

How to strike a balance between data analytics and data privacy

At the beginning of the decade, case was being made out for organizations to adopt a data driven business model to retain the competitive edge. This was because big data and analytics [promised](#) to transform business performance. As we stand at threshold of the next decade, data has become even more important, as evident in a survey undertaken by NewVantage Partners' 2019 [Big Data and Executive Survey](#).

Findings of the survey indicate that companies are acknowledging the need for a data driven business model:

- 92% respondents reported acceleration in pace of big data and AI initiatives
- 88% reported a greater urgency to invest in big data and AI
- 55% companies reported big data investments in excess of \$50MM
- 68% organizations had Chief Data Officer (CDO) roles as compared to just 12% in 2012

However, these data driven initiatives have the potential to go against data privacy issues if not taken care of proactively. The ever-evolving data privacy regulations across the globe are forcing enterprises to look at ways in which they can use key data without any conflict with privacy compliances.

The 2018 Cambridge Analytica scandal was a watershed moment in the history of data privacy when people realized what could happen to their personal data in the wrong hands. The scandal also brought to light the role of businesses in ensuring data security measures for storing and providing access to customer data. Records of 87 million Facebook users had been harvested by simply hosting a quiz. The interesting point was that only a couple of thousands of people had taken the quiz. But Cambridge Analytica could access the personal record of all the “friends” of Facebook users who had taken their quiz. The systems to maintain data privacy were not in place.

In this article we will discuss why data driven approach is essential for businesses and how they can strike a balance between data analytics and data privacy. Let's dive straight in.

Why do businesses need a data driven approach

The data driven approach is no longer a luxury; it is becoming a strategic necessity that can make or break companies' chances of future growth. Data driven businesses have access to meaningful operational data in all business-critical areas, which strengthen decision making as well as process innovation. Both crucial to business growth.

Collection and analysis of data is nothing new for businesses. Customer feedback forms, telephonic or snail mail surveys, customer interviews, etc. have been around for centuries. But Internet has taken

all forms of data collection to another level. And Internet of Things keeps churning out data every second, without sometimes even the customer being aware of it. Humans are generating [2.5 quintillion bytes](#) of data every day.

Enables data-driven decision making

Using data and insights provided by it to make an informed decision is called **data-driven decision making**. Past data can provide estimated projections for the future, which can be used to validate a decision being taken.

Businesses may collect the data using survey responses, user testing launch a new product or service to a selected group of customers. The decision of which data to include and how, depends upon business goals and data available.

Only [41.4%](#) of CDOs considered their chief responsibility to be managing and leveraging data as an enterprise data asset. Probably the overwhelming amount of data makes it difficult for them to analyze into real actionable insights.

Generates more confidence

Traditionally business decisions were made on the basis of gut instinct and past experience. This approach to business decision making has two major flaws. One, gut instinct does not always prove right. Two, not every business has access to experience at all times. If they rely only on experience, what would happen when the senior most leader is no more available to guide.

Data driven decision making can be adopted by any organization, irrespective of its age and expertise. Data can serve as the benchmark against which the efficacy of current processes can be verified. Data can also be used to finetune the current processes and reliably predict how effective they can be. Also, data is more logical and tangible as compared to gut instinct or experience. By using data to take decisions, you are effectively removing the subjective elements from decisions, which makes you more confident of the outcomes.

Ensures cost savings

Taking a data driven approach to business decreases expenses, as found in a [survey](#) of Fortune 1000 executives. 49% of the organizations claimed their data projects to be successful and reported an actual decrease in expenses.

Is data privacy a hurdle in adopting data driven model

Making decisions on the basis of hard evidence in the form of data needs a major cultural, technological and mind set change. Established organizations have internal barriers culturally as well

as practically (think legacy infrastructure and traditional ways of operating). But this should not mean they cannot transform their situation. If you think of it, organizations that are decades old have that much more amount of data at their disposal. Still they struggle to exploit it because they are unable to transform data into usable, actionable insights. Forrester [reports](#) that between 60% and 73% of data within an enterprise goes unutilized for analytics. This could be due to siloed data, poor reliability and a lack of analytical talent. The data may be spread in different formats across different themes and cannot be compared using the legacy systems.

The primary requirement of established organizations is to link data to business-critical impact. The data and insights generated by them must be easily accessible, interpretable and actionable whenever required. This can be made possible if organizations employ requisite technology and stop thinking in terms of “we have always done it this way.” And this is something businesses must resort to because the true power of data is in its use.

Once the cultural challenges are taken care of, two major operational challenges come up in creating a data-driven approach to business:

- Evolving data privacy regulations
- Increasing consumer awareness

Privacy can broadly be defined as access to individually identifiable personal data.

The GDPR defines personal data as any information relating to an identified or identifiable natural person. It further clarifies that an identifiable natural person is a person who can be identified directly or indirectly, in particular by reference to an identifier such as a name and identification number location data and online identifier or to one or more factors specific to the physical and physiological, genetic, mental, economic, cultural or social identity of that natural person.

Data privacy compliance

Data can be misused online in multiple ways, from banking frauds to identity theft. Users are increasingly aware of importance of keeping their private data safe. They are also aware of their legal rights to data privacy. Enterprises collecting, storing and processing data had it much easier initially. But as people became more concerned about who has access to their private data, governments have woken up to the extent to which private data can be misused in unscrupulous hands.

Data privacy and security guideline and regulations are being drafted and made into law all over the world. [GDPR](#) and [CCPA](#) are the two most prominent ones but other countries have their own laws. The [Data Protection Act 2018](#) is the UK's way of making organizations collecting private data responsible for keeping them safe rather than the individuals who provide that data.

Enterprises need to be compliant to privacy regulations of the territory where they operate as well as where their customers reside. These compliances not only pose operational challenges but increase costs as well.

Handling privacy aware customer

Customers are aware of the pitfalls of data breach. So, they prefer products and services of organizations that are transparent about their data collection, storage and analysis processes. Consumers also want to know who has access to the insights generated by their data.

Customers are just one click away from changing allegiance. So, enterprises need to be transparent about their privacy policies for retaining customer loyalty and acquiring new customers.

Balancing the need for data analytics and privacy

Contrary to widespread belief that data analytics and data privacy are contradictory, it is possible to strike a balance between them. Let us see how.

Holistic approach to data privacy compliance

A CGOC [study](#) found that just 57% of organizations train their staff on data protection compliance, and out of those only 25% are regular in their training and audits. This indicates a disjointed approach towards data privacy compliance. The study further reveals that 50% of respondents think that internal staff and practices are the biggest threat to data security as compared to just 38% who think external hackers are the biggest threats.

Data privacy compliance can be achieved only if enterprises do away with their siloed operations and there is continuous collaboration among its IT, security, legal and marketing departments. The focus here must be on utilizing the right tools and technologies to ensure data privacy without increasing business overheads. People handling private data must be sensitized to the perils of data theft because one weak link in the security chain, from data collection and storage to analysis and distribution of insights, can prove dangerous.

