Dimension Data: Enabling Our Clients' Digital Transformation Journey

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Abstract

There are emerging and disruptive technology domains that are driving the formation of the next generation of digital enterprises. The Group CTO Office at Dimension Data (part of the NTT family since 2010) investigates and tracks these emerging technology trends to assist our business units in developing client solution strategies to address the impact these technology domains will have on our clients' digital enterprise strategy. This article explores the opportunities around artificial intelligence and machine learning, Internet of Things, and blockchain, and highlights Dimension Data's capability to provide the full stack and underlying infrastructure to truly enable these disruptive technologies for our clients.

Keywords: AI, IoT, blockchain

1. Introduction: dawn of the digital transformation economy

We are seeing the dawn of the digital transformation economy. This is characterized by enterprises utilizing next-generation platforms to create value and more importantly, gain competitive advantage in the market via new offerings and business models. Generically, *digital business* is an overarching theme that covers how the blurring of the physical and virtual worlds is transforming business designs, industry markets, and organizations. What is occurring now is that the continuing digital business evolution is exploiting new digital models to align the physical and digital worlds more closely for employees, partners, and customers. This digital transformation is happening on a macro-economic scale as all types of industries act to deliver digitally enhanced products, services, and experiences to their end-customers. Rich digital services will be delivered, and the development of those services will all happen at a faster rate and to a larger scale when it comes to reaching end-customers and/or consumers, and intelligence will be embedded in everything behind the scenes.

There are various economic and social changes and models that are shaping how businesses are investing in digital transformation. Let us call them the drivers of digital transformation. One economic driver is the fact that there are new funding models that are affecting both the demand and the supply side, especially when we witness a shift in focus from CAPEX (capital expenditure) to OPEX (operational expenditure) as technology software solutions are delivered to the market.

Another key driver is the rise of computer-based intelligence and the fact that all of us are holding computers in our hands today. This changes how we interact with the world around us, with the technology around us, or with the endpoints around us, whether in our work lives or personal lives. Data is rapidly becoming a form of digital capital. Data has real value and has become a way of exchanging information but also exchanging value between organizations or between individuals. The more we can apply data to business processes and decision making, the more value our clients are going to get out of their business, and their ability to digitally transform their business will increase.

Finally, there is the platform economy driver. Whether it is a cloud platform we are talking about,

social platforms, or device platforms, we need these platforms to be able to scale, leading to more effective business operations resulting in increased revenue and better profit margins.

Those drivers lead us to some pretty disruptive trends that are having an impact on, and will evolve, the digital enterprise. They are evolving the end user experience to be more engaging, more robust, and more immersive. These innovations will also enable businesses to engage directly with customers through merging digital forms and to operate their business more efficiently by enabling employees to perform their business functions with the speed and scale that the new digital transformation economy demands.

You could say an intelligent digital mesh of technology is emerging to support the future of digital business and its underlying technology platforms and information technology (IT) practices. The mesh focuses on people and the Internet of Things (IoT) endpoints, as well as the information and services that these endpoints access. Artificial intelligence (AI) and machine learning are the means of injecting intelligence into new and existing applications (apps) and things to form the intelligent digital mesh. Capabilities such as blockchain will bring the physical and digital realms ever closer to supporting digital business initiatives. I highlight these three specific trends, as we believe they are now starting to break out and have an impact on organizations as the organizations look to transform their enterprise into a *digital* enterprise.

2. Key emerging technology domains to impact enterprise strategy

A number of technology domains are driving organizations' digital transformation and are having an impact on their operational strategies. Three key domains are introduced in this section.

2.1 AI & machine learning

AI already seems to be all around us. As we see today in countries like the United States, there are millions of consumer devices with embedded intelligent assistants such as Google Home and Amazon Echo. Intelligent things are also appearing in industries such as healthcare, for example, intelligent MRI (magnetic resonance imaging) image analysis for unique types of cancer that are difficult for human doctors to identify. We will see more AI use cases and investment in industries such as healthcare or manufacturing over the next few years. As we move forward, AI will be applied in a focused manner, and implementations will be for well-scoped purposes. Furthermore, underlying this trend is having systems that adapt or learn to act in ways that were not explicitly programmed. It is more of an implicit programming model with feedback loops so the system can act autonomously.

