
StarLeaf 

Global Network

Whitepaper

September 2015

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1. Overview

StarLeaf owns and operates a global video communications network, the StarLeaf Cloud, with eight Points of Presence (PoP) across North America, Europe, Asia and Australasia.

The infrastructure on which this communications network is based was entirely developed by StarLeaf and provides a powerful, reliable platform for the provision of video conferencing as a service to businesses globally.

Key for business users is that StarLeaf does not rely upon or use any third-party legacy infrastructure, this unique position allows StarLeaf to rapidly respond to, and continually evolve its service, to meet the demands of organizations and their workers.

The underlying technology combined with many advanced techniques, provides users:

- The ability to call anyone, anywhere irrespective of the type of their device, whether it is Microsoft Lync, Cisco, Polycom, Lifesize or any other standards-based endpoint
- Exceptional quality of service and call quality
- Security to ensure the privacy of all calls
- Reliable firewall traversal without the need to open up ports through the enterprise firewall, that weaken a network's defenses
- Simple remote provisioning, monitoring and reporting
- A web portal for user and endpoint management
- Ability to register and manage not only StarLeaf endpoints but any standards-based endpoints already installed

2. Global connectivity, quality of service and reliability

The Points of Presence (PoP) are strategically located all around the world to ensure unparalleled connectivity and efficient call routing with low latency.

Figure: 1. StarLeaf Points of Presence



2.1 Exceptional quality

The use of advanced techniques allows StarLeaf to deliver the highest possible quality of service whatever the network, such as the use of resilient codecs (H.264 SVC and AAC-LD for instance), forward error correction, direct media paths, and dynamic bandwidth management. These techniques deliver exceptional quality not only over high-reliability, enterprise-class, MPLS wide area networks but also over less reliable networks, such as the Internet.

2.2 Resilience and reliability

The StarLeaf Cloud is fully redundant and duplicated at each of the PoPs. Therefore, in the exceptional case of failure at any one of its data centers, connections are automatically redirected to an alternative PoP.

3. Endpoints and clients

StarLeaf supports registration of standards-based H.323 and SIP endpoints to its service, allowing them to be part of the dial plan and providing them with firewall traversal.

3.1 Endpoint capabilities

The StarLeaf Cloud provides **all** clients, whether H.323, SIP or StarLeaf software and hardware video endpoints, with the following capabilities:

- Allocation of directory numbers
- Built in dial plan
- Ability to call other clients connected to the StarLeaf Cloud by;
 - » directory number
 - » email address
- Ability to call external H.323 and SIP devices by URI
- Ability to call external H.323 devices by IP address
- Ability for clients registered to the StarLeaf Cloud to be called by external H.323 and SIP devices by URI
- Ability to call and be called by Microsoft Lync clients
- Download of call progress logs for fault or call quality diagnosis

3.2 Additional capabilities of StarLeaf endpoints

In addition, the StarLeaf hardware and software video endpoints feature the following capabilities:

- Centrally managed address book, set up in the portal, that can contain frequently called numbers for each room endpoint and individual user endpoints
- Ability to connect to the StarLeaf Cloud using various firewall traversal techniques (including fallback to TCP, allowing the system to effectively work when connected using poorly configured networks, such as some public Wi-Fi hotspots or hotel networks)
- Ability to constrain available ports for efficient firewall management
- Low latency, ultra-wideband audio using AAC-LD
- Advanced techniques for handling varying network conditions such as:
 - » Dynamic bitrate control
 - » Scalable video coding
 - » Forward error correction for packet loss errors
- Ability to escalate a point-to-point call into an ad hoc multi-party conference using the create conference button

4. Management

At the heart of the StarLeaf Cloud is a management portal that gives an organization complete control of its video conferencing deployment. From this one dashboard there is the ability to provision and manage video endpoints, rooms and users, including all adds, moves and changes, thus ensuring easy and accurate directory management. It offers control over the internal and external distribution of the StarLeaf Breeze software client, to any or all users and temporarily invited guests. There is also the facility for the management and registration of an organization's existing video endpoints, alongside any StarLeaf hardware endpoints and software clients.

4.1 Provisioning

The StarLeaf Portal provides administrators with all that they need to provision users with hardware or software, as well as the ability to provision meeting room systems.

