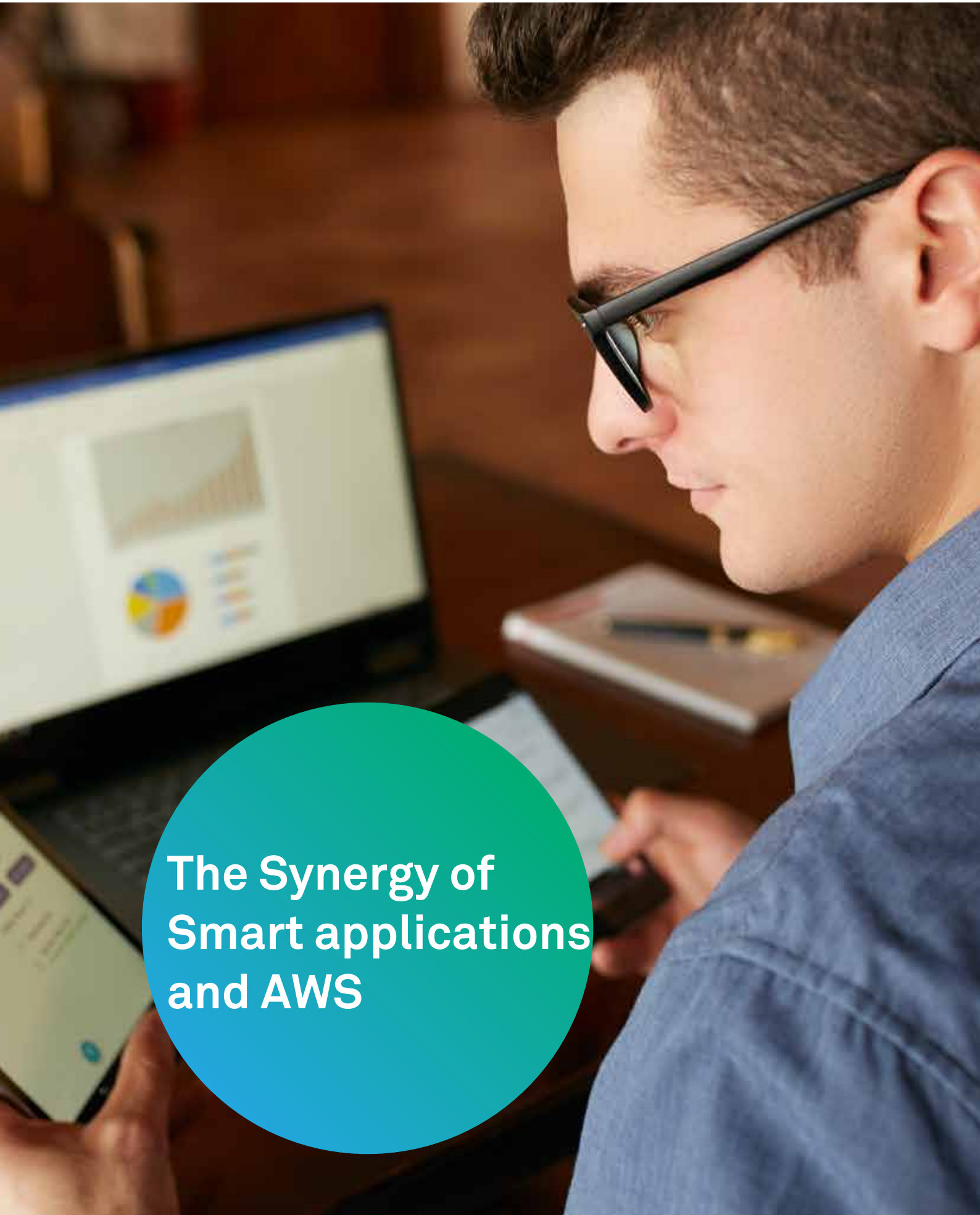

The Synergy of Smart applications and AWS

The era of Smart applications has arrived. It is inevitable that every application of the future will be Smart. Wipro's report on "Smart applications – the future of applications" details the 'What, Why and How' of Smart applications. It covers the 4 Smart imperatives: Smart Interactions (how applications interact with users); Smart Processes (processes that make core businesses smart); Smart Platforms (platforms that form the building blocks for smart apps); and, Smart Security (the need for security through data-driven intelligence.)

