EPISODE 1312

[INTRODUCTION]

[00:00:00] JM: Blockchain protocols like Bitcoin and Ethereum have changed the world dramatically in the last decade. They've created communities of likeminded developers, generated new financial markets and popularized decentralization in computer networks. But obviously, the problems in networks are not solved. We have slow transactions and things are expensive. And there're all kinds of issues in the world of crypto. Fiat and crypto don't even talk to each other. That's the main reason that we're doing this new company called Rectangle, which is an open source fintech company that is led by Yad Conrad. But that's not what today's episode is about. Today's episode is about Hedera HashGraph, which is a company that's built around proof of stake public networks, the Hashgraph consensus, and other things. Today we talk about the future of blockchains with Leemon Baird, who is a very interesting individual, and the founder and chief scientist at Hedera HashGraph.

[INTERVIEW]

[00:00:57] JM: Leeman, welcome to the show.

[00:00:59] LB: Well, thanks. It's great to be here.

[00:01:02] JM: So the place I want to start this podcast is with a fundraising round you got, I believe, in 201 from Ari Paul and BlockTower Capital. So Ari Paul, being one of the most respected investors in the world of crypto, the fact that he would put $100 million into Hedera HashGraph is significant to me. Can you tell me where the product/thesis/infrastructure was at when you receive that financing?

[00:01:34] LB: Yeah. So the 120 million actually came from a large number of different people. But where the project was at at that point is we had the HashGraph algorithm that has all sorts of nice math proofs about it. We had it implemented in the ledger system itself. We had been already, for several years, selling it as a private ledger. So we had customers using it as a private ledger. And we were now starting a public ledger, Hedera, with its own cryptocurrency

and so on. And so that's what they invested in. And they knew that it would be a while before we opened it up to the world and people could actually trade the cryptocurrency. But they believed in the project then, and still seem to be very excited about it now. Our early investors have done very well, obviously. And they're still very excited about what we're doing and how we're growing.

[00:02:22] JM: If you want to convince me of the significance of Hedera HashGraph in as few words as possible, how would you do that?

[00:02:30] LB: So it is 10,000 transactions per second is what we've slowed it down to. It can go a lot faster. It is asynchronous byzantine fault tolerant, which really does mean a level of security that you don't always have, and its math proofs of that that have been checked by computers by Carnegie Mellon and other people. And it is governed well. The governance is transparent. You know who the governors are. They're spread around the world. They're large organizations that care about the reputations, and anything they do wrong will be known. And they act as checks and balances on each other. And they're in different countries under different governments. And so in that sense, it is decentralized governance and transparent governance. Those are the key features.

[00:03:16] JM: Am I using this for the same use cases as I use Ethereum?

[00:03:20] LB: Sure. So you can run smart contracts on it. You can store files on it. You can do cryptocurrency on it. It has tokens at the native layer, which is nice. You can do an ERC-20 contract or something. But you can also do our native layer tokens, which are of course much faster and much cheaper. I said before, it was very fast. It's also very cheap. You're paying a 10th of a cent to transfer a token to someone, or a 100th of a cent to transfer cryptocurrency or to send a message to the consensus service. And that is the other thing that you don't have with most ledgers is this consensus service.

The Hedera ledger that has the trust of the council, and of the nodes, and the decentralization, that trust can be brought to a private network that is using Hedera to do its consensus. So you can build a private ledger on – Well, you can use EEA. We talked about Ethereum. You can use a theory. You can build a private ledger on Hyperledger. You can do Cordon. You can do these

private ledgers. But you plug in at the bottom, the consensus engine is Hedera. And all your transactions flow through Hedera. And you can encrypt them if you want privacy. But Hedera puts them in order. Hedera puts timestamps on them. Hedera ensures that everyone in the world can see exactly which transactions went through and which ones didn't in immutable record. All of that comes from Hedera. And so it allows you to build these fast private networks that can be fast and private and whatever logic you want, but with the trust inherited from Hedera. So we have all of those things. Ethereum does the same things, although a subset of that. Not all of that.

[00:04:52] JM: If I deploy a smart contract to Hedera, can I use Solidity?

[00:04:58] LB: Yes. You can take a smart contract that runs on Ethereum and just transported over without any changes. It does that. It even supports commands like tell me the timestamp on the latest block. Well, we don't exactly have a latest block, but it uses the transactions consensus timestamp to give you that answer. And the reason we do that is to be as compatible as possible. So if you want to write a smart contract for things like atomic swaps, they will actually work well. So yes, it is very compatible.

[00:05:24] JM: Can you paint a picture for me of the multi-blockchain ecosystem that we're moving towards? So for example, we have an Ethereum that is – I would say, the analogy is Ethereum is AWS. And it's so pioneering that it's going to capture perhaps a plurality of value among multipurpose blockchains. We don't know for sure, but it may capture a plurality of value. But there's going to be plenty of room for Salona, Hedera HashGraph. What else? I don't know, Matic network or something. Anyway, you have these different multipurpose blockchain platforms that can run smart contracts on Solidity, or on another language, or whatever. They're going to have different performance systems. What does that world look like?

