Public Sector Future

EP XX

Guest Host: A.T. Ball

Guest: Rob Clifford

[TCR 00:00:00]

**OLIVIA NEAL**: Hello and welcome to Public Sector Future. This is a show for anyone who cares about using digital approaches in the public sector in order to deliver better outcomes. Today we’re going to be focusing on digital transformation in defense and intelligence organizations, and I’m delighted to be joined by guest host, AT Ball. AT is part of the Defense and Intelligence team here at Microsoft, and prior to joining, he had a 30 year career in the US military, where as a distinguished commander and aviator he built extensive, on the ground, experience in operations around the globe.

Today, AT is joined by Rob Clifford, Chief Data Officer for BAE Systems, Maritime and Land Division. They’ll be discussing digital engineering, covering what this is, what the benefits are, and how organizations can move from more traditional waterfall engineering models into development with more agile systems and procedures, cloud-enabled technologies. Over to you, AT.

[01:17]

**AT BALL:** Welcome, Rob. It’s super to have you here

First of all, who is BAE Systems, what – what’s your mission, and what do you do out there?

**ROB CLIFFORD:** Great question. Well, thanks, first of all, for having me on. I’d love to answer that. So BAE Systems, we’re one of the largest defense contractors in the world. We employ upwards to 90,000 people in 40 countries, so really dispersed geographical base. I suppose the mission statement is to work closely with local partners, to support economic development, for transferring knowledge skills in technology.

We’re a big company. We cover a lot of ground, and our defense solutions protects people in national security, critical information infrastructure, and we have a diverse portfolio of customers, so there’s never a quiet moment. We’re always looking to deliver that competitive edge across air, maritime, land and cyber.

So one of the big players, the biggest in Europe, and one of the largest in the world, in the defense space.

**AT BALL:** I would like to understand, what is your role, and your objectives, and how do you see this digital transformation occurring within your company, and how you play a role in that?

**ROB CLIFFORD:** So my role is chief digital officer for BAE Systems, Maritime and Land. I’ve been with BAE for four years, two of those as a consultant, supporting the UK’s Royal Navy on digital transformation, but two of those years in my current role.

My journey into this position wasn’t traditional in some respects. I started off as a library assistant, actually. I left university, worked in the library, and then joined the UK’s National Archives. I know you have a similar institution in the U.S. And from there, I moved into central government, into the Home Office, which is the equivalent of our State Department, and throughout that time, I suppose I was immersed in data and technology and information.

My current role really applies all of that into transforming some of the work BAE is doing to orchestrate information in the business and deliver for our customers. So I guess, at the heart of this, I’m excited by information. I want to help those in search of information to use it and solve problems to make their life better.

I’m one of those people who was – I suppose for Microsoft colleagues, I was raised on Encarta 95, if you remember that, the old visual encyclopedia. I don’t know, it – it lit a match inside me, so that ability to, I suppose use technology to take some really abstract ideas and apply them to problems. That’s been something that’s energized me.

And in BAE, you know, we are a fantastic business with a fantastic set of problems and opportunities for our customers. There’s never a dull moment, and information is required in every possible context. So for every piece of information out there, there’s probably someone who’s looking for that information. And so the puzzle piece here, or sort of the challenge is to connect that together, and technology particularly, which I know we’re talking about today, is one of those great enablers for that, and doing it at pace and at scale.

[04:00]

**AT BALL:** That’s a perfect segue, because the technology piece of this, as global defense and intelligence organizations embark on a digital transformation journey, they’re looking to technology to assist in the design, development and deployment and sustainment of military assets. And they want to do this with increased agility and speed.

You know, this is going to require a shift for both the defense organizations, but also the industry partners because they’re going to have to move from these legacy methodologies into a more advanced digital engineering approach with forces in industry collaborating across the entire mission capability lifecycle. And this is going to require a transformation moving from unwieldy and resource-intensive legacy procurement and development methodologies into agile and adaptive approaches that can deliver high value and innovative capabilities at the speed of relevance.

Do you, Rob, in your role, have a plan for how you might implement this sort of change within your organization?

