Hype Cycle for Unified Communications and Collaboration, 2021

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Initiatives: Digital Workplace Applications

UCC investment strategies must shift to reflect the disruptive change in the way people communicate, collaborate and work. Application leaders can use this Hype Cycle to challenge the traditional UCC architecture and redefine the new one to incorporate new ways of working and tools required.

Additional Perspectives

- Summary Translation: Hype Cycle for Unified Communications and Collaboration, 2021
  (26 November 2021)

Strategic Planning Assumption

By 2024, 80% of organizations will prioritize collaboration and meeting platforms over telephony when defining unified communications portfolio strategy, up from 30% in 2019.

Analysis

What You Need to Know

Enterprise telephony, workstream collaboration and meeting are the three main traditional functional components of unified communications and collaboration (UCC) solutions. Defining the priority for each is pivotal to support the changing needs for employee communication and collaboration. The pandemic necessitated widespread adoption of a work-from-anywhere culture and has been influencing the growing usage of collaboration tools. Unlike traditional architectures, which used to prioritize telephony over collaboration, next-generation UCC architecture and investments are collaboration-driven (see Telephony Is Dying: Reprioritize Your Unified Communications Strategies).

Early 2020 saw a dramatic rise in UCC application usage as well as rapid innovation and accelerated growth in the UCC landscape. The innovation included expanded capabilities for workstream collaboration, advanced meetings/webinars/webcasting, communications platform as a service (cPaaS), artificial intelligence (AI), ambient virtual meetings, virtual personal assistants (VPAs), virtual events, and collaborative work management.

Evolving user requirements for communication and collaboration will continue to influence UC application procurement strategies. Enterprises struggling to react to changing UCC needs will pay more for overlapping services and miss out on the benefits associated with the new structure, which is collaboration-driven rather than telephony-centric.

The Hype Cycle

Organizations rely on UCC solutions to provide traditional communications services, as well as innovative and engaging collaboration capabilities (such as virtual assistants and virtual meetings, webinars, and event experiences).

A recent Gartner survey found: [1]

- 76% of workers use collaboration tools either on a daily or weekly basis, and 78% use real-time mobile messaging tools for quick and informal conversations related to work on a daily/weekly basis.
- The time workers spent in virtual meetings in 2021 outpaced in-person meeting time dramatically, though total meeting time has barely increased or remained the same.
- The top three devices most often used in video meetings are laptops, mobile phones and desktop PCs.

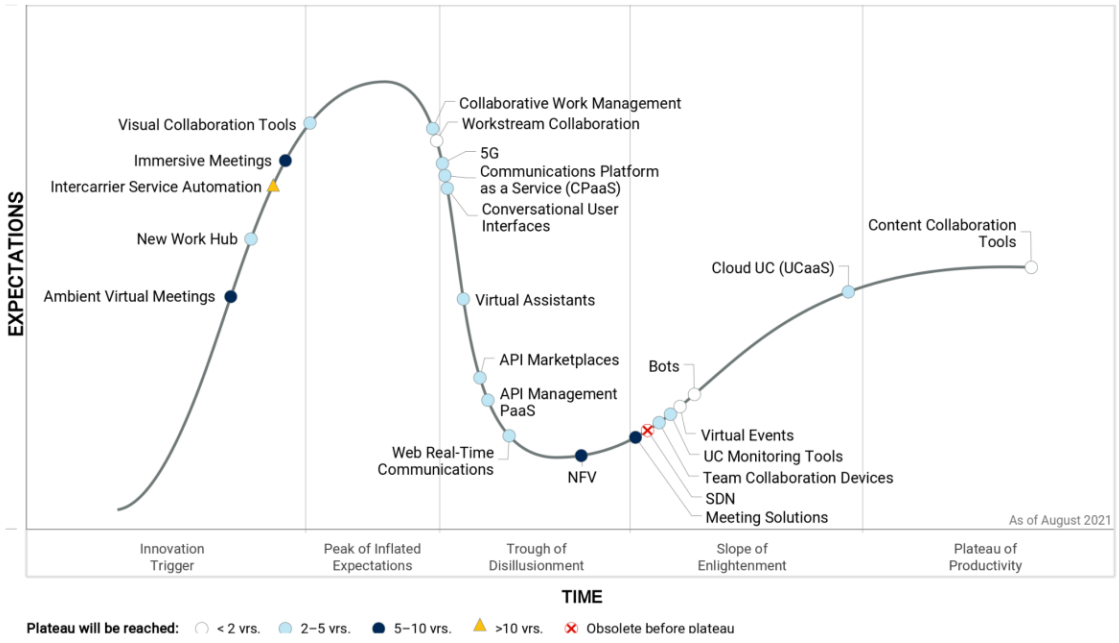
The survey results clearly identify the increased relevance of collaboration and meeting solutions in 2021 and will continue to influence the UCC strategy in the future. The growing importance of meeting solutions for internal and external collaboration comes at the direct expense of telephony services.

Technology and service providers continue to prioritize the enrichment of their cloud-based UCC offerings over on-premises-based platforms. Long term, unified communications investments are also well aligned with cloud-based solution delivery, especially multitenant/pure cloud services (see Forecast Analysis: Unified Communications, Worldwide). Unified communications as a service (UCaaS) solutions are integrating more deeply with new work hub offerings, such as Microsoft 365 and Google Workspace (see Magic Quadrant for Unified Communications as a Service, Worldwide). In fact, organizations already invested in new work hub tools are increasingly adopting them for the broader UCaaS functionalities to maximize ROI. The COVID-19 pandemic has also inspired organizations to invest in auxiliary solutions mostly for collaboration and conferencing as that's inevitable for business continuity.

cPaaS technology helps implement a cloud-based middleware for bridging the gap for elementary services in legacy platforms mainly, such as SMS, video, voice calling and speech recognition.

This Hype Cycle reflects many mature but critically important capabilities that provide foundational communications and collaboration services to cover hybrid working and related emerging technologies. UCC also includes a wide set of technologies that continue to evolve incrementally and provide a high level of benefit to the digital workplace that look to leverage existing investments.

Figure 1: Hype Cycle for Unified Communications and Collaboration, 2021



Source: Gartner

Downloadable graphic: Hype Cycle for Unified Communications and Collaboration, 2021

The Priority Matrix

Application leaders rely heavily on the mature technologies in this Hype Cycle for productivity improvement and smart investment strategies. After the onset of COVID-19, there were many technologies becoming mature and falling into this category compared to last year.

Technologies like virtual events and workstream collaboration have shown tremendous uptick in interest and actual usage. These technologies are now used by organizations as a better alternative to traditional ways people used to do events and to enable higher levels of collaboration. These technologies, due to reach maturity in less than two years, indicate that now is the right time to capitalize on them. WebRTC has also seen increased adoption, given its nimbler web-first approach and ability to support remote-working initiatives.

One of the important frameworks to examine due to the onset of COVID-19 is new work hub, which is a customer-assembled collection of personal and team productivity applications, along with services for development, automation and analytics.

Application leaders should also evaluate and plan to invest in technologies that will be mainstream in five years, like immersive meetings, which involve the use of extended reality technology (e.g., extended reality [XR], virtual reality [VR], augmented reality [AR] and mixed reality [MR]) to host meetings, gatherings and events.

Table 1: Priority Matrix for Unified Communications and Collaboration, 2020

(Enlarged table in Appendix)

Benefit	Years to Mainstream Adoption			
↓	Less Than 2 Years ↓	2 - 5 Years ↓	5 - 10 Years ↓	More Than 10 Years ↓
Transformational		Conversational User Interfaces New Work Hub Virtual Assistants Web Real-Time Communications		
High	Bots Content Collaboration Tools Virtual Events Workstream Collaboration	5G Cloud UC (UCaaS) Collaborative Work Management Communications Platform as a Service (CPaaS) UC Monitoring Tools	Immersive Meetings Meeting Solutions	
Moderate		API Management PaaS API Marketplaces Team Collaboration Devices Visual Collaboration Tools	NFV	Intercarrier Service Automation
Low			Ambient Virtual Meetings	

Source: Gartner

Off the Hype Cycle

The following technologies have been renamed:

- Cloud Office is now covered as New Work Hub.
- NFV and uCPE was renamed to NFV.

The following technologies have been removed from the Hype Cycle this year:

- Speech Analytics for Customer Service
- Freemium UCC
- Enterprise Video Content Management
- IoT Business Solutions
- Digital Security

On the Rise

Ambient Virtual Meetings

Analysis By: Christopher Trueman

Benefit Rating: Low

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

AVM applications are real-time collaboration tools that support interactions over a network between team members to more closely approximate a real-world office experience. AVM apps are often positioned as creating a “virtual office” environment in one of three ways: through always-on meeting rooms/channels; gamified, social spaces; or instant-connectivity to colleagues via video conference based on presence status. In this way, AVM apps make video an omnipresent part of the work environment.

Why This Is Important

Ambient virtual meetings (AVMs) emerged from the meeting solutions market in response to the unique needs of remote workers. AVM apps focus on ad hoc collaboration between workers and allow for persistent video channels or gamified meeting spaces. AVM apps promote more social and collaborative work styles; encouraging spontaneous meetings, the virtual equivalent of chatting to someone in the office. They should be treated as a complement to, not a replacement for, existing meeting solutions.

Business Impact

AVM apps add novel ways to engage remote/hybrid workers through video conferencing. They are useful for IT leaders and managers seeking to increase social collaboration.

This engagement style can:

- Build team cohesion
- Mitigate feelings of isolation
- Improve responsiveness
- Resurrect serendipitous meetings

- Create more productive work styles

Teams spread across different time-zones (i.e., more than four to five hours difference) will see a reduced impact due to AVM apps' reliance on real-time communication.

Drivers

- COVID-19 caused a significant shift to hybrid and remote working. Most organizations have come to recognize that video meeting tools are a fundamental requirement to maintaining productivity and team cohesion in a hybrid work environment.
- Meeting solutions and other collaboration tools allowed structured and planned collaboration activities to continue, but spontaneous interactions and unstructured team conversations proved difficult to replicate with these tools. This resulted in IT leaders and managers exploring alternative solutions, such as AVM apps.
- AVM applications provide novel capabilities which make spontaneous and unstructured conversations more tenable. They do this in one or more of the following ways: (1) By creating persistent, video-enabled, virtual rooms or channels. Entering one of these channels is analogous to opening your office door, inviting colleagues to stop in randomly throughout the day to converse; (2) By introducing spatial video capabilities, where users can only hear/see other users in close proximity to them within the app. In these setups, users are represented as an icon or avatar and can either click on colleagues to join them or can roam a 2D virtual world freely using the arrow keys (or other input); and (3) By providing richer presence statuses and increased transparency into meetings taking place within a team or cohort. Users see who colleagues meet with in real time and can pull "available" colleagues into meetings.
- Most of the major technological hurdles have been solved by the meeting solutions, web-conferencing and communications platform as a service (CPaaS) providers that preceded today's AVM vendors.
- AVM apps provide the greatest benefits to teams or groups whose activities require frequent contact or are conversationally driven.
- With hybrid working now becoming the norm, even teams with infrequent conversation needs may find AVM or other collaboration tools necessary to bridge the gap created by moving work out of the office.

Obstacles

- Since most IT organizations prefer to minimize the number of meeting platforms they support, the value that AVM apps can bring has had difficulty resonating with enterprise IT buyers as they cannot replace traditional video conferencing tools.
- The use of AVM tools is still very new. Cultural and work style changes will be required for successful adoption of AVM apps at most organizations. This means that strong messaging and example setting from leadership/team managers will likely be needed. Expect a heightened focus to be placed on video/meeting etiquettes.
- AVM apps are built around real-time video conferencing capabilities. As such, they are only useful to teams with similar, overlapping work hours. AVM apps do not work well for teams spread across time zones that are more than four or five hours apart.

User Recommendations

- Evaluate AVM apps as a means for increasing the engagement and visibility of remote or geographically separated workers by first testing them as social gathering spaces among a pilot group.
- Align your organization's use cases for AVM applications with the most appropriate vendor(s) by assessing each vendors' strengths and weaknesses. Some AVM vendors specialize in internal, team collaboration, others specialize in education, large events or social gatherings.
- Do not become overly dependent on any individual AVM vendor. AVM apps are an emerging market. IT leaders should be prepared to switch vendors as the market evolves. Gartner expects many vendors to enter or exit the market, or to be acquired over the next few years.