[00:06:22] LB: Yeah. So remember the early days of the Internet? There were actually private networks. There was Prodigy and America Online, and I think Microsoft had one. And they had their own little thing like the World Wide Web, and their own little thing like files, and their own little thing like email, and they were separate networks. But the Internet is the inter-network. It allows them to connect to each other. And eventually the web just spread across the entire inter-network. And the whole Internet does the web. It's seamless. But it's actually different

computers running on different little networks all connected together. You have the same thing with email and other services.

I think we'll see the same thing in the ledger space, in the world of blockchain, in DLT. What we will see is a number of these ledgers. And they differ in various ways. And maybe you use one rather than another. But it's very important then to also then connect them all together. And that is what's happening. And what you end up with is you end up with bridges between them. You might have to have a set of validators that you have to trust in some sense that tells each ledger what happened on the other ledger, and so the two are talking to each other. Currently, that's the way it's done. I think, ultimately, it'll be based on state proofs where a ledger can do something and then give you a cryptographic proof that this was the consensus of that ledger. And you take the cryptographic proof to another ledger and now it knows what happened on the first one. And so that makes it very easy then to move tokens from one ledger to another or have a wrapped token on one ledger that is from another ledger. We have lots of ways of doing that today. But I think that ultimately what will end up happening is that we will have things based on state proofs to make this easier. This is something that we're doing, or will be doing very soon. We have a form of state proof right now that the mirror nodes can understand. We'll be doing it to make it easy to also have inter-ledger communication using them.

In addition, to the degree that we continue to use bridges that are little networks of their own, Hedera can do the consensus service that I just described to allow themselves to be powered by Hedera and have the trust of Hedera. And so building bridges as appnets on Hedera, using the consensus service, is also a good way to interoperate between ledgers. So I think we'll see both. I think we'll see – Or all three. The current systems that maybe sometimes you do various things where you tell things on one ledger, a smart contract on one ledger hashes that you're revealed to another ledgers smart contract. You can do some things like that for atomic swaps. You can also go further and have something like these networks that act as bridges and the validators you have to trust in the bridges. And then they can act as an Oracle on both ledgers and tell each one with the other said. And then ultimately, you can build those on top of the consensus service, which is very fast way of doing it. And then ultimately, you can use state proofs, where you just get cryptographic proofs and messages flow between ledgers well. This is the path the world is on.

And just like the internet started with a bunch of walled gardens and ended up with a single inter-network. I think we're seeing the same thing in the world of ledgers. And this is great. And then CBDCs will play into this, all sorts of applications will play into this, where the whole world is, in one sense, one big ledger. In another sense, they aren't. But they all interoperate in a way that makes the whole world seamless. This is the world we're going towards.

[00:09:31] JM: The key axes of tradeoffs between these different multi-purpose blockchains. So I don't want to use Ethereum today, because the transaction costs are too high. I can't really do micro payments or detailed smart contract infrastructure that is not high-margin there, because it's just going to be too expensive to really have any value. Over time the costs are going to drop for Ethereum. That's for sure. But I presume that with Hedera HashGraph, you're doing something that lowers the cost. Do I have that right?

[00:10:07] LB: Absolutely. And it's all about TPS. How many transactions per second can you do? There was a certain cost in running nodes, and they somehow have to be reimbursed for that. And if you can only do a handful of transactions each second, then that cost is spread over a smaller number of transactions. But if you can do 10,000 transactions per second, then that cost is spread over a large number of transactions, they can become cheap. So hopefully Ethereum will have Ethereum 2.0 in a couple of years that makes them faster, and then their price might go down per transaction, which is what you care about.

We're currently slowing ourselves down to only 10,000 per second. People aren't using that yet. But we have users that keep using more and more, and we have in the pipeline users that will be doing a lot. So we recently talked about, “Hey, we're over a billion transactions we've processed,” but we expect to get to be doing that every month, a billion a month. We expect to be really doing a lot of transactions. And so the cost to run the network gets amortized over a lot more transactions. That's the key to having low cost. You have to be able to do lots of transactions per second. And so we're doing that. And ultimately, I think everyone needs to do that. And I think those are the two big things you need, is the cost, and then you also need the security. ABFT and some other things I think are important. But if you can have the speed that gives you low cost and still be secure with that speed, then it's a good combination. And this is what we need to do.

[00:11:29] JM: How does Hedera HashGraph work? Can you tell me? I know how Ethereum works in broad strokes. I'm not an Ethereum expert. But I basically understand Ethereum is a multi-purpose blockchain with a smart contract language built on top of it. I know a little bit about finality and stuff, but I know how to do – Something about Merkle trees and whatnot. But can you give me the right level of abstraction that helps me understand the key breakthroughs of Hedera HashGraph?