This point is critical; these are model driven systems. Typically, we explicitly program software or a machine to act based on rules we give it. In these advanced systems, however, instead of an explicit rule-based method, you would build a model to understand some purpose and feed the system data (with content acting as code), and the system would learn from that data and eventually operate with little or no human input or guidance. This is what makes the smart machines appear *intelligent*. Instead of explicitly defining the rules, you define how it is going to interpret the data. An interesting concept to realize is that if a system makes a mistake, it is not actually a bug; the system just has not learned it yet. AI and machine learning will drive the development of both intelligent things and apps.

2.1.1 Intelligent things

One implementation of intelligent things is in the field of robotics. From retail robots in hardware stores that help customers find items in the aisles to hospitality robots in hotels that take reservations or deliver room service, they are already here. Also, robots in healthcare will deliver medications and supplies to doctors and nurses in the hospital.

Another example of intelligent things, with the notion of leveraging AI, is in autonomous vehicles for specialized environments, since the digital enterprise extends beyond office buildings. Mature implementations exist within farming, mining, and warehousing. Companies are saving hundreds of millions of dollars by using autonomous trucks and autonomous drilling mechanisms for mining ore. Farm tractors operate in a coordinated fashion on farms. These are specialized and controlled environments—the low hanging fruit for these types of intelligent things.

These are specific use cases, but they will drive AI forward to permeate in more general scenarios. The question is how this innovation will affect our clients' digital strategy—regardless of where their operations are focused, whether in a warehouse or hospital or in a carpeted office.

2.1.2 Intelligent apps

Organizations are applying AI and machine learning

to create new app categories. Intelligent apps have the potential to transform the nature of operations within a digital enterprise. Some types of intelligent apps focus specifically on operational efficiency. One example is from McDonalds, which is driving greater efficiency over human or manual processes by moving to automated inspection of burger bun production to ensure and improve quality. The system uses a photo-analyzer to autonomously inspect over 1000 buns per minute for color, shape, and seed distribution, and it continually adjusts the oven processes automatically. This has resulted in the elimination of thousands of pounds of wasted product per year, a higher speed of production, and a reduction in manual labor costs.

Another category of intelligent apps is the virtual personal advisor such as the oncologist advisor at Memorial Sloan Kettering Cancer Center in New York City. This advisor uses IBM Watson on the backend. The premise is that doctors cannot keep up with all of the oncology trial information that is constantly being published. When a group of doctors gets together to discuss new treatments for a cancer patient, they try to pull research from various sources, and the oncologist advisor is another feed into that committee that can provide unique insights that the doctors could not have seen within their own human capabilities. This is therefore a high-value use case—the treatment of a potentially lethal disease of a patient. A complex problem with a lot of data such as this—the results of research from oncology trials from around the world—is that much of it is scattered, and the amount is overwhelming. In this use case example, the final result is a high-impact treatment plan (hopefully).

An important example of operational initiatives to support next-generation digital enterprises involves collaboration analytics. Dimension Data is writing analytics around collaboration including voice and video conferencing and messaging. As part of the next generation of digital enterprises, it is important from an operational efficiency perspective to know that these tools are being used and by whom and how often. How do companies know that they are really getting a return on their investment? Through Dimension Data's collaboration analytics, companies will achieve license optimization and cost savings, and will get a truer sense of the adoption patterns and use of collaboration technology in the business. This valuable information will ensure that organizations are in a better position to make decisions on investments around these tools to support better operational execution in their digital enterprise.

2.2 IoT

IoT is not just about things. It is also about building an experience for a user, designed to support a business function. IoT is much more complicated than deploying technology at the edge or platform or an application layer. Some of the complexities are explored below, and in the interest of brevity, focus is placed on edge-related technology considerations.

