

White Paper

Embracing Globally Distributed Databases in the Cloud

YugabyteDB and Tencent Cloud Ushering in
the Cloud Native Future



yugabyte**DB**



Tencent Cloud

Table Of Contents

Introduction	1
Overview of YugabyteDB	1
Overview of Tencent Cloud	2
Benefits of YugabyteDB and Tencent Cloud	3
Target Use Cases	6
User Case 1: Global Gaming	6
User Case 2: Logistics and Globalizing Business	8
Deploying YugabyteDB on Tencent Cloud	9
Cloud Virtual Machine based Deployment	9
Tencent Kubernetes Engine based Deployment	10

Introduction

Technology leaders are busy transforming organizations into data-driven digital enterprises. Over the past decade, organizations have embraced microservices running in hybrid and public clouds and agile development practices to leverage data through new innovations. Because the transformation to date has mainly focused on the infrastructure and application layers, we have not yet seen that same level of focus on the critical database layer.

Developers today continue to work with costly monolithic databases and NoSQL databases that forgo strong data consistency and important relational features. Enterprises are also moving from largely private datacenters based in one or several locations, to a cloud environment with globally distributed data. Modern distributed SQL databases, like YugabyteDB, are finally addressing these problems, by providing a cloud native database built for scale and agility

The combination of best of breed solutions in YugabyteDB and Tencent Cloud are helping organizations overcome common challenges by delivering:



Higher Performance

Traditional databases and legacy cloud solutions result in high latencies due to low performance and expensive network traffic.



Consistent Data

Global applications built on legacy solutions often face the challenge of trading off scale for consistency, leading to stale or inaccurate data.



Compliance Requirements

New and existing compliance requirements, like GDPR, require simple data localization at scale to protect personal user information.

Overview Of YugabyteDB

Yugabyte is the company behind YugabyteDB, the open-source distributed SQL database designed from the ground up for mission-critical applications. YugabyteDB is used by some of the world's most demanding enterprises to drive data-driven innovation in the face of uncertainty and change. Over the past 10 years, organizations have radically changed how they build and deploy applications, making now the right time to evolve the systems of record and embrace a cloud native data layer.

YugabyteDB eliminates legacy database tradeoffs by combining the best of SQL—consistency, familiar interfaces and security—with the best of NoSQL—resilience, horizontal scalability and geo-distribution—into a single logical database. By enabling developers and IT teams to focus on innovation instead of complex data infrastructure management, YugabyteDB helps them accelerate developer productivity, reduce costs, and lower risks.

Fortune 500 companies like Kroger, Wells Fargo, Fiserv, Temenos, and GM adopted YugabyteDB to modernize their data layer and eliminate legacy solutions.

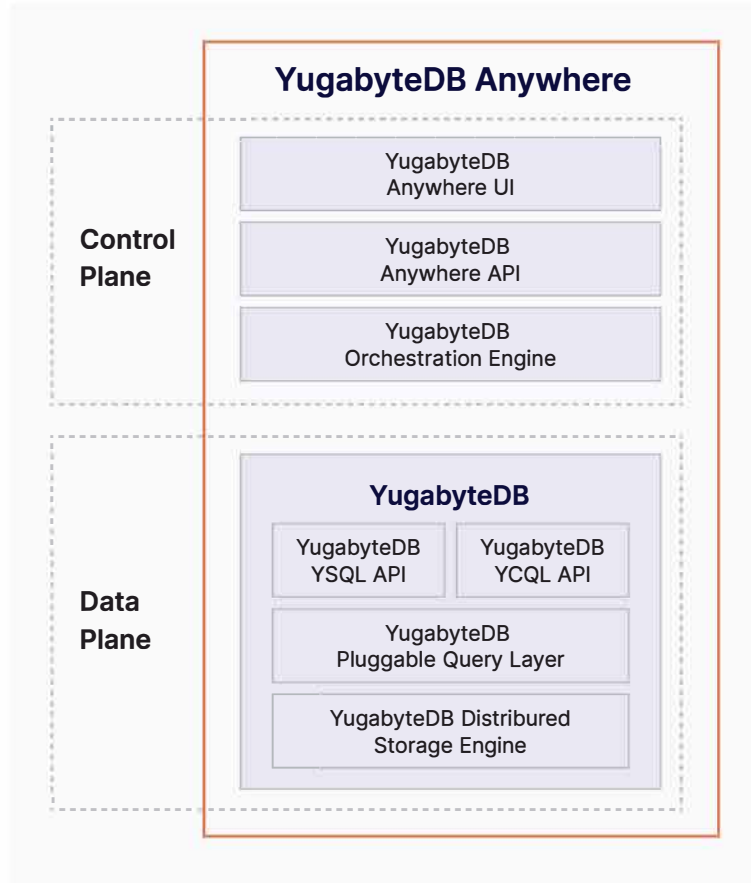
Along with the open source YugabyteDB, which is available for anyone to download and use, Yugabyte also offers a few solutions to help companies who want to simplify deploying, operating and managing YugabyteDB at global scale. YugabyteDB Anywhere is the best option for midsize and large enterprises who have a strong IT team and want more control of where data lives. YugabyteDB Anywhere includes a powerful orchestration engine that makes it easy to manage and deploy YugabyteDB in any environment—like Tencent Cloud—through built-in automation.

