Calling, Meeting, Video Conference, and Telephony in Microsoft Teams: State of the Art

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Alessandro Appiani - About me

- 30-years experience in IT Technologies and Solutions
- Computer Science Master’s Degree (magna cum laude) in 1989
- Founder of Italian Association for Artificial Intelligence in 1988
- Microsoft Certified since 1995
- Microsoft TechNet speaker & Train-the-trainer since 1996
- MVP, MCT, MCITP Windows+Exchange+Lync+Office365
  - Microsoft Most Valuable Professional Skype for Business (Office Servers)
  - Microsoft Exchange Expert since first product release (Exchange 4.0 - 1996)
  - Microsoft Lync/Skype Expert since first product release (LCS 2003)
  - Microsoft Office 365 Expert since first Cloud version (BPOS - 2009)
- Pulsar IT Founder & CTO
  - technologies, strategy, digital transformation, advisory, ...
- Twitter: @AlexAppiani
Microsoft Excellence since 1995

www.pulsarit.net

Design, Deploy, and Support Microsoft Solutions

Enterprise Collaboration
Teams, OneDrive, SharePoint, Skype, Exchange, Office 365 Apps

Telephony & Enterprise Voice
Skype for Business Telephony, Microsoft's Phone System / Cloud PBX

Smart Working & Devices
Trusted environment for Smart Productivity

Modern & Hybrid DataCenter
Azure, Windows Server, Hyper-V, System Center

Enterprise Mobility + Security
PC & Device Management, Mobile Application Management, (Hybrid) Identity-based Security
Agenda

• Teams Communications
  • Intro
  • Architecture
  • Network & Protocols
• Calling
• Meeting & Video Conferencing
• Telephony
• Skype to Teams Roadmap
• Q&A
Disclaimer

• I’m working on Microsoft Communications since 2006 (Exchange UM, OCS 2007 Beta) ... but I’m not a Microsoft employee!
  • My first PBX & PSTN integration with OCS was implemented on Spring 2007 ... more than 10 years experience 😊

• Thinkings, strategic info, and opinions here expressed are mine 😊
Microsoft Teams

• “The hub for teamwork in Office 365”
• A premiere Collaboration & Communication tool
• In this session we will focus on Communications
ARCHITECTURE
Teams logical architecture

- Tabs
- Apps
- Chat
- Modern Group
- Team
- SharePoint Folder
- Channel
- Tabs
- Apps
- Messages, Emojis, Stickers, Giphy, Recordings
- Reply Chain
- Message
- Activity Feed
- Calling
- Meetings
- One Drive
- Contacts
High level architecture

Teams
- Web
- Desktop (Electron)
- iOS App
- Android App
- Graph API

Services
- Settings and O365 access
- Messaging
- Audio / video
- Teams services
- Chat & Presence services
- Bots
- Calling / Meeting
- PSTN
- Connectors
- Publish / Subscribe
- Stream Recording
- Push Notifications
- Exchange
- Search
- Notification service
- Information Protection
- Email service
- Graph Webhook

Other Workloads
- Notes
- OneNote
- WAC
- OneDrive for business
- SharePoint
- Exchange
- Experimentation
- MRU
- Calendar
- Most recent files

Telemetry
- AAD
- Policy
- SMTP
Calling (Audio & Video)

Teams Client

Chat Service
Conversation Service
Notification service
Media Services
Call Controller
Registrar

message sync
messages
create call, join call, ...
incoming notifications
media
Roster, Transfer, Renegotiate
register as callable endpoint

call state messages
client notifications
incoming call notification
callable endpoints?

Policy store
Voice Gateway
Calling SfB Interop / PSTN

Next Generation services for VOIP
Leverage SfB services for PSTN

Skype for Business Online services

SfB Resource Forest
SfB User Forest
NETWORK & PROTOCOLS
Teams is a new world

• Collaboration & Communications in the Modern Workplace

• Teams is Cloud-born
  • Leverage Microsoft new Azure-based Skype Communications Platform

• Teams is Cloud-only 😊
  • We have to plan and deploy accordingly
Firewall & Routing planning

• Rules of thumb
• Shortest path to Office 365 is best
• Closing ports will only lead to quality degradation
• Any obstacles in between such as proxies are not recommended
• General flow & hops
  • Client to Network Edge, 3 to 5 hops
  • ISP to Microsoft Network, 3 hops
  • Microsoft Network Edge to final destination, irrelevant

• Get Office 365 traffic to Office 365 ASAP
Microsoft Global Network

Global footprint

- Microsoft’s global network is one of the top two networks in the world
- Tens of thousands of route miles of privately-owned dark fiber
- Peered with over 2700 ISPs globally in 190 locations and 38 countries
- Available for 90+% of the internet connected population with metrics comparable to the Tier 1 ISPs/Telcos
- Media processors & relays deployed to 50+ Microsoft data centers and edge sites with more being deployed