2.2.1 IoT cuts across several Dimension Data practices

Endpoint management is a critical component of IoT. Our enterprise mobility teams consider IoT device (or thing) management every day and how traditional mobile device management or enterprise mobility management systems fit in. Long-lived nontrivial *things* will require management and monitoring. This includes device monitoring (e.g., are devices still alive, are they connected, what is their battery status). They will need firmware updates, diagnostics and crash analysis, as well as physical management (e.g., installation, retirement, and relocation of things). This must include remote security management, of course (as edge endpoints will be vulnerable to security threats). IoT also brings new problems of scale to the management task, as tools must be capable of managing and monitoring thousands of devices.

Connectivity via low power wide area networks (WANs) is an area our networking practice is considering for our clients. They will be of critical importance in terms of data rates, the battery life of devices, cost, and density support. These types of advances will also have an impact on any organization deploying low-bandwidth IoT devices over wide areas. Some example applications include smart cities, utility meters, environmental monitoring, equipment tracking, and telemetry. Challenges to overcome include a lack of global standards and quality of service.

Our collaboration teams consider how IoT will affect the experience of employees and end-customers in the digital enterprise. As IoT emerges, there will be significantly more interfaces to the building or space, leading to collaboration smartspaces. A basic example here is a smart meeting room; if you walk into such a room, the lights will turn on, and the room will detect people in the room and perhaps adjust the environmental controls accordingly. It may also be able to detect and reconcile the number of attendees versus the number of people who said they would

attend the meeting and feed that information into backend managerial reporting systems. Connected assets such as temperature sensors, lighting, audio/visual equipment (speakers, microphones) will enable these use cases.

2.2.2 Opportunities & use cases

Dimension Data operates in about 47 countries globally, and we are seeing opportunities for IoT across all regions. Manufacturing and transportation seem to be the top industries spending on IoT in the Americas. Body-worn cameras and passenger traffic flow are two rapidly emerging use cases funded by increasing government security budgets. Manufacturing and transportation are also top spending industries in Asia-Pacific and Europe, as is utilities, with enterprise use cases centered around construction machinery management and environmental monitoring. Worldwide, momentum is building in the healthcare industry, as patient monitoring/experience becomes a growth area as a use case.

In addition to smart appliances, system automation and emergency services sit atop the highest-growth IoT use cases. Two specific uses cases are worth mentioning:

a. Securing and monitoring high-value assets is a critical use case, especially in the construction and healthcare industries. Assets are constantly being lost or stolen, and the installation of sensors to track location and measurement metrics such as fuel consumption or temperature tolerance has resulted in a reduction in loss and downtime of assets.
b. Implementing the Connected Workers solution has improved safety for employees in hazardous work areas (e.g., mines) by being able to track locations and to operate/monitor intelligent ventilation systems to alert radio frequency tags worn by workers. This helps to evacuate workers faster in case of emergency.

2.2.3 Dimension Data projects

Dimension Data's client experience in the realm of IoT is across many industries and regions. From connected cities (Barcelona) to connected healthcare (Australia and the United States), we are assisting many clients as they embark on their digital transformation journeys using emerging and innovative technologies. Two projects where IoT, data intelligence and analytics, and connected intelligent devices and sensors are utilized to address two very different use cases are described here.

To remain relevant in the sports industry and cater for existing fans and younger, more tech-savvy audiences, Amaury Sports Organisation (A.S.O.) needed to revolutionize the viewing experience of the Tour de France and other professional cycling races. They recognized that digital transformation is changing the way the world consumes sports media. Partnering with Dimension Data as an Official Technology Partner, A.S.O. used live tracking and data analytics to bring a second-screen viewing experience to pro cycling. This involved publishing real-time tracking data online through social media and on television (TV) during the race. Dimension Data helped A.S.O. build a live-tracking and data analytics solution connecting tracking devices on each bike to a fully mobile datacenter, and then to Dimension Data's cloud. Data are then analyzed and served up on TV and Internet screens around the world.

