

# Hype Cycle for ICT in China, 2020

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Emerging technology is the key innovation engine to support digital transformation for enterprises in China. The Hype Cycle for ICT in China includes technologies and practices that equip I&O leaders to address digital revenue opportunities and achieve a sustainable business capability.

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## Analysis

### What You Need to Know

Digital transformation remains a high priority in 2020. Enterprises are focusing on three areas:

- **Digital Business.** Most initiatives involve applications that drive revenue, including live commerce and digital commerce platforms.
- **Modern Infrastructure Platforms.** Enterprises are shifting from technology-oriented to service-oriented approaches such as container as a service, DevOps and multicloud.

- **Emerging Technology.** New technologies such as blockchain, 5G and narrowband-Internet of Things (NB-IoT) are generating interest.

Since the outbreak of COVID-19, enterprises in China have taken decisive actions in the following areas:

- **Remote Home.** Gartner has observed increasing demand for workstream colocation tools and received evaluation requests on topics including colocations, conference and other digital workspaces.
- **Cost Optimization.** Many Gartner clients plan to improve efficiency with new tools and processes.

I&O leaders can use this Hype Cycle to determine where and when to invest. Technology vendors can refine their go-to-market strategies with a better understanding of public expectations and the requirements of new technologies.

## The Hype Cycle

To address the above-mentioned challenges and opportunities, I&O leaders in enterprises doing business in China must evaluate the potential for emerging trends and technologies in digital business enablement to improve operational sustainability and cost optimization through infrastructure modernization.

In this Hype Cycle, we have added new technologies that are emerging or being hyped in China:

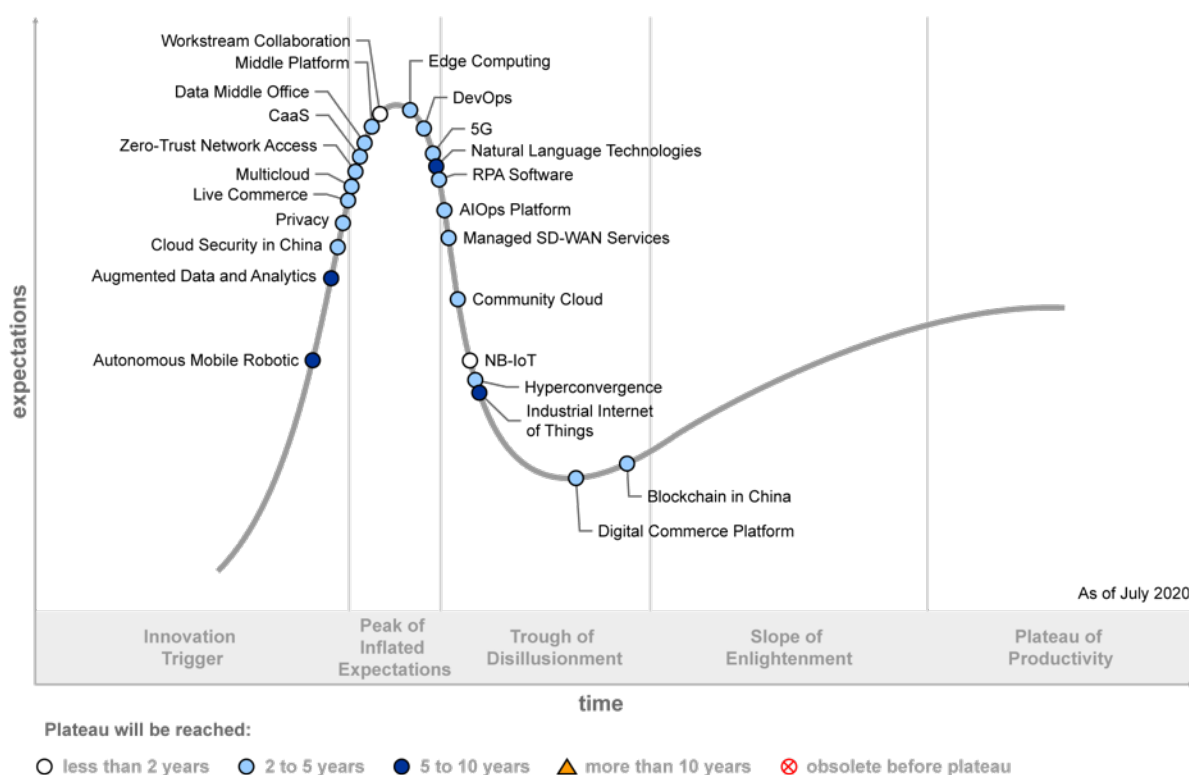
- **Cloud Security** in China. Gartner clients inquire about security improvements with public cloud. Gartner expects security to be a topic of intense interest over the next two to three years.
- **Live Commerce.** This new approach to selling products through digital commerce platforms, such as Taobao, Douyin or Kuaishou, presents business opportunities, but also risks.
- **Data Middle Office.** Data and analytics are at the center of digital business platforms to support decision making and collaboration silos along the digital transformation. CIOs should make data middle office an organizational strategy to develop reusable and composable data assets.
- **Middle Platform.** The digital middle platform enables the new business model. It is one approach to building digital business capabilities, but that is difficult to achieve if treated as purely technical solution.
- **Workstream Collaboration.** Work-from-home initiatives accelerated SaaS adoption, especially in collaboration and conference tools.
- **Blockchain in China.** This topic is very popular after China's president identified blockchain as a disruptor in China's economy and the China central bank (PBOC) announced a cryptocurrency initiative.

In addition, we renamed/replaced some innovation profiles to reflect market dynamics:

- Replaced analytics and BI platform as a service (cloud ABI) with augmented data and analytics. The latter is large in scope in the data analytics area.
- Replaced conversational AI platform with natural language technologies. “AI” is a broad term, covering multiple technologies. We use a key technology to address its maturity.
- Replaced private cloud with container as a service (CaaS). A CaaS initiative is more focused on service delivery for agility rather than hardware and software management.
- Replaced public cloud with multicloud to emphasize the complicated management when clients use public cloud to support critical applications.

Figure 1. Hype Cycle for ICT in China, 2020

## Hype Cycle for ICT in China, 2020



Source: Gartner  
ID: 448134

## The Priority Matrix

The Priority Matrix illustrates the relative benefits and likely adoption times of relevant technologies and services in China. Because of the technology selection criteria, the technologies in this year's update mainly have been transformational, with a high or moderate impact during a 10-year time frame. The following innovation profiles are introducing transformational benefits to cities:

- Blockchain in China and natural language technology. These initiatives are core functions used to enable the ecosystems needed to embrace extra business value, but the adoption risk is also high.
- Edge computing is the extension of current platforms to drive a disruptive business case that enables new revenue streams.
- DevOps can enable transformational delivery models that drive more agile and innovative capability.

In this year's Priority Matrix, we address new technologies with shorter times to adoption in the China market, such as RPA software, data middle office, middle platform, workstream collaboration and CaaS.

Figure 2. Priority Matrix for ICT in China, 2020

## Priority Matrix for ICT in China, 2020

benefit	years to mainstream adoption			
	less than two years	two to five years	five to 10 years	more than 10 years
transformational		Blockchain in China DevOps Edge Computing	Natural Language Technologies	
high	NB-IoT Workstream Collaboration	5G AIOps Platform Cloud Security in China Digital Commerce Platform Hyperconvergence Managed SD-WAN Services Middle Platform Multicloud Privacy RPA Software	Autonomous Mobile Robotic Industrial Internet of Things	
moderate		CaaS Community Cloud Data Middle Office Live Commerce Zero-Trust Network Access	Augmented Data and Analytics	
low				

As of July 2020

Source: Gartner  
ID: 448134

## Off the Hype Cycle

We have retired the following technologies from this Hype Cycle because they are trending to align with worldwide adoption and maturity, they have less impact on China's ICT, they have become obsolete, they were renamed, or they have merged with new technologies:

- Quantum computing
- Corporate compliance
- Digital financial services

- Machine learning

## On the Rise

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### Autonomous Mobile Robotic

**Analysis By:** Roger Sheng

**Definition:** Autonomous mobile robots (AMRs) add intelligence, guidance and sensory awareness to the conventional automated guided vehicles (AGVs) with a new mobile robot platforms, which allow AMRs to operate autonomously and collaboratively. AMRs eliminate the supporting infrastructures of traditional AGVs to expand the usage to more service application areas such as logistic, medical, retail supply chain and other delivery services.

**Position and Adoption Speed Justification:** AMR is the subcategory of autonomous things which is one of Gartner's top 10 strategic technology trends in 2020. Supported by emerging AI technologies and IoT platform, AMRs have the capabilities to recognize the objectives and make decision to complete the assigned tasks, such as picking up the packages and taking them to the target places. Inside of a typical AMR, there are three major functional blocks: autonomous system, mobile mechanism system and robot system. The autonomous system uses sensors and/or lidars to detect the environment and objectives and a AI accelerated processor controls the mobile mechanism system without manual operation, then robot system executes the tasks based on the instructions from IoT platform control center. Compared to traditional AGVs, AMRs don't require supporting infrastructures in the working area so that it can be adopted in different facilities easily.

The AMR market is still a niche market in China due to the lower cost labors. However, there are quite many startups focusing on this technology because they believe the increasing labor cost and industry automation will generate new use cases for AMRs. It always requires the trigger point to adopt the AMRs replacing labor workers. For example, AMRs were quickly deployed in the Wuhan hospitals to provide equipment and medicine delivery service to reduce the workload of medical workers during the COVID-19 pandemic period in China. Also, the increasing express packages need more AMRs working in the warehouse and delivery robot can be used to eliminate people contacting. The AMR platform can manage the robots by collecting the information from the field with manual instructions or automatically.

AMR will be a part of digital transformation in China logistic and delivery service automation. Currently the limitation of autonomous capabilities is the major technical issue for complicate environment use cases and the high cost is the business issue to the end users. However, we believe AMRs will be a promising innovative technology driving digitalization in the logistic and delivery service industries. Also, the market-proven AMRs can be a general platform to integrate more service functions such as service robot in the more fields.

**User Advice:** AMR will drive the innovation in the supply chain management in the warehouse, logistic and delivery as a digital solution to improve the operation efficiency and reduce the labor cost. Enterprise architecture and technology innovation leaders should consider below advice when they plan to adopt AMR solution:

- Investigate if AMR can provide value to existing company's operational system.
- Set up areas in their facilities to have the current processes compared to new process, which is designed specifically around AMR capabilities.
- Design creative process and solutions by experimenting with many AMR scenarios to identify AMR opportunities with the best value proposition.
- Evaluate multiple AMR vendors by considering lifetime cost and efficiency improvement.
- Working with the vendors to understand the resource requirements and planning the deployments without impacts to daily operation.

**Business Impact:** AMRs will widely be used in the complex distribution centers but they will not fully replace people. They will provide support and supplement in the facilities. The common use cases are an automated picking process in the warehouse to reduce the labor workload. The autonomously navigating function can create a worker-less logistic process for a 24-hour operation. The efficiencies can be improved by saving the time of traveling in the warehouse and optimizing the moving paths for multiple AMRs. By leveraging AMRs, the company or facility users will be less fatigued and more productive. In China, the fast growing e-commerce requires more automation in the logistic services. The adoption of AMRs can accelerate the digitalization of delivery services.

**Benefit Rating:** High

**Market Penetration:** Less than 1% of target audience

**Maturity:** Emerging

**Sample Vendors:** Aethon; Amazon Robotics; Fetch Robotics; Noah Robot; OMRON; Swisslog

**Recommended Reading:** "Innovation Insight for Autonomous Mobile Robots"

"Top 10 Strategic Technology Trends for 2020: Autonomous Things"

"Hype Cycle for Drones and Mobile Robots, 2019"

## Augmented Data and Analytics

**Analysis By:** Julian Sun

**Definition:** Augmented data and analytics incorporate machine learning (ML) and artificial intelligence (AI) to deliver data management and analytics capabilities on a unified platform. It automates workload both in data management and analytics to make more efficient data and analytics adoption by applying ML and AI on the existing operational and usage statistics. It further enables more users to get more in-depth insights in the organization with less time, skill and interpretation bias of current manual approaches.

**Position and Adoption Speed Justification:** The use of ML and AI is being seen as augmenting work in data and analytics, rather than replacing it. The overall data literacy in China region is still low. Organizations are looking for all-in-one solutions to support both data management and



analytics with ease of use functionalities. With the increased availability of ML and AI, vendors are incorporating modern ML and AI into both data management and analytics as augmented capabilities. There is a growing interest in and adoption of augmented capabilities to reduce the manual workload and make up for the lack of people's technical skills. As the rapid growth of local hyperscale cloud vendors, more and more companies are deploying these capabilities on the cloud. From data management perspective, these capabilities are currently being implemented in data integration, data quality, metadata management. Additionally, these are implemented in DBMS software to tune and optimize the use of the products, suggest and implement new designs, schemas and queries and infer the semantics and associations of the data in order to recommend structural improvements. From analytics perspective, their capabilities are currently being used in data preparation, automatically finding and visualizing relevant findings with natural language and automation of key aspects of advanced analytics modeling. There is no single platform that can do everything, but vendors keep expanding the augmented capabilities on their stacks and offer them in a unified platform.

