Cloud computing is reaching for the sky

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The future of cloud is sky computing—a fluidly interoperable user-focused computing ecosystem

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Talking points

The approaching Sky computing era
Today's cumbersome, siloed, patchwork implementations of private, public, and hybrid clouds will be replaced by the services of an agile, open-source, fluidly interoperable, user-focused approach called Sky computing.

A customer-driven model
Sky computing's modular plug-and-play business and consumer offerings are expected to provide unprecedented user convenience and cost efficiencies in consuming computing resources.

Dramatic business metamorphosis
But Sky computing's most powerful impact should be in helping organizations transform into profoundly agile organisms that nimbly respond to customer needs and competitive threats.

Building bridges in the clouds

Most enterprises are already using cloud computing as a business platform to drive revenue growth and innovation. Specifically, a global IBM Institute for Business Value study found that more than three quarters of survey respondents are using cloud computing to expand into new industries. Seventy-four percent have adopted cloud to improve customer experience, and 71 percent use cloud to create enhanced products and services—while simultaneously downsizing legacy systems and reducing costs.[1]

But for most enterprises today, cloud environments can be a patchwork of insufficiently coordinated private, public, and hybrid clouds that can create security and performance issues. As a result, it's not surprising that many enterprises have yet to trust most of their mission critical applications and sensitive data to the cloud.[2]

But, if enterprises are not willing to move their most important processes to the cloud, they cannot hope to compete with escalating market expectations that might be better served by born-on-the-cloud competitors or leading-edge cloud adopters.

A strategy of maintaining processes outside the cloud will ultimately prove competitively unsustainable. This is why, over the next ten years, organizations will be able to move practically all of their business processes to Sky computing.

Sky computing goes beyond
hybrid cloud by making
computing infrastructure
unnoticeable to users

Sky computing is the cloud of the future

Sky computing is a business and consumer-focused computing platform that represents a major advance over current cloud environments (see Figure 1). It goes beyond hybrid cloud by making computing infrastructure unnoticeable to users. For example, Sky computing will showcase seamless, modular plug-and-play enterprise and consumer offerings that can allow both organizations and consumers to optimally and affordably meet their unique transactional and informational needs—without focusing at all on the technology, systems, or computing resources those needs require.

In addition, Sky computing will provide easy access to the latest technologies, such as edge computing or quantum algorithms, while concealing the underlying complexity of the computing resources and technologies required—including computing capacity, scalability, availability, storage, and data security. For enterprises, the burden of interconnecting cloud services from different layers of the cloud computing stack—such as IaaS, PaaS, SaaS, and more—will become irrelevant and simply cease to exist.

In the Sky computing era, organizations will be able to buy, assemble, and flexibly integrate plug-and-play business offerings almost as effortlessly as a consumer today adds and deletes apps on a smartphone. This will enable new businesses to be instantly "born-in-the-Sky."

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Figure 1

Sky computing's advantage over today's cloud environments

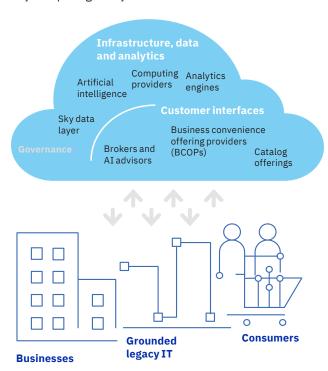| Differentiators	Today's cloud environments	Future Sky computing era
Infrastructure	Unharmonious installation of a patchwork of various cloud deployment models, such as public, private and hybrid.	Computing invisible to users, who focus instead on selecting seamless plug-and-play hosted business offerings from an artificial intelligence-facilitated catalog.
Data	No common or universal governance or platform to collect, contribute, and distribute data or to compensate for data consumption.	Universal approach to free flow of data across the entire Sky computing ecosystem with global governance.
Enterprise innovation	Innovation constrained by lack of a common operating environment across the enterprise.	Rapid innovation using advanced technologies without vendor lock-in or being limited to vendor constraints.
Cost	Siloed clouds cause capital and operating cost redundancies.	Access to extremely granular payment options, e.g., per single transaction.
Ecosystem	Multiple, fragmented ecosystems clustered around various cloud vendors and offerings.	One unified, holistic ecosystem of providers, developers, distribution partners and customers.
Business growth	Slower growth due to need to establish technical infrastructure and corresponding technical providers.	More nimble expansion of competitive footprint due to easy extension into new products/services, geographies and target customer groups.