Dimension Data's Connected Conservation solution is another example of looking at digital transformation to mitigate the escalating crisis around unlawful rhino poaching in South Africa. The solution looked to provide better data and analytics by digitizing and analyzing the entry and exit information of people visiting the game park. Data are collected (e.g., fingerprints, identification scans, video captures) to create an electronic record of everyone coming into the park, with expectations of when they will be leaving the park. The data collected are analyzed on a continuous basis to enable better decision-making in terms of determining whether poaching is occurring, and the situation is escalated to the authorities when necessary. Multi-screen communication and wireless network connectivity keep rangers connected across multiple devices in all areas so that when it is time to act, there is little delay. This solution has been designed to provide a secure network and data flow, eliminating the risk of information falling into the wrong hands or criminals hacking into the system to falsify visitor records to gain access to the park.

2.3 Blockchain

Blockchain is a decentralized and distributed ledger for recording and validating transactions that enables trust to be placed in a heretofore untrustworthy environment. Verification of transactions or events is done without a central intermediary to slow things down or increase the cost of transactions and is therefore consistent with the speed and agility demands of a digital economy.

Think of the blockchain as a simple public ledger in

the cloud, and why the space is also referred to as distributed ledger technology (DLT) in some enterprise circles. This ledger is populated (append only) via a decentralized network of nodes that record transactions with a digital signature in the header. A group of transactions that are approved at the same time and added to the ledger is called a block, and such blocks are continuously and sequentially added to the chain. Each successive block contains a hash, which is an encryption algorithm that provides a unique result of each block. Tampering with any record in the block will cause the hash to change and show attempted fraud. Therefore, cryptography (via these hash codes) is used to secure the authenticity of the transaction, which removes the need for a central intermediary to verify or settle the transaction record. The excitement here comes in looking at how to use the same authenticated, distributed, and decentralized protocol to rethink transaction processing or recordkeeping in a more efficient and less costly manner.

SmartContracts, a sort of killer app of blockchain, offers a lot of promise to create intelligent systems with self-enforcing contracts to enable business processes to execute independently. This could change how patient medical recordkeeping is done, how healthcare institutions track medications, how we keep track of car ownership or shipping records, or even how we track utility usage in a city.

Blockchain and DLT will bring about a huge transformation in the operating model for many companies because we are going from a centralized transaction model to a decentralized one. Two important metrics to look at here are speed and cost. In a traditional centralized model, a transfer can take days, and the efficiency varies by country/institution. Moreover, there are high costs due to the number of intermediaries that need to provide the services necessary to settle payments. In the decentralized model, settlement is near real time, and there are lower direct transaction costs because processing is distributed across the network. For the long term, the increase in speed and reduction of costs will mean that everyone using traditional centralized systems will be disrupted.

2.3.1 Opportunity & use cases

When looking at the opportunities from a sector perspective, we can see that it is the financial services industry (FSI) that has been most active in embracing blockchain. After FSI, the top sectors that are starting to explore this area and invest financial resources in various use cases and proofs of concept are manufacturing and resources, as well as distribution and logistics. We feel there is a great opportunity for growth in the public and government sector, as there are several use cases that make sense for a technology that establishes provenance and an immutable record. Enterprises in Europe and the Middle East and Africa are spending money on use cases around regulatory compliance, which is driven by new legislation. In these regions as well as in Asia-Pacific, energy settlement in the utilities industry is experiencing growth driven by peer-to-peer trading to facilitate direct sales of power. Much of the money spent in the Americas is in the areas of banking and process manufacturing.