In summary, there is little hype around these tools, especially for a unified solution for both data management and analytics, but a clear need for them in many organizations.

**User Advice:** Most of the organizations start with data management capabilities and gradually add analytics capabilities to establish a comprehensive platform to support their business. CIOs and data and analytics leaders should:

- Embrace augmented capabilities on both data management and analytics as part of a digital transformation strategy to automate the process and deliver more advanced insights to a broader range of users. Pilot to prove the value and build trust.
- Make augmented capabilities a “must have” selection criterion for new purchases of data and analytics products.
- Audit the results of augmented data and analytics to assess the risk of introducing errors and reduced performance.
- Invest the foundational technology such as graph, explainable AI to harness the power of augmented data and analytics.
- Evaluate vendor's ability to leverage augmented data management capabilities to support analytics on a pipeline.

**Business Impact:** Augmented data and analytics will offer benefits in the following areas:

- Complement and extend existing data and analytics platforms with more advanced analytics generated by business analysts, decision makers and operational workers across the enterprise.
- Reduce the time users spend on managing data, while giving them more time to act on the most relevant insights from data.
- Give frontline workers access to more contextualized analytical insights and guided recommendations to improve decision making and actions.

**Benefit Rating:** Moderate

**Market Penetration:** 1% to 5% of target audience

**Maturity:** Emerging

**Sample Vendors:** Alibaba Cloud; Hengshi Sense; Kyligence; SmartBI; Tencent

**Recommended Reading:** “Achieve Bimodal Equilibrium With Cloud Analytics”

“Cool Vendors in Analytics and Data Science”

“Cool Vendors in Data Management”

“Worlds Collide as Augmented Analytics Draws Analytics, BI and Data Science Together”

“Augmented Analytics Is the Future of Analytics”

## Cloud Security in China

**Analysis By:** Kevin Ji; Evan Zeng; Tao Wu

**Definition:** Cloud security has a broad coverage which contains the core concepts from people and process to the technology including cloud security architecture as long as cloud access security broker (CASB), cloud workload protection platform (CWPP), cloud security posture management (CSPM) and secure access service edge (SASE). In China, this is a hot topic and also a big challenge during cloud migration journey.

**Position and Adoption Speed Justification:** If the organization is embracing development in the cloud using PaaS, containers and agile processes, then the cloud security architecture will benefit from inclusion of DevSecOps tools and services. There are multiple approaches to security architecture, including the uses of frameworks and methodologies to support design and implementation steps. A typical example of security architecture methodology is SABSA.

CASB is a critical control to ensure the secure adoption of SaaS-based cloud apps. As more organizations move sensitive data into approved cloud apps such as Dingding, video conference, CASB helps identify and protect sensitive data in these cloud apps. CASB policies in API mode connect to cloud apps out of band to identify sensitive data with various content inspection techniques, remove risky external sharing, encrypt files in place or revoke risky cloud-to-cloud connections.

CSPM tools go beyond assessment of security configuration at the cloud control plane (usually for IaaS and CSP-provided PaaS services) to provide management capabilities, including the ability of these providers to take action on policy violations. They deliver risk identification and alerting capabilities by reviewing cloud audit and operational events.

CWPPs offer a very broad set of capabilities focused almost solely on infrastructure workloads. Vendor solutions vary across categories; some offer wide-ranging capabilities, while others focus on a protection approach or a deployment pattern, such as containerization.

IT architectures are evolving in the face of demands for scalability, flexibility and increased security, and also because of network challenges such as requirements for low-latency and WAN-edge needs. This broad set of drivers defines a unified service model that is called SASE. Cloud security architects must be cognizant of these expectations, and as cloud and distributed services grow, must implement SASE-aligned capabilities.

In China, we observed that cloud security is the one of key obstacle to slow down the large enterprise cloud migration journey. Enterprise cannot expected that cloud security vendors deliver a one-size fits all solution as it fits in on-premises. In China market, most of local vendors focus on the cloud workload protection to help client use public cloud safely. But enterprise need understand the security capability gap between physical infrastructure and cloud service environment and start to transform security capability to fit for hybrid infrastructure in future.

**User Advice:**

- Start with defining your cloud security strategy, and favor cloud-native tools augmented by third-party tools based on identified requirements.
- Define cloud security ownership and build a cloud security architecture framework and define best practices.
- Evaluate the end to end data/security protection by categorizing different cloud adoption approach, not expect one-size fits all cloud security product in this market
- Use CASB to protect sensitive data in approved cloud apps and to provide visibility and granular access control to unapproved cloud apps.
- For IaaS and aPaaS, use CSPM tools to provide overall visibility, and employ CWPP vendor tools to provide workload insights across multiple clouds.

**Business Impact:** Cloud security is the broad topics which is due to the constant drive for organizations to move their infrastructure to the cloud, and security concerns are at the top of the list. An additional challenge with cloud security is there is a constant growth of technologies, strategies and new vendors.

The architecture which fits for on-premises data center such as fortress host equipment, it is hard to copy to cloud platform without massive change.

**Benefit Rating:** High

**Market Penetration:** 20% to 50% of target audience

**Maturity:** Adolescent

**Sample Vendors:** DAS-security; NSFOCUS; QI-ANXIN; Qingteng; Sangfor Technologies; Topsec; Venustech

**Recommended Reading:** “Clouds Are Secure: Are You Using Them Securely?”

“How to Evaluate Cloud Service Provider Security”

“Staying Secure in the Cloud Is a Shared Responsibility”

## Privacy

**Analysis By:** Jie Zhang

**Definition:** Privacy in China is preserved by a national standard for privacy, a cybersecurity law, and is enforced by other relevant regulations. Personal information for Chinese citizens is defined to include two categories: general and sensitive. The Privacy Standard, the Chinese Cybersecurity Law and the multiple-level protection scheme (MLPS) outlined special data protection practices on both types of personal information. For example, locally storing private data collected in China or data localization is a mandate.

**Position and Adoption Speed Justification:** The position is adjusted from 2019 as the drivers for hype continue to exist. The rapid adoption of digital business in China (especially mobile payment, large and complex third-party data sharing and processing especially in financial services, online shopping, and news and information content platform) continues to add risks for personal data to be breached or mishandled. The overall trailing privacy practice in society, fraud activities, excessive data collecting and trading, etc., have driven Chinese lawmakers and regulators to establish guardrails for protecting its citizens' privacy. The government effectuated MLPS 2.0 which includes further guidelines on private data protection at the heel of its first Privacy Standard in May 2018 and the first Cybersecurity Law in June 2017 and subsequently drafted a regulation on cross-border data transfers. In early 2019, China also finalized its “Guideline for Internet Personal Information Security Protection” offering additional detailed privacy requirements. These guardrails have a direct impact on how both global and local businesses operate in China. Reactions to Chinese privacy-related topics peaked immediately after the enactment of the law (demonstrated by media and business interest, and Gartner client interactions). [Cases of severe penalties](#) have been continually reported on mishandling or insufficient protection of personal information in 2019. These cases demonstrate the will and wish from the central Chinese government of controlling and regulating personal data protection practices. The pandemic of COVID-19 has also pushed the hacking of personal information to another [level](#). The clarity provided by the Privacy Standard plus MLPS 2.0 continues to provide urgencies on business to pay attention to privacy protection practices. However, it will take time for the overall privacy culture or lack thereof and the associated legal enforcement to mature.

**User Advice:** Security and risk management leaders should:

- Discover, classify and map data between operations in China and other corporate locations, as it is the necessary first step to prepare for collecting explicit consent and preparing for data localization.
- Incorporate a privacy assessment for the Chinese privacy standard in enterprise information governance by treating it as a parallel, but complementary, effort to General Data Protection Regulation (GDPR), California Consumer Privacy Act (CCPA) and other privacy compliance requirements.

- Continuously monitor the development of future guidelines relevant to privacy by working with legal experts that specialize in the Chinese market with strong privacy practices.
- Treat the Chinese Privacy Standard and MLPS 2.0 within the context of the Chinese Cybersecurity Law as privacy requirement is not only an integral part of the law but also guided and enforced by the law in reality.
- Separate data protection and retention for China operations from global information governance as local privacy rules could often be enforced differently from other regions.

**Business Impact:** Defining and addressing privacy compliance needs support business goals and market access especially for businesses in highly regulated sectors such as financial services or multinational operations expanding in China. Therefore, global business leaders need to rethink their market growth strategy. Additional investment is necessary, or a path of “China for China” strategy is needed as potentially the privacy risks outweigh business benefits; because costs for new IT infrastructure, application architecture, data management and skills will rise. Although the central government and industry-specific agencies continue working on defining details around privacy requirements, compliance risks and potential penalties for violations in China are real and can be significant. For businesses serving the China market, privacy leaders need to consider introducing new roles, new controls and policies to manage Chinese privacy requirements. Near-term privacy management changes from various Chinese authorities (i.e., industry-specific agencies) are also expected. Therefore, privacy in China has an ongoing impact on monitoring and security audit/assessment as well.

**Benefit Rating:** High

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Adolescent

**Recommended Reading:** “China’s Data Privacy Standard Unfolds Measures for Its Cybersecurity Law”

“Security Assessment Becomes Prerequisite for Transmitting Data Out of China”

“Address Chinese Cybersecurity Law With This Playbook”

“Balancing the Risk of China’s Social Credit System for Business Benefits”

At the Peak

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## Live Commerce

**Analysis By:** Sandy Shen

**Definition:** Live commerce uses live video streaming to demonstrate products and interact with shoppers in real time to encourage purchases. It is typically delivered through mobile apps and the

live streaming function can be embedded in commerce platforms, or offered by online marketplaces and social networks with purchase links or check-out functions.

**Position and Adoption Speed Justification:** Live commerce had seen strong adoption in China before COVID-19, and Credit Suisse estimated the market reached **\$5 billion in 2019**. The service saw huge spikes during COVID-19 when many businesses were forced to use digital channels and live commerce was attractive due to its quick launch time and little technical expertise required. Leading live streaming platforms such as Douyin and Kuaishou with a combined user base of close to one billion have become important traffic sources. Some organizations reported encouraging data where they reached as many visitors in a three-hour streaming session as they would have from physical stores in **six months**. Online marketplaces such as Taobao, JD and RED have also launched live commerce channels integrated into the marketplace, offering a seamless check-out experience.

Outside China, the service hasn't seen much adoption as live streaming is mostly used for digital content and services such as performing art, literature, entertainment and fitness. Amazon has launched Amazon Live in the U.S. for a selected amount of merchants to showcase products with limited adoption, and social networks such as Facebook, Instagram and Twitter have live streaming function but not well-integrated with the commerce experience. In addition, many consumers have not gotten into the behavior of using live commerce which can be time-consuming and exhausting.

Live commerce faces challenges in brands discovery as there are tens of thousands sellers broadcasting at the same time, and products typically sell at deep discounts to lure shoppers. Organizations need to have a strategy to upsell from a few loss-leading products so they can justify the investment. Delivering a quality show experience requires detailed planning and professional setup to ensure the scene can support the brand positioning. They also need to design mechanisms to retain customers so they will come back for repeat purchases. These challenges will see the service taking at least two years to reach plateau.

**User Advice:** Organizations considering live commerce should:

- Decide whether live commerce is the right channel for your products. If so, work with marketing to increase visibility of your channel and design the experience relevant for shoppers. Be aware that the majority of live commerce shoppers are younger consumers between ages 18 to 35.
- Work with merchandising to select a few products that can be offered at attractive pricing points and define the supplies enough to increase brand awareness, generate traffic while curtailing the costs.
- Identify the live commerce platforms you want to have your presence on based on customer experience for interactions and purchases. Be aware that integration may be needed when embedding live streaming in the commerce platform and integrating the check-out experience with social networks.
- Design mechanisms, once the shopper comes to the product/check-out page, to upsell and encourage future purchases.

- Identify use cases that can leverage live streaming functions but for a more tailored experience. Retailers and brands have used live commerce in a one-to-one setting to allow store staff help customers find the right products and provide personalized support.
- Provide training to employees to prepare them for live commerce, and align incentives to encourage active participation.

**Business Impact:** Live streaming can increase brand awareness and generate large amount of traffic in a short time, and have low entry barriers that anyone with a mobile phone can set it up. Organizations with limited digital presence can set up commerce presence in a few days and those with established commerce presence can bring more traffic to the site. As the service mostly targets younger consumers and sells products at deep discounts, it can have impacts on profitability and brand positioning. Setting up live streaming without careful planning can potentially tarnish the brand image and deliver poor ROI if unable to retain customers or upsell.