Overview Of Tencent Cloud

Tencent Cloud, the cloud business of global technology company Tencent, is one of the world's leading cloud companies and is committed to creating innovative solutions to resolve real-world issues and enabling digital transformation for smart industries. Through an extensive global infrastructure, Tencent Cloud provides businesses across the globe with stable and secure industry-leading cloud products and services, leveraging technological advancements such as cloud computing, big data analytics, AI, IoT and network security. Their constant mission is to meet the needs of industries across the board, including in the fields of gaming, media and entertainment, finance, healthcare, property, retail, travel and transportation. Tencent Cloud also strives to help overseas businesses enter the China market through the China Connect solution and help Chinese enterprises to go global.

Tencent Cloud has deployed 2,800+ acceleration nodes in over 70 countries and regions, with bandwidth reaching 200 trillion bytes, providing strong technological support for more enterprises to expand their business quickly.

Tencent Cloud provides highly available, reliable, and scalable cloud services to help organizations implement their products or applications on a regional or global scale.



Of these services, the following three Tencent Cloud products are especially well suited to take advantage of both this global cloud infrastructure and the high performance, globally distributed architecture of YugabyteDB:



Cloud Virtual Machine (CVM)

is a scalable cloud computing service that frees enterprise organizations from estimation of resource usage and upfront investment. With this scalability and reliability of the service, organizations would have flexibility to scale as needed in the cloud and in the data layer with YugabyteDB, helping them avoid paying for idle resources.



Tencent Kubernetes Engine (TKE)

is a container management service with high scalability and performance that enables you to easily run applications in a managed CVM instance cluster. The TKE service frees you from installation, operations, and expansion of the cluster management infrastructure. YugabyteDB natively supports Kubernetes and can be efficiently installed through Helm. YugabyteDB plus TKE enable organizations to implement their database in any region they have a business without sacrificing network performance.



Cloud Connect Network (CCN)

plays a key role in implementing services at a global scale. CCN bridges between a **Tencent Cloud VPC** and another or between VPCs and local IDCs with a high-quality private network connection. Combining CVM, TKE, and YugabyteDB, enterprise organizations can deploy a global distributed database with high performance, low latency networks, and scalable and reliable infrastructure.



Benefits Of YugabyteDB And Tencent Cloud

YugabyteDB and Tencent Cloud solutions provide organizations with a cloud native and cost-effective solution that can help companies of all sizes—from enterprises to SMEs—accelerate their modernization initiatives and achieve business success. Companies have discovered that modernizing just one part of a business is not enough to truly evolve into a cloud native organization.

By combining a modern data layer and with a modern cloud IaaS solution, organizations are able to architect a cloud native business from infrastructure all the way to the applications providing them with key benefits:



Innovate Faster and Reduce Time to Market

Businesses are increasingly focusing on delivering more capability, iterating functionality and building products that are extremely aligned to fast changing market conditions. Recent years have clearly proved that it is absolutely necessary to deliver solutions quickly to stay competitive.