Wipro's applications framework called Smart Applications and AWS' differentiated set of services are coming together to build a strong enterprise application foundation. Wipro's Smart Applications have the power to understand latent user needs and create intuitive experiences, while AWS has the solutions to make it real and relevant for organizations. It is this blend that can show actual proof and drive business results.

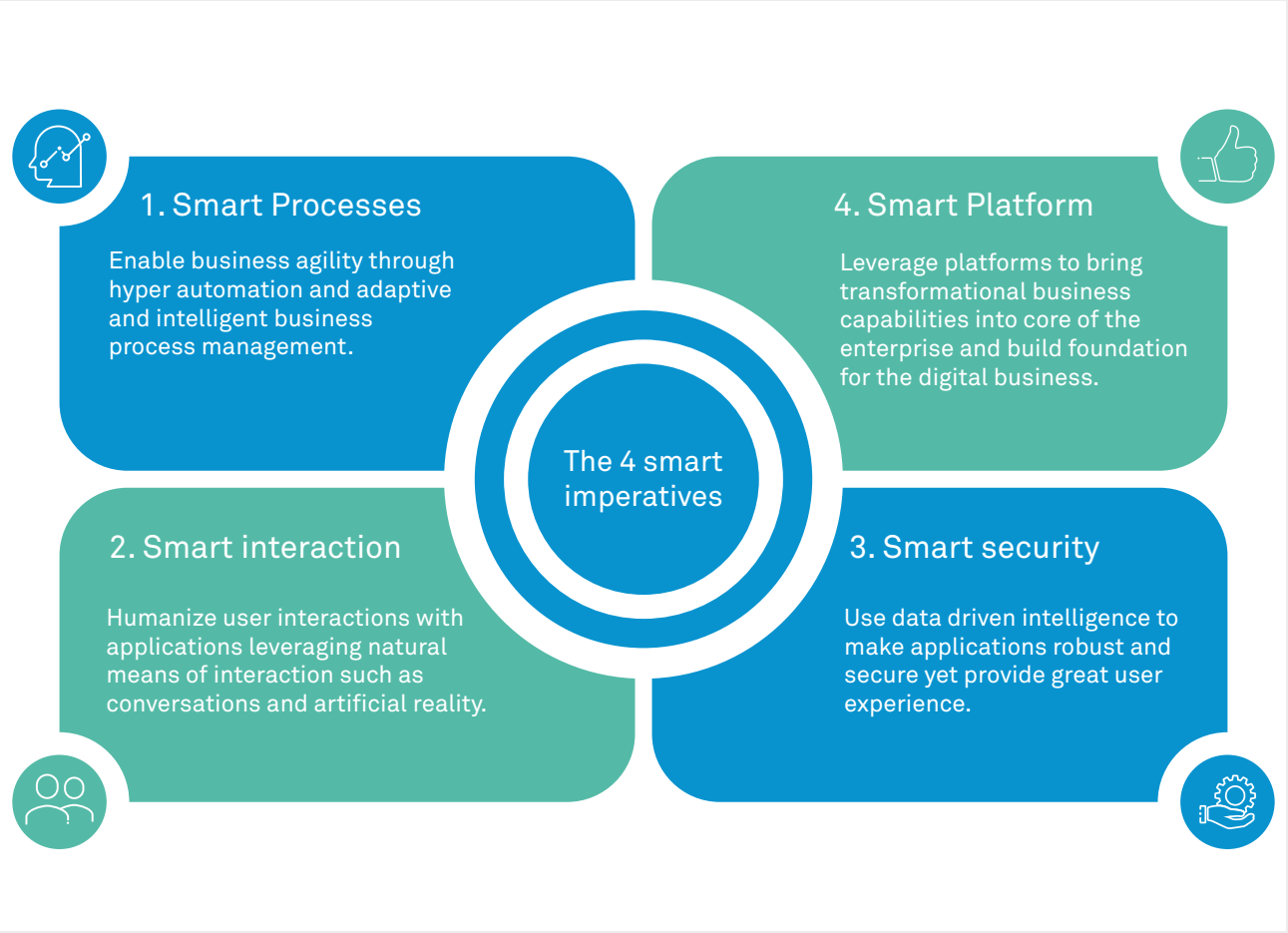

Figure 1: The 4 smart imperatives

Wipro's report clearly defines the important role cloud plays in the Smart platforms imperative, doing most of the heavy lifting to deliver Smart applications. What's the most logical step then? The answer lies in collaborating with AWS, one of the leading cloud computing companies to take smart applications to the next level i.e. making it real in industry scenarios.

Amazon Web Services to deliver smart applications – all the 4 smart imperatives

AWS has added a plethora of services for the creation of Smart Applications. Let's take the 4 imperatives into focus here and explore how AWS can be leveraged.

Enabling smarter interactions requires services like Amazon Lex that allow businesses to quickly and easily build sophisticated, natural language, conversational bots. Similarly, Amazon Polly uses advanced deep learning technologies to

synthesize speech that sounds like a human voice. Amazon Sumerian helps in creating immersive experiences using augmented reality with very little coding.

Smarter processes are fuelled by automation that can be delivered by a suite of AWS services, which automate end-to-end business processes. Take for instance, Amazon Rekognition that offers image and video analysis, transcribes data for speech recognition and enables language translation. Cognitive process automation can be enabled by SageMaker (a machine learning platform) and its low code approach to ML, while MXNet (a deep learning software framework) and an array of data intelligence services such as Elastic MapReduce (EMR) and Elasticsearch can bring artificial intelligence into any process.

