EPISODE 805

[INTRODUCTION]

[0:00:00.3] JM: A currency can fulfill numerous financial use cases. One use case of a currency is store of value; currency holders can reliably expect their currency to maintain some value, though that value may fluctuate over time. Another use case of currencies is speculation; currency holders are owning currency in the hope that the market price of the currency will increase over time in the case of a speculative use of a currency.

Bitcoin is useful as a store of value and also to some people as an instrument for speculation. However, Bitcoin still does not fulfill the financial use case that most people need from a currency; price stability. The price of Bitcoin fluctuates rapidly, making it difficult to use Bitcoin for small purchases such as coffee. Imagine you want to buy a cup of coffee with Bitcoin. The coffee shop owner needs to offer the option to sell you that cup of coffee using Bitcoin as the medium of exchange. This owner of the coffee shop must denominate the price of that coffee as some number of Bitcoin.

Since the price of Bitcoin fluctuates so rapidly, the coffee shop owner needs to adjust the price of that cup of coffee constantly in order to make sure that the coffee is cheap enough for the consumer to want to buy it, but expensive enough to make a profit. It's hard to assign prices to market goods in terms of Bitcoin, because the currency is in constant flux.

Imagine you're on the way to a coffee shop to get a cup of coffee and while you're on the way there, the price of Bitcoin shoots up and the coffee is denominated in Bitcoin, you end up paying $30 worth of Bitcoin for a cup of coffee. Even though many of us would like to use Bitcoin in our everyday lives, most marketplaces are denominated in US dollars, or other currencies, because a marketplace needs a stable currency in order to operate. This illustrates the massive demand for a Stablecoin.

Rune Christensen is the CEO of MakerDAO, a system that provides a price table cryptocurrency. MakerDAO is an elegant set of currencies, collateralized debt, smart contracts and other incentive tools that result in the creation of several transparent, decentralized financial

instruments. Rune joins the show to talk about the importance of Stablecoins and how MakerDAO has engineered a decentralized currency that has maintained stability, even through tumultuous market conditions.

We are doing a hackathon for the new product I'm working on, FindCollabs. FindCollabs is a place where you can meet collaborators and build projects. Our hackathon has a $4,000 first prize and a $1,000 second prize, as well as some other prizes. It's a great way to meet people and work on cool projects. We've got a lot of collaboration going around Software Daily, the open source project that is a improved way to interface with Software Engineering Daily.

You can see our progress by going to softwaredaily.com, or by checking out the FindCollabs. Just go to FindCollabs and find the Software Daily Collab. I'd love to see you in FindCollabs if you're interested in building projects with some other people.

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[0:03:28.3] JM: DigitalOcean is a reliable, easy-to-use cloud provider. I've used DigitalOcean for years, whenever I want to get an application off the ground quickly. I've always loved the focus on user experience, the great documentation and the simple user interface. More and more people are finding out about DigitalOcean and realizing that DigitalOcean is perfect for their application workloads.

This year, DigitalOcean is making that even easier with new node types. A $15 flexible droplet that can mix and match different configurations of CPU and RAM to get the perfect amount of resources for your application. There are also CPU-optimized droplets perfect for highly active frontend servers, or CICD workloads.

Running on the cloud can get expensive, which is why DigitalOcean makes it easy to choose the right size instance. The prices on standard instances have gone down too. You can check out all their new deals by going to do.co/sedaily. As a bonus to our listeners, you will get a $100 in credit to use over 60 days. That's a lot of money to experiment with.

You can make a $100 go pretty far on DigitalOcean. You can use the credit for hosting, or infrastructure and that includes load balancers, object storage, DigitalOcean spaces is a great new product that provides object storage, and of course computation. Get your free $100 credit at do.co/sedaily. Thanks to DigitalOcean for being a sponsor.

The co-founder of DigitalOcean Moisey Uretsky was one of the first people I interviewed and his interview was really inspirational for me, so I've always thought of DigitalOcean as a pretty inspirational company. Thank you, DigitalOcean.

[INTERVIEW]

[0:05:35.4] JM: Rune Christensen, you're the CEO at MakerDAO. Welcome to Software Engineering Daily.

[0:05:39.6] RC: Thanks. Glad to be here.

[0:05:40.9] JM: I want to start with the subject of Stablecoins, because this is not necessarily an intuitive subject to most of the listenership. What is a Stablecoin and why is it important?

[0:05:53.8] RC: Well, in very simple terms a Stablecoin is a cryptocurrency like Bitcoin, except that it has a stable value. Stable value is defined as impact, or being stable reference to an external asset like the US dollar.

[0:06:09.7] JM: Why is that important?

[0:06:12.8] RC: I mean, blockchain has existed for 10 years now, right? So far to a large extent, mostly what has been seen is things like speculation and ICOs and a lot of stuff that's really related to the hype and the future potential of blockchain, right? What Stablecoins enable is to finally get past this speculation and the volatility and this very immaterial use cases of the technology and gets us into a face where we – because we now have stability, we can actually build solutions that just solve real-world problems.

I mean, and really the fundamental problem is that if you're a small business, or if you're a person that doesn't have access to a bank account or something like that, you you're already in a situation where you can't accept this extra externality of high-volatility to use some new technology, right? If you're going to adopt new technology, it's going to need to be presented to you in a way where it's a very easy choice to switch over and there are no obvious drawbacks. Stablecoins are really a way to in a sense, make blockchain more invisible, right? Make it more like what you're already used to using.

[0:07:25.9] JM: One perfect example of this that comes to mind for me is during the crypto bubble, Stripe stopped accepting Bitcoin. I don't know if they ever had Ethereum integration, but Stripe is a very forward-thinking company. They're very innovative and a lot of their customer base, or significant proportion of their customer base would want to pay for stuff in Bitcoin, but they had to stop accepting it, because there was so much volatility and there was just so much overhead in supporting the price volatility of Bitcoin.