Sample Vendors

Bramble; Gather; Pragli; Remo; Remotion; Shindig; Sococo; SpatialChat; Tandem; Teemyco

Gartner Recommended Reading

Product Manager Insight: Talent and Resourcing Through 2025 — Superheroes or Superteams?

Magic Quadrant Meeting Solutions

Critical Capabilities for Meeting Solutions

Digital Workplace Applications KI Primer

Digital Workplace Strategy KI Primer

Cool Vendors in Social Software and Collaboration, 2017

New Work Hub

Analysis By: Gavin Tay

Benefit Rating: Transformational

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

New work hub is a customer-assembled collection of personal and team productivity applications, along with services for development, automation and analytics, created for a particular constituency.

Why This Is Important

Enterprise adoption of the new work hub surged on account of the COVID-19 pandemic, a general preference for cloud deployments and the desire to reduce costs, redeploy IT staff, drive simplicity and provide more functionality to users. Organizations desperately want to offer their workforce the most attractive new features, especially as hybrid work becomes a long-term arrangement, including mobile apps, content discovery tools and AI available through cloud deployments only.

Business Impact

New work hubs are the basis on which vendors innovate and build ecosystems through add-ons and integrations. They have become widely adopted and supported by a variety of collaboration styles including video, conversational and social as well as the more conventional email and IM. Organizations adept at using a new work hub prior to COVID-19 had a much easier time pivoting to mandatory remote work.

Drivers

- Driven by the COVID-19 pandemic, business innovation is accelerating continuously and driving new work hubs.
- Organizations need to transition into an era of AI, machine learning and conversational experiences, on account of maturing SaaS.
- The ambition and ability of the workforce to use technology for better business outcomes, what we call “digital dexterity,” is an essential talent ingredient for continued organizational prosperity.
- To succeed in the long term, organizations must take a proactive approach to ensure that employees have the digital skills to exploit continuous technology change.
- Most organizations are moving to a stack of SaaS-based personal and team productivity applications, such as Microsoft 365 or Google Workspace.
- Migrations to the cloud are treated as infrastructure and operations projects, where uptime, security, compliance, governance and full provisioning are the marks of success.

Obstacles

- Three-decade-old collections of locally deployed personal and team productivity applications — such as email — are being replaced by an ever-changing portfolio of cloud-based applications that have substantially new capabilities, which we call the “new work hub.” This shift is not only technically complex but also hard to keep up with.
- Given the significant shift from conventional technology and the continuous change new work hubs entail, leveraging them as an extension rather than merely a replacement can be overwhelming to end users.
- Driving individual and team accountability, transparency, efficiency and autonomy via new work hubs requires a conscious departure from on-premises predecessors, which is a complex process.

User Recommendations

- Focus beyond current-term technologies as chosen new work hub solutions may not meet all collaboration and communication requirements of users.
- Take note of the new work hub vendors' roadmaps and product announcements closely. The cloud model assumes almost continuous enhancement with new features and improvements. Assess these additions for their impact on your operations and how to take advantage of them.
- Plan specific efforts to address user adoption by focusing on user change management. It is usually not obvious how to use the new capabilities to increase effectiveness. Users will benefit from assistance and guidance, perhaps from more advanced colleagues, as a part of the digital dexterity initiative.
- Deem the new work hub to be a source of continuous innovation in a form that is relatively easy to adopt. Innovations like everyday AI, cross-tool integration and better meetings are likely to come from solutions that innovate in the cloud.

Sample Vendors

Adobe Workfront; Dropbox; Google; Microsoft; Salesforce (Slack); Zoho; Zoom

Gartner Recommended Reading

Digital Workplace Applications Primer for 2021

Market Guide for Cloud Office Migration Tools

Toolkit: Data Slicer to Derive a Cloud Office Migration Tools Shortlist

Quick Answer: What Is Microsoft Viva?

Expert Insight Video: Understanding Communications Culture and How It Shapes a Digital Workplace Applications Portfolio

Intercarrier Service Automation

Analysis By: Amresh Nandan

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Definition:

Intercarrier service automation refers to infrastructure and service orchestration capabilities that are automated for operations and life cycle management across multiple service providers. These capabilities allow CSPs to build and offer network services, such as bandwidth on demand, IoT connectivity and cloud connect services, across multiple partner networks.

Why This Is Important

Integration, orchestration and automation of intercarrier services have been evolving through multiple CSP' partnerships, as well as standardization efforts by telecom industry bodies such as TM Forum and MEF. With 5G and advanced enterprise services in view, many CSPs have initiated focus on intercarrier services. POCs and trials have been conducted by several leading CSPs. During 2020, some CSPs further focused on developing their strategy for intercarrier service integration and automation.

Business Impact

- Intercarrier service automation will allow CSPs to build and offer advanced services such as bandwidth on-demand, IoT connectivity and other network services across multiple partner networks.
- Several managed network and security services can also be offered using this capability.
- This will be a major boost for the CSP network service business.
- Ability to orchestrate and automate across carriers will enable better service management, geographical coverage and quality of service focus.

Drivers

- Intercarrier services automation will make life easy for enterprise customers availing such services because they won't have to deal with multiple service providers and can integrate various services on their own.
- Enterprises prefer to reduce the number of technology and services vendors and wish to get services from a single CSP. This enhances agility and flexibility, especially for international network/connectivity services when connectivity requirements span multiple local connectivity partners.
- This capability allows CSPs to build and offer advanced services, such as bandwidth on-demand, IoT and cloud services across multiple partner networks.

Obstacles

Adoption of intercarrier service automation is still slow because of several reasons such as:

- Many CSPs with dedicated network-level partnerships continue to use network-to-network interfaces (NNIs) for integration purposes with slow upgrades toward new service-level control and management capabilities.
- Several CSPs have been exploring the best set of APIs applicable for their requirements from the API sets available from TM Forum and MEF. However, most of them want to keep things simple by not adopting a mix of APIs from the two bodies.
- Platform capabilities for enterprise network services management are still evolving, and intercarrier service automation demands a certain level of maturity in enterprise services management and automation.

User Recommendations

Intercarrier service automation capability can be a boost for CSPs. As a first step,

- Focus on automating own service orchestration and network service operations. This automation drive needs to mature across multiple service providers in various geographical markets for intercarrier service automation to become mainstream.

- Pay specific attention to interoperating operating support systems (OSSs) and business support systems (BSSs) functionalities with partners. Use of standard and open API-based integration, end-to-end service orchestration and intent-based networks are steps in the right direction. CSPs should also explore blockchain technology for settlement across carriers.
- Start developing and trialing solutions based on initiatives led by TM Forum and MEF to further drive the capability toward becoming a reality, by focusing on a few key services with near-term business opportunities, like IoT and bandwidth on demand.

Gartner Recommended Reading

Market Guide for CSP Business Support System Solutions

Market Guide for CSP Operations Support System Solutions

Hyperautomation: How Can CSPs Prepare for and Implement It?

Immersive Meetings

Analysis By: Christopher Trueman

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Immersive meetings involve the use of extended reality technology (e.g., XR, VR, AR and MR) to host meetings, gatherings and events. Attendees — represented by avatars — are able to see, move and interact with shared virtual elements to simulate an in-person meeting or event experience.

Why This Is Important

Immersive meeting tools allow in-person meeting and event experiences to be more faithfully recreated in a virtual setting. Traditional video conferencing and meeting solutions do not provide the same level of immersion or participant engagement as they cannot convey the same sense of presence, nuanced body language or gestures. Hosting an immersive meeting results in a more natural and casual meeting experience and could ease meeting fatigue.

Business Impact

Immersive meetings can scale from very small meetings to more than 1,000-attendee virtual events. Meeting use cases where personal connections are highly valued will see the greatest benefits from these technologies.

There are several added values provided by these technologies over existing video conferencing and meeting solutions, such as:

- Greater attendee/employee engagement
- Reduced distractions/multitasking
- Natural gestures and body language
- Replacement of additional physical meetings (saving travel costs)

Drivers

- COVID-19 caused a significant shift to hybrid and remote working. Most organizations have come to recognize that collaboration and meeting tools are fundamental requirements to maintain productivity and team cohesion in a hybrid work environment.
- Employee preferences have shifted in favor of remote or hybrid working. Organizations are reevaluating their strategies and processes as a result of this shift, making them open to disruptive new technologies such as immersive meeting tools.
- Immersive meetings provide new capabilities that allow additional meeting use cases to be digitized. As such, they can further reduce the need to travel and add to the cost savings from traditional video conferencing. Companies seeking to actively reduce travel in order to meet corporate sustainability goals can tie immersive meeting technology to these key initiatives.
- Proven success stories from organizations pioneering VR collaboration and immersive meeting tools will drive more companies to pilot and adopt these solutions.
- Initial attempts to move in-person meetings and conferences to virtual events hosted on video conferencing platforms were met with, at best, moderate success in 2020. There is a growing interest in using VR and other technologies to build more engaging virtual events going forward.
- Using VR to simulate a virtual conference or event space allows experienced event-planning teams, advertisers and vendors to leverage more of their skill set in planning the event than video conferencing platforms would allow. Virtual event spaces can be planned and staffed similar to in-person events. Banner advertisements, vendor booths, stages, showrooms, information desks, gathering spaces, signage and other aspects of in-person events can be recreated in VR.
- Head-mounted display (HMD) technologies will see significant improvements and price reductions in the coming years, reducing the cost of entry.

Obstacles

- Immersive meetings do not replace traditional video conferencing.
- HMDs are expensive today, and a lack of standardization in display technologies, controllers and input devices means that selected devices can directly limit or enhance the user experience, and make setup difficult.
- The creation of custom environments or custom-made event experiences requires specialized skill sets that most IT departments lack today. Extensive professional service engagements or commissioned work can inflate costs if required for a particular event or activity.
- VR can cause users to experience motion sickness, eye strain, headaches and other physical symptoms. This can make long meetings or events challenging for new users who have not had sufficient experience with the technology to adapt to it. Improvements to hardware, devices and VR collaboration software to mitigate these adverse reactions are still in an early, experimental stage, with different platforms offering different, customizable options.

User Recommendations

- Start any virtual or augmented reality implementation by carefully considering the use cases for VR collaboration and immersive meetings within your organization.
- Create a successful initial pilot by targeting an area where there is a clear benefit for VR collaboration and immersive meetings over a traditional video conferencing approach.
- Link VR collaboration and immersive meetings to key business initiatives, such as the organization's digital transformation, by coordinating your actions with key stakeholders.
- Supplement any lack of skills or experience with immersive meetings within IT by leveraging professional services, training and other resources available from your XR software partners or third parties.

Sample Vendors

AltspaceVR; Arthur; ENGAGE; Glue; Kazendi; meetingRoom; MeetinVR; Spatial; The Wild

Gartner Recommended Reading

Virtual Reality and Augmented Reality for Remote Workers

At the Peak

Visual Collaboration Tools

Analysis By: Brent Stewart

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Visual collaboration tools offer a set of features designed to enable collaborative creativity in a real-time, cloud-based workspace. Visual collaboration tools go way beyond the virtual whiteboard with feature sets and templates that allow users to facilitate live sessions, run planning sessions, generate ideas, evaluate concepts, and co-design.

Why This Is Important

Prior to COVID-19, visual collaboration tools were already gaining traction. Since the remote work imperative, they have become a key toolset for creative teams, including UX. Top vendors in the market have successfully handled their new status and the associated business and functional demands, revealing a level of maturity that is remarkable. Gartner expects visual collaboration tools market to expand and solidify a foundational role in the continuing global shift to remote work.

Business Impact

Visual collaboration tools further legitimize and support the case for remote work. In fact, it is possible visual collaboration tools elevate creativity in general due to the frameworks they provide for ideation, evaluation and participation (by multiple team members and/or customers).

Drivers

- **Shift to remote work:** Global shift to remote work makes visual collaboration tools the “new whiteboard.”
- **Design thinking and collaborative creativity:** The rise of design thinking and collaborative creativity in the form of workshops, design sprints, strategy sessions and more requires a shared workspace that enables shared ideation, evaluation and decision making.

