CHAPTER 1

Microsoft Teams Overview

These days, communication needs are frequently changing because of the modern workforce, which has evolved to be more focused on team contributions than those of an individual. As technology creates remote and global teams, all users must be able to connect. Microsoft Teams provides all that the modern workforce requires. Teams is a single product that also offers a complete meeting solution, supporting sharing, voice, and video conferencing, allowing users to meet from anywhere. Users can use Teams for all types of meetings—spontaneous or scheduled, formal or informal—with internal and external participants.

Microsoft Teams is a unified communication and collaboration tool build on a cloud platform that combines various services for collaboration, such as chat, meetings, calling, and files. Teams is tightly integrated with Office 365 and combines multiple workloads into a unified communication and collaboration system. Teams also offers integration capabilities for additional tools and third-party applications.

This chapter covers several introductory topics to get you started with Teams. At the end of this chapter, you will be able to describe:

- What Microsoft Teams is and what it is used for.
- Microsoft Teams architecture and different components involved.
- How Microsoft Teams stores data and interacts with SharePoint Online and OneDrive for Business.
- Where Teams stores chat conversations and how Teams interacts with Exchange.
- Live events and their architecture.
- What Microsoft Stream is used for and its architecture.

B. N. Ilag, *Understanding Microsoft Teams Administration*, https://doi.org/10.1007/978-1-4842-5875-0_1

- Teams Phone System overview and voice communication capabilities.
- Teams licensing requirements and add-on licenses.
- Teams integration with Office 365 and third-party applications.

What Is Microsoft Teams?

Microsoft Teams is a center for teamwork, which brings chat, meeting, calling, content, office 365 application, and the third party and custom applications all in one place [1]. A definition of *team* that resonates better with Teams is "a collection of people, content, and tools surrounding different projects and outcomes within an organization." According to Microsoft, the teams formal definition is a collection of people, content, and tools surrounding different projects and outcomes within an organization.

Teams is a single product that provides extensive capabilities, starting with a conversation platform that allows team members to communicate via voice and video calls, with content sharing and application integration opportunities that teams and team members require to be successful in their technical journey.

Microsoft Teams Architecture

Microsoft Teams brings together Office 365 services and intelligent communications to provide a single platform. Before using Microsoft Teams, you, as an administrator, support person, or even end user, must understand the design and how Teams services work together to provide a unified experience.

Understanding the Microsoft Teams architecture is crucial because without knowing the Teams architecture building blocks and their functionality, you as an admin cannot manage teams or answer user questions. One of the important questions users often ask is, "Where are my Teams data stores?" In Microsoft Teams, each feature stores data in different services. Hence, it is also essential to understand Teams data storage. The word *architecture* came from the Latin *architectura*, which means building boxes [2].

Teams Architecture Overview

It is essential to understand how Teams was architected and what is happening behind the scenes. As Figure 1-1 shows, from an architecture perspective, Microsoft Teams brings together Office 365 services and intelligent communications (intelligent communications is the Skype next-generation service). Microsoft 365 Core Services such as Exchange Online, SharePoint, and OneNote; Office 365 apps; and the intelligent communication cloud are the components of the architecture that enable all communication capabilities including persistent chat, meetings, and audio and video calls. Teams services are the services that the Microsoft engineering team built to create Microsoft Teams. They orchestrate the layer that brings together all the other pieces; for example, attaching an Office 365 Group to a team created for easy membership management.

This is important because whenever someone creates a team, two things happen on the back end. First, creating new team creates an Office 365 Group for membership management (that's how Teams manages membership); second, Teams also creates a SharePoint Team site for file sharing. This means every team has an Office 365 Group as well as a SharePoint team site. All these features build on the same scalable Azure infrastructure that Microsoft used in Teams. On the top rest the Teams clients, which are available for all platforms, such as the Teams Web app, Teams desktop client (Windows and macOS), Teams Mobile app (iOS and Android), and Teams Linux client.

In many cases, the Teams client not only sits on top of the Teams layer, but it is also more efficient because it directly talks to the Office 365 services as well.

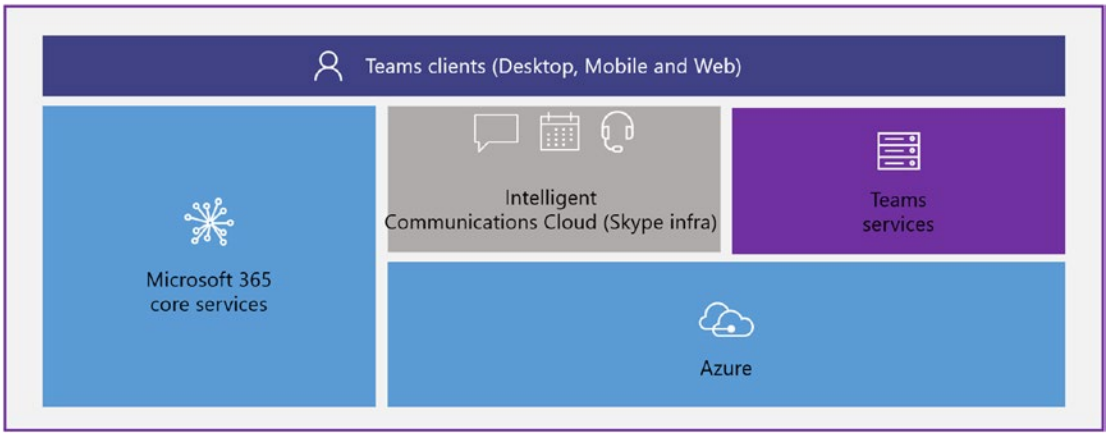

Figure 1-1. *Teams high-level architecture [4a, 7a]*

To help you in the deployment of a Teams client in your organization, Microsoft has added Microsoft Teams client to Microsoft 365 Pro. In addition, Microsoft Teams has a semiannual update channel.

What Is the Intelligent Communications Cloud?

You might be wondering what the intelligent communications cloud is and what it consists of. The Intelligent communications cloud was formerly known as the Skype next-generation service; it is where the messaging, calling, and meeting services, people, configuration, and identity service reside (see Figure 1-2). These represent the next-generation evolution of Skype services that Teams uses for messaging and voice over IP (VoIP) calling. The intelligent communications cloud also contains the PSTN telephone network integration system, and that is also used for the Skype for Business Online stack. Another critical service is a unified presence for Teams and Skype for Business Online.

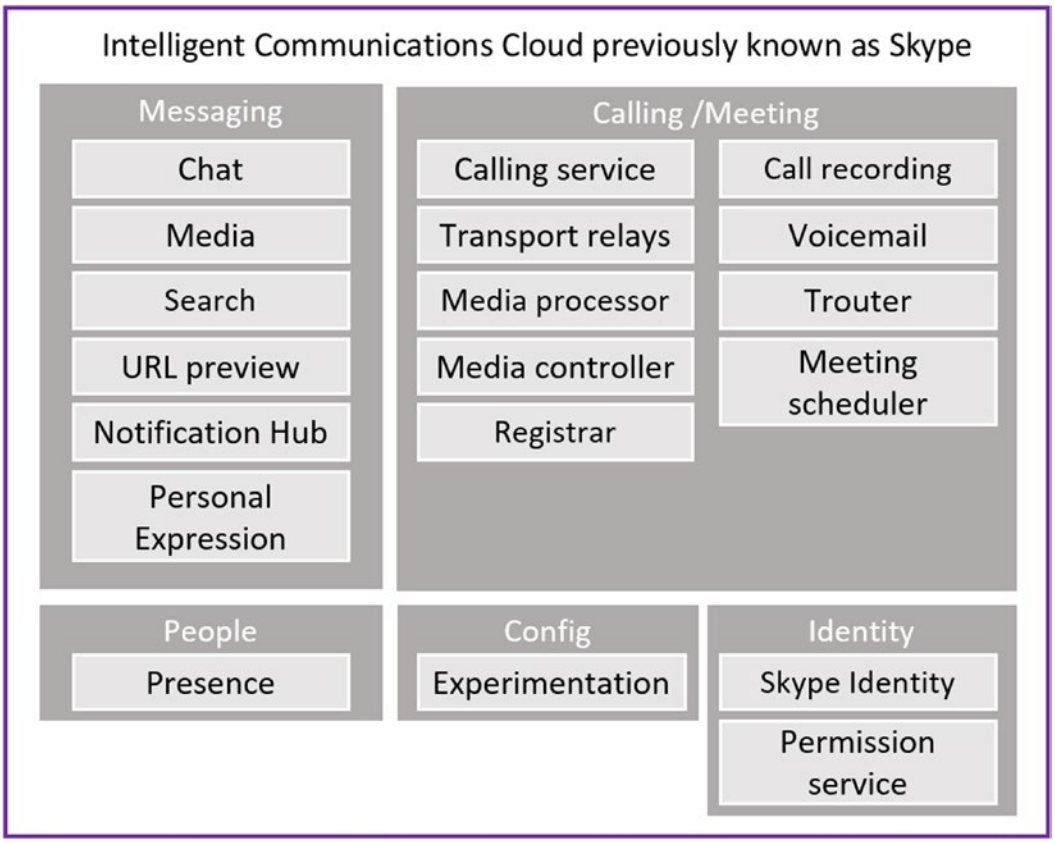

Figure 1-2. *Microsoft Teams next-generation services [4a, 7a]*

Note There is no unified presence between Microsoft Teams and Skype for Business On-Premise.

The messaging stack handles messaging as well as media, which means images attached in chat go to blob storage. This stack also takes care of search functions, URL preview (when a user puts a URL in Teams chat it shows a preview from the URL preview service). Notifications for tracking activity that happens in the team and personal expression services for emojis and stickers are handled in the messaging stack.

The calling and meeting stack includes call recording, calling, voice mail, Trouter, and meeting scheduler services.

The presence server gives users' presence or availability information. The configuration service for experimentation and Identity for Skype (consumer) identity have different tokens than the Active Directory token for authorization and permission services.

