

November 2018

# Evaluation of the Teamline by StarLeaf 5250

*Hands-on testing of a Skype for Business video conferencing system and the Maestro management platform*



This evaluation sponsored by:



# Background

Founded in 2008 by Mark Loney, Mark Richer, and Will MacDonald (the trio who previously founded video bridging company Codian, which was acquired by Tandberg in 2007), UK-based StarLeaf is a privately-held company that provides voice and video conferencing hardware and cloud services.

The company's portfolio of offerings includes:

- StarLeaf Cloud – an infrastructure as a service (IaaS) offering that includes messaging, meeting, and calling capabilities. StarLeaf Cloud is owned and operated by StarLeaf, offers unlimited point-to-point and multiparty standards-based (SIP / H.323) video calling, and a centralized management portal.
- StarLeaf Meeting Room Systems – a line of room video conferencing appliances, available in various audio, video, and control options, that register to and connect to StarLeaf Cloud meetings or third-party meeting services (e.g. BlueJeans, Cisco Webex, and Zoom).
- StarLeaf PT Mini Desktop Endpoint – a compact video conferencing appliance / IP phone package that adds StarLeaf video calling to PC desktops.
- StarLeaf App – a collaboration application offering persistent messaging, meetings, and calling that lets users on Windows, Mac, iOS, and Android devices connect to StarLeaf Cloud meetings.
- Teamline by StarLeaf - a line of dedicated meeting room systems that offer native Microsoft Skype for Business (SfB) support and Exchange interop, and can connect to on-premises, online (O365), or hybrid Microsoft-hosted meetings.<sup>1</sup>

 <b>Rooms</b> From small huddle spaces to large meeting rooms and conference suites, StarLeaf allows participants to communicate, share, present and discuss as if they were there in the room.	 <b>Meetings</b> Remove barriers to communication and hold online meetings that anyone can join. Connect with the widest possible audience with audio, video and screen sharing.	 <b>Interoperability</b> Complete interoperability so you can hold meetings with Skype for Business and any standards-based systems including Zoom, Cisco, Lifesize and Polycom.	 <b>Messaging</b> Help your employees to work more productively and collaborate more easily with one-to-one instant messaging, group chats, and the ability to escalate any chat to a video call.
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In October 2018, StarLeaf commissioned the Recon Research (RR) test team to perform an independent, third-party assessment of the Teamline by StarLeaf 5250 – a Skype for Business (SfB) group video conferencing appliance for use in medium to large meeting rooms.<sup>2</sup>

As a part of this effort, we also evaluated the StarLeaf Maestro management platform, a web-based solution used to provision, monitor, and manage Teamline room systems.

This document contains the results of our hands-on testing.

<sup>1</sup> The Teamline endpoints use the standard Windows 10 Skype for Business client and thus offer native SfB interoperability.

<sup>2</sup> After we completed our testing, StarLeaf was given the opportunity to correct any inaccurate statements in the results report. However, StarLeaf was not permitted to alter the test results or change Recon Research's commentary and opinions in any way.

# Understanding the Teamline Approach

Teamline by StarLeaf (previously called the GTm series) is a line of appliance-based video conferencing systems designed to bring high quality, reliable, and secure Microsoft Skype for Business (and eventually Microsoft Teams) video calling into shared meeting spaces.

But wait – there are already various ways that customers can bring SfB into the meeting room including:

- **The Microsoft Approach** (Skype Room System v2) – installing a Microsoft Surface Pro tablet running a room-friendly version of Skype for Business.
- **The Do It Yourself (DIY) Approach** – installing a PC running the SfB client in a meeting room.
- **The Skype Endpoint Approach** – running a Skype for Business-“compatible” software stack on a standard hardware video conferencing endpoint.

RR is aware of many organizations using one or more of these approaches throughout their global environment. But each of these approaches involve some degree of compromise. For example:

- The first two options (Microsoft and DIY) are based on standard PCs running off-the-shelf software.<sup>3</sup> While functional and familiar to IT managers, these systems depend on standard desktop operating systems (e.g. Microsoft Windows), which introduces reliability, managability, and security concerns.
- The DIY option uses the standard Microsoft Skype for Business client which is not designed for use in a meeting room. For example, the UI includes non-room-friendly capabilities (personal favorites list, text chat capabilities, etc.), and the system is controlled using a keyboard and mouse.
- The Skype Endpoint approach, which is available from Polycom, offers a solid Skype for Business experience in an appliance form factor, but does not support some features (e.g. sending RDP content during SfB meetings).<sup>4</sup>

Like the first two options above, Teamline video endpoints also run the standard Skype for Business software app. But Teamline takes a very different approach.