[0:08:00.6] RC: Yeah, absolutely. I think another interesting dynamic is also that typically, people who hold something like Bitcoin or Ethereum, they hold it because they believe it will go up in value, right? They're not very happy to actually go on out and spend that as money, because they expect it to go up in value. An interesting story is the story of the 10,000 Bitcoin pizza that was bought, I believe it was back in 2011 or 2012 perhaps, when a guy bought two pizzas for 10,000 Bitcoins. Obviously, he wouldn't be too happy – he's not too happy about that today.

[0:08:36.1] JM: Gets me every time. Yeah, I mean, this question I've asked to a lot of different people in the crypto ecosystem, like what do we need to get to this beautiful world of micro-payments and decentralized currencies? For a long time I thought it was a technological question. Maybe we need better Lightning Network, maybe we need better apps for somehow paying. It seems the hurdle might be stability, would you agree with that?

[0:09:08.4] RC: Well, I would certainly say that stability is one of the absolute key pillars that are necessary for blockchain to become truly useful in the real world. There's definitely also a large range of other well-known issues, such as scalability, right? To a large extent, also regulation and understanding of the technology by the incumbents.

[0:09:30.0] JM: Let's talk about currencies more generally. The US dollar is “stable.” Why is that? Why is the US dollar a stable currency?

[0:09:41.3] RC: That's an interesting question, right? Because in the end when you really think about stability and what it means, it becomes obvious that it's actually a very subjective, right? Because what's stable to one person may not be stable to someone else. In fact, I'm sure that there are some people out there who really do think in Bitcoins and really consider Bitcoin to be stable and everything else to be volatile if everything they do is in Bitcoins, right? They buy the stuff in Bitcoins and receive their salary in Bitcoins and so on.

The thing that makes the US dollar stable is simply that there are so many people who think in terms of US dollars, because the US is the world's largest economy and there's more than 300 million people in the country. It's even used for international trade, right? Ultimately, when central banks they think about stability, they think very much about purchasing power. Something like how many pieces of bread can you buy for a dollar and what's the – I mean, food and the housing costs, but also technology, or services and all these different things ultimately, what you would like to achieve when you want to have a stable currency is that the price of all this stuff doesn't swing wildly from day-to-day, right?

Actually in particular, what's very bad is if the prices of stuff goes down over time. You typically want not very wild swings and you want prices to slightly increase over time. That's the point where people in general and an economy in general seems to be most able to flourish.

[0:11:16.7] JM: I want to go just a little bit deeper on this question, because to me, it's really hard to understand. It's hard to think through why the US dollar seems to remain flat, at least in terms of how we operate with it as humans. Is it due to some – almost religious, cultural belief that we just say we need this thing so badly. We need this idea of a stable currency. We don't even know why we need it, but intuitively we just feel we need the stable agreed-upon currency that underpins everything else? Is it like that, or is this is this the work of central banks and policy makers that are doing really, really complex calculations to figure out how to buy things and sell things and increase debt and decreased debt in order to maintain that stability?

[0:12:12.0] RC: I would say it's a combination of both, right? I would say first and foremost, it really is that subjective, personal feeling of stability that matters the most. It's really a question of whether – if you're receiving your salary in US dollars and you're buying all your stuff in US dollars, then at some point that's simply how your world works, right? You simply think of the US dollar as the fixed constant in your world that you can rely on to be how you want to save up your money, but also just how you think of everything else in terms of it value.

I think something that's important to remember is that it's actually only primarily the Americans that think that the US dollar is the fundamental a stable currency, right? I mean, so myself I'm Danish, right? For me, the US dollar isn't actually really stable. If I have a bunch of US dollars, I'm not going to be – it could easily fold significantly in its bursting power compared to my local currency. For that reason, it's not as stable as my local currency, right? That's how I think in terms of value of different things.

That's the most important thing is that just the element of how do you think in terms of the stuff you buy and in terms of what you earn from your job. Then the second element is definitely also then actually that the central bankers and the regulators of the economy are actually able to try to use different monetary policy levers, to then ultimately ensure that it makes sense for you as an American, or as an individual to think of the US dollar as being stable, because when you go to the shop to buy something with US dollars, you generally get around the same thing whether you go on one day of the week or another.

There are actually some countries where this fails, right? Argentina is an interesting example. Venezuela is an even more extreme example. In Argentina, you have a society where the Argentine peso isn't completely destroyed in the same way that Bolivar is in Venezuela. You still ultimately get an economy where people they think in terms of pesos, but they don't really consider them stable, because the inflation is just too high.

Pretty much every single other country in the world, they do have this sense that their own local currency is how they think of value. Also, because they can trust their government to probably manage it, they can consider it stable.

[0:14:33.4] JM: For whatever reason that US dollar is stable, why do we need to create an additional stable currency? Why do we need a Stablecoin?

[0:14:44.6] RC: Well, so it's wrong to think of Stablecoins as a replacement to existing fiat currency. It's really more of an extension, right? In the same way that you could think of a Visa card being an extension to banknotes, because you can do new stuff with it. Stablecoins really fulfill that same role, except on an even more broad basis, because there's simply so many new use cases that opened up when you have Stablecoins.

That's because what Stablecoins bring with them is the power of the blockchain. It allows for a completely new use cases based on the fact that blockchains are programmable in how you want to use them. Then there's also just the general fundamentals of blockchain money, which is things like instant transfer ability, very low-cost of transactions and this permissionless access by everyone.

[0:15:35.8] JM: I agree with you on the thrust for a Stablecoin. I think if people are still skeptical of that, they can take a look at plenty of other articles and documents that have been created around the need for a Stablecoin. We know that this thing would provide a lot of utility. What are some of the different approaches to creating a Stablecoin that have been tried before MakerDAO?