4.2 Installation

All provisioned equipment is automatically preconfigured for a simple plug and play installation. To do this, the portal generates a QuickConnect™ code, which is entered directly into the touchscreen of the StarLeaf hardware video endpoint. Once the code is entered, the system connects to the StarLeaf Cloud, authenticates the endpoint, connects it to the StarLeaf video conferencing and calling service and auto populates the endpoint with the organization's directory information. This whole process takes minutes and the user or meeting room system is up and running, ready to make or receive calls immediately.

4.3 Meeting room management

Once provisioned, meeting room endpoints can be managed and all settings are configured using the portal. Information about the endpoint connection type and speed is also available.

4.4 User management

From the portal, administrators can provision users with accounts, software clients and/or desktop systems and then update the detailed information for the user.

Figure 2. User management in the Cloud Portal

The screenshot shows the 'Edit user' page in the Cloud Portal. On the left is a navigation menu with options like 'Users and meeting rooms', 'Directory entries', 'All conferences', etc. The main content area is divided into several sections:

- User:** Fields for Type (User), Email address (kevin@bernitz.com), First name (Kevin), Last name (Bernitz), Cell number (+447884266040), Work number (5033@starleaf.com), Home number (5133@starleaf.com), Location (UK), Time zone (DEFAULT: [UTC] Europe/London (GMT)), and Language (DEFAULT: English).
- Software endpoint: Breeze:** Includes 'Allow Breeze' (checked), 'Advanced' link, 'Hardware endpoint' section with Type (StarLeaf PT, PT Mini, Phone, or Touch), 'Don't send hardware endpoint settings email' (unchecked), and Serial number (SMS1200482).
- Dialing information:** Video address (kevin@bernitz.com), Directory number (1100), and Legacy video address (891031100@bernitz.call).
- Users endpoints:** A table listing active endpoints with their status, connection type, speed test results, CPU usage, and last connected time.

Model	Status	Connection	Speed test up	Speed test down	CPU rate up	CPU rate down	Last connected
Breeze (Windows)	Offline	UDP tunnel (public address 81.142.184.230)	>2000 kbit/s	>2000 kbit/s	>2000 kbit/s	>2000 kbit/s	Jul 9, 2014 1:47:31 pm
Personal Telepresence Mini (reno SMS1300888)	Online	UDP tunnel (public address 109.152.124.3)	>2000 kbit/s	>2000 kbit/s			Jul 13, 2014 8:27:46 am
Breeze (Windows)	Online	UDP tunnel (public address 81.142.184.230)	>2000 kbit/s	>2000 kbit/s	>2000 kbit/s	>2000 kbit/s	Jul 13, 2014 8:27:46 am
Breeze (Windows)	Online	UDP tunnel (public address 109.152.124.3)	>2000 kbit/s	>2000 kbit/s	128 kbit/s	256 kbit/s	Jul 13, 2014 8:28:29 am

























In the above example, the administrator sees information concerning software clients and hardware endpoints and views information about the connection speed and type, and also can change advance settings for systems.

5. Monitoring and reporting

5.1 Call detail records

To help with end user support, in the **Call Detail Records** view, the administrator can scrutinize and search all the call activity. Various filters, such as the caller's name, can be applied to enable the administrator to quickly find the records they are interested in.

