

GOVTECH DECODED
EPISODE 3
BUILDING BLOCKS OF A RELIABLE TECH STACK

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Guests: Liyana Fauzi and Charis Anne Lim

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[Liyana] So is it true happy developers equals great apps?

(Intro music)

[Alicia] Hello everyone and welcome to GovTech Decoded where we decode technical speak. In this series, we will discuss hot tech topics and how the Singapore government leverages technologies to build tech for public good. I'm GovTechie Alicia.

[Michael] And I'm GovTechie Michael and we're your hosts for today's episode. Today we're talking about tech stacks. So we've invited two experts to join us. They are Charis and Liyana. Yay!

[Charis] Hi, so I'm Charis. I'm the design lead for GatherSG, which is an internal case management product of sorts that actually aims to help improve inter-agency collaboration and coordination.

Yeah, so I guess a fun fact was that I actually studied computer science. So I was on track to be an engineer. But then I realised that I would actually really enjoy talking to people, understanding how they behave and translating that into my job. So I kind of pivoted into UX design. And here I am.

[Alicia] I also pivoted to UX design after studying computer science.

[Liyana] Hi everyone, I'm Liyana. I'm currently the lead product manager for the SG Tech Stack, which is a suite of developer tools, and we'll talk more about that later today.

So I have had a pretty diverse career in tech, ranging from digitalisation strategies all the way to now looking at tech stack adoption, as well as developer productivity. I do quite a few things in GovTech. Together with Alicia, I'm also the [Women in GovTech Employee Resource Group](#) co-chair, and I'm very interested to talk about diversity in the workplace. So I really do enjoy what we do with the tech stack. Looking forward to talking more about the tech stack today.

[Alicia] So welcome both! Let's dive into today's content about tech stacks. For our audience who might not be familiar, Michael, would you like to share in simple terms what a tech stack is?

[Michael] So even if you might not know what a tech stack is, you're actually making use of it every day. As you scroll through on TikTok, Instagram, Facebook, you're watching or even watching this on YouTube. These are apps that we all build on various technologies, and they're all part of a set of tech stack.

[Liyana] So you guys have seen my shirt, it says stack here. So in the government, we have our own [Singapore \(Government\) Tech Stack](#) too and many of our apps and products actually tap on our tech stack.

So a tech stack stands for technology stack. It's a set of technologies used to develop an application including programming languages, frameworks, databases, front-end and back-end tools, as well as APIs.

So Charis, I hear you have an amazing analogy about the SG Tech Stack. Would you like to share more?

[Charis] Yeah, so I guess it's an analogy that we use with our stakeholders to kind of explain it in more layman terms. So I think if you can think about it, it's kind of like building a BTO. So you know, to do that you need to have land, I guess that's the most simple. So you need that foundation there. So that's the first step.

[Liyana] So that's like our [Government on Commercial Cloud](#).

[Alicia] So what is Government on Commercial Cloud?

[Liyana] So the Government on Commercial Cloud is actually the government's alternative to the commercial cloud providers out there. What we've done is that we've made it compliant with some of the government policies and requirements so that we do it one time, so that all the agencies can use the government on commercial cloud moving forward. So that's been around for a while and I think we've been pretty successful at rolling it out.

[Charis] Right. So it means all the products kind of like exist on the cloud in the same sense that all the different flats are built on this land.

Yeah, so I guess, okay, then from the foundation, that's when you start building, you're putting your concrete, your piping, your electrical trunking, that kind of facilities to enable all the different amenities within the blocks. So actually, yeah, what products do you think would work?

[Liyana] I think that would be quite similar to, you know, when you're putting the structure of the environment. It's kind of almost like one of our products called [SHIP-HATS](#), which is for source code management, and it's a toolchain product for running tests and for deploying the actual application. So kind of deploying a building of sorts onto the land.

[Charis] Right. Yeah, so if that's all settled, then you can start building and then you have the individual flats. So I guess that's where all the different products that GovTech builds, kind of resides in.

So I think for us and my product, we actually benefit a lot from this SG Tech Stack because we don't actually have to get the foundation ourselves. We don't have to do our electrical trunking ourselves. We don't have to, you know, build brick by brick from scratch. So it really saves time. And we just, you know, have to focus on interior design, I guess, to put it simply.

[Michael] So speaking about BTO and building blocks, let us play a game to illustrate what a tech stack really looks like. Let's go!

(Transition music)

[Michael] And now we have a game section. So in this game section, we'll be building a web application. Everybody's ingredients on the table represent a different part of our tech stack, SG Tech Ttack. So the bread represents the cloud, and then the programming language and so on and so forth. So in the next 15 seconds, you should put all these together into the ideal tech stack for a web application that citizens can use. One, two, three, go!

Let's look at our two burgers that we built. So Liyana, tell us a bit more about your tech stack.

[Liyana] Okay, so my tech stack has the burger, which is the cloud. It doesn't matter which cloud provider. Then for the cheese. Cheese represents the front end. Meaning React and maybe Tailwind. And then this (patty) represents the programming language, Node.js. And this represents, you said a web app, right, so I'm assuming you use a database, maybe MongoDB for structured data. And then this (pickle) represents the deployment. So maybe using containers, Docker, Kubernetes.

