The hybrid client will be needed for the next stage of hybrid work, requiring enterprises to purchase pervasive acceleration (dedicated chips, 5G networking, etc.) across the entire stack and apply additional graphics acceleration to cloud-based client resources.

Accelerated Computing Will Empower Hybrid Clients and Work

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Questions posed by: NVIDIA

Answers by: Shannon Kalvar, Research Director, IT Service Management and Client Virtualization

Q. What is the future of hybrid work?

A. The first stage of hybrid work, in which the long-promised but never achieved goal of doing work from anywhere became not only possible but required, occurred as the world adapted to the COVID-19 pandemic. This stage caused a surge in videoconferencing and various collaboration tools as well technologies such as application and desktop virtualization, virtual private networking, and software-as-a-service production applications.

The transformation came at the same time as a revolution in personal productivity automation took hold. Over 80% of companies surveyed (IDC's *Future of Work Survey*, April 2021) indicated that they had deployed or would deploy automation tools directly to employees within the next 24 months. This deployment allows hybrid work not only to occur from anywhere but also to be faster, more productive, and even less bound by time and space. At the same time, the first stage is still limited to manipulating digital information, albeit in an increasingly visual format.

The increase in visual forms of data and document interaction, along with pervasive automation, suggests that the second stage of hybrid work will have technologies that are distinctly different from those of the first stage. The second stage of hybrid work will include visually *modeled digital twins* of factories, conferences, hospitals, machines, and process workspaces, which can be translated through robotics into physical action. The second stage will be accessed through both virtual and augmented reality technologies, primarily visual but also including haptic and auditory components, some of which will be adaptive to diverse needs. Intelligence, both human and artificial, will guide these actions while adapting the interface to anyone, anywhere to contribute to the corporate, common, or social good at any time.

Q. Is the cloud journey over?

A. At the same time as the first stage of hybrid work began to unfold, unprecedented demand forced a surge in public "cloud" offerings. Everything from software-as-a-service to computing resources was required to meet the moment. This trend accelerated the so-called "cloud journey," the transition from running all computing as if it were a long-term asset to paying for resources as they were needed and leveraging features only possible previously for data and computing at scale.

However, it turns out that the "cloud journey" never truly ends as organizations discover that the cloud isn't always the ideal platform for every application. It is instead a dynamic process, just like the building out of networks and the creation of datacenters. Like any process, the cloud journey continually improves and evolves as humans and machines improve their collaboration between and with each other, often in the form of new features, improved interfaces, and new ways of connecting. We see this evolution playing out as the primary driver for selecting which cloud to use — it is not cost but rather what features a cloud brings to specific applications/collaborations.

This continuous improvement combined with "automation that physically works" will drive workloads first and then data and user identity. Eventually, this improvement will impact the process of ideation across and between datacenters as well as clouds and down to the edge of computing with complex networks of devices including phones, tablets, laptops of various kinds, and desktops. This dynamic will also drive adoption of 5G wireless technologies as traditional wireless networking (both Wi-Fi and cellular) cannot keep up with the increasing demand.

IDC research already shows such a trend in motion, with *over 85% of companies* indicating that they will "repatriate" applications (IDC's *Cloud Pulse Survey*, July 2021). These applications either were originally in the cloud or were moved there during a migration but will be brought back into the datacenter for price, security, or performance reasons.

Q. How will end-user devices keep up with the dynamic locations and increasingly visual presentation of ideas, data, and identity?

A. Simply put, they will not.

The current era of the "end-user device" — where the resources used to run an application exist exclusively in one location, whether on the device or remotely in a datacenter, public cloud, or elsewhere — is over. Instead, we already see the emergence of the "hybrid client," a device that leverages computing and storage built into the network, datacenter, edge, and cloud to deliver a responsive user experience. As with any major design shift, this idea started out years ago, and the pressures put on technology by the pandemic forced it into the mainstream.

The increasingly visual nature of collaboration — whether from video streams, metaversal concepts, or data visualization — would crush traditional endpoints. Even with onboard graphics processing units (GPUs), endpoints would not be able to keep up with the exponentially increasing demands for data transfer and rendering. However, by integrating acceleration into the hybrid computing environment at all parts of the stream, the new hybrid client will be able to apply acceleration where it will have the most impact, without human intervention or configuration.

Q. What do hybrid work and the hybrid client mean for virtualized computing today?

A. IDC 2021 research on VDI identifies the trends around virtualization, one of the core technologies for hybrid work and hybrid clients:

» On average, enterprises want to have 50% of their virtualization in their datacenters and 50% in various clouds. Responses indicate that enterprises are designing for a multicloud world, where they will need to support increasingly intensive and visual workloads wherever they might land.

» Enterprises purchased graphics acceleration for both datacenter and public cloud virtualization, with a preference for graphics acceleration in the datacenter except for when they have end-user performance problems in their public cloud environments that do not have a clear root cause. As expected, the amount of graphics acceleration varies by user type, with more visual and data-intensive roles (e.g., engineering, entertainment, finance) receiving more acceleration than general business users across both environments.

This trend is just the beginning. To take advantage of the hybrid client that will be needed for the next stage of hybrid work, enterprises will have to both purchase pervasive acceleration (dedicated chips, 5G networking, etc.) across the entire stack and apply additional graphics acceleration to cloud-based client resources. As more and more people interact with digital twins of all sorts, and those twins are increasingly connected to the kinetic world through robotics, this need will increase until, finally, every hybrid client will be accelerated across its ecosystem of resources.

Establishing pervasive virtualization, sometimes called the "software-defined datacenter," is the first concrete step that enterprises can take to support hybrid clients. This pervasive virtualization should also be supported by graphics acceleration, both for its obvious benefits in delivering visual experiences and for its benefit in creating the artificial intelligence required for the next stage of hybrid computing.

About the Analyst

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Shannon Kalvar is Research Manager for IDC's IT Service Management and Client Virtualization Program, responsible for delivering research and advisory for IT executives, vendor management teams, and investment executives. Mr. Kalvar's research coverage includes IT service management, desktop as a service (DaaS), virtual client computing, cost transparency tools, software asset management, and the use of AI and NLP for service management.

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