Teamline is based on a hardware appliance running Linux. From the IT-perspective, this is a dedicated network appliance, offering Linux-grade performance, reliability, security, and manageability.<sup>5</sup>

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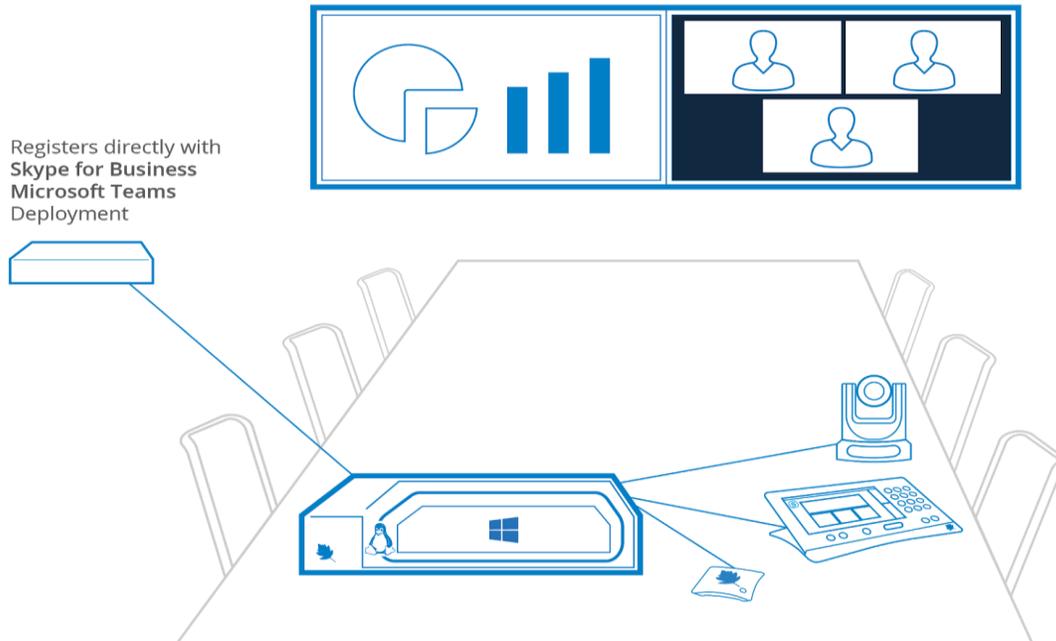
<sup>3</sup> The Skype Room System leverages the Microsoft Surface Pro tablet (SP) running Windows 10 and a version of Skype for Business intended for use in a meeting room environment.

<sup>4</sup> Polycom also offers RealConnect, a cloud-based video interop service that allows standards-based video systems to participate in Skype for Business and Teams meetings. Based on RR’s hands-on testing, this hosted gateway service works well, but allowing non-SfB endpoints to connect to SfB meetings is not the same as bringing SfB into the meeting room.

<sup>5</sup> While no operating system is completely secure, Linux is widely considered to be more secure than Windows because, i) Linux is targeted less frequently by hackers (due to its smaller deployment size), ii) Linux limits user access by default, and iii) Linux makes it difficult for users to open dangerous files / attachments.

Teamline then uses a hypervisor installed on the Linux layer to create a virtual machine (VM). Within that VM, Teamline runs a Microsoft Windows 10 image including the standard Microsoft SfB Client. StarLeaf then provides a meeting-room friendly UI using the Skype for Business APIs.

So why start with Linux, create a VM, and load a Windows image? Why not just install Windows on a standard PC? The answer is simple – to shelter the Windows instance from the outside world.



When installed within a Linux-hosted virtual machine in this way, the Windows 10 instance is separated from the underlying physical hardware of the system, making it virtually untouchable. Only the data flows that StarLeaf specifically allows through the Linux and VM layers can reach the Windows OS.

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***StarLeaf's approach combines the reliability, security, and manageability of a Linux device, with the user experience of a native Windows platform running Skype for Business.***

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Real World Example – a few weeks ago, Microsoft released a Windows update that was pushed automatically to one of the Skype Room Systems in our test lab.<sup>6</sup> And after this update, the mic / speaker / camera device connected to that particular Skype Room System stopped working.

In our environment, this unexpected system downtime was a minor inconvenience. We simply used another video conferencing system until a subsequent software update corrected the issue. But in a busy enterprise environment, this would likely have been a major problem – especially if it simultaneously impacted all of a company's Skype Room Systems deployed around the world.

StarLeaf's approach would have blocked this Windows update, thus avoiding this entire issue.

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<sup>6</sup> To minimize security risk, we configure most of the Windows-based systems in our test and production environments to automatically download and install Microsoft updates.

And the Linux-layer allows StarLeaf to monitor all aspects of the physical device including memory usage, processor utilization, network utilization, and more.