[00:11:54] LB: Sure. So we do the same things on top of the ledger. You have smart contracts and things. And we had to consensus service. Any ledger could do a consensus service if it was fast enough. But if you can only do a dozen a second, or six a second, or 15 a second, then you wouldn't want to do a consensus service. So the stuff that we're building on top of the ledger is sort of traditional, except we get to do some more things, because we're fast. The reason we're fast is because of what's happening under the hood. And that is we are running these extremely secure ways that have been known for 30 years of coming to an agreement. So we've known for 30 years how to do agreement where you have finality, absolute guaranteed finality very quickly. And you have this asynchronous Byzantine fault tolerance. There's no leader. You don't have to do any proof of work. You're using lots of electricity, but there's no leader. We don't even take turns being the leader. We don't we don't elect leaders. Every node is equal. And they're basically voting with each other. And the problem with these 30 year old systems is they have to send lots of votes back and forth in order to come to a consensus. But the nice thing is you can shut down any one computer and it doesn't matter. They still reach consensus. You can shut down a third of them, almost a third, and they'll still reach consensus. And you have these strong mathematical guarantees on it. Even if the Internet is slow, even if you DDoS computers, even if there're firewalls slowing down, some packets, and not others, you still have all these guarantees.

HashGraph, though, is different. Because the problem with those voting algorithms is that you have to send all these votes back and forth. And it just uses a lot of time, and a lot of bandwidth and so on. In HashGraph, every node is just sending messages to the other nodes. And so when you submit a transaction, every node can submit these transactions out. We don't have to take turns putting a block on the chain. I mean, you could say it's a directed acyclic graph. If you know what DAGs are, yeah, it’s a picture of it. Yeah, right here. But the important thing is that all the nodes are the same. They're all adding transactions to the immutable ledger at the same

time. They're not taking turns. They're doing it with gossip, which is the fastest way to get these things out. But of course, then you need consensus on what order to put them in. And you would say, “Ah, that's the stuff. It's going to be very slow.”

What we do is every time we send one of these messages, we add on just two hashes, just two little notes at the bottom of the message saying, “Here's the last message I created. And here's the last message I received.” That's it. So as we're all gossiping with each other and sharing these transactions with each other, and we all are sending these notes around, these messages around, but every message has these two little hashes that you know the creator of that message when they created it, what the last message was they created and the last message that they received. You can put these all together like puzzle pieces that fit together. And you can see the entire history of how we have talked to each other. You actually get a history of how the entire gossip process worked. When I get the message, I don't just know that I now have the message. I know exactly what paths it flowed through the network. And it might have branched out, it's like a tree. I reached him, and then it reached her, and then it reached him, and then it reached me. And I got it from this branch, but it was also this other branch spreading. I see the complete history.

And given that much information, I can run those old 30 year old algorithms in my head with no votes whatsoever going over the Internet. It's virtual voting. In my mind, I can say, “If you ran one of those 30 year old algorithms, I know exactly how you would vote. So don't bother voting. I'll just pretend that you voted that way and run the algorithm.” And you still get all of those math proofs that it's ABFT. And we've actually had computers check the math proofs, and they are true. And a Carnegie Mellon professor did that, set up COQ systems to check it. And so you get this extreme security, but the speed is just the speed of gossip. It's just how long it takes to gossip about these transactions. And we don't have to send any extra messages at all to get consensus. We don't have to use proof of work to say whose turn it is to add to the chain. It's everybody's turn at the same time. We don't have to take turns on who the leader is. Everyone's a leader at the same time. Everyone is equal. Completely decentralized. That's how HashGraph works.

[00:15:59] JM: It's profound. And you're essentially revealing that there is a domain specificity to these different block chains. You're revealing a bias towards certain applications in Hedera

HashGraph. What are those kinds of applications that you're optimized for? I know you listed some, but can you just double down on that?

[00:16:23] LB: Yeah. So it is as good as any ledger at doing the things the other ledgers do. So it's not like there's a tradeoff where we've lost something. But it is then very fast. And it is known to be very secure. You don't take turns having leaders. Not having leaders is actually very important. If you do a DDoS attack on the leader and you follow the leader as it changes, you can shut down a network. There're no leaders, but it's very fast. And so we slowed it down to 10,000 a second. We'll let it go faster in the future. We're not yet using 10,000, but our usage keeps growing.