Microsoft Office 365 Services Used by Teams

Figure 1-3 shows the Office 365 components. Applications include OneNote, PowerApps, Planner, PowerPoint, Word, and Excel. Platform services include Exchange for email and calendars in Teams (this is the same as Outlook calendar, as Teams uses graphs to retrieve the calendar). Additional features include Modern Groups, also known as Office 365 Groups, SharePoint for content collaboration, Stream for voice recording, OneDrive for Business for file sharing, and Information Protection, which provides a shield for these services. The final component is Power BI for data analytics.

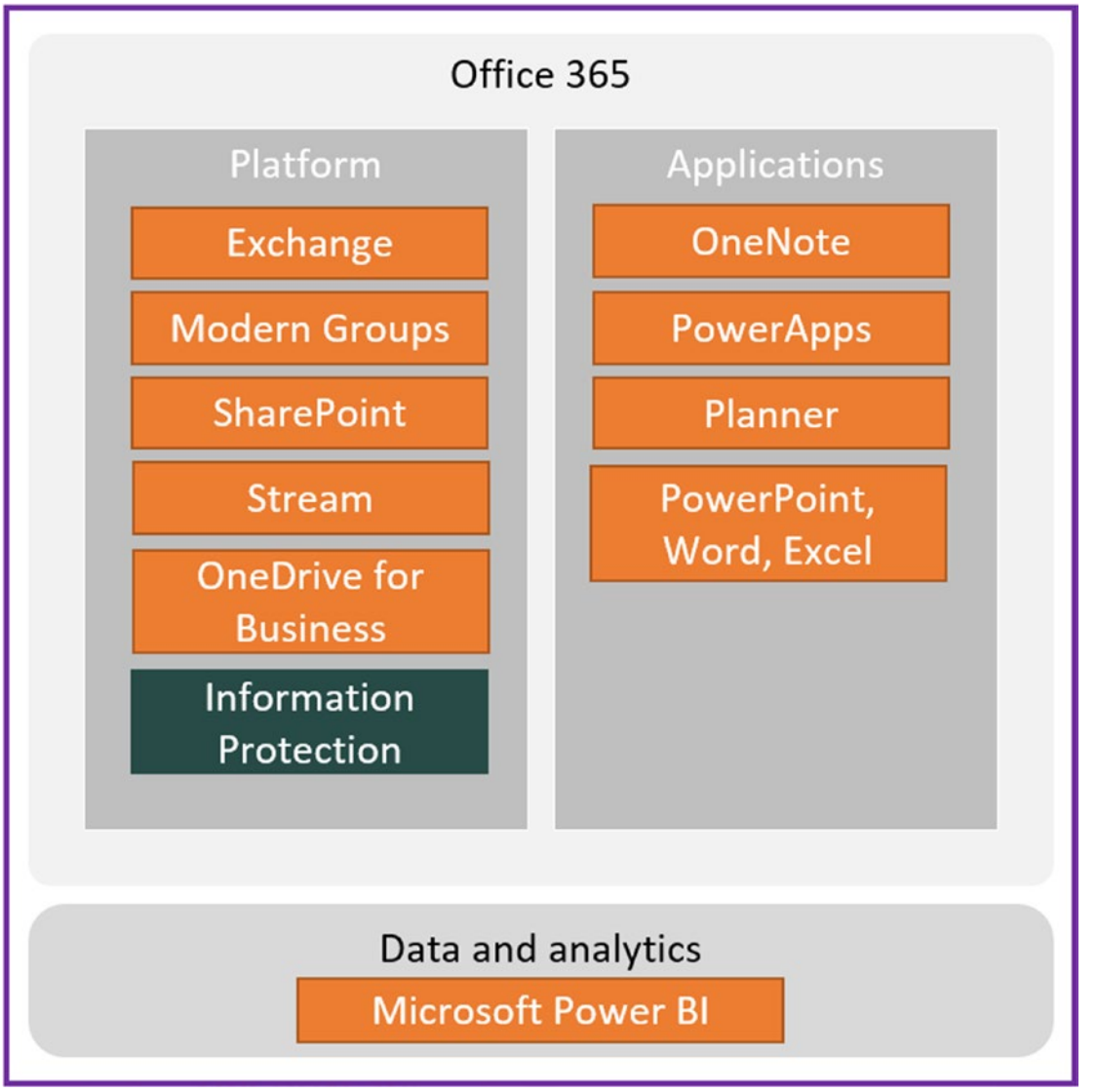

Figure 1-3. *Office 365 services and Teams [4a]*

Office 365 provides a great set of services and applications, but there is nothing that synthesizes all of the functionalities in one place as one application. Microsoft envisioned Teams as that application that makes the whole greater than the sum of its parts. That's why Microsoft built Teams this way, to be the hub of Office 365.

Microsoft Teams Capabilities and Their Data Storage Locations

Those supporting Teams users frequently get asked by users where their Teams data is stored, including conversations (chat), files that users shared, images, and others. Teams chat is persistent, which means it is stored entirely, and it uses its own storage. Group chat and one-to-one chat is stored in Cosmos DB, and channel conversations are stored in Cosmos DB as well [7a]. Teams also keeps a copy of all chat messages in Exchange, mainly to enable information protection.

If users have a one-to-one chat or group chat, Teams keeps a copy of that chat in the mailbox of the individuals who are part of that chat. If you chat in channel teams, Teams keeps a copy of that chat in the mailbox of the Office 365 Group that is attached to that team.

Specific to files, Teams leverages OneDrive for Business and SharePoint for file storing. There are two scenarios shown in Figure 1-4. First, a file shared with one-to-one chat is stored on OneDrive for Business and permission is automatically granted by Teams for users who need access. Another scenario is when a file is shared between channels. In this case, Teams will upload that file to the SharePoint team site that is created when that team is created and the file permission is automatically granted to every member of that team. This is important for content collaboration [7a].

Voicemail is another critical feature that most of the enterprise users utilize. Voicemail is stored in the Exchange mailbox of the user who receives the voicemail, similar to Skype for Business. Calendars and Teams contacts are also stored in Exchange. Calendar is stored in an Exchange unified group mailbox that is created with the team and user's Calendar stores in an individual mailbox.

Where are users' meeting recordings stored? Whenever a user records a meeting it is first stored in the same media storage where images are stored. The recording is then encoded and made available on Microsoft Stream for content collaboration. Within 24 hours, Teams purges the recording from media store to Microsoft Stream so that users can share their meeting recordings with others.

The Teams telemetry is stored in Microsoft Data warehouse without any customer content such as email address and contact numbers.

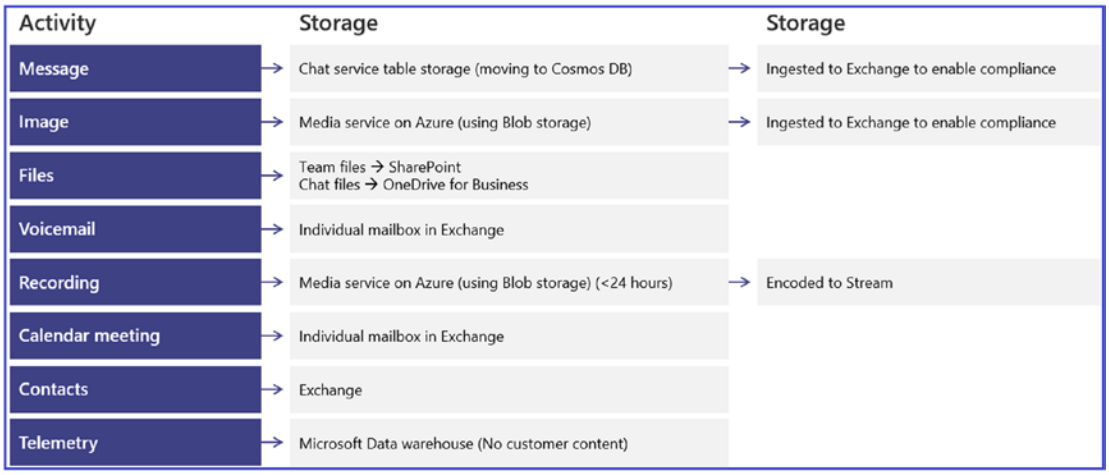

Figure 1-4. *Teams activity and data storage locations [4a, 7a] [4a]*

Note Data in Teams resides in the geographic region associated with your Office 365 tenant. Currently, Microsoft Teams supports Australia, Canada, France, India, Japan, South Africa, South Korea, United Kingdom, Americas, APAC, and EMEA regions.

Now that you understand how many components are involved in Teams architecture, the next important question comes from the technical community: How does Microsoft Teams intermingle with Office 365 technologies?

Teams delivers multiple functionalities, including persistent chat, online meetings, voice and video calls, calendar, content sharing, and many more. All these features come from underlying technologies, but as an admin, you must know how this technology interaction works. When a user creates a team, on the back end it creates a new Office 365 Group, SharePoint Online site, and document library to store team files. Exchange Online shares a mailbox with the Calendar, and a OneNote notebook is automatically provisioned for the team.

Microsoft Teams Logical Architecture

In Figure 1-1, you saw the different components of Teams and how they communicate with each other. Figure 1-5 demonstrates the logical architecture of Teams [4]. The Teams client is the interface to access Teams services in real time for communication and collaboration for teams. Teams connector provides a novel way to integrate third-party apps.