[05:22]

**ROB CLIFFORD:** Yeah, absolutely, it’s not a small challenge to have. I mean, you’ve described a fantastic problem set there. In BAE, you know, as an organization, we deliver solutions to complex problems. As a global manufacturer, we have to embrace advances in technology and innovation is our sort of life’s blood. It’s what we do for our customers, and it’s integral to our business.

And what you’ve described there is what we call a high-assurance environment. What we do matters. The people we deliver for, those are the people who are keeping us safe. So there’s no second-best here. There’s no second attempt. We’ve got to get it right the first time, and we’ve got to do it at speed.

The sort of geopolitical landscape, as people wiser than me will tell you, is changing and changing at pace. We need to adapt to that, and the whole enterprise has a role to play in that. So when we talk about technology and we talk about data, what we’re trying to do is orchestrate those capabilities in front of us to deliver maximum effect, as you say the speed of relevance, to make that difference.

When you’re talking about some of the platforms that the BAE does deliver, and other partners deliver, you know, these are ships and boats, submarines that will be around for decades, so you have to sort of square that in your mind, that this is an enduring product that you want to deliver, that delivers a capability to our people, but you need to be able to—at all times—be able to looking for that edge, that innovation that will de-risk the delivery of that improved capability, and also give a much better, I suppose, product and service to the end user.

You know, that’s a particularly cold term. What we’re talking about when we say end user are the men and women, the people who are keeping us safe and defending us. So that engagement, the way in which technology can deliver for them is absolutely critical, so yes, we can talk about efficiency. We can talk about the effect, but that relationship we have to the people who deliver and work with these platforms, that’s absolutely critical.

**AT BALL:** I want to drill down on a couple of things that you pointed out there, and precisely what are some of the technologies that are useful in this process. I love this term. I hear it all the time, digital twins. Can you help for our listeners today, describe – okay, what are digital twins, and what benefits do they bring in the development of these very, very complex systems that you describe?

[07:41]

**ROB CLIFFORD:** So, I’ll try and set it out, if I can, as straightforwardly as possible. Digital twins, so let’s – start off– information, really important. Information delivered to people who can use that information, that’s what this is all about.

Digital twins are a real gamechanger for us, that whole field, or I suppose model-based engineering, where you don’t need to be an engineer to understand this.

A digital twin is effectively a data created or virtualized entity of a physical object. It’s that sort of virtualized view of a physical product.

Now, a digital twin can be of a thing. It can be an asset, a system. It could be a process even. The point being that there is a physical analog of it, and he digital twin is using the information we have to recreate that.

So why would you create a digital twin, and to what complexity?

Well, there are so many reasons why you’d do this. You might create them to test data or hypotheses which are very expensive or risky to test, again and again, or to actually test out many scenarios in parallel. When we talk about that speed and efficiency, we can’t afford to keep doing tests or research in sequence; we need to do it at the same time.

Digital twins ultimately, depending on how they’re used and depending on how information is gleaned from them, they can solve a range of problems. They can improve efficiency, they can de-risk outcomes. They can actually allow you, if you’ve got good enough data quality—and we’ll come back to this because that’s really important—if you’ve got good enough data quality you can start to predict outcomes and then you can start to change your entire system to reflect the outcomes you want to see.

So hopefully that’s done a job. The digital twin, it’s that virtual view of a physical asset created with data, hopefully derived from the physical asset.

**AT BALL:** I love the points you made about de-risking. Certainly, risk is a major factor for the end customer as you described, as well as the defense industry. But, I look at that as an incredible way to get at better outcomes at a much-reduced cost and being able to do it at a much quicker pace. it just seems to me, trying to do that development with actual physical models would be a costly and slow process.

**ROB CLIFFORD:** Yes, absolutely, and I think if we’re going to talk about digital twins and talk about technology, we also need to keep in mind that sort of wider ecosystem of capabilities. The digital twins, they’re great, great by themselves, but they also work in concert with these DevOps as an approach, the cloud, improved sharing of information.

When you start to orchestrate all of these things together, yes, you can see efficiencies. You can move away from that risk of getting it wrong once, and having to rebuild, but actually what you can start to do, if you connect your people together with that twin, with that information, you can share learning as you go along.

