two different entities to anything that is private B to B, I think the fabric would be fascinating.

Eric: Interesting. And certainly, for private B2B it's, we, uh, a few weeks ago we had what was going on in Congress with the IRS and the taxation of crypto.

Obviously it has an impact on the Hyperledger. Use case as well, right? It's not just a public blockchain issue. It's a private blockchain issue as well, particularly if it's yes.

Matt: To some extent, I am not sure because the thing is that on the fab, because on the fabric, the consensus algorithm is different.

And then the parties involved, they own the notes, right? So, it's private, not that they have for example, your computer, my computer, we are sharing some of this stuff in your computer. So, it's, um, it's a little bit different. It's very difficult for government common audit that because the private, you cannot just go to a company to see what data is shared between.

So, for fabrics is I'm just a doubt that they can really enforce on the fabric. Just the private data, but, and then plus the consensus algorithm is different, right? Because there is no cert party like minor that they can say they are working and there is a proof of the work. And then we get the money. So, it's done like by itself for the system, but at the same time again, what I'm thinking is that I cannot pass any judgment.

I may be wrong, I know I may be wrong, but just that, the IRS is going to squeeze anything as far as they can. For me, it's very difficult to imagine, but it's not impulsive.

Eric: I mean, the impact of it is really forcing reporting of B2B asset transfers on the private, on Hyperledger is what it would require.

So, it would require a level of reporting that. Potentially already done again, maybe because it's enterprise, there's a more ready capability to implement that, who knows. But anyway, this is my first, this is our podcast first deep dive on Hyperledger. So, I it's certainly, it's certainly not going to be the last.

So, moving on to version two, that's the second version, obviously. That is the essence of what you're trying to cover in your book, not only covering fabric, but how it's now improved and how it can be, and how that improvement can really impact its use cases and, and draw, additional features.

So, what are some of the new functional features offered in V2? Just in order of. To the extent you can in order of impact and help us understand, why those yeah.

Matt: Um, one thing is that you most of the, like for example, right now at AWS and some of the AWS, I'm not sure about Oracle, but AWS right now is the most popular cloud platform.

And they support version 1.6, I believe. And interesting enough starting the April of this year. Fabric Hyperledger community that are not supporting that version anymore if I'm being lit up suited. And so that opens the door for vulnerabilities and risks, because once they stop supporting that, not passing up anymore.

So, I think Amazon is behind these things. They are preparing because IBM is version two. And Oracle is mentioned too. I just remembered Oracle is version two. IBM is version two, just AWS is behind now. Even the Alibaba is version two. So, one thing is that, um, coming back to the version so as you that, uh, over the time, the community realized that there were some features are missing and some of the things need to be fixed.

And then some of the key highlights of division two, And at the most, most notable one is a small contract lifecycle management, or it's called chain code life cycle management. And it's one of the crucial, very important element of the enterprise. So, over the time business requirement changes and you need to change your smart contract adopted, but it's not that easy for the blockchain that runs by itself.

So, you have to be come up with a way to manage different regions of your small country. And then upgrade that results, minimum effect on the network. So, it was lacking the previous versions and then version two, they came. And so could we have something called a small contract lifecycle management, so you can easily manage different versions of this long contract.

And over the time it can opposite it. The old one is not using it. So that's just the fantastic features that came. And we talk about that in your book. And then also private data

collections. As we talk early, it allows certain members, internet folks to have a private chat with one another without getting approval order over and going to the, the main network.

So, it facilitates, it makes things faster. Communication. And internet folk among participant is also supportive of the raft because in version one point C the consensus of the raft was next to the CAFCA and CAFCA was at that time, but like most dominant in all areas.

Eric: There's a couple of terms that you just threw out there that I wasn't ready to.

It was the

Matt: vision of the fabric. The consensus was done was CAFCA and then the later on the ad, the raft invasion system, there was a rafting CAFCA, but envision too forward. They don't accept Cafco anymore. It was only raft, R a F T draft.

Eric: What does that stand for?

Matt: Yeah, it seems that if you are like if you have done something, the fabric.

He's going to immediately ring the bell because this are so much done in the fabric, lady fielding, anything fabric you're going to run into Jeffco now, chaff cover Java base, right? To give you a job. And then raft is a Golang language. Cool. So basically, they just moved that and then they're coming back and other things I forgot to mention is that it's very important for people listening to this question they might have.