YugabyteDB with Tencent Cloud helps you reduce lead time for your product iterations. Tencent Cloud provides extremely robust infrastructure services. These services are manageable with a variety of automations like Infrastructure as Code (IaC), DevOps, ChatOps, and on-demand scaling. Applications can benefit from this automation and are able to continuously integrate and continuously deliver (CI/CD). Yugabyte provides the same benefits for database systems, and is able to deliver database changes and upgrades with zero-downtime.



Reduce Time to Recovery and Scale

Tencent Cloud provides integrated monitoring, alerting and healing capabilities for all its services. This allows applications and databases to remain resilient and scale quickly. Almost all common errors (node failure, process failure, etc.) are healed automatically and transparently. Overall management and operations are automated with exception based manual oversight. You can set the level of automation to your organization's needs. These capabilities are used by YugabyteDB to keep recovery time to seconds and recovery point to zero, i.e. no data loss.

Tencent Cloud's CCN service makes scaling to a global audience effortless, while maintaining the same level of quality of service for users across the globe. Combined with YugabyteDB's ability to scale and geographically distribute data, overall user experience is extremely reliable and smooth.



Reduce Operational Costs

Tencent Cloud provides extremely competitive pricing for its services. These prices are further reduced when you opt for committed use. Users can take the benefit of this by standardizing their computing configurations.

YugabyteDB takes this to the next level. It allows users to start with a small number of machines and add more resources as the business demand grows. It also allows switching from one configuration to another to cater to major spikes. All this without impacting application.

YugabyteDB allows applications to simplify their architecture and remove components like caching service. This reduces running costs as well as error rate due to complex data movements. YugabyteDB's pluggable query layer helps consolidate SQL and NoSQL databases into one database solution.



Accelerate Modernization and Cloud Adoption

Application modernization is a multi-year undertaking and is mostly seen in parallel with cloud adoption. Cloud is an enabler for application modernization. Tencent Cloud accelerates application modernization through its DevOps Pipelines and TKE offering.

Application modernization often descopes database modernization due to criticality of data. Adopting new database technology poses engineering (migration and refactoring) and operational (skillset, integrations, etc.) risks.

YugabyteDB with its SQL compatibility and automation operations removes a lot of these risks and helps accelerate modernization initiatives, resulting in successful and end-to-end transformation.



Improve Compliance and Security Posture

Security and compliance are integral parts of any IT policy. Tencent Cloud and YugabyteDB enhances the shared responsibility model of the cloud and streamlines it further. Data security and encryption can be done at infrastructure as well as database level. All the communications can be encrypted to prevent any network or MITM attacks.

YugabyteDB also provides row level access control for consumers. Combined with the Network ACLs and Security Groups of Tencent Cloud, the overall security profile of the application is improved significantly. YugabyteDB's row-level geo-partitioning and geo-pinning capability allows efficiently implementing data privacy and residency rules. This eliminates the need for complex application logic scattered across all the microservices.

Target Use Cases

Globalization is the business target for more and more enterprise organizations. By utilizing Tencent Cloud and YugabyteDB, they can adopt an ideal solution that delivers high availability, scalability, and reliability. Gaming and logistics are two of the industry use cases that perfectly demonstrate these benefits.

User Case 1: Global Gaming

Online gaming market is experiencing a rapid growth in recent years especially after the Covid-19 pandemic, and online games must increasingly support players from all over the world. You probably still remember the days when you needed to constantly refresh the game lobby and find a server room that was close to you and tried to squeeze it. These days are history now. Players from different countries and continents can now be gathered together in one game in seconds by just clicking “Find Match”. Gaming globalization is happening. That’s how the concept of Global Gaming came into our sight.

The upward tendency in global gaming is not only a result of new innovations to the gaming experience, such as new gaming consoles and hardware, 5G, and ultra high-speed internet, but also because of the booming cloud industry.

Deploying your online game on the cloud globally can solve classic scalability, availability, reliability, and network latency issues. Especially for MMO and MOBA types of games, a large player pool is necessary to ensure low matchmaking time. Low network latency is needed to ensure smooth gaming experience for players coming from all over the world. Following data local compliance requirements and lowering operation cost are also part and parcel of having a successful game. All of these factors can be addressed with rational designing the global gaming architecture by utilizing Tencent Cloud and a high-performance, distributed database like YugabyteDB.