The result is a Windows-based appliance, with enhanced remote monitoring and management capabilities, that can't be upgraded, changed, or re-configured by anyone other than StarLeaf.

## The Teamline 5250 Video System

The Teamline 5250 (a.k.a. “the system” or “the 5250” within this study) is a video conferencing system designed for use in small, medium, or large spaces, that offers a native Skype for Business experience.

A complete Teamline 5250 package includes the following:

- **The Teamline 5250 Appliance** – a rack mountable (1.5 RU) device that runs the Skype for Business native client and offers a wide range of audio and video inputs and outputs including:
  - o 3 x HDMI camera inputs with 3 Visca camera control ports
  - o 2 x 1080p60-capable content inputs (1 x HDMI and 1 x DVI-I)
  - o 2 x HDMI video outputs for system displays
  - o 2 x XLR mic inputs including phantom power
  - o 1 x line audio in and 1 x line audio out
- **The Teamline Camera** – a 1080p/60 motorized pan / tilt / zoom camera with 12x optical zoom.
- **The Touchscreen Controller** – a touch display that acts as the system user interface and sends commands to the Skype for Business client in the 5200 appliance using the SfB APIs.
- **A StarLeaf wired microphone**

The system also ships with assorted cables and a few other accessories (e.g. an HDMI audio embedder).



The Teamline 5250 has a list price of US \$10,000 and is sold via a network of channel partners.

For smaller spaces, StarLeaf also offers the Teamline 5140 (list price of US \$3,995) - a Skype for Business endpoint available with a choice of USB cameras and single or dual-screen support.

# System Installation

For this evaluation effort, StarLeaf provided Recon Research with a complete Teamline 5250 system, which we installed on a movable cart with a 55" display.

The installation of the Teamline 5250 within our test environment was quick and easy, requiring only:

- Placing the Teamline 5250 codec on the equipment shelf on the movable cart
- Making the following connections:
  - o Power and network (wired Ethernet)
  - o Camera (1 x HDMI cable, and 1 x Visca control cable)
  - o Microphone (1 x XLR connection)
  - o Video Out (1 x HDMI cable to the system display)
  - o Video / Content In (1 x HDMI cable)
  - o Control Panel (1 x Ethernet cable from the codec to the touch display)

These connections were quite easy for our team for the following reasons:

- 1) The 5250 codec is well labeled (see the image below)
- 2) The 5250 uses industry standard AV connectors (e.g. XLR for mic inputs, 8-pin mini-din for Visca)
- 3) The 5250 ships with all necessary cables and adapters

Note – the 5250 does not embed far-end audio onto the HDMI signals. For this reason, if the system display's speakers will be used as the in-room speakers, the provided HDMI audio embedder should be used. This required a few additional connections, but took us less than one minute to install.



All in all, it took our team less than 15 minutes to unpack, connect, and power-up the Teamline by StarLeaf 5250 meeting room system within our environment.

# System Configuration / Activation

To simplify the configuration (and monitoring and management) of its Teamline Skype for Business video endpoints, StarLeaf created the Maestro management platform. Maestro is available as a hosted (SaaS) application or for on-premises (CPE) deployment behind the customer's firewall.

For this project, StarLeaf provided us with a standard user account on the hosted Maestro platform. To configure our newly installed 5250 endpoint, we logged into Maestro, went to the Meeting Rooms tab, and clicked Add Room. We then completed the on-screen form to define the system's name, location, and Skype for Business account. (See the screenshot below).

The screenshot shows the StarLeaf Maestro Management interface. The top navigation bar includes the StarLeaf Maestro logo, a 'Management' menu, and a user status indicator 'Logged in as Ira Weinstein' with a 'Logout' button. A left sidebar contains navigation options: 'Meeting Rooms' (selected), 'Locations', 'Certificates', and 'Maestro Users'. The main content area features a table with columns for 'Room name', 'Room location', and 'Status'. Below the table is the 'Add Room' form, which includes fields for 'Room name' (Recon Test Lab), 'Location' (Default), 'Sign-In Address' (iweinstein@reconres.com), 'Username' (iweinstein@reconres.com), and 'Password' (masked). There is a checkbox for 'Clone existing room settings?' and a 'Model' selection area with two options: 'GTm 5140' and 'GTm 5250'. The form concludes with 'Cancel' and 'Add Room' buttons.

After submitting our information, the system provided our quick-connect code as shown below.,

This screenshot shows the same StarLeaf Maestro interface after the room has been successfully added. The table now lists the 'Recon Test Lab' room with a 'Default' location and a 'New Room' status. The 'Add Room' form is replaced by a green success message: 'Adding meeting room succeeded. Quick-Connect Code: 1812 - 9073 - 3614'. At the bottom of the message box are 'Manage Room', 'Add Another Room', and 'OK' buttons.