Figure 3. Monitoring calls in the Cloud Portal

Cloud Portal		Call detail records							Download Breeze	Log out
Dates shown are in [UTC+1] Europe/London (BST)										
Users and meeting rooms										
Filter by all <input type="text"/> Search										
Directory entries										
All conferences										
Displaying 1 - 50 of 1510 results										
Download all CDRs										
Call detail records	Seq ID	Record ID	Type	Start time	End time	Caller / Conference participant	Answered by / Conference owner	Outcome		
Calls in progress	499461	SLP1101217-5303-e114-0be4-9fa1-9fa2	Initial	Jul 14, 2014 2:54:28 pm	Jul 14, 2014 2:55:47 pm	Int:1105 (Charles Bernitz)	Int:1117 (Jill Kusse)	Answered successfully (video @ 8177176kb/s)	 	
Edit organization	499476	SLP1101217-5303-de5d-0af1-f1a2-9faa	Initial	Jul 14, 2014 2:42:53 pm	Jul 14, 2014 2:46:47 pm	Int:1105 (Charles Bernitz)	Int:1114 (Melanie Bernitz)	Answered successfully (video @ 1408/1408kb/s)	 	
My profile	499492	SLP1101217-5303-d9d9-8380-f1a2-9faa	Initial	Jul 14, 2014 2:23:37 pm	Jul 14, 2014 2:24:28 pm	Kevin.Bernitz@starleaf.com (Kevin Bernitz)	Int:1105 (Charles Bernitz)	Answered successfully (video @ 1408/1408kb/s)	 	
My conferences	499458	SLP1101217-5303-910a-80d4-f1a2-9fa2	Initial	Jul 14, 2014 9:13:00 am	Jul 14, 2014 9:13:09 am	Int:1100 (Kevin Bernitz)	+441923495033	Answered successfully	 	
	499450	SLP1101217-5303-0a0a-3ba7-f1a2-9fa4	Initial	Jul 13, 2014 11:45:02 pm	Jul 13, 2014 11:46:15 pm	Int:1105 (Charles Bernitz)	Int:1999 (Voice & Video mail)	Answered successfully (video @ 1408/1408kb/s)	 	
		SLP1101217-5303-0a0a-3ba7-f1a2-9fa3	Initial	Jul 13, 2014 11:45:02 pm	Jul 13, 2014 11:46:53 pm	Int:1105 (Charles Bernitz)	Int:1114 (Melanie Bernitz)	Not answered	 	
	499446	SLP1101217-5303-092d-5a8a-f1a2-9fa0	Initial	Jul 13, 2014 11:33:17 pm	Jul 13, 2014 11:34:07 pm	Int:1105 (Charles Bernitz)	Int:1999 (Voice & Video mail)	Answered successfully (video @ 1408/1408kb/s)	 	
	499445	SLP1101217-5303-092d-5a8a-f1a2-9fa1	Initial	Jul 13, 2014 11:33:17 pm	Jul 13, 2014 11:35:42 pm	Int:1105 (Charles Bernitz)	Int:1109 (Jonny Harris)	Not answered	 	
	499441	SLP1101217-5302-e075-9267-f1a2-9fa0	Initial	Jul 13, 2014 8:39:33 pm	Jul 13, 2014 8:41:07 pm	Int:1109 (Jonny Harris)	Int:1999 (Voice & Video mail)	Answered successfully (video @ 2938/2938kb/s)	 	
		SLP1101217-5302-e075-9267-f1a2-9faa	Initial	Jul 13, 2014 8:39:33 pm	Jul 13, 2014 8:40:39 pm	Int:1109 (Jonny Harris)	Int:1105 (Charles Bernitz)	Notified	 	
	499430	SLP1101217-5302-0a90-0a6e-f1a2-9fa7	Initial	Jul 13, 2014 5:34:32 pm	Jul 13, 2014 5:52:13 pm	Int:1105 (Charles Bernitz)	Int:1117 (Jill Kusse)	Answered successfully (video @ 8177176kb/s)	 	
	499427	SLP1101217-5302-0a65-0a0e-f1a2-9fa0	Initial	Jul 13, 2014 5:35:47 pm	Jul 13, 2014 5:36:19 pm	Int:1105 (Charles Bernitz)	Int:1999 (Voice & Video mail)	Answered successfully (video @ 1408/1408kb/s)	 	

5.2 Call information

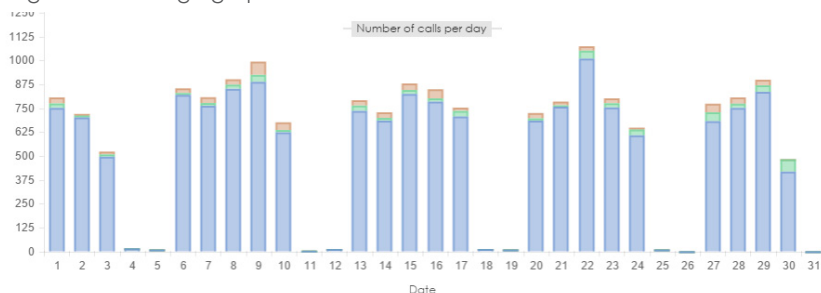
The **Call Information** view shows summary information about the call such as the codecs used, the health of the network during the call (bit rate, packet loss rate, max/min/average jitter etc.) on the various channels (video/audio/sharing) in both directions. This is useful and will help administrators diagnose call quality issues.