How you deploy your gaming architecture largely affects how you are going to handle the gaming operation and data compliance. Mainly five different types of gaming architecture are taken into consideration and have different pros and cons:



Globally Centralized Deployment

servers are deployed in one region, serving global players. Acceleration tunnels such as [Global Application Acceleration Platform \(GAAP\)](#) can be used to lower the network latency. This architecture can be implemented fast, but include no remote disaster recovery, limited localization options, and higher data compliance risks.



Locally Centralized Deployment

each region contains a complete fleet of servers, using standalone deployment. Thus, localization and data compliance issues can be solved, and games can be effectively customized by different countries' cultures. However, deploying such infrastructure can be extremely time consuming, and organizations will face high operation cost and poor data communication between countries.



Globally Distributed Deployment

platform services are deployed in one region and dedicated game servers are distributed globally. Players access the nearest game server to ensure low latency and smooth gaming experience. Although this architecture can do cross-region failover, it is still hard to resolve localization and data compliance concerns.



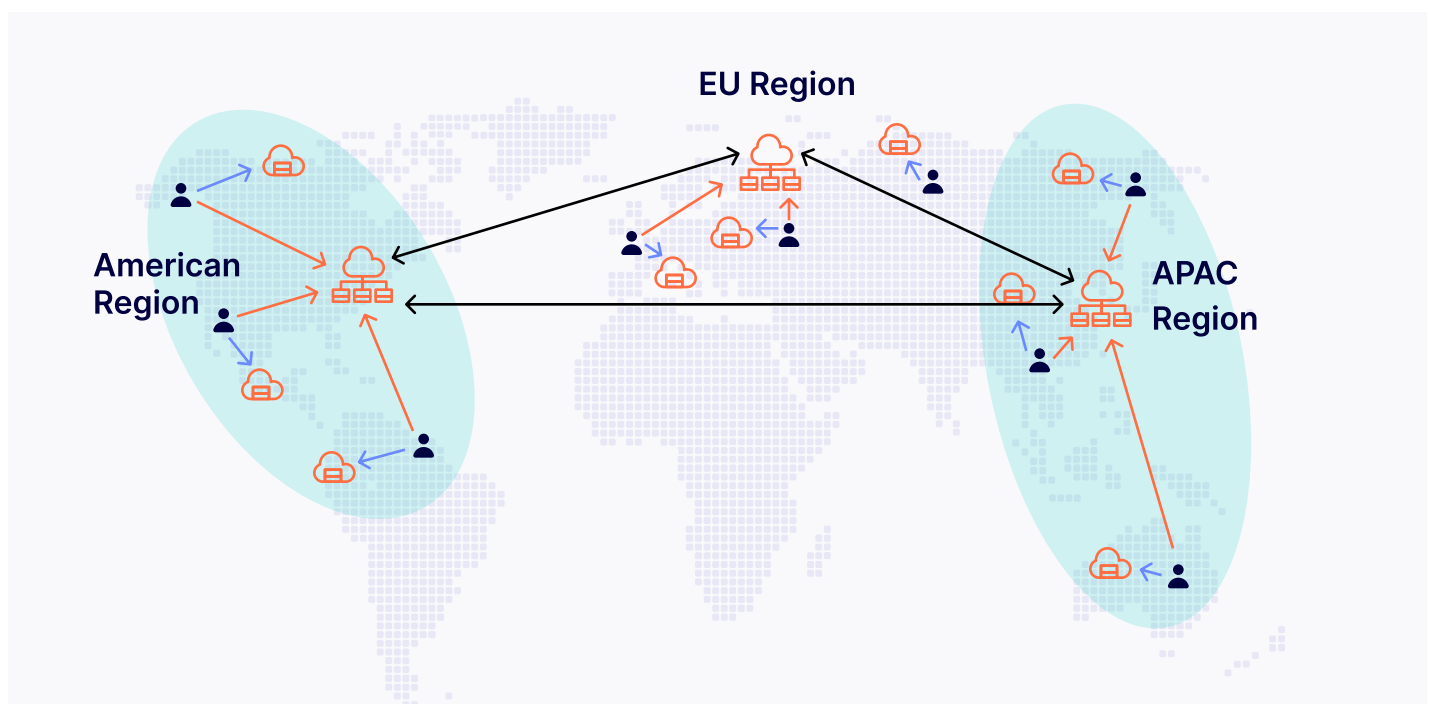
Regionally Distributed Deployment

servers are deployed by continent, language, or time zone, which supports regional failover and provides players nearest access point and smooth battling experience, but this architecture faces complex infrastructure deployment and operation.



Regionally Distributed Deployment with Globally Distributed Database

this architecture combines globally distributed deployment and regionally distributed deployment. Each region has its own dedicated centralized servers while databases are distributed globally. It provides more flexible gaming operation and data compliance control as well as smooth gaming experience to players.