Privacy-first design for data analytics projects

It is possible to protect data being used for Data Analytics projects. The most important and easiest way of doing this is anonymizing data. Most Data Analytics projects are designed to identify patterns

and Trends from huge volumes of data. It is not necessary to identify an individual with their personal data to get this analysis. So, anonymizing data can ensure data privacy while still being useful for getting insights.

In fact, anonymizing data renders data protection regulations like GDPR and CCPA invalid. Because these regulations apply on data that can identify an individual. When the individual cannot be identified through the available data, there is no need to implement these data privacy regulations. This absolves the organization using anonymized data of most of the privacy compliance requirements. All they need to ensure is that the data remains has been collected legally and it remains anonymized during storage and sharing.

If the data is truly really anonymized, it is not even subject to the rights of data owners. This means they cannot request access to their data, ask the data to be removed, or object to processing it in a certain way. Come to think of it, using really anonymized data would be the ideal situation where the business potential of data can be unlocked without compromising privacy of individuals.

Be honest about your data privacy policies

Brand trust has never been more important for businesses than it is now. Customers have always been fastidious about which products they choose or which services they use. Recently, Accenture conducted a study that quantified the impact of trust. The study [revealed](#) that a USD 30 billion retail company experiencing a material drop interest stands to lose USD 4 billion in future revenue. And, 54% of the companies surveyed experienced a material drop interest over the last two years. So, it's not a matter of if but when a trust issue will crop up.

Being honest about your data privacy policies can be an effective way of winning trust of the customers. Building customer trust can also ensure your data quality because people are more honest about their personal data with organizations they trust. Privacy can be used as a differentiator to establish brand loyalty and engage with customers on equal footing.

How TechAhead helps in developing privacy compliant apps

The team of app design and development experts approach app design with data privacy first approach. They have developed 100+ standalone or integrated data analytics projects that are fully compliant with data privacy regulations.

Summary

Data-driven approach to business helps an organization retain competitive edge as it gives access to meaningful operational data across all functions. These data can be used to generate insights that support and strengthen the decision-making process. Businesses have been collecting and analyzing

data for ages with the help of feedback forms, telephonic interviews, snail mail, customer interviews, etc. But Internet has made it very easy to collect data globally because it is easier, faster and cheaper to reach customers for feedbacks.

Data driven decision making is informed decision-making, which makes businesses more confident of their future. Taking a data driven approach to business also decreases expenses as claimed by executives in a survey of Fortune 1000 companies.

However, these data driven initiatives have the potential of going against data privacy issues if data collected is not shared, analyzed and distributed responsibly. As people and governments become aware of what could happen to personal data in the wrong hands, data privacy regulations are evolving across the globe. GDPR and CCPA are just two cases in the point. Besides evolving data privacy regulations, businesses also need to deftly handle the increasingly aware consumer. Consumers are aware of their legal rights to their personal data, even if it has been collected by a business. They know they can demand access to their data anytime and object to how it is processed to generate Insights. All constraints can put restrictions on the amount of data that can be collected and analyzed by organizations.

But data and the insights that it generates is so critical to businesses that a middle path has to be found — a balance between maintaining data privacy and generating useful insights through data analytics. Any organization planning to collect user data and using it for insights must comply with all data privacy regulations wherever it operates and where its customers reside. Another effective way of maintaining data privacy is anonymizing the data collected, so that persons cannot be identified based on data being used for analytics. If data is truly anonymized, even the provisions of privacy regulations like the GDPR become invalid because they apply only to personally identifying data.

LinkedIn/Facebook Post

Do you know that

60% of consumers are uneasy with companies using their data for analytics

74% are nervous about their personal details being sold to third parties

65% are more likely to be loyal to a company if they trust them to use personal data properly

But data-driven decision making is critical for business growth. A recent survey found that:

46% organizations treat information as an asset

34% use information to predict future trends and behaviour

49% feel that data is a revenue generator or will become in future

But data privacy concerns have been increasing rapidly due to spate of data breaches and third party access in the recent years.

Organizations need to approach data analytics projects with data privacy in mind.

Data sources:

<https://bi-survey.com/data-driven-decision-making-business>

<https://www.truata.com/truata-customer-state-of-mind-survey-2019-data/>

Tweet

Data is being touted as the new oil. But 74% consumers are nervous about their personal details being sold to third parties. To use data effectively, businesses need to strike a balance between data analytics and data privacy.

Decoding DevOps: A Whitepaper

Cassie is the CTO and CEO at her company. They are not big enough to require separate people to manage these roles. One of her teams has deployed a software at client site. A few bugs have come up, out of which one is a major customer facing issue. Understandably, the client wants it fixed urgently.

Cassie orders the bug to be fixed and rolled out at the client site immediately. A week later the bug is as live as it ever was and the client is breathing down her neck.

The coding team says it has already delivered the code to the operations. Good. Operations team says that it is being tested; how can they roll out without being doubly sure. Fair enough. The testing and security teams have no idea that they have an upcoming piece of code to be tested on priority as no one has “informed” them. Unacceptable but the truth.

So, there is a crisis situation where half the team is not aware of the progress. No one is ready to take responsibility of delivering the fix to the client successfully.

Cassie also realizes that this is not a one-off situation. In fact, it occurs more frequently than she would care to own up. This time maybe it'll be managed, as in the previous occurrences.

But this time Cassie decides to sit down and do an analysis of the impact of these firefighting situations on time spent, resourced required, company reputation and financial implications. She realized she needed to do something to deliver quality products in cost and resource effective manner. She also needed her team to be agile enough to roll out fixes and upgradations within hours or weeks.

What should Cassie do to achieve her goals?

She needs to adopt DevOps.

Cassie is not alone in her problems. It's not just the Fortune 500 or Fortune 1000 companies who are embracing DevOps because they can afford it.

Even mid and small sized organizations are adopting it because they can't afford not to.

Don't throw up your hands at yet another tool that must be rolled out, requiring all the time and resources that is needed in such exercises.

In this whitepaper will look at what DevOps is, how it is can help up the game for you in the industry and how you can embrace it with minimum disruption to your existing environment.

What is DevOps?

Before we dive into what is DevOps, you need to understand what DevOps is not.