- **Tools and templates:** Visual collaboration tools include templates for brand, business, marketing and product strategy methods and techniques that accelerate discovery, exploration and validation

Obstacles

- **Return to the office:** As the pandemic subsides, Gartner expects several companies will return to the office and/or implement hybrid working models. When teams can gather around a physical whiteboard, visual collaboration tools become less critical.
- **Digital product design platforms:** Collaboration and co-design features in digital product design platforms, specifically in Figma, are close to — or on par with — purpose-built visual collaboration tools.
- **Integrations:** Visual collaboration tools need to enable deeper integration with design, product management and development tools to become a permanent part of the digital product design toolset.

User Recommendations

Software engineering leaders interested in collaborative creativity should:

- Engage in a platform evaluation and selection process.
- Employ a visual collaboration tool as the de facto meeting tool for research, strategy and creative teams (potentially replacing Zoom, Teams or Webex).
- Plan and execute workshops and design sprints on the selected platform.
- Plan and execute user research methods and techniques that require real-time one-on-one facilitation.

Sample Vendors

Bluescape; Figma; Miro; MURAL

Collaborative Work Management

Analysis By: Nikos Drakos

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Collaborative work management (CWM) tools provide task-driven workspaces that support business users in work planning and execution. They combine task, project, workflow and automation capabilities with conversations, content publishing, reporting, analytics and dashboards.

Why This Is Important

CWM blends work modeling and planning with management oversight and work execution. CWM fills a gap between free-form collaboration and business or custom applications by supporting emergent structure and coordination, such as in organizing a marketing campaign coordination or in planning an event. CWM technology supports work that can be planned top down, as far as it is possible to plan it, while enabling flexible, self-organizing execution and collaboration.

Business Impact

- Improve activity coordination in a flexible and agile manner
- Empower business users with sophisticated but easy-to-use tools for planning, execution, coordination, optimization and, increasingly, automation of day-to-day work
- Transparency for oversight, as well as the ability to define and fix guardrails that represent constraints on outcomes, timelines, budgets or resources
- Real-time visibility into execution with status roll-ups, dashboards and notifications depending on role or interest

Drivers

- Remote and hybrid work: Rise in interest in CWM, consistent with the recent increase in remote and hybrid work. In-person meetings and conversational channels that lack focus and context and are not enough to provide clarity and alignment — for example by modeling objectives and key results in a flexible and dynamic way. CWM tools are a natural complement to workstream collaboration and/or meeting solutions.

- Supply-side investments: There is notable investment activity and early signs of market consolidation on the supply side. In 2020 we had the Asana IPO as well as the acquisitions of Workfront and Wrike by Adobe and Citrix, respectively. But there is also no shortage of new vendors entering the market (we are aware of at least 80 vendors in the CWM market).

- Interest from vendors in adjacent markets: Vendors are entering this market from multiple adjacent markets (including project management, workstream collaboration, cloud office suites, employee communications, and business applications) contributing to the diversity and heterogeneity of the available products. They are recognizing an opportunity to position their products as solutions that appeal to a much broader user base.

- Demand generation tactics: Vendors are trying to attract business buyers with prebuilt work templates and/or generate demand directly by targeting end users with free/freemium products. One consequence of this use-case-specific vendor push is that many organizations end up purchasing more than one product, each narrowly deployed in a narrow business domain.

- Rising customer demand for a variety of work use cases: Buyers are recognizing the relevance of CWM to work scenarios that are collaborative by nature.But, they also require activity coordination in a context that may not justify purchasing or building specific solutions for everyday or ad hoc projects, case management, service management, product management, work scheduling, etc.

Obstacles

- Vendor and product risk: Most of the vendors in this market are small, in a market that is changing rapidly and where large platform vendors have yet to play their hand. This means buyers face a higher vendor and product risk than in more mature markets.
- No enterprise role for steering large scale deployments successfully: CWM solutions are introduced into many organizations by end users or via small departmental deployments. Most organizations using CWM solutions are introduced tactically without a coherent plan of what it would mean to operate them at scale.
- Lack of experience on governance at scale: When business users are effectively building applications for modeling work, it has implications for roles and responsibilities, quality control, release management and support.
- Culture attitudes and skills readiness: Not everyone will be comfortable or willing to work transparently or welcome more autonomy. Also, some may not have the digital skills to use the technology effectively.

User Recommendations

- Identify business context: Establish specific work management use cases and identify participants, activities and context by working together with relevant business stakeholders to ensure business alignment.
- Address governance issues: Address inevitable governance questions by determining access rights to work management capabilities to ensure consistency, quality and reuse.
- Start small and iterate: Test product and vendor readiness by starting with small, targeted deployments, making sure that use-case-specific issues and vendor readiness are addressed. Focus early deployments on situations where working transparently and collaboratively is already the norm to minimize the challenges from culture and behavior attitudes. As usage grows, rationalize technology choices, including interoperability with existing technology. Establish roles, support structures and governance principles to ensure consistency, quality, and best practice diffusion.

Sample Vendors

Adobe; Asana; Atlassian; Citrix; monday.com; Smartsheet

Gartner Recommended Reading

Market Guide for Collaborative Work Management

Toolkit: Collaborative Work Management Vendor and Product Data

Quick Answer: Which Technologies Can Support an Objectives and Key Results Program?

Market Guide for Marketing Work Management Platforms

Workstream Collaboration

Analysis By: Mike Gotta

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Workstream collaboration (WSC) tools create a persistent chat-based workspace divided into channels. Tools integrate direct and group messaging, along with meeting capabilities, file sharing, alerts, activity streams, tasks, bots, search and other plug-ins. They also come with APIs for customized applications.

Why This Is Important

WSC tools improve aspects of teamwork, especially intrateam messaging. They combine support for channel-based chat, information sharing, task coordination and meetings in order to act as team activity hubs. They help coordinate work, regardless of where team members are located — a key feature for hybrid working. Although still not popular among frontline workers, WSC tools will increasingly impact operational work and external collaboration.

Business Impact

WSC tools help team communication, information sharing, task coordination and management of the overall work process by acting as new work hubs. They also act as governance points for security and compliance, helping to safeguard organizational communications and content.

Business use cases include project management, service and support, sales, marketing and operational scenarios.

WSC tools also help maintain continuity as hybrid teams split their time between remote and on-premises working.

Drivers

- The shift to hybrid working models makes WSC tools essential to satisfy communication, information-sharing and task coordination needs, and creates synergies with collaborative work management tools. It also supports work governance, security and compliance, sometimes via third-party add-ons.
- COVID-19 has prompted a significant increase in the number of remote workers, who need a common work hub to support individual and team productivity in lieu of in-office interactions.
- Online meetings with audio and video support are a fundamental requirement for organizations, and this has resulted in tremendous reliance on WSC tools for everyday productivity.
- Many WSC tools natively support, or are easily integrated with, content services to provide workgroup management of files, which also aids remote working.
- Additional integration capabilities of WSC tools enable plug-ins for other needs, such as tasks, meetings and intranet services. They also enable developers to create more custom extensions.

Obstacles

- Although Microsoft and Google offer native WSC tools, not all business scenarios can be accommodated by everyday productivity suites. This can prompt organizations to adopt multiple WSC tools, which increases costs and complicates IT management.
- WSC vendors are not collaborating on message interoperability. Use of multiple tools to ensure workers can communicate creates “chat silos” and can lead to “tool sprawl.” Although third-party vendors use public APIs to exchange messages between tools, risks arise if these vendors lack contractual relationships with WSC tool vendors.
- Frontline workers have not adopted WSC tools to the same extent as office workers. WSC tool vendors need to better address the distinct needs of frontline workers and adjust their offerings.

User Recommendations

- Assume everyday productivity needs can be satisfied by the incumbent productivity suite vendor (Microsoft or Google) when evaluating WSC tools. Remain open to adding WSC tools for process-driven and operational-role-based work when assessing business use cases that are not productivity-centric. Consider frontline workers’ needs as being “stretch goals” for many WSC tool vendors.
- Prioritize a strong focus on employee communications, a champion program, analytics, training and promotion of best practices based on successful use of WSC tools by staff, in order to reinforce new ways of working.
- Onboard new team members using WSC solutions and establish the right usage behaviors early.
- Reduce “noise” and fatigue by educating staff about chat etiquette and communicating best practices for using WSC tool features by, for example, showing them how to fine-tune alerts and notifications.

Sample Vendors

Cisco; Coolfire; Google; Mattermost; Microsoft; Rocket.Chat; Salesforce (Slack)

Gartner Recommended Reading

Market Guide for Workstream Collaboration

Forecast Analysis: Workstream Collaboration, Worldwide

Forecast Analysis: Social and Collaboration Software in the Workplace, Worldwide

Sliding into the Trough

5G

Analysis By: Sylvain Fabre

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

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 is as low as 4 milliseconds in a mobile scenario and can be as low as 1 millisecond in ultra-reliable low-latency communication scenarios, and massive scalability. New system architecture includes core slicing as well as wireless edge.

Why This Is Important

5G is key for industry digital transformation, with 162 operators rollouts (Source: GSA, April 2021), 20% of mobile networks (up from 9% one year ago). 3GPP 5G standards releases deliver incremental functionality:

- R15: Extreme mobile broadband
- R16: Industrial IoT (massive IoT, slicing and security
- R17: MIMO enhancement of MIMO, Sidelink, DSS, IIoT/URLLC, bands up to 71GHz, nonterrestrial networks and RedCap
- R18: Under definition

Business Impact

- Material impact on multiple industries and use cases by enabling digital transformation.

- 5G enables three main technology deployment and business scenarios, which each support distinct new services, and possibly new business models (such as latency as a service), namely enhanced mobile broadband (eMBB) supports high-definition video, mMTC supports large sensor and IoT deployments, and URLLC covers high-availability and very low-latency use cases, such as remote vehicle/drone operations.

Drivers

- Increasing device penetration: Gartner estimates that 5G-capable handset penetration will reach 87% in 2023 in Western Europe, similar to North America.
- Operational cost savings for industry use cases.
- Agility — in particular, in oil and gas and manufacturing.
- Requirements from industrial users value 5G lower latency from ultra-reliable and low-latency communications (URLLC) and expect 5G to outperform rivals in this area.
- Demand for massive machine-type communications (mMTC), to support scenarios of very dense deployments up to 5G target of 1 million connected sensors per square kilometer.
- Increased availability of industry-specific spectrum options (e.g., CBRS).
- mMTC addresses the massive scale requirements of IoT.

Obstacles

- Availability of spectrum, in particular for industrial private networks, in some countries.
- Security concerns over certain vendors, and when using 5G in critical industrial scenarios.
- Readiness of R16 solutions; availability and pricing of networks and modules.
- Use of higher frequencies and massive capacity requires very dense deployments with higher frequency reuse.
- Uncertainty about use cases and business models that may drive 5G for many CSPs, enterprises, and technology and service providers (TSPs).

- Different dynamics by regions: where in many parts of Africa for example, 5G would not be the next step up from lower bandwidth services, and handset cost may be an inhibitor for lower-income subscribers. Adoption is more aggressive in APAC and NAR, with Europe cautiously enthusiastic — and the developing world lagging.
- Feedback from some industrial clients mentioned that the majority of their use cases could be serviced by a 4G private network, and/or NB-IoT and other LPWA such as LoRa.

User Recommendations

- Enable a diverse network that can offer adequate and cost-effective alternatives to 5G for many use cases (e.g., LPWA, NB-IoT, LoRa, Wi-SUN).
- Enable 5G for temporary enterprise connectivity, mobile and FWA secondary/tertiary use cases for branch location redundancy, as long as 5G is not the primary link for high-volume or mission-critical sites, unless there are no other options.
- Provide clear SLAs for network performance by testing installation quality for sufficient and consistent signal strength, signal-to-noise ratio, video experience, throughput and coverage for branch locations.
- Ensure backward compatibility to 4G devices and networks, so 5G devices can fallback to 4G infrastructure.
- Focus on architecture readiness — such as SDN, NFV, CSP edge computing and distributed cloud architectures, and end-to-end security — in preparation for 5G.
- Build their ecosystem of partners to target industry verticals more effectively with 5G.

