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SOLUTION BRIEF

Deploying Microsoft Teams

ARCHITECTURE AND CONSIDERATIONS FOR DEPLOYMENT IN A NON-PERSISTENT CITRIX VDI ENVIRONMENT

This article provides an overview of Teams architecture, potential pain points, and architecture recommendations with a focus on deployment in a non-persistent Citrix VDI environment. As Covid precautions continues to drive business trends, Microsoft Teams usage has continued to increase as it has been added to the default Office 365 suite and increased in functionality. Usage in 2020 compared to 2019 is up around 600% compared to the previous year.

At first glance admins could believe Teams is a typical collaboration tool such as Citrix Podio or a meetings app such as Citrix GoToMeeting. It is possible for Teams to replace the aforementioned tools, however, getting there is not simple and requires significant pre-planning and implementation of additional Microsoft components. Managing Teams within a VDI environment also adds additional issues and considerations.

There are three major design decisions for an admin deploying Teams for VDI: install location, endpoint device and Citrix optimization feature. The pros and cons of each option will be covered in detail below.

For now, most of our customers are moving forward with AppData install location to allow not running Teams at login, and Citrix optimization disabled. Once the major feature gap of chat screen sharing is resolved we will then enable Citrix optimization. This means considerations must be taken for profile size increases for the Teams install files for every user.

Disclaimer: *MS Teams is one of the fastest changing Office applications and currently is on a bi-weekly update schedule. This can make any recommendations obsolete without notice from Microsoft. At the time of this article creation Teams is on version 1.4.00.2879.*

MS TEAMS DEVELOPMENT DESIGN

Teams is fundamentally an end-user friendly wrapper for SharePoint where every “MS Team” creates a SharePoint team site collection and group. Teams allows for users within a team channel to share documents, collaborate on Office 365 content, video / audio call users, chat, and set up meetings. These features all sound great to an admin wanting to enable his end-users. However, execution requires more then simply deploying the Teams app onto a desktop.

One way to describe the complexity of Teams by defining it as an Electron framework-based wrapper for SharePoint, which uses OneDrive to store data, and Squirrel to auto-update. What this means to an admin / architect is:

- **Electron framework:** The app is just a wrapper for the Teams website which means it is not as optimized for a virtual desktop and can be a huge CPU and memory hog. This coupled with the fact it prefers to load at logon, means your logons can become slowed just by installing the Teams application.
- **Wrapper for SharePoint:** Every MS Team channel made automatically creates a SharePoint team site where documents are stored. A lot of work and planning must go into who can create and manage teams or the sprawl can get out of hand quickly as well as introduce potential for data security loss. The larger number of teams a user is in correlates to a larger memory and storage footprint for the application as well.
- **OneDrive for Storage:** Teams can be stored in a user’s profile to decouple it from the OS and ensure faster loading at logon. However, as Teams grows in usage, the storage footprint can get very large and this gets multiplied for each user resulting in a need for a lot of storage and for fast drives to keep up with the reads & writes.
- **Squirrel Auto-update:** By default, Teams is installed into user appdata and will automatically update while users are using the application. This results in an inability to establish change controls for version updates and feature releases. The fact that the application is constantly fixing bugs and rolling new features means a good change control process is imperative to keep up to date if installing per machine.

SHOULD I INSTALL PER-MACHINE OR PER-USER?

It is important to understand that Teams typically updates on a bi-weekly basis with Microsoft reserving the right to push "features" at any time. This is one of the reasons installing in appdata is nice because user's profiles follow them, and you do not have to update your image every two weeks to keep it up to date. A zero day or a business enhancing feature released will be able to be introduced to the environment quickly.

However, an environment breaking patch can also be released uncontrolled if installed per-user. For example, Citrix optimization was only available when deploying on the system drive. However, with a recent patch this was no longer true, and Teams automatically switched to Citrix optimization mode which has limited features. These types of issues result in a significant number of help desk calls until a workaround could be implemented.

The original version of this article in early 2020 recommended installing per-user as it allowed preventing Teams from auto-starting. This let users who were not interested in teams not have it launch and reduced the infrastructure resource requirements of every user having a Teams session. However, as Covid precautions stuck around and adoption drastically increased it no longer makes sense to allow per-user installs to persist and provide inconsistency in the environment.

The migration from per-user to per-machine is automatic. Microsoft will convert the install when a per-user logs into a per-machine image. We noticed two commons issues and one rare one:

- Taskbar shortcut must be unpinned and repined as it still pointed to per-user install
- Teams Outlook add-in pointed to the old per-user install and had to be fixed with a registry key update
- Rarely the migration did not work successfully. In the session as an admin, Teams had to be uninstalled and then reinstalled

The following lists the pros and cons of per-machine and per-user:

Per-Machine Pros:

- It is possible for an individual's per-user install to become corrupted. This then requires a help desk call where their Teams install needs to be recreated. Installing on the system drive prevents this scenario.
- Per-machine install prevents auto-updating which allows proper QA of new Teams releases
- Most virtual desktop optimization clients recommend per-machine installs

Per-Machine Cons:

- Teams updates frequently and bug fixes must be implemented often to keep up to date in the golden image.
- Once a user launches teams you are unable to prevent auto-launch of teams. Teams will always auto-launch and cannot be turned off by the user.
    - Teams consumes all session resources to launch. This effectively means auto-launching is increasing your user logon times because the session will be unusable until teams finishes launching.
    - Note that there are some hacks copying XML configuration files that sometimes work but these can be cumbersome to maintain and will not necessarily continue to work in future version.