With our quick-connect code in hand, we used an Internet browser (in our case Chrome) to navigate to the 5250's IP address which is shown on the system display and available on the settings page on the touchscreen controller.

This automatically directed us to the system configuration page. We then indicated that we wanted to use the "Hosted" version of Maestro, entered our quick-connect-code (see screen shot below), and clicked "Ok."

### Overview

Software Version	1.3.12-119928
Serial Number	SMS1604193
MAC Address	00:26:8C:01:CC:D0

### Status

Please enter your quick-connect code:

-  -

### Configuration

Maestro



**Hosted**  
Maestro hosted and managed by StarLeaf. You can configure this GTm at [maestro.starleaf.com](http://maestro.starleaf.com).



**On-premise**  
Requires a dedicated Maestro installation on your local network.



**Demo/Unmanaged**  
Configure basic settings via this webpage whilst deciding on a Maestro solution.

A few seconds later, the status area changed from blue to green and displayed the “Connected to Maestro” message as shown below. We were now ready for our first Skype for Business call.

### Overview

Software Version	1.3.12-119928
Serial Number	SMS1604193
MAC Address	00:26:8C:01:CC:D0

### Status

Connected to Maestro

### Configuration

**GTm configuration is locked**  
*A password is required to change any configuration. This can be found under "Meeting Rooms" on Maestro.*

Maestro



**Hosted**  
Maestro hosted and managed by StarLeaf. You can configure this GTm at [maestro.starleaf.com](http://maestro.starleaf.com).



**On-premise**  
Requires a dedicated Maestro installation on your local network.



**Demo/Unmanaged**  
Configure basic settings via this webpage whilst deciding on a Maestro solution.

The above system activation process took only a few minutes to complete.

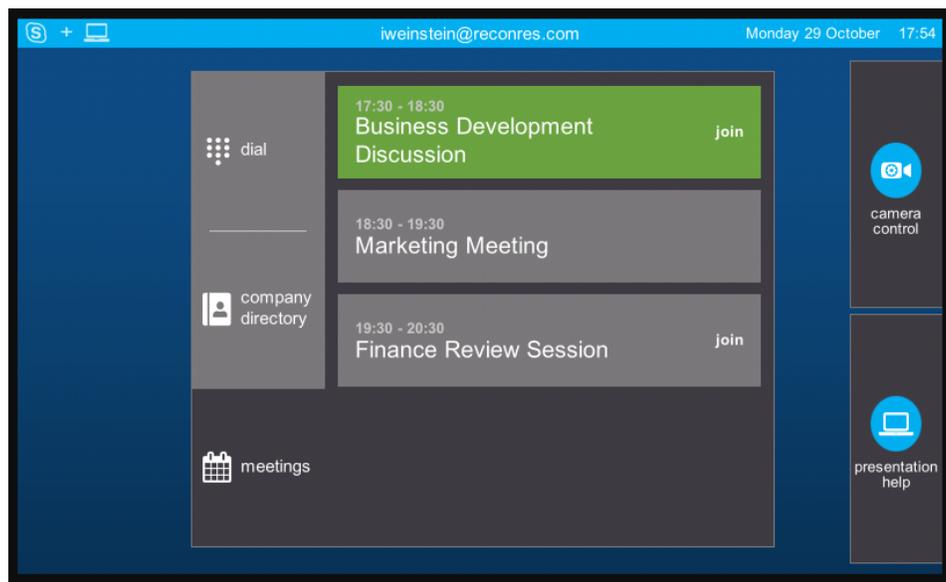
Author's Note - In most cases, the StarLeaf reseller would use Maestro to create quick-connect-codes for all of a customer's Teamline systems in bulk. The system installers would then simply enter the proper code into each system to activate the endpoint. This eliminates much of the time and complexity traditionally associated with configuring and provisioning video systems.

Once a system is connected to Maestro, its settings cannot be changed using the web UI unless the unlock password, which is available from within Maestro, is entered. This ensure that only admins can reconfigure the system.

## The Teamline SfB Meeting Experience

To test the Teamline 5250's Skype for Business meeting experience, we used the standard Microsoft Skype for Business Outlook scheduling plug-in to schedule a number of Skype for Business meetings.

We then invited the Teamline 5250 to each meeting. A few seconds later, each meeting was displayed within the room's calendar on the Touchscreen Controller (see screen shot below).



As shown above, the calendar shows all of the room's meetings, and the system provides a Press to Join button for each Skype for Business meeting.