However, there are two top (and one emerging) use cases that are leading worldwide:

a. Cross-border payments/settlements across multiple industries is a key area that needs improvements in efficiency, trust, visibility, and traceability. This use case involves tracking, tracing, and managing cross-border/international payments and settlements and creating alternate payment and settlement rails (i.e., platform or network) for immediate payment and settlement.
b. Lineage/provenance is critical across many industries and regions across the globe. The ability to verify the origin and authenticity of a product as it moves throughout the value chain is invaluable whether the product is food or diamonds. This use case captures information about all inputs of a product, enabling accurate visibility and traceability into the history of that product.
c. Identity management is rapidly gaining traction as one of the most important use cases blockchain can address. The ability to accurately authenticate identities is part of the issue, but so is managing personal and financial data, as that will be critical in the new world of legislation around data privacy in many countries that is designed to address fraud prevention and data protection.

2.3.2 Dimension Data's role in blockchain and DLT ecosystem

In addressing the opportunity and blockchain use cases in the market, Dimension Data will look to enable DLT platform vendor solutions by providing the full stack around the digital infrastructure necessary for these platforms to operate. Leveraging our networking, security, and datacenter/cloud expertise in our role as an infrastructure and technology partner will be most effective in the ecosystem, and leveraging

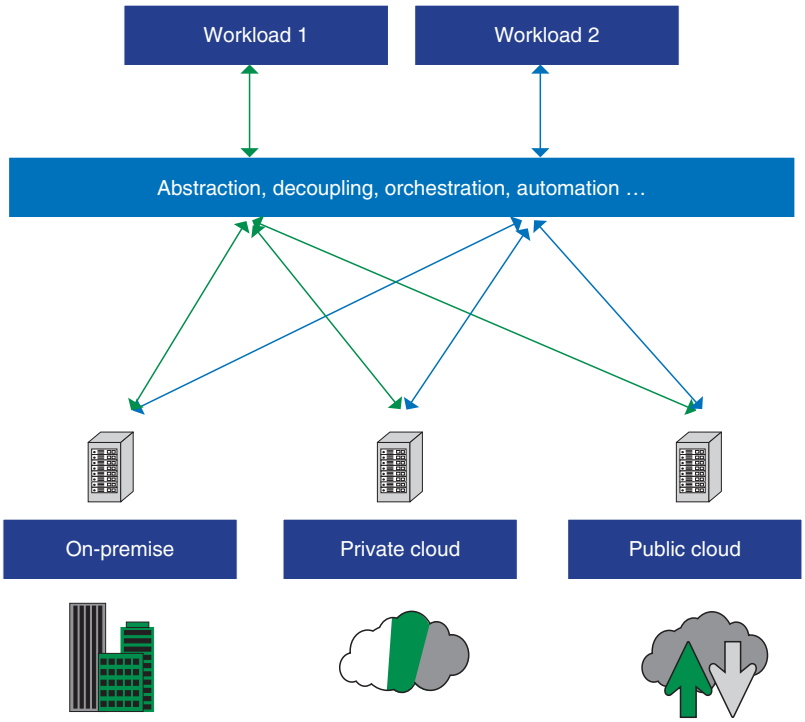

Fig. 1. Hybrid IT enabled through the Service Layer.

our system integration experience in interoperability among different blockchain networks and legacy systems will be critical to this emerging technology domain's success. We anticipate continued engagement with leading DLT platform vendors and application development and consultancy houses such as everis, an NTT Group company.

3. Service Layer: key component of platform-delivered managed services

Support for innovation across the emerging technology domains discussed above must be enabled via a platform to deliver operational and managed services. Dimension Data is well suited to help our clients in their digital transformation journey by providing a foundational Managed Services Platform (MSP) and its key enabling component—the Service Layer.

3.1 What is Service Layer?

Dimension Data's approach to our MSP covers several layers, from the presentation and application layers to the infrastructure layer. One key component or layer within the MSP is called the Service Layer. This layer provides a common service abstraction (via reusable components and services) for rapid integration, automation, and analytics. This layer is our approach to integration architecture.