So what does that mean that it's unusually good for? Well, it's unusually good for any application where it would be helpful to have transactions cost a 10th of a cent rather than $30. Now it is true, if I tokenize a million dollar painting and I sell it to someone for a million dollars, I can afford to pay $30. Yeah, but a 100th of a cent would be nice, or a 10th of a cent would be nice, but I can afford to pay the $30. But you mentioned microtransactions. If I want to do microtransactions, then I really don't have a choice. $30 really won't help. I really haven't need a 10th of a cent. And so this enables any applications where you really did need high speed and low cost. And so there are lots of applications where we do this, where you want to be flowing through the network lots of information, like Coupon Bureau. When you spend coupons in stores, it goes through Coupon Bureau for many stores. It’s an enormous organization for handling coupons. And the way it's done today is very manual, and you ship it off to a country in big garbage bags. And people count this manually on paper. You should just be able to scan them in and have them all be immutably recorded in a way that everyone can see. And every store and every coupon issuer knows they're seeing the exact same thing.

And so what you do is you float them all through Hedera, because it only cost a 10th of a cent to send you – 100th of a cent to send each one through Hedera. They're immutably recorded. Everyone can see them. They go through in seconds. You have finality in seconds. You have cryptographic proofs you can take to a court later to prove that you did it, that it really was the consensus of the network. It actually gives cryptographic proofs to prove that it happened and that was true to the consensus. That's an application that maybe you wouldn't be able to do on a slower network. So there are some applications that are run on a slow network or a fast one,

on an expensive one or a cheap one. But when you have something that's fast and cheap, it actually enables new kinds of things that you can do. So that's what I would say. Anytime that you really need the security with the low cost and the high speed, those two come together, then this is a good way of doing it.

[00:18:53] JM: Where are we today? Are you powering anything that is – Don't take this the wrong way. But are you powering anything that's like really meaningful production technology?

[00:19:02] LB: Yes. So meaningful can be in two senses. Is it changing the world and is it just doing a lot of transactions every second? We've processed over 1.3 billion transactions. That's more than anyone, more than Ethereum and Bitcoin put together. But we did it in a year and a half. And we're accelerating. I told you, I think we'll have a billion a month at some point, because people are using it. So is it meaningful? Yes, we have lots of real users doing real things. Those were not test transactions. Those are real transactions that real pain people are using. So in that sense, yes, this is being used in the real world. We have enormous interest from both startups and big established companies that want a system that is cheap, that is fast, that is secure, but that has predictable price. I should say that too. You have to pay in HBARs of course, like any ledger you pay in your cryptocurrency, but the pricing is pegged to the US dollar.

So as you have cryptocurrency price volatility, your company that you're building on this can still predict your costs. So that's another thing that we do to make this real world. So people are using this in the real world. And they like the fact that the costs are predictable. I don't have to wonder if the price of the HBAR goes up or down tenfold tomorrow, either way. Is the price of my transaction going to go up or down? You don’t have to worry about this. It's pegged to the dollar. You'll pay more or less HBARS based on the price. But in US dollars, it's constant. So these are why we're getting a lot of traction in real world companies using it. And of course, the council itself is using it. Google is using it. They're one of our council members. They own and control us. Or DLA Piper, one of the largest legal firms in the world is using this for tokenization. There're a lot of people using this.

But that might not be the full question. The full question might be, “Is this having a real impact on things in the world that matter?” Is this in some ways helping the world? Yes. So it is helping,

say, with COVID. It is being used for tracking the provenance of COVID vaccines to see if they have been kept cold. It is being used for tracking the provenance of other things. You might want to make sure that things have value. Your food really is good. If it claims to be organic, is it really organic? Was it produced with slave labor, or child labor, or other unfair practices? You can track the provenance. And people are doing this, tracking provenance of things on Hedera.

People are also using Hedera for markets that help the world become greater. So carbon credit markets. We have carbon credits being tokenized and traded on Hedera. And then we have renewable energy itself being tokenized and traded. And the idea is that if you put a solar panel on your roof, you might want to sell excess energy back to the grid. You might want to have a market of people who are consuming energy and people who are producing it. This encourages more people to build the reusable energy. If you can put a windmill in your backyard or a solar panel on your roof, if there's a good market for you to sell your energy with supply and demand, not just the electric company, but supply and demand, actually a real market, then you're more likely to do it. And so there are people building these kinds of markets on Hedera.

And so Hedera is having an impact on the real world by allowing things like these markets in carbon credits markets electricity. But I said it was fast. And I said it was cheap. And when you have that, you can afford to do new kinds of things that haven't existed before. You can take the carbon credits and the kilowatt hours that are being traded. And you can even build combinations of them, where you can end up buying or selling a single token that reflects a certain number of kilowatt hours and a certain number of carbon credits at the same time.

So as you're buying your electricity, you are becoming carbon neutral, or carbon negative like we are. You can do that at the same time. And this kind of a market, for very tiny amounts, that works best if you're buying tiny amounts of electricity, you're doing this in real time as you're using the electricity. We can buy tiny amounts of electricity and tiny amounts of carbon credit bound together at the same time in a market with supply and demand and not just the price the electric company sets. These are the kinds of things that we are enabling. And so people are doing that on top of us.