**Benefit Rating:** Moderate

**Market Penetration:** 1% to 5% of target audience

**Maturity:** Emerging

**Sample Vendors:** Alibaba Group; Douyin; Facebook; HERO; Instagram; JD.com; Kuaishou; Shopee; Tencent; Xiaohongshu

**Recommended Reading:** “How the COVID-19 Coronavirus Has Changed the B2C Marketing Approach in China and What Western Brands Can Learn”

“Cool Vendors in Retail for Excellent Execution of Customer Expectations”

“What’s Hot in Digital Commerce”

## Multicloud

**Analysis By:** Tao Wu

**Definition:** Multicloud computing refers to the use of cloud services from multiple public cloud providers for the same purpose. It is a special case of hybrid cloud computing, which is a broader term.

Multicloud computing, by the Gartner definition, does not refer to the simple use of multiple cloud services within the organization — only the use of multiple providers for the same purpose.

**Position and Adoption Speed Justification:** Multicloud computing is a deliberate strategy for an organization’s use of multiple cloud services from different providers. The adoption is being driven by varying use cases, such as disaster recovery, avoiding vendor lock-in, and leveraging best-in-class capabilities across multiple providers. A typical case of leveraging best-in-class capabilities is, using Alibaba Cloud for IaaS and Microsoft Office 365 for cloud office SaaS.



Now the top 5 Chinese cloud providers share about 70% of IaaS market. Multicloud computing has the potential to provide lower price, warrant provider independence and address concentration risk. COVID-19 outbreak is another catalyst pushing enterprises to adopt multicloud to increase broader service resiliency, capability and availability.

**User Advice:** Managing and governing multicloud services becomes challenging. Enterprises should have multicloud architectures that rely on architectural principles, portability solutions and other dynamic placement efforts. We recommend that you:

- Establish a multicloud strategy across the enterprise to identify the types of services needed and deliver the benefits of a cloud environment. It includes a strategy for vendor management, a framework for workload placement, and a strategy for developing and maintaining employee skills.
- Have a coordinated approach to multicloud management and governance. Standardize policies, procedures, processes and tools; for example, tools for allowing cost governance and optimization across multiple cloud providers.
- Use a multicloud application architecture to exploit unique capabilities from multiple providers, get greater resilience and lower cost. Please note applications that use a multicloud architecture are typically more complex than applications that use only one cloud provider; it increases the potential risk.
- Identify a primary strategic cloud provider for a particular function, such as IaaS, to maximize the ability to exploit a provider's capabilities, concentrate employee skills and maximize discounts.
- Leverage multicloud tools, cloud management platform (CMP) and managed service provider (MSP) for operation. Many vendors enable the management capabilities across multicloud environments by providing an abstraction layer across on-premises and public clouds. CMP and MSP in a multicloud environment can enable organizations to implement governance and optimizations.

**Business Impact:** Multicloud provides an organization with agility and the potential of some target cost optimization opportunities. A multicloud strategy can help an enterprise gain access to a broader range of capabilities, especially bleeding-edge innovative capabilities.

Customers seeking lower price, avoiding vendor lock-in and sourcing best-of-breed solutions will benefit from multicloud strategy.

**Benefit Rating:** High

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Adolescent

**Sample Vendors:** Anchang Network; Bepin Global; Deloitte; FIT2CLOUD; Futong Technology Development Holdings; Shanghai Connex Information Technology; The Yunion; Yungoal

**Recommended Reading:** "2020 Planning Guide for Cloud Computing"



“The Cloud Strategy Cookbook, 2019”

“IT Leaders’ Strategy Deck: Multicloud and Hybrid Cloud”

“Technology Insight for Multicloud Computing”

## Zero-Trust Network Access

**Analysis By:** Peter Liu

**Definition:** Zero-trust network access (“software-defined perimeter” in prior Hype Cycles) creates an identity- and context-based, logical-access boundary around an application or set of applications. The applications are hidden from discovery, and access is restricted via a trust broker to a set of named entities. The broker verifies the identity, context and policy adherence of the specified participants before allowing access. This removes the application assets from public visibility and significantly reduces the surface area for attack.

**Position and Adoption Speed Justification:** The zero-trust network access (ZTNA) notion has been gaining momentum since an initial specification for software-defined perimeters (SDP) was introduced by the Cloud Security Alliance Summit in 2014. The initial SDP specification addressed web-based applications only, and updates to the specification have lagged. Commercial products roughly based on this initial specification are available, as are products based on Google’s BeyondCorp zero-trust networking vision. In addition, many alternative commercial products using other approaches that are not limited to web applications have entered the market.

The ZTNA market is still nascent, but it’s growing quickly. It has piqued the interest of organizations seeking a more flexible alternative to VPNs and those seeking more precise access and session control to applications located on-premises and in the cloud. ZTNA vendors continue to attract venture capital funding. This, in turn, encourages new startups to enter the market and seek ways to differentiate.

Gartner forecasts that by 2022, 80% of new digital business applications opened up to ecosystem partners will be accessed through ZTNA, and by 2021, 60% of enterprises will phase out most of their remote access virtual private networks (VPNs) in favor of ZTNA.

In China, although the ZTNA market is still in its early stage, it is starting to attract venture capital funding and startup funding.

**User Advice:** Security and risk management leaders responsible for secure network access should:

- Budget and pilot a ZTNA project to demonstrate the benefits of ZTNA to the organization.
- Start your ZTNA journey from identifying the specific use cases as ZTNA is still not a generic technology yet. It can be extremely difficult to setup an “identity and context-based logical access boundary” in many daily operations.

- For legacy VPN access, look for scenarios in which targeted sets of users performing their work through a ZTNA service can provide immediate value in improving the overall security posture of the organization.
- For DMZ-based applications, evaluate what sets of users require access. For those applications with a defined set of users, plan to migrate them to a ZTNA service during the next several years. Use the migration of these applications to public cloud IaaS as a catalyst for this architectural shift.
- Replace designs for employee- and partner-facing applications that expose services to direct internet connections. Pilot a ZTNA deployment using a digital business service that needs to be accessible to partners as a use case.

**Business Impact:** The benefits of ZTNA are immediate. Similar to a traditional VPN, services brought within the ZTNA environment are no longer visible on the public internet and, thus, are shielded from attackers. In addition, ZTNA brings significant benefits in user experience, agility, adaptability and ease of policy management.

For cloud-based ZTNA offerings, scalability and ease of adoption are additional benefits. ZTNA enables digital business transformation scenarios that are ill-suited to legacy access approaches. As a result of digital transformation efforts, most enterprises will have more applications, services and data outside their enterprises than inside. Cloud-based ZTNA services place the security controls where the users and applications are — in the cloud. Some of the larger ZTNA vendors have invested in dozens of points of presence worldwide for low-latency user/device access.

**Benefit Rating:** Moderate

**Market Penetration:** 1% to 5% of target audience

**Maturity:** Emerging

**Sample Vendors:** Akamai; Cisco (Duo Security); CloudDeep technology; Cloudflare; DataCloak; Palo Alto Networks; Perimeter 81; Symantec; Zscaler

**Recommended Reading:** “Top Security and Risk Management Trends”

“Solving the Challenges of Modern Remote Access”

“How to Overcome Four Major Challenges in Edge Computing”

“China Summary Translation: ‘The Future of Network Security Is in the Cloud’”

“Market Guide for Zero Trust Network Access”

CaaS

**Analysis By:** Tao Wu; Kevin Ji; Uko Tian

**Definition:** Containers as a service (CaaS) is a cloud service which supports the management of containers at scale, in production environments. It includes container runtimes, container orchestration, job scheduling, resource management and other container management capabilities.

**Position and Adoption Speed Justification:** Interest in containers and CaaS is rising sharply due to the growing adoption of container runtimes. Which have introduced common container packaging formats that are more easily consumable by, and useful to, application developers and those with a DevOps approach to IT operations. A variety of solutions are available to use Kubernetes as the basis for CaaS platforms on-premises and in public cloud services. And all most all major cloud service providers offer CaaS that make Kubernetes easier to deploy and manage.

CaaS provides various functions including orchestration and scheduling; monitoring and logging; security and governance; registry management which enable the agility of CI/CD processes. Public cloud infrastructure as a service (IaaS) solutions specifically designed to run containers, and PaaS frameworks that have incorporated integration with container management software.

There has been growing interest in deploying containers in public cloud IaaS, due to the availability of turnkey CaaS offerings, as well as the tight integration that these offerings have with other products offered by cloud providers. Cloud IaaS offers on-demand consumption of resources, rapid scalability and managed services that could obviate infrastructure integration, management and deep know-how. Most cloud providers offer a managed container service, and some offer multiple orchestrators. In addition to native services, on-premises offer a cloud-based product as a fully hosted service.

Although Docker runtime and managed Kubernetes are becoming ubiquitous across on-premises and public cloud environments, seamless hybrid environments require better federation and service brokering than is currently available. On-premises CaaS vendors, such as Docker, Rancher, Red Hat and VMware-Pivotal, offer cloud-based services, with varying degrees of integration and support. Alauda.io, DaoCloud and BoCloud are the major local competitors in China market.

**User Advice:** We recommend:

- Objectively evaluate your organization's ability to deploy and manage the appropriate tooling for packaging and deploying Linux applications and their runtime environments.
- Choose the points of lock-in carefully; where possible, implement open-source software, and strongly consider cloud container management services as an alternative.
- DevOps-oriented organizations should experiment with altering their processes and workflows to incorporate containers through CaaS Services.
- Select providers with consistent operating models across hybrid environments that offer single-pane-of-glass management of federated clusters and open service brokers that simplify IaaS self-service.

If one organization wants to use CaaS Services in conjunction with OS containers (as an alternative to hypervisor-based cloud management platforms), it should meet following criteria:

- It's DevOps-oriented or aspires to become DevOps-oriented
- It has high-volume, scale-out applications with a willingness to adopt microservices architecture; or large-scale batch workloads
- It can ensure security and isolation to enable trust between containers
- It intends to use an API to automate deployment, rather than obtaining infrastructure through a self-service portal

**Business Impact:** CaaS makes it easier to take advantage of container functionality, since cloud-native applications require a high degree of infrastructure automation and specialized operations capability, which are not commonly found in enterprise IT. CaaS provides productivity and/or agility benefits, including the ability to accelerate and simplify the application life cycle, enabling workload portability between different environments and improving resource utilization efficiency and more.

**Benefit Rating:** Moderate

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Emerging

**Sample Vendors:** Alauda.io; Alibaba Cloud; Amazon Web Services (AWS); BoCloud; Docker; Rancher; Red Hat; VMware

**Recommended Reading:** "Market Guide for Container Management"

"Best Practices for Running Containers and Kubernetes in Production"

"Top Emerging Trends in Cloud-Native Infrastructure"

## Data Middle Office

**Analysis By:** Julian Sun

**Definition:** Data middle office (数据中台) is an organizational strategy that allows organizations to effectively enable citizen data users in the front office to make decisions using data generated in the back office from a single consistent view. The simplest way to think of building data middle office is how a company curates the composable and reusable data and analytics (D&A) capabilities that deliver distinct digital operations, and connects them throughout the value chain via its technology stack.

**Position and Adoption Speed Justification:** Data middle office is inching closer to the Peak of Inflated Expectations due to the hype in the market and the inherent confusion on what is data middle office and how to deliver it. It was introduced by Alibaba Group and many internet companies followed their own definition and products. Organizations lacking ideas on how to build reusable D&A capabilities within own business context will struggle to adopt it effectively.

The tricky part of the establishment of data middle office is not just technology but people and process which is important for an organizational strategy. Many data integration tools and analytics

tools can suffice the need to deliver a combination of data virtualization, microservices, catalog, semantic capabilities, integration platform as a service (iPaaS), data preparation and visual data discovery. However, most of the organizations in China are lacking data literacy engage broader citizen data users with these tools. Lastly, it is not realistic to implement a full D&A architecture in one go. Organizations proceed in stages, driving a related series of use cases to scale in one part of the business before turning their effort to the next group of business. A common problem that organizations face when they build their D&A architecture stage-by-stage is that they work in silos and separately build similar solutions, such as data marts and analytics models for different business purposes that share common elements.

The reason many companies adopt data middle office is to reduce redundancy in their data analytics architecture, bridge the data silos across different systems and drive reusable data and analytics capabilities. However, introducing new technology to adopt it gives them another layer of complexity and usually loosely connects with the business outcomes. It causes more redundancy and silos. Hyperscale cloud vendors have all-in-one solutions but fail to provide industrywide support to resonate the reusability of D&A capabilities.

In summary, hype around data middle continues to be high, but is now facing growth pains as organizations face adoption challenges with their own industry problem.