So the ability to do something in one part of the forest, to learn from it, at speed, and then share that insight, that virtual insight somewhere else, using the cloud, or using another means, that’s absolutely critical. That improves efficiency. It de-risks. And now, risk is a great word, because you can apply it either way. It can remove a problem, or it can remove the risk of not being able to go as fast as you want.

So these capabilities, when orchestrated together, can start to join up different teams and organizations, and receive real – I suppose real mood change and a change in the paradigm across the defense community.

[11:02]

**AT BALL:** Rob, I love the comment you made about partnering across the defense industrial base, and there have been multiple announcements about different areas where we’re teaming together to provide better technologies, our defense customers in the UK, in the U.S., in Australia.

**ROB CLIFFORD:** Yeah, so the relationship – I mean, with technology providers like Microsoft partners for our common customers is absolutely critical, I think in the modern connected digital ecosystem. You know, we all have to bring part of the solution to the problem.

I think if you look back, perhaps over your shoulder into the past, different organizations have tried to do the whole thing themselves, now that the future the future that’s going to be successful is working together to do that. Microsoft, you know, as a hyper-scaler, as a provider of cloud through Azure, and as a technology leader, it has so much to bring, that it complements the work and the knowledge of BAE.

BAE has a rich understanding of the military domain, of the operating environment and, again, we’ll get onto this, but multi-domain integration – I know it’s called slightly different things in different theaters, but you know, that ability to understand how you cause effect in different domains, different environments, and how you use technology to share that knowledge and assimilate understanding, that’s absolutely critical.

And I, you know, I’m really excited about the partnership with Microsoft, not just for BAE, but also opening up some of our suppliers and original equipment manufacturers to this and saying that we’re part of an ecosystem, what we’re gaining there for these partnerships is the ability to transfer knowledge, to share ideas and actually deliver far more efficiently for our customer base.

**AT BALL:** That’s a fabulous lead into the next thing I’d really like to share with the folks listening. We’ve described this movement towards digital engineering. Are there specific examples of this kind of work that you’re seeing done by BAE, for defense and intelligence organizations that use these modern technologies and digital approaches, perhaps examples that you can cite, that we can hold up as exemplars of transformation?

[12:54]

**ROB CLIFFORD:** Absolutely. One example that absolutely jumped out at me recently, it’s not necessarily in the manufacturing space, you would think, and we do understand, you know, digital twinning. Connectivity is really important there. This is actually in the training space for armed forces.

So, in the UK, recently, it’s been announced that BAE, working with partners QinetiQ and Inzpire, and that’s with a zed in Inzpire, are going to be doing work for the Royal Navy to develop a synthetic training environment. This means using advanced sensors to link together to create a digital twin, which can be connected to BAE’s combat system, So, BAE provides the combat system to the Royal Navy, so the idea being that the sensors which are deployed connected to that combat system’s digital twin can start to replicate a synthetic environment for training, and the idea being that the carrier task group, which involves the Queen Elizabeth carrier, can work together to simulate threat environments.

Now, this is a game changer. And combined with technologies like HoloLens, and AR and VR, what we’re starting to see is that sort of multidomain view, different environmental inputs, which, you know, this is – this is getting the best out of all these organizations. And at the heart of it is data. It’s data, it’s understanding, it’s knowledge, different technologies, different approaches coming together to deliver for that customer, who ultimately deliver for us, in terms of protecting the UK and the wider democratic world.

**AT BALL:** Great example. And some of the things you cite specifically in that example, I think, are just worthy of calling out. You mentioned mixed reality, augmented reality. You know, our HoloLens devices are a fabulous example of that, and the machine learning models. These are clearly all cloud-enabled technologies.

And I just wonder, because you called out data over and over again in our discussion today, Rob, I think, for all the right reasons, as you look at some of the modern systems that BAE has fielded and deployed for defense forces all over the world, they are increasingly loaded with sensors, and just add to this challenge that defense organizations and defense contractors have with the proliferation of data. And maybe that alone is one of the fundamental reasons why so many defense industrial companies and our defense organizations are moving to cloud technologies as a way to contend with that proliferation of data. How do you see that?