And then of course, we ourselves are trying to be green. We start in July. Starting this month is the first month that we are committing to be carbon negative for our ledger and even for our test

nets. For a network, we'll be carbon navigate negative for all future months starting this month. And I think this is good to be carbon negative, to buy carbon offsets to offset the carbon footprint you have in the energy you're using. The only thing better than offsetting your footprint is to shrink the footprint in the first place. We do have to use electricity. There's no way around that. But you want to minimize it.

And so I saw a report that someone published recently that said the energy used per transaction – Yes, it was the energy usage per transaction compared to Bitcoin was 1/5 millionth. So we're using one 1/5 millionth the energy per transaction. And even compared to a credit card, it's like a 10th, far less. And so I think it's great to be carbon negative, where you have ensured that you're offsetting all the carbon your network is using and more, but it's even better to have your carbon footprint low in the first place. And then it's even better to have people building on top of you for green things that change the world.

So those are some of the ways that we're doing. There're a lot of other things. There're people that are recording immutably now a records of the Holocaust, so that in the future, Holocaust deniers can see these things recorded by the people that were there. People had firsthand knowledge. We have people that are combating fake news by recording news on our system. They're even going into war-torn countries ensuring that notifications get to the people that are in danger. If the war is moving towards a certain area, then the people there are warned ahead of time. These are real world things built on Hedera that are making the world better.

So we are both getting traction in the real world of having real world big customers, big companies using us and lots of startups using us, but we're also making an impact on the world and the things that are being built on us. Some of them really are impacting the world. And in some cases, in ways you really couldn't do until you have a fast ledger. Ledgers really do make a difference there.

[00:25:12] JM: Wonderful. Really good to hear that. So deploying this stuff, what's the current infrastructure look like today? Is it actually decentralized? Where you're running your nodes? Give me the bird's eye view of the infrastructure.

[00:25:27] LB: Sure. So it's on every continent, except Antarctica. Yeah, we're in Australia, but not Antarctica, but in every other continent. It's in countries around the world. It's in every region of the world. We have computers spread around the world, because we want the network to be decentralized. We would not want, for example, a coal mine to have a problem that then shuts down a third of your hashing power. That's not good. That's not the kind of decentralization that we want. We want the kind of decentralization that if a power plant goes down, maybe one of our nodes goes down, but just one. Not a third of our nose.

So we are spread around the world. We are spread on different countries under different governments. That's the other thing. You don't really want most of your nodes to be under a single government, because you never know what that single government will do. It could shut you down. It could even take over your nodes and cause them to maliciously do bad things, which makes it hard to even move off shore. Instead, we are under different governments, under different cultures. Our council members, some of them are universities, we have companies, and they are diversified in different areas, different markets. They're even diversified in time. They have term limits, and they have to leave after a while. So we have tried to be decentralized in how we set up our infrastructure and in how we have our council. The number of nodes we have is small. It's growing. It is spread out it is run by these people. It will be growing over time. We have a pathway where right now they are permissioned, but they will go un-permissioned so anonymous people can run nodes. We're doing that as we get to the point where the proof of stake is sure to be safe enough, spread out enough, the tokens are spread out enough. So we have that path that we'll be doing.

And our network, you can see what's going on. We even have dashboards where you can watch which computers are up and down and see their history. You can see real time stats on them. The council itself is transparent and decentralized. We publish the minutes of all the meetings. So it's not talking in smoke filled rooms behind our back. It's the whole world can see what they're doing. And the people doing it are people that care about their reputation. These are big companies, big universities, top 10 universities, top 10 companies, that kind of organizations. And it's totally transparent. And I think that the decentralization really goes along with transparency. It doesn't matter if you say anyone in the world can help run this thing and build it. If then power just over time devolves to a small handful of people that are actually building it and running it, and they meet behind closed doors, and they're strangers, and you don't know much

about them. So we have tried very hard to be decentralized in our governance and transparent in our governance and making sure that you know who they are and that you can trust them. And then our infrastructure follows that.

[00:28:15] JM: Your background is fascinating. You have a very serious background. I have a ton of respect for you given your credentials. Just a brief condensation for the listeners, you went to the Air Force. You studied computer science at the Air Force Academy. Then you did a PhD at CMU. So you're clearly – Then your resume just goes off like that. You're a founder. You've done tons of work. Why, when you could work on literally anything in the world, are you working on Hedera HashGraph?