- DevOps is not a single tool or technology stack
- DevOps is not a module on which you need to train your teams in before it can be used
- DevOps is definitely not a process or method of software delivery

That brings us to the question what DevOps is. DevOps is

- A mind set
- A culture
- A healthy work environment
- A belief in your own capabilities
- An approach to delivering value to the end user
- A holistic approach to full lifecycle management
- Every team member being responsible for delivering value to the end user
- A state that must be achieved if you want to avoid living in a constant state of firefighting

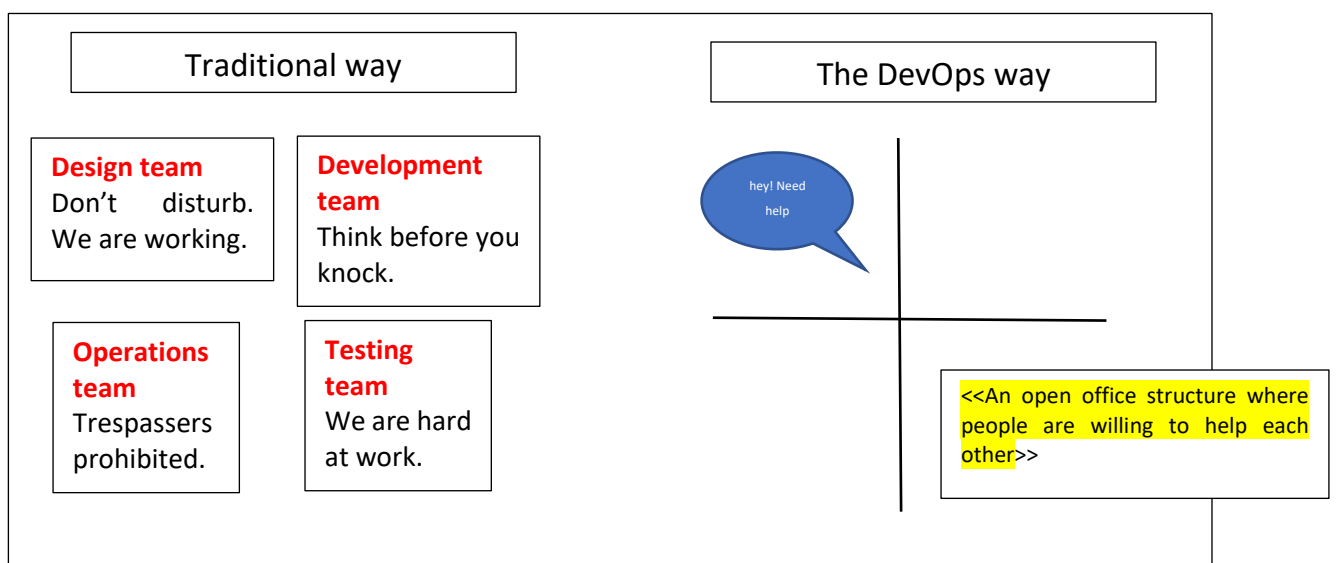
What DevOps offers

The term DevOps is a combination of two words – development and operations. the concept DevOps also derives from the need to combine Development and Operations

team into a single unified team that takes end-to-end responsibility of delivering a product to the customer. The latest DevOps culture requires not just the development and operations team to come together but all the teams involved in software development life cycle should form a single team.

Do we need DevOps?

Traditionally, software development has been associated with unwarranted delays, shunning of individual responsibilities when things go wrong, long-drawn development cycles and full deployment taking years. These problems arise mainly because people involved in developing the product are divided into silos, or teams as we call them. So, you have a design team with its own set of tools, a development team that has a very different set of tools, operations team that it uses processes and procedures no one else outside the department is aware of, and the testing and quality team expects certain standards that it has not yet published.



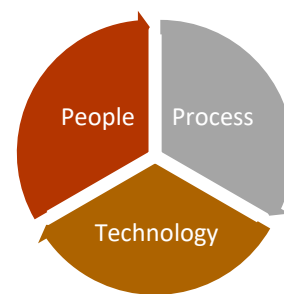
It is understandable that every team performs different tasks and hence will have its own favorite and efficient set of tools. The problem lies in the fact that these are totally disconnected with each other. To the extent that the output of one cannot be typically used as an input for the next. This disconnect decreases efficiency, increases product development time, gives rise to blame game among the teams, increases costs and decreases product quality. Once the product has been delivered and some

moderate tweaking and changes need to be made, the whole product has to undergo the same silos again. The time to do a simple change can take days and even weeks. And time is money. Costs shoot up and overall performance of the organization takes a beating.

DevOps decreases the overall time taken by unifying all teams into one team that takes end-to-end responsibility of delivering the product to the customer. The concept of *Idea to Execution* divides team horizontally rather than vertically. As there are no silos, there is no blame game, no shying away from responsibilities, and no wastage of resources in communication.

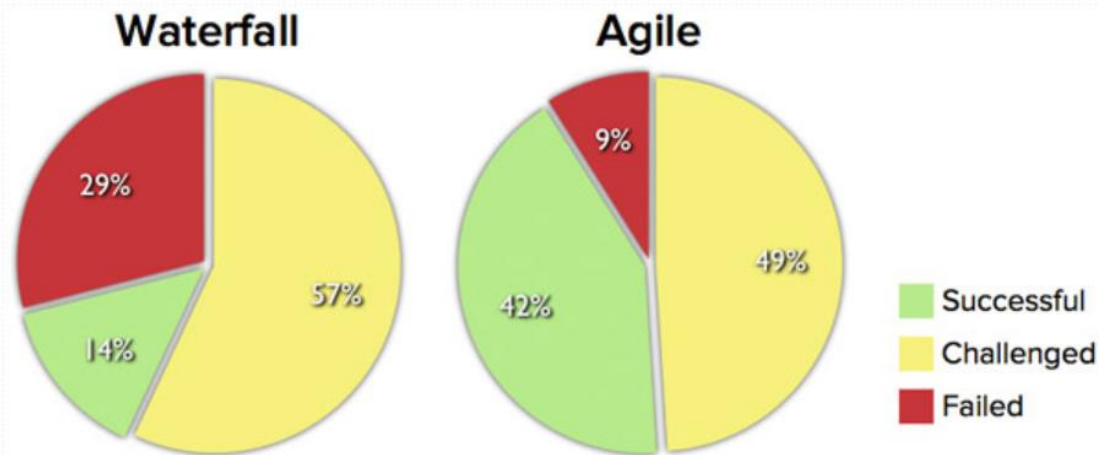
How DevOps works

The practical aspect of unifying teams needs a two-pronged strategy – establishing end-to-end **process** chain and developing a set of integrated **tools** that can be used by the **teams**. This is essentially the DevOps trinity – people, process and technology.



What you need to remember here is that the software or product development still goes through the same processes of gathering requirements, designing, coding, debugging, testing and roll out. But not in the traditional waterfall model but by the agile methodology. Team members typically have multiple skillsets to perform more than one process.

The 2012 CHOAS manifesto reported the agile project delivery success to be 42%, as compared to just 14% for waterfall project delivery success rate.



Source: The CHAOS Manifesto, The Standish Group, 2012.