Leveraging YugabyteDB on Tencent Cloud services empowers you to quickly deploy the last and the most effective global gaming architecture mentioned previously—regionally distributed deployment with a globally distributed database. DevOps can spin up regionally distributed servers on Tencent Cloud in no time, and each region's Yugabyte database can be interconnected with very low latency when CCN is enabled.

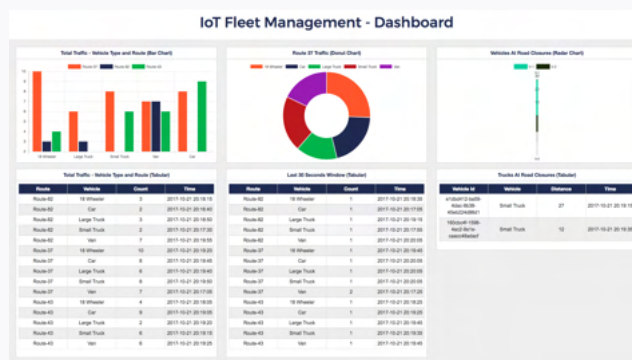
To further improve the performance, read replicas can also be provisioned based on the actual usage of each region. Meanwhile, Personally Identifiable Information (PII) data can be securely stored in its own region by enabling YugabyteDB geo-partitioning. PII data can be categorized so these types of data are not going to be replicated to other regions. Non-PII data will be automatically shared with other regions with a small amount of latency. In this way, such regional data compliance issues can be resolved.

User Case 2: Logistics And Globalizing Business

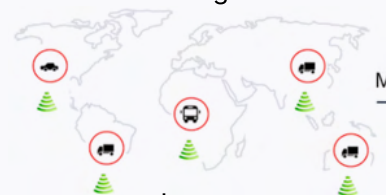
Adopting both Tencent Cloud and YugabyteDB also empowers the global logistics industry to solve challenging global shipment tracking. Imagine you have a fleet of vehicles that are going to ship to different countries around the world and you want to track them in real time so you can optimize the route and evaluate the risk of each shipment. To fulfill this requirement, these vehicles should be equipped with advanced IoT devices and applications.

You can perform live tracking to know exactly each vehicle's route, the type, time, and so on by combining YugabyteDB with Tencent Cloud **Message Queue Ckafka** as a message broker and Elastic MapReduce Apache Spark streaming for real-time analytics and Spring Boot for application framework.