The real power of AWS lies in its platform services, which offer umpteen options to build Smart platforms for a business of any size and type. Consider AWS Elastic Load Balancer, which automatically distributes incoming application traffic across multiple targets, and Amazon Kinesis which durably stores, encrypts, and indexes data streams. AWS server-less offerings like Lambda and DynamoDB bring the power of smart platforms without the hassle of maintaining them. With SQS, Greengrass and API gateway literally any 'Thing' that is powered on, can be connected to build smart business platforms. Along with X-Ray, CloudWatch and Cloud Trail, AWS platform services are ideal building blocks for creating autonomous platforms that host applications and provide elastic scaling, self-healing and automated configuration.

Data-driven intelligence enables smarter security, and AWS is at the forefront with Amazon Macie, and GuardDuty. AWS Cognito & Single-Sign-on enable simple and secure user sign-up, sign-in, and access control to web and mobile apps, and Amazon Inspector - an automated security assessment service helps improve the security and compliance of applications deployed on AWS.

Making it real: Smart Healthcare

Smart Applications enable patient centricity and personalized care. With Smart Applications, patients can have better awareness and transparency during the healthcare, doctors and healthcare practitioners can offer highly personalized and accurate care, thereby improving patients' overall health and wellbeing.

To better illustrate the prowess of AWS in assisting the creation of smart applications, let us consider the example of a user, Jane, and see how her journey of health and wellbeing could be re-imagined using Smart applications.

Jane, a 30-year-old architect, uses a fitness tracker which in tandem with a conversational assistant, measures activity and guides her to upkeep day-to-day wellbeing. The wearable also monitors her blood glucose levels in real time. Any deviation from the optimum glucose levels triggers the conversational assistant to ask Jane some basic questions to gauge her wellbeing. Besides, the app connects with her insurance provider to check policy coverage, schedules an appointment with her preferred provider, reminds her when it's time for renewal, and even helps her navigate to the clinic.