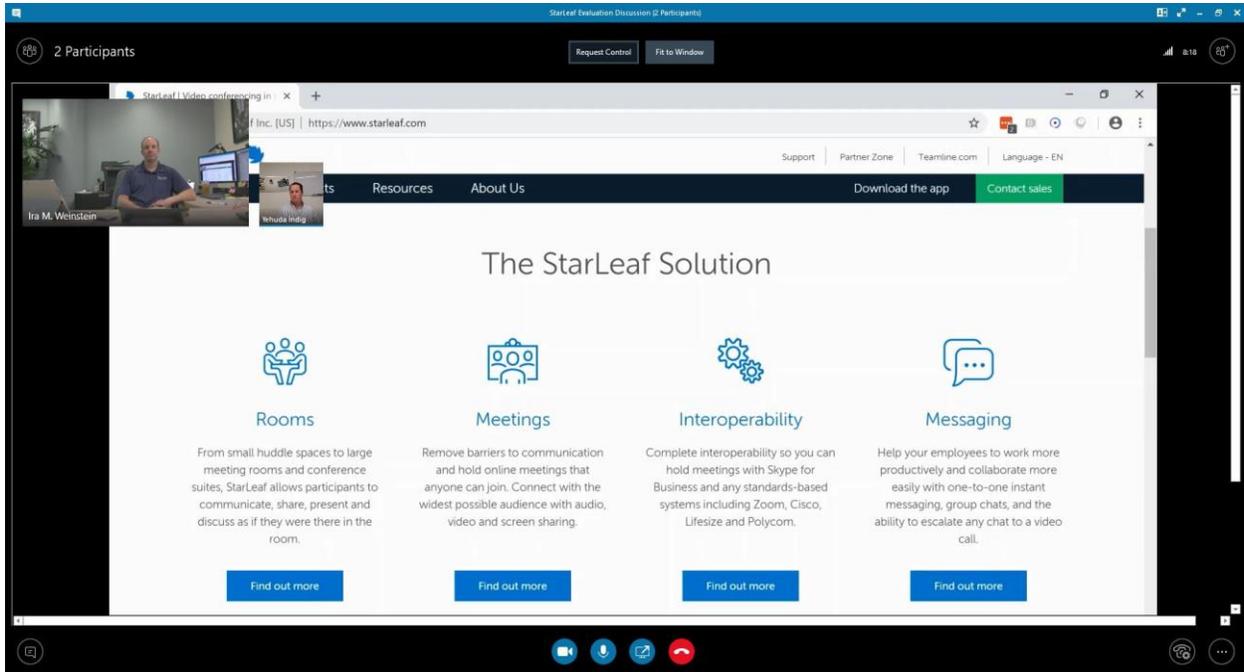
Joining a scheduled Skype for Business meeting was as easy as pressing the Join button. Without exception, all of our SfB calls connected quickly, and the overall meeting experience was exceptional.

- The incoming and outgoing video quality was excellent
- The incoming and outgoing audio quality was very strong
- The content sharing experience was also quite good

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***Without exception, the Teamline by StarLeaf 5250 provided an exceptionally strong Skype for Business audio, video, and content sharing experience.***