**User Advice:** Data middle office has put business closer to organizations' data and analytics deployment but there are some gaps and potential problems. CIOs and data and analytics leaders who want to adopt data middle office should:

1. Understand the establishment of data middle office needs a continuous collaboration between business and IT and constant refinement as business requirements grow.
2. Create a hybrid organizational model featuring a centralized team working with a number of decentralized line of business teams placed throughout the organization to define and build the reusability of data and analytics capability within business context.
3. Using business-driven data and analytics capability building as a guiding principle, complement existing data and analytics architecture rather than reconstruct it.
4. Use Gartner's Data and Analytics Infrastructure Model (DAIM) to identify the gaps or area of over investment on existing architecture.
5. Invest ML-augmented data catalog to simplify and, in some cases, automate the process of discovering, inventorying, profiling, tagging and creating semantic relationships between distributed and siloed data assets.
6. Understanding modern data management requires a balance between collecting data (when needed, into repositories such as data warehouses) and connecting to data (through data virtualization techniques). Evaluate vendor's capability to complement organization's existing data management investment.

7. Use augmented analytics to enable more self-service analytics users. Rich the output of data middle office with more ease-of-use ways such as conversational analytics, data storytelling and visual data discovery.

Besides all the advice above, a long-term ongoing data literacy program is essential to the success of data middle office. It would act as a “force multiplier” during the establishment of data middle office.

**Business Impact:** Data middle office has triggered many CIOs and D&A leaders to rethink about how to build a business-driven D&A architecture. Clients have embarked on this initiative cites three approaches that affect their organizations.

8. Close the loop — Use data middle office to enable the collaboration between business and IT, enable cross-enterprise collaboration and planning, opening up data analysis for sharing between constituents in an extended value chain.
9. Portfolio Management — Integrating cluttered systems into a unified D&A platform. Most of the organizations are still replacing everything rather than complementation.
10. Productization — Transform organization’s project-oriented data and analytics initiatives to product-oriented by continuously building up reusable data analysis capabilities.

Data middle office has not lived up to the extremely high expectations that have been placed on it. But as the local cloud vendors continue to grow with their ecosystem, bringing more business consulting for low-maturity organizations, we can see it continuing to move forward on Hype Cycle.

**Benefit Rating:** Moderate

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Emerging

**Sample Vendors:** Alibaba Cloud; DTStack; DTWave; Mininglamp Technology; NetEase; Tencent

**Recommended Reading:** “Augmented Data Catalogs: Now an Enterprise Must-Have for Data and Analytics Leaders”

“Toolkit: Map Your Data Management Landscape With the Data and Analytics Infrastructure Model”

“Toolkit: Gartner Analytics Atlas”

“Achieve Bimodal Equilibrium With Cloud Analytics”

“The Use of Augmented Analytics to Improve Analytics and BI Adoption in Low-Maturity Organizations”

## Middle Platform

**Analysis By:** Arnold Gao; Daniel Sun; Kevin Ji

**Definition:** Middle platform is an architecture design with underlying technologies and organizational structure to reduce resource redundancy, exploit efficiency gains, and empower the new business operated by smaller teams. It breaks down the back-end business and technology capabilities within the organization and remodel them in order to keep up with the pace of client driven business changes.

**Position and Adoption Speed Justification:** Since Alibaba Group introduced the concept of “middle platform” (aka Zhongtai) in 2015, other major internet companies including Tencent, Baidu, ByteDance, Didi Chuxing (DiDi) have also launched their own versions of middle platform initiatives. Given the exponential growth of the adopters during the past years, middle platform has become a key topic in China where many enterprises believe it is one of the critical factors for them to accelerate digital transformation. Meanwhile, providers have been promoting the benefits of middle platform and investment has been active during the past 12 months.

However, many enterprises also find the implementation of middle platform is much more challenging than expected especially when the initiative is driven by CIOs and IT leaders. There are also many versions of middle platform products/solutions in the market in which the most common ones are technology middle platform, data middle platform and business middle platform. The coexistence of middle platform variations and no clear definition has caused a lot of confusion, while unsuccessful adoption of middle platform without adequate due diligence efforts have caused negative impacts to CIOs who made such the decisions.

**User Advice:** Understand the definition of middle platform in the context of your business. It is also necessary to supplement the definition with what isn't middle platform to obtain further clarification. Despite middle platform is highly relevant to technologies, it is not a “one-size-fit-all” software suite or straightforward technology solution of any kind. In addition, specify the examples and use cases that are relevant to your organization.

Conduct scenario planning with clear business result metrics to determine whether organizations need middle platform. For example, a new stand-alone business can be developed more efficiently by launching a separate business unit, while in a later phase the middle platform can play a key role to combine redundant resources and prevent reinventing the wheels. Middle platform can be worthwhile for organizations when clear use cases can be defined, and the commercial value can be articulated.

Engage with executive leaders to obtain support, endorsement and more importantly sponsorship as a complete middle platform adoption is a cross-business, cross-function enterprise governance strategy.

Plan for middle platform adoption in at least two main aspects: technology and business, which can be further narrow down to enterprise architecture, data, business capabilities, organization structure, etc.

Employ a middle platform architect from the very beginning of middle platform adoption to streamline the business process change, technology selection, data strategy, etc. and ensure the expected commercial value can be delivered through the execution.



**Business Impact:** Not every organization in every phase of its growth needs middle platform, also different industry has its diversified demand. For large enterprises, middle platform can be used to exploit efficiency, reduce cost in existing business and rapidly support the launch of correlated new businesses. For smaller organizations, middle platform can help to consolidate reusable resources (e.g., staffing, data, technologies, etc.) to be shared by various business units/teams in order to support its fast-growing pace after it has successfully overcome the initial surviving challenges.

**Benefit Rating:** High

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Emerging

**Sample Vendors:** Alibaba Cloud; DEEPEXI; NEXTTAO; Yunxi Technology

**Recommended Reading:** “Adopt a Mesh App and Service Architecture to Power Your Digital Business”

“MASA: How to Create an Agile Application Architecture With Apps, APIs and Services”

“A Digital Business Technology Platform Is Fundamental to Scaling Digital Business”

“Innovation Insight for Packaged Business Capabilities and Their Role in the Future Composable Enterprise”

## Workstream Collaboration

**Analysis By:** Arnold Gao

**Definition:** Workstream collaboration in China leverages integrated communication and collaboration, business process and knowledge management technologies, and tools to provide users with self-service, out-of-the-box experiences that scale across platforms. It allows real-time internal and external collaborations, and client delivery on any device, from any location.

**Position and Adoption Speed Justification:** During COVID-19, workstream collaboration has become a key digital capability to support daily communication, conference and other business operations. In China, collaboration tools such as DingTalk, WeLink and Tencent Meeting have been widely adopted during the social distancing period to ensure business resilience.

The demand spikes have caused challenges on the capacity of telecommunications, VPNs and even cloud services due to the scale of adoption. Security and privacy issues have also become a major concern as employees need to work out of enterprises' security perimeters.

Workstream collaboration used to be “good to have,” but has now become a critical part of the CIO's agenda, not only to “keep the lights on” during a period of uncertainty, but also to facilitate digital transformation in the longer term.

**User Advice:** In the short term, I&O leaders should identify use cases of workstream collaboration, and employ vendors and solutions (e.g., remote collaboration tools, desktop-as-a-service solutions,



etc.) to support immediate needs. Work with infrastructure and network providers to establish a digital workspace resilience program by employing scalable architecture to support business operations and address increased business demands from digital channels. Establish a security response and monitoring program to mitigate the security and privacy risks by leveraging identity and access management, endpoint security products, and solutions.

In the long term, CIOs should develop a workstream collaboration strategy with the expectation that the trend will become a new norm. Consider not only technology adoption, but also the potential paradigm shift on the employment model, product offering and business model. For example, workstream collaboration will not only support employees working remotely, but also will help to adapt products to be delivered via digital channels due to the changing demand. The workstream collaboration strategy should prioritize business capabilities to support the organization's digital transformation ambitions.

**Business Impact:** The adoption of workstream collaboration in China goes beyond cloud office migration or online collaboration; it will enable a new way of working empowered by hyperautomation, multiexperience and other strategic technology trends. As a fundamental pillar of digital transformation, organizations with workstream collaboration will gain competitive advantages by providing better user experiences to their employees and clients.

**Benefit Rating:** High

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Adolescent

**Sample Vendors:** Alibaba Group; ByteDance; Huawei; Tencent

**Recommended Reading:** “Coronavirus (COVID-19) Outbreak: Short- and Long-Term Actions for CIOs”

“Limit the Business Impact of COVID-19 Coronavirus Outbreaks by Improving Infrastructure Resilience”

“A Digital Workplace Is Crucial to Digital Transformation”

“Crafting Workspaces That Enhance the Employee Experience”

## Edge Computing

**Analysis By:** Evan Zeng; Kevin Ji

**Definition:** Edge computing describes a distributed computing topology where information processing is placed close to the things or people that produce and/or consume that information. Edge computing is used to keep traffic and processing at network edge and off the centralized cloud or data centers.

**Position and Adoption Speed Justification:** In 2020, Chinese carriers have started to launch their projects to build stand-alone 5G core networks. Alongside this, multi-access edge computing infrastructures are planned to be built together with 5G cores, triggering a new round of market hype on 5G and edge computing. Besides, public cloud providers have been expanding their cloud footprints to compete for edge applications such as the edge node service from Alibaba Cloud. Also, local zones and outposts are the focus of Amazon Web Services (AWS) China in 2020 to expand its centralized cloud to distributed clouds to serve edge.

COVID-19 outbreak is another catalyst pushing enterprises to adopt edge computing because they need to further digitize their business operations at edge (such as branch and/or field operation, etc.). Doing so can reduce human on-site efforts and is better for maintaining social distancing at work.

**User Advice:** Edge computing has wide-range of use cases from IoT applications requiring edge infrastructure to provide near-real-time processing to general applications' edge data processing, analytics and computation offloading. Still, physical and network proximity from edge to the field versus that from the core (cloud and/or enterprise data centers) to field is the key differentiation for edge computing.

Infrastructure and operation (I&O) leaders responsible for cloud and edge infrastructure should:

- Develop pilot edge use cases for your organizations as well as your edge strategy
- Prepare in-house skill sets for the adoption of edge computing by identifying skill and talent gaps and developing upskill programs
- Explore vendors' edge offerings for pilot edge deployment cases with a focus on the integration challenges between edge and core (cloud and/or enterprise data centers)

**Business Impact:** Edge computing solves challenges that endpoint computing and/or core computing cannot address. For example, computation offloading from endpoint to edge address the challenge that endpoint usually has limited computation capacity to support compute-intensive workloads such as video rendering, especially when network latency is important. Edge computing complements computation at cloud or enterprise data centers, making digital transformation gets close to fields that business, people and things interact locally.

**Benefit Rating:** Transformational

**Market Penetration:** 1% to 5% of target audience

**Maturity:** Emerging

**Sample Vendors:** Alibaba Cloud; Amazon Web Services; Baidu; China Mobile; China Telecom; China Unicom; Huawei; Microsoft; Tencent Cloud; VMware

**Recommended Reading:** "Market Guide for Cloud Infrastructure as a Service, China"

"Hype Cycle for Edge Computing, 2019"

## “Exploring the Edge: 12 Frontiers of Edge Computing”

### DevOps

**Analysis By:** Manjunath Bhat; Kevin Ji

**Definition:** DevOps is a customer-value-driven approach to deliver solutions using agile methods, collaboration and automation. It emphasizes people and culture to improve collaboration between development, operations and other stakeholders to navigate uncertainty and accelerate the delivery of customer value. DevOps implementations use architecture and tools to improve the flow of work.

**Position and Adoption Speed Justification:** DevOps continues to be a topic of interest in China. Both midsize and large enterprises across different industries in China aim to adopt DevOps in their organizations. The primary objective of DevOps is to accelerate digital transformation. However, organizations typically put the toolchain ahead of the necessary cultural practices that need to precede automation. Thus, in many ways, DevOps in China is treated synonymously with CI/CD.

The organizational readiness, security concerns and lack of technology talent remain top challenges in the implementation of DevOps.

IT delivery model in China traditionally is driven by projects with a rigid hierarchies governance team. Therefore, a cultural transformation that requires aligning business, development, QA, security and operations teams using a product line operating model is seen as very disruptive. This way it possible to build a rapid experimentation to demonstrate business results by the culture of “fail fast,” “fail cheap” that is at the heart of DevOps.

The traditional security policy is based on the approval gate to mitigate the risk. DevOps needs a different approach on how to mitigate risk. It relies on fast delivery through a minimum viable product mindset and fast recover through automation, immutable infrastructure and observability tools. The traditional COST software cannot afford this capability to improve the security capability.

The rapid digital transformation in the country has led to organizations adopting open source technologies in a big way. However, a dearth of open-source skills and talent poses an immediate challenge. Adopting open-source technologies, such as Docker, Kubernetes, Jenkins, Chef, Ansible or the Elastic Stack (monitoring), requires modernizing legacy applications, and this is where the talent shortage becomes acute. Another reason to drive enterprise IT move to DevOps is their IT team’s service target was changed from internal user to external clients. IT needs to work with sales and marketing team to develop new business and serve customers with agility and flexibility.