The Service Layer retains some key features (**Fig. 1**) designed to truly enable Hybrid IT:

- Abstraction of common services required by all workloads. This is where we deal with identity, metadata, integration, analytics, development and operations (DevOps) and portal frameworks.
- Decoupling of the workload from the underlying infrastructure. This effectively removes the close coupling of the reference architecture to the underlying physical or virtual infrastructure.
- Automated readiness discovery and remediation. As we deploy projects, we encounter recurring challenges in trying to get existing environments ready to move to new architectures and platforms. We can now address automation at the workload level.

3.2 Service Layer overview

In terms of architecture, the Service Layer is an API (application programming interface) driven microservices architecture with a pluggable framework to

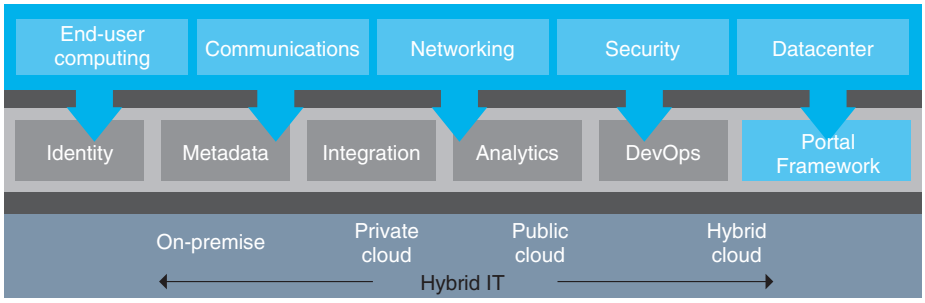

Fig. 2. Service Layer components.

support multi-service orchestration containing 100+ fully extendable micro-services. The Service Layer has a global footprint with availability in 20 datacenters distributed throughout 10 countries servicing 180+ enterprise clients globally cutting across major sectors including government and education, manufacturing, logistics, telecommunications, and banking. To put it in perspective, the Service Layer supports over 300,000 end users and facilitates over 1,000,000 transactions per day.

Currently the popular workloads the Service Layer supports include Compute as a Service, Managed Cloud Services for Microsoft Exchange (includes Skype for Business and SharePoint), Unified Communications, and Managed Backup. Common features of these products include automated onboarding, automated provisioning, and simpler management and monitoring.

The Service Layer has several components (**Fig. 2**) that address common challenges:

- *Identity*: Identity management capabilities to integrate with the client's Active Directory environment—ensures mailboxes & Microsoft Office accounts are tied to each user's corporate identity.
- *Metadata*: Key information about services that a client has deployed, users that have been provisioned, and top-level configuration information are stored in the MSP's metadata system.
- *Integration*: Integration capabilities exist to synchronize users between the on-premises Active Directory and the cloud-hosted Active Directory. Furthermore, it uses the MSP's asynchronous messaging capabilities to enable the automatic provisioning of accounts for new users.
- *Analytics*: Analytics capabilities are present to audit system access by administrators, generate usage reports, and meter resource usage per client so they can be billed appropriately.
- *DevOps*: Addresses deployment, multi-cloud libraries, and cloud portals as well as integration to common DevOps tools such as Terraform and Chef. Shared code is in GitHub.
- *Portal Framework*: A web-based management interface leverages the Portal Framework to share branding and navigation with other Dimension Data cloud services and to provides users with a single sign-on experience using their corporate credentials.

3.3 Case studies

Several clients have already benefited from the use of our Service Layer as part of our MSP offering across several industries. A couple of example case studies are from the government sector.

A large government in the Oceania region struggled with high costs around small mailboxes on older exchange infrastructure as well as difficulty in adding new services such as archiving or Skype for Business (S4B) and was looking for a managed service to facilitate seamless migration from a previous provider. Our Service Layer provided integration capabilities for S4B, email archiving, backup, and other services. These services are used by 80,000 users, and they are integrated among systems across 26 agencies. The government effectively reduced the cost of ownership of their email and collaboration solution while also adhering to government data sovereignty and regulatory security requirements.