Optimized for media

- Fiber connections designed to reduce latency between regions
- Edge sites placed close to the users to reduce number of hops and latency
- Keep improving ISP peering performance based on Skype call quality telemetry
- Audio traffic prioritized throughout the Microsoft Global Network
- Meetings hosted close to the participants
- Single consolidated IP range for calling and media

Microsoft’s fiber optic network could stretch to the moon and back, three times over!
From Teams to Microsoft Online Services

Customer Network → Internet Provider Network → Local Microsoft Network Entry Point → Microsoft Owned Network with Maximum Performance → SfB Online Services

- American Branch Site: Teams Client
- American Internet: Customer Edge Router
- American Microsoft Edge: Public Internet
- Transatlantic Backbone: Microsoft Edge (Azure Front Door)
- European Datacenter: Microsoft Online Servers
QoS?

- Small <250 seats won’t deploy QoS
- Larger will deploy QoS and planning is essential

Oversubscription = dropped packages or next queue
CALLING

... and Media Streaming
Basic call flows principle --- same as Skype for Business

Call Flows – 1:1 Call Direct

Chat Service users Port 443 TCP (see long list of FQDNs)

Direct media connection

Call Flows – Multi-Party

In “Meetings”, audio gets mixed in O365 and sent out to all participants. Video and desktop sharing is also sent to O365 and distributed from there.

Call Flows – 1:1 Call Firewalled

O365 functions as a relay for the media traffic, if direct connections are not possible.

Media ports from the participant to O365 use: UDP 3478, 3479, 3480, 3481, TCP 443
Teams Audio / Video Communications: Skype is the backbone

• Audio / Video Communication is online only
  • Skype for Business on-premises not used and not required
• Teams & Skype for Business loosely coupled
  • “Federated” integration
  • Presence is independent (integration / unification in roadmap)
  • Chat & Calls enabled from-to Teams users and Skype for Business Users
• Teams and Skype Consumer interop not available (initially in roadmap, but now stripped 😞)
Meetings & Distributed User/Endpoint

• No matter where the tenant is located, users in single regions always have meetings in their region
  • A meeting will always be located in a data center closest to the first user joining

• Distributed relay for media transport
  • Each user «speak» with closest DataCenter to minimize latency
## Performance Requirements

*For optimal Teams media quality, the following network performance metrics must be met*

<table>
<thead>
<tr>
<th>Metric</th>
<th>Client to Microsoft edge</th>
<th>Customer edge to Microsoft edge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latency (one way)</td>
<td>&lt;50ms</td>
<td>&lt;30ms</td>
</tr>
<tr>
<td>Latency (RTT or Round-trip Time)</td>
<td>&lt;100ms</td>
<td>&lt;60ms</td>
</tr>
<tr>
<td>Burst packet loss</td>
<td>&lt;10% during any 200ms interval</td>
<td>&lt;1% during any 200ms interval</td>
</tr>
<tr>
<td>Packet loss</td>
<td>&lt;1% during any 15s interval</td>
<td>&lt;0.1% during any 15s interval</td>
</tr>
<tr>
<td>Packet inter-arrival jitter</td>
<td>&lt;30ms during any 15s interval</td>
<td>&lt;15ms during any 15s interval</td>
</tr>
<tr>
<td>Packet reorder</td>
<td>&lt;0.05% out-of-order packets</td>
<td>&lt;0.01% out-of-order packets</td>
</tr>
</tbody>
</table>

[https://support.office.com/en-us/article/Media-Quality-and-Network-Connectivity-Performance-in-Skype-for-Business-Online-5fe3e01b-34cf-44e0-b897-b0b2a8d70017](https://support.office.com/en-us/article/Media-Quality-and-Network-Connectivity-Performance-in-Skype-for-Business-Online-5fe3e01b-34cf-44e0-b897-b0b2a8d70017)
DEMO
MEETING & VIDEO CONFERENCING
Teams meeting (powered by Skype)

- Meetings are video-based
- Network guidelines similar to SfB apply (firewalling/ports, bandwidth, ...) with some differences
- Each participant can receive up to four video streams
- When more than four participants (max 250), the most recent four speakers will be shown
- A/V protocols are the ones of Skype (SILK, H.264, Opus, ...) not SfB