At the hospital, the doctor receives Jane's history via a smart dashboard that summarizes her case. The doctor diagnoses Jane, and then dictates her prescription to a chatbot, which uses NLP to transcribe and then transmit it to the closest pharmacy. Upon arrival at the pharmacy, the medication is dispensed by the pharmacist after a QR code-based verification. At home, Jane uses a connected "smart bottle" which dispenses the right dosage of medicine.

Like with any data that moves across the internet, Jane has reservations about the safety of her sensitive medical records. Through seamless integration and systems interoperability, and the use of right encryption and authentication levels, smart applications ensure that her information is secured even as it is shared across various points including the app, services and the myriad systems involved.

Meeting each of the smart imperatives with multiple products and services, AWS is undoubtedly a powerful platform for building smart applications. Here is a realization of the architecture using various AWS offerings across the eco-system players and platforms involved to implement this scenario.

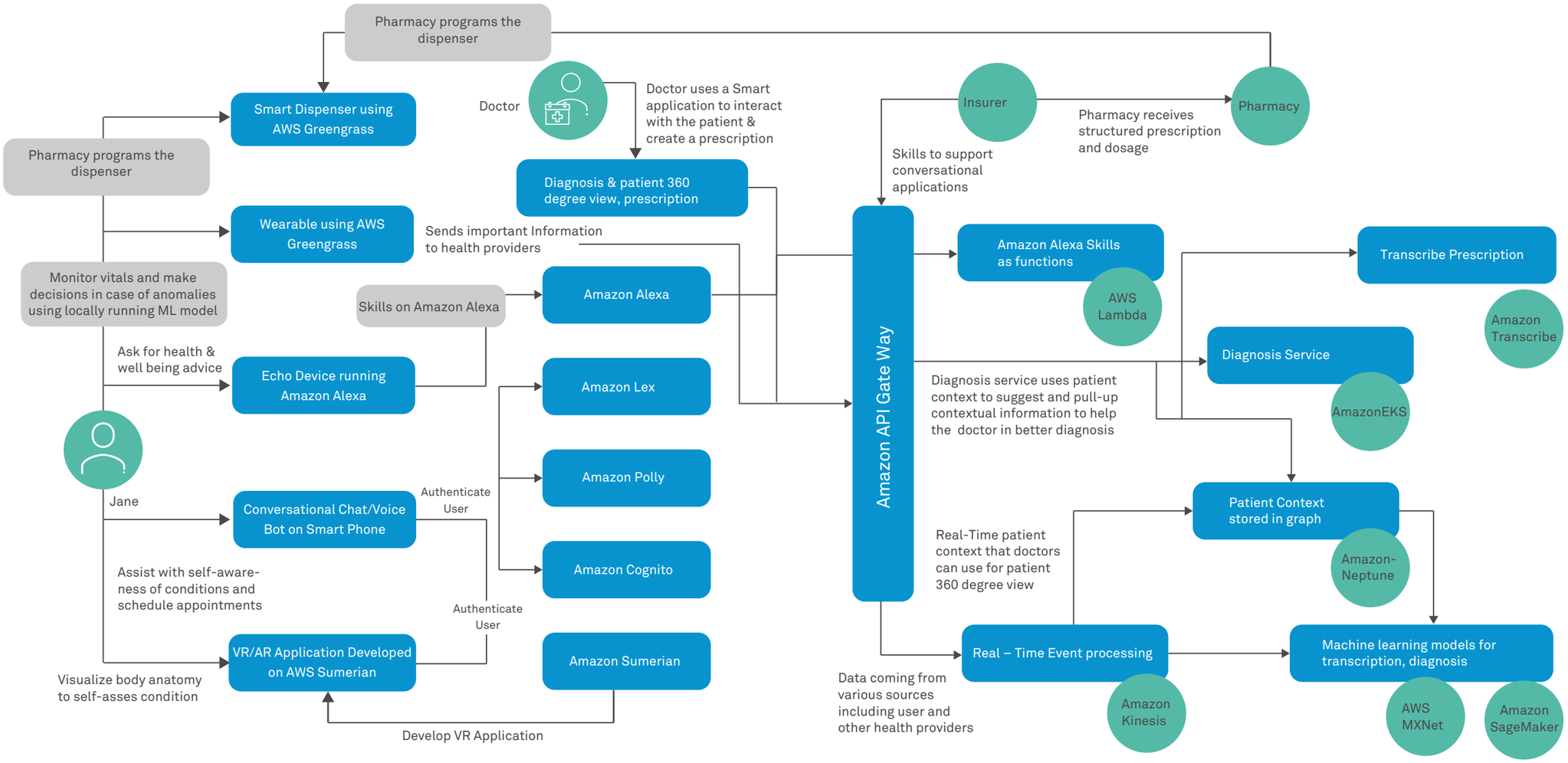

Figure 2: The healthcare experience goes smart

Amazon Web Services has in its portfolio, all the services and capabilities for creation of the smart applications required in this scenario.

Smart Interactions	Lex, the Conversational Chatbot helps Jane to understand her condition. Conversational applications also help in scheduling appointments or answering any questions that Jane might have. Along with Lex, Polly (service that turns text into lifelike speech) helps in offering natural voice responses and alerts to Jane.
	AWS Greengrass (an AWS service that extends Amazon Web Services functionality to Internet of Things (IoT) devices, allowing a business to perform data collection and analysis closer to its origin) helps run local diagnosis modules that monitor and compute on the wearable to understand Jane's vitals and flag any potential issues.
	AWS Sumerian (an AWS service that lets you create and run virtual reality (VR), augmented reality (AR), and 3D applications quickly and easily without requiring any specialized programming or 3D graphics expertise) can help Jane understand human anatomy and increase her awareness of personal health and wellness.