Gartner sees DevOps initiatives in China align with the broader adoption of cloud services (private/public), microservices and the shift from project to a product line operating model.

**User Advice:** Successful adoption of DevOps and agile development methodology requires an organizational, cultural and philosophical shift, which is not easy to change, particularly in China, where companies tend to have rigid organizational structures. The executive team needs to take sponsorship to support IT delivery model change.

Establish an adaptive and responsive culture by selecting DevOps leaders with a team-oriented mindset focused on enabling collaborative learning teams with shared goals and responsibilities.

Improve the security capability from traditional security control management to DevSecOps. Leverage automation tools to expedite the test frequency. Build the immutable infrastructure to make the platform self-healing and auto-scaling. Improve the release process and invest observability tools to make the operation transparent.

Create an open-source talent pool by hiring and training individuals in open-source technologies and behaviors, such as community mindset and continuous learning. Automate open-source governance by implementing software composition analysis (SCA) and binary repository tools for security and license compliance.

Establish dedicated platform operation teams by recruiting diversified subject matter experts (SMEs) who will promote agility and responsiveness to product teams. Redefine the platform as a set of products that continuously evolves to fulfill developer needs by building a collaborative product mindset.

**Business Impact:** DevOps emphasizes people, culture and collaboration between development, operations and other stakeholders to improve the delivery of customer value. DevOps value stream is the sequence of activities required to deliver customer value through software using agile and DevOps practices.

DevOps practices improve the flow in the value stream through agile delivery methods, collaboration and automation. Continuous feedback is an important aspect of value streams because it helps remove constraints and, thus, improves quality, reliability and safety.

Organizations must not use cost reduction as the primary driver for DevOps. Costs will indirectly decline due to improvements in process efficiency, collaboration and automation. However, starting with reducing costs will be counterproductive. Organizations can expect an increase in initial costs due to the reskilling and retooling of processes.

Gartner views DevOps as transformational because it accelerates an organization's journey to digital business. DevOps invariably brings IT closer to business and the customer due to rapid feedback loops and closer collaboration, thus shortening the time an idea takes to go from inception to realization.

**Benefit Rating:** Transformational

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Adolescent

**Sample Vendors:** Atlassian; CloudBees; Datadog; FossID; Octopus Deploy; Red Hat; Selenium; Snyk; Splunk; UWinTech

**Recommended Reading:** "How to Navigate Your DevOps Journey"

"Adopt an Iterative Approach to Drive DevOps Success in Large Organizations"

“Three Ways Midsize Enterprises Can Maximize Value From DevOps”

“Four Steps to Adopt Open-Source Software as Part of the DevOps Toolchain”

“DevOps Success Requires Shift-Right Testing in Production”

“Avoid Failure by Developing a Toolchain That Enables DevOps”

“How to Scale DevOps by Building Platform Teams”

“Top SRE Practices Needed by Teams Scaling DevOps”

## 5G

**Analysis By:** Peter Liu; Sylvain Fabre

**Definition:** 5G is the next-generation cellular standard by the 3rd Generation Partnership Project (3GPP). The standard targets maximum downlink and uplink throughputs of 20 Gbps and 10 Gbps respectively, latency below 5 milliseconds and massive scalability. New system architecture includes core slicing as well as wireless edge.

**Position and Adoption Speed Justification:** Seventy-three operators have announced 5G rollouts (Source: Global Mobile Suppliers Association [GSA], April 2020), just under 9% (up from 5% one year ago) of mobile networks. 3GPP Release 16 freeze date has been postponed due to the COVID-19 pandemic, with a freeze target date of mid-2020. 5G encompasses a range of 3GPP standards focused on different functionality:

- R15: Extreme broadband (5G NSA and then 5G SA)
- R16: Augmentations for Industrial IoT (massive IoT, slicing and security improvements)
- R17: Augmentations for wider ecosystem expansion (freeze target date end of 2021)
- R18: Additional augmentations (e.g., extra territorial 5G systems, railway smart station services)

Due to this phased introduction, and the time required from the vendors' ecosystem to build standard compliant networks and grow silicon and device availability, Gartner expects the full potential for 5G use cases to materialize first in 2022.

Use of higher frequencies and massive capacity, will require very dense deployments with higher frequency reuse. Here we see regional differences, whereby mmWave will be leveraged in the U.S. but not elsewhere. Gartner expects many 5G deployments to initially focus on islands of deployment, without continuous national coverage.

Uncertainty about the nature of the use cases and business models that may drive 5G is currently a source of uncertainty for many CSPs, enterprises, and technology and service providers (TSPs). We are seeing different dynamics by regions, adoption is more aggressive in APAC and NAR, with Europe cautiously enthusiastic — and the developing world lagging.

China did launch 5G Nov 2019 and with a massive 5G network roll out plan across the country in 2020. China Mobile recently prepared to start the [second phase of its 5G rollout](#) — deploy more than 232,000 base stations across 28 provinces and autonomous regions in 2020. China Unicom will partnership with China telecom and plan to deploy no less than 250,000 base stations nationwide in 2020.

In addition, Chinese operators wants to be quickly deploy 5G Stand Alone (5G SA), which allows them to enable more innovative opportunities and enterprise services. China will lead 5G deployment, thanks to factors such as large mobile user base, LTE maturity, government policies support, and leading device manufacturers. With operators and enterprises forging ahead in the development of 5G services, and growing consumer excitement, china will accelerate the 5G maturity.

In addition, china also lead the 5G devices deployment. 2019 MWC Shanghai, CMCC executive mentioned that CMCC mandate their vendors to support NSA and SA from January 2020.

**User Advice:** Enterprise business leaders should:

- Identify use cases that definitely require the high-end performance of 5G; these may be few or even nonexistent for many verticals.
- Evaluate the multiple alternatives currently available that may prove adequate and more cost-effective than 5G for many use cases (for example, low power wide area [LPWA] such as NarrowBand Internet of Things [NB-IoT], long range [LoRa], Wireless Smart Ubiquitous Networks [Wi-SUN]).

CSP product managers should:

- Ensure backward compatibility to preceding generation (LTE) devices and networks. This is necessary because 5G coverage may be limited, so new 5G devices need to be able to seamlessly transition to 4G infrastructure as a fallback.
- Focus on related architecture initiatives — such as software-defined network (SDN), network function virtualization (NFV), CSP edge computing and distributed cloud architectures, as well as end-to-end security in preparation for 5G.
- Provide solutions where new frequency allocations (preferably) should be used for the latest technology — 5G — to benefit from lower cost per byte, higher bandwidth and more capacity.
- Have a clear understanding of specific verticals and their use cases for more effective consultative selling of their 5G solutions.
- Build their ecosystem of partners to target verticals more effectively with 5G.

**Business Impact:** Gartner Enterprise 5G surveys indicate that vertical use cases with 5G would be first motivated by operational cost savings. In addition, the vertical users for 5G appear to value lower latency from ultrareliable and low-latency communications (URLLC) and expect 5G to outperform rivals in this area.

5G enables, principally, three technology deployment and business scenarios, which each support distinct new services, and possibly new business models (such as latency as a service):

- Enhanced mobile broadband (eMBB) supports high-definition video.
- Massive machine-type communications (mMTC) supports large sensor and IoT deployments.
- Ultrareliable and low-latency communications (URLLC) covers high availability and very low latency use cases, such as remote vehicle/drone operations.

URLLC and mMTC will be implemented after eMBB. Only eMBB addresses the traditional mobile handset requirement of ever higher throughput. URLLC addresses time critical industrial applications such as automation, with latency around 1ms over a limited range for a limited number of connections — where reliability and latency requirements surpass bandwidth needs. Finally, mMTC addresses the scale requirements of IoT. mMTC may not be required in most locations for some years, with NB-IoT and other LPWA such as LoRA being sufficient for a while.

**Benefit Rating:** High

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Early mainstream

**Sample Vendors:** Cisco; Ericsson; Huawei; Mavenir; Nokia; Qualcomm; Samsung; ZTE

**Recommended Reading:** “Market Guide for 5G New Radio Infrastructure”

“Assessing 5G Mobile Technology for Organizations”

“How to Select 5G NSA/SA Migration Paths”

“Forecast: Communications Service Provider Operational Technology, 1Q20 Update”

“Market Trends: Strategies Communications Service Providers Can Use to Address Key 5G Security Challenges”

“Reduce Privacy Risks When Using 5G Products and Services”

## Natural Language Technologies

**Analysis By:** Tracy Tsai; Adrian Lee

**Definition:** Natural language technologies (NLT) are a subfield of linguistics, computer science, and artificial intelligence and the use of machine learning techniques to enable intuitive forms of communication between humans and systems, and analysis of those contents. NLT encompass the broad areas of natural language processing (NLP), which includes natural language understanding (NLU), natural language generation, text analytics, dialogue systems, language knowledge graphs, machine translation and text summarization, as well as others.



**Position and Adoption Speed Justification:** We are replacing the term “conversational AI platform” with “natural language technologies (NLT)” as conversational AI platform is just one of the many different technologies under NLT. In China, chatbot or automatic speech recognition (ASR) were the initial adopted applications. It later evolved into conversational platforms for insight discovery or sentiment analysis. The major progress of user experience and the efforts to maintain the training model is to shift away from key words to NLP to improve intent understanding. This is done by using recurrent neural networks (RNN), generative adversarial networks (GANs) or specific long- or short-term memory RNNs to improve NLU. There is increasing use of NLP for text analytic for contract review. During COVID-19, NLP has been used to extract insights from social media regarding patient symptoms, infection spread, to bring any necessary alert for the people. Another new area of NLT is the use of NLP and OCR to support robotic process automation (RPA) with intelligence capabilities. For example, analyzing the email subject and content to automatically classify emails into different folders or automatically generate email response for customers’ inquiries. Some are using NLP to analyze the person’s application for credit approval. Another area of NLT adoption is outbound call by using ASR and text to speech to synthesis human voice to auto dial hundreds or thousands of promotion call; saving on the labor cost effectively. Despite various application, NLT will still take at least five to 10 years to mature as diversity and complexity of different use cases require resources to build up intent models for optimizing user experiences.

**User Advice:** Enterprise architecture and technology innovation leaders planning to develop NLT-based applications should consider the following factors while evaluating and selecting vendors:

- Identify your business objectives and the kind of incremental value the NLT-based applications will bring to support the organization’s objectives.
- Start with text-based applications before moving into voice enabled ones.
- Collaborate with line-of-business stakeholders on how to scope your NLT product requirements, features and experiences such as building a shared understanding and common agreement on the taxonomy, ontology to ensure the data scope and quality.
- State your requirements during preliminary vendor qualification to ensure that automatic speech recognition (ASR), STT, text to speech (TTS), NLP, domain knowledge graphs and ease of use are offered. Only STT and keyword-/rule-based NLP do not provide natural conversational experiences.
- Request vendors to provide inference model for testing with your own company data. Each model needs to be trained and optimized with a new set of data.
- Be prepared to change to or add new providers of conversational platform applications. Ensure the datasets and business logic can be retrained and transferred seamlessly to the next vendor.

**Business Impact:** The initial business value of NLT for enterprises was to improve customer experience. Other benefits came from improving operational efficiency via cost reduction in call centers or increase in sales transactions. Gartner has observed an increase in the number of inquiries regarding NLT to support enterprise employees and improve productivity in China. Finally, there are new revenue models created by TTS and ASR through retail apps, smart speakers or home appliances. Chinese enterprises cannot delay the deployment of NLT or they will face the risk of losing their brand relevance to customers, as well as operational competitiveness.



**Benefit Rating:** Transformational

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Adolescent

**Sample Vendors:** AISpeech; Alibaba Group; Baidu; Emotibot Technology; iFLYTEK; IBM; Microsoft; Tencent; Xiaoji; Zhuiyi Technology

**Recommended Reading:** “Cool Vendors in Natural Language Technology”

“Enhance the Value Proposition for Natural Language Technologies”

“Market Guide for Natural Language Generation Platforms”

“Market Guide: China AI Startups”

“Competitive Landscape: AI Startups in China”

## RPA Software

**Analysis By:** Roger Sheng

**Definition:** Robotic process automation software is a digital enablement tool which is combined by user interface recognition technologies and by connecting to APIs to execute business process automation and predictable data transcription work. It can simulate the human operations (such as mouse clicks and keystrokes) that drive applications and process execution work. Sometimes, it can be designed for application-to-application automation as a software-based robotic operation.

**Position and Adoption Speed Justification:** The robotic process automation (RPA) software can reduce the human workload on a routing work process, which is rule based and repetitive rekeying or data collation. Retail, insurance, banking, security, even manufacturing and public service organizations are the users in China, which is similar as the global situation. RPA software can be used for accounting or client data collection, which requires human operation heavily as a digital labor, to reduce both labor cost and human errors in the process as well as improve efficiency. RPA is mainly used in the scenarios which don't have frequent process and rule changes. A robust system with strong recovery capabilities is important to RPA when it is required to fall back or recover from the accident. RPA has two types: attended robot and unattended robot defined by with human or without human working together. The attended robot requires people control for more flexible working process and the latter one is fully automated which can be used in the more routine process. E-commerce companies are the major users for RPA because the massive volume of trading data only can be processed by an automatic process. Alibaba Cloud developed an RPA solution based on its internal RPA development experience and promoted it to outside cloud clients. In China, some RPA vendors offer a development platform for the users to design their workflow and introduce the market-proven practices to other clients.