<<this can be put into the final whitepaper in a better presentation. Source: <https://www.braintrustgroup.com/2012/agile-success-rates-versus-waterfall/>>>

DevOps focuses on complete automation. It starts by automating the repetitive tasks first, thereby getting instant wins for the team adopting DevOps culture. The free time can then be utilized by teams in focusing on innovation. Then a technology stack that integrates with the DevOps principles is used to develop applications quickly, without compromising on quality.

The aim here is to combine the existing best practices of each team with industry best practices to develop a fully customized DevOps practice.

TechAhead approach to DevOps

At TechAhead, these three keywords – automation, ownership and measurement – are ingrained for DevOps practitioners.

Automation

Every process that can be automated is automated. Latest tools like Chef, Ansible and Puppet are used to automate processes that are repetitive, time consuming and generate maximum errors. Some processes that we routinely automate are infrastructure, environment, code inception and integration, and deployment.

Infrastructure automation

To facilitate development of high-quality products, world class infrastructure is imperative. And it would be a shame if teams are unable to utilize organization's best infrastructure due to avoidable reasons. This is how our DevOps experts ensure access to best possible infrastructure at all times:

- Automatic provisioning
- Scaling up service within minutes
- Eliminating server state mismatch
- Bringing up service in deployed state

Environment management

Availability of the right environment is essential for successful product development, deployment and use. DevOps team achieve this by

- Eliminating configuration mismatch
- Error free faster configuration deployment
- Single tool management for all environments
- Configuration of activity reports

Code Inception and continuous integration

To improve team productivity and integrate the various disparate parts of the development process, Trechaleid DevOps team provides this:

- Well tested code
- High quality coding
- Verified artefacts very for deployment
- Comprehensive built and code reports

Deployment automation

To reduce production time and number of configuration errors while increasing deployment quality e and better monitoring of the overall process. This is what Trechaleid DevOps team does

- Automated, error-free, and faster deployment
- Single click and continuous deployment
- Single tool for all deployment environment
- Comprehensive deployment metrics monitoring and reporting

<<The highlighted info could be presented as an infographic>>

Ownership

Everyone involved takes complete ownership of the end-to-end product lifecycle, from *design to delivery*. There are no blame games and open discussion takes place about smallest of failures. The learnings from these go into improving not just the current product but the process that gave rise to that product. This futuristic approach ensures that such failures are not repeated with any other client.

DevOps is an extension of Agile stratagem, so people take precedence over everything else. To ensure complete ownership, open communication between all team members is essential. Tools like _____ are used to enhance communication and collaboration, and reduce mis-communication.

Measurement

Everything that can be quantified must be measured. Unless you measure, you cannot judge where you are progressing. Our DevOps team uses various tools to keep track of multiple parameters like business goals, performance, people integration, business value, etc. Automated logs make it easier to revisit processes while analyzing issues.

To achieve this, processes are standardized to death. To give you an inkling of what all we measure, some of the processes that are standardized include source control check-ins, code review, code quality, change control, RCAs, etc. All these processes produce a goldmine of metrics that can be measured to gauge where you are headed in the development process.

7Cs of DevOps

TechAhead has embraced the 7 Cs of DevOps:

- ✓ Continuous operations
- ✓ Continuous planning
- ✓ Continuous integration
- ✓ Continuous testing
- ✓ Continuous monitoring
- ✓ Continuous delivery
- ✓ Continuous feedback

The 7 Cs ensure that we can have a seamless agile delivery right from idea to release and then some more as we provide world class product maintenance and customer support services.

Are you ready for DevOps

DevOps is a cultural change. It is essential for you to know whether your organization is ready to embrace DevOps before actually starting with it.

CALMS is a conceptual framework that is widely used to evaluate whether the organization is ready for DevOps or not. To be honest, it is a DevOps evaluation tool, but it can be used as a maturity model to check DevOps readiness as well. The five pillars of the CALMS Framework are:

Culture – Is there a culture of sharing responsibility rather than indulging in blame games?

Automation – Do team members try to find innovative ways of automating tasks? Are they comfortable with the idea of continuous delivery?

Lean – Are the team members adept at working with small batch sizes and managing length of WIP queues efficiently?

Measurement – Are your systems transparent and data is collected wherever possible?

Sharing – Do team members communicate with each other openly and freely using latest technologies?

It's perfectly possible that you are not able put a tick against all the five requirements of CALMS framework. If you have the vision to adopt DevOps, TechAhead has the expertise to help you achieve this.

How TechAhead can help you

The report generated by maturity model analysis forms the starting point of DevOps implementation. As you know by now, people are the most important assets for any DevOps team. We focus on changing mindset of team members, skilling them and providing continuous support while they adopt DevOps.

Our DevOps team works with you to

- ✓ Adopt an Agile mindset
- ✓ Understand business goals
- ✓ Grow long-term perspective
- ✓ Dismantle existing silos
- ✓ Develop ownership mindset

At the end of successful DevOps implementation:

- ✓ Whole team works as one
- ✓ Overall higher collaboration and motivation level
- ✓ Increased efficiency in product delivery
- ✓ Minimal time-to-market
- ✓ Better quality products that drive user engagement and satisfaction

Why is Serverless Architecture becoming so popular for App Development?

Serverless architecture is an increasingly popular approach to application development, where deployment and maintenance of servers is outsourced to third parties. In a sense the term serverless architecture is something of a misnomer because eventually the code has to run on a server.

The term serverless class architecture is used from the point of view of developers, who do not need to maintain the underlying infrastructure required for the testing, running and deployment of application code.

Most of the cloud companies are already providing serverless architecture facility. Some of the most prominent ones include Amazon AWS, Microsoft Azure, Auth0 Webtask, and Google cloud.

What is Serverless Architecture?

In serverless architecture the infrastructure is provided by third party vendors as BaaS (back end as a service). Companies and individuals signing up for this cloud-based infrastructure need to install an API at their end to access the services provided by the vendor.

The payment mode of using serverless architecture is pay as you use, which proves to be a viable option for companies of all sizes. The development team focuses only on writing the code, which is then submitted to the vendor for testing, debugging, deployment and maintenance.

The vendor provides the necessary tools for all tasks like testing, debugging, maintenance, monitoring, security, etc. The users simply need to decide which tool to use.

Serverless architecture is completely event driven. Each event at the developers' end calls a function rendered as function as a service (FaaS), which is used to perform all the required activities.

Frameworks of a Serverless Architecture

Now that we know that serverless architecture is not exactly serverless, let us see the components that are required to work with third party servers. The framework of serverless architecture for application development must include these components.

Client Application

Whatever the state of your server architecture, the client interface must be rendered on the client side. So, a static web server is enough for running client applications.

Web Server

The web server required for rendering client applications must be robust enough to serve all the static html, CSS and JavaScript required.

FaaS solution

FaaS stands for *Function as a Service*, which is often interchanged with serverless architecture. Although it is not the complete architecture in itself, it is the most important component of serverless computing. These functions enable teams to develop, run, deploy and manage applications without worrying about server software and infrastructure.