[0:16:00.0] RC: Well, so interestingly MakerDAO is actually one of the oldest Stablecoins in the whole space. In general, there are considered to be three different types of Stablecoins. The first type of Stablecoin is called the centralized Stablecoin. The way a centralized Stablecoin works is that there is essentially a trusted custodian that holds a lot of let's say, US dollar in a bank account and then issues a number of tokens that correspond to those US dollars in the bank account.

Then this trusted custodian then promises holders of that token that at any time, someone can come with token and redeem it for the underlying US dollars in the bank account from that trusted custodian. The advantage of this approach is that it's quite simple, so it's also very easy to understand why a Stablecoin with this model will remain stable, because you know you can always just go and actually redeem it directly for underlying US dollars, right?

The disadvantage is of course that it's completely centralized. You're essentially letting go of a lot of the benefits of the blockchain when you use this Stablecoin, because let's say if you're trying to build a decentralized application, if you build this decentralized application on top of a centralized Stablecoin, you're ultimately dependent on this centralized Stablecoin as the trust, sort of guarantor of your application and you're not really building it truly on the blockchain itself, right? There is this trusted middleman.
That means that centralized Stablecoins basically have a lot of obvious use cases. In particular, they're very good when you're trying to interact with other stuff that's already centralized. Then they also have a number of obvious places where they aren't so good, which is for instance when you're trying to build decentralized applications. Another interesting fact around how centralized Stablecoins have proliferated is that because there is this strong element of the trusted custodian that's really the central component of it, we've seen just a wide range of centralized Stablecoins emerge, because they all compete on their different brand of trust.

One person may not trust Coinbase as Stablecoin for instance, but would be much more happy to trust JP Morgan's Stablecoin. There's a big room for competition there. As a result, we've seen at this point I believe hundreds of them already emerge. That's the first kind and it's called the centralized Stablecoin.

The second type of Stablecoin is a decentralized, collateral-backed Stablecoin. A decentralized, collateral-backed Stablecoin is a type of Stablecoin where there's no trusted custodian who ultimately controls the Stablecoin and ultimately guarantees its value, but rather there is a decentralized smart contract system on the blockchain that automatically is able to store collateral assets, so basically other blockchain assets. Then use those collateral assets to back the value of the Stablecoin.

It's a little bit like the gold standard perhaps, except that you can have different types of assets backing the Stablecoin ultimately. Also, the huge advantage is that it's completely decentralized, so there's no custodian, no counterparty you have to trust to manage it correctly. It's also completely transparent, so you can always go and in real-time audit exactly how much collateral there is in the system compared to how many stable contract circulation. Through that as a user,

it's very easy to make the judgment call on whether you want to trust a particular decentralized, collateral-backed Stablecoin.

Finally there is the third type of Stablecoin, which is not too well-known and many people believe it's not really possible to actually make this approach work. Basically, it's a decentralized, non-collateralized Stablecoin. It's a decentralized Stablecoin that is backed by nothing, other than an algorithm essentially. The approach is to try to have an algorithm that prints Stablecoins when there's more demand for Stablecoins and then remove them from circulation when there's less demand for them. Then through this algorithm, be able to basically stabilize the market price of the Stablecoin.

The criticism of this Stablecoin is that there – because it's backed by nothing, it ultimately – there's ultimately the chance that it could just essentially to go poof and collect completely. So far, there is actually one of these types of Stablecoins that have done exactly that, because it basically ran out of – I guess you can say ran out of momentum and then people realized that there was nothing really backing it. Then as a result, it just completely collapsed and wasn't able to recover.

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[0:20:46.3] JM: Deploying to the cloud should be simple. You shouldn't feel locked in and your cloud provider should offer you customer support 24 a day,7 days a week, because you might be up in the middle of the night trying to figure out why your application is having errors and your cloud provider's support team should be there to help you.

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Thanks for supporting Software Engineering Daily and thanks to Linode.

[INTERVIEW CONTINUED]

[0:22:23.3] JM: The first two that you described are the ones that I would like to focus on. The first type of Stablecoin you described is the centralized Stablecoin, where you have a guarantor of the stability of the Stablecoin, such as Coinbase or JPMorgan. In this model, you have a single centralized entity that says, "Look, we're going to do what's necessary to maintain the stability of this coin and we're backing that stability with our reputation."

In some ways, this is similar to the idea of the US dollar where I think you could think of the US dollar as a stability based – people trust the stability of the US dollar, based on the stability of the US government, the success of the US government over the last several hundred years perhaps. Then the second approach which is MakerDAO's approach is a fully decentralized approach. Well, not fully decentralized yet. We'll get into that. Mostly decentralized. More decentralized on a path to fully decentralized.

What are the salient differences in the approaches of the centralized Stablecoin, versus the decentralized Stablecoin?

[0:23:39.8] RC: Yeah. I mean, that's really the key question, right? Like I was saying, right? The big advantage of a centralized Stablecoin is that it's very pragmatic and it's very easy to understand and it's easy to use. Ultimately, it's easy to keep it stable through arbitrage, because it's quite simple to understand how if the Stablecoin is let's say, trading on the market above $1, you could do very well to just go with real US dollars, generate more of these Stablecoins and then sell them into the market to bring the price down.

Obviously, that if you find a centralized Stablecoins that's priced at 50 cents on the market somewhere, you'd be very happy to buy that immediately up until the price goes back to $1, because you can go and redeem it for real US dollars one-to-one through the custodian.

Then the advantage of the decentralized Stablecoin, like MakerDAO's Dai Stablecoin is that you have this complete transparency into the system, right? While you're not able to directly redeem it one-to-one for US dollars in the bank account, you're rather able to directly see exactly that the value is really there, right? You don't have to worry whether or not the custodian is actually going to payout and whether or not they're going to live up to their promise. You can just go and check directly on the blockchain to see whether the value is there or not.