During the COVID-19 lockdown period, RPA was recognized to be effectively useful in China when the government and companies required huge data processing to provide essential services and trace the high-risk people by collecting the data across various data platforms. It can provide automated information and Q&A service to the citizens to help protect them from the pandemic all the time and support the government in managing people flow across the country/city. Also, RPA was widely used in the increasing demand from online shopping and logistics management during the city lockdown.

The major barrier for RPA in China is the customized software development capabilities of the end users. Usually there are not enough IT engineers engaged in business operation and process in traditional Chinese enterprises, which is important to RPA development. Recently, thanks to the hype of digital business, Chinese companies see RPA as one important component for digitalization especially operations process efficiency. Also, the adoption of AI technologies can improve the data collection accuracy, which supports more structured RPA solutions. The expanded use cases in the public area in COVID-19 will accelerate the development of RPA in China.

**User Advice:** Most RPA solutions include screen capture and working process automation, and some will use AI for data collection and process decisions. The end users need to integrate the RPA in their systems throughout the execution process to achieve the returns of automated work.

Currently, there are many examples to prove that RPA can develop automation capabilities and reduce the labor workload by software tools. In China, enterprises should consider to use RPA by the following factors:

- RPA tools can eliminate keying errors.
- Automated work is time-stamped, trackable and auditable.
- RPA software can be cheaper than increasing labor cost.
- RPA can reduce the employee management issues.
- RPA tools can be designed to operate 24/7.
- User interface recognition is less able to work in complicated system environments.

The labor-intensive traditional industry enterprises should consider RPA but it is not a complete solution. End users should consider developing RPA with their BPO and IT suppliers, which have built RPA tools. The existing process automation should be incorporated with both process transformation and digitalization. For digital-business-oriented enterprises, RPA should be developed by working with business flow partners to ensure the structured data and process output sync. End users should consider, attended or unattended, which RPA type is more suitable based on its business characteristics. The selection of RPA vendors should consider flexibility, stability, compatibility, maintenance and system costs.

**Business Impact:** For the enterprises that have huge demand on data process work, which rely on heavily replicated labor work, RPA can be the effective solution to reduce labor cost and increase the process efficiency. It can lead to the lower cost for related process operations. The enterprises can design the process automation for digital business outcomes and develop new business

models. Especially in digital transformation and digital governance, RPA software will take an important role to optimize the business process operation.

**Benefit Rating:** High

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Emerging

**Sample Vendors:** Alibaba Cloud; Daguang Data; i-Search; LaiYe Technology; LeanPro

**Recommended Reading:** “Best Practices for Robotic Process Automation Success”

“Magic Quadrant for Robotic Process Automation Software”

“Competitive Landscape: Robotic Process Automation Service Providers”

## Sliding Into the Trough

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### AIOps Platform

**Analysis By:** Peter Liu; Kevin Ji

**Definition:** Artificial intelligence for IT operations (AIOps) platforms combine big data, AI/machine learning and other technologies to support all primary IT operations functions with proactive, personal and dynamic insight. AIOps platforms enable the concurrent use of multiple data sources, data collection methods, analytical technologies (real-time and deep) and presentation technologies.

**Position and Adoption Speed Justification:** Growing demand for AIOps platform capabilities is fueled by the need to automate more and more IT operations functions as roles and responsibilities converge (with DevOps as a leading example) in the pursuit of greater agility. Adoption of AIOps platforms continues to rise in support of monitoring and root cause analysis efforts. Gartner estimates the size of the global AIOps platform market at between \$300 million and \$500 million per year (see “Market Guide for AIOps Platforms”).

The following trends are emerging in this space:

- Vendors outside the AIOps market, including APM solution providers, are expanding into the AIOps market in hopes of broadening their market opportunity.
- AIOps solutions are beginning to offer capabilities to triage problems and direct their resolution via integration with run book automation and application release orchestration (ARO) tools.
- Some vendors are pursuing an “open box” approach, allowing the algorithms to be accessible for user modification, while the majority of vendors are pursuing a “closed box” approach, disallowing user interaction.

Interest in AIOps is growing in China, with many enterprises looking for ways to become more proactive and less reactive in IT operations. I&O maturity varies in the Chinese market and industries eager to build digital business will pioneer AIOps system adoptions. For the financial and transportation industry, the primary demand is operation improvement for private cloud and data visualization. The fast-moving consumer goods (FMCG) and internet industries also want to use AIOps to improve their DevOps pipelines. During the next two to three years, successful AIOps use cases will be scenario-based solutions, rather than complicated, one-size-fits-all solutions. We expect at least two or three monitoring suppliers to support one AIOps initiative in the Chinese market.

Global IT vendors (e.g., IBM, Microsoft and VMware) have operated in China for decades, but have struggled to penetrate the rapidly expanding AIOps market. This has cleared the way for several local companies in the Chinese marketplace to fill the gap. These companies are moving beyond replicating outside tools to addressing key issues in the Chinese market. Many of these companies are innovating in the adoption of AIOps. China provides a unique ecosystem in which these companies can develop their products.

**User Advice:** I&O leaders looking to adopt AIOps in China should (see “Market Guide for AIOps, China”):

- Develop an enterprise AIOps strategy by identifying their current gaps in ITOM. Improve the likelihood of AIOps adoption success by adding functionality incrementally.
- Evaluate Chinese vendors identified in this research by comparing them with international vendors. I&O leaders in the APAC region should familiarize themselves with these vendors, because they are likely to expand beyond China during the next one to two years.
- Maximize the advantages provided by AIOps tools by increasing the use of automation tooling around closed-loop resolution.
- Maintain a flexible position regarding which vendors to include in their AIOps strategy, because tools are likely to undergo evolution, integration and consolidation. China’s cloud AIOps market is highly fragmented, with multiple small and large vendors, and has not yet gone into the phase of significant provider consolidation.

**Business Impact:** Organization across all verticals can benefit from adopting AIOps through:

- **Agility and productivity gains** via active analysis of both IT and business data, yielding new insights on user interaction, business activity and supporting IT system behavior.
- **Service improvement and cost reduction** via a significant reduction of time and effort required to identify the root cause of availability and performance issues. Behavior-prediction-informed forecasting can support resource optimization efforts.
- **Risk mitigation** via active analysis of monitoring, configuration and service desk data identifying anomalies from both operations and security perspectives.

- **Competitive differentiation/disruption** via superior responsiveness to market and end-user demand based on machine-based analysis of shifts, beyond those that are immediately obvious to human interpretation.

**Benefit Rating:** High

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Emerging

**Sample Vendors:** Alibaba Cloud; AsialInfo; Baidu; Cloudwise; EOITek; Huawei; LinkedSee; OneAPM; Tencent BlueKing; Tingyun

**Recommended Reading:** “Market Guide for AIOps, China”

“Market Guide for AIOps Platforms”

“Assess Approaches to AIOps for a Comprehensive Solution”

## Managed SD-WAN Services

**Analysis By:** Evan Zeng

**Definition:** Managed SD-WAN services include the SD-WAN product, WAN transport and management, and are fast emerging in China. Such providers include NSPs, carriers, cloud providers, OEMs with service arms and network SIs/VARs. They operationally manage customers’ SD-WAN products (physical appliances or software instances) that are either enterprise-owned or are included with the service. Overlay the top with intelligent software agents to decide best internet routing is a new way for WAN transport in managed SD-WAN services.

**Position and Adoption Speed Justification:** In China, the three big Chinese carriers (China Telecom, China Unicom and China Mobile) have dominating influence over managed SD-WAN service market development. This not only comes from the telecommunication market regulation in China, but also from their market share, pricing power on WAN transport and service bundled selling capabilities. Such carriers’ main interests are still on monetization of their existing MPLS networks, even though some provincial operators are taking the lead to offer managed SD-WAN services.

NSPs and public cloud providers are the major competitors to carriers in China for managed SD-WAN services. But their market shares are still small compared to carriers. Further, most enterprises in China are still on legacy hub-and-spoke WAN architecture and have not started modernizing that. Due to COVID-19 outbreak, Gartner sees more enterprises are keen to discuss WAN transformation by leveraging SD-WAN technologies and this clearly is an opportunity for managed SD-WAN services providers.

**User Advice:** Different from adopting SD-WAN technologies, managed SD-WAN services provide operation support for increased range of vendor-neutral hardware compatibility and software

transportability (licenses and certifications) across different CPE vendors, reducing capex and increasing enterprise agility.

When evaluating SD-WAN technologies for WAN transformation, I&O leaders should:

- Adopt managed SD-WAN services when outsourcing the management of SD-WAN products and WAN transport well fits to your organization strategies
- Include features beyond WAN connectivity such as security, WAN optimization and the integration of application performance monitoring for your managed SD-WAN services evaluation
- Pay attention to the optimization of WAN transport, which is the big area for cost optimization in China. Gartner sees sizable enterprises leverage centralized WAN procurement to get very high discount from providers.

**Business Impact:** Managed SD-WAN services can provide the following values to enterprise:

- Cost optimization by leveraging managed SD-WAN services, SD-WAN technologies, and hybrid WAN architecture.
- Improve WAN agility by enabling enterprises to quickly adopt modernized WAN technologies without the required upskill journey.
- Risks mitigation by standardizing WAN architecture and policies and consolidating WAN equipment across HQ, data centers, and branch offices.

**Benefit Rating:** High

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Adolescent

**Sample Vendors:** Alibaba Cloud; China Mobile; China Telecom; China Unicom; Huawei; InfoQuick; Tencent Cloud

**Recommended Reading:** “Market Guide for Managed SD-WAN Services”

“Magic Quadrant for Network Services, Global”

## Community Cloud

**Analysis By:** Evan Zeng; Kevin Ji

**Definition:** Community cloud refers to a multitenant offering where the subscribers have explicitly chosen to share the offering with a precertified community of organizations like government agencies. It is neither a fully public, nor private model. It can be offered at customer premises or at provider premises. In China, tenants are often organized and isolated by the industry, and it is also named industry cloud.

**Position and Adoption Speed Justification:** Regulators in highly regulated industries such as government agencies and banking still have major concerns on high availability, security, industry compliance and risk control of public cloud in China. They prefer industry-based community clouds with certified providers which are under governance. However, at this moment, provider certification frameworks have not yet been announced by regulators and there is no formal, disclosed certification process for providers. Provider maturity is still developing with only a few established providers, not many, in each highly regulated industry segments. This includes Alibaba Cloud, Tencent Cloud and Ping An Cloud in financial services community cloud segment, and Inspur cloud, China Telecom (Tianyi Cloud) in government community cloud segment.

Industries outside of highly regulated industries do not have such limitation on cloud providers and it is an open market for competition. But community cloud makes less sense in such industries and if there are some, the size of each one is normally not big.

**User Advice:** CIOs in highly regulated industries such as government agencies and banking:

- Closely communicate with regulators of your industries with the progress of certified industry-based community cloud providers
- Understand regulators' guidelines on your industries about whether it can host industry-based production workloads in any public cloud because of regulated compliance requirements.
- For workloads that are not under highly regulated requirements, consider public cloud over community cloud because of the faster innovation pace and bigger ecosystem of providers on public cloud platforms.

CIOs in other industries:

- Prioritize the adoption of public cloud over community cloud. Only when public cloud is not fit to your specific requirements such as vertical integration environment, then try community cloud.
- For large conglomerates, evaluate community cloud for implementing shared-service strategy across all your subsidiaries to achieve better IT efficiency and agile service delivery.

**Business Impact:** Community cloud is being increasingly adopted in enterprises because it can provide the following business benefits:

- **Less requirements on end user governance skills** — Community cloud is not entirely public and has more access restriction to limit tenants for their access. It is considered to be less exposed to security risks than public cloud, thus it lowers the bar for end users' governance skills to adopt community cloud.
- **Industry regulatory compliance** — Public cloud does not customize its cloud platforms by industry regulation, but industry-based community cloud can do. This can help tenants to easily achieve industry regulatory compliance.
- **Business agility** — In comparison to internal private cloud, community cloud can provide better agility to tenants, although less agility than public cloud.



- **IT efficiency** — Building an internal private cloud is a high-cost activity. Leveraging existing community cloud is a lower-cost approach if enterprises do not have mature skill sets to govern public cloud adoption.
- **Economies of scale** — Compared with internal private cloud which is built for one enterprise model, industry based community can be built for one whole industry. It has better economies of scale.