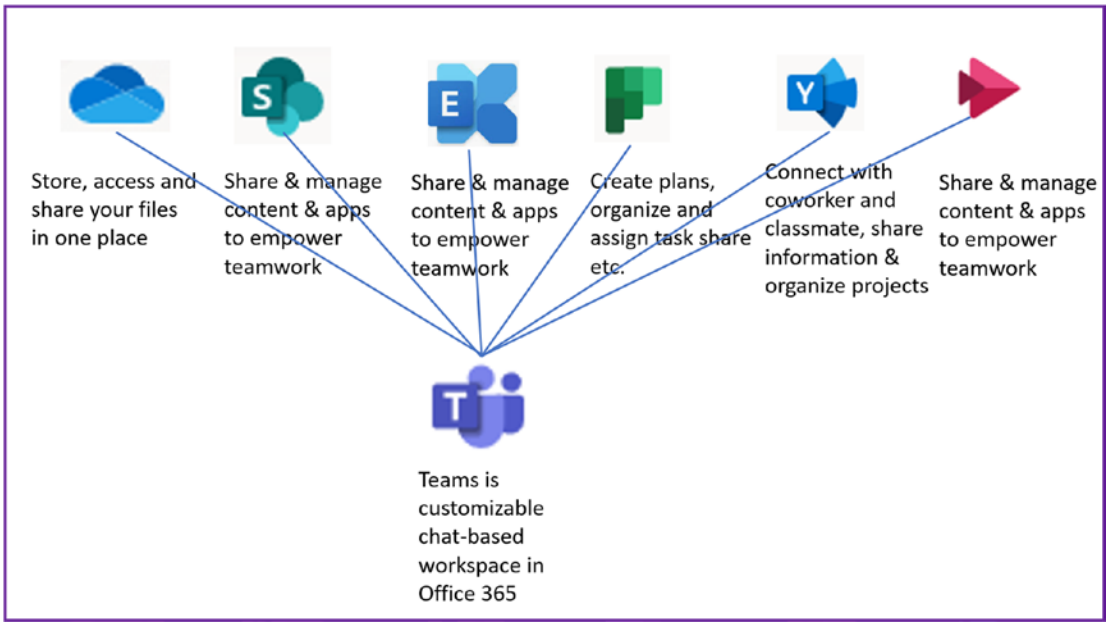

Figure 1-5. *Teams interaction with underlying services [4, 4a]*

Microsoft Office 365 Group and Teams are tightly integrated. For example, when a user creates a team from an existing Office 365 Group, that Group's membership, site, mailbox, and notebook, if any, are merged in Teams. If the Office 365 Group and Teams integration breaks, then the Office Group will not materialize in Teams. That is why Office 365 and Teams are tightly integrated.

- *OneDrive for Business:* OneDrive for Business is mainly used for storing personal user documents until they are shared with others. From a Teams perspective, when a user shares a file in one-to-one chat, which is stored on OneDrive for Business, permission is automatically granted by Teams for the user who needs access.
- *SharePoint Online:* This is mainly used to store Teams files that are shared within channel and team sites. When a team creates a SharePoint site, it is automatically provisioned. Once a file is shared within a team, the access permission is automatically granted by Teams to all team members. The Teams file tab therefore directly interacts with SharePoint Team sites.

- *Exchange Online:* Every team has a group mailbox, and each team member has an individual user mailbox. Teams meetings scheduled by an individual are stored on his or her mailbox and calendar. The Teams calendar therefore directly interacts with the Exchange Online mailbox.
- *Microsoft Stream:* This service is used for creating and sharing videos securely. With Teams, all team meeting recordings are stored and shared using Stream. Also, live events (large broadcast events) are hosted in Stream, as covered later in this chapter.

Microsoft Teams Depends on Other Services

You just saw how the Teams logical architecture works with Office 365 services. Teams does have specific dependencies with other services (see Figure 1-6); for example, Teams chat features directly interact with the chat service in Office 365, one-to-one chat is stored in the user mailbox, and group chat is stored in the Teams group mailbox. Chat is therefore dependent on Exchange Online [4]. Teams files and wiki are dependent on SharePoint Team sites. Teams meetings and calls are dependent on Skype next generation calling and meeting services, meeting calendars are stored on the user's mailbox, and files (one-to-one sharing) depend on OneDrive for Business.

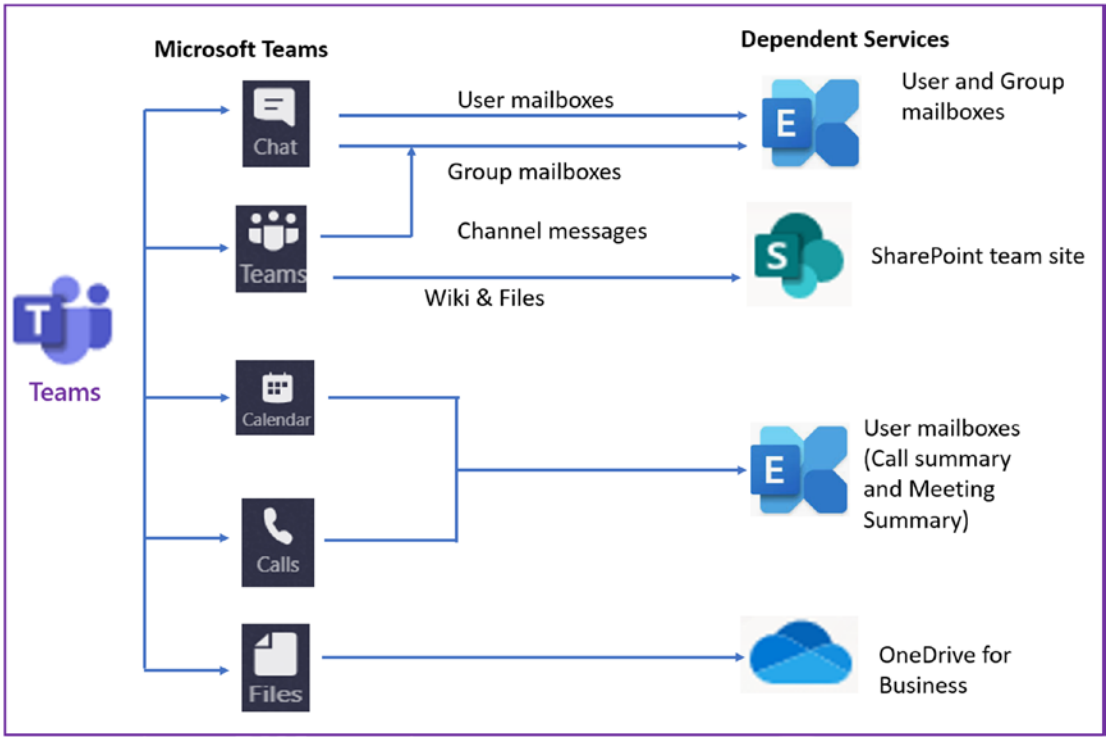

Figure 1-6. *Teams dependent services [4, 4a]*

Note SharePoint Online is a requirement for using OneDrive for Business. Users cannot store and share files on the channel without SharePoint Online and OneDrive for Business.

Microsoft Teams Teams and Channels

Teams

Microsoft Teams provides a tool set that a team requires to execute project tasks. When a user creates a team, he or she will be asked to choose the option to create a private team (only invited users can join) or a public team (anyone from the organization can join). As a team owner, he or she can add members and designate them as a team owner for administration. We recommend adding more than two team owners to mitigate a single point of failure. If a team has a single owner and that owner is terminated or leaves the

organization, then the team will not have an owner to administer. For this reason, having a minimum of two owners is recommended.

Note As of this writing, a team can have a maximum of 10,000 members, including private or public teams and organization-wide teams. The prior limit was 5,000 members in a team. You can refer to Chapter 8 for the complete Teams feature limitations and expiration periods.

There are three types of teams (see Figure 1-7):

- *Private team:* People need permission to join this type of team.
- *Public team:* Anyone in your organization can join this type of team.
- *Org-wide team:* Everyone in your organization automatically joins this team.

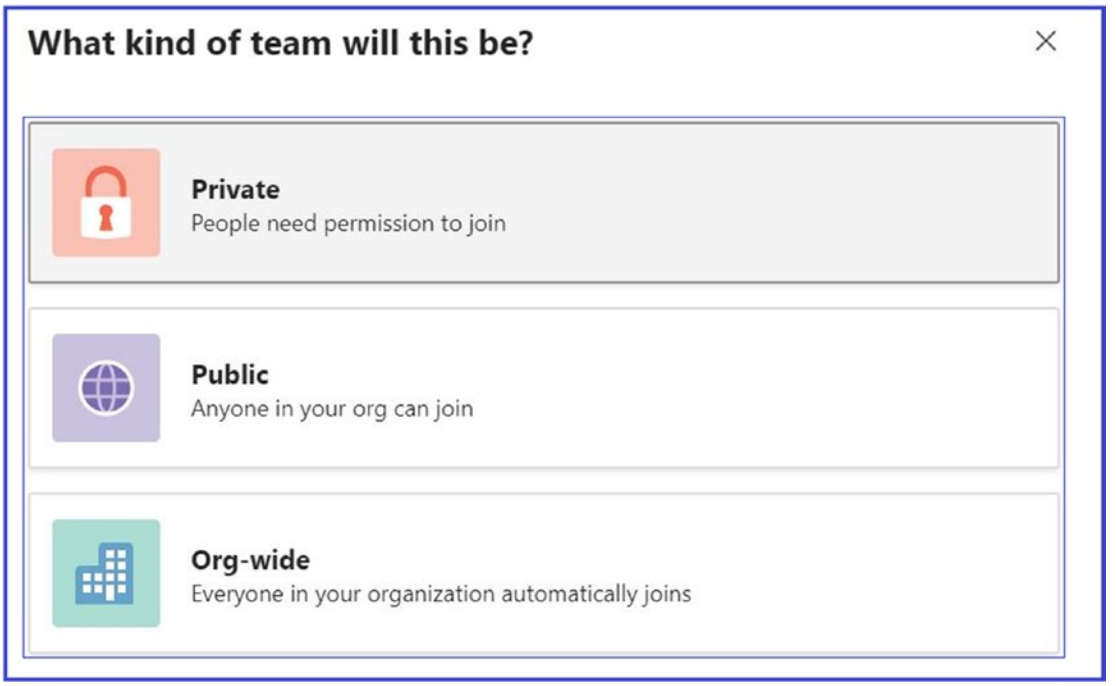

Figure 1-7. *Team types*

Note Regular users cannot create organization-wide teams. Only global administrators can create org-wide teams, and currently, an org-wide team is limited to organizations with no more than 5,000 users. There is also a limit of five org-wide teams per tenant.