Ultimately, that means that you for instance remove this potential element of too-big-to-fail, where with a centralized Stablecoin, the larger it gets, you feel you're putting more and more of your eggs in one basket, right? If the large portion of the economy ends up being sitting with just one trusted custodian. Whereas with a decentralized Stablecoin, because you first of all have complete transparency and insight into what's going on with that Stablecoin, you can make sure that there isn't some underhanded accounting happening somewhere deep in the machinery.

Secondly, there just is no central counterparty, or central authority that ultimately controls the system, right? Or has some special access to the system. As a result, it just basically aligns better with the values and the advantages of the blockchain and it allows more interesting and more diverse types of applications to be built, that can really attain true decentralization.

[0:26:00.1] JM: I'd to get into an explanation of what MakerDAO does. I think it's a really elegant and beautiful system when you start to dive into it. Unfortunately to understand it, you need to understand at a certain level what a smart contract is, what Bitcoin is, how some of the dynamics of this ecosystem work. That's beyond the scope of this podcast, so people can listen back, or listen to other podcasts, or read about other – read from other resources what smart contract programming is, how basic blockchain stuff works.

We're going to make a assumption that the listener is a little familiar with the smart contract world. Let's explain what MakerDAO is at a high-level and then we'll get into some of the technical weeds.

[0:26:53.1] RC: Yeah. At the very high-level, MakerDAO is a financial infrastructure on the blockchain that enables first and foremost, the Dai Stablecoin, so a decentralized Stablecoin of the type we just discussed. Also a number of other interesting financial use cases, such as collateralized lending and ultimately, decentralized governance.

The most important aspect really is the decentralized Stablecoin, which is called Dai, because this Stablecoin is and just this use case is very relevant to most people in a sense that it's just a better form of money. Like we were saying right in the beginning, right? It's basically an asset like Bitcoin, or any other cryptocurrencies, but it has a stable price of 1 US dollar. It can be sent incredibly cheaply and it can be used in all these very advanced, programmable use cases. Most importantly, it's actually something for regular people to use, right? It's not really that difficult for someone to just get their salary in Dai and then send it to their friends via their phones, or buy stuff in online shops that accept cryptocurrency with it. It doesn't really require a deep knowledge of the underlying mechanics to just use Dai as a currency, just like you don't need to know how the Federal Reserve works to use US dollar cash.

The actual, I guess you can say machinery that backs the Dai and makes it possible for Dai to remain stable, then is this platform for decentralized, collateralized lending. In a way, you can actually think of Maker like infrastructure for a bank, because it has both sides of the equation just like you have in a bank, right? On one hand, it has savings and deposits, so basically money for regular people, right? The way that normal people they have money in the bank and they can go and spend that money, or they can go and they can save up that money in the bank account.

Then the other element is that banks also give out loans, right, so to small businesses, or to people who need a mortgage. MakerDAO is the same thing. On one hand, it has the Stablecoin for regular people to use as money that is worth 1 US dollar and very simple to use. On the other hand, it has this more advanced functionality, for advanced users that allows them to actually access collateralized lending on the blockchain.

[0:29:22.8] JM: MakerDAO involves two currencies. It involves Dai and Maker, or MKR. Why does MakerDAO need multiple currencies?

[0:29:35.6] RC: Yeah, that's a great point. Dai again is this simple Stablecoin for regular people. Then what I was just talking about was this decentralized, collateralized lending platform. Then actually, which is for more advanced users. Then actually there is also yeah, a third type of user and a third type of use case of the system, which is for not just advanced users, but for highly, highly specialized users. This is the governance element of the system; the element where the fundamental mechanics of the system is controlled in a decentralized manner. That is where the MKR token comes in.

The MKR token is essentially the governance token. Where Dai is this simple Stablecoin that's easy to use as money for regular people, MKR is this advanced governance token for specialists who use it to vote in the system on how to properly regulate and how to properly stabilize the system. What they essentially regulate is the dynamics of how the collateralized lending platform works so that the Dai Stablecoin is kept stable through the dynamics of that collateralized lending platform.

[0:30:47.6] JM: Just to assuage people who are already thinking, “Oh, my God. This sounds really complicated and probably is going to fail completely,” it's worth noting that when Bitcoin came out it looked really complicated. Over time, people developed an intuition for how it works, despite the fact that when it first came out it was the most confusing thing, even to advanced distributed systems people, as far as I can tell. Over times just won people over.

All computer systems are to some extent like that. I mean, no basic encryption probably. I don't know the history, but it probably seemed very confusing and impractical when it first came out. I think that's whether or not MakerDAO succeeds, intuitively to me, it feels a system that looks complicated at first, but over time will make a lot of sense to people.

There's the functionality of Dai, which is the Stablecoin. The functionality of MKR, which is this other currency that you need in order to have governance and some other features, so we need to discuss these two different currencies and how they manifest, what their interaction is. Dai, the Stablecoin, how does Dai get created?

[0:32:20.0] RC: Yeah. Dai is created through the collateralized lending platform itself. Actually think the easiest way to try to get a bit of a more intuitive understanding of it is to just come with some examples, right? Like I was saying earlier, right? It's a banking infrastructure, right? Dai is the deposit of the money in the bank and then the collateralized lending platform is getting loans from the bank, getting a mortgage from a bank.

What's interesting is actually when you go to a bank and you get a mortgage for your house for instance, what actually happens is that the bank doesn't have that money already sitting somewhere that it lends to you. No, the bank actually creates the money it gives you. I mean, you can really say it creates it out of thin air. The moment you get the loan, the moment that the bank takes control of your – the deed to your house on their balance sheet as security for the mortgage, then they are able to actually create this new money that they then lend to you and put into your account that you can then use to for instance, buy the house, or go and spend on other stuff.