[00:28:51] LB: I want to work on something that matters. Yes, I could do anything. And when I was a professor, that matters, you are changing a few lives. But it's a few lives. I want to do something that really matters on a larger scale. And I really love teaching. Being a professor was a lot of fun. But for the last 20 years, I've been starting companies and I've been trying to move towards things that make the world more secure, more efficient. We disintermediate so that you don't have to have central authorities that have power over you. But the people themselves have the power. I think that this point in history for ledgers, for this whole blockchain industry, is amazing because you don't oversell. It it's not going to do everything. But it is going to affect every piece of society. It's not going to do the whole economy. But every piece of the economy is going to be affected by ledgers. I think that we're going to see, as a result of this revolution when it gets done, you will be able to do things cheaper and faster and simpler than you can today. But you will also be able to do with more trust. There'll be less power that's centralized because you don't have to go through a trusted third-party to interact with someone. You just interact with them. And it won't take you weeks to do a title search on your house. It happens in three seconds, because it's on a ledger.

If I want to send you money, I don't have to know who you are, and you don't have to know who I am. And we go to a third-party, and we have escrow. I can just do it with ledgers and ensure that it actually works. If I'm a company claiming I have organic food. I've actually read about some of what organic means. It starts with they go to organic farmers in United States and they get their milk. And then they say, "Oh, there's not enough." So then they go to other countries and get organic milk, but freeze dried and reconstituted. Okay, maybe it's still organic. It's still

not enough. So then they go to developing world countries, and they go to these very poor farmers that are desperate to make a living and they say, “I'll pay you a little bit more if you tell me your milk is organic.” You know what they say? “Yeah, it's organic.”

This kind of thing is a problem. And there's no easy way to solve it unless you have some way of immutably recording for the world where everyone is seeing the same thing of things like provenance. Ledgers are going to change the way the world works. Just like the Internet changed the way the world works and make information flow more freely. Ledgers are going to make information flow more trustworthily, if that's a word, and they're going to allow us to be able to interact with each other in ways that we haven't even done before. Like Galaxy. Have you seen Spencer Dinwiddie has set up this company, The Creator’s Galaxy?

[00:31:32] JM: What does it do?

[00:31:34] LB: So what he has done is he is – He's a real level basketball player. Spencer Dinwiddie is famous. He started by tokenizing his own career, his own future value, his own future income, and creating markets for his own future income. That's pretty cool. And then he went further and started tokenizing things like the shoes he wears. And then he used this tokenization system to set it up so that fans can interact with him in new kinds of ways. Like they can even vote on what shoes he wears the next game. These sorts of things for him as a creator to tokenize, and to monetize, and to share with fans things that were not available before. And it was so cool that he created Galaxy, The Creator’s Galaxy. And so he now helps other companies to – Not just companies, individual artists, individual creators to tokenize what they're doing, to tokenize their work to be able to have a market for things that we didn't have a market for before.

There has never in the history of this planet been a market for bidding on what shoes someone will wear it the next game. It's creating whole new kinds of things. Tokenizing and selling your own future income, unless you're a billionaire, your future income isn't worth the difficulty of selling shares in something. But with tokenization, anyone can do it. And so Galaxy is helping people do that. And they're built on Hedera. I got to talk on a stage with him. That was very exciting. Consensus. This is really cool. So these are the sorts of things that we're seeing.

[00:33:07] JM: So three years in KubeCon, and this is around 2018, maybe around 2017. This is like right before the crypto crash I think. Right before the – What was it? That crypto crash was late 2017, was it? Late 2017, early 2018.

[00:33:22] LB: 2018, I think. But yeah, I remember the crypto winter.

[00:33:25] JM: Right. Well, it was warming then, right? Like in the late 2017, I believe it was warming. Things were ramping up again. People were starting to get excited again. Things were working a little bit in late 2017 if you recall? Do you remember that?

[00:33:38] LB: I think the time was slightly different. But I know what you're talking about. Continue.

[00:33:41] JM: Okay, anyway. Well, so in this atmosphere, so I was at KubeCon in – Where was it? Amsterdam or something like that? Anyways, somewhere in Europe. And I go to these conferences, and I just kind of like walk around, kind of think about things. And I realized that even though Kubernetes is at the forefront of distributed systems, there was an allergy to crypto stuff. There was a lack of taking it seriously. I would literally walk around trying to have conversations about crypto. I'd say, "Hey, you're from the Kubernetes world. You know a lot about distributed systems. You want to talk about crypto? That's no. Why would I talk about that silly thing? It's so interesting to me. And as somebody who has spent a lot of time in very serious computer science domains, I'm actually kind of surprised that somebody like you is running Hedera HashGraph. I kind of thought it'd be somebody in a crazy hat with a big beard.

[00:34:31] LB: Sorry, I don't have the big beard and the crazy hat. Crypto went through a period, of course, where no one had ever heard of it. It has had its Wild West scams more than its fair share of scams and sleazy things. But crypto and ledgers in general are growing up. And really, this year, I'm seeing really big – Like big organizations, governments and big companies who for you years have said, "This crypto thing may be important someday. We should have a crypto division or a little team inside of us watching it to see when it's right to jump in." This year, a lot of them are jumping in. I think that this is really where it starts to mature where everybody is doing it.

