Our presentation is about a blockchain system called EOS.

And this disclaimer basically says that we are NOT in any way associated with block.one, the company which has created EOS.

However, rest assured, this event has been coordinated with them, so hopefully we'll be talking sense.

So the goal of this presentation is to make you consider building businesses on top of EOS.

Our action plan is quite predictable: first we present a couple of problems to get you depressed and then we offer a couple of solutions to those problems to cheer you up.

Hopefully our presentation will not be too technical. However, we do assume that you are familiar with some of the basic concepts.

We also assume that you know what a smart-contract is. But in case you don't – you might think of it as an autonomous computer program living on a blockchain.

Tokenika is the name of our company dealing with blockchain ventures.

As you can see we originate from real-life traditional businesses: manufacturing, real-estate, currency trading, education.

We've been in the crypto-space for quite a long time now. We were early adopters of Bitcoin, MaidSafe, BitShares, Ethereum, Steem. And also EOS.

And we try to stay in touch with the big guys out there. We travel to conferences and try to talk to them in person. This year we've been to London Fintech Week & Shanghai Blockchain Summit.

OK, so before we talk about EOS we’ll briefly describe what we consider to be the main problems facing the crypto-space.

We’ll go through them one by one.

**Scalability**

This is a big one. If we want to host real-life businesses on the blockchain we need high performance. And what is high performance? These are the requirements of real industry:

* You need about 20k transactions per second just to do Visa & MasterCard, not to mention all the other payment systems out there.
* Facebook does 50k likes per second, not including all the posts and voting and other actions that the users take.
* And if you're in the financial industry and you're trying to do trading, it's sometimes a hundred thousand transactions per second.

So, imagine putting all of these on a single platform, so they can interoperate. Well, that would require millions of transactions per second. This is a massive scale.

And what can the blockchain currently offer? Bitcoin does 4 transactions per second. Ethereum – something between 15 and 30.

And those two systems are extremely expensive to run. Bitcoin and Ethereum shareholders are spending something like 6 bln USD a year just to be able to process less than 35 transactions per second. This is mad.

You might say it's just a matter of time before scaling solutions are put in place. But actually, there are only two ways to go:

* You can go off-chain, which is basically the idea behind state channels. Will it work? Who knows. But even if it does, it only fixes the problem for basic payments, and does nothing for anything more complex than that.
* Or you can go into creating sub-chains, which is basically the idea behind Ethereum sharding and also Plasma. This helps a bit, if you want to run a lot of small apps within the same ecosystem. But if you want to compete with big businesses like Facebook, Uber or eBay, or if you're into currency trading - this solves nothing. For those apps you need enormous processing power on a single chain and oftentimes on a single CPU thread.

#### Transaction fees

Right now transaction fees are absurdly high. On average you pay 3 USD for a Bitcoin transfer and 30 cents for moving funds on Ethereum, and this will only get worse once Ethereum hits its capacity limits.

No business can survive this.

Even if we introduce a second level of transaction processing and the fees do get lower, they will still be totally unpredictable. They are decided by block producers, so you as a blockchain-based business have no say in it. In other words, any unexpected rise in transaction fees can kill your business overnight.

#### Private key security

People get hacked. It's a fact. And if you're hacked on a blockchain app similar to Uber or eBay, you lose not only your money, but also you lose your identity and reputation.

There will be more and more unsophisticated users entering the space and they cannot be expected to perfectly protect their private keys. So, we must have a way to recover a blockchain account from a hacker, or otherwise this thing will never go mainstream.

#### Blockchain governance

How to make decisions in a decentralized environment? Obviously, a blockchain, like any other enterprise, needs to make decisions, in order to survive in a changing environment. If this process fails, we end up with a fork, which usually hurts everyone involved.

Blockchain governance is basically about what you do when you have a disaster similar to the infamous DAO incident, which happened last year. Or how you solve the block size issue in Bitcoin, where you have two camps of shareholders wanting a different outcome.

These can be tough problems, especially when nobody is in charge.

#### Smart-contracts running amok

One way to tackle this problem is trying to prevent it from happening in the first place. Which means one thing: formal verification of the code before it is deployed.

However, formal verification of a Turing complete programming language is really hard. And it just minimizes the risk, it does not eliminate it completely. Software development is an imperfect art, so no matter how much effort you put into checking the code, there will always be a black swan event waiting to happen.