This is called fractional reserve banking, right? It means that there is some fraction of the money that is created on the basis of the value of the loans in the bank. Dai works the same way. The moment that collateral is put into the system through the collateralized lending platform, the system is then able to assess the value of that collateral. Right now, typically the way a transaction works is that you would put in let's say $300 worth of Ethereum tokens and you would then want to take out let's say a $100 worth of Dai. You'd want to borrow a 100 Dai from the system. The system would then analyze to see whether it is safe to do so, whether it's safe to take $300 worth of Ethereum and give you a $100 loan on the basis of those $300 worth of Ethereum as collateral.

If the system based on its internal risk parameters as they're called, basically the parameters that decide what terms you can get with different types of collateral, if the system believes that it is safe to do this, to back a 100 Dai with $300 worth or Ethereum, then it will allow you to directly generate that Dai, in the same way that a bank generates money when they give, that do fractional reserve lending. Ultimately, the Dai enters and exits circulations and ultimately exists based on the collateral that people put into the system when they borrow from it.

[0:34:48.5] JM: If I have some Ethereum, I can pay an Eth and get some Dai, and that's mediated by a smart contract. I put up my 1 ether and gets translated into Dai. Why would I want to do that?

[0:35:08.0] RC: Yeah, so that's a key question, right? The important thing to understand is you're not exchanging your Ethereum to Dai, right? You are pledging your Ethereum as collateral for a loan that you then – that loan you then receive in Dai, right? The best thing to compare to really is a mortgage, right? Because in a mortgage, what you do is you give your house to the bank essentially, the bank looks at the value of your house and they say, "Okay, we can see that this house is worth this much, so we'll let's say, the house is worth a million dollars." Then they'll lend you $800,000 of cash. You then take that $800,000 of cash and you go and you buy whatever, a bunch of cars, or whatever you want to do with it, right?

The bank now has a claim on your house. Over time, you have to pay back your loan, right? Because you want to make sure that the bank doesn't one day seize your house. Ultimately, when you pay back your entire loan, in the end you then gain full control and full ownership over your house again. The important thing is that while the bank has that claim on your house, it's still your house, right? You still get to live in your house. That's the key aspect of collateralized lending is that it's about accessing liquidity, so accessing cash, or accessing value of assets that you don't want to sell. You still want to own them, but you want to also access the value of those assets.

In the blockchain world, in the Ethereum world, the reason why people would go and let's say put in $300 worth of Ethereum as collateral to then borrow a 100 Dai with, could very well be because they believe so much that the price of Ethereum is going to go up, that they just do not want to sell the Ethereum, right? Maybe they have some bill, there's something they need to pay, they need to spend a $100 on it. They also really think that the price of Ethereum is going to go up, so they don't want to start selling a $100 of their $300 worth of Ethereum. They'd much rather just take a loan, pay the bill and then later pay down the loan, so that they still have access to those $300 worth of Ethereum.

There's actually some examples of this as well. There's been some people who for instance wanted to buy a car. There's been multiple examples of people using the Maker system for that.

They want to buy a car, but they don't want to sell their Ethereum, so they collateralized their Ethereum, borrow enough money to buy the car, then go and buy the car and then pay down the loan over time through the salary.

Throughout this entire process, they will then have kept their exposure to Ethereum. If the price of Ethereum would have gone up, they would have gotten that entire benefit, because the whole time they still kept owning the Ethereum as it was sitting in the Maker system.

[0:37:44.5] JM: Now the listener is thinking, “Cool, collateralized debt platform. Why is this related to a Stablecoin?”

[0:37:55.3] RC: That's basically what I was talking about earlier, right? That it is through this collateralized lending that the Dai Stablecoin is created in the first place. The Dai Stablecoin in a sense, although – I mean, although it's really the most important product of the Maker platform and the product that is most relevant to most people from the Maker platform, you could also just simply consider it a byproduct of the collateralized lending process. Because basically, the Dai tokens are what ultimately are created out of these collateralized positions that exist in the Maker system when someone comes to take a loan.
It's almost the accounting tool that allows you to then receive the value out of the system. You put in your Ethereum, you borrow the Dai from the system, you now have a Dai and obviously, you want to do something with it, right? You don't just want to borrow Dai just to hold that. You want to actually go and let's say buy more Ethereum, or pay down a bill, or buy a car, or something.

That's when the Stablecoin element becomes apparent, right? Because that's where then it's an opportunity for someone else to buy your Dai from you that you've just created. It is in this process that borrower and lender is essentially paired up, right? This is where someone comes with actual dollars for instance and says, “I have a $100. I want to buy a 100 Dai, because I need a Stablecoin to use on some decentralized application.” The guy who just did this collateralized lending, he put in his Ethereum and he generated a 100 Dai, but he still needs to turn it into real money, because he needs to pay his bill.

Then that's how the dynamic happens essentially. You get these two types of uses. On one hand, you have the regular users that just want to use a Stablecoin, who just need stability and need to maybe send money to their relatives abroad, or need to use a decentralized application. Then you have the collateralized borrowers, right? Those who have some collateral assets like Ethereum and want to access liquidity from those assets and ultimately go and use that liquidity to buy something in the real world, for instance.

Those two groups then need to be evenly matched essentially, so that there are just as many people who want to borrow from the system as there are people who want to hold their money in the system, right, so have demand for the Stablecoin. As long as you have that balance between the two, then you also get stability in the price of Dai.

[0:40:30.9] JM: I think it's again worth noting here that for people who are thinking that this looks like a big bucket of too much complexity going on, one interesting property if you look at Bitcoin is when we got Bitcoin, we didn't just get decentralized currency. We got these other properties, like decentralized information storage and smart contract platforms and these other side effects of the core innovation, almost because Bitcoin required such a leap in game theoretic thinking.