[15:30]

**ROB CLIFFORD:** So data, yes. (Laughter.) I mean, the data proliferation issue is a real one. I suppose as a data professional, I would say, you know, it’s the insight that matters, not the data. But how do you get to the insight? You get to the insight by crunching the data, by analyzing it. So, whilst the goal isn’t to get more and more data, the reality is we need those inputs. We need that variety of data sources to give us the insights that will give us that effective edge.

Now, you know, we are past the point where I think most organizations can manage the volume of data, the volume of analysis that’s required at the speed of relevancy in their own estate. I think, you know, companies, organizations like Microsoft and other hyper scalars have proven the utility of the cloud. It’s more secure, it has greater processing power.

And when you adopt, start to adopt new DevSecOps as a discipline, you can start to see that real immediate translation of understanding and insight from the cloud to where it matters. And you can repeat that and you can scale it. So, it doesn’t surprise me at all, that, you know, cloud is a critical part of most planning and major organizations in the defense community.

Now, we all know, there are, you know, questions around how do you orchestrate that in the high assurance environment, but there are answers to that as well. And it’s not an all or nothing thing. It’s not a zero sum game. There are different places where you can start, and there are still huge benefits to be seen by even taking the sort of smallest step into that environment.

So, I think, you know, if you’re a modern defense organization, or you’re delivering to the defense community, we all know that data, IoT, the amalgamation of sensor information is going to be critical to the next gen of capability. So, we need to make sure we have the infrastructure, the culture and the tools to make the most of them. all of the directions point towards cloud as being the enabler for that.

**AT BALL:** Rob, you said some interesting things that I think deserve a little bit more explanation, particularly when it comes to working environment and collaboration with partners across an ecosystem of defense partners, and those who would provide solutions for the end users.

Can you talk about how smaller independent software vendors, might team and work with Microsoft and BAE, in terms of the ultimate delivery of cutting-edge technologies for our customers?

**ROB CLIFFORD:** Absolutely. I think a commonality between BAE and Microsoft, as two primes in this space, is that we integrate solutions from other parties be that SMEs or large scale primes as well. So, you know, when I talk about a platform, and to be clear, I’m talking about a warship, a submarine. But the platforms we build, you know, these are high tech things. They’re large scale.

BAE provides the integration of solutions on to that. We provide our own solutions, but we work with partners like Microsoft, and we work with our vast supply chain, both in the UK and internationally, to make sure their cutting-edge solutions find a way into these products.

I think a great example is some of the work, and you may know of this yourself, but the combat systems teams and the naval ships business have been working with Microsoft to essentially create an open architecture, which can enable, from a software development kit, third parties to bring their capabilities into that platform environment.

Now, this is all – it’s all public domain, and it’s really exciting. I think in the past, the idea that you would deliver all of the capability to your customer yourself was, you know, dyed into the wool, as it were, or in the blood. But actually, now, to get the best of the market economy, and to get the best of those solutions, we, BAE, Microsoft and others, we need to be opening up our platforms, our services to integrate and incorporate these solutions as well.

So, we do a lot of work in this space. And, you know, it’s – BAE is a collection of different organizations working together to deliver the result for a customer.

**AT BALL:** I just love that explanation. We’re a collection, when you describe BAE, because this move, Microsoft was guilty of this in the past as well. And now, we’re an extreme proponent of modular, open architectures, and incorporating these open architectures, because it provides for technology insertions and enables sharing across defense industrial partners, but also across our coalition allies.

And I want to get one last thought in before we close out today, because we are seeing this, Microsoft, as we try to introduce new technologies, like for example, the IVAS program with U.S. DOD, that there is a desire, increased desire for defense organizations to actually work with industry in the development of these new technologies. Are you seeing that in BAE? And how is that being manifest for you in the delivery of your systems?

[20:25]

**ROB CLIFFORD:** BAE is, you know, a signatory we have in the UK, the Armed Forces covenant alongside other institutions. We pride ourselves on the fact that a lot of our staff and employees have come from the armed forces themselves. So in a cultural sense, you know, we’re already working very closely together.