As we can see from this screen-shot, smart-contract platforms do NOT consider this issue to be part of their business model. So, when things go wrong, you, as a business, are on your own.

#### High difficulty of app development

Where are we today? We have the decentralized computer and a bunch of people trying to build applications on top of it. But actually nothing is coming to market. All we have are just prototypes. The developers are trying to build those amazing apps, but they don't get to spend their time on building business logic and user interfaces. Instead, they are stuck on figuring out the low-level stuff, things like databases, data storage and inter-app communication.

And because everything is being implemented in the app layer, it's being done within relatively inefficient scripting environment. Which makes it really hard.

Furthermore, even if generic solutions eventually emerge this way, they will be expensive to use - it will cost gas each time your app needs to access them.

#### Inter-blockchain communication

Right now blockchains are quite lonely creatures - they live in their own silos, separated from each other. Even apps on similar blockchains cannot talk to each other: a smart-contract on Ethereum is unable to communicate with a smart-contract living on Ethereum Classic, even though technically they are identical platforms.

OK, so we've painted this scary picture of blockchain space being overwhelmed with really big problems.

So now it's time to show that there might be some way out of this mess.

It’s time to introduce you to EOS.

What is EOS? The simplest way to put it would this: EOS is a general-purpose smart-contract platform, similar to Ethereum.

That's a fair definition, but in my view, it doesn't do justice to EOS. I prefer this one: EOS makes decentralized apps look and behave like conventional apps.

Before we go any further, let's make sure we understand what we mean when we say "decentralized apps".

In the simplest terms, it's any internet-based app which is transformed in such a way that it doesn't need any owner or administrator. It just runs on its own. It's like Uber but without the Uber company running it.

Let’s take a moment to describe what decentralized apps need, if they want to stand any chance against conventional apps:

* Your app needs to be scalable and cheap to run. That's pretty obvious. You need to be able to scale in order to have enough users to recover your initial costs.
* You need to have access to freemium models or different monetization strategies. If you want to charge your users, it should be the application choice, not the platform it's running on.
* Your app needs to be available via mobile phones and web interfaces, so that users don't have to download and install anything.
* Your users need account names, no public keys, no fancy cryptographic stuff. And they need a procedure for account recovery, in case they are hacked.
* And you, as a business owner, probably need a rich development environment: lots of programming tools, and access to experienced developers.
* Your app needs to be upgradeable. You need to be able to improve your app to keep your business afloat. And finally, your app needs bug recovery, something that's often overlooked in this space.

So what is EOS doing to address all those requirements? Let's see.

This is actually what Ethereum looks like. We have a bare-bone computer (in this case the EVM) and we have some apps trying to run on top of it.

They have a tough job because apart from some basic stuff, like the ability to send funds from one account to another and maybe store some data, they need to take care of pretty much everything else. It's like building a mobile app on a smart-phone without having Android or iOS at your disposal. It’d be pretty hard, I guess.

So what are we missing here?

Right, we need an operating system.

And this is what EOS brings to the table.

OK, so now let’s go through all the major features that make EOS unique.

We’ll discuss them one by one.

We will start with a very bold claim: on day one EOS will be capable of at least 50k trxns per second. Maybe more.

Let’s take a look how this fits into our market landscape.

How is EOS going to achieve that? It's gonna do it in two dimensions:

* Firstly, via enormous speed of sequential processing. EOS uses a solution borrowed from a currency exchange engine called LMAX, which is capable of millions of trxns per second on a single thread.
* On top of that we'll have parallel processing, made possible thanks to a clear separation between the things which can be done in parallel and things which cannot. This is an important distinction because not everything can be subject of parallel processing, e.g. managing an order book of a decentralized exchange always needs to be run on a single thread.

And what helps a lot to speed things up, is the fact that in EOS there is no such thing as gas – the processing power is free, we will talk about it in a moment. As a result, a lot of complexity is being eliminated, as you don't need to count all the tiny operations performed inside the VM.

Anther helping factor is the fact that in EOS nodes establish consensus over events, not over state, as is the standard in all other blockchains. So in EOS state is derived from events. At first this might look like an unnecessary complication, but it actually simplifies a lot of things inside EOS and it allows for powerful optimizations.

In EOS the assumption is that no matter what, bugs will be happening and handling them in an orderly manner is treated as integral part of the business.

To this end, block producers will have the ability to freeze & fix broken apps – of course only in case an app is unable to recover from a bug on its own. Of course, if block producers abuse this power, they will be voted out by the shareholders.