I think, you could describe MakerDAO in similar terms. In order to get a Stablecoin, we have to go through this mental exercise of what stability actually means and what are some ways that we can manipulate incentives in order to enforce that stability. Just one of the little financial abstractions you have to play with that can really push people in a certain direction is this idea of debt and collateral.

For people who are curious about this, it's worth just taking a look at the system, because I think it's pretty interesting. I don't think we'll be able to really convert people to really understanding MakerDAO fully over the podcast medium, but I am glad to shed some light on the rough contours of it at least. To get a little bit further, I think it's worth talking about a few other abstractions that you work with, because you have this liquidation ratio that describes how these collateralized debt positions are going to get liquidated, or how they're going to get judged for their quality, because obviously, debt in the non-crypto world has different qualities. A debt that's

20-years-old and has no chance of being paid back, maybe it gets sold off for pennies, even though it was a million dollars of debt.

Debt has subjective qualities to it in terms of at what rate it's going to get “liquidated.” Then you also have this property that you need to figure out how to actually get Dai to track the price of the US dollar, because that's the goal of this system, at least from the Stablecoin perspective. You need to track USD. Let's go a little bit deeper into the technical aspects and talk about liquidity and how you track USD.

[0:43:00.2] RC: Right. I think the liquidation ratio that you just mentioned is one of the really important aspects of the system, right? Because the liquidation ratio is the point where like you say, right? Where the system basically says, “Okay, I'm no longer willing to hold this loan on my balance sheet anymore.” Basically, it means that the collateral that's backing a particular loan it has now fallen low enough that it has to be liquidated. It has to be immediately sold off.

The liquidation ratio is then essentially the ratio of debt of collateral to debt where that happens, which right now in the current version of the system is a 150% for Ethereum. That means that if you have borrowed a 100 Dai from the system and you've used let's say $200 worth of Ethereum to initially back that loan with, if the price of those $200 worth of Ethereum then falls to a certain extent and you actually reach the point where your Ethereum is now only worth let's say a $145, then what happens is you have a $100 of debt that's backed by a $145 of collateral, which is a ratio of collateral to debt that's below a 150%.

Then the system automatically actually detects this and then immediately proceeds to liquidate this position. What that means is basically it takes a collateral, it just sells the collateral on the open market and retrieves as much Dai as it possibly can. Hopefully, it's able to retrieve at least a 100 Dai, which should be possible in most situations, because the collateral has a value of a $145. Then whatever is left over is then given to the original owner, or the original person who took the loan in the first place.

This way the system really guarantees that even if the price of Ethereum for instance, or the price of the collateral assets in the system fall overtime, it's still able to maintain a proper ratio of collateral in the system to outstanding debt and outstanding Stablecoins in circulation. Again,

this is very similar to how banks work, right? Because this is also what happens if you have a housing crash and people's mortgages go underwater, right? If you have a mortgage where suddenly the debt that you owe to the bank is higher than the actual value of the house that you pledged to the bank as collateral for the mortgage, the bank will then also go and be like, "I don't want this loan anymore. I'm just going to take your house. I'm going to sell it and I'm going to try to de-risk out of this situation."

That's where the liquidation ratio sits in the system, right? It's a risk parameter, so it's a way for the system to understand whether a particular loan makes sense from a risk perspective of whether it has become too risky and needs to be sold off immediately.

[SPONSOR MESSAGE]

[0:46:01.6] JM: Testing a mobile app is not easy. I know this from experience working on the SE Daily mobile application. We have an iOS client and an Android client and we get bug reports all the time from users that are on operating systems that we did not test. People have old iPhones, there are a thousand different versions of Android. With such a fragmented ecosystem, it's easy for a bug to occur in a system that you didn't test.

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you have some exploratory testing without writing any code. Thanks to Bitbar. You can check out bitbar.com/sedaily to get that free month and to support Software Engineering Daily.

[INTERVIEW CONTINUED]

[0:48:11.9] JM: In order to track the price of USD, we need to do something called choosing an Oracle. We also need to figure out how we're going to track the price of the USD Oracle price that we agree on. That's going to sound foreign to some people. Can you explain the term Oracle in more detail and how we're using an Oracle to track the price of USD?

[0:48:40.2] RC: Yeah. Actually, I think there's two separate points here. First, let me just talk a little bit about Oracles and actually what's known as the Oracle problem. Because MakerDAO needs to know when a particular loan has become risky, right? It needs to know whether there is enough value of Ethereum, or the collateral sitting in the system to back a particular loan, it actually needs to know the value of that collateral, right?

Right now when Maker is giving out Ethereum-backed loans, Maker needs to know the price of Ethereum in real-time, because that's how it knows whether a 100 debt is safe to back by 2 eth or not, right? It needs to know that those 2 eth are then worth let's say, a $150 each. As a result, the total loan is a $100 of debt backed by $300 of Ethereum.

The problem is that smart contracts don't inherently understand – they can't inherently see the real world, right? You can't really see beyond just the state of the blockchain of your smart contract. Oracles are the components of a smart contract system that deliver trusted data from the outside world. Essentially what they do is that – what they are are basically components in the system where you can push in data from outside.

The Oracle problem is then the fact that you could potentially abuse this input into the system. There's a number of solutions for that. Maker is probably the project that is leading the most in terms of how you actually overcome the Oracle problem. We do have a really good solution that ultimately allows the system to safely operate, even with potentially billions of dollars' worth of value in it, despite the fact that you always will have that Oracle problem.

The Oracle and the price of Ethereum in the USD is mainly about when the system has to make the judgement that a particular loan has to be liquidated, because the value of the collateral has now fallen too low. For the system to be able to actually make that decision, it needs to have some input source that gives it the price of Ethereum and that's called the Oracle.