5.3 Organization Usage Graphs

The administrator can also view monthly usage reports (for the current 3-month period) for the organization. These comprise:

- Number of calls per day (showing point-to-point, QuickMeet, and scheduled conference calls)
- Number of call minutes per day (showing point-to-point, QuickMeet, and scheduled conference calls)
- Users with the greatest call usage
- Room systems with the greatest call usage

Figure 4. Organization usage graphs



6. Security and firewall traversal

6.1 Outline

Security is of paramount importance and security considerations have been taken into account at all levels of the StarLeaf architecture to ensure privacy for all of calls.

The StarLeaf range of endpoints and clients all contain signed certificates, as do the StarLeaf servers at the heart of the network. These are used for mutual authentication of the endpoints and the servers to eliminate any possibility for a man-in-the-middle attack.

Furthermore, the StarLeaf service fully supports firewall traversal to allow endpoints to remain safely inside their company's firewalls and also industry standard encryption techniques for third party endpoints such as AES encryption.

6.2 Authentication and encryption

Authentication with the StarLeaf platform requires a signed certificate that all StarLeaf endpoints (hardware and software) have burned into them, at the point of manufacture. All of the servers, resident in the PoPs, have signed certificates that are required by the StarLeaf endpoints to guarantee that they are connected directly to a genuine server.

Every call made by a StarLeaf endpoint is authenticated and encrypted, both media and signaling. When a user calls from a StarLeaf endpoint to any other video device, it will use encryption if the recipient device supports it. All other StarLeaf client to server communications: signaling, media, software upgrades etc. are protected by TLS (Transport Layer Security—a cryptographic protocol that provides communication security over the Internet).

When using 3rd party endpoints with the StarLeaf service, industry standard encryption methods such as AES, H.235 and TLS are used.

6.3 Firewall traversal

All video endpoints that are registered to the StarLeaf Cloud, are able to connect from within the organization's private network, behind the resident firewall. This provides easy and direct business-to-business video conferencing and calling, without compromising security. This is made possible by StarLeaf's inherent firewall/NAT traversal technology, which only requires a single port to connect securely to the StarLeaf network.

The firewall traversal solution for StarLeaf endpoints and software clients has been designed to use a single TCP port and at most one UDP port. This means that the end user does not need to open up a range of ports through their firewall, thereby weakening a network's defenses.

When using 3rd party endpoints with the StarLeaf service, industry standard firewall traversal techniques such as H.460 and ICE are used.

6.4 Known Points of Presence

Some organizations run very restrictive firewall rules which need to be configured to allow any traffic out. As the StarLeaf network is fully owned and operated by StarLeaf these customers only need to open their firewall to a single IP or DNS name further enhancing their security.

EVERYTHING YOU NEED TO KNOW

With StarLeaf you have a phenomenal range of features that just make video conferencing and calling so simple, rich and satisfying.



Easy — meet anyone, anytime, anywhere

Our touchscreen and software client offer the same smartphone like user experience, but 'easy' doesn't stop there. We offer one management interface: the StarLeaf portal, which is the only destination you need to manage end users, rooms, video endpoints and the distribution of the StarLeaf Breeze software client.



Point-to-point — unlimited calling

All video endpoints and clients connect to the StarLeaf Cloud and provide users with unlimited calling. This means that users can make as many direct calls, whenever and for as long as they wish, without incurring any additional charges.



HD voice & video — exceptional quality

HD video is standard across the StarLeaf range. But we think that crystal clear audio is also critical. With StarLeaf you benefit from both HD video and ultra wideband audio.



Screen Sharing — collaborate on content

We make it easy for teams to share and review materials and spreadsheets, work on plans, look at prototypes, update content, or analyze data – whatever's on your screen you can share. With StarLeaf, there's one button to push and screens are immediately shared.