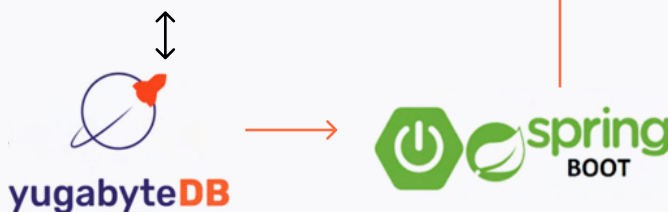
IoT Streaming With Kafka And YugabyteDB



Fleet w. Location Tracking Enabled Using IoT Sensors

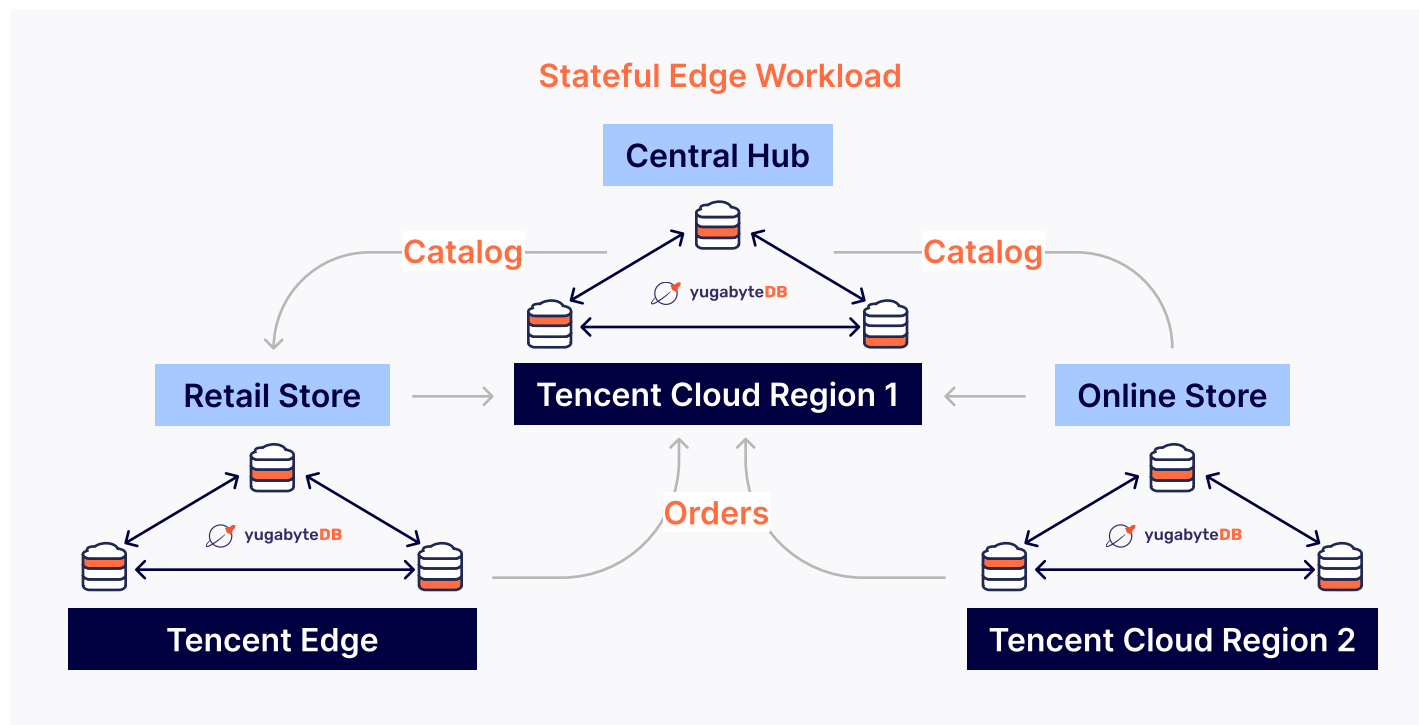


Bootstrap.js
Chart.js
jQuery.js
Socks.js



Tencent Cloud (CVM,TKE)

IoT Applications in a variety of industries can benefit from the combined power of Tencent Cloud and YugabyteDB. Tencent Cloud offers scalable infrastructure suitable for all the streaming data needs. It provides the flexibility of starting small and growing as the business grows. It also allows simplifying operations and handling spikes in an automated fashion.