Oh no, the burger upside down.

[Michael] Flip it around. And we have a tasty tomato, cheese, pickle burger! Not bad. And Charis?

[Charis] So for mine, I guess also the cloud. The foundation of any system. And I also have a patty, but this is a chicken patty. Chicken patty. Yeah, so I think I chose... Sorry, what it represents, not the actual patty. Sorry, sorry. This is Node.js as well. I think I chose it because I think our developers are familiar, and this is something that they're used to. So chicken patty, they know how to cook it, they know all the different ways of using it, adapting it, and stuff like that. I also have React and Tailwind, so I think this is what my product developers use.

I think all these very commonly found ingredients are helpful because there's a lot of people who know how to deal and make recipes with these kinds of ingredients. I guess the only difference for me and Liyana's burger is perhaps a different database. So I think we use Amazon, I think Aurora. So I think that is the lettuce.

[Michael] Awesome. And here we have the awesome tech stack. So you can tell that we can recombine all the different components in our tech stack to build any

kind of web application. And that's what we want to give to our developers in GovTech, the ability to recombine and build things that will serve our citizens.

[Liyana] Actual tech stacks, not burgers.

[Michael] Yes, actual tech stacks.

(Transition music)

[Alicia] The Singapore government actually has our own tech stack called the SG Tech Stack, and Liana is actually the lead product manager in GovTech for the SG Tech Stack!

[Liyana] So maybe I can start by sharing some history about the SG Tech Stack. So actually, this dates like 10 years ago. I don't know, I think some of you may not have even been in GovTech then. But 10 years ago what happened was that a group of software engineers, they had actually sat together to pull together several products that they needed in order to do their own software development.

So they started out with a toolchain product for source code management. Now it's called SHIP-HATS. This product also enables them to do testing and deployment, and over time they realised that this was something that everyone needed. So they started within the government digital services team and the pioneering team. I think some of them are still in the SG tech stack team, so a shout out and kudos to the pioneering team of the SG Tech Stack. If they hadn't done this 10 years ago, who knows what we'd be today.

But if I could fast track to like a few years later in 2020, there was around the period when, or even slightly before that, that was around the period when the SG Tech Stack was labeled as a strategic national product due to its importance in being a digital infrastructure for the government. What happened was that over the years, more and more agencies started developing more applications, and we also started doing things a lot more in-house. So we used to outsource a lot, but now we do more in-house, more co-source and still outsource to some of our partner vendors. So they also needed a tool that's part of the SG Tech Stack.

And it didn't make sense really for agencies to develop their own tech stack because then you just have duplicative efforts across the government. So what happened was that we then opened up the tech stack to more users beyond the government digital services or government digital products team. And today there are many, many agencies that are using the tech stack today.

[Charis] So Liyana, how many agencies or users are using it now?

[Liyana] Yeah, great question. So it's quite surprising even for me seeing the growth of the SG Tech Stack. When we first kind of started out, there were about 25 agencies across like about 1,007 users. Today we've grown to cover more than 60 agencies and close to 5,000 users. So our users include both public officers as well as partner vendors.

[Alicia] Sounds super amazing. Four years already.

[Liyana] So GovTech is the lead agency for building the tech stack. We are also the lead agency for digitalisation. As you guys may know, I think Charis you work with agencies as well, a lot of the agencies are now developing more apps. We've seen the shift in the past where we used to do a lot of outsourcing. So if you take us back to maybe 10, 15 years ago, the government used to outsource a lot. Today we're trying to bring more of these capabilities in-house. So we do more co-sourcing. We still do a fair amount of outsourcing. But there's a lot more emphasis to say that we want to build these capabilities closer to the government. So that's why things like the tech stack are really important for developers that work for the government, whether you're a public officer or you're a vendor partner that we work very closely with.

[Michael] So Liyana, what are the key components of the SG Tech Stack?

[Liyana] Great question. I should know this. So the SG Tech Stack has many components within it. Maybe we'll start at the very bottom. So like what Charis mentioned earlier about the foundations, starting with the Government on Commercial Cloud, this is kind of our so-called hardened version of what's available in the market. The Government of Commercial Cloud basically is the hosting layer that has already been built in with the right security and whatever requirements so that government applications can be hosted on the Government of Commercial Cloud. So that's the very basic.

And I would say the next most basic layer is what we call SHIP-HATS. So this is our source code management and toolchain product. This allows agencies to be able to store their source code, run tests, and do deployments. It's really the very basic fundamental tool that most application teams will require. So that's SHIP-HATS.

Then the next few layers are things that may be not required by every single team. So, for example, we have a product called [C-Stack](#), which is for containerization. Some teams may use containers, some teams may not, and containerization really is a way to deploy your application into the next environment.

And then another product that is also maybe not used by everyone, but used by some is what we call [APEX](#), which is for API management. So this is the layer or the part of the SG tech stack that actually enables different applications to speak to each other using APIs, which are application programming interfaces that are commonly used in software engineering.