Team creation and management are covered in Chapter 2.

Channels

A team is a collection people who gather to perform a project for their organization. That project might have multiple subtasks, so performing these individual tasks requires conversations, calls, or meetings. Each task might have separate documentation requirements. To maintain these separate tasks, Teams provide a dedicated section that is called a channel [19]. Channels are dedicated sections within a team that keep conversations organized by specific topics, tasks, or subjects. Team channels are locations where everyone on the team can openly have conversations. They are most valuable when extended with apps that include tabs, connectors, and bots that increase their value to team members.

Figure 1-8 shows the team and channel structure for the Bloguc organization. It shows three channels for each team. At this point, there is no limitation on creating channels or teams in any organization. That means your organization can have any number of teams and channels. Remember, though, that Teams management efforts increase along with the numbers of teams and channels, so as a Teams admin you must keep track of how teams and channels are used in your organization.

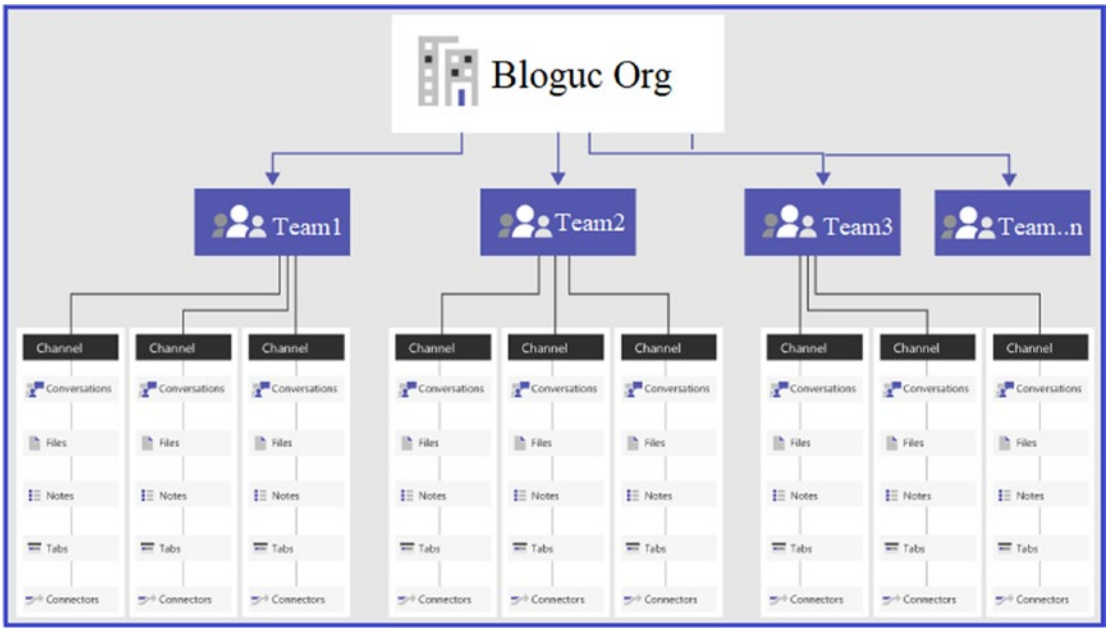

Figure 1-8. *Team and channel structure*

There are two types of channels (see Figure 1-9):

- *Standard channel:* The standard type of channel is accessible to everyone on the team, including team members and guest members.
- *Private channel:* Private channels are accessible only to a specific group of people within the team.

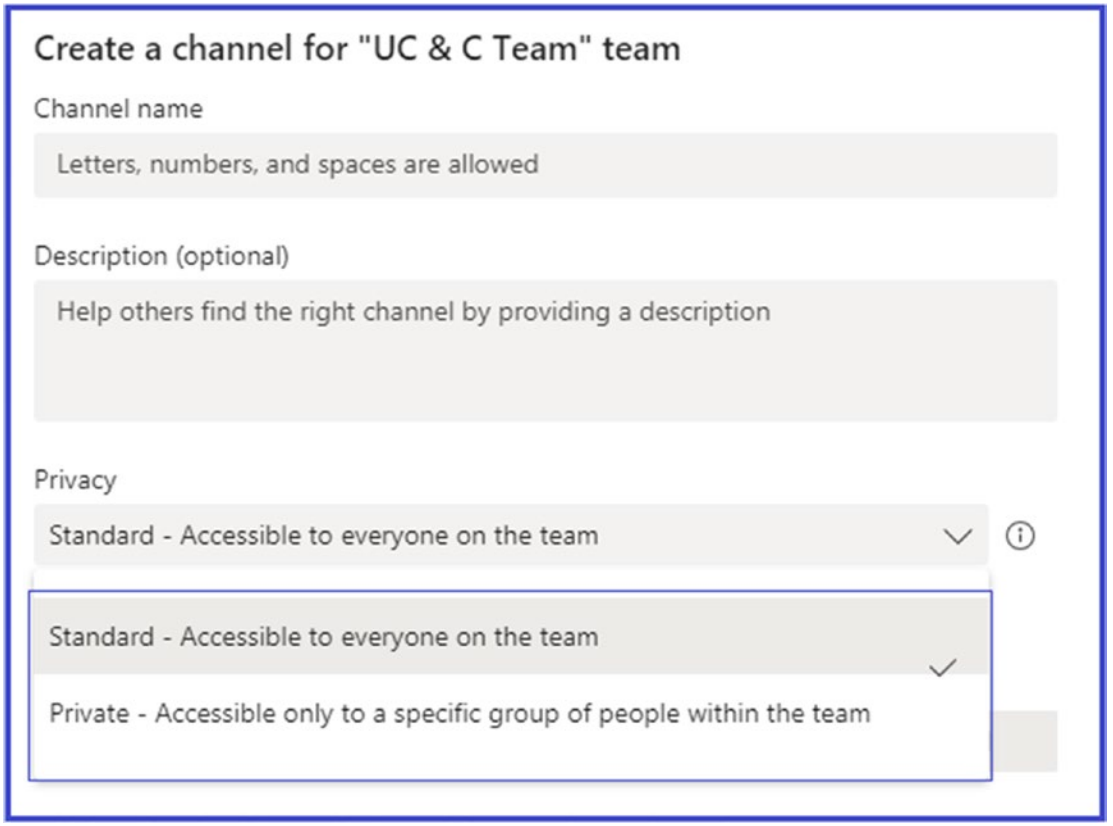

Figure 1-9. *Team channel types and their uses*

Channel use and management are covered in Chapter 2.

How Does Microsoft Teams Manage Identities?

Microsoft Teams is a cloud-only service, which means that users who access Teams must have a cloud identity. It does not mean teams require a cloud-only identity. Teams does support all identity models that are available with Office 365. Teams leverage identities stored in Azure Active Directory (Azure AD), which combines core directory services, application access management, and identity protection into a single solution.

Today Microsoft Teams supports all the identity models that are available in Office 365, including Cloud Identity, Synchronized Identity, and Federated Identity.

- *Cloud Identity model:* Using the Cloud Identity model, a user is created and managed in Office 365 and stored in Azure AD, and the password is verified by Azure AD.
- *Synchronized Identity:* Using Synchronized Identity, the user identity is managed in an on-premises server, and the accounts and password hashes are synchronized to the cloud.
- *Federated identity model:* The Federated Identity model requires a synchronized identity where the user password is verified by the on-premises or online identity provider (e.g., Active Directory Federation Services [ADFS]or Okta).

Most of the organization will use Synchronized Identity for security reasons, as users maintain their on-premises identity. They then synchronize with Azure AD through Azure AD Connect. The organization will want to maintain its own on-premises identity as the source that is synced with Azure AD. Teams then leverages the synced user identity to provide services such as enabling and assigning Teams licenses, creating a Phone System license, enabling Exchange mailboxes, assigning phone numbers, policy assignment, and so on.

The Microsoft Teams authentication process, conditional access, and multifactor authentication are covered in Chapter 2.

Tabs, Files, and Connectors in Teams

The channel tabs, files, and connectors improve the user experience and allow users to configure their frequently used applications to expedite application access.

Tabs

Tabs allow team members to access services and content in a dedicated space within a channel or in a chat. Tabs let a team work directly with tools and data and have conversations about those tools and data, all within the context of the channel or chat.

Team owners, as well as team members, can add tabs in the team channel (standard and private), channel chat, and private chat (one-to-one and group) to use Microsoft cloud applications and third-party applications in the team to manage the information that they use frequently. For example, Microsoft Planner is a useful tool to plan and

prioritize project tasks. Adding a planner as a tab allows users to access their assigned project tasks within the team.

Files

Files allow users to upload new files and share them with team members or access existing files uploaded by another team member in Teams.

Remember, in every channel, the Conversations and Files tabs are created by default. In every private chat, the Conversations, Files, Organization, and Activity tabs are created by default. Apart from the built-in tabs, the team owner and members can design and add custom tabs. Refer to the Microsoft official documentation to learn how to design a custom tab (https://docs.microsoft.com/en-us/microsoftteams/built-in-custom-tabs).

Microsoft Stream and Live event

Microsoft Stream is a Microsoft enterprise video solution that is part of Office 365. Customers can securely create and deliver videos to their organization. Streams support live events through Teams, Stream, and Yammer. Microsoft provides a portal to upload, share, and discover videos that can be used for things like executive communication or training and support. Microsoft Stream allows users to upload videos, search groups and videos, broadcast their live events, and categorize and organize videos. Users can also create a group and Stream that allows users to embed video in Microsoft Teams.

Stream supports Teams video recording. When a user records a Teams meeting by clicking the record button in a Teams meeting, that recording goes out over Stream and all of the sources are fully integrated with Stream, including automatic transcripts, search, the and enterprise security that customers expect from Microsoft Office 365 services.