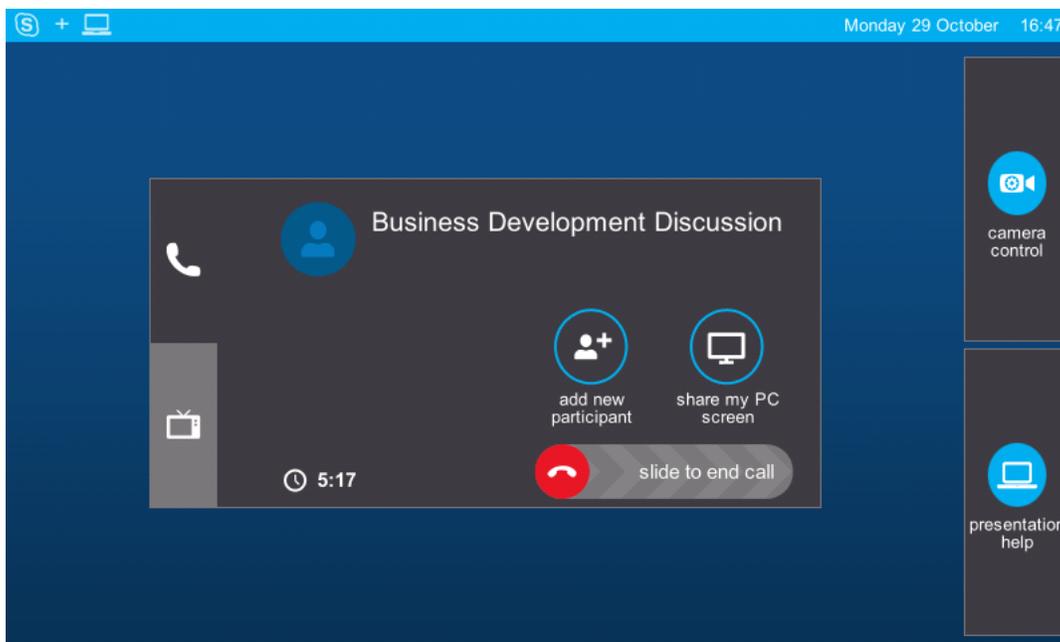
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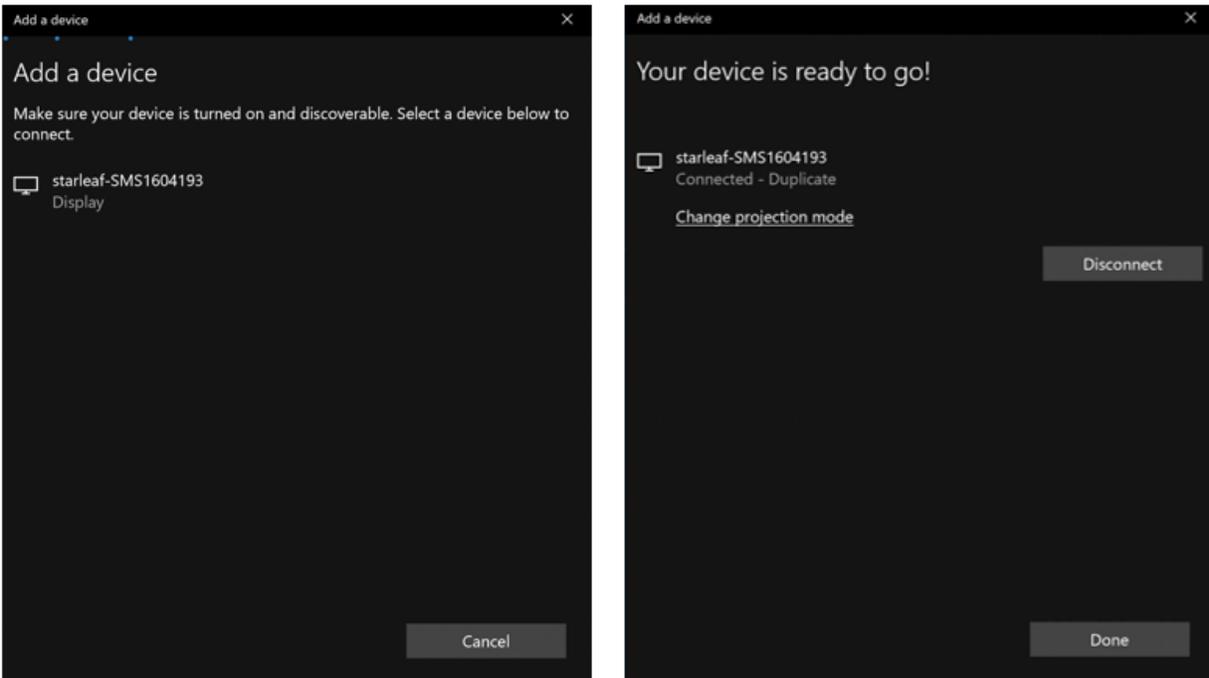
Skype for Business Video / Audio / Content Sharing Call using Teamline 5250

During a call, the Touchscreen Controller allows in-room participants to share content in various ways:

- The Teamline 5250 offers two wired content inputs – one HDMI and one DVI.
- The system also supports wireless content sharing using Miracast.