Now, I started this a few years ago when it was very much the Wild West. And maybe the hat and the beard would have been better. But at this point, it's starting to grow up. And the real world is starting to take notice of it. I think it was in the wastelands for a long time, but now everyone is taking notice of it and is starting to say, “This really is something real that we would now want to get involved in.”

I think for a number of years companies have been saying, “Oh, yeah, I think this is real, probably. And I think someday we should get into it. We should watch it.” But now they're actually saying let's get into this. And I think the population as a whole has heard of it. I talked to an Uber driver. Most of the time, they say, “Yeah, I own some cryptocurrency.” Or they'll talk about how the prices have been going up and down. I think that it's becoming part of the mainstream in a lot of ways. And all these people that have been with it from the beginning knew it would go mainstream someday. I think we're actually seeing it. And that's kind of fun to watch.

[00:36:16] JM: What's the integration between classical banking infrastructure and crypto infrastructure? What does that look like? And when do we get there?

[00:36:27] LB: Yeah. Isn't that interesting? Every country is different of course.

[00:36:30] JM: I'm thinking about this a lot, because I'm working with a friend on putting together an open source Stripe, because I think that's the answer, basically.

[00:36:41] LB: Cool. Okay. So I was about to start talking about banks, because you said banking, but as you pointed out, banking doesn't need banks, or doesn't mean just banks. Right.

[00:36:49] JM: Yeah. It doesn't. It just needs a middleware.

[00:36:53] LB: I understand. So all of fintech, all of banking, all of this DeFi, all of these areas are extremely hot right now, and I think this is a great time to be starting startups in this area. It is also a great time for the big old giants that had been around for 100 years to get into this area. And I think we're seeing both. We are seeing a lot of startups coming in. And we're seeing some of the old fogy organizations that have been around forever also getting in. And we're

seeing the regulators starting to say, “Well, maybe this isn't all such bad stuff.” The banks were recently told that they're allowed to hold digital assets. They can actually be custodian of these things. They can run a node in a network. This is cool.

Our Council has several banks on it. The oldest bank in South Korea, and the biggest one in Africa, and one of the oldest financial institutions in Japan are on our council. And it's not just banks. You talked about payments. Eftpos is a household word in Australia. They're doing payments. And of course, they've been doing payments non-blockchain ways for a long time. But they're now part of our council. And they're using Hedera. They're building on Hedera to do payments. So you pay at the store using eftpos, which is every Australian apparently knows that name. And it'll be flowing through Hedera. So I think that this is exciting.

And I liked what you said, what you said made it sound like we're disintermediating. We're not allowing these big organizations that have a stranglehold on all of payments to control all of payments, but we're actually going to be more decentralized and allowing people to do it more easily without having the stranglehold from the big players. And I think this is what ledgers enable. Now the big players that are smart will become nimble, and they'll get to compete also. But ultimately, we the consumers, the people will benefit, that we will not be held hostage by a small number of players. We will have more choices, and then all the players have to act better.

[00:38:47] JM: I swear, I wouldn't even care paying the amount of money I do to infrastructure providers if they were just better designed. They’re just like so janky. Every time I have to log into my bank, I feel a little bit sick. Or even my – There’s actually one thing I'm pretty excited about. There’s new credit card companies, business credit card company – I mean, Hedera HashGraph, you’re a business, right? Like you actually have a business. Okay. Do you mind if I ask? What do you use for business credit cards? I don't know if that's a security risk if I ask you that. You don't have to answer. I’m just curious.

[00:39:16] LB: I don’t know. I have an American Express card from companies.

[00:39:19] JM: Okay, right. I mean, do you login to Amex to do stuff?

[00:39:23] LB: I don't know. I have people in the company that deal with all these stuff.

[00:39:25] JM: Okay. Well, I bet if you talk to them, they'll say it's horrible. Because I mean, no offense to Amex. I'm sorry. I shouldn't criticize so publicly. Anyway, Amex could do with the interface upgrade. And the only reason I mentioned that is because there's these companies, Ramp and Brex, these new credit card companies that are competing, and they're quite interesting, because they just unify expense reporting and expense management. With, say, credit cards, is a unification point. We're going to build a unified system of credit cards, very compelling vision. And it's just like that's what I want the banks to be thinking like, and they can't seem to get there. There's too much legacy. It's really hard to make that move. And I feel for them. But I'm really looking forward to a better world. Please. Please.

[00:40:13] LB: And this is the problem of monopolies, the problem of oligopolies, is they need to be good enough that people will use them. But if you have no choice, they don't have to be any better than just barely good enough. And when you have more players, then you have more competition, you have hungry, eager startups. And they do it right. And they work really hard on making it exactly what users want and what users need. And users don't even know what they want. They don't even know what user interface would be best for them, what user experience would be best for them. But you need to find what user experience is best for them and make it a high priority. And I love that. And a lot of people say, "Well, we can rake in the dough without having to bother about that. If our users are happy enough that they don't go to our other equally bad competitor, we're satisfied." But if you can start building little companies that are able to truly care about the user experience, then it's a win. It's a win for you. And it's a win for all your users.