Sample Vendors

Cisco; Ericsson; Huawei; Mavenir; Nokia; Qualcomm; Samsung; ZTE

Gartner Recommended Reading

U.S. Telco 5G Plans Take Shape

Emerging Technologies: 5G Technology Spending, 2020 Survey Trends

5G as a Service: Deployment Scenarios of Private Networks in the 5G Era

Market Guide for 5G Network Ecosystem Platform Providers

Creating Your Enterprise 4G and 5G Private Mobile Network Procurement Strategy and RFQ

Communications Platform as a Service (CPaaS)

Analysis By: Daniel O'Connell

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Communications platform as a service (CPaaS) is a cloud-based middleware on which organizations can develop, run and distribute communication software. The platform offers APIs that simplify the integration of communication modules — including SMS, voice, messaging apps, social and video — into applications, services and business processes, complemented with development tools and documentation. A CPaaS vendor may also offer off-the-shelf modules as programmable components and complete solutions.

Why This Is Important

CPaaS is important because it provides a simple way for organizations to integrate communications into workflows via developer-friendly software APIs. Even organizations with modest IT skills now have developers that can deploy SMS, voice and 2FA for basic workflows like notifications and appointment reminders. Digital natives and larger enterprises with robust developer teams can build more complex business workflows with features such as email, video, payments, webchat and WhatsApp.

Business Impact

CPaaS will have an increasingly stronger impact on the enterprise IT landscape through 2025. The impact may not appear to be as pronounced as it actually is because CPaaS is about a new, agile way of delivering software through a DIY developer-based ecosystem of APIs, SDKs and documentation. CPaaS will not focus on any particular part of the business, but instead it will be embedded across the organization, spanning multiple products and business units. Hence its “bite” will exceed its “bark.”

Drivers

- CPaaS is highly correlated with the emerging API economy. Organizations now hire developers to leverage today's API-enabled software. Software companies open up their software to expand their total addressable market. At the same time, CPaaS provides a developer-friendly ecosystem of APIs, SDKs, IDEs and documentation to an increasingly broader mix of communications modules.

- The value proposition of CPaaS centers on its simplicity, diversity and tech runway. Basic SMS CPaaS can now be consumed by digital laggards. And as their proficiency improves, they can explore a more diverse and powerful set of communications modules like email, video, WhatsApp, Apple Business Chat (ABC), Google Rich Business Messaging (RBM), and payments. The tech runway includes the ability to build custom-made workflows like an application for a sporting event, an educational tutoring package or an insurance approval tool. Gartner projects API-enabled 5G to be available in two to three years.

- COVID-19 kick-started organizations to become more digital and operationally efficient. Low-tech organizations have a developer workforce that can connect their CRM system with CPaaS SMS for simple payment reminders, order refills, emergency alerts and the like. Many CPaaS providers now offer "visual builders" to allow non-coders to graphically build CPaaS workflows. Alternatively, new CPaaS users can hire boutique consultants to train their team on the usage of CPaaS.

- COVID-19 also accelerated CPaaS video for such verticals as healthcare, education, telejustice and consumer dating. While parallel video offerings from Cisco, Microsoft and Zoom are good to start with, the market demands an even better user experience with the video integrated into an app. With CPaaS video, a physician will also gain access to a patient's prescriptions, insurance and treatment plans within a single app. In-app video also has greater reliability, improved performance and fewer technical hurdles to connect with the patient.

Obstacles

- The greatest obstacle to CPaaS is executives understanding the importance of API software. As CPaaS is a middleware solution, it is an abstract concept that takes time for nontechnical executives to comprehend. Its complexity is furthered because it can solve such a wide range of unrelated use cases — spanning simple patient reminders, to embedded video for telehealth, to complex IoT cardiac monitoring. So it is incumbent for IT leaders to educate their C-suite on the benefits that can be derived because the C-suite controls budgets.

- A second obstacle to CPaaS deployment is developer talent. The developer workforce tends to be younger so organizations that have not been in a hiring mode recently may lack the appropriate skill sets. Some companies in this situation will hire boutique consulting teams to co-build CPaaS solutions for six months — with the goal of the existing staff picking up the CPaaS skill sets in the process.

User Recommendations

- Start the CPaaS process at the basic level and expand from there. The first implementations should focus on SMS, A2P and 2FA. Once this is mastered, it is time to leverage other communications modules. The specific modules will depend on the organization's use case. But in 2021, Gartner is starting to see greater adoption of email, video, voice calls and WhatsApp. After this group, some customers are engaging with Apple Business Chat (ABC), Google RBM, billing and omnichannel.

- Explore the benefits of CPaaS across the entire business. Often CPaaS is implemented by a single business unit, and stays there. But in most cases if the customer service BU succeeds with CPaaS, other BUs such as HR, operations, supply chain and logistics can benefit from CPaaS.

Gartner Recommended Reading

Market Guide for Communications Platform as a Service

Quick Answer: What Are the Implications of Twilio's Investment in Syniverse?

Impact Appraisal: Cisco's Acquisition of IMImobile

CSPs Should Pivot Forward With CPaaS Video API for Increased Customer Engagement

Conversational User Interfaces

Analysis By: Magnus Revang, Van Baker

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Conversational user interface (CUI) is a high-level design model in which user and machine interactions primarily occur in the user's spoken or written natural language. The sophistication of a CUI can vary from understanding just simple verbal utterances to handling complex multiturn interactions.

Why This Is Important

CUIs promise a shift in responsibility between the user and the interface. In traditional UIs, the user operates the technology and is largely responsible for the effects of using it. In a CUI, this responsibility shifts. The CUI is responsible for determining the user's intention and executing it, meaning the CUI has taken over some of the responsibility from the user. This makes CUIs the first widespread adoption of agent user interfaces for software, devices and the IoT.

Business Impact

The conceptual shift away from the user as the operator, toward the user conversing with an agent that will execute on a determined intention, has a greater impact on the enterprise than most realize. Training, onboarding, escalations, productivity, empowerment and responsibility all change with this new model and need to be embraced as part of CUI projects. Treat CUIs as transformative, and plan on CUIs becoming the dominant interaction model in the future.

Drivers

- The underlying technology supporting CUIs, either front ends delivered as part of software or custom-developed CUIs (like chatbots and virtual agents) built on top of conversational platforms, still needs to evolve until it reaches its potential. Vendor and technology choice are tactical for the foreseeable future. Voice will also arrive as a strong modality.
- Users increasingly expect to be able to hold conversations and ask natural language questions of applications they use.

Obstacles

- Developing a good CUI requires much more effort than similar instructional GUIs. More intelligence has to be built into the conversation to deal with different kinds of users, different modalities and different edge cases.
- A conversational UI will make predictions about the user's intent. These predictions will sometimes be wrong, so the designer of a CUI has to have deeper knowledge about potential consequences, and design defensively with nonreversible actions and keeping ambiguity in mind.
- CUIs will need to employ anthropomorphism for the foreseeable future, lending elements of human communication to make it easier for users. A lack of personality, fragmented tone of voice, poorly written dialogue and flows that do not align with the user's behavior are affecting user sentiment toward CUIs, labelling them simple and, in many cases, useless.

User Recommendations

- Prepare for CUIs to communicate with each other. Larger architectures connecting different use cases for CUIs, like virtual agents for customer service, HR, IT to front ends for enterprise software, business intelligence tools, etc., will be a central challenge for organizations in the next three to five years. This will lead to a variety of architectural models entering the market, such as CUI-to-CUI communication and specialist tooling.
- Prepare for new roles in the enterprise. Dialogue designer, AI trainer, digital coach, humanizer and AI interaction designer are all titles Gartner is seeing in the market to support the creation of conversational experiences.

Virtual Assistants

Analysis By: Van Baker

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Virtual assistants (VAs) help users with tasks previously handled by humans. VAs use semantic and deep learning models, natural language processing, prediction models, recommendations and personalization to interact with people via voice or text conversations. Increasingly, they also automate processes and workflows. VAs learn from user behaviors, build data models, and recommend and complete actions to support VA users. VAs can be deployed in simple as well as complex use cases.

Why This Is Important

Conversational interactions are inherently appealing to both customers and members of the workforce. The ability to converse with applications to retrieve information or accomplish transactions is a natural extension of human-to-human interactions to human-to-machine interactions. A well implemented virtual assistant is always available, cannot be distracted, and can be very efficient in assisting humans in accomplishing tasks and retrieving necessary information.

Business Impact

VAs, RPA, event brokers and other technologies are automating the enterprise. VAs use contextual multiturn conversations to drive business workflows. Integration with enterprise applications enhances the handling of complex tasks by VAs. Consumer VAs led to enterprise VAs embedded in SaaS platforms. Business channels such as websites, mobile apps and messaging are commonplace. Voice-based VAs are becoming the focus of conversational AI providers. Additionally, use of VAs can expand hours of operation and improve customer response time.

Drivers

- Customer expectation for access to customer service anytime, anywhere. This is especially true for online e-commerce businesses that have seen extreme growth in response to the pandemic.
- Consumer expectation for access to product information anytime, anywhere. E-commerce is a 24/7 business and consumers expect to get their answers whenever they engage.
- Employee access to information on a real-time basis via conversational queries, resulting in enhanced productivity because of increased use of business-critical information.
- Increasing demand for technology that is easy to understand and interact with. While this is true for all workers, it is especially needed by remote workers in the enterprise.
- A strong desire by businesses to automate business workflows and processes wherever automation can deliver value to the business.
- The ability to initiate communication with your workforce in response to event triggered conditions or transactions. This facilitates more timely response to changing business conditions by removing the need for workers to initiate transactions.
- The ability of conversational AI platforms to deliver more complex transaction capabilities spanning multiple users and business processes.
- Improved access to the business across multiple channels addressing the preferences of particular customer segments, allowing them to select their channel and modality of choice.
- Improving capability for conversational AI platforms to use natural language generation. This allows the virtual assistants to initiate interaction with customers and employees rather than just reacting to user requests.
- VA tools are becoming available that enable the automatic ingestion of unstructured and structured data to enhance and improve the language models.
- Enabling technologies are making creation of VAs easier such as low-code tools, automated identification of intents and entities, and the use of APIs for complex integrations.

Obstacles

- Poor or inadequate language models for the use case that is deployed. The virtual assistants need to be able to respond to an extraordinary variety of users' questions. They should also be able to handle off-topic questions to some degree.
- Inadequate conversational AI platforms that do not have the capabilities needed to deliver virtual assistants. Many platforms lack the ability to handle complex transactions, context switching, multi-intent utterances, strong integration, process automation and other functionality needed for virtual assistance level capabilities.
- A design approach that oversimplifies use cases for virtual assistants. Many dialogue designs assume consistency in the way that people ask questions or do transactions that do not exist. This often leads to successful pilot development efforts that fail upon deployment.
- The need for ongoing continual retraining of the language models is often overlooked or ignored leading to poor performance over time.

User Recommendations

- Assess the continual rapid evolution of the technologies that support the creation and deployment of virtual assistants. These technologies are evolving at a very rapid pace that is not expected to slow in the near term.
- Deliver significant levels of integration and business process automation in conjunction with virtual assistant conversational capability as the platforms in the market are becoming increasingly sophisticated. Many conversation AI platforms include workflow automation capabilities as part of their offering.
- Evaluate that VAs will have voice and text capabilities with voice becoming the dominant modality.
- Define a chatbot strategy at the enterprise level and decouple the technical decisions from it.
- Pick your core services by favoring modular technical solutions that allow the same.

Gartner Recommended Reading

When Should I Use Embedded Conversational Assistants?

Making Sense of the Chatbot and Conversational AI Platform Market

Craft a Chatbot Initiative Based on Your Business Requirements and Solution Complexity

Roles and Responsibilities for Scaling Chatbot Initiatives

Solution Criteria for Enterprise Conversational AI Platforms

API Marketplaces

Analysis By: Mark O'Neill

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Definition:

An API marketplace is a platform for API providers to publish and market APIs. They range from API directories to API portals provided by a single API provider to commercial marketplaces. Consumers, mainly developers, use API marketplaces to discover APIs and (in some cases) purchase access to APIs. Although public API marketplaces are better-known, a growing number of organizations are deploying internal or private API marketplaces.

Why This Is Important

API marketplaces empower organizations to share APIs. External API marketplaces allow organizations to share APIs with a community of developers, including facilitating an ecosystem by enabling partners to implement solutions using their APIs. Internal API marketplaces address a different use case, which is to help developers discover and share APIs between teams.