[1] Prepare your organization's network for Microsoft Teams
https://docs.microsoft.com/en-us/microsoftteams/prepare-network
[2] Known issues for Microsoft Teams
https://docs.microsoft.com/en-us/microsoftteams/known-issues
[3] Limits and specifications for Microsoft Teams
https://docs.microsoft.com/en-us/microsoftteams/limits-specifications-teams
Familiar experiences and capabilities across all end points and devices

Desktop
- Windows 7+
- OS X 10.10+

Mobile
- iPad
- iPhone
- Android

Browsers
- Edge
- Chrome
Frictionless join for Mobile meetings
A range of certified devices in every size, for every space and working style
Video Conference Interoperability

- Enables interoperability between Microsoft teams and your existing meeting room technologies

- Legacy devices can now be full-fledged participants in Teams meetings

- Polycom Available Today
- BlueJeans and Pexip soon
Work is changing

**NEW WORKSTYLES LEAD TO NEW EXPECTATIONS FOR VOICE**

→ **COLLABORATION IS CENTRAL**

- 50% increase in collaborative work
- 80% of employee time is spent collaborating
- 2x as many teams
- 62% connect to meetings using mobile phones
- 72% of workers will be working remotely by 2020
Microsoft is (still) committed to voice

<table>
<thead>
<tr>
<th>#1</th>
<th>3B</th>
<th>79%</th>
</tr>
</thead>
<tbody>
<tr>
<td>New voice seats sold for Office 365</td>
<td>minutes of voice and video per day on the Skype ecosystem</td>
<td>of U.S. enterprises are deploying or planning to deploy voice in Office 365, including telephony</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>135M</th>
<th>90+</th>
<th>12 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft Office 365 monthly active users</td>
<td>countries with audio conferencing available</td>
<td>as a leader in the Gartner Unified Communications Magic Quadrant</td>
</tr>
</tbody>
</table>
Calling for the Cloud

Phone System, when paired with Microsoft Calling Plans and/or Direct Routing, provides a full business calling experience for Office 365 users in Teams on a global scale.
Connecting the PSTN

• Microsoft Calling Plans
  • Microsoft as a Telco provider (Carrier)
  • Bring your phone numbers to Microsoft
  • Not available in Italy
• Office 365 Direct Routing for Teams
  • Leverage Onpremises Telephony
    • existing PBX (integration)
    • existing Telco PSTN Connectivity
    • legacy devices (analog, fax, ...)
  • Keep your numbers with traditional Telco/Carrier

Microsoft Calling Plans Availability
- Europe - Belgium, France, Germany, Ireland, Netherlands, Spain, UK
- North America – US, Puerto Rico, Canada

3rd Party Calling Plans Availability
- Australia (Telstra)
Direct routing for Teams

Session Border Controllers (SBC) from certified partners such as AudioCodes or Ribbon
DEMO
Skype to Teams Roadmap (as July 2018)
Roadmap & Transition notes

• Microsoft is implementing in Teams huge of features available today for Hybrid and Online Users
  • **main focus in now on Online Users**, Hybrid and On-premises will follow

• Roadmap schedule is strong, but a lot of work has to be done for complete feature-parity (from User expectation point-of-view too)
  • maybe mid/end 2019 will be reasonable time

• Coexistance & migration with Skype for Business will be a hard job to deliver! 😊
Summary

• Teams will replace Skype for Business for Online Users
  • on-premises users may run Skype for Business and Teams side by side
  • Teams include new Skype cloud-born architecture
  • Skype for Business Online will be retired (starting this month 😊) and Tenants migrated to Teams/Skype (on demand)
• Voice & Video architecture to new Skype/Teams platform is changing
• Skype for Business on-premises will be maintained and evolved
  • new Skype for Business Server 2019
• Hybrid will protect investments (in voice / telephony too)
Resources

• General:
  • Start using Microsoft Teams: teams.microsoft.com/start
  • User community forums: aka.ms/teamscommunity
  • Product feedback: aka.ms/teamspublicfeedback
  • Help videos: aka.ms/teamshelpvideos

• For IT admins:
  • How to successfully plan, deliver, and operate: aka.ms/myadvisor
  • Intelligent communications: https://aka.ms/skypeandteams
  • Detailed training videos: aka.ms/microsoft-teams-readiness
  • Service endpoint whitelisting: aka.ms/teamsurls
  • IT help: aka.ms/teamsadminhelp, aka.ms/teamsadminfaq

• For developers: dev.office.com/microsoft-teams
  • SDKs and sample code for tabs, connectors, and bots

https://aka.ms/SuccessWithTeams
Your hub for all things Microsoft Teams including vision, practical onboarding guidance, success stories, and support.
QUESTIONS & ANSWERS
Need more info?

- Interested in Teams, Skype and Innovation Scenarios with Microsoft Technologies?

Contact us!

www.pulsarit.net

Thank you!