[00:41:07] JM: Okay, right. So can we go deeper on banking infrastructure? Can you tell me, like when do we get this future? Sorry, I kind of like derailed us a little bit. Maybe you can ground the conversation a little bit more? When do we actually get this stuff?

[00:41:19] LB: Yeah. So we do have – In other countries, the banks have been more free to get involved. But now even in the US, the banks are able to get involved in some of these things, run a note in a ledger and hold digital assets. The regulation is slowly becoming clearer. I hate that we still don't know exactly what the regulations are, but they're slowly getting better. And so I think that we will see the traditional banking industry will be more and more moving in this

direction. And if governments do CBDCs, the central bank digital currencies. If the countries themselves have their actual currency being available on a ledger, that's the ultimate stable coin, depending on the country. But that will be great as all these things start to integrate. But it is a spur. If a government is doing it, then that spurs all their banks and all their businesses to start doing banking using ledgers. And this is the direction we absolutely are headed. I think every country is headed in this direction in some degree. US Congress is talking about it. Other countries are far farther down the line than that. So that is important.

But of course, I understand when you say banking, you don't just mean banks. You also mean is it possible to set up systems? Could we set up systems where just small organizations are taking money, lending a fraction of it out, keeping a reserve, doing all the things that banks do, but maybe be able to get the government to allow them to do it? Because the ledger itself ensures they can't cheat or do the wrong thing in various ways. And so the regulation becomes a lighter hand that small startups can afford to do. Not just big companies that have to spend millions of dollars on compliance, maybe so. Maybe a lot of areas of compliance can be made cheaper, even all the tech system that's really hard. Maybe that can be made much easier using ledgers. Maybe new kinds of financial things start to take place. So you can talk about people in the developing world that don't have access to traditional bank accounts because they don't have identity. Okay, ledgers can start to bring them identity. Ledgers can even start to bring them things that take the place of a bank account. They can make it possible for them to interact with each other and do buying and selling perhaps without as much of this traditional financial infrastructure involved. And yet, the ledger can be made such that it's still trustworthy, which is why we have the traditional infrastructure, is because you have to trust where your money is going. And that's what ledgers bring, is trust to the financial world. So we may be able to see this.

We'll may be able to see this with micropayments. Micro payments even extend to – Right now, everything online is supported by advertising, or by monthly subscriptions. You don't really have a choice. If you want to watch videos, you either have to watch commercials, or you have to pay every month. But ledgers are going to expand the kinds of financial interactions that we do to allow micropayments. And so maybe I could just do pay per view on lots of different sites without having to have any – And pay per view for even very short things, because it's a very small payment. Maybe it's a penny or less. These sorts of things, instead of having to sign up for

a monthly subscription, which honestly, I might set up for a few, but I'm not going to sign up for a hundred different monthly subscriptions, or advertising. And advertising of course means it's free. And if you're not paying, then you aren't the customer, you're the product, and they will be spying on you a lot and using AI to model you.

So I think ledgers enable things like micro payments, which enable a new kind of, you said banking, but financial interactions in general. Human beings can start interacting with micro transactions, which enable new kinds of things to preserve privacy and cheap other goods things. So it's all interrelated. But I do think that ledgers are the key to shaking up the financial industry, the banking industry, and into allowing whole new kinds of things to empower people that don't have an identity so they can't get a bank account in the developing world. Well, we can now help them, these sorts of things.

[00:45:18] JM: Leemon, it's been a real pleasure talking to you. I feel like I could talk to you for a much longer period of time, but got to cut it short. Congratulations on building something significant. I think you share my enthusiasm about where things are headed. And you're a Texan. I'm from Austin.

[00:45:34] LB: Oh, wow! We're right next door. Dallas isn't too far away.

[00:45:37] JM: No, it's not. You know, this is getting a little off topic, but I was just telling a friend – I have a bunch of friends that just moved to Austin. I'm telling them, "You got to go to Schlitterbahn over the summer." Are you a Schlitterbahn fan? Have you ever been?

[00:45:49] LB: I have not.

[00:45:50] JM: Oh, you're missing out? I don't know if you're waterpark person, but it's the hottest, coolest time in Texas if you haven't heard.

[00:45:54] LB: Oh, very cool. That sounds fun. I'll have to do that.

[00:45:57] JM: Cool. Well, Leemon, thank you so much for coming on show. Great talking.

[00:46:00] LB: Well, thank you. It has been wonderful to talk with you. And I appreciate you having me on the show. Thanks.

[END]