Per-User Pros:

- Teams can be prevented from auto-launching by an admin by default and a user can toggle auto-launch on or off.
    - Reduces login times
    - Reduces resource consumption for virtual machines
- Teams stays current by automatically updating.

Appdata Cons:

- Teams disk storage requirements multiplies by every user instead of the number of machines.
- Teams auto-updater can corrupt or introduce "features" without the ability to test or QA before going live.

WHAT END DEVICES DO I NEED?

The decision is largely dependent on whether optimization will be enabled as described in the next section. If unoptimized, the end-device is less important as most of the computation occurs in the VDI, however all audio and webcam must still traverse the network to the VDI. Different end-devices map audio/video peripherals into sessions differently based on agent vendor whether Citrix, VMware, or WVD and whether the device is Windows, Mac or Linux. This can provide a wide disparity in end-user experience if a standard is not implemented.

If Optimization is enabled, the end-devices are now rendering the audio/video and transmitting directly to Teams servers. This increases outbound network load to the internet for your branch sites. Different VDI vendors provide different Optimization feature sets based on agent version and end-device OS. For instance, currently WVD only supports Microsoft end-devices while Citrix supports Windows, Mac, and Linux for optimization.

SHOULD I LEAVE ON OPTIMIZATION?

Microsoft has worked together with virtual desktop vendors such as Citrix an VMware to implement optimized mode of Teams. This enables H.264 redirection optimization for audio and video in the Teams app. While significantly improved over 2020 there are still potentially deal-breaking feature limitations in the optimized version of Teams.

Optimize Pros:

- Optimizing allows Teams to efficiently manage and redirect audio and video. This will improve performance while reducing server resource utilization.
  - Audio does not have to double hop between end-device, VDI, and Teams servers but instead goes directly to Teams servers.
  - Audio and webcam video is not rendered in the VDI reducing resource utilization
- Mapping of audio and webcam devices functions more natively without leveraging VDI vendor technologies such as Citrix HDX audio which can be buggy.

Optimize Cons:

- Optimization relies on the implementation by the vendors agent and the version of Teams in the VDI. The pace with which versions are released provides a significant operational requirement to stay up to date.
  - End-client agent versions must be released by vendor such as Citrix and VMware and then updated on the end-device. The Teams version in the VDI must also be updated if per-machine installed.
  - If thin-clients are used as end-device, the updates can be further delayed as the vendor agents are typically included as part of the thin-client OS. This means operations must validate and deploy new OS versions of thin-clients as well as testing in VDI.
- Features are limited as defined in section below.

Unoptimized Pros:

- Almost the full feature set of Teams as compared to physical device install.
- Teams functions the same way as all other conferencing tools such as Webex reducing user confusion.

Unoptimized Cons:

- Audio and video performance is reduced and heavily dependent on the end-device and VDI network stability. Any latency or bandwidth issues are compounded due to the double-hop between device, VDI, and Teams servers.
- Audio and video device instability causes users to have to restart Teams and sometimes and the VDI session itself to continue working after crashing.

CURRENT LIMITATIONS WITH TEAMS OPTIMIZATION ENABLED

As of March 2nd 2020, the following Teams Optimization features are not available compared to the physical version:

The following Teams Sharing features are not supported:

- Can only share PowerPoint or the primary monitor
- Cannot request or give control during screensharing
- Cannot share screen and webcam at the same time
- Can only share your webcam and view the current speaker's webcam. This limitation is made worse in that the switching between the current speaker is slow. This means if you have multiple people talking quickly after each other, Teams is not able to show each user as they speak.
- Shared system audio/computer sound when presenting

Teams accessibility features are not supported:

- Zoom text size control is removed
- Any multi-window functionality like the new meeting experiences or any functionality that comes with the new meeting experience

The following calling and meeting features are not supported:

- Enhanced emergency service
- HID buttons and LED controls between the Teams app and devices
- Background blur and effects
- Broadcast and live event producer and presenter roles
- Location-Based Routing (LBR)
- Call park
- Call queue
- Media bypass for Direct Routing

WHO SHOULD BE ABLE TO CREATE A TEAM?

We are not going to cover this topic in-depth in this article, but it is worth mentioning that this question is likely one of the most important when designing Teams as a solution. The proper creation and moderation of Teams is critical to maintaining data security and preventing team / channel sprawl and subsequently limiting the resource impact on your environment.

CONCLUSION

The feature set and integration into the Office suite makes MS Teams a compelling app to deploy into your VDI environment. It can be tempting to include the Teams app with the rest of the Office 365 installation to gauge end-user interest. However, Microsoft's decision to develop Teams using Electron and Optimization limitations requires VDI architects to consider unique design decisions compared to the rest of the Office 365 suite. The fast pace and complexity to implement Teams requires careful planning, design and proper hardware prior to implementation to prevent data loss and performance degradation.