Business Impact

For API providers, registering APIs in API marketplaces can increase developer visibility and consumer mind share, to drive API usage and, by extension, business impact. The API marketplace provider may take a share of the revenue for APIs sourced through the marketplace, but this can be considered a cost of sale. An API marketplace can also facilitate ecosystem creation and is a critical enabler of composable business.

Drivers

- Use of APIs is growing; according to the infrastructure and security vendor CloudFlare, in 2020, API traffic grew 300% faster than web traffic, reaching 50% of HTTP traffic. This demonstrates the need for API marketplaces to discover APIs from the large amount of APIs available.
- The number of APIs within an organization is also climbing, driving the need for developers to find which APIs and services are available.
- Composable business, including composable commerce, relies on the use of API marketplaces to share APIs and packaged business capabilities.
- Increased use of low-code platforms, iPaaS, RPA and analytics tooling enables more citizen development, using APIs which may be sourced from API marketplaces.
- New open-source platforms such as Backstage, from Spotify, are driving the creation of internal API marketplaces as part of larger developer hubs.

Obstacles

- Public API marketplaces which provide a public directory of APIs have generally had disappointing results, because developers are more likely to go to API providers directly to sign up for APIs. This has resulted in API marketplaces approaching the Trough of Disillusionment. However, internal API marketplaces have had more success, since they enable developers to share APIs across multiple teams.
- API portals provided as part of API management platforms are typically basic in nature, resulting in significant customization work to create an API marketplaces based on such an API portal.

User Recommendations

API providers:

- Manage senior business stakeholders' expectations by ensuring they are aware that outcomes from placing APIs in public API marketplaces are often disappointing.
- Examine billing terms to understand what goes to the marketplace provider when considering commercial API marketplaces. Since your APIs may be side-by-side with competing APIs, think carefully about differentiation.

- Establish a commercial model upfront (e.g., through registration fees and/or revenue share) and a clear governance process for onboarding third-party APIs if you plan to build your own API marketplace.

API consumers:

- Ensure that you use APIs from trusted marketplaces and trusted API providers, examining usage agreements, licensing and billing terms carefully. In general, ensure that you are governing your organization's usage of third-party APIs.
- Investigate if subscribing to an API directly from the API provider offers better pricing or usage terms than consuming the API through a marketplace.

Sample Vendors

Achieve Internet; Backstage; Constellant; Cortex; Effx; ProgrammableWeb (Salesforce); Pronovix; RapidAPI; Roadie

Gartner Recommended Reading

How to Derive Value From APIs Using API Marketplaces

Create API Portals That Drive API Adoption Among Internal and External Developer Communities

Choose the Right API Monetization and Pricing Model

To Create a Successful API-Based Ecosystem, Look Before You Leap

API Management PaaS

Analysis By: Mark O'Neill

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

API management PaaS (APIM PaaS) takes an on-demand approach to the delivery of API management. It provides an alternative to the purchase and installation of stand-alone, full life cycle API management software. APIM PaaS manages API access via provider-hosted API gateway services, with the option of on-premises API gateways, as well as providing an API developer portal. It is typically designed to be used with other PaaS services such as function PaaS (fPaaS) and integration PaaS (iPaaS).

Why This Is Important

APIs are increasingly built on cloud platforms and using platform as a service (PaaS), so it is natural for API management to also be delivered as-a-service. APIM PaaS takes full advantage of cloud benefits, such as autoscaling, resiliency and robust security. It also allows some vendors to offer per-API-call pricing. APIM PaaS may include the ability to deploy on-premises API gateways, to enable hybrid API management architecture with APIs on-premises and cloud-based API management.

Business Impact

APIM PaaS allows costs to scale with the business value of APIs, reducing the impact of a large outlay as an API program scales up. It enables APIs to be managed effectively when API traffic is unpredictable and potentially very large. APIM PaaS also brings business benefits when an APIM PaaS offering is provided as part of the PaaS platforms already in use by an organization, through unified procurement and billing.

Drivers

- APIM PaaS is driven by migration to and adoption of cloud platforms.
- Function PaaS (fPaaS) can act as a major driver for APIM PaaS. This is because fPaaS offerings can make use of API management on their associated cloud platforms. In some cases, they can automatically populate API gateways with endpoints so that fPaaS functions can be called via REST APIs.
- iPaaS and aPaaS are also drivers toward the need for API management provided by PaaS platforms.
- Since many organizations are building APIs in the cloud, APIM PaaS is also increasingly used in hybrid scenarios and multicloud scenarios.
- Automation is also a driver for APIM PaaS. This is because APIM PaaS also includes APIs into the API management platform itself. These are used to automate the creation and management of APIs, often as part of a DevOps pipeline, as well as for customizing the developer experience (DX) provided by an API developer portal.

Obstacles

- Perceptions of network latency can impact on the uptake of APIM PaaS for managing on-premises APIs.
- Data residency concerns, such storage of API payloads that may contain private information, are also an obstacle to the uptake of APIM PaaS for managing on-premises APIs.
- APIM PaaS can result in higher-than-expected pricing as API traffic grows.
- Architecting a hybrid or multicloud API PaaS architecture is nontrivial (see Comparing Architectures for Hybrid and Multicloud API Management).
- APIM PaaS solutions from cloud hyperscalers are generally tied to their larger PaaS platforms, and are not portable for use on other PaaS platforms.

User Recommendations

- Apply API mediation and prioritize the use of APIM PaaS to provide a cost-effective means of providing API management, even when your APIs are on-premises.
- Compare the pricing of APIM PaaS vendors, since not all provide consumption-based pricing (see How Are API Management Platforms Priced?).
- Include API PaaS as part of your API strategy, since it can accelerate time to market for mission-critical digital initiatives.

Sample Vendors

Alibaba Cloud; Amazon Web Services; Google (Apigee); IBM; Microsoft Azure; Oracle; VMware

Gartner Recommended Reading

Magic Quadrant for Full Life Cycle API Management

Critical Capabilities for Full Life Cycle API Management

Ensure Your API Management Solution Supports Modern API Trends Such as Microservices and Multicloud

Toolkit: RFP Template for API Management Platforms

Comparing Architectures for Hybrid and Multicloud API Management

Web Real-Time Communications

Analysis By: Rafael Benitez

Benefit Rating: Transformational

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Web Real-Time Communications (WebRTC) is an open-source project that delivers runtime voice, video and data communications directly to a browser and to mobile applications using JavaScript APIs, and without the requirement for additional software or applications. The WebRTC project was initially launched in 2011, following Google's open sourcing of the code they got from the acquisition of San Francisco-based Global IP Solutions in 2010.

Why This Is Important

WebRTC seeks to enable real-time communications, such as voice and video, to be delivered via web browsers, mobile applications and IoT devices without additional software being necessary (e.g., browser plug-ins or extensions). WebRTC standardization groups in the Internet Engineering Task Force (IETF) and the World Wide Web Consortium (W3C) have defined a set of protocols and JavaScript APIs for these services which can be used to develop web applications that use voice and video.

Business Impact

The benefit to organizations of WebRTC is that voice and video interactions can occur within an application's context and its web client. By contrast, with other solutions users have to use desktop apps or a personal device like a desk phone or a mobile phone's native calling capability. With embedded voice, video and data channels, a web app, running natively in a browser, can add contextual information on the same browser, delivering a richer web application experience.

Drivers

- **Ubiquity:** The ability to make voice and video more widely and easily available on any computing device and operating system that supports web browsers.
- **Administrative Simplicity**: The ability to make applications that use voice, video and data services available to users without the requirement of installing any software.
- **Embeddability**: Web applications that can benefit from the addition of real-time voice, video or data can more easily embed them with WebRTC.
- **Quality of Experience**: The WebRTC standard has mandatory minimum requirements for voice and video codecs to ensure that quality of experience is high.

WebRTC will allow click-to-call applications to shift away from proprietary software clients, allowing customers that start on a company's website to stay on the website for voice and video sales, support, or collaborative interactions. Within contact center operations or communications-enabled business applications, WebRTC can provide voice, video and messaging (chat) objects in webpages where workflows, e-commerce and business process applications could be enriched or optimized. WebRTC will potentially transform the communications industry, since no desktop app or plug-in software is installed to access communications. The codecs that WebRTC currently designates as "mandatory-to-implement" are G.711 and Opus for audio, and H.264 and VP8 for video. Optional codecs currently supported include G.722, iSAC and iLBC for audio, and VP9 (with SVC) H.265/HEVC and AV1 for video. The wideband and adaptive codecs that have been implemented by leading vendors are designed to provide a high-quality user experience even over best-effort networks (e.g., residential broadband internet service), where end-to-end quality of service (QoS) cannot be guaranteed.

Obstacles

- The main obstacle to more widespread adoption of WebRTC has been the inability to achieve 100% feature parity with desktop apps designed specifically for a given operating system. Native Windows desktop apps, for example, still enjoy superior user experience in areas like application navigation (typically driven by an input device like a keyboard or mouse), and screen sharing.
- Desktop apps also can deliver a better notification user experience as they have access to the built-in notification frameworks of the host operating system (e.g., delivering notifications when a PC is locked), as well as a better experience selecting audio and video sources (mic and camera).

User Recommendations

- Seek contact center technology that leverages WebRTC. Contact center offerings that adopt the ability to engage customers with voice, video and chat through the browser will have a competitive advantage over those that require the customer to make phone calls. The latter lacks insight into the customer's valuable browsing history.
- Evaluate the use of WebRTC-enabled meeting solutions if your organization regularly uses meetings with external parties, as they allow guests to join meetings without having to install desktop clients or browser plug-ins on their PCs.
- Evaluate and compare the desktop client and the web client versions of applications delivering voice and video focusing most on user experience. Web UC apps are currently not as feature-rich as desktop apps, therefore ensure the features your users require are available on WebRTC clients before committing to them. The convenience of WebRTC clients improves the ease of deployment for IT and accelerates deployment to users.

Sample Vendors

Cisco Consumer Business Group; Google; Microsoft; NICE inContact; Oracle; RingCentral

Gartner Recommended Reading

Magic Quadrant for Unified Communications as a Service, Worldwide

Magic Quadrant for Contact Center as a Service

Magic Quadrant for Meeting Solutions

Market Guide for Communications Platform as a Service

NFV

Analysis By: Bjarne Munch, Mike Toussaint

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Network function virtualization (NFV) virtualizes network functions (such as firewalls, WAN optimization, SD-WAN and routing) that can be deployed as software on open server platforms or universal customer premises equipment (uCPE) platforms, as opposed to dedicated physical appliances. Virtual network functionality can be deployed both on-site and off-site, in branch offices, internal data centers, providers' point of presence, cloud services, or hosting facilities.

Why This Is Important

NFV and related uCPE are important because these technologies offer enterprises an opportunity to improve their WAN architectures by making their WAN more agile, flexible and scalable.

Business Impact

There are three main value propositions of NFV:

- Off-site-deployed NFV can improve enterprise network agility because it enables enterprises to rapidly deploy new functionality where needed.
- Off-site-deployed NFV can facilitate simplification of branch office designs.
- For branch office uCPE-based NFV, business impacts are mainly due to the ability to consolidate functionality on fewer appliances, and to enhance deployment flexibility and ability to move functions to different platforms if needed.

Drivers

- NFV has grown out of the requirement to support and consolidate multiple network functions at the WAN edge. However, the ability to move functions out of branch office and centralized data centers to off-site provider nodes is now a key driver as it enables simpler branch office design as well as more scalable solutions.

Obstacles

- Lack of best practices and standardized dimensioning of the uCPE platform to suit multiple NFV, leading to performance issues due to lack of procession power or memory
- Insufficient guidelines from the vendors that specify what type of virtual network functions (VNFs) can work together on specific platforms
- Limitations of standard orchestration systems, leading to cumbersome processes when deploying VNFs on remote uCPE platforms

User Recommendations

- Prefer off-site NFV services, as opposed to on-site, for optimum scalability and cost-efficiency, and establish strategies to evolve these services to SASE.
- For on-site deployments, do not deploy uCPE in-house without following VNF vendors' precertified configurations, unless there are sufficient IT resources to perform detailed technical evaluations and full load testing. Ensure that any proof of concept or pilot is performed with all functionality required on the uCPE to ensure these functions operate acceptably together on the chosen hardware, at the required traffic load.
- For off-site NFV, ensure that virtual functionality is located close to the enterprise locations (ideally not more than a 10 ms to 20 ms round-trip delay). Also ensure that providers offer sufficient resilience in their NFV node design, such as redundant nodes.