Whatever operating system, tool or framework required by the developer; it is available through FaaS with a few clicks.

Security Token Service (STS)

Users of the serverless computing use the service provider API for logging into the system and using its various services. The serverless architecture must be able to generate security token for each user, which then triggers access to API.

User Authentication

In a typical serverless environment, the customer signs up for the service and then it is up to the serverless computing to ensure that each end user is able to sign up and log into the application quickly and easily.

Database

Even if an application has been developed and is being used through a serverless architecture, the data related to the application needs to be stored in a database. This database must be a part of serverless architecture.

Why should I choose Serverless Architecture?

Choose serverless architecture if:

- You want to invest time and resources in developing a solution rather than provisioning, implementing, debugging and maintaining the infrastructure.
- Reducing development costs without affecting the quality is a priority.

- You have to develop flexible and lightweight applications that need to be updated frequently and immediately.
- You need to set up many different types of environment in the application development.
- You want automatic scaling up, without getting involved in the complexities.

How does the Serverless App works?

Serverless applications are event driven systems that run completely on the cloud. The triggering events make calls to compute containers, and dynamic allocation of server capabilities is done by vendors providing backend services. The compute containers are provided as Function as a Service (FaaS) while vendors provide Backend as a (BaaS).

Examples of Serverless Applications

Some categories of serverless applications are very popular and have been developed time and again. Here are a few examples:

Web application architecture

You no longer need to maintain dedicated or shared server for your websites or web applications. The vendor providing back end services will help you build the API for connecting with the cloud services and the rest is as simple as logging into your account and running the code.

Building single page applications is even easier and quick with serverless architecture. These pages are lightweight, with few dependencies, making them perfect for going serverless.

IoT back end

When you have hundreds of applications connected to your IoT network, managing them and the data generated by them can be a nightmare for engineers maintaining the application server. Because the server must always perform to its fullest without any downtime.

Using serverless architecture, you can focus on building the rules that will trigger device registration logic, database search for specific devices, activation code for activating the device is requesting access.

SaaS integration

Building SaaS applications is all about ability to handle fluctuating load on the service in terms of tasks and customers both. Traditionally this has proved challenging for the solution architects, as they need to factor in the

ever-changing demand landscape. With serverless architecture this can become very easy as automatic scaling up is inherent to serverless computing.

In fact, the consumption model of serverless architecture is precisely suited for the continuously changing requirements of SaaS applications.

Mobile back end

The most important aspect of serverless architecture is its ability to provide different types of environments in just a few keystrokes. Using serverless architecture, software engineers can build mobile applications that behave and perform like native apps.

When it comes to end users, mobile users can easily perform tasks by calling serverless functions that are actually rendered by the cloud vendor.

Benefits of Serverless Architecture

Serverless architecture provides lots of benefits to the developers and organization management.

Hassle free operations management

Legacy systems have always integrated software development with the infrastructure required to do so. This has proved to be an obstacle for innovation in solution development. Because the state of infrastructure must always be kept in mind while developing solutions. And it is a well-known fact that technology for software development has evolved at a much faster rate than that for infrastructure.

With serverless architecture, developers can think only about providing the best solution to the client, without worrying about the infrastructure required to develop and deploy the system. This is almost a dream come true for operations management team trying to bring development and operations on the same page.

Serverless architecture does away with the need for continuous integration and continuous delivery tools. If an organization uses DevOps approach to solution development, going serverless can help implement it more fully.

Empowers development teams to innovate

With infrastructure issues out of the way, the team can now focus on delivering innovative solutions to client problems. Decreased operational time ensures smoother adoption of Agile methodologies and DevOps approaches during application development.

Product managers have all the freedom and resources to focus on developing business logic, providing innovative solutions, developing applications quickly and solving client concerns.

Reduced operational costs

For any project, the two main components of cost are infrastructure and human resource costs. Serverless architecture ensures that infrastructure costs are reduced to a fraction of original cost. As people are also focusing more on developing solutions rather than maintaining the infrastructure, their productivity increases, thereby increasing RoI on human resource. Added up together, the overall operational costs reduce drastically as compared to maintaining your own infrastructure.

Quick scaling up

With serverless architecture, applications can be scaled up quickly without having to worry if the infrastructure will be capable of this. Just with a few keystrokes the developers can start using the new services and environment essential for scaling up.

Drawbacks of Serverless Architecture

Not everything is perfect with serverless architectures. It has its own bunch of issues that must be taken care of before it can be popularized further.

Third party API issues

When developers use serverless architecture, they give up control of their own applications. When the end users are using these serverless applications, rendering of third-party APIs may throw up many unexpected issues like forced updating, vendor control, security, loss of functionality, etc.

As most of these third-party service providers charge based on the amount of time resources used or number of functions running, costs may go up unexpectedly. If the vendor provides shared infrastructure, speed, security, and bug fixes may prove tricky.

Complexity of serverless architecture

Building distributed computing architectures is both complex and time intensive, even if it is serverless. Due to this going serverless poses problems of its own. Deciding the size of each function is a very crucial step in developing serverless solutions. If the function sizes are too small, developers can end up with a huge conglomerate of functions in the name

of application. If the function sizes are too big, it's development, testing, debugging and monitoring cannot be optimized.

Another common problem faced by developers is the selection of tools for each step of solution development.

Cold/warm start up issues

The speed of service is not fixed in case of serverless functions. A function that has not been used for quite a long time is called a cold function. A function that has been used recently is called a warm function. A cold function takes longer to launch as compared to a warm function, which is undesirable.

Lack of operational tools and metrics

Most of the operations in serverless architecture are opaque and currently the amount of operational metrics released by the third party is also not sufficient. Developers face lots of trouble in debugging and monitoring applications. In case of outages, developers do not have sufficient tools to redirect traffic or take any other step necessary to solve the problems.

Why Serverless Architecture is the Future of Modern App Development

Despite all the issues listed here, serverless architecture is the future of modern application development. This is because it enables application development in low cost, time to market is very less and operations can be scaled up easily.

At just five years old, serverless architecture is still in nascent stage. It is gaining popularity because of its many advantages but it needs to be made more robust, secure and transparent for wider adoption. Companies providing serverless architectures services must look towards releasing more operational metrics and providing more tools to the developers for debugging and maintenance.

Azure for Serverless Architecture

Microsoft Azure is a rich set of tools for implementing serverless architecture. The functions can be easily triggered by developers when they want to execute their code. The programming language is not an issue here and charges are levied only for the duration that it is used. The services can be scaled automatically as per requirement.