Microsoft Stream Architecture

Stream is a service, which has a front end and a set of back-end services, as shown in Figure 1-10. Users access and interact with a stream through the front end, the Stream portal that users can access by visiting Microsoftstream.com. Stream support is embedded in videos, channels, and sets of other applications, so customers who are using other applications don't have to leave their application to consume Stream

videos. Stream also supports a simplified form of embedded service. As a result, an application can call Stream to embed an endpoint to dynamically get embedded code and automatically embed videos inside of the application.

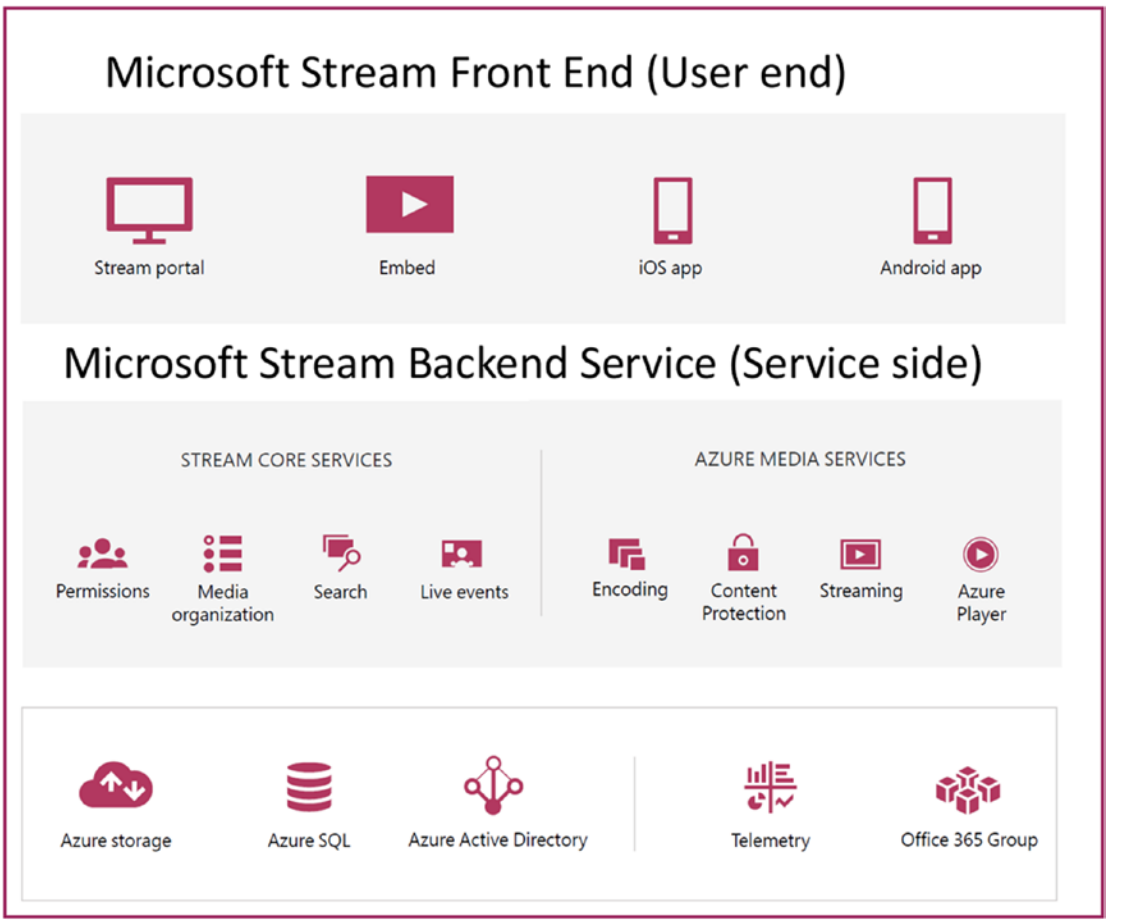

Figure 1-10. *Stream architecture [68a, 69]*

Stream does support iOS and Android apps that are used for consuming as well as creating content on the go using mobile apps.

Streams back-end services include Stream core services, such as permissions, media organization, search, and live events. These services use the Stream business logic. Microsoft implements a permission service that allows users to authenticate and access permitted content when they log in to the Stream portal, which allows users to authenticate and authorize to access their resources on Stream [69].

Media organization is the back-end service that allows access to groups and channels, so Stream implements Office 365 Groups and channels and this service organizes the content.

Search is another back-end service. When a user inputs keywords, that search usually takes place inside the title and description. Stream also does a deep search inside its automatically generated transcripts to find the most relevant content for users.

Stream supports live events, and all the involved logic, including live event scheduling, connection with an encoder, working with Azure Media Services to set up a channel, and getting the whole live event started. That knowledge is implemented inside the back-end service.

Microsoft Stream has dependencies on Azure Media Services. Azure Media Services is the Azure offering that does the media processing of streams through encoding. Whenever a user uploads a video to Stream (Stream supports multiple types of video formats), encoding in Azure Media Services encodes the video in different bit rates to support the various network conditions.

Content Protection dynamically encrypts the video content using Advanced Encryption Standard (AES) 120-bit encryption so that the user content is secure while streaming.

The Streaming service implements the adaptive bit rates so that irrespective of customer network conditions and media player size, streams adapt to these different conditions to provide optimal video quality.

The Microsoft Stream player is based on the Azure Media Player. In addition to that, Stream also has dependencies on other Azure services, including Azure Blob storage. That's where the video assets are stored, including video files, the thumbnail that is generated, and the transcript that is. Stream uses Azure SQL DB to store video metadata, which includes things like the title, description, permissions, and view count. Both Azure storage and SQL DB are encrypted at rest.

Azure AD is also integrated with Stream to authenticate users. Stream is also on top of Office 365 Groups, and Stream uses telemetry services to show uses and performance.

When a user logs in to the Stream portal, authentication happens first so that the user gets validated. After the login, Stream loads the front end from the nearest datacenter. For example, the Bloguc organization tenant is hosted in the United States; however, user Balu is located in India, so the front end is loaded from the datacenter that closest to user Balu, not the tenant that is in the United States. On the back end, Stream determines the back-end tenant location and loads the back-end services for the user.

Where Is My Stream Data Residing?

Microsoft Stream presently hosts data in regions including the United States, Europe, Asia Pacific, Australia, India, United Kingdom, Canada, and the U.S. Government Community Cloud (GCC). Remember, if your tenant is located in one of these regions, then your organization stream data will also be located in that region. However, if a user lives in a region not listed, then Microsoft hosts Stream data in the closest tenant region. Microsoft is planning to host Stream data in few other regions, including but not limited to China, Germany, and GCC-High/GCC-DoD (government community).

Tip To learn the data storage location in Stream, simply log in to Stream and then click About Microsoft Stream.

Microsoft Teams Live Event

Microsoft Teams provides unified communication and collaboration capabilities, including persistent chat, calling, meetings, and live events. Teams meetings are interactive meetings in which both the presenter and attendees can interact with optimal voice and video with application sharing. Teams meetings are limited to 250 attendees, though. When your organization wants to host a larger meeting, such as a broadcast events or organization-wide events with thousands of online attendees, that's where live events comes in handy. Microsoft Teams, through live events, provides an option that enables users to expand their meeting attendees by broadcasting video and meeting content online to large audiences of up to 10,000 attendees.

A live event is created for one-to-many communications (one organizer or presenter to many attendees), where the host of the event conducts the interactions. Attendees, or the audience, views the content shared by the host or presenter. The attendees can watch the live or recorded events in Yammer, Teams, and Microsoft Stream, and they can also interact with the presenters using moderated questions and answers (Q&A) or a Yammer conversation [67].

Live Event Architecture

Figure 1-11 displays the live events high-level architecture. The organizer organizes the live event in either Teams, Yammer, or Stream, depending on the production method chosen. It will be in Teams if all presenters are using the Teams client. If the production type chosen is an external app or device, the presenter can use a production app or tools like media mixer, microphones, speakers, and so on. When more professional video equipment is used and the producer is using Teams or Stream to produce live events, all this content is sent over Office 365, which uses Azure Media Services, where it goes through the Content Delivery Network (CDN) to customers.

On the left in Figure 1-11, you can see the certified third-party Enterprise Content Delivery Network (eCDN) providers (Kollective, Hive, or Ramp) and then content viewed by all the attendees via the Teams client, Yammer, or Stream.

Note eCDN use is not mandatory; however, it will help to save your enterprise bandwidth.

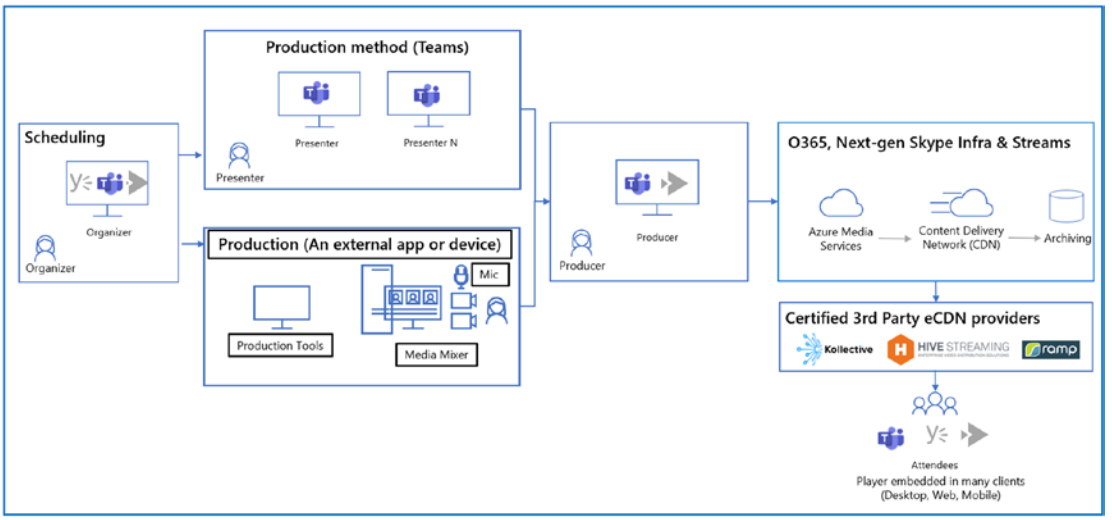

Figure 1-11. *Live event architecture [67, 68]*

How Do Media Flow in Live Events?