Sample Vendors

AT&T; BT; Cisco; NTT; OBS; VMware

Gartner Recommended Reading

Pump the Brakes on Network Function Virtualization Services

NFV/uCPE Is a Deployment Option — Shift Focus and Resources to SASE and Edge Computing

Opportunities

Magic Quadrant for Network Services, Global

Critical Capabilities for Network Services, Global

5 Options to Secure SD-WAN-Based Internet Access

Climbing the Slope

Meeting Solutions

Analysis By: Tapan Upmanyu

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Definition:

Meeting solutions are real-time collaboration tools that support participants engaged in teamwork, presentations, training and webinars. Enterprise offerings perform equally well for desk-based workers (in an office or at home), mobile workers and workers in meeting spaces, thanks to integrated voice, video, messaging and content-sharing capabilities.

Why This Is Important

The meeting solution market emerged from two formerly distinct markets — web conferencing and group video systems — as a response to buyers' preferences for converged solutions. Meeting solutions have core features for video, audio, content sharing to support hybrid working environments for real-time collaboration between local and remote participants. Meeting solutions also offer audio-video enabled meeting room systems for office spaces like boardrooms and training rooms.

Business Impact

Meeting solutions offer a richer and more flexible experience than audio conference bridges and video rooms. A properly specified meeting solution for workers' activities and needs can:

- Enable faster decision making for internal collaboration and speed up business processes such as sales, interviews, training, etc.
- Reduce travel costs and in-person visits.
- Enrich customer experiences.

Drivers

- Remote and hybrid workplaces postpandemic have increased the need for advanced conferencing and collaboration tools.
- Hybrid work environments require real-time collaboration for internal and remote workforce to increase the engagement, inclusion and visibility for remote workers. Meeting solutions come with messaging-based real-time collaboration, content sharing and virtual whiteboards, either as embedded capabilities or options to integrate with third-party applications.
- Meeting participants prefer the bring-your-own-device (BYOD) method to access meeting solutions. Majority of vendors offer the options to participate in the meetings from personal computers (downloadable applications or browser-based clients), mobile phone-based applications and the meeting room kits.
- Users expect an enhancement in premeeting and postmeeting experience than the legacy conferencing tools. Modern meeting solutions are including the innovations through AI to add a degree of automation to levitate the premeeting, during the meeting, and postmeeting experience for the users.

Obstacles

- Digital workplace leaders responsible for managing the meeting portfolio often struggle to select the best solution for the organization, as the communication requirements of different users, departments and teams vary with their operations.
- Some users see meeting solutions as a replacement of audioconference and conference bridge alone. However, they also have additional valuable functions for workstream collaboration, online training, webinars, among others. The users may miss out on leveraging the benefits of these collaboration features.
- The pandemic has increased hybrid workplaces where a proportion of the employee base will work from remote locations. These hybrid workplaces demand similar experience for the meetings, no matter if the participants are joining from office or remote locations.

User Recommendations

- Evaluate the meeting use-case scenarios for the organization and select the most suitable vendor from available options. Selecting more than one vendor may be necessary, as one solution may not support all the scenarios.

- Improve meeting experiences by first looking at innovations in the meeting products they have already deployed. Experiment with workstream collaboration technology, meeting-related virtual personal assistants, natural language processing, meeting transcription, digital whiteboards.
- Select technologies that offer consistent experiences on mobile devices and desktops for both browser-based application and downloadable client application, and in meeting spaces.

Sample Vendors

BlueJeans by Verizon; Cisco; Google; LogMeIn; Microsoft; Zoom

Gartner Recommended Reading

Magic Quadrant for Meeting Solutions

Critical Capabilities for Meeting Solutions

How to Pick the Right Virtual Meeting Portfolio and Save Money

Improve Remote Work Effectiveness by Rising to These Top 10 Meeting Challenges

SDN

Analysis By: Andrew Lerner, Joe Skorupa, Mark Fabbi

Benefit Rating: Low

Market Penetration: Less than 1% of target audience

Maturity: Obsolete

Definition:

Software-defined networking (SDN) is an architectural approach to designing, building and operating networks that promised increased agility and extensibility by decoupling the network topology from the control plane.

Why This Is Important

SDN products never made it to mainstream enterprise adoption. Rather, SDN spawned innovations in automation, orchestration and programmability. This paved the way for things like SD-WAN, microsegmentation, brite-box switching and SD-branch.

Business Impact

There is very little direct commercial impact of full SDN solutions. However, products that are marketed as “SDN” (but don’t meet the architectural definition) can increase network agility, simplify management, improve security and lead to reductions in operational and capital expenses, while fostering cross-functional collaboration.

Drivers

- SDN was driven initially by academia, combined with large network operators that were looking to drive innovation into traditional proprietary networking solutions.
- Early SDN drivers were aligned with separating hardware from software, to foster innovation in both hardware and software, while increasing agility with the potential to lower costs.
- While technologically obsolete, SDN terminology is widely used by vendor marketing efforts. This remains the top driver behind SDN discussions today.

Obstacles

- There are effectively no SDN technologies available in the mainstream marketplace today. Thus, true SDN technologies have not achieved any significant enterprise market traction.
- Vendors widely market non-SDN technologies as SDN, leading to customer confusion and misinformation.
- The hope that SDN would allow the decoupling of the control plane from network hardware and foster independent software innovation never came to fruition.

User Recommendations

- Don’t get caught up in the hype and vendor claims that commercial products are SDN or engage in any discussions/planning to deploy it. SDN is not the answer to any enterprise networking challenge today.
- Focus on reducing or eliminating the “human middleware” (i.e., manual operations) problem that has plagued traditional network solutions for the past two decades. This can be achieved by executing network automation initiatives to reduce human errors, increase quality, improve agility and cut costs.

Sample Vendors

NEC

Gartner Recommended Reading

State of SDN: If You Think SDN Is the Answer, You’re Asking the Wrong Question

Team Collaboration Devices

Analysis By: Stephen Kleynhans

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Team collaboration devices often combine a computer and videoconferencing and/or audioconferencing hardware with a digital whiteboard and custom software to create a turnkey solution for meetings. As self-contained devices, they are relatively expensive; however, they can provide customized interfaces and simple operation, and are typically shared conference room devices, without specific assigned users.

Why This Is Important

Plans for future office use include a focus on increasing and improving meeting spaces. Team collaboration systems act as intelligent whiteboards and can improve meeting experiences. They include software to manage meetings (e.g., start, stop, share), enable projection from both the device itself or from participant devices, and include all of the functionality of interactive whiteboards. Features include the ability to walk up and use the device with limited or no sign-in process.

Business Impact

As the nature of work becomes increasingly collaborative, organizations will invest more to equip shared workspaces to encourage physical and virtual collaboration. The rise in remote workers increases the need for better tools that extend the meeting experience to all participants.

Drivers

With all meetings now including some remote participants, the need for a digital whiteboard solution has increased. Team collaborative systems are positioned at the premium end of the market and provide:

- Easy walk-up usage with minimal effort on the part of users, including inviting the device to join a meeting
- High-precision pen inputs with low latency, to make drawing feel natural
- An embedded whiteboard canvas with easy capture to an enterprise repository (e.g., Microsoft OneDrive for Business and Google Docs), and usually the ability to support third-party collaboration canvas applications
- Content sharing with local and remote participants (Microsoft Teams and Cisco Webex)
- Security that removes meeting content from the device after it ends
- Integration with enterprise collaboration tools

Team collaborative systems combine these capabilities into an easy-to-deploy and easy-to-operate solution that spans multiple use contexts. Smaller units are well-positioned for huddle spaces, offices and ad hoc meetings, with larger units servicing full-size meeting rooms. Both enable small-to-midsize groups to have more effective meetings, with some participation from remote participants. Team collaboration devices provide a natural use model with no setup required to start drawing on the device. However, some basic user training may be required to fully unlock some of its more-complex features in multitasking or conferencing.

Obstacles

- Team collaborative systems are priced at the high end of the market, compared with basic digital whiteboards. Prices run from $5,000 to $10,000 for entry-level systems to more than $25,000 for large, full-featured solutions.
- They are also often best integrated with a specific vendor's communication and collaboration ecosystem. In the current environment, many companies require access to multiple conferencing tools to handle internal and external meetings of varying sizes.
- Newer systems often offer access to alternative collaboration platforms, so they often sacrifice some of their simple, intuitive operation. Devices are often not used to their potential, because users are unfamiliar with their capabilities.
- These devices compete with and complement turnkey meeting room systems from various suppliers (e.g., Microsoft Teams Room and Zoom Room Systems) complicating meeting room design. However, products are improving to enable these separate solutions to work together smoothly.

User Recommendations

- Educate users, and develop localized expert champions to ensure ROI. Even though these devices are simpler to use than cobbled-together solutions, they are rarely used optimally, because users are often poorly trained or are unable to understand their value.
- Analyze collaboration requirements across different user groups and physical workspaces.
- Select vendors based on integration with existing productivity software, and on the ability to support your organization's different geographical locations. Some vendors require an ongoing cloud subscription that should be calculated as part of the overall platform investment. Expect the life span of these systems to be no more than five years.

Sample Vendors

Cisco; DTEN; Google; Microsoft; Prysm; Ricoh; Sharp

Gartner Recommended Reading

Select the Right Technology for Modern Meeting Rooms

Create a Catalog of Activity-Based Spaces in the Digital Workplace to Improve the Employee Experience

UC Monitoring Tools

Analysis By: Lisa Pierce

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Unified communications (UC) monitoring tools collect and analyze the performance of voice, video and messaging sessions from vendor-supplied data sources, including call detail records (CDRs), quality metrics, real-time end-user data from devices/clients, and other sources. Some tools use standard APIs, and extract relevant data from UC/VoIP vendor databases and repositories. Advanced tools also collect session and packet data, decode voice and video codecs, and employ synthetic call testing.

Why This Is Important

Regardless of whether an enterprise UC capability employs an on-premises, cloud or hybrid on-premises cloud implementation, using monitoring and management tools that are optimized for UC and UCaaS is a fundamental prerequisite to ensure a satisfactory end-user experience across an array of work environments, including remote work. These tools should combine both applications and network performance monitoring by employing synthetic testing, and real-time and end-user monitoring techniques.

Business Impact

Enterprises are implementing UC solutions to support a variety of working environments, including traditional office-based environments, teleworkers and road warriors. They have also adopted videoconferencing services en masse in the past year. Tools that (1) monitor performance as the user experiences the technology, and (2) isolate and anticipate troubles across a range of real-time services and worker environments are essential to corporate productivity.

Drivers

- In the past three years, adoption of cloud-based UC services (UCaaS) has been a major driver of adoption of advanced UCM solutions that use digital experience monitoring (DEM) technologies: synthetic testing, and real-time endpoint and end-user monitoring.
- Since 1Q20, accelerated migration to telework environments that employ residential broadband service, coupled with rapid adoption of cloud-based videoconferencing, have revealed the fragility of UC applications' performance when employed across diverse work environments whose performance is rarely controllable by the IT manager. Thus, awareness of and appreciation for the role UCM tools play has sharply escalated. As organizations plan their postpandemic work environments, many will continue supporting remote workers in addition to traditional workers; they also will again support frequent travelers.
- The difference between 2019 and 2022 is important in one key way: In 2019, IT shops had not frequently supported real-time application performance across diverse work environments, including work from home. They now know they are expected to do this, and that tools are available to help them deliver the desired outcomes.

Obstacles

- Some vendors with broad NPMD functionality provide UC-oriented components to augment their current monitoring products. But these tools typically are not specifically developed for UC; for example, they may not sufficiently drill down on performance.
- Niche vendors solely focus on providing deeper UC insight, often from specific UC vendors. But they often cannot support other applications or discern root cause absent NPMD tools, resulting in acquiring and using an increasing number and array of tools.
- Some UCaaS monitoring tools are cloud-only; they do not look at on-premises-based UC performance. Others are outgrowths of tools that assess the performance of on-premises-based UC systems, making them less than ideal for cloud-first services.
- Finally, some UCaaS providers offer monitoring tools for their services; however, the level of sophistication varies widely.