Here are some important tools in Microsoft Azure:

- Azure Functions for executing code
- Azure Storage for cloud storage
- Azure Cosmos DB for database services
- Azure Active Directory for security and access control
- Event Grid and Service Bus for cloud messaging
- Logic Apps for workflow orchestration
- API Management and Azure Functions Proxies for creating and managing micro service architectures
- Azure Stream Analytics and Event Hubs for analytics support
- Cognitive Services for artificial intelligence support
- Azure SDKs and Tools for API
- Visual Studio Developer Tools for integrated development experience and Continuous integration/Continuous delivery
- Open source Serverless Framework to build serverless architecture

AWS for Serverless Architecture

AWS also offers a set fully managed services that can be used to build serverless applications regardless of scale and complexity. It will empower you to focus on building solutions that drive your business growth.

Here are some important tools from the stable of AWS:

- AWS Lambda for executing code
- Amazon S3 for cloud storage
- Amazon DynamoDB for database services
- Amazon API gateway for API management
- Amazon SNS for application integration
- Amazon Event Bridge for event bus services
- AWS Step Functions for orchestrating components of distributed applications
- Amazon Kinesis for analytics

Conclusion

Serverless architecture made its appearance in 2014 and since then it has been growing slowly but steadily. It is the future of application development because every organization, irrespective of its size, prefers to channelize its resources prudently to achieve maximum return on investments. Using serverless architecture enables software engineers to deliver solutions that can perform at any scale, in record time, at reduced costs, without compromising on quality.

Serverless computing has to be a change in approach towards software development, where the focus is on providing innovative solutions rather than worrying about how those solutions will be implemented. As companies scale up and realize the potency of serverless computing, its usage will increase. It is also expected that serverless computing will become more secure, reliable and easy to use in future.

How data processing works in IoT

Introduction

IoT stands for Internet of Things. It essentially means a network of devices and objects that are connected to the Internet. Being connected to the Internet means that they can either collect data and send it through the Internet, receive information from the Internet, or do both the things.

All solutions in IoT typically involves four components – sensors, connectivity, data processing, and a user interface.

Sensors are objects that collect data and send it over the Internet. The data could be sent for storing, processing, or further dissemination of information.

Wired or wireless connectivity between the devices and processors is very essential, and is always through the Internet.

The amount of data collected by IoT devices is humongous. The amount of storage space as well as processing capacity required to utilize this data is also very huge. Cloud solutions for both storage and processing are proving to be a boon because they are:

- Affordable
- Scalable
- Fast response times
- Quick time to market

User interface in IoT solutions need not always be visual, which presents challenges to solution developers. Here user experience becomes more important and must be taken into account before any discussion on user interface can ensue.

All the four components of an IoT solution are important but data processing proves to be the most challenging as well as crucial.

Here we will look at how data processing works in IoT.

Data processing cycle

Data processing in IoT follows the typical Input → Process → Output cycle of any computer activity.

Input

For any processing to occur, input must be available. The data collected may be in the form of images, QR codes, text, numbers, or even videos. All these data must be converted into machine readable form before they can be sent for processing.

Process

This is the phase where the actual data processing happens. Different techniques like classification, sorting, calculations, etc. are used to get meaningful information from the data received.

Output

Although the information is produced in the processing phase itself, it is rendered into human readable format in the output stage. This output maybe in the form of text, graphs, tables, audio, video, etc. Output may also be stored as data for further processing at a later date. This is essential because comparison of current information with historical data can produce useful insights into the overall functioning of a system. This comparison can also be used to predict future behavior.

IoT platform

One advantage of using an emerging technology is that there are many options available to you, before some of them are deemed so successful that all other take a back seat. In business, where each problem is unique, availability of multiple options should always be encouraged.

Currently there are hundreds of IoT platforms available in the market. You should select the one ideal to you depending upon your unique challenges and the amount of time, resources, and money you are willing to put on it.

Typical IoT architecture

You must have knowledge about what a typical IoT architecture should comprise, before you can select the ideal platform for you. Any IoT architecture is a multi-layered structure that has different tools for performing different activities.

The first step in any IoT solution is data collection and your platform must provide multiple ways of doing this. The objects should be constantly connected so that critical data is not lost. The architecture should also take care of back-end management of these devices, including continuous software updates and remote device management.

Once the data is collected it needs to be converted from its analog form to digital so that it can be stored, processed, and analyzed for further action. You must confirm that the IoT platform provides a robust engine that can take care of all the rules to be applied for real time analysis of incoming data.

Storing the important data sets and the analytics is a crucial function of any IoT platform because it affects the action that must be taken as per the data collected.

Criteria for selecting an IoT platform

Some of the factors that you must take care of while selecting the most suitable IoT platform include:

- **Suitability** – The platform should be suitable for your unique business requirement. It would be ideal if the platform has been used previously for a similar use case.

- **Stability** – The platform that you are going to use must be stable under all circumstances most of the time.
- **Scalability** – One of the most important advantages of using IoT is the ability to scale up as per requirement. You should take care that your choice of platform does not hamper this in any way.
- **Security** – How secure are your processes? How secure is your data? how secure is the information provided by the users? These are some answers you must get before selecting a platform.
- **Data ownership** – You should never assume that since it's your business you automatically own the data generated. Ensure that it's you and not the service provider who owns the data.
- **Pricing model** – IoT platforms typically use cloud for storing, processing, and displaying information. The usual payment model is pay as you go. Understand the pricing model thoroughly, with its caveats and loopholes, to ensure that you do not end up paying much more than anticipated when you actually start to use.
- **Performance** – It is essential to enquire into the past performance of the platform. You want a nearly 100% up time for the platform so that your users do not face any glitches anytime.
- **Additional tools** – The platform should provide additional tools that your developers can use to create their own customized tools, apps, reports, and interfaces.

Best Tools for IoT Data Processing

Here are some of the best tools and platforms being used for IoT data processing in 2019.

Google cloud

Google cloud provides multi-layered architecture suitable for organizing, managing, and sharing documents. It has AI/ML capabilities and provides real time business insights.

IBM Watson IoT

It allows businesses to collect, collate, and communicate data from smart devices, embedded machines, and wearables. It boasts of domain expertise that can be used to develop customized and flexible solutions. It is supposed to be highly secure platform in its price range.

Amazon AWS IoT Core

AWS from Amazon is a suite of software designed to provide end to end IoT solutions right from sensors, connectivity, data processing, storage, and user interface. It is a highly secure platform that can track and communicate even when your devices are not connected with the Internet.

Microsoft Azure IoT suite

The beauty of Microsoft Azure suite lies in its flexibility. It can be used to develop solutions for varied industries from health care, manufacturing, and retail to transportation, predictive maintenance, and smart connected spaces.

Oracle IoT

Oracle IoT cloud enables you to connect your devices to the cloud so that you can collect data, analyse them in real time, and relay them to enterprise applications as well as web services. It can be used to easily extend existing systems like retail management, supply chain management, human resource management, ERP, and customer handling.