A large government institution in Europe identified the need for a single unified communication and collaboration platform as well as a desire to have a dedicated centralized S4B service platform for all federal institutions. The Service Layer provided such a platform designed based on a private cloud architecture with integration into third-party contact center

solutions and included metering based on federal institutions. This solution helped reduce the total cost of ownership of their unified communication solution, which was compliant with security and data sovereignty requirements and also designed to scale for 80,000+ users.

4. Summary: co-innovation with NTT operating units

As we continue to engage in the emerging technology domains discussed above, there will be plenty of opportunities for Dimension Data to collaborate and extend our proposition through engagement with other NTT operating units. There has already been plenty of activity in this regard.

We have engaged in co-innovation within the IoT domain with the NTT laboratories and have used "hitoe" technology [1] in the Deakin FLAIM Trainer project. This was a collaboration with our client, Deakin University in Australia, that involved a solution to train future fire fighters without exposing them to dangerous life-threatening conditions. The solution consisted of a head-mounted virtual reality display to visualize various realistic training scenarios, protective "hitoe" clothing with heat generation components so the user could feel the conditions of the simulation, and Dimension Data's analytics platform to analyze performance data and present results in a supervisor dashboard. This solution was demonstrated at the 2018 NTT R&D Forum.

Dimension Data's Networking practice has engaged NTT Communications around a full stack hybrid WAN offering utilizing Virtela. The solution will offer global bandwidth to our clients as well as focus on software-defined WAN & MPLS (multiprotocol label switching). Our clients will be able to leverage the benefits of points-of-presence in 160 countries.

Hybrid Cloud is a key go-to-market area for Dimension Data's Next Generation Data Centre practice, and the team at this practice has engaged with NTT Communications in offering private, public, and hyperscale solutions including elements such as advanced managed hosting, co-location, datacenter relocation utilizing NTT Communications' facilities, and leveraging of global datacenter interconnects.

Dimension Data's Cybersecurity is working with NTT Security to offer full suite cybersecurity to our clients by leveraging ten security operation centers to deliver services over a global threat platform with managed security services in tow. Together we can offer cyber advisory services such as vulnerability assessments and pen testing focused on the infrastructure, users, and applications.

Dimension Data's Digital Business Solutions practice looks to achieve ERP (enterprise resources planning) scalability by working with NTT DATA around offerings such as SAP and Oracle migration as well as cloud services for SAP HANA Enterprise Cloud.

Full suite collaboration is the goal as Dimension Data's collaboration teams engage with other NTT Group companies such as NTT Communications and Arkadin. Our joint approach is to address a multi-vendor asset footprint whether implemented on-premises or via the cloud. Together we can achieve full collaboration as a service on a global basis in a hybrid IT model that includes Microsoft Office 365. This is all supported with system integration and managed services, as well as telecom expense management and analytics to deliver an end-to-end solution to clients.

Reference

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Nadeem Ahmad is a technology professional with over 20 years of experience in the software consulting and infrastructure services industry with an Internet application development background. He has been working within the specialist IT services area for the past 15 years with recent experience across cloud services, and a current focus within the IoT and blockchain domains. He has built technology delivery organizations in terms of people, capability and processes as well as led multi-disciplinary teams during technical delivery projects across several client industries including financial services, higher education, healthcare, and consumer goods.

Nadeem is currently involved with business innovation projects and defining strategic technology direction, as well as solution development and execution, across several technology areas that will impact enterprise clients in the near future. This involves looking at current trends in the enterprise markets and evolving certain trends from concept to revenue generating solution strategies. Nadeem's recent areas of focus include IoT, containers, microservices and blockchain, with a previous focus on end-user computing and cloud, enterprise mobility, wireless LAN solutions, and mobile Internet strategies.

Nadeem was born in Zambia, Africa, grew up in New York City, lived in London, UK, and now resides in Austin, Texas, with his wife and five-year-old daughter, Aaliyah.