User Recommendations

- Employ solutions that combine real-time monitoring and diagnostic functions through collecting and analyzing data from endpoints, with synthetic agents to gain performance insights into VoIP/UC infrastructures. These solutions may be supplied by dedicated UCM vendors, broader performance monitoring tools that include packet acquisition, analysis and storage, or tools provided by UCaaS providers. Clients may also employ these strategies in combination.
- Validate that third-party tool vendors collect and analyze API data provided by the specific UCaaS provider. (Third-party tools are particularly useful in monitoring multivendor or hybrid UC environments.) When this data alone is insufficient to diagnose and troubleshoot problems, also employ synthetic testing and packet-based NPMD solutions.
- Affirm the chosen vendor supports the proprietary codecs and protocols being employed if browser-based VoIP and video, desktop video, or media stream monitoring are required.

Sample Vendors

8x8; AppNeta; Catchpoint; ExtraHop; Fuze; IR; Lakeside Software; Optanix; TeleMate.Net Software; Unify Square

Gartner Recommended Reading

Market Guide for Digital Experience Monitoring

Market Guide for Network Performance Monitoring and Diagnostics

Magic Quadrant for Application Performance Monitoring

Critical Capabilities for Application Performance Monitoring

Three Key Factors to Improve the User Experience When Deploying UC on SD-WAN

Magic Quadrant for Unified Communications as a Service, Worldwide

Critical Capabilities for Unified Communications as a Service, Global

Virtual Events

Analysis By: Christy Ferguson

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Virtual events bring large groups of people together online for short periods for defined purposes. Organizers mix technology, content and format types to engage audiences in varying experiences, ranging from few-to-many presentations to interactive activities. Audiences may be internal and/or external to an organization. Planning, operations and production workstreams typically operate in parallel to execute complex events. Hybrid events add virtual, remote experiences to face-to-face events.

Why This Is Important

Enterprises rely on events to achieve demand generation goals, accelerate deals in the pipeline and strengthen customer relationships. A variety of event types are required to support the engagement objectives with customers and buyers. Virtual events enable teams to engage attendees, execute dynamic content delivery, manage event logistics and integrate with other technologies in order to deliver world-class experiences for attendees.

Business Impact

The proliferation of virtual events due to the COVID-19 pandemic required a new approach and focus on engagement. The hype accelerated as enterprises were forced to shift to virtual delivery models and quickly turned to a need to expand into a hybrid model as in-person events return. As enterprises look to the future, hybrid event strategies — a mix of in-person and virtual event models — will grow. While virtual events have a place in this future, support for multiple delivery models, including in-person, will be necessary.

Drivers

- The global health pandemic resulted in the mass cancellation of in-person events, which forced enterprises to accelerate digital transformation and rethink the entire event experience, resulting in a quick shift to virtual events.
- Audience reach of virtual events increased when compared to in-person events as barriers of travel budgets and schedules became less prominent.
- The cost-effectiveness of virtual events enabled enterprises that had not hosted their own events to expand into this engagement channel over the last year.
- While Gartner clients have expressed interest in hybrid delivery models that enable streaming in-person content to virtual attendees, Gartner sees hybrid evolving as an event strategy that requires both in-person events and separate virtual events supported in a single platform where users have real-time access to all event data in one solution.

Obstacles

- As in-person events return, enterprises will need to determine whether a point solution to deliver virtual events is the most appropriate. As the market evolves, enterprises should expect to see the growth of all-in-one solutions that can deliver every event model: virtual, in-person and hybrid.
- The hybrid event model has yet to be fully defined, and vendors are immature in this delivery model.
- The expansion from adjacent markets is likely to include well-established meeting solutions that will broaden their offerings to meet the needs in this market over time.
- Integrations and ecosystems are lacking in this market, impacting the ability of enterprises to leverage attendee engagement data to move attendees along the buyer journey and measure return on investment.

User Recommendations

- Define objectives and determine whether an existing meeting solution or webinar tool will meet the needs of one, some or all of your virtual events. Use virtual event vendors when you have multiple tracks, require a high level of engagement requirement, plan various session types or seek to integrate data into a martech stack.
- Expect rapid product roadmap evolution and advancement in the market. Develop a clear understanding of plans to ensure that short-term goals and expectations are met.
- Develop the skill set among existing employees to manage virtual as attendee expectations increase. If not, seek professional services to supplement existing internal capabilities.
- Define expectations for integration to the existing technology stack, with a focus on attendee tracking. For example, session attendance, view time, survey results, meeting engagement and target account engagement are all metrics to track to optimize efforts and align back to objectives.

Sample Vendors

Bizzabo, Hopin, Intrado, ON24

Gartner Recommended Reading

Market Guide for Event Technology Platforms

Market Guide for Enterprise Video Content Management Systems

Magic Quadrant for Meeting Solutions

Event Data: An Opportunity to Improve Marketing Performance

The Future of Event Marketing: Virtual, Hybrid and In-Person Events

Bots

Analysis By: Van Baker, Saikat Ray

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Adolescent

Definition:

Bots are software modules that automate tasks based on predefined rules or via algorithms, which may involve machine learning. The most common forms of bots are RPA bots and chatbots, but ML models and event-driven software can also automate events. Bots can operate on other bots, apps or services in response to events or user requests. These requests can be initiated via conversational UIs (chatbots) or in response to events, such as receipt of an email or a change in state of an application.

Why This Is Important

Enterprises have an opportunity and a mandate to automate business processes and workflows so as to improve business responsiveness and better serve customer needs. Bots, event-driven architecture, ML models and other technologies are changing application interactions from people-driven to automated processes that improve performance while reducing costs. Many enterprises are striving to achieve a state of hyperautomation, where workflows will be automated when it contributes to business value.

Business Impact

Bots have the ability to automate tasks, resulting in improved workflow efficiency. They enable automation of conversational interactions between users and applications. Bots can push information and/or data to users or other applications, reducing response time. Bots can be combined to create complex bots that perform complex tasks, eliminating dependence on the user to initiate activities and resulting in streamlined business processes and more efficient operations.

Drivers

The benefits of bots are clearly understood, and as a result there are many factors driving their deployment, including:

- Reduction in the amount of menial repetitive tasks for the workforce, freeing employees up and enabling them to work with greater impact.
- Automation of tasks that are currently performed manually.

- Facilitation of better resource allocation by extending the value of legacy monolithic applications without the need to modify or change these applications.
- Extension of normal business hours.
- Reduction of errors and the resulting rework.
- Reduction of mean time to respond for business-critical tasks.
- Ability to simplify integration between applications without having to build complex integrations or refactor applications.
- Improvement of customer service by automating responses to repetitive questions or processes.
- Improvement of legacy customer engagement channel interactions, such as interactive voice response (IVR).
- Improved accessibility to existing workforce applications with the use of conversational interfaces and interactions.
- Combination of robotic process automation (RPA) bots, chatbots, event-driven architecture, automated machine learning and other technologies to enable a hyperautomated enterprise.

Obstacles

The deployment of bots is not without challenges, including:

- Bots are brittle, and rely on applications and models that are consistent in their execution.
- Bots will need to be continually updated as applications, language models and integration points change.
- Bots can drive significant technical debt.
- Complex solutions that leverage multiple automation technologies are not easy to build and can be difficult to implement.
- Language models for custom use cases can be very challenging to build, requiring machine learning expertise.

- Complex bots may require significant levels of model operations to ensure continued performance.
- Bots can simplify processes, but they can also be complex to integrate and orchestrate, complicating application modernization efforts in the enterprise.

User Recommendations

Enterprises looking to improve efficiency and productivity need to create an automation strategy spanning a range of technologies, including RPA bots, chatbots and others. For enterprises striving to improve competitiveness and reduce costs via automation, bots are a critical element. Enterprises should:

- Enhance bots by allowing RPA bots to be triggered by transactions that are monitored by event managers, typically utilizing a pub/sub service.
- Initiate apps, functions and services via bots to deliver results to the workforce, initiate business processes or notify employees or customers as needed, without requiring user initiation of business processes.
- Exercise caution and ensure that process visibility and understanding regarding the context are prerequisites of automating tasks through bots.
- Be prepared for ongoing management of bots, due to changing technologies and the brittle nature and resulting technical debt associated with the use of bots.

Gartner Recommended Reading

Robotic Process Automation (RPA) Environment and Operations

Magic Quadrant for Robotic Process Automation

Consult the Board: Business Value of Robotic Process Automation

Guidance Framework for Evaluating Conversational AI Platforms

Consolidate Your Chatbot Initiatives Into a Single Enterprise Strategy

Top Strategic Technology Trends for 2021: Hyperautomation

Cloud UC (UCaaS)

Analysis By: Rafael Benitez

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Mature mainstream

Definition:

Unified communications as a service (UCaaS) is a cloud-based approach to UC that integrates enterprise telephony, personal and team messaging, SMS integration, meeting solutions (audio/web/video conferencing, whiteboarding and content sharing), and mobility. Organizations typically buy 3- or 5-year agreements and pay a flat recurring per-user charge monthly. UCaaS is typically delivered from multitenant “cloud” platforms.

Why This Is Important

Unified communications is a foundational service for organizations of all sizes and industries. In developed economies with reliable and inexpensive data networking services, cloud-delivered UC is the preferred option. New premises-based UC systems are seldomly deployed. Less developed regions still see premises-based UC systems, but Gartner expects that as data networking services improve in availability and price, these regions will transition to UCaaS quickly, as UCaaS is now proven.

Business Impact

UCaaS enables organizations to outsource the delivery of telephony, mobility, messaging and meetings.CFOs are attracted to UCaaS because it:

- Transforms large investments every two to three years for upgrades into predictable monthly recurring charges.
- Provides agility to organizations as they grow, retrench, acquire or merge with other organizations.
- Supports disaster recovery with data replication across various network operations centers.
- Supports mobility and remote work much more easily.

Drivers

The most common factors driving the adoption of UCaaS are modernization, system management outsourcing and the expectation that total cost of ownership (TCO) can be lowered.

- **Modernization:** Although most on-premises UC solutions include messaging, mobility and meetings, UCaaS offerings are vastly superior in these capabilities, as well as in user experience. Most leading vendors are not investing significantly in on-premises UC solutions, and are instead focused on UCaaS innovation.
- **System Management:** On-premises solutions typically require engineering-level skill to manage, while UCaaS solutions require much less technical skill and less effort from the organization.
- **TCO Optimization:** Although TCO reduction is often expected when adopting UCaaS, this not only depends on the price of UCaaS, but also on the current costs for a premises-based system. In some cases, organizations may have exceptionally low costs with a premise-based system, and therefore may have higher costs with UCaaS. Typically, organizations can realize savings or keep costs at a similar level, while benefiting from modernization.

Many businesses opting for UCaaS believe that UC has become commoditized and is therefore suitable for cloud delivery. This enables them to focus on core competencies, and reallocate IT staff to focus on other strategic areas. The long-term view of UCaaS is positive, evidenced by how aggressively premises-based UC vendors are pivoting their R&D investment to the cloud.

The licensing policies of vendors such as Cisco, Microsoft and Google favor single-vendor, or dominant-vendor, solutions. Hence, UCaaS is well-suited to organizations that are open to dominant-vendor solutions. Organizations adopting UCaaS will need to undertake a process of vendor rationalization to reduce overlapping tools in their environments.

Obstacles

- **Regional availability:** Multinational organizations sometimes find it challenging to find providers that can deliver local/domestic calling service in less developed countries. Also, organizations that are not multinational but operate in less mature markets may consider the options there unsuitable.
- **Telephony feature gaps:** Although UCaaS is mature and can satisfy the telephony requirements of most organizations in developed regions, some organizations still require advanced telephony features (e.g., certain types of queuing, hunt groups, etc.) that may not be easily found with UCaaS providers. This is increasingly rare, but can still limit the migration to UCaaS for such organizations.
- **Unusually stringent SLA targets:** Some organizations have exceedingly stringent meantime to repair service level targets (e.g., stock brokerage companies often require less than one hour), which may not be achievable with typical UCaaS providers.