And maybe I could highlight a few more products. There's another product that's called [StackOps](#). So can you see a theme here? Everything is stack. C-Stack, StackOps, Stack. So StackOps is actually our monitoring and logging solution.

I don't know, Michael, when you do, when you do monitoring for your applications, do you also monitor your applications?

[Michael] Yeah, of course. All applications will emit some kind of logs so you can troubleshoot and figure out what's going on with your application..

[Liyana] Yeah, so essentially, that's what StackOps is about. And then maybe a couple more products I could call out are things that we call [CloudSCAPE](#) and [CodeSCAPE](#). So these are dashboards that actually automate the monitoring if our applications have met several of the requirements, in terms of policy requirements, best practices. So that's CloudSCAPE and CodeSCAPE.

So yeah, I think in a nutshell, those are pretty much what makes up the SG Tech Stack and we're always looking to build more components into the tech stack. So we're looking, I think, probably the next few products might be something related to data engineering. I think you all know AI is a huge topic today. So that might be something that will eventually come forward and be a common product across government.

[Alicia] Okay, so Liyana, what are the benefits of having our own SG Tech Stack?

[Liyana] Yeah, who do you think benefits from the SG Tech Stack?

[Alicia] I think you mentioned developers, partners like agencies and vendors, and maybe the downstream is the citizens, businesses, normal everyday citizens.

[Liyana] Yeah, yeah, that's absolutely right. It's interesting that you highlighted developers as a main user and then the downstream are citizens and businesses. In fact, when I first joined the team, we were always talking about how happy developers would lead to great applications. And I still think that's really true. Because if your developers are happy with the setup of the tools that they're using, they're likely to be able to generate really great applications.

So one of the main users for the SG Tech Stack and the center of why we do what we do is really developers. What we try to do is to abstract away all the complexities from them having to set up their own tools, so that they can just focus on app development, and that's really one of the main benefits, taking away that complexity. The complexity comes in many forms, having to make sure there's compliance, make sure there's security needs being met, so that it doesn't have to be done multiple times by different developers. So that's just done once at the SG Tech Stack level. So developers are really at the heart of what we do.

And of course, the downstream benefits to those end users, like citizens and businesses, who may not know that SG Tech Stack powers a lot of the applications that they actually use today. So the benefits to them are really a few, and if I could call out some of them, one of them is really the fact that you can get access to application updates a lot faster, because when the application is on the SG Tech Stack, your source code is being stored. You can run through the tests within the so-called toolchain. It means that applications get delivered to citizens a lot faster and citizens can be assured that the application is of high quality, or it has met all the security needs.

So an example I'd like to share is, during COVID time, there were applications that had to be rolled out really quickly because of all the various changes to all the COVID rules and all the policies. So applications were able to be delivered really

quickly because they were already on the SG Tech Stack. Everything was set up. They just needed to make changes, and the beauty of it is that you could roll out a new feature, but with the knowledge that the application was secure, was of quality and something that's easy to use without much downtime required.

So I think that's one of the benefits. Another benefit that I think we should call out is that with the SG Tech Stack, it means that there's a seamless digital experience across all developers within the government, regardless whether you're from agency A or agency B. People can actually feel free to work for different agencies and ensure that they have a good experience developing apps for the government.

[Alicia] So Michael, if today the SG Tech Stack did not exist, what would your reaction be?

[Michael] PANIC! You see, my product team uses the SG Tech Stack quite extensively. So without SG Tech Stack, we would not be able to roll out our applications so quickly. For example, our application is hosted on GCC and our source code management is done on SHIP-HATS and our continuous integration, continuous deployment, integration and unit tests all runs on the ship and hats as well. So it's like we click on a button, we can deploy our app very easily through.

[Liyana] And you had a deployment last week, right?

[Michael] Yes, we had a deployment last week as well, and we all were in the office. The deployment was so fairly simple, just click a button, it's out there. We had a bug, we had to fix it, and we were able to roll out the fix also very quickly, because it was so easy to just deploy things on the SG Tech Stack.

[Liyana] So is it true that a happy developer equals great apps?

[Charis] I think that what Liyana mentioned, all these different agency teams that we work with also... I think the tech stack is also extended to them, be it the vendors we work with or our own development team, all of us make use of all the different products that I think Liyana mentioned.

[Liyana] I'm so happy to hear that!

[Alicia] Thanks, Liyana and Charis for sharing all about the SG Tech Stack. I learned so much. I'm really amazed that we have one for ourselves and I'll definitely go and look up more about this later.

[Michael] So if you're keen to find out more about the SG Tech Stack or resources that we have discussed, you can check out our site at <https://go.gov.sg/GovtechDecoded>.

So if you like this episode, please share with others and post it on social media. You can follow our speakers at their LinkedIn and follow GovTech on our social media platforms. Find it out by going to <https://go.gov.sg/ConnectWithGovtech>. We'll leave all the links in the description.

[Alicia] I'm Alicia.

[Michael] And I'm Michael. And we'll catch you in the next GovTech Decoded.

(Outro music)