**Benefit Rating:** Moderate

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Adolescent

**Sample Vendors:** Alibaba Cloud; Baidu Cloud; CCB Cloud; China Telecom; China TravelSky Holding; CIB Fintech; Inspur; Ping An Cloud; Tencent Cloud

**Recommended Reading:** “Market Guide for Cloud Infrastructure as a Service, China”

“‘Distributed Cloud’ Fixes What ‘Hybrid Cloud’ Breaks”

## NB-IoT

**Analysis By:** Peter Liu

**Definition:** NarrowBand-Internet of Things (NB-IoT) is a low-power wide-area (LPWA) radio technology standard which is specified by 3GPP in Release 13, Release 14 and Release 15, aiming to provide wide-area connectivity for massive machine-type communication. NB-IoT technology occupies a frequency band of 180kHz bandwidth, which corresponds to one resource block in LTE transmission. NB-IoT focus specifically on IoT applications requiring wireless transmission over a more extended range at a relatively low cost and using lower power for long battery life.

**Position and Adoption Speed Justification:** Globally, 93 CSPs have deployed or launched NB-IoT networks based on GSA as of January 2020 (see [NB-IoT & LTE-M: Over 100 Operators Have Deployed Networks](#) and [Mobile IoT Network Launches](#) for more details). Commercial deployments include those of China Mobile, China Telecom, China Unicom, T-Mobile (the Netherlands), Telia (Norway), TELUS (Canada) and Vodafone (Spain). NB-IoT has the potential to become a mainstream LPWA technology, but first it has to see significant price erosion to achieve cost parity with alternative variants (LoRa, Sigfox and Random Phase Multiple Access [RPMA]). In terms of chipset, more than 10 chipset suppliers announced their commercial NB-IoT products. Regarding shipments, Huawei (HiSilicon) is currently in the leading position, benefiting from the mass rollout in China.

China is currently the biggest market for NB-IoT. NB-IoT was designated as the country’s preferred LPWA technology compare with Sigfox and LoRa, and it plays a key role in national IoT policy. Backed by strong government support, all three operators claim to have rolled out the technology to tens of thousands of base stations. Developments in China will benefit the entire NB-IoT ecosystem. China’s three operators (China Mobile, China Telecom and China Unicom) have built the world’s



largest NB-IoT network so far by upgrading more than 1 million base stations across China to support NB-IoT. The target is to update more than 3 million base stations by 2025. The massive rollout and operator subsidy allow the price of NB-IoT modules to fall to 20 renminbi (about \$3). By the end of 2019, China operators had more than 100 million NB-IoT connections, account over 90% of the global market. Considering the large volume machine-type connections that are still on 2G and 3G nowadays, the ongoing phase out of 2G and 3G initiatives will accelerate the NB-IoT adaptation in China.

Key applications include

- Smart metering (electricity, gas, and water).
- Facility management services.
- Intruder alarms and fire alarms for homes and commercial properties.
- Connected personal appliances measuring health parameters.
- Tracking of people, animals or objects.
- Smart city infrastructures such as street lamps or dustbin.

**User Advice:** CIO and IT leaders who are responsible for IoT initiatives should:

- Test NB-IoT for more-demanding industrial use cases, as NB-IoT supports authentication (which is supported by the SIM card on mobile devices in 3GPP) and high reliability, which a licensed spectrum operation supports better than unlicensed alternatives.
- Use NB-IoT on the basis that investing in the standard will be a long-term play but a low-risk strategy — while planning for continuous evolution (such as 5G massive machine-type communications [mMTC] and Cat NB2).
- Work closely with NB-IoT ecosystems and effectively reduce the NB-IoT device price to achieve scale and business value.

**Business Impact:** No IoT connectivity protocol is necessarily better than another, but each caters to a different set of business requirements. Among LPWA alternatives, NB-IoT will address the needs of use cases with higher requirements for reliable connectivity, higher SLAs and robust 3GPP security. It is expected that NB-IoT can be enabled in existing radio access network (RAN) infrastructure without the need for additional hardware upgrades, although vendors' implementations vary.

NB-IoT is technically complicated and is covered by numerous patents, contributing to the cost of implementation at the endpoints. The main difference between NB-IoT and other proprietary LPWA technologies (such as LoRa, Sigfox or Weightless) is that NB-IoT is backed by 3GPP standards. As such, it will be deployed in a majority of mobile CSPs and will benefit from the stronger and richer 3GPP ecosystem.

Finally, as an extension of LTE, NB-IoT will be deployed within mature networks, with established operational and customer experience management key performance indicators (KPIs) and practices, along with mature systems, such as self-organizing network (SON) IT support systems.

**Benefit Rating:** High

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Adolescent

**Sample Vendors:** China Mobile; China Telecom; China Unicom; Ericsson; Huawei; Nokia; Quectel; ZTE

**Recommended Reading:** “Exploit LPWA Networks Now — 5G Won’t Change Them”

“Competitive Landscape: IoT Mobile Virtual Network Operators”

## Hyperconvergence

**Analysis By:** Uko Tian

**Definition:** Hyperconvergence is scale-out software-integrated infrastructure seeking operational simplification. Hyperconvergence provides a building block approach to compute, network and storage on standard hardware under unified management. Hyperconvergence vendors build appliances using off-the-shelf infrastructure, engage with system vendors that package software as an appliance, or sell software for use in a reference architecture or certified server. Hyperconvergence may also be delivered as a service or in a public cloud.

**Position and Adoption Speed Justification:** The adoption of hyperconvergence solutions is rapidly expanding in China. Time to deploy and management simplicity are main values recognized by users. In addition to the typical workloads running on hyperconverged infrastructure (HCI), such as VDI, server consolidation and remote office/branch office (ROBO), HCI has also been marketed by vendors as a valid option to build private cloud. Midsize business are major users. Appliance is the primary delivery model.

From supply side, the market remains fragmented. Local vendors are leading the market. There are three types of players in the market: established data center vendors, like Dell EMC, Huawei, H3C and Sangfor; dedicate HCI players like Nutanix, SmartX and ZETTAKIT; cloud providers with HCI offerings, such as QingCloud, EasyStack and Kingsoft Cloud. Due to market diversification, there remains growth opportunity for small vendors. Local players show more flexibility in pricing and better scalability, which bring them competence in the market.

The demand for remote working has surged due to COVID-19, and HCI-based VDI solution is well-suited for its advantages in cost, automation and remote manageability.

**User Advice:**

- IT leaders should implement hyperconvergence when agility, modular growth and management simplicity are of greatest importance. The acquisition cost of hyperconvergence may be higher and resource utilization rate lower than for three-tier architectures, but management efficiency is often superior.
- Plan strategically, but invest tactically. IT leaders should evaluate carefully vendors' viability, service capability and product reliability because the market is still evolving.
- Keep in mind that current hyperconvergence offerings in the market may vary significantly in terms of performance, availability, data services and hypervisor support. Identify your use cases and workload characteristics to validate your HCI vendors' solutions.
- Be aware of the infrastructure and process challenge that HCI deployment may bring. For example, network maybe an issue when dealing with demanding workloads; and HCI will require alignment of compute and storage refresh cycles, consolidation of operations, budgets and capacity planning.

**Business Impact:** The lower total cost of ownership, modularity and scalability offer resource-constrained organizations fast deployment, simplified management and opportunities for automation. Hyperconvergence is of particular value to midsize enterprises that can standardize on hyperconvergence and the remote sites of large organizations that need cloudlike management efficiency with on-premises edge infrastructure.

**Benefit Rating:** High

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Adolescent

**Sample Vendors:** Dell EMC; EasyStack; H3C; Huawei; Inspur; Nutanix; QingCloud; Sangfor; SmartX; ZETTAKIT

**Recommended Reading:** "Magic Quadrant for Hyperconverged Infrastructure"

"Solution Comparison for Four Hyperconverged and Software-Defined Infrastructure Solutions"

"Competitive Landscape: Hyperconverged Infrastructure, China"

"Use Hyperconverged Infrastructure to Free Staff for Public Cloud Management"

## Industrial Internet of Things

**Analysis By:** Milly Xiang

**Definition:** The industrial Internet of Things (IIoT) as a subsegment of IoT, is used to improve asset management decision making and operational visibility, and control for plants' infrastructure and equipment within asset-intensive industries and environments. These include industries such as manufacturing and natural resources, transportation and logistics, and utilities.

**Position and Adoption Speed Justification:** China's government backing on industrial internet is a major driver for IIoT proliferation in China. IIoT providers, in many instances, have sacrificed their operating margin during the past few years to incentivize adoption. From the bottom up, industrial businesses across China also know they must modernize their operations, cut their operational cost, improve product quality, and drive innovation in order to compete globally. Especially during the recent COVID-19 crises, IIoT helped industrial enterprises be more adaptive and resilient while facing labor shortage, and supply chain uncertainty.

The demand for IIoT becomes increasingly entwined with cloud, analytics, AI and ML techniques to transform the industrial sector in managing complex processes and driving innovation. Overlaid with these technologies, IIoT can help industrial enterprises monitor and interpret data from production lines and complex machinery in real time to anticipate faults, manage infrastructure and mitigate risk.

Although IIoT is growing rapidly, it continues to face several obstacles such as standardization, security and privacy concerns, interoperability issues, skill shortages, business model struggles, and a highly fragmented provider marketplace. This moves further it down into the trough as industrial enterprises and the entire ecosystem need time to tackle these challenges, while the economic uncertainty as a result of COVID-19 also leads to project postpone for small and midsize enterprises.

**User Advice:** Enterprises should be educated on the value of IIoT-enabled business solutions, from a perspective of both how IIoT affects internal operations and how IIoT extends externally to augment and support customer engagement. For Chinese companies that want to implement IIoT technologies, Gartner has the following recommendations:

- Create a roadmap for the current and future use cases which aligned with business objectives and shortlist vendor proposals by identifying and prioritizing vendors whose IIoT solutions match the most important elements of the use-case requirements for your enterprise.
- Identify use cases for IIoT in tackling COVID-19 issues such as assess and certify health status, as well as those can support enterprises cost optimization and process optimization in face of the current economic cycle.
- Evaluate vendors' capabilities beyond the pure IIoT platform by extending the analysis to cloud versus on-premises capabilities, multicloud integration capabilities, ability to scale, and most importantly, their proven ability to implement vertical market use cases.
- Rate vendors' responses for specific vertical market experience and their demonstrated ability to support the appropriate KPIs and SLAs that align to OEM versus brownfield owner-operator implementations.
- Use certified system integrators to build custom solutions (for complex requirements) that may involve a unique set of sensor or edge devices, algorithms and visualization capabilities in order to offset various vendor risks.

**Business Impact:** IIoT solutions improve technology and business insights, and related actions, across a heterogeneous asset group. This is achieved through aggregating, orchestrating and analyzing historically siloed data sources to improve data accessibility across the industrial

enterprise and with partners. IIoT can broadly benefit various buying centers within the industrial sector:

- Product managers focus on applying IIoT to create “connected products” to change customer experience, improve partner relationships, and extend into adjacent or new markets.
- Supply chain managers relating to the acquisition and logistics of materials, production optimization, and distribution of products, acquire and storage data for OT applications, such as manufacturing execution systems (MES) and asset performance management (APM), and stand-alone analytics relating to business planning and manufacturing operations.
- Asset operations and engineering managers concentrate on the planning, building and management of the physical plant and the assets required to produce goods and/or services (for example, utilities).

**Benefit Rating:** High

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Emerging

**Sample Vendors:** Accenture; Alibaba Cloud; CyberInsight; Foxconn Technology Group; Haier Group; HANYUN; Huawei; Mogulinker Technology; PTC; ROOTCLOUD

**Recommended Reading:** “Magic Quadrant for Industrial IoT Platforms”

“Critical Capabilities for Industrial IoT Platforms”

“Market Guide for Edge Computing Solutions for Industrial IoT”

“Market Guide for Industrial IoT Gateways”

## Digital Commerce Platform

**Analysis By:** Sandy Shen

**Definition:** Digital commerce platforms enable customers to purchase goods and services through an interactive and self-service experience. The platform provides necessary information for customers to make purchase decisions and uses rules and data to present fully priced orders for payment. It supports multiple channels such as web, mobile, stores, social, IoT devices and call centers.

**Position and Adoption Speed Justification:** Chinese B2C organizations have heavily relied on online marketplaces that account for more than 80% of the online retail transactions. COVID-19 saw more businesses using aggregate platforms for online grocery and food delivery to accelerate their shift to digital channels. These organizations tend to use multiple online platforms including third-party marketplaces (e.g., Tmall.com and JD.com), social networks (e.g., WeChat) and live streaming platforms (e.g., TikTok and Kwai) to reach end customers. It won’t be long before they face

challenges in managing all customer interactions and data from these platforms which will prompt them to invest in commerce and related CRM solutions. Established brands and brands focusing on developing long-term customer relations are investing into direct-to-customer commerce platforms which give them better control of the customer experience, data and relationship. Large B2B organizations are more likely than B2C organizations to build their own platforms due to the lack of dominating marketplaces. They intend to improve customer experience, increase selling efficiency and reach out to new customers.