As an admin or support person, you must understand the live event architecture and how media flow in a Microsoft Teams Live event. The live events media flow is similar to a Teams meeting. If the Teams production method was chosen, all the presenters will join a native Teams meeting. It is a bit of a special Teams meeting because it has all the presenters controlling the meeting, but from a media perspective it's just a Microsoft Teams meeting. The presenters will send their audio, video, and screen sharing via Real-Time Protocol (RTP) to the meeting service, which sends the RTP traffic to Azure Media Services. If you use an external production method, however, videos provided by hardware or software encoder are sent by the Real-Time Messaging Protocol (RTMP) to Azure Media Services, all of which is basically RTP communication. Figure 1-12 shows how attendees watch Stream via Transmission Control Protocol (TCP) as a stream. Although it is not real-time communication, attendees can watch a live event as near real-time because they are viewing content created multiple seconds after it occurred (delayed); however, from a technical perspective, it is just a TCP stream that they are consuming, that is not sensitive to latency, jitter, and packet loss. If attendees have packet loss or latency network impairment, there might be delays in streaming, but they will not lose any of the content [67].

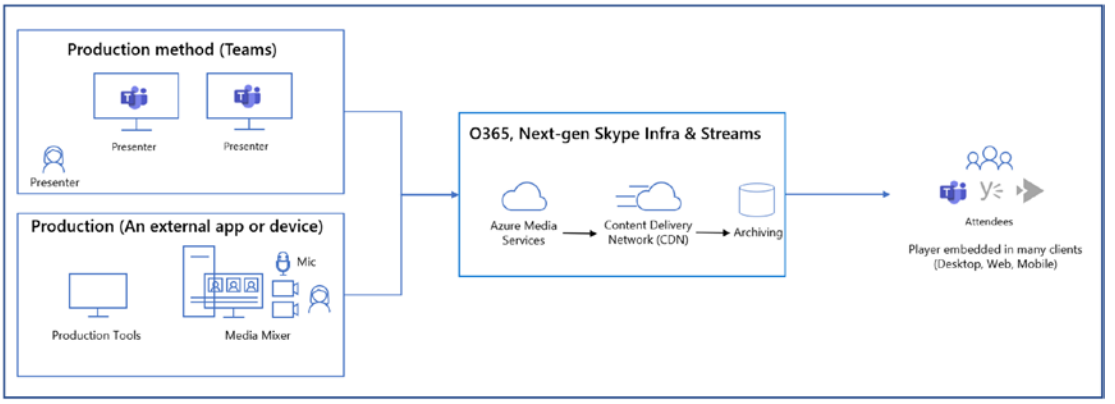

Figure 1-12. *Live event media flow [67, 68]*

How Does Microsoft Teams Live Events Work?

Live events are online meetings with audiences of up to thousands of concurrent viewers, where the presenter team shares audio, video, and content, and audience view that content. In live meetings, there are specific key roles that perform different activities

to run the live event successfully, and every role has different permissions assigned. Here is detailed information about each role.

- *Tenant admin:* The tenant admin has nothing to do with live event operation; however, the tenant admin can configure the live events settings for the tenant and set the right permissions.
- *Organizer:* The organizer of a live event is the person who schedules the event and ensures the event is set up with the right permissions for attendees and the event group, who will manage the event.
- *Producer:* The producer is a host of the meeting. This person is part of the event group, so he or she is invited to the event by the organizer. It is the producer's responsibility to ensure attendees have a great viewing experience by controlling the media sources that are sent to the live event. The producer actually decides whose audioand video goes live in the event.
- *Presenter:* The presenter is the person who presents audio, video, or a screen in the live event, or he or she might moderate the Q&A.
- *Attendee:* An attendee just views or watches the event live or on demand, either anonymously or authenticated. Attendees can participate in the Q&A.

You can schedule live events using different options. As a user or admin, you can schedule the live event in the Teams client, Yammer, or Stream. Producer options for the live event are using the Microsoft Teams client or using the external (third-party) encoder as the source used for production methods. If you are unable to schedule a live event and get an error message that indicates you do not have a live event meeting policy assigned, contact your organization admin to allow you to schedule a live event.

How Does the Live Event Production Method Work?

You can produce a live event using two different methods, using Teams or using an external app or device.

Using the Teams Live Event

In a Teams live event, all audio, video, and content captured from a producer or presenter are joined into a Teams regular meeting. For example, presenters and the producer both join a Teams meeting and share audio, video, and content (see Figure 1-13).

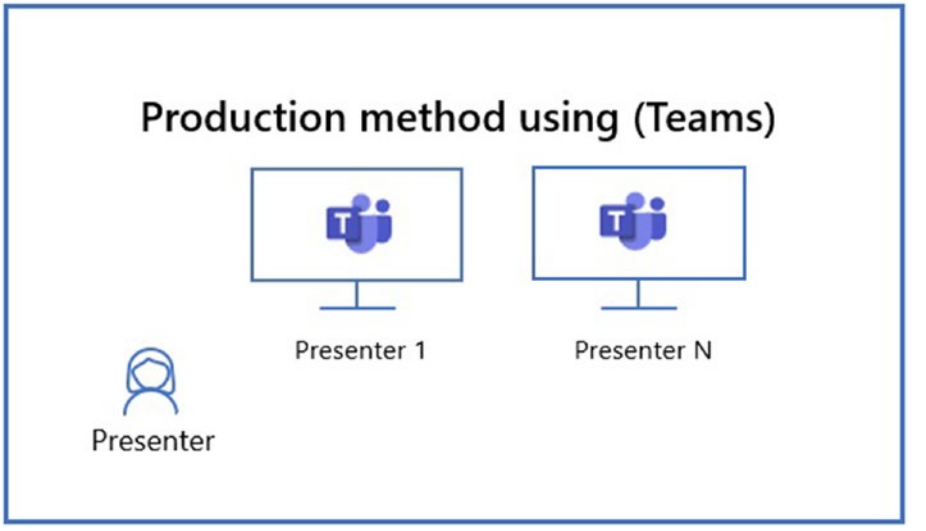

Figure 1-13. *Live event production through Teams*

Using an External App or Device

In an externally coded live event, audio and video come from an external hardware or software encoder (see Figure 1-14). All media comes in one stream and goes into the live event meeting, then it is broadcast to all attendees. Learn more about external encoders by visiting `https://aka.ms/teams-encoder`.

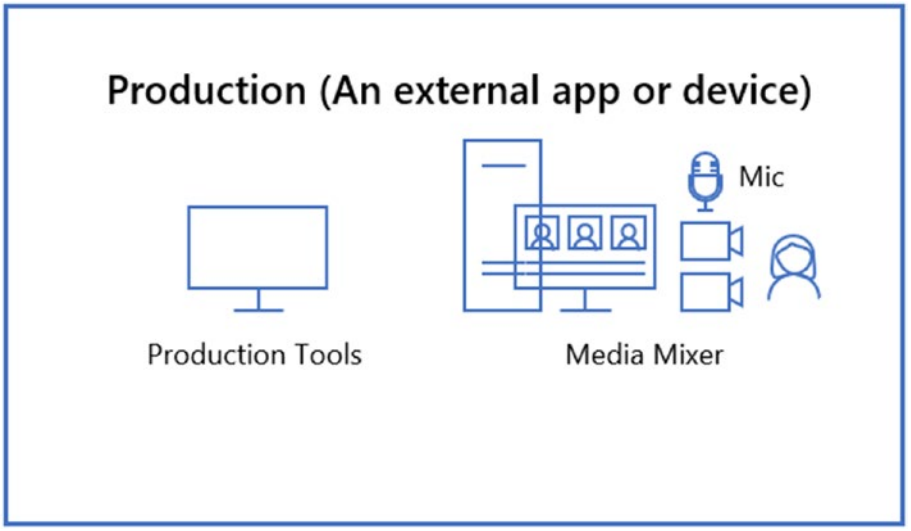

Figure 1-14. *Live event production through external apps [67]*

How Do I Use Live Events Effectively with Minimum Knowledge?

Live events can be scheduled quickly in teams, and users can present and produce live events from a macOS or Windows Teams client with one or more presenters, including application sharing. You can present from a Teams room system, or a presenter can join via phone dial-in to a live event using Teams Audio Conferencing. You, as a live event organizer, can control access to the public, including everyone from an organization, or specific groups or people.

Organizing a live event is very simple: Start by scheduling the event. As shown in Figure 1-15, scheduling a live event in Teams is straightforward. Just click Meeting and then choose Live event and set permissions like public, org-wide, or people and group.