QuickMeet™ — hold instant multiparty meetings

Only StarLeaf lets you escalate from a point-to-point call to a multiparty session with one key press. The create conference button allows you to add up to five people, just select from the directory or call out to anyone on any other video system.



QuickConnect™ — plug and play installation

Installing a StarLeaf video endpoint does not require a technician. All you do is plug the endpoint directly into your network, enter the StarLeaf QuickConnect™ code provided, and the system takes care of the rest.



Guest invite — ask anyone to join you on video

It's never been easier to reach anyone by business video. From your endpoint you simply enter an email address and the system fires off your personal invitation. This invite includes a link to download the StarLeaf Breeze software client and dialing instructions should your guest want to use an existing video endpoint. For the first time, you'll be able to see business associates and not worry about dialing conventions or calling protocols, or even the equipment they want to use.



Interoperable — works with Cisco, Lifesize, Microsoft Lync, Polycom, H.323, SIP

You name it, and we will work with it. Not only can you call between all professional business video systems, you can also maximize the longevity of your existing video equipment by registering it to our cloud and dispense with the need for on-premise infrastructure.



SmartPath™ — intelligent routing and quality control

Fluctuating bandwidth is the enemy within for most video conferencing users. Using advance techniques, we squeeze maximum performance from the flimsiest of connection. During a call, we monitor and instantly respond to inconsistent bandwidth thereby optimizing the caller's experience. In addition, we ensure the most direct route for all calls and, with highly advanced techniques, we deliver low latency and great quality every time you use the StarLeaf service.



Contacts — scroll and search directories and personal contacts

The contacts button is right there on the touchscreen. One press and you can scroll through the company directory or your personal contacts. Don't want to scroll? Then use the search feature and the pop-up keyboard.



Call+ — transfer, hold, forward, call history and do not disturb

We've brought the functionality of the telephone into the world of video. No other video conferencing solution allows you to easily transfer a video call to someone else, nor do they make it possible for you to place a call on-hold, answer an incoming call and then add them to your conversation!



Favorites — speed dials with availability

We give you speed dial buttons which also show you availability, keeping you up-to-the-minute on who's busy, who's opted for 'do not disturb' and who's on call forward. Speed dials come into their own for your frequently called contacts since, in one touch, you can dial straight through even if they are in another company on another manufacturer's system.



Video mail — send and receive personal video messages

StarLeaf is all about video first, that's why with our solution you can record a personal video message for when you are away, or unable to answer. But this is a two-way street, as anyone calling you from any other video system can leave you a personal recording – even if a caller chooses not to leave a message, you can still see you've missed a call and check out the caller ID in your recent call list.



Join now — see today's meeting and join instantly

This is a great example of what happens when you have a tight integration between video conferencing as a service and a video endpoint. When you've accepted an invitation to attend a virtual meeting room/video conference, your endpoint will automatically notify you when the meeting is about to start. Then by pressing this one button on the touchscreen you will be taken straight into the virtual meeting room.



Auto upgrade — always on the latest version

All StarLeaf endpoints, connected to the StarLeaf Cloud, are automatically upgraded and will therefore, always offer the latest features. So, no matter how many years you keep your StarLeaf endpoint, it will never fall behind on functionality.



Secure — end-to-end encryption with secure connection at all times

We guarantee privacy for all your video conferences and calls, and adhere to industry standard AES-128 encryption. We also authenticate all connections and encrypt both media and signaling. Furthermore, the StarLeaf Cloud firewall traversal solution has been designed to use a single TCP port and at most one UDP port. This means that you don't need to open up a range of ports through your firewall, which can weaken your network's defenses.



Multiparty — ideal for all video meetings

Bring anyone into your VMR, no matter what system they use or where in the world they are. Our conferencing service allows up to 17 people to join and QuickMeet™ caters for instant sessions for up to 5 participants.



Scheduling — easy set up & management for all conferences

We offer easy set up of permanent meetings, where you have a personal VMR and one step to schedule meetings.



Calendar integration — meetings appear in participant's calendars

All participants are sent automatic meeting notifications, which appear in their calendar. Each invite includes dial-in instructions, making it easy for anyone on any video system to enter the VMR.



Global audio dial-in — join via phone

Literally anyone can join a conference. Particularly important for those that only have access to a telephone, the meeting notification features audio dial-in instructions.