Now for the second part on how you actually keep Dai stable, that is actually slightly – in the long run, that process will actually also rely on Oracles, but in the short run it actually doesn't. In the short run, the process of stabilizing Dai is done directly through the governance process. It is actually managed directly by the whole dose of MKR, who ultimately vote on the risk parameters of the systems, but ultimately they vote on the way that the different financial dynamics of the system are setup to properly just protect the system and keep it stable in the right way. For instance, MKR holders are the ones who chosen that right now, the liquidation ratio is a 150%.

Then the other really, really important risk parameter that MKR holders choose and that they use to actually balance the price of Dai in real time is the interest rates of the system. Right now in Maker, that's called the stability fee. The stability fee is effectively the interest rate you pay on your loan over time when you have collateralized some Ethereum into the system and you've borrowed some Dai out of the system.

When you later go to pay back that Dai and retrieve your collateral, just like when you pay down your mortgage to get your house back, you also have to pay an interest rate. That interest rate then is variable and it is managed in real-time – well, not really in real-time. It's managed on right now mostly – like for the most part on a bi-weekly or monthly basis and is adjust that to make sure that the supply and demand for Dai meets in the middle exactly at the $1 point of equilibrium.

Basically, that's how it's kept stable in the short-run, right? Basically, the interest rates are continuously modified to ensure that if there is let's say too little demand for Dai right? There is simply – there are too many people who want to borrow Dai, there are too many people who collateralized Ethereum into the system and borrow Dai and try to sell it in the market. There are not really that many people who want to hold Dai, what you would get in this scenario is higher

supply and lower demand, which results in a lower price, right? That could ultimately result in a price below $1.

What the governance then does in this situation is it votes to increase the interest rates, because by increasing the interest rates, there's now going to be less interest, I mean, less demand by people to borrow from the system, because now it's become more expensive to borrow from the system. There's even going to be people who will want to immediately close their loans, because they'll decide, “I don't want this loan anymore. It's become too expensive. The interest rate is too high. I'm going to pay down my debt and retrieve my collateral.”

Through that, they will actually become – the supply of Dai will then go down, right? Because there will be less debt in the system and that demand for Dai will increase, because there'll be people who go and actually buy Dai on the market to obtain that Dai and use it to pay down that debt with.

Ultimately, that means that the governance can adjust the price of Dai in the marketplace through these interest rates, ultimately pushing either the price up if it's too low, or pushing it down if it's too high. Through that, actually get real stability.

[0:54:12.3] JM: When I was looking at MakerDAO, I was thinking about and maybe this is not a good way of looking at it, but I was thinking about it as you have this system of Dai, which is this debt-based system where people can borrow money and you're aiming to have this stable currency that you can pay things in terms of. You can get more or less of that based on your credit, or the amount of collateral that you're willing to put up. Then on the other side, you have this MKR currency, which is in a governance instrument.

People who have MKR have skin in the game to govern things intelligently. What are the governing? They’re governing the same thing that the central banks are governing in the centralized world. You have a decentralized governance mechanism for working on those interest rates, because we the public understand to some degree, I mean, people who are interested understand what central banks do and how they create incentives for currencies to remain stable.

Most of us aren't concerned with that. Similarly, most of us don't own MKR. People who do own MKR maybe their policy walks and they want to help decide and vote on where the interest rates should go in order to enforce this system of stability in the Dai world. Is that a fair way of looking at the overall system?

[0:55:52.9] RC: Yeah. I mean, I would definitely say so that – I mean, some people do indeed describe Maker as a decentralized central bank and describe MKR holders and the governance as buying a token that then gives you a vote under on the board of governors, in the same way that there are these seven people that control the USD interest rates and the Federal Reserve Board of Governors.

With Maker, it's just anyone who holds the MKR token who gets that access to actually be a part of that policy discussion. Then also what you mentioned which is really critical is that there is the skin in the game element that MKR holders don't just freely get to choose and vote and do whatever they want with the system just for fun, right? They actually have very clear and very strong incentives that make sure that they always make the choices that they believe will keep Dai the most stable.

That's because ultimately, the stability of the system itself is underwritten by MKR holders, in the sense that if there is basically at default in the system on under collateralization, or you could also think of it as a bad debt, right? Basically, if there is let's say a loan in the system that reaches a point where the loan has a 100 Dai of debt, but it only has $50 worth of collateral backing that 100 Dai. Then you have a problem, right? Because now you have a 100 Dai that’s in circulation, but there's no way for that Dai to be fully backed by collateral, because this particular loan is under collateralized.

That could happen for instance if there's a very, very sudden and very steep crash in the price of the collateral. It would fall so much in value that it actually goes below, even the one-to-one ratio, right? The value of collateral against the debt. What you then get is this shortfall, right? If there's $50 missing basically in the system, and if you don't deal with that, you would actually have insolvency, right? You have a system that ultimately doesn't really make sense in the way that Dai would no longer really be worth $1, because a part of the Dai would be unbacked.

MKR ultimately underwrites this risk. Meaning that if there is $50 missing in a system, the system actually detects this and starts diluting and generating more MKR tokens to then sell an urban market in order to buy back Dai from the market and ultimately recapitalize the shortfall. That is why MKR holders are very heavily incentivized to vote in such a way that you don't get a situation where you actually have this under collateralization and this potential insolvency in the system, because they just get – they have to pay directly the moment they make a mistake and don't govern correctly.

Then on the flipside, they of course also get a benefit if they govern it very well and they keep it stable. Then there's essentially this continuous value stream that goes to MKR and insures that over time the total supply of MKR falls. With these two dynamics together, it's like a private, or maybe you could even say publicly owned decentralized central bank that manages this credit system, versus stable current system to ensure that it remains in balance, so the Stablecoin remains $1, and also ensures that the collateral and the backing of the Stablecoin remains healthy and remains over-collateralized, so that the Stablecoin is always going to be worth $1.