	Alexa- enabled Echo can provide an alternate channel for Jane to get answers to her health and wellness- related queries in a natural way.
Smart Processes	Connected services along with intelligence connects and automates the entire process of patient health. API gateways play an important role - right from the initial alert, to the doctor's appointment - diagnosis, prescription and then medication. AWS Lambda functions act on events as they occur and connect the blocks as needed to deliver a truly smart process.
	Sage Maker provides a low-code environment for data scientists to create machine learning models that will help in creating intelligent diagnosis and providing relevant suggestions.
	Custom MXNet models and Transcribe service help in making voice dictated or hand-written prescription into a structured prescription that can be sent to the pharmacy.
Smart Platforms	AWS EKS offers a cloud native and elastic infrastructure that will help run compute services that will help in business logic and data processing required diagnosis, patient 360 view.
	AWS Kinesis offers real-time and elastic event processing infrastructure to get real-time view of patient condition as required.
	AWS Neptune helps in building a graph view of various patient context attributes that can be easily queried and correlated for better diagnosis and dash boarding.
Smart Security	AWS Cognito provides smart user authentication across the scenarios for all users involved: Jane, the doctors and the pharmacists.
	AWS provides security services including GuardDuty, Macie, Inspector to help protect sensitive patient information and also ensure the authenticity of the patient information received.
	Data is encrypted at the rest using Cloud hardware security module (HSM) and Key management services.

Way forward

Smart Applications are the future of applications. AWS, as a platform provider, has all the platforms services to build Smart Applications. Products and services offered by AWS comprehensively addresses the imperatives defined in Wipro's Smart applications framework, such as Smart Interactions, Smart Processes, Smart Platforms and Smart Security.

To know more, readclick Wipro's Comprehensive Report on Smart Applications. To book a smart applications workshop for your enterprise write to aws.practice@wipro.com.

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IND/BRD/AUG 2019-JUL 2020