And you've skipped that. If I want to write a small contract in fabric, what are my language choices? The good news is that we can do JavaScript as simple as JavaScript. You don't need to learn Solidity. So similar as JavaScript, we talk about jealous, but if you want to do you know, more heavy duty, let go or Java, you can do those languages impact.

Now other features that offer invasion to it's called external chain code launcher. And coming back to what you mentioned if you remember in your previous about Oracle. So, this is another feature that's called external chain code or smart contract launches. So, you can invoke call this small contact without being in the network.

So that features, it offered invasion too. And that's where the Oracle that you are talking can benefit from.

Eric: Interesting. So, it definitely provides greater public private interactions, cross chain interaction, cross chain functionality. Interesting. And to, to take one step back, particularly on the smart contract lifecycle management.

How would you compare and contrast the functionality of Hyperledger smart contract lifecycle management with what occurs on the public blockchain?

Matt: Um, so the thing is that as far as I'm not adept on Ethereum, and to be honest, like I just uh, read the book like two years ago that Ethereum doing theorem strings on this stuff and that kind of lifestyle and management, but is very important.

Yeah. Coming back. If you if I notice I mentioned business requirement, right? So, in the public blockchain network, I am not sure how it looks up and non-fungible token. Once you put it up, there is the business requirement. I'm not sure how fast it's going to. But it is not the case is private business, private business.

I'm guessing the requirement not only changed more, more frequently, but the effect of change is more important because you have to adopt those changes rapidly. You know what I mean? And you cannot afford what is not the case. It's a public you're dealing with public, right? Um, for three of the most important things that you're going to do is to update your record.

Because, as I said, for the risk and cyber security you have the oldest versions. Now you need to deploy to put the new, latest versions. You're not dealing with like 20 different contracts, 10 different, small contracts that they need to update and talk to each other. So, you don't have that level of complexity.

Nevertheless, again, 3m has that functions, right? It has the options. How have I seeing the developers often use that? As far as I've seen it, but then when it comes to the business comes to the private, but opportunity is a must because I'm guessing that right now if the government was almost serious, when deployed in a private blockchain, they're going to ask this question.

Hey guys, have you thought is the due diligence or precautions about what will happen? Things going to become opposite of. I asked this, I have heard some comparable client. Okay. You know what? We do this for two years from now, what if is going to go away? What is going to change? And again, initially we didn't have answer for them, but now recently, thanks to this.

Because before this, it was a nightmare. You have to redeploy everything. You do, unit tests, everything is just so much work. So, it's like saves a lot of time and effort for developers. And also, it gives a peace of mind just to the enterprises that look, it's just going to be a step like a software. You can stay suffering like Microsoft windows on yours.

And right now, you can, Peter, that you need to worry about upgrade to patches. It automatically, down by itself, is the same thing with that kind of the life cycle.

Eric: So, it seems that from at least your perspective, that if you're an enterprise that's contemplating nesting a series of smart contracts in a way that could be managed in a private network versus a public blockchain network, the flex, the ability to manage that life cycle and to control it and to upgrade, it would be enhanced if you will.

In, let's say in Hyperledger fabric is that going to be your

Matt: perspective then the complexity of small contract for the private might be more, especially for enterprise consortium compared to the poverty. That. So that's really demand that you just watch for that and upgrade that. So again, coming back the things is that I haven't dig into see the application of that lifecycle management Ethereum or public.

All I know is that some of the use cases that I've seen right now, they are no one or two or three, a small contract Ethereum and blockchain network. And the only thing is they need to operate. And they are not going to change that much. For example, both in, see if you look at and this smart contract has been around for a few years, they may operate division, which I didn't see because they didn't.

I saw the other day that was the same erosion, but the only thing is that it might not be the case for the private blockchain network because business requirement in general changes more in the private sector and

Eric: the. Interesting. Um, uh, certainly something in, in terms of architecture, this would factor prominently in your decision making for which architecture.

So, this next question is actually a question that you suggested, but we might've covered it, which is, is hybrid blockchain architecture becoming trendy. Yes,

Matt: exactly. That's what we covered already. An answer to that is yes, the public and private now become like you know, between and better.