Retailing reborn in the Sky

In the Sky computing era, a new business can be "born-in-the-Sky" simply by selecting the apps it needs to operate its entire value chain. For example, a Sky retailer could select a customer profiling application linked to a transaction processing service that is interconnected with a blockchain-based security offering. These applications would then be integrated with product selection, marketing, and distribution-related applications to nimbly assemble a virtual online store. Used in this manner, the value of the Sky computing platform is in the overall stack it provides, not just its underlying computing infrastructure.

This same approach would also apply to any enterprise with legacy technology. Technical infrastructure could be moved into the Sky application by application or workflow by workflow, facilitating a smooth transition away from outdated data siloes and constrained innovation. For both born-in-the-Sky competitors and legacy technology organizations, as new business applications are launched, Sky computing will facilitate continuously adaptive operating models, countering competitive actions and customer demands with up-to-the-minute technological capabilities.

The architecture of the Sky

From earth-bound servers to satellites in space, Sky computing will place no limits on infrastructure's next era of evolution. Within the next decade or so, most of today's hybrid, multicloud environments will be absorbed into the Sky computing ecosystem. While some legacy systems will remain as part of proprietary, hosted infrastructures for security or regulatory reasons, execution of mission-critical activities will occur in the Sky (see Figure 2).

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Figure 2

Sky computing ecosystem

Source: IBM Institute for Business Value

Customer interfaces

The heart of Sky computing's modular ecosystem will consist of what we call Business Convenience Offering Providers (BCOPs). Agile aggregation and reshuffling of BCOP offerings will allow an ever-changing assortment of uniquely competitive business and operating models for established and newly launched businesses alike—each touting their ability to serve their customers better. Most of the BCOPs themselves will likely outsource their underlying tangles of technology architecture—crucial to their success—to technology providers in the Sky.

Continuously updated BCOP offerings will be available via Sky offering catalogs. The choices will be so numerous and competition so fierce that potential buyers will rely on brokers and AI advisors to help recommend, select, and even install the most suitable applications for a specific objective. Plus, monitoring will be available for better replacement offerings over time.

Sky computing's fundamental value proposition of agile, composable integration across multiple platforms, clouds, and data sets will require two essential developments:

– Ubiquitous open standards and faithful adherence by BCOP vendors. This includes modular design principles using open interface standards and technologies to enable instant plug-and-play capabilities.
– An independent Sky governance body to audit and enforce adoption of consistent regulations and standards.

While not trivial, we believe business need and the tremendous value of being a full participant in the Sky computing ecosystem will drive new levels of global collaboration. It will be in the best interest of computing vendors to develop and respect emerging conventions and standards that provide data privacy, comply with local rules, and enforce government regulations.

Infrastructure, data and analytics

Behind the scenes, the Sky ecosystem's underlying computing power will be sourced from an amalgamation of multiple platforms and clouds, including traditional forms of cloud-enabled, server-based computing, and emerging computing approaches—such as edge, fog and quantum computing, and other technologies as they become commercialized.

In the Sky, edge computing will become a prevailing foundational technology that will include endpoint systems and devices facilitating advanced AI functions. In contrast to today's centralized cloud data centers, edge computing will decentralize data processing as computational elements migrate from cloud to edge and from edge to cloud. Future equivalents of technologies, such as Dockers and Kubernetes, will be extended to manage containers that pass across the edge/cloud membrane, dissolving existing IaaS/PaaS/SaaS cloud constructs.