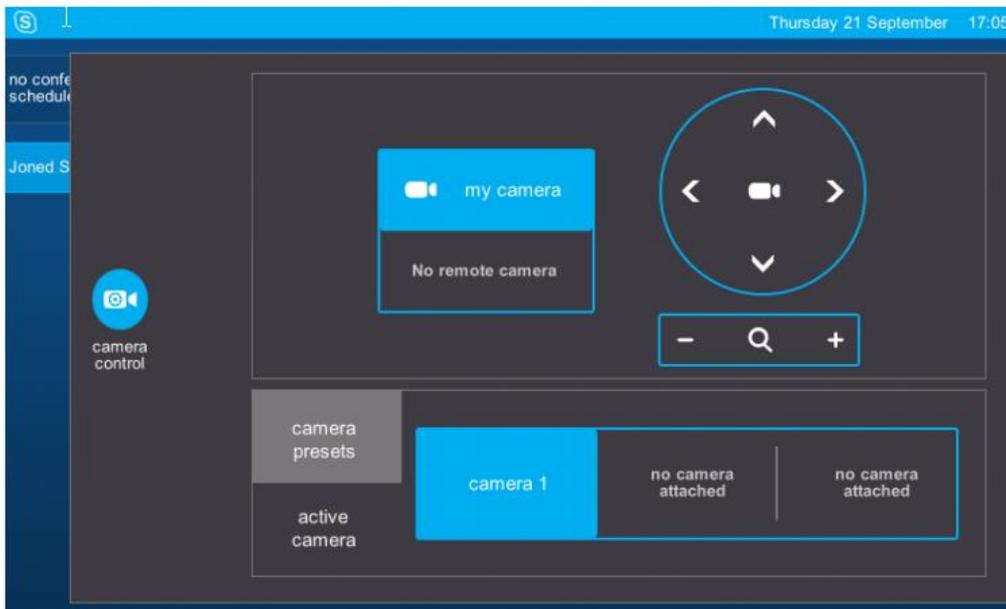


Both of these content sharing methods worked well during our testing. We were especially pleased by the results of the Miracast testing. With just a few clicks, our Microsoft Surface Pro 4 tablet found and connected wirelessly to the StarLeaf display (see below).



Miracast Testing – Finding the Teamline System (Left) and Connection Confirmation (Right)

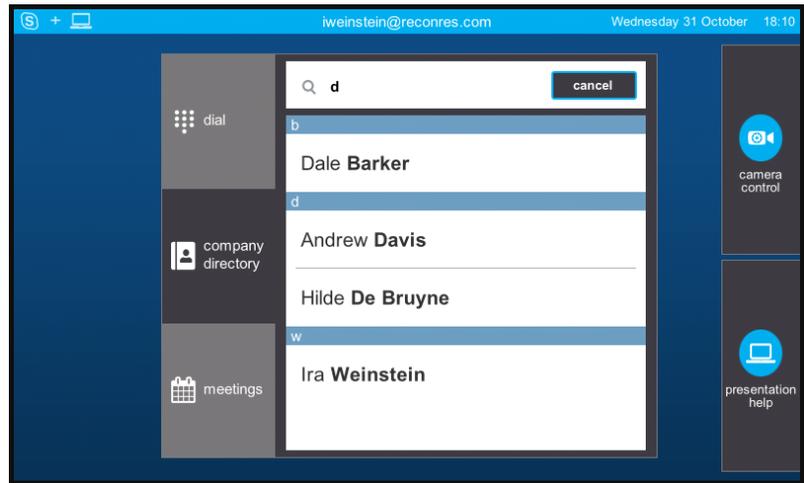
The Controller also allows meeting room participants to choose between and control three Teamline cameras (see screen shot below).



Any HDMI camera can be used with the 5250, but Teamline currently supports Visca camera control only. Neither USB cameras nor USB camera controls are supported on the larger 5250 device. The smaller 5140 device, however, makes use of industry standard USB cameras.

In addition, the system UI allows in-room participants to invite additional users or systems to the meeting by dialing a SIP URI (e.g. [milanroom@reconres.com](mailto:milanroom@reconres.com)) with the on-screen keyboard, or by choosing a user or room from the company’s Skype for Business directory (see screenshot below).

The Teamline UI and workflow feels like the standard Skype-for-Business user interface adapted for use in a meeting room.



## The Maestro Management System

To complete our assessment, we spent some time using the additional features within Maestro.

Before providing our test results, it's worth pointing out that in our experience, the vast majority of Skype-powered meeting rooms are not monitored or managed in any way. The systems register to SfB on-premises or online, but the systems are treated as Skype users – not as Skype systems.

In addition, as far as we know, StarLeaf Maestro is the only monitoring / management platform focused specifically on Skype for Business in the meeting room.

Maestro provides a number of key features including:

- Device status information (online / offline)
- System information (serial #, mac address, firmware version, model #, IP address, etc.)
- Meeting room / system creation (add new, edit, define locations, etc.)
- Remote device management (system reboot, change settings, etc.)
- Centralized directory management
- Centralized firmware updates
- Certificate management
- Basic usage information including active call information and call history (see next page)

StarLeaf **Maestro**

Management Call Records

Room name	Room location	Status
Recon Test Lab	Recon Research - South Florida	OK
Tel Aviv - Room 6	Recon Research - Israel	New Room
Boston Meeting Room	Recon Research - Brookline	New Room

Meeting Rooms  
Locations  
Certificates  
Directory  
Maestro Users

And every Maestro function worked as expected. However, as it stands today, Maestro is lacking some features that would simplify large scale room and device management.