But in that sort of co-design or co-engineering, if I can call it that, in that respect, yes. You know, we’ve seen in the UK, we see it in the U.S. and elsewhere, everyone’s really clear about where we’re trying to get to and what the sort of next technology revolution is going to look like in the defense space. And it’s going to take all parties working on the solution together.

And, you know, that can take shape, both in the technology domain, but also from commercial, from strategy. We need to educate our customers on the art of the possible, and our customers need to be more demanding of defense primes and vendors to say, look, this is what we’re trying to get. This is the effect.

And I’ve got to say, you know, technology is becoming more complex all the time. It is a – there’s a steep learning curve in this space. We don’t want it to be steep. We want it to be more gentle, and we have to help each other with that. So, we need people who can go out there and translate what effect the actual armed forces are requiring, what capability they want to see in domain, and then understand how we unpick that and set up the technology solutions, the manufacturing processes to deliver that.

And I think it’s a partnership in development. We’re going to see more and more of that close collaboration. We don’t have the time or the money to spend thinking about this. We need to actually just get on with it and working together.

[21:48]

**AT BALL:** Rob, that’s brilliant. I wonder if you have faced any blockers in that regard with defense organizations or with procurement policies or procurement agencies that have inhibited your ability to work directly with the end users to make your design and your develop more responsive to their needs.

**ROB CLIFFORD:** I suppose I’d turn that on its head slightly. I would say, as someone who’s new, new to the defense domain, in some respects, from different background, what I see here are challenges very similar to those faced in other parts of public service and public sector. They’re just, I suppose they’re being gripped now in the defense domain, because this is a high assurance sector, because things need to be understood and really carefully tested before they’re applied.

What I’m seeing is some of these problems are eminently solvable. If I were to list them, well, it’s the usual suspects, you know. Rather than any one specific procurement policy or strategy, it’s time, it’s complexity, its understanding. It’s making sure that that ideas market is open and accessible to everyone. I think the main thing is there can be disconnects, and we take too long to understand that we’re all talking the same language to start with.

And, you know, a great example, and I was discussing this actually, recently, with Microsoft colleagues, is we talk about software engineering. That means different things in different contexts. If you’re delivering a highly secure platform that needs to be at sea for the next few decades, you have a really specific technical keyhole you’re working through. That is distinct, perhaps from some digital natives’ approach to software engineering, which is focused on agility, speed, standing things up, locking it down as quickly as possible, but these are totally complementary disciplines. Totally complementary. So, I just think, you know, a bit more education, a bit more understanding. I don’t think there’s any will to work across purposes. That’s my rose tinted view on this.

[23:41]

**AT BALL:** (Laughter.) Oh, I’m the eternal optimist also, Rob. So, I just want to wrap up our session today and thank you for being such an informed guest on the topic.

If people want to learn more about BAE and want to understand more about the way that you develop and bring to market systems for defense and intelligence customers, where can they go to find out more?

**ROB CLIFFORD:** That’s an easy one, for me. I think the starting point, I’d have to say, is the company website. You know, there’s a lot of material there. I think part of BAE remit, yes, it’s to deliver products, but it’s also to educate that, you know, on the capability and why we deliver it. So, I think I’d start there.

I think if you want to understand more about, you know, digital engineering, digital twins more generally, there’s some great work being done in the UK and internationally. Team Defense Information has produced a lot of work here, and that’s a cross industry group, not for profit that’s really doing some of the academic work on this. Similarly, Tech UK.

But, you know, if you want to open a conversation, I’m very happy to do that. And you know, please don’t hesitate to roll over to the BAE page and see what you can find out.

**AT BALL:** Well, thank you so much. for being our guest today, and I look forward to collaborating more with you in the future.

**ROB CLIFFORD:** Great, absolute pleasure. Thank you for having me.

[24:55]

**OLIVIA NEAL**: Thank you to Rob and to AT for sharing their insights, and thank you to you for joining us today. Check out our show page for links to all of what was discussed today and visit us at wwps.microsoft.com. Please do reach out and send us your questions and your feedback.

As always, you can find me on Twitter. I’m @LivNeal. I’m also on LinkedIn, where you can also find guest host AT Ball. Or you can email us at Ask-PS@microsoft.com.

Thank you and see you next time.

[25:43]

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