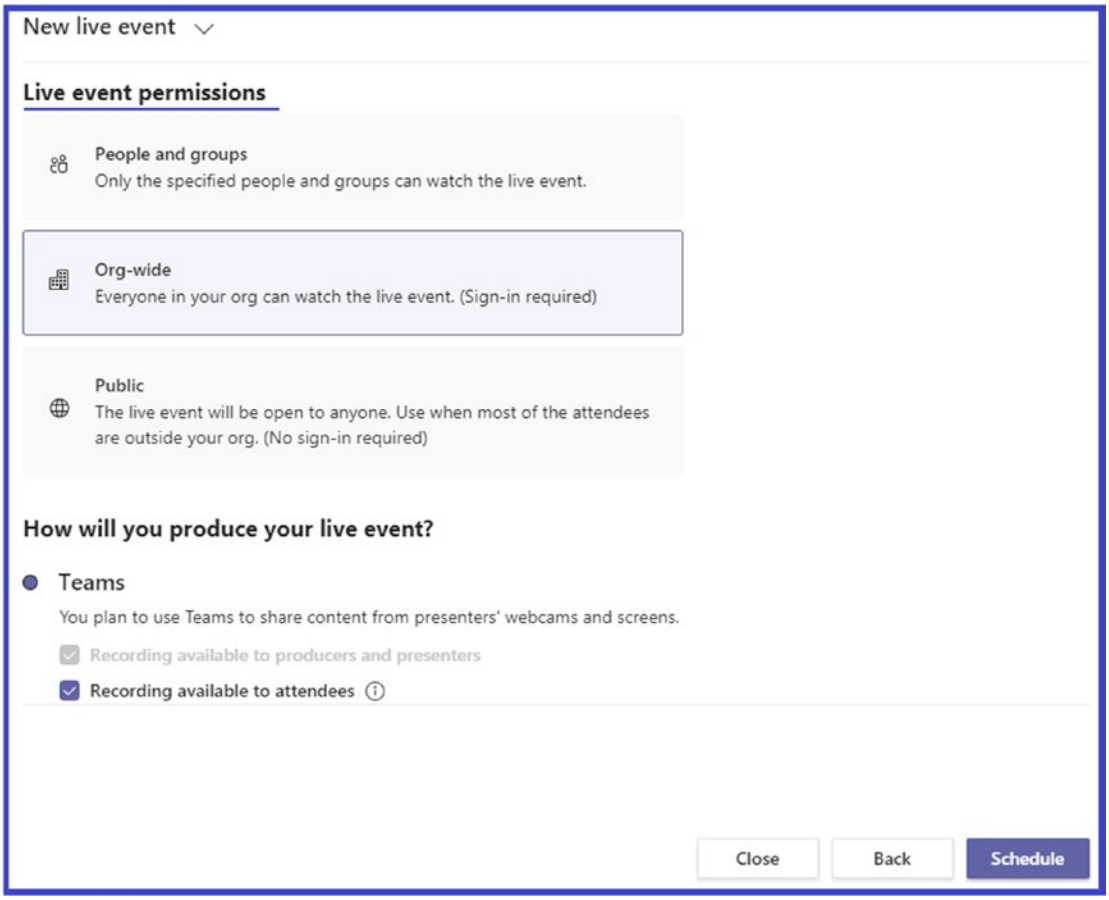

Figure 1-15. *Scheduling a live event [67]*

The next step is to set the production type by selecting a Quick start or third-party production, and then click Schedule to get the event scheduled. The examples in this book use the Teams meeting as a production type, as shown in Figure 1-16.

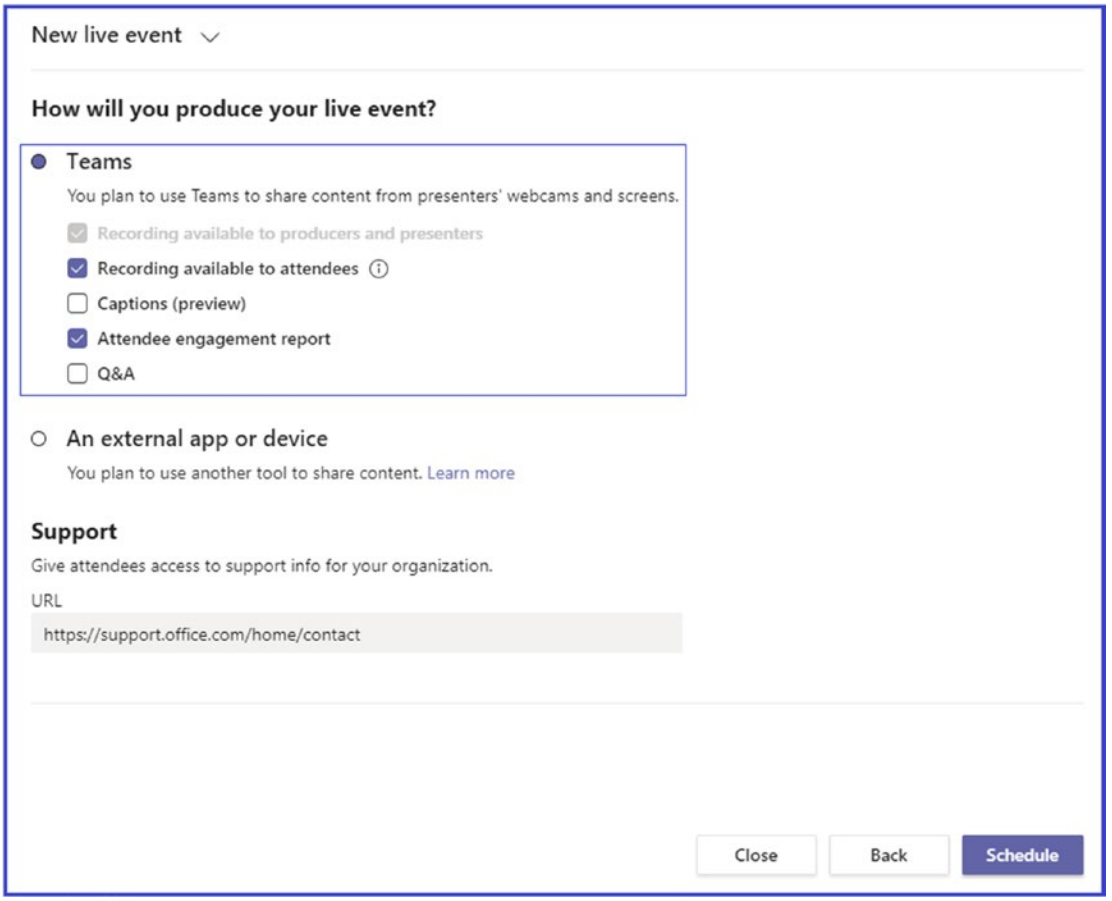

Figure 1-16. *Live event production type [67]*

After the live event is scheduled, the event team can join the event. Figure 1-17 shows the producer view. At the top, you can see two windows, Queue and Live event. On the left you can always queue contents to follow, like presenting a slide after a video. Once the presentation is ready to begin, click Send Live so everyone can see it.

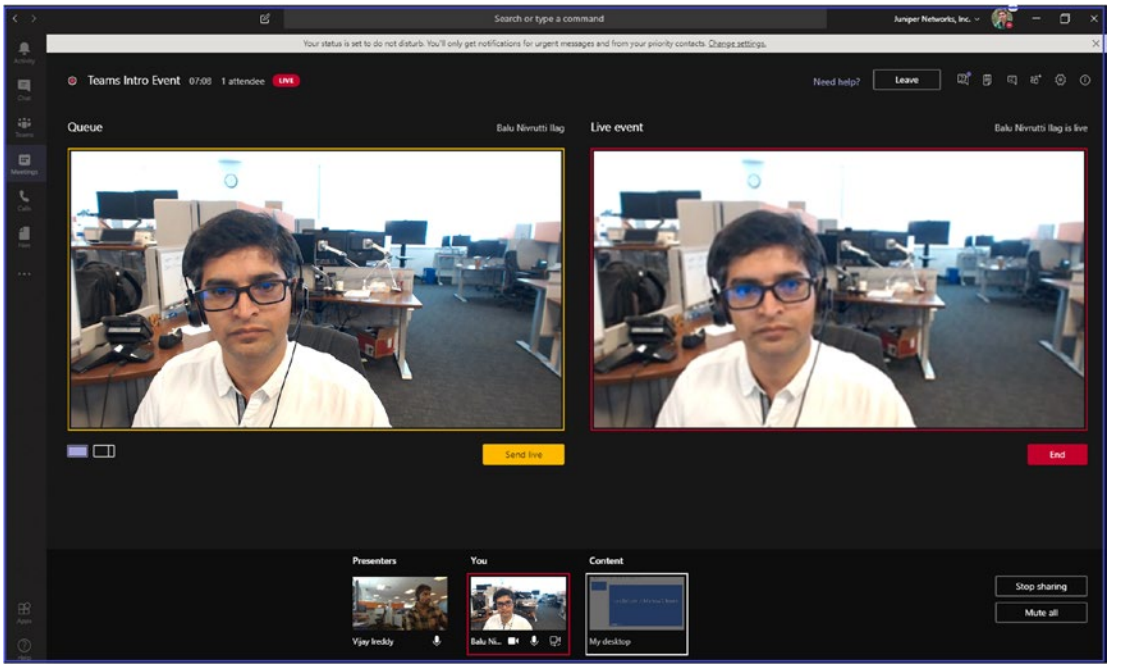

Figure 1-17. *Live event producer view [67]*

Attendees see whatever is presented under the Live event. At the bottom, audience members see different presenters. Event members can choose a different video, people, and content there.

If the presenter decides to schedule a meeting with the Q&A Manager to allow users to ask questions, then they can open or hide the Q&A Manager or keep it open all the time. The producer can send broadcast messages or share links during the session.

Teams Voice and Video Call and Meetings

Teams Voice and Video Calls

Microsoft Teams provides voice and video call capabilities with desktop sharing so that users can elevate their chat conversation to voice and video calls. Teams allows users to have a private, one-to-one call or group calls. This voice and video calling happens through VoIP. Teams voice and video calling has some network requirements, which are covered in Chapter 3 as part of organization preparation and readiness.

Users can make calls to their colleague as internal users, as well as external users, including guests, federated, and external phone calls. All of the following user types can leverage voice and video call capabilities.

- *Teams call with internal users:* These include corporate users who have an account in the same tenant; for example, balu@bloguc.com.
- *Call with guest users:* Guest users are invited to join one or two teams in your organization. That's why they are called guest users. Users who have a guest account in the same tenant can utilize calls and chat in Teams.
- *Call with federated (external) users:* Federated users are users of a different organization with federation configured between both organizations, where both organizations are using Teams; for example, bloguc.com and microsoft.com.
- *Phone (PSTN) call (audio only):* Teams allows users to make phone calls (voice only) using PSTN. However, the user must have enabled enterprise voice to make a phone call.

Microsoft Teams Meetings

Meetings provide a rich set of capabilities using various devices. Teams meetings provide a premeeting, during the meeting, and postmeeting opportunity to collaborate with members.