User Recommendations

- Select UCaaS instead of premises-based UC if your organization is an SMB (<1,000 users). UCaaS has matured to the point where it meets the telephony requirements of SMBs and has suitable resiliency. SMBs can build a compelling business case for UCaaS by weighing their limited IT resources and skill set, the complexity of supporting remote sites, and the benefits of the high pace of innovation that UCaaS vendors provide.
- Adopt UCaaS if your organization is large (>1,000 users) and has locations concentrated in a single-developed region. Many public-sector organizations fall into this category and are adopting UCaaS frequently.
- Opt for premises-based UC if your organization is multinational and operates in regions where reliable data networking services may be unavailable or prohibitively expensive. While MNOs should explore UCaaS, less developed countries are also often challenged by restrictive local telecommunication regulations, making premises-based UC a better option.

Sample Vendors

8x8; Cisco; Dialpad; Fuze; Microsoft; Zoom

Gartner Recommended Reading

Magic Quadrant for Unified Communications as a Service, Worldwide

Critical Capabilities for Unified Communications as a Service, Global

Gartner Peer Insights 'Voice of the Customer': Unified Communications as a Service, Worldwide

Top 3 Considerations When Moving From Premises-Based Unified Communications to Cloud-Based UCaaS

Compare the Costs of Replacing Desk Phones With Softphones in UC

Entering the Plateau

Content Collaboration Tools

Analysis By: Michael Woodbridge

Benefit Rating: High

Market Penetration: More than 50% of target audience

Maturity: Mature mainstream

Definition:

Content collaboration tools (CCTs) are the primary content services within the “new work hub.” They are mostly SaaS-based and enable access to content regardless of location or device, making them important for remote work. Core functionalities include file sharing, search, collaborative document editing, team workspaces, lightweight content management and workflow automation.

Why This Is Important

CCTs are an essential part of the new work nucleus and have helped transform the way people work with content. They increased in importance during 2020 and 2021 as remote work left employees unable to access various sources of content. The predominantly SaaS-like nature of CCTs means they are often available to employees outside of corporate VPNs and firewalls. CCTs support new work styles including synchronous editing of documents, external sharing and task management.

Business Impact

CCTs enable productivity and collaboration for workers and teams (distributed or mobile) by offering a modern user experience. They lead to a more agile and connected workforce. They are relevant to all sectors and business units. Business benefits include support for remote working, increased productivity, application rationalization, cost savings and digital workplace transformation.

Drivers

- Modernization of file system infrastructure: Traditional file systems pose both operational and functionality challenges to organizations. From an operational perspective, they are often not cloud-based and therefore difficult to provide access to. They also lack fine-grained access control and classification, limiting the ability to govern them effectively. From a functionality perspective, they lack search and sharing controls meaning users often duplicate information, increasing operational overhead. CCTs fill all of these gaps, offering a more modern and effective alternative.
- Support for external collaboration: External collaboration with partners, suppliers and customers is a common requirement for any organization. CCTs provide functionality to support this with stringent levels of access control to apply appropriate security. More advanced CCT vendors provide native data loss prevention (DLP) capabilities to provide further protection for sensitive information.
- Inclusion with other technologies: CCTs are increasingly bundled with other software suites. The two most popular new work hub suites Microsoft 365 and Google Workspace both contain CCT capability as standard (OneDrive and Google Drive, respectively).
- More fine-grained control: CCTs are sometimes used as a desktop backup service to ensure that individual user productivity remains unaffected by data loss. They offer more fine-grained control and access to files than traditional backup solutions, and also provide for search and retrieval online.

Obstacles

- Fierce competition (particularly from Microsoft) and the commoditization of key features drive market segmentation as vendors look to differentiate themselves by branching into other areas such as content protection and broader collaboration.
- In addition to inclusion in new work hub, CCT capabilities are increasingly found in other content services. Content services platforms provided by Hyland, OpenText, and M-Files have CCT capabilities. Organizations overprovisioned with these technologies may look to rationalize their portfolio.
- CCTs lacking critical capabilities that enterprises require for information governance and business processes present challenges for enterprise clients with strong compliance needs. Though some vendors in the CCT market (notably, Box, Egnyte and Microsoft) have strengthened their offerings in this respect, this is not the case with all vendors.

User Recommendations

- Evaluate capabilities of OneDrive (often a default consideration for CCT implementation given the increasing presence of Microsoft 365 in the workplace) against other vendors' offerings to determine the best fit for your requirements.
- Assess vendors such as Box, Dropbox, Google and Microsoft if your organization has a public cloud strategy. Organizations with stringent data control requirements should focus on hybrid solutions, such as those from Axway (Syncplicity), Citrix and Egnyte, that enable organizations to maintain greater control and to draw on existing storage investments. Some organizations require both depending on data sensitivity levels.
- Centralize CCT capabilities where possible. Leaving users and departments to implement personal services poses significant risks. Only paid, enterprise versions of common CCTs contain the security, privacy and DLP controls necessary for organizational deployment.

Sample Vendors

Axway; Box; Dropbox; Egnyte; Google; Microsoft

Gartner Recommended Reading

Market Guide for Content Collaboration Tools

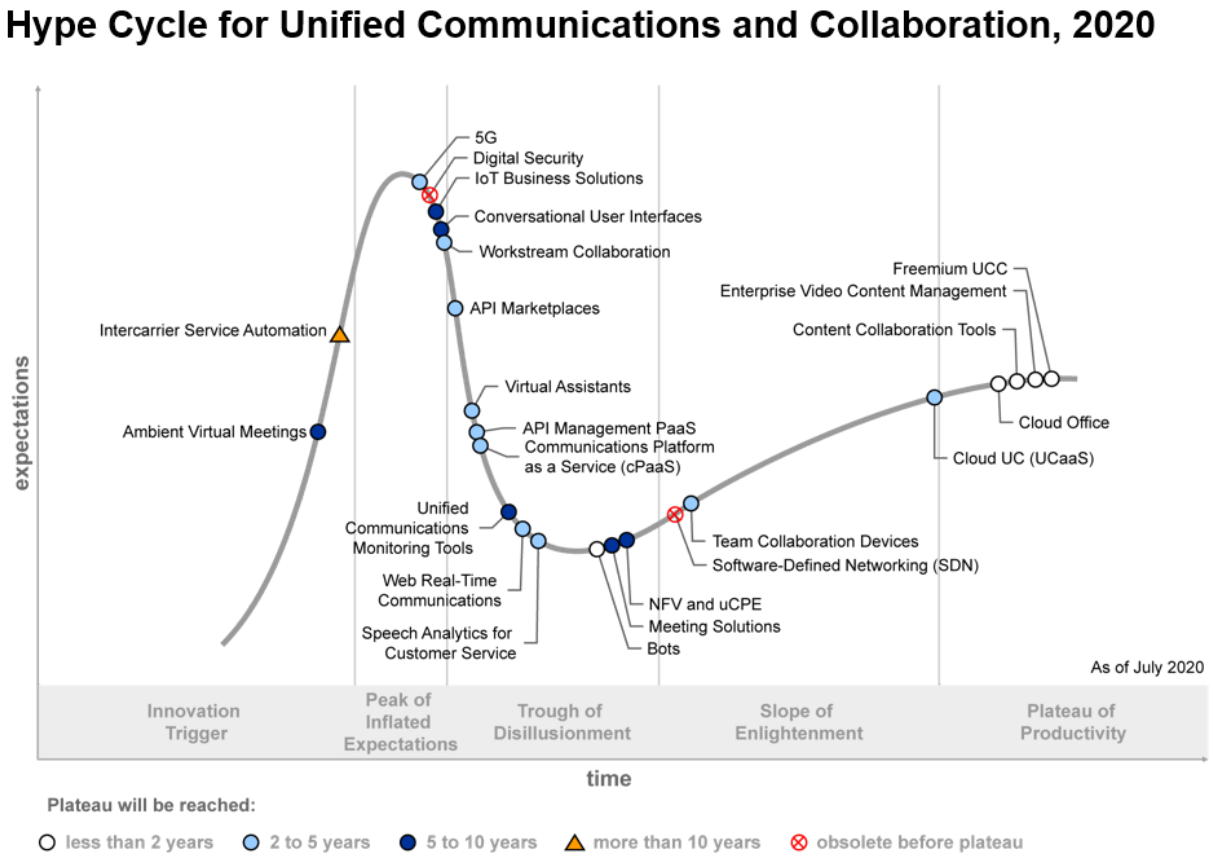
Gartner Retires 'Magic Quadrant for Content Collaboration Platforms'

Toolkit: Sample RFP for Content Services Platforms and Content Collaboration Platforms

Apply Gartner's ACME Framework to Make New Work Nucleus Technology Decisions

Appendixes

Figure 2. Hype Cycle for Unified Communications and Collaboration, 2020



Source: Gartner (July 2020)

Hype Cycle Phases, Benefit Ratings and Maturity Levels

Table 2: Hype Cycle Phases

(Enlarged table in Appendix)

Phase ↓	Definition ↓
Innovation Trigger	A breakthrough, public demonstration, product launch or other event generates significant media and industry interest.
Peak of Inflated Expectations	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 innovation is pushed to its limits. The only enterprises making money are conference organizers and content publishers.
Trough of Disillusionment	Because the innovation does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
Slope of Enlightenment	Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the innovation's applicability, risks and benefits. Commercial off-the-shelf methodologies and tools ease the development process.
Plateau of Productivity	The real-world benefits of the innovation 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.
Years to Mainstream Adoption	The time required for the innovation to reach the Plateau of Productivity.

Source: Gartner (August 2021)

Table 3: Benefit Ratings

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

Source: Gartner (August 2021)

Table 4: Maturity Levels

(Enlarged table in Appendix)

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

Source: Gartner (August 2021)

Evidence

[1] Gartner's 2021 Digital Worker Experience Survey. The research was conducted online during November and December 2020 among 10,080 respondents from the U.S., Europe and APAC. Participants were screened for full-time employment, in organizations with 100 or more employees and required to use digital technology for work purposes. Ages range from 18 to 74 years old, with quotas and weighting applied for age, gender, region and income, so that results are representative of working country populations.

Results of this study do not represent "global" findings or the market as a whole, but are a simple average of results for the targeted countries covered in this survey.

- More than 2,500 inquiries about UCC received from Gartner clients between January 2020 and April 2021.
- Gartner's Peer Insights forum.
- Discussions with other Gartner analysts with expertise in this area.

Document Revision History

Hype Cycle for Unified Communications and Collaboration, 2020 - 31 July 2020

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Hype Cycle for Unified Communications and Collaboration, 2017 - 17 July 2017

Hype Cycle for Unified Communications and Collaboration, 2016 - 21 July 2016

Hype Cycle for Unified Communications and Collaboration, 2015 - 21 July 2015

Hype Cycle for Unified Communications and Collaboration, 2014 - 23 July 2014

Hype Cycle for Unified Communications and Collaboration, 2013 - 31 July 2013

Hype Cycle for Unified Communications and Collaboration, 2012 - 31 July 2012

Hype Cycle for Unified Communications and Collaboration, 2011 - 2 August 2011

Hype Cycle for Enterprise Communication Applications, 2010 - 3 August 2010

Hype Cycle for Enterprise Communication Applications, 2009 - 27 July 2009

Hype Cycle for Enterprise Communication Applications, 2008 - 3 July 2008

Hype Cycle for Enterprise Communication Applications, 2007 - 12 July 2007

Hype Cycle for Enterprise Communication Applications, 2006 - 16 October 2006

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Table 1: Priority Matrix for Unified Communications and Collaboration, 2020

Benefit	*Years to Mainstream Adoption*			
↓	***Less Than 2 Years*** ↓	***2 - 5 Years*** ↓	***5 - 10 Years*** ↓	***More Than 10 Years*** ↓
Transformational		Conversational User Interfaces New Work Hub Virtual Assistants Web Real-Time Communications		
High	Bots Content Collaboration Tools Virtual Events Workstream Collaboration	5G Cloud UC (UCaaS) Collaborative Work Management Communications Platform as a Service (CPaaS) UC Monitoring Tools	Immersive Meetings Meeting Solutions	
Moderate		API Management PaaS API Marketplaces Team Collaboration Devices Visual Collaboration Tools	NFV	Intercarrier Service Automation
Low			Ambient Virtual Meetings	

Source: Gartner

Table 2: Hype Cycle Phases

Phase	*Definition*
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Phase ↓	Definition ↓

Source: Gartner (August 2021)

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