For example, Maestro does not currently support bulk system firmware updates. Instead, each system must be updated individually. In addition, Maestro does not support a hierarchy of locations. So admins can't define a location structure like Region / Country / City / Facility / Building / Floor.

id	Start	Duration	Direction	Local Site	Remote Site	Outcome
400031	2018-10-29 17:59:37	-	Outgoing	Recon Test Lab	y	Unanswered
400026	2018-10-29 17:34:45	-	Outgoing	Recon Test Lab	Ira.weinstein@rec.vc	Unanswered
400024	2018-10-29 17:05:02	43m 35s	Outgoing	Recon Test Lab	Finance Review Session	Ended
400022	2018-10-29 16:42:01	08m 57s	Outgoing	Recon Test Lab	Business Development Discussion	Ended
40001f	2018-10-25 10:32:52	04m 29s	Outgoing	Recon Test Lab	Test SFB Call	Ended
40001d	2018-10-24 16:28:07	09m 47s	Outgoing	Recon Test Lab	Test AVMCU screen share	Ended
40001b	2018-10-24 16:21:30	03m 20s	Outgoing	Recon Test Lab	SFB Test Meeting	Ended
400017	2018-10-24 15:46:02	04m 46s	Outgoing	Recon Test Lab	Test meeting SFB IMW Y1	Ended
400015	2018-10-24 15:45:21	24s	Outgoing	Recon Test Lab	Test meeting SFB IMW Y1	Ended

Furthermore, Maestro does not currently support user roles. This means that each user with a valid Maestro login can monitor and manage all of the Maestro-connected systems in his company.

According to StarLeaf, these capabilities and more are on the Maestro short-term roadmap. But for now, admins managing large Teamline deployments will find themselves managing systems one at a time.

# Conclusion

The Teamline by StarLeaf video systems are Windows-based appliances that run the standard Microsoft Skype for Business (SfB) client, and therefore provide a native Skype for Business experience.

Teamline then goes one step further by wrapping the Windows instance within a virtual machine (VM) running on top of Linux. This multi-layered approach may seem a bit excessive, but it offers an important benefit – the ability to dis-associate the Windows operating system from the underlying system hardware.

The result is a system that runs any Windows app (Skype for Business today, and perhaps Microsoft Teams, Zoom, and Webex Meetings tomorrow), but behaves like a hardened appliance. A compelling combination of flexibility, reliability, and security – in an integrator-friendly, IT-friendly appliance.

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***The Teamline 5250 provided an exceptionally strong  
Skype for Business meeting experience.***

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For several weeks, our team used the Teamline by StarLeaf 5250 meeting room system to participate in numerous Skype for Business video meetings. Throughout our testing, the system performed extremely well. In fact, our Teamline testing forced us reconsider our long-standing belief that standards-based (SIP) video systems provide a better experience than Skype-based systems. Yes – the experience was THAT good.

Truth be told, we have only two critical comments about the Teamline 5250. First, the 5250 is more expensive than some competing Skype for Business meeting room systems. However, most of those systems are using standard Windows PCs and are designed for use in smaller meeting rooms. Second, although the Teamline camera works extremely well, we wish the Teamline 5250 supported USB mic / speaker / camera peripherals.<sup>7</sup> The combination of the Teamline 5250 SfB codec and a well performing, cost-effective USB group-add on device (e.g. Biamp Devio, Crestron Mercury, Logitech Group or MeetUp, Yamaha CS-700, etc.) would be quite compelling.

Our team also used StarLeaf's Maestro management system to provision, monitor, and manage our Teamline video endpoints. While not as feature-rich as some management platforms we've used, Maestro adds the key management features frequently lacking in Skype for Business meeting room deployments.

For organizations looking to support high-quality, native Skype for Business conferencing in their meeting rooms, we expect that the Teamline by StarLeaf meeting room systems – and certainly the Teamline 5250 - will not disappoint.

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<sup>7</sup> According to StarLeaf, the Teamline 5140 supports the use of USB cameras, mics, and speakers.

# About StarLeaf



(Information below provided by StarLeaf)

[StarLeaf](#) brings people together with a range of communication solutions designed to deliver businesses all they need for an agile, connected, and empowered workforce.

Founded in 2008, StarLeaf is a privately held global company with offices throughout the world. We are a service provider and manufacturer with messaging, calling and video conferencing services and a comprehensive range of video premium meeting room solutions.

Teamline by StarLeaf is entirely focused on delivering the enterprise premium meeting room solutions that are native to Skype for Business and Microsoft Teams.

For more information, please visit [www.starleaf.com](http://www.starleaf.com).

# About Recon Research



[Recon Research](#) (RR) is an analyst / market research firm focused on the enterprise communications space. Our areas of coverage include unified communications, video conferencing, collaboration and ideation, audio visual / AV solutions, wireless presentation, and more.

RR provides enterprise customers, vendors, channel partners, and investment professionals with the information and insight needed to make fact-based decisions.

What makes RR different is the depth of our knowledge and experience that comes from 15+ years of company briefings, market analysis, and hands-on testing of products and services in the space.

For more information, visit us at [www.reconres.com](http://www.reconres.com).

## Contact Information

Recon Research, Inc.  
3111 N. University Drive  
Coral Springs, FL 33065 USA

Contact us at: [info@reconres.com](mailto:info@reconres.com)

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