Cisco IoT Cloud Connect

Cisco has stuck with its core competence of networking even while developing IoT cloud Connect, its mobility solution. It is designed to help mobile operators optimize their network, secure communication channels, and manage data effectively.

Emerging Use Cases for IoT Data Processing in IoT

Let us look at some of the most popular use cases for IoT data processing, areas that have been impacted the most through the use of IoT.

Use Case #1: Consumer Product Usage Analysis for Marketing

Whatever the technology, customer remains the king. Businesses are always looking at ways to get more information about the way a product is used by the consumer, so that further marketing strategies can be built around it. IoT has become a useful tool for these purposes. Data collected from smart devices enables them to understand how the consumer is using their product and create further marketing and new product launch strategies around them.

Use Case #2: Serving Consumers and Business Users with the Same Analytics

The data collected by IoT devices can be used by both consumers and business users for their unique purposes if different analytics and interfaces are created for different set of users. For example, consumers can use data provided by smart coffee machines to monitor their coffee intake in a day. The same data can be used by coffee machine makers to analyze usage pattern and strategize for selling coffee machines as well as coffee capsules accordingly.

Use Case #3: Sensors and Cameras Enable Connected Events

As the concept of emotional selling is gaining momentum, businesses want to know what their consumers are thinking, and what is shaping their behaviour. Events connected via use of sensors, cameras, facial recognition, and social analytics are gaining popularity. Data provided during connected events enable them to identify the parts that were liked by the viewers and parts that were boring. This can be further used to decide which clips of the events should hit the social media sites and which should not, for maximum traction and visibility.

Use Case #4: Video Analytics for Surveillance and Safety

One of the most important areas where video analytics is being used is surveillance and safety of both indoor and outdoor spaces. This will enable availability of safe environments in schools, colleges, playgrounds, offices, shopping malls, and others public places. The live feed provided by video cameras can be monitored so that proactive safety measures are taken rather than reactive ones.

Pitfalls/challenges in data processing for IoT

Like every coin has two sides, every technology has advantages as well as disadvantages. Some of the challenges faced in data processing for IoT include:

- **Handling volume of data generated:** As discussed earlier, the amount of data generated by the sensors is humongous. As time, money, and effort are required to store and process this data, it is essential to confirm that generating such amount of data is necessary for the functioning of the system. Further, businesses also need to develop or purchase tools for handling the data generated. This requires allocation of budget as well as resources.
- **Is cloud really secure:** Although cloud has gained widespread acceptance, the jury is still out on whether cloud solutions are really safe and secure. As someone invested in using cloud solutions for storage and processing of IoT data, you must ensure that all the data and information stored on the cloud secure. The connection pathways between the sensors, storage devices, processors, and user interfaces must also be completely secure.
- **Service level agreements:** When you are entering into agreement with cloud service providers for availing their storage and/or processing solutions, you must look into the service level agreements minutely. You must be aware of all the services that they are supposed to provide, how secure their system is, how frequently their system is prone to breakdowns, and what are the provisions in case you wish to change cloud vendor.
- **Lack of industry standard architecture:** As discussed, there is no standard industry standard architecture for IoT solutions. You must ensure that the platform you have chosen is suitable for solving your problems, fulfilling business needs, and transforming your business to the next level.

Conclusion

IoT has utility across multiple industries like manufacturing, retail, consumer goods, event management, social media, health care, energy conservation, etc. It is up to us how we embed intelligence in two devices and use them to collect data that can be used to make life better, transform businesses, and achieve growth. As discussed here, there are still many challenges to overcome before the potential of IoT can be fully utilized. But that should not stop anyone from using it in its current transformational stage to start getting benefited by IoT.

Ultimate Guide to Blockchain Technology

According to [Statista Report 2017](#), the global blockchain technology market will be 2.3 billion USD in size by 2021, assuming a CAGR of 61.5%.

Blockchain is proving to be one of the most promising technologies of 21st century. Building upon work done by Stuart Haber, W. Scott Stornetta and Bayer on [cryptographically secured block chains](#) in 1991-92, Satoshi Nakamoto built the first blockchain in 2008. Satoshi Nakamoto maybe a person or a group of persons using this pseudo name; no one has been able to ascertain their offline identity till date.

What is blockchain?

Blockchain is basically a digital ledger where data can be entered, verified and then processed further by the approval of computer nodes on a peer-to-peer network. Whether you want to enter new data, validate existing ones or delete data, a predefined number of nodes on the P2P network must validate each transaction.

The digital data is stored in blocks that are then linked together form the blockchain. To create a new block of data, any one of the nodes first needs to create a new block and then put all the new transactions in the block. This new block is appended to the existing blockchain and then broadcasted to other nodes on the network. Other nodes must verify the validity of the new transactions before it can be accepted and become part of the blockchain.

Features of blockchain

Having a P2P network implies that all users are equal - there is no server that is superior than its clients, as in the case of Internet. This gives rise to **decentralized control** over the data contained in the whole blockchain.

This involvement of all the nodes for all transactions ensures that there is no single point of control as well as failure. The distributed data ensures that hackers cannot hack into the blockchain from any single point. Similarly, if any one node fails, the whole blockchain would not be disrupted and it will be business as usual.

All the blocks are in public domain and hence there is complete **transparency**. This feature of blockchain has found widespread use, as we will discuss later.

Bitcoin and blockchain

Blockchain was first implemented as Bitcoin, a digital currency design by Satoshi Nakamoto. Or rather, it was the other way round. Blockchain was invented so that digital currency could become a reality. This is the reason why many people think of blockchain as Bitcoin and find it difficult to believe that blockchain is a concept that can be taken much beyond cryptocurrencies. However, blockchain's contribution to popularizing digital currency cannot be glossed over.

Blockchain was the first technology to eliminate the problem of double spending in digital transactions.

You can also take blockchain to be a digital ledger where entries are made only after the approval of all those who have access to the ledger. once the financial data of the ledger is replaced by any other data or document, you have a blockchain useful for other non-financial fields.

How Does a Blockchain Work?

The best part about blockchain is that you do not need to understand the technology behind it to use it. However, it sure helps to appreciate any technology better if we understand its basics. Even though blockchain has been made to sound something highly technical, it is based on a very simple concept for implementation. If you know how Internet works, you can easily understand how a blockchain works.

The backbone of any blockchain is the P2P network formed by nodes with huge computing capabilities. The huge computing capability is required because nodes are needed to solve complex puzzles to find new blocks or validate transactions. The moment they join the network, the blockchain is automatically downloaded on their system. There is no copy of the blockchain, the node simply shares the blockchain with other nodes. When a new block has to be created or data has to be added to an existing block, it must be done by a node. Once this new node is put out on the network, it is verified by all the nodes. This is called **reconciling** the transaction. The network checks itself every 10 minutes to see if any new transaction has taken place, which needs to be reconciled.