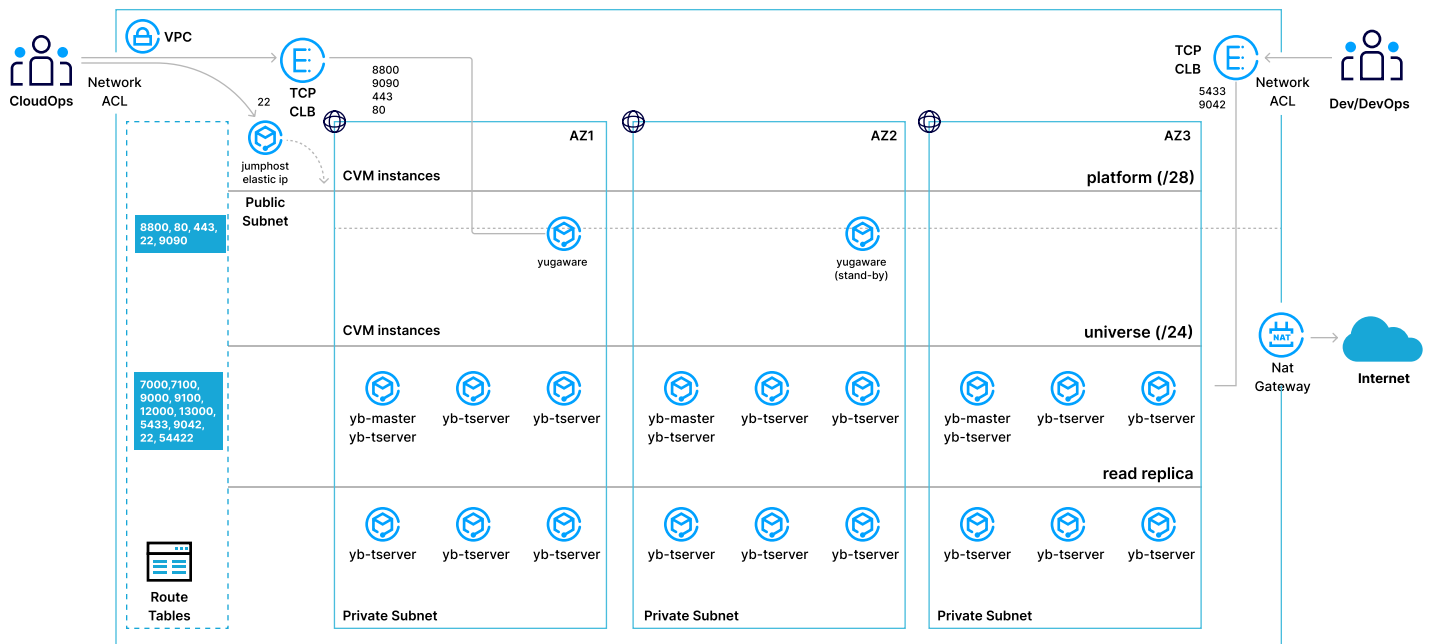
Changing consumer behavior has created a variety of patterns in multiple industries. Order in-store and deliver to home as well as order online and pickup in store are some of the examples of how edge computing is helping businesses meet their customer demands. YugabyteDB with Tencent Cloud can provide end-to-end solutions for your business. Pushing data to the edge, like with a product catalog update, and aggregating data to a central hub, such as collecting all orders and fulfillments, require resilient, consistent and low latency data streams. YugabyteDB with Tencent's backbone delivers this effortlessly.

Deploying YugabyteDB On Tencent Cloud

YugabyteDB can be deployed on Tencent Cloud using Cloud Virtual Machine (CVM) or Tencent Kubernetes Engine (TKE2) service. YugabyteDB works well with either of the services and one can use either or both services for deployments.