On the technology front, local commerce platform providers are not well-established, and their solutions are not as comprehensive or sophisticated as their global peers, even though they are well-integrated with the local ecosystem. Some providers choose to focus on marketplace integration such as order management and customer service to help organizations manage multiple channels, and some choose to become fully outsourced service providers. A large number of smaller vendors offer mobile and WeChat solutions that are attractive to SMBs but may not fulfill serious commerce needs for larger enterprises. These factors will see digital commerce platforms take between two to five years to reach the plateau in China.

**User Advice:** B2C organizations looking to deploy their own digital commerce platforms should be aware of the dominance of online marketplaces. We recommend:

- Obtain management commitment for long-term investment as digital commerce, especially your own commerce platform, doesn't usually turn profit in a short time. Position the commerce site for multiple purposes including marketing and customer engagement to better justify the ROI.
- Set up a storefront on WeChat using the miniprogram or third-party plug-ins to have a simplified commerce platform and operation that allows you to directly engage customers.
- Use a combination of WeChat, marketplaces and your own commerce platforms to reach a wide audience and increase online sales volume.

Organizations selling B2B:

- Define your B2B commerce business — whether it is to serve new customers or existing customers, whether to target SMBs or enterprises, what products and markets to sell and how to align with the sales team and channels.
- Investigate enterprise marketplace business model where you open the commerce platform to third parties that include partners, suppliers, solution providers and other brands, and see how your organization can benefit strategically and financially.
- Deliver a consumer-like user experience and help customers streamline the purchase process.

Consider local providers, especially for integration with local channels and partners. Use Gartner's "Toolkit: RFP for Digital Commerce Platforms" to compare vendor solutions on functionality, compatibility with your existing applications, integration needed and support level from the vendor.

**Business Impact:** Organizations in China face a highly competitive market because of the diverse customer preferences, business practices and infrastructure in regional markets. Although marketplaces are good at reaching a large number of customers and driving sales, companies don't

own customer experience and data. Customer data and insights are key in developing a differentiated experience and offering in this competitive market, and this is a reason why more organizations are deploying their direct commerce platforms including WeChat stores. B2B organizations have the chance to establish their own commerce platforms and become leaders in the verticals they play and can even operate their own marketplace to build a digital ecosystem.

**Benefit Rating:** High

**Market Penetration:** 5% to 20% of target audience

**Maturity:** Adolescent

**Sample Vendors:** Adobe (Magento); Kingdee International Software Group; Oracle Commerce; Salesforce; SAP Hybris; ShopEx; Weidian; Youzan

**Recommended Reading:** “How to Develop a Digital Commerce Strategy”

“11 Imperatives When Building an Enterprise Marketplace”

“Create Enterprise Marketplaces to Accelerate Digital Business”

## Blockchain in China

**Analysis By:** Arnold Gao

**Definition:** Blockchain refers to a broader, decentralized architecture that has the potential to disrupt, for example, data sharing, business model transformation or governance. It is a consensus system with multiple participants. The consensus is the result of an incentive mechanism that can reward or punish — those who obey the rules will be rewarded, while those who break them will be punished or even removed from the system.

**Position and Adoption Speed Justification:** Blockchain in China has more advanced progression comparing to the rest of the world due to the strong support from the central government. In 2016, Blockchain became part of country’s 13th five-year plan and after passing the Peak of Inflated Expectations in late 2018, it was designated as a ‘national priority’ in October 2019 and climbed through the trough. with a surge to invest, implement Blockchain from a more practical and commercially viable perspective.

Despite the ‘Blockchain complete solutions’ are not widely available yet, Blockchain use cases with business value have emerged in the China market. Those use cases deliver value by creating novel business models in the areas such as supply chain finance, trade finance, insurance, etc.

Due to the strict regulations on cryptocurrency, ICOs and other tokenization initiatives, the Blockchain “speculation bubble” in China has busted. The remaining players with proper funding mainly focus on the technology development or exploiting the business value of Blockchain.

**User Advice:** Change the focus from technology to blockchain’s value by designing a consensus system with multiple participants.



Extend the technology options by involving not only the blockchain-enabling technologies (for example, distributed ledger, smart contracts and tokenization), but also other technologies such as AI/machine learning, data and analytics and cloud computing. Blockchain is not only a set of innovative technologies, but also a philosophical concept for a new way of working, living and collaborating supported by different technologies and business processes. Its implementation doesn't need to be tied to any particular platform, vendor or technology. Use any means — technology ones and nontechnology ones — to create a consensus system.

Justify the success or failure of a blockchain project on its business value (for example, increased revenue, reduced costs or enhanced customer satisfaction).

**Business Impact:** Blockchain is a conceptual notion that introduces a new architecture to challenge and disrupt the status quo. Besides its novel technological innovation, its greater potential is to create new business and governance model. A Blockchain inspired business model creates equality for all the participants comparing to the centralized models which increase the productivity of the entire system. Also, Blockchain is an alternative to the existing ad hoc security and regulation framework, which allows risks to be exposed in a limited scale but can never override the entire consensus system.

**Benefit Rating:** Transformational

**Market Penetration:** 1% to 5% of target audience

**Maturity:** Adolescent

**Sample Vendors:** Ant Financial Services Group; Hangzhou Qulian Technology; Tencent; WeBank

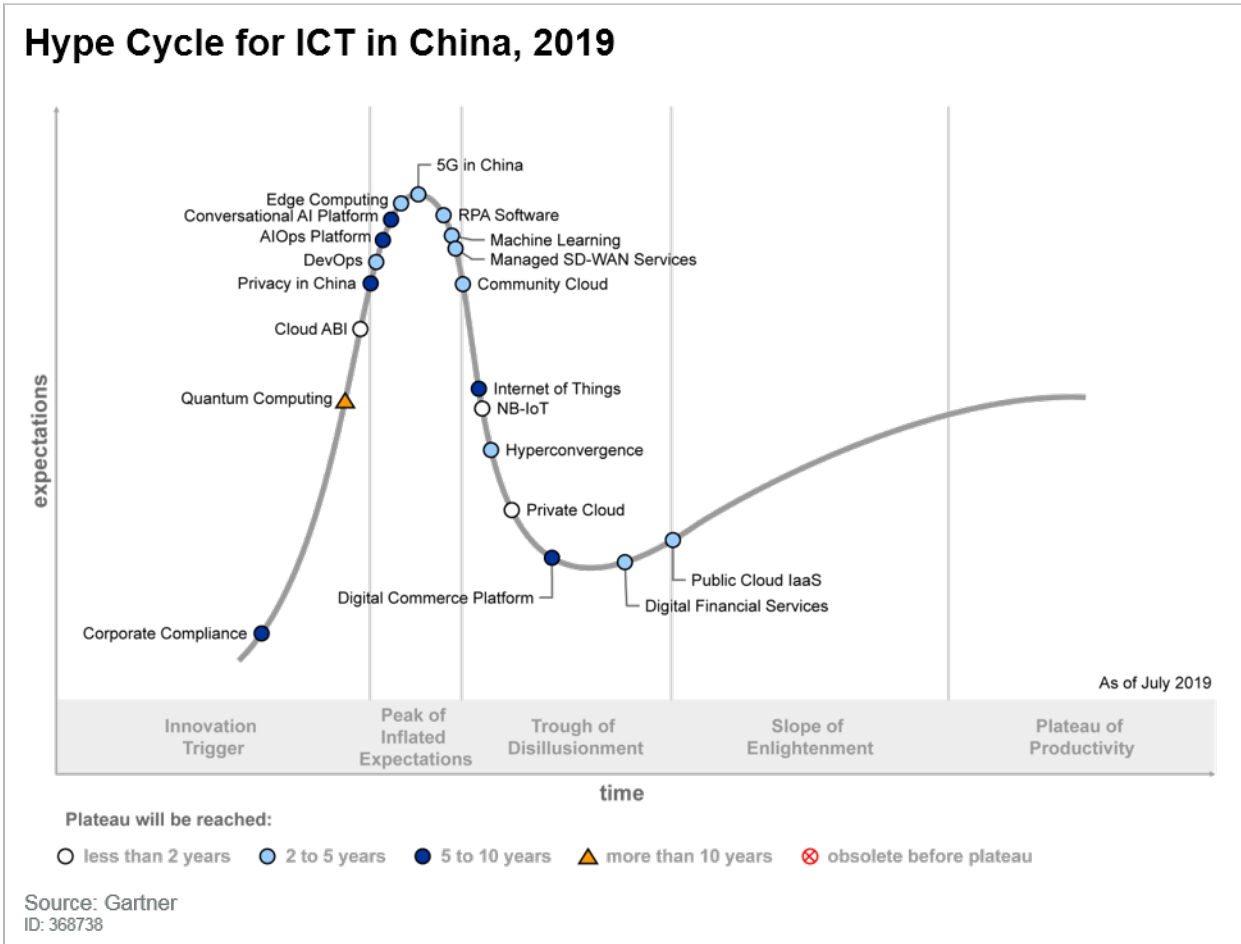
**Recommended Reading:** “Blockchain Reimagined — Apply Game Theory to Unleash Its Potential”

“Blockchain in Digital Business: What the Board Needs to Know”

“Top 10 Strategic Technology Trends for 2020: Practical Blockchain”

Appendixes

Figure 3. Hype Cycle for ICT in China, 2019



## Hype Cycle Phases, Benefit Ratings and Maturity Levels

Table 1. Hype Cycle Phases

Phase	Definition
<i>Innovation Trigger</i>	A breakthrough, public demonstration, product launch or other event generates significant press and industry interest.
<i>Peak of Inflated Expectations</i>	During this phase of overenthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes, but more failures, as the technology is pushed to its limits. The only enterprises making money are conference organizers and magazine publishers.
<i>Trough of Disillusionment</i>	Because the technology does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
<i>Slope of Enlightenment</i>	Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the technology's applicability, risks and benefits. Commercial off-the-shelf methodologies and tools ease the development process.
<i>Plateau of Productivity</i>	The real-world benefits of the technology are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generations. Growing numbers of organizations feel comfortable with the reduced level of risk; the rapid growth phase of adoption begins. Approximately 20% of the technology's target audience has adopted or is adopting the technology as it enters this phase.
<i>Years to Mainstream Adoption</i>	The time required for the technology to reach the Plateau of Productivity.

Source: Gartner (July 2020)

Table 2. Benefit Ratings

Benefit Rating	Definition
<i>Transformational</i>	Enables new ways of doing business across industries that will result in major shifts in industry dynamics
<i>High</i>	Enables new ways of performing horizontal or vertical processes that will result in significantly increased revenue or cost savings for an enterprise
<i>Moderate</i>	Provides incremental improvements to established processes that will result in increased revenue or cost savings for an enterprise
<i>Low</i>	Slightly improves processes (for example, improved user experience) that will be difficult to translate into increased revenue or cost savings

Source: Gartner (July 2020)

Table 3. Maturity Levels

Maturity Level	Status	Products/Vendors
<i>Embryonic</i>	<ul style="list-style-type: none"> <li>In labs</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
<i>Emerging</i>	<ul style="list-style-type: none"> <li>Commercialization by vendors</li> <li>Pilots and deployments by industry leaders</li> </ul>	<ul style="list-style-type: none"> <li>First generation</li> <li>High price</li> <li>Much customization</li> </ul>
<i>Adolescent</i>	<ul style="list-style-type: none"> <li>Maturing technology capabilities and process understanding</li> <li>Uptake beyond early adopters</li> </ul>	<ul style="list-style-type: none"> <li>Second generation</li> <li>Less customization</li> </ul>
<i>Early mainstream</i>	<ul style="list-style-type: none"> <li>Proven technology</li> <li>Vendors, technology and adoption rapidly evolving</li> </ul>	<ul style="list-style-type: none"> <li>Third generation</li> <li>More out-of-box methodologies</li> </ul>
<i>Mature mainstream</i>	<ul style="list-style-type: none"> <li>Robust technology</li> <li>Not much evolution in vendors or technology</li> </ul>	<ul style="list-style-type: none"> <li>Several dominant vendors</li> </ul>
<i>Legacy</i>	<ul style="list-style-type: none"> <li>Not appropriate for new developments</li> <li>Cost of migration constrains replacement</li> </ul>	<ul style="list-style-type: none"> <li>Maintenance revenue focus</li> </ul>
<i>Obsolete</i>	<ul style="list-style-type: none"> <li>Rarely used</li> </ul>	<ul style="list-style-type: none"> <li>Used/resale market only</li> </ul>

Source: Gartner (July 2020)

## Gartner Recommended Reading

*Some documents may not be available as part of your current Gartner subscription.*

Understanding Gartner's Hype Cycles

3 Ways to Jump Start Digital Commerce

Cool Vendors in Analytics and Data Science

Blockchain Reimagined — Apply Game Theory to Unleash Its Potential

Cool Vendors in Natural Language Technology

Market Guide for AIOps, China

Market Guide: China AI Startups

## Market Guide for Cloud Infrastructure as a Service, China

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