And a bigger kind of desire right now, a better conversation in them. And they are managing, because again, as I said, some of the companies that offer one blockchain, then they start offering another blockchain solutions. And similarly, they run into a situation that is going to go to the, for example, I'm going to give you an example, right?

You're writing right now; you're working on his side product for rewards and loyalty management. And so, we started with buildings, product for the public, No customers of the companies or e-commerce that gets rewarded by talking. But as we add more to it, when it comes to the point that we want to engage multiple public companies to sell their product and the platform as a reward, then we are going to use the fabric private so that they can do all the transaction B2B in art himself.

So, as you see, even the public network that is starts off as they scale up to get to the point that them. See the demand or need for the private one come to picture or vice versa. So, we are seeing that as the market become more mature, as, as the, because initially there was a skepticism, it was hesitant, do this, do that.

But now people become more conscientious, become more aware of use cases of blockchain and then become mostly comfortable, the expense of ether, things like that. So, as we get to that point, I think we are getting to a point. These two different communities come together and realize that, okay, they're going to support each other.

It's not like why I'm a standalone in the data. Be a part of the same ecosystem.

Eric: Yeah. I completely agree with that. That's certainly the impression that as the use cases for the public blockchain build out, it necessarily will cause private blockchains to mature and to integrate and to have more expansive technology.

In other words, I think. It's an inevitable partnership. There's X amount you can do on the public blockchain, but there's probably, there's a higher degree of comfort in doing

potentially more on the private blockchain and then integrating with the public blockchain. So, I think I certainly expect Hyperledger to be a, a use case, the use cases for Hyperledger to start to be explored more, even by Public protocols and projects as a think about how we expand our functionality.

So, if you're deploying for deploying and managing Hyperledger fabric on the cloud, what options are there to the market?

Matt: Um, first of all one of the, one of the barriers that I know exists for the fabric developers is that unlike the Ethereum that you can deploy the fabric on a test network for free, this option is not available.

And the fabric because it's the private. And then there is a one there was a one cloud provider in China that they, every, since they start offering a free service for testing the fabric, but that's the only things available as to the best of my knowledge is still coming back for the cloud providers.

So, there are Amazons IBM, Oracle and Alibaba, Azure. They shut down the production cloud services like few months. And that's what disappointed me as she was very good platform for that for blockchain, but unfortunate, you're not doing it anymore. And then so basically, uh, right now the most popular one there for, I think AWS is a, is to have managed services, which are very easy to deploy.

And then IBM has Oracle has Oracle is very good tied to their data analytics. Because Oracle space is a database and then they have a very good off the chain, uh, applications. And then IBM has been one of the key you know, the supporter of the fabric at the beginning of the score. And then the thing is that Alibaba is also catching up.

They have a blockchain as a service. That is very fantastic. It's just that in the United States, as that Chinese clouds don't like. Chinese cloud provider. So, they're a little bit behind, but they're coming with very huge budget. I hit that. Yeah.

Eric: I mean, definitely it sounds like there's opportunities in this space.

If you want to break away from the usual suspects. I suspect that I don't know, what's involved in maintaining that platform and why Azure backed out whether costs were a component or whether they weren't.

Matt: One thing is that, um, so among these four, all of them are a little bit expensive.

But if you get the prices that are more listed around the same price, it comes down to the ease of using and deploying. And because the way that cloud works is like this. If your company is already using Oracle, most likely you're going to use the Oracle for blockchain. You're not doing the IBM. What I know is because all configuration, everything is so different.

It is just, you have a tendency. Okay. We are using Oracle. Okay. I'm going to use Oracle. Yes. The only challenge that I drive now is there's so many because Azure is a second cloud

providers after AWS in the world. And once they announced that it was shocking the community, and then now they say, okay, now that Azure is not the way we go.

So, if you're, if your company is everything. Then for you is the decision. Okay. And what are from Azure? What are these like? Which one of these four, I need to sell it, but price wise are there on the same? It's just that, as I said, some of them are coming with more features than the others will go. For example, if you want to do the data science analytic workloads.

All

Eric: right. So, we are continuing the last part of the podcast after a 24 hour interruption that started technically and then continued to schedule. But we're at the end of the podcast with Matt and Matt. You know, if somebody is interested in learning more about Hyperledger, who hasn't really followed it.