Like its customers, the Sky platform itself will engage AI advisory systems to continuously evolve its own system design and operations with minimal human intervention. These predictive modeling systems can help define and optimize workflows for advanced transaction processing, while securing computing resources to run these activities. These intelligent advisors will also facilitate the operations of highly elastic self-healing infrastructures.

Data is an essential resource that must flow freely across the Sky ecosystem and be available to all participants who understand the value of sharing it. The Sky's data layer— some of which will reside on space satellites—will act as a data hub. This hub will facilitate the analysis of data for its own evolving infrastructure management needs as well as make data available for consumption by Sky participants, including BCOPs. Via standardized service connectors and software programming interfaces, the Sky's raw computing capability will drive specialized data processing and exchange capabilities, ranging from simple request-response, Sky content browsing, and IoT device communication, to complex enterprise analyses and transactions. Sky computing will also likely support agreements to buy and sell data, while its governance body, regulations and open standards will support essential privacy and security.

Sky computing's power will be in enabling businesses to transform into truly agile organisms

The business impact of Sky computing

Sky computing has the potential to fundamentally change how businesses operate. On an infrastructure level, enterprises will outsource their entire cloud environments to focus on operating dynamic business models that nimbly respond to changing market demands and competitor moves. In the Sky computing era, an organization's IT function will outsource its infrastructure development and maintenance "factory," becoming primarily a procurement and governance function.

It should be unnecessary for organizations tapping into the Sky to worry about acquiring and managing complex underlying computing infrastructures or obtaining enough bandwidth or processing power to fulfill their operational needs. Neither will they countenance proprietary, static, tightly-coupled workflow architectures where a change in infrastructure breaks the associated business process. Sky users should be able to simply order the business capabilities they need when they need them.

As a result, the differences between traditional and born-in-the-Sky businesses will blur. For most organizations, the Sky will provide necessary computing capabilities and transactions, with business convenience offering providers taking over the role that traditional IT functions play today. Due to global economies of scale, the cost of IT infrastructure per transaction or compute unit should become so low that most organizations will be able to justify divesting their IT "factory", leaving a thin management layer to coordinate business application decisions.

Thus, Sky's real power will be in enabling user organizations to transform into true agile organisms, nimbly responding to customer needs and competitive threats. Due to Sky computing's focus on business convenience, born-in-the-Sky competitors and transformed traditional players will emerge quickly in response to new market demands. To stay competitive in this intense, fast-paced environment, companies will need to continuously upgrade to the latest relevant BCOP

offerings as soon as they are available, with business models in which workflows are loosely coupled to technical architectures. Seamless configuring and connecting of BCOP offerings will inconspicuously support the uninterrupted deployment of new workflows.

In addition to providing effortless scalability in computing power, offerings, and applications, Sky computing, married with artificial intelligence, will be able to analyze vast quantities of data to help tackle more difficult commercial and societal challenges. These may include:

– Developing autonomous car navigation systems for urban centers that provide real-time connectivity and decision making to mitigate congested traffic conditions during peak times

– Optimizing the production and distribution of food crops globally using interconnected weather and farming data to derive more accurate forecasts of potential areas of oversupply and shortfall

– Identifying new drugs and therapeutic treatments targeted for specific individuals, optimizing efficacy while reducing deleterious side effects

– Tracking illegal wildlife poaching and trafficking against market demand to better identify and shut down unlawful trade

– Improving climate models for more accurate prediction and mitigation of natural disasters and the effects of climate change.

Questions to consider

– How far down the path is your organization in adopting open standards for your hybrid and multicloud environments?

– How well does your organization orchestrate multiple clouds, platforms, and ecosystems while facilitating secure data exchange and analysis whenever and wherever it is needed?

– How should your organization's operating model evolve to ensure key processes and workflows are loosely coupled with technical infrastructure?

Notes and sources

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