Are you wondering why any user would do reconciliation and relaying blockchains to other nodes or users? Well, all nodes that successfully create a new block or reconcile a transaction are paid in Bitcoins. That is why bitcoins were invented in the first place – a means to incentivize joining and working on a blockchain network. This process for verifying transactions and getting paid in Bitcoins in return, is called “**mining.**”

The users also mine for blocks to which new transactions can be added. Once the new Block with the new unverified transactions is added to the chain, it is broadcast to all the other nodes. When all the nodes are able to verify the transaction, it becomes a part of the digital ledger.

Remember that no new transactions can be added to the old block because they are already verified. This makes the blockchain tamper proof. To change data of any old block the rogue node needs to put out a complete new blockchain to the network, which is practically not possible because of time and resource constraints.

Impact of blockchain on industries

Although blockchain was designed to launch cryptocurrency Bitcoin, it has found acceptance in all major Industries like entertainment, sports, retail, finance, logistics, healthcare, etc. Here are some use cases that have the potential to change the face of many industries:

- Blockchain can be used in [supply chain](#) to verify authenticity of products being delivered.
- Smart contracts can be used to perform transactions without the need for middlemen.
- Blockchain can be used for crowdfunding where people donating can easily track if they are donations have been put to correct use.
- Securing personal identities online is one of the biggest drawbacks of current online systems. Blockchain can be used to distribute this data in a way that it becomes secure and there is no Central point of hacking.
- People can store records pertaining to their achievements academically and professionally on blockchain and share with other people like prospective employers or loan managers. As it is on blockchain, the other party can easily verify the authenticity of information.

- Data that should be in public domain, like land title deeds, stock market value, etc. can be securely put on blockchain so that anyone can access and view them.
- Patient data can be shared across healthcare organizations to ensure better and more efficient care.

How governments are using blockchains

Most governments around the world grapple with issues of transparency, reliability and security in their various programs. All these issues can be taken care of by using blockchain to maintain information. So, governments are embracing blockchain technology to implement transparency and data security issues. As all information on a blockchain is in the public domain, which can be verified, all government measures become automatically transparent. Smart contracts are also being used to ensure that all the promises made by the government are enforced by concerned parties. Data loss or leakage is also diminished as the need to maintain data physically is not there now.

Blockchain apps development technologies

NEED MORE INPUT ON TECHNOLOGIES OR TOOLS USED TO DEVELOP DAPPS

Future of blockchain technology

The future of blockchain technology will become self-evident when you read these numbers:

- A simple search on AngelList shows more than [7500 blockchain start ups](#)
- Blockchain related jobs posted on LinkedIn tripled between 2017 and 2018
- Global spending on blockchain solutions was USD 2.1 billion in 2018

However, the blockchain technology faces some challenges as well, which is two pronged. On the one hand they need to worked upon their technological limitations and on the other they need to improve the general perception among common people. the technological challenges that disease include issues like scalability, security and decentralisation. SegWit upgrade has improved blockchain protocol to some extent but block size needs to be improved further.

While the blockchain technology was gaining traction among industry expert over the past couple of years, its image was taking a beating in the eyes of general public due to controversy over Bitcoin and other cryptocurrencies.

FAQs - Blockchain Technology

What is the difference between bitcoin and blockchain?

Bitcoin is Digital currency that is maintained on a public verified digital ledger. Blockchain in a chain of blocks containing data verified by independent users. Bitcoin ledger is also implemented using blockchain Technology.

What is Hyperledger?

Hyperledger is an umbrella organization for cross-industry open source blockchain technologies. It is promoted by the Linux Foundation. It was launched in December 2016 and supported by companies like IBM, SAP and Intel. It has participants from some of the major Industries like Finance, Banking, IoT, manufacturing and retail. Starting with just four business blockchain codebases, it now hosts many private blockchain codebases (<https://www.hyperledger.org/about>)

What are smart contracts?

Smart contracts are legal contracts converted into lines of code and implemented using blockchain network. this contract can be used to perform the allowed legal transactions without the need for a centralised authority. that is why these contracts are also called self-executing contract. as blockchain is used to maintain and verify transactions, all the transactions are traceable, transparent and Irreversible. By using smart contracts, you save on time as well as money.

What is SegWit?

SegWit is the acronym for Segregated witness. it is a protocol Upgrade applied by Bitcoin in August 2017 and Litecoin in May 2017. it took care of two issues with the original blockchain protocol - scalability and transaction malleability.

- **Transaction malleability** - The original blockchain protocol had a bug which enabled a user to modify the transaction ID - specifically the witness signature - without modifying the contents. This was no issue for the blockchain per se, but posed problems in developing complex applications over the basic blockchain.
- **Scalability** - The original blockchain protocol limited block size to 1MB. This meant that any blockchain could handle only 7 new transactions per second, a huge limitation as the popularity of blockchains grew and more and more transaction were performed using it. SegWit upgrade enabled a greater number of transactions to be stored in each block. So, the throughput of the blockchain increased.

What can blockchain do?

Due to decentralized reconciliation of each data on a peer-to-peer network, a blockchain can help its user in following:

- Establishing digital identities
- Keeping records that are immutable, i.e., they do not change over a period of time.
- Maintain and provide digital audit trails
- Offer Blockchain as a Service (BaaS) through platforms like cryptocurrencies and smart contracts.

What are blockchain issues and limitations?

Every coin has two sides. Blockchain is taken to be one of the most promising technologies of 21st century. however, it has its own limitations:

- **Resource hog** - Data mining requires great amount of electricity and high computational power. According to a study, blockchain uses more electricity than countries like Switzerland and Czech Republic. It needs to be judged whether the benefits of blockchain far outweigh the resources required to keep it running.
- **51% assault** - Every blockchain is prone to 51% assault. This essentially means that if 51% of the nodes are taken over by rogue elements, they can add new transactions according to their own wish. This can be taken care of only if more and more people join blockchain network.
- **Politics** - As blockchain is being embraced by governments, the politicization of blockchain has already begun. When a blockchain becomes too big, it is forked into two smaller and more manageable blockchains. This **forking** is becoming a bone of contention between the concerned parties.

- **Complex language** - Blockchain technology uses lots of terms and complex concepts. People need to be as educate in these terminologies so that they feel comfortable to join the blockchain network and make it more useful. The full benefits of blockchain technology can be utilised only if the nodes joining the network come from diverse backgrounds.
- **Offline interface** - The last Mile gap between online information and offline entity to wait that information belongs is not taken care of by the blockchain. It must be done manually and hence it is prone to human error.

Conclusion

Blockchain is essentially an immutable, decentralized and tamper proof ledger. As we have seen, it has the potential to make life easier by providing secure, fast, transparent and middlemen-free way of performing transactions.

As more and more people are realizing the way blockchain technology can revolutionize the way we perform transactions, both financial and non-financial, it has the potential to become the most valuable technology of 21st century.