What else have we got? There'll be a built-in governance mechanism, including a legally binding constitution, an arbitration system for resolving disputes, and an entire system of shareholders voting to decide on things like the level of inflation and the way the income from inflation is being distributed.

So for example the constitution will guarantee that the maximum level of inflation will be say 5%, and shareholders voting will decide how to distribute this income.

Basically, EOS itself acts like a fully autonomous decentralized app whose business is hosting other decentralized apps.

In EOS developers only need to write code for what's unique for their application. All common features, including low-level stuff, are provided by the blockchain.

Those features include: account permissions, account recovery, scheduling, authentication, inter-app communication, biometric 2nd factor validation.

Account recovery might be especially interesting here. It works like this: if you get hacked, and the hacker changes your password, so that you can no longer access your account, you can get your account back, if you know the previous password.

Furthermore, EOS provides every application with its own private database. The system has a built-in storage solution based on IPFS and maintained by block producers. And this storage solution is free to use by your app, provided you're a token holder.

This is my favorite. Your EOS tokens are never consumed, as there is no such thing as transaction fee or gas payment for running a smart-contract.

If you're a shareholder, you can use the system for free.

The deal is very simple: if you own 1% of the tokens, you own 1% of the network, including all its bandwidth and all its resources.

However, if you still prefer the Ethereum pay-as-you-go model, you can rent EOS tokens, instead of buying them, and this way use the platform on pay-as-you-go basis.

The point is, you have a choice.

As a result, you can monetize your app any way you want.

This one looks quite innocuous but actually it's a big deal. What this means is that the source code of your app can be recompiled in the future.

It also means that EOS can have multiple VMs and your contract can switch from one to the other.

Also, your smart-contract becomes upgradable, so you are no longer stuck on the very first version of your app.

And now I'll tell you a little bit about EOS origin.

There are two ways of building a smart-contract system:

* Either you start by creating the damn thing and then try to use it to run concrete apps on top of it. We might call it a top-down approach.
* Or you start with building a couple of concrete, non-trivial apps, make some mistakes when doing it, learn from those mistakes, and as a next step try to figure out what's common between your apps, and only then start building the abstraction layer. So it’s a bottom-up approach.

You can make your own judgement which one is more likely to be more effective.

Unfortunately, the prevailing approach in the crypto-space is the first one, top-down. Teams of very talented people are creating abstract smart-contract systems, and then they are confronted with tough reality when they try to build something useful on top of it.

EOS goes the other way, bottom-up. The team behind EOS has built some of the most successful blockchain apps in the crypto-space, and now they set out to leverage their experience by building a platform for hosting such apps.

And when I say most successful apps, I don't mean market capitalization, I mean how popular those apps are among actual users.

This is what it looks like. BitShares and Steem were created by the same developers who are now behind EOS.

And those two apps are very different: BitShares is a decentralized exchange, whereas Steem is a social media platform.

As you can see, Steem is the most used blockchain app in the entire space. BitShares is pretty popular, too.

This is what their UIs look like. Those are very complex apps. They still have their deficiencies, but they work smoothly enough to trick you into thinking that they are just normal web apps. They have a couple of amazing features, e.g. account recovery was first introduced in Steem.

And one more interesting thing: while those apps are quite popular among users, in reality none of them could run on any existing smart-contract platform, including Ethereum.

Why is that?

Firstly, because those two apps alone would eat up all processing power of Ethereum.

Secondly, Steem business model requires that all user actions are free of charge (as otherwise nobody would upvote anything). Ethereum is unable to offer that and most probably never will.

The heart of EOS is its consensus mechanism called DPOS, which stands for Delegated Proof of Stake. We don't have enough time to go into the details, so I'll just do a quick overview.

Basically, there is a fixed number of block producers (around 20) and all of them are elected by the shareholders, each voting according to their stake.

The whole thing is powered by reputation, which, when treated as a resource, has some very interesting properties: it's hard to earn and easy to lose. Actually, reputation works in a similar way to a deposit, which might be forfeited if you misbehave.

And DPOS, as an incentive scheme, leverages this simple fact. As a result DPOS allows for efficient decision making, while ultimate power always rests with the shareholders.

Because the number of block producers is limited, the whole thing runs amazingly fast - your transaction is almost fully confirmed in just a few seconds.

And this chart proves that, contrary to most opinions about it, DPOS is the most decentralized system out there.