Both from a technical perspective, like as a developer or as a just somebody trying to understand the capabilities. What's a good place to learn more?

Matt: Yeah. So basically, the Hyperledger foundation, hyperledger.org, they have a very good resources for people who want to learn the hyphen. Now a couple of very quick note is that, so in order to learn the Hyperledger, you need to have some basic understanding of prerequisites of that.

So, like knowing how to use a Linux command or bash script, and this is good really needed for that administering or managing guy publisher network. And then if you want to do the Hyperledger development, you need to know at least one programming languages, , So this resource is Hyperledger website.

And then if you want to learn more about other kinds of structure training, and we have a coding boot camps that you can get chaining and other things also is like that there are two major certifications and the Hyperledger. So, one's called a certified Hyperledger for system. And I think called Hyperledger certified Hyperledger for developers.

These are very good too. A high-profile certification issued by the Linux foundation. So, if you want to validate your credential in the Hyperledger community and for your employer. Make sure check these two certifications and then prepare for these two certifications.

Eric: And then just before I you know; we get into how people can contact you.

Now, we talked a bit on this podcast on how Hyperledger is basically available through for enterprise cloud providers. We talked about AWS, Oracle Alibaba. What's the other one I'm missing. Sorry. AWS.

Matt: IBM Oracle. Yeah, of

Eric: course. Of course. Do you see a path where, it's certainly expensive Georgetown, I'm not going to say expensive, but it's more expensive than a public blockchain to deploy Hyperledger from our licensing and contracting with AWS?

Do you see foresee in the future, maybe the cost of it coming down, maybe it being available and distributed platforms where it becomes. Almost as assessable or cost-effective. Listen, we can talk about cost-effectiveness in terms of the value that you get out of it, but do you see the prices and the availability changing in a way that distributes it more widely in the future?

Matt: It's possible. Again, the idea is, as I mentioned, most of the participants existing participant in the Hyperledger community companies, large companies, or mostly average large company in medium, Companies that they therefore, they have no problem with all this payment to the hotline, UWS.

And so, what I really like to what you are saying, I really like to see in the community. Because it makes Hyperledger more widely spread and become more popular. So definitely be for, to see that. What do one thing is that one thing is that the things that there is I'm going to mention is link. If someone contact me, if someone want to know about that, there is a cloud provider based in China that they offer free services uh, you know, test network of the Ethereum for Hyperledger and they are doing good.

They are doing. So, the answer to questions is very likely as more people start using Hyperledger and appreciate the value of private blockchain network. Definitely take on you know; they're going to look into that and they're going to be opportunities like that. But as of right now again, most of the participants are private companies that they can afford.

And again, for the developers, they can test on their own local machines and that's what's most developer right now, they are doing so they just, everything on the local machines. And then when they are ready to deploy the deployed on a cloud.

Eric: Great. All right. Certainly, something to continue to follow.

Maybe it's Hyperledger, maybe it's a protocol like Hyperledger. What's really nice about Hyperledger is the extent that it's been battle tested in an enterprise environment. And obviously for. For private blockchain, that would seem to give it a leg up, over some of the other public blockchain, like the Ethereum of deployment for the private cloud.

So, if people want to learn more about you and where can they find you?

Matt: Yeah. Um, in a YouTube, um, down below the YouTube video that you're watching, there is a link to my LinkedIn. You can, LinkedIn, You can message me on LinkedIn. And then my company is hash us hash was. And then also for the book, I'm going to add the link at the, in the YouTube video you can buy from there or the media website, or you can apply from the Amazon.

There's a link there. I also doing, I have done a lot of public speaking for the Hyperledger community. And on the European United States and I'm planning on there's some talks about my book. So basically, once you add that my Lincoln, I'm going to add shared information about my upcoming speaking engagement is devoted to Hyperledger.

Eric: Excellent. Matt, thanks so much for coming on the show and enlightening us on the Hyperledger fabric and the Hyperledger family and how it integrates in with the public blockchain.

Matt: Yeah. Thanks so much. Thanks for having me. And it was a pleasure, speaking to your community, and I look forward to seeing more engagement on your community.

If they have any questions, we'd be happy to discuss that after this, and have wonderful morning, Eric, from New Jersey take care.