Microsoft Teams provides a better meeting experience by allowing users to organize easily, prepare, and follow up using pre- and postmeeting experiences like collaboration before the meeting using chat and meet-now. Users can be more engaged and productive by sharing content from desktop (Mac and Windows) or mobile devices and add video to meetings for face-to-face video. Finally, Teams meetings offer excellent audio and video quality and reliability from desktop (Windows and Mac) and mobile devices, phones, or conference rooms. The meeting organizer can also invite external users to join via a web browser. All this meeting experience builds on the foundation of the next-generation Skype infrastructure, and Office 365 services including Exchange, SharePoint, Stream, Microsoft AI, and Cortana [32].

For example, when a user schedules a Teams meeting to discuss project work, they will have the opportunity to engage in premeeting collaboration. For example, before the meeting, they can use the chat that is automatically created for that meeting to discuss the agenda and share files. Members of the team can join from all kinds of different devices, such as desktops (Windows or Mac), Android phones, and iOS phones. Office users can join from a Surface hub, if available. They can also share links, audio, video, and desktops so that everyone can see project materials. Also, they can record meetings so that users who were not able to join live can review the recording as well as any notes created during the meeting and continue collaborating in chat.

Teams meetings have some network requirements, and the network has a high impact on user experience, so it is essential to get the network right to have the best experience possible. Network assessment and bandwidth planning details are covered in Chapter 3.

There are different types of meetings that you can create in Microsoft Teams, depending on the nature of the meeting.

- *Private meeting:* When the user wants to have a meeting with individual people, but does not want the meeting to be visible to others.
- *Channel meeting:* When channel meetings are scheduled in the Teams team, all team members are automatically invited, and they will have access to the discussion and meeting recording if that meeting is recorded.
- *Ad-hoc meeting (Meet now):* When the user wants to meet immediately without previously scheduling a meeting.

Teams meetings do have a meeting life cycle that includes after the experience before, during, and after the meeting.

- *Premeeting:* Users can have contextual conversations in Teams and prepare and discuss content before the scheduled Teams meeting.
- *During meeting:* Users can use face-to-face video, follow the action, share content, record the meeting with transcription, and join from a Teams room quickly.
- *Postmeeting:* Users can play back meetings with transcription, and they can share notes and engage in postmeeting chat and collaboration.

Who Can Attend the Teams Meeting?

As mentioned earlier, Teams allows internal (within the organization) and external (outside organization) participants, but there are more than just these two attendee types, and Teams allows all of them to join a Teams meeting. Depending on what type of attendee they are, however, they will have different information and options in the meeting.

- *Internal users:* These are corporate users who have an account in the same tenant; for example, balu@bloguc.com.
- *Guest users:* These users are invited to join one or two teams in your organization; that's why they are called guest users. Users who have a guest account in the same tenant can join the Teams meeting.
- *Federated users:* Federated users are users of a different organization with federation configured between both organizations. Both organizations are using Teams; for example, bloguc.com and microsoft.com.
- *Anonymous users:* Anonymous users have no account at all or an account in a tenant without a federation.

Remember that attendee type is determined at the meeting join time, and the user cannot change attendee type. For example, if a federated user forgot to sign in, that user will be treated as an anonymous user when he or she joins a meeting. If To join the meeting as a federated user, that user must leave the meeting and rejoin as federated by signing in.

Note It is not possible to promote users from one attendee type to a different attendee type. However, it is possible to demote or promote attendees as presenters or attendees in a Teams meeting.

Teams meetings, including Audio Conferencing details, are covered in Chapter 4. External access (federation) and guest access details are covered in Chapter 5.

Teams Phone System Overview

Microsoft Teams provides cloud voice facilities that are provided from Office 365 cloud services; additionally, it provides Private Branch Exchange (PBX) functionality and options for connecting Teams infrastructure to PSTN. The Phone System is the terminology that Microsoft uses for call control and PBX functionality.

What Does the Phone System Require?

Phone System provides call control and PBX Phone System capabilities that allow an organization to connect the Teams infrastructure to a PSTN provider that allows Teams users to make phone calls to external PSTN numbers. PSTN is essential because it is reliable, universal, and most important, it is deeply integrated with human life. Wherever users go, a phone is there, even when they are in an elevator or in the field somewhere.

Using Phone System in Teams allows users to place and receive phone calls, transfer calls, and mute or unmute phone calls. Calling functionality in Teams supports required Phone System features, such as call answering and initiating (by name and number) with an integrated dial pad, call holding and retrieving, call forwarding and simultaneous ringing, call history, voicemail, and emergency calls. Users can also use a different range of devices to establish calls, including mobile devices, headsets connected to a computer, and IP phones [71].

Now you understand why calling and Phone System is required in Teams. However, you should learn about the different components involved in Teams calling and Phone System that combine to provide complete Teams Phone System capabilities.

- *Phone System:* Teams Phone System is an add-on license on top of the Teams license that provides phone calling capabilities in Microsoft Teams. It turns on everything from simultaneous ringing to call queues to emergency calls.
- *Calling Plans:* These provide a way to connect Teams Phone System to the PSTN using Microsoft as a service provider through a Calling Plans license.
- *Direct Routing:* If an organization wants to continue with its existing PSTN service provider and wants to connect that on-premises session border controller (SBC) to the Teams Phone System, that can be

achieved Phone System through Teams Direct Routing functionality. It is another way to connect to the PSTN, where customers interface existing PSTN services to Teams through an on-premises SBC.

- *PSTN:* The PSTN is the aggregate of the world's circuit-switched telephone networks that are operated by national, regional, or local telephone operators, providing infrastructure and services for public telecommunication [70]. The PSTN needs to integrate Teams modern software with modern coding technique.

Teams Phone System details, including phone number management, Direct Routing, phone number porting, and call queues are covered in Chapter 4.

Microsoft Teams Licensing Requirement Overview

Microsoft has designed Teams licensing to provide maximum flexibility for the organization. After using basic Teams features including chat, internal calls, and content sharing, you as an admin can buy add-on licenses for more features, such as Audio Conferencing, Phone System, Calling Plans, and Microsoft Teams rooms.

Table 1-1 shows all Office 365 subscriptions that include Microsoft Teams.

Table 1-1. *Teams License*

Small Business Plans	Enterprise Plans	Education Plans	Developer Plans
Office 365 Business Essentials	Office 365 Enterprise E1	Office 365 Education	Office 365 Developer
Office 365 Business Premium	Office 365 Enterprise E3	Office 365 Education Plus	
Microsoft 365 for Business	Office 365 Enterprise E4 (retired)	Office 365 Education E3 (retired)	
	Office 365 Enterprise E5	Office 365 Education E5	
	Office 365 Enterprise F1		

Note All supported subscription plans are eligible for access to the Teams web client, desktop clients, and mobile apps.

- Is Teams meeting included in all Office 365 subscriptions?
    - No, Teams meetings are included in almost all the Teams licenses, with the exception of the F1 license, which doesn't have Teams meetings.
- What Teams license do I need to use for Teams Audio Conferencing?
    - If you want to use Teams Audio Conferencing, which gives you the ability to dial in and dial out from and to phones, this requires an additional license. An Audio Conferencing license is included in an E5 license or is available as an add-on for E1 and E3 licenses.
- Do I need a separate license to use the Teams Phone System and calling?
    - Yes, you need an add-on Phone System license or E5 license that includes a Phone System license on top of that. To use phone calling you need Calling Plans. Each user will need Phone System plus a domestic or domestic and international calling plan to allow them to make and receive phone calls.
- Is a Microsoft Stream license included in all Office 365 subscriptions?
    - A Microsoft Stream license, which provides the ability to record Teams meetings, requires E1, E2, E3, A1, A3, A5, Microsoft 365 Business, Business Premium, or Business Essential. Remember this is the case for both the organizer and the user who initiates the recording.
- Do I need any license to schedule a live event?
    - Yes, to schedule Live event, you need the following licenses:
    - An Exchange Online mailbox.

- An Office 365 Enterprise E1, E3, or E5 license or an Office 365 A3 or A5 license.
- A Microsoft Teams license.
- A Microsoft Stream license.

By default, Teams is turned on for all organizations. Administrators can assign user licenses to control individual access to Teams and allow or block which content sources are used.

Teams Integration with a Third-Party Application

Microsoft Teams provides greater customization within the Teams client by changing color themes and notifications within Teams customization for channel tab, connector, bot, and Microsoft apps, as well third-party apps integration. All this communication, collaboration, and customization happens securely with compliance capabilities.

Microsoft Teams provides a default set of apps published by Microsoft and by third parties that are designed to connect users, support productivity, and integrate commonly used business services into Teams. For example, users can use the Planner app to build and manage team tasks in Teams. These apps are available to organizations through the Teams Store. By default, all apps, including custom apps that your organization has submitted through the Teams Store approval process, are turned on for all users. Although all Microsoft apps and all custom apps are available by default, you can turn the availability of individual apps on or off. For efficiency, an organization-wide setting is available that allows you to turn all custom apps on or off for your entire organization.

Teams apps are a way to collect one or more capabilities into an app package that can be installed, upgraded, and uninstalled. The capabilities include the following:

- Bots.
- Messaging extensions.
- Tabs.
- Connectors.

Apps let you find content from your favorite services and share it right in Teams. They help you do things such as pin services at the top of a channel, chat with bots, or share and assign tasks. Microsoft recommends that you add featured apps such as Planner in your initial Teams rollout. Add other apps, bots, and connectors as you drive Teams adoption.

Managing apps policy and administration is covered in Chapter 5.

Summary

In this chapter, you were introduced to Microsoft Teams, its architecture, and the different components involved. You also learned about Teams service dependency, live events and Stream architecture, Phone System, licensing requirements, and Teams apps integration opportunities.

Now that you have completed this chapter, you should understand the following:

- Microsoft Teams architecture and different components.
- How Microsoft Teams interacts with SharePoint Online and OneDrive for Business.
- How Microsoft Teams interacts with Exchange.
- What live events are and their architecture.
- The uses of Microsoft Stream and its architecture.
- Teams Phone System and voice communication capabilities.
- Teams licensing requirements and add-on licenses.
- Microsoft Teams integration with Office 365 and third-party applications.