Of course, only if we use a rational measure of decentralization: that is counting how many unique entities are involved in producing something like 80 or 90% of the blocks.

Anyway, I understand this is a very controversial subject, so let's move on to the actual reason why we want a system to be decentralized in the first place.

And I guess the answer is this: decentralization is just a means to make a system resilient to attempts to take it over from the inside or shut it down from the outside.

And in this respect DPOS is very powerful. And very flexible. It can adapt to extremely tough conditions and still survive, and then fully recover. This is mainly because in EOS it's very easy to replace non-performing block producers.

* EOS has a very efficient team with a proven track-record. Steem was invented, created and launched in just four months. And this is probably the most complex blockchain app currently in production.
* EOS is using Web Assembly as a VM for compiling & running smart-contracts. Web Assembly is a big deal - it's an emerging industry standard for web applications supported by Google, Microsoft, and Apple. You should look it up, but basically it's a universal compile target for several programming languages, including C++, C#, Java, JavaScript and possibly even Ethereum's Solidity.
* Regarding EOS financial supporters, we have some big names there: Brock Pierce and Bo Shen. Interestingly, both of them were also early investors of Ethereum, and still are.
* And last but not least, we have a declaration from EOS founders to spend about 1 bln USD on creating an ecosystem around EOS. Apparently, this is where most funds from the currently running ICO will go - not on EOS code development (as this is already fully funded) but on those of you who will try to do something useful with EOS.

Unsurprisingly, EOS has also got its weak points.

* Generally, people are skeptical about EOS being able to deliver on its promise. This is not really surprising, as what it’s attempting to do is quite unprecedented. I guess some of you are skeptical at this point as well.
* The other problem is that the ecosystem around EOS has not really emerged yet. But it’s growing day by day.
* Also, using C++ is right now the only way to create smart-contracts on EOS. This will surely change, as Web Assembly gets upgraded, but unfortunately at this stage this might be a big turn-off for developers who are unfamiliar with C++.
* And it's not live yet, but it will be in June next year.

This is the roadmap. Currently we are at the MVP stage.

You can already play with the system on your local machine and start building smart-contracts with it, provided you have some basic knowledge of C++.

In a couple of days there'll be a subsequent release, called Dawn 2.0, and there’ll be a public test-net up & running.

Let's revisit our crypto-space problems. You can see how EOS features nicely match just about all of them.

I hope all of this is self-explanatory, maybe except the last one - inter-blockchain communication.

EOS works like a giant email server, as it's based on messaging. And all messages in EOS are asynchronous. This is the opposite of all other smart-contract platforms, where the smart-contract communication is fully synchronous.

And it just happens that asynchronous communication is the only way to arrange communication between blockchains. As a result, EOS apps can communicate with each other NOT only within the same blockchain, but also across blockchains.

So, if we had multiple EOS blockchains, both public and private, everything could be fully interconnected.

And we can also revisit our list of requirements for decentralized apps. As you can see EOS is doing a pretty good job here.

The only weak point is the lack of robust development environment – I have to admit that it will be hard for EOS to match the high number of developers currently attracted to Ethereum. But hopefully this will change in the coming months.

* What sets EOS aside, is not just the technology. It's actually the way it's going to operate, e.g. the unique role of the token.
* EOS builds on solutions which have already been battle-tested in real-life blockchain apps.
* EOS takes the notion of smart-contracts to the next level, as it is extremely business oriented: you can reliably build businesses on top of it, businesses with predictable cost and ones which will scale.
* Can other systems (like Ethereum or Neo) copy EOS solutions? Not really. EOS is quite different from anything else on a very fundamental level. To follow EOS path, other platforms would have to backtrack a lot regarding the fundamental elements of their technology. So, it's very unlikely.

And finally, this graph shows the conclusion we have reached when observing how blockchain technology evolves.

Back in 2008 we started with a simple payment system, which then evolved into a smart-contract system, which now is about to evolve into a fully blown operating system, not just for smart-contracts, but for entire blockchain-based apps.

Will EOS replace Ethereum? I don't think so, at least in the predictable future. But what will probably happen is EOS playing the same role for Ethereum, as Ethereum is playing for Bitcoin.

* Our focus is on blockchain-based fundraising and digital asset management solutions.
* We are in the process of setting up a software house dedicated to building dApps, both on Ethereum and EOS.
* And we are aiming to be elected as an EOS block producer. We have some experience with that, as one of our advisors is already a witness for Steem.