[0:59:24.2] JM: There are many engineering problems that we could discuss in actually building this system. We've talked about it mostly at an economic level and we haven't really talked about creating and deploying smart contracts and testing those smart contracts and actually rolling out this system. It's quite a feat of engineering and maybe we can discuss it in a future episode, or I can talk to CTO, or an engineer on your team. I would actually love to do that at some point in the future.

I want to begin to close out by just talking about your reflections on the crypto bubble and how the ecosystem changed since then. My understanding is one of the things that tested MakerDAO as a durable system, was the fact that Dai remained fairly stable throughout the extremes, the tumultuous extremes of the crypto bubble. Tell me about your reflections on the crypto bubble and how the world has changed since that bubble.

[1:00:33.1] RC: Yeah. I definitely think that the crypto bubble was obviously going to happen and I also think that is in general been very healthy for the ecosystem, because it's really made sure that today, crypto startups and blockchain startups primarily focus on actually making good

products and making stuff that that makes sense, right? Not just making white papers that sound good.

It's also just really incredible that we managed to launch the Dai Stablecoin almost exactly at the peak of the bubble. Then rode, like you said rode, the bubble all the way down to the bottom, because this was really – you really see this as a very significant trial by fire of the system, right? Because the system is backed by Ethereum. In this period of time, Ethereum lost something like 98% of its value from the most extreme point to the lowest point. At least 95%, I believe.

Despite that incredible loss in value over time, Dai did remain stable. This was really proof that the various dynamics in the system that kick in whenever something like the value of the collateral falling too much, we're able to dynamically keep the system stable over time, even despite these very extreme conditions. On one hand, I mean, it was pretty incredible to see that play out, but on the other hand, it was of course also exactly as we expected, right? Because we did build it exactly to be able to withstand that scenario.

One of our main takeaways is ultimately that the system will always be able to handle this situation where there is a sustained deflation of a bubble over time. Really the only thing that poses a serious risk to the system is a very, very sudden, really a matter of hours, or a matter of one or two days complete crash in the value of the collateral. That would be the point where the system wouldn't be able to maintain its stability.

Otherwise, something like the crypto bubble really was just in general a very nice test of the system and ultimately, also a good thing for the blotch in ecosystem as a whole and the startups and the values that people now focus on when they do blockchain products.

[1:02:45.3] JM: To take analogies even further, there's a lot of analogies I can explore in this subject, I think that when other cloud providers started getting created, AWS was really happy about that. That's because when the entire world was relying on AWS for cloud infrastructure, it puts so much pressure on AWS to be able to stand up in the face of that. Now we have these other cloud providers like Google and Microsoft and it gives us a sense of failover. It's unlikely that both of these – all three of these cloud providers, or you can talk about DigitalOcean. It's

unlikely that all of these will go up in smoke at exactly the same time. Whereas, in the centralized failure case is really problematic for our entire world.

That's where we're at with the world of currencies today. If we're all dependent on USD as the “stable” currency of choice, some Black Swan event that totally wipes out the United States and devalues our currency, that could be really problematic for humanity as a whole, which just is it from a distributed systems point of view is just terrible, fault tolerance. We would like to have another abstraction that we can fail over too. Similarly, what you're describing with the Black Swan vulnerability of MakerDAO, you actually have systems in place that incentivize the holders of MKR to unwind the entire system in the event that something goes wrong.

I just find that it's a humble approach and it's an approach that I would like to see in more Stablecoins, assuming Stablecoin is not a winner-take-all thing and we have multiple Stablecoins. It would be great for them to have different fault tolerance properties where yeah, if a black swan of one kind event occurs, Maker gets unraveled, the people get paid back in eth and Bitcoin and that's fine. Then maybe we've got another centralized Stablecoin over here that people can failover to for a while. We can even failover to whatever the Coinbase one is, or the JPMorgan one is, or tether, or who cares? It's nice to have a failover mechanism.

I know we're running up against time and I guess the last question is I guess, do you have any other reflections on the world of crypto in 2019 and what you're excited about? Any predictions you have for the near future?

[1:05:26.4] RC: Yeah. I was saying, I was mentioning this briefly at the very beginning, right? That I think one of the really critical steps and things that are about to happen now is the moment when regulators and governments around the world start to actually seriously look at blockchain and try to regulate it. Because what's happening in many places is that they're failing miserably, because they don't understand the technology.

In other places also are actually succeeding very well, because they do in fact take the time that it takes to learn how the technology works and then create appropriate regulation for it. One thing is for sure and that is regulation is definitely needed and that’s because a lot of blotching products concern themselves directly with financial services and you always need to regulate

financial services, otherwise you get problematic outcomes, like the housing bubble, or whatever, all sorts of financial disasters of the past.

I'm very much hoping that what we will see is that it will become this very clear innovation advantage that would go to the countries that are able to properly regulate cryptocurrency and properly understand how to regulate the technology in a way that enhances the benefits, but also deals with the drawbacks in a proportional manner. Then as a result, ultimately get regulation around the world to finally be able to properly interact with the advantages of blockchain, so that so everyone can get to benefit from it.

[1:06:55.2] JM: Rune Christensen, thanks for coming on the show. It's been great talking.

[1:06:57.9] RC: Yeah, it was great. Thanks so much for having me.

[END OF INTERVIEW]

[1:07:03.5] JM: GoCD is a continuous delivery tool created by ThoughtWorks. It's open source, it's free to use and GoCD has all the features that you need for continuous delivery. You can model your deployment pipelines without installing any plugins. You can use the value stream map to visualize your end-to-end workflow. If you use Kubernetes, GoCD is a natural fit to add continuous delivery to your cloud native project.

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It's great to always see continued progress on GoCD with new features, like Kubernetes integrations, so you know that you're investing in a continuous delivery tool that is built for the long-term. You can check it out for yourself at gocd.org/sedaily.

[END]