Cloud Virtual Machine Based Deployment

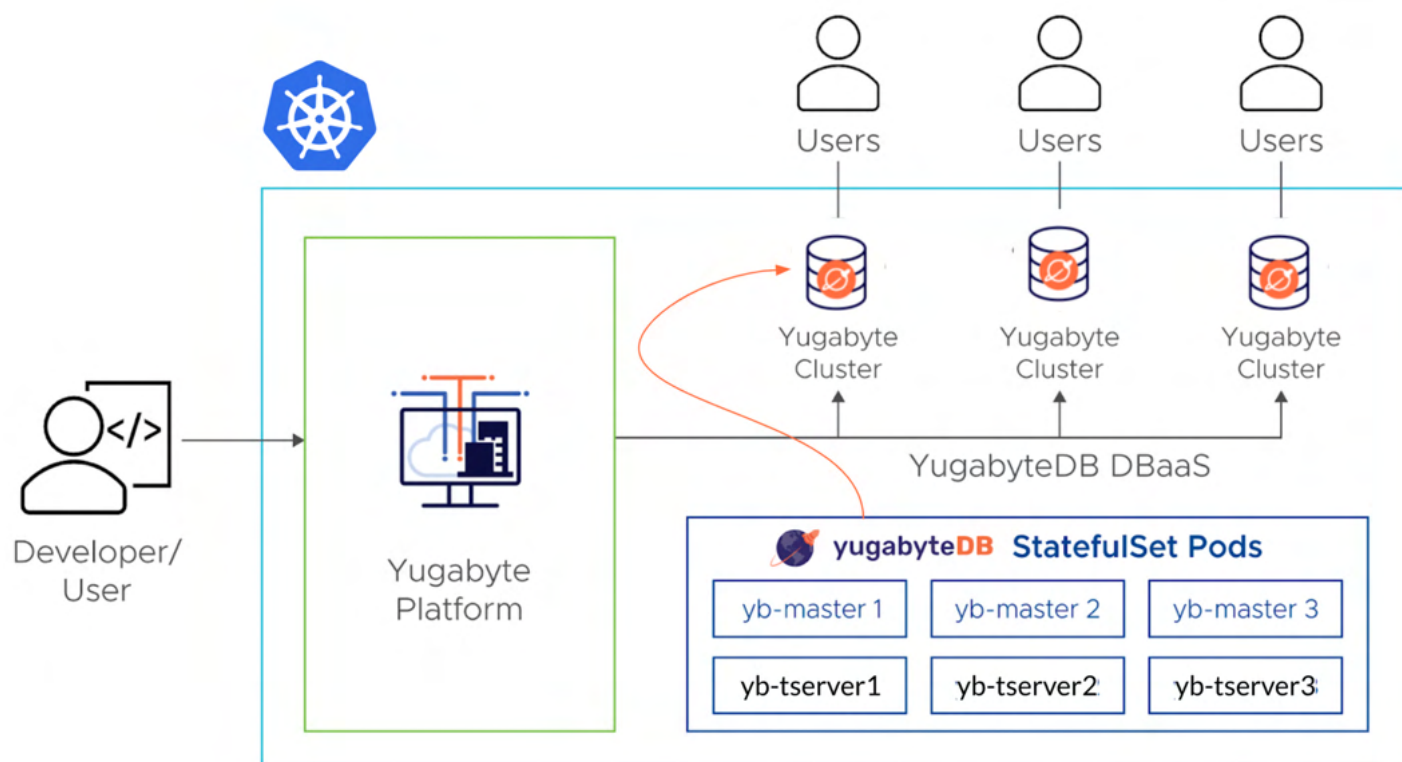
YugabyteDB Anywhere is a self-managed DBaaS solution that simplifies and automates the provisioning and management of YugabyteDB clusters at scale. YugabyteDB Anywhere has a management portal called YugabyteDB Anywhere UI, that makes management of database clusters effortless. The portal can also be deployed on a CVM.



Before deploying YugabyteDB clusters, VMs have to be created and registered under the cloud configuration of the YugabyteDB Anywhere UI. Detailed documentation on [creation](#) of CVM and [registration](#) can be found in the official documentation. These VMs should satisfy the [prerequisites](#) of YugabyteDB.

Tencent Kubernetes Engine Based Deployment

YugabyteDB can also be deployed on a TKE environment. TKE can be created following the official [documentation](#). YugabyteDB Anywhere UI is deployed on TKE using the [Helm chart](#) provided by Yugabyte. Same TKE cluster can be used as the target for deploying the YugabyteDB cluster. You can follow official [Kubernetes cloud provider configuration](#) instructions from the official documentation, to prepare TKE for deploying YugabyteDB clusters.



Multi-region deployments require connecting each VPC via CCN service. In case of TKE based deployment, VPC CNI has to be used. A detailed demo of this is available on Yugabyte's [vimeo](#) channel.



How to get started

For more information on using YugabyteDB and Tencent Cloud, reach out directly to the [Yugabyte team](#), follow us on LinkedIn or join our [Community Slack](#).