



ICON Teams Connector Customer Setup and Pre-Requisites Document



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Change History

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Objective Statement

This document provides the requirements for customers deploying Maintel's ICON Teams Connector service within their Microsoft Office 365 Tenant. These settings are critical to successfully connect to your new Maintel service and to ensure reliable ongoing operation.

Although the ICON Teams Connector Service has been designed for easy setup with minimal configuration within the customer's tenant, Maintel strongly recommend that you also follow the "Best practices" section to provide the best possible experience for your users.

Maintel will pre apply the configuration within our ICON core and it is the customer responsibility to configure their tenant, devices, and policies within Office 365 and Teams for their users. This guide covers the setup of the ICON Teams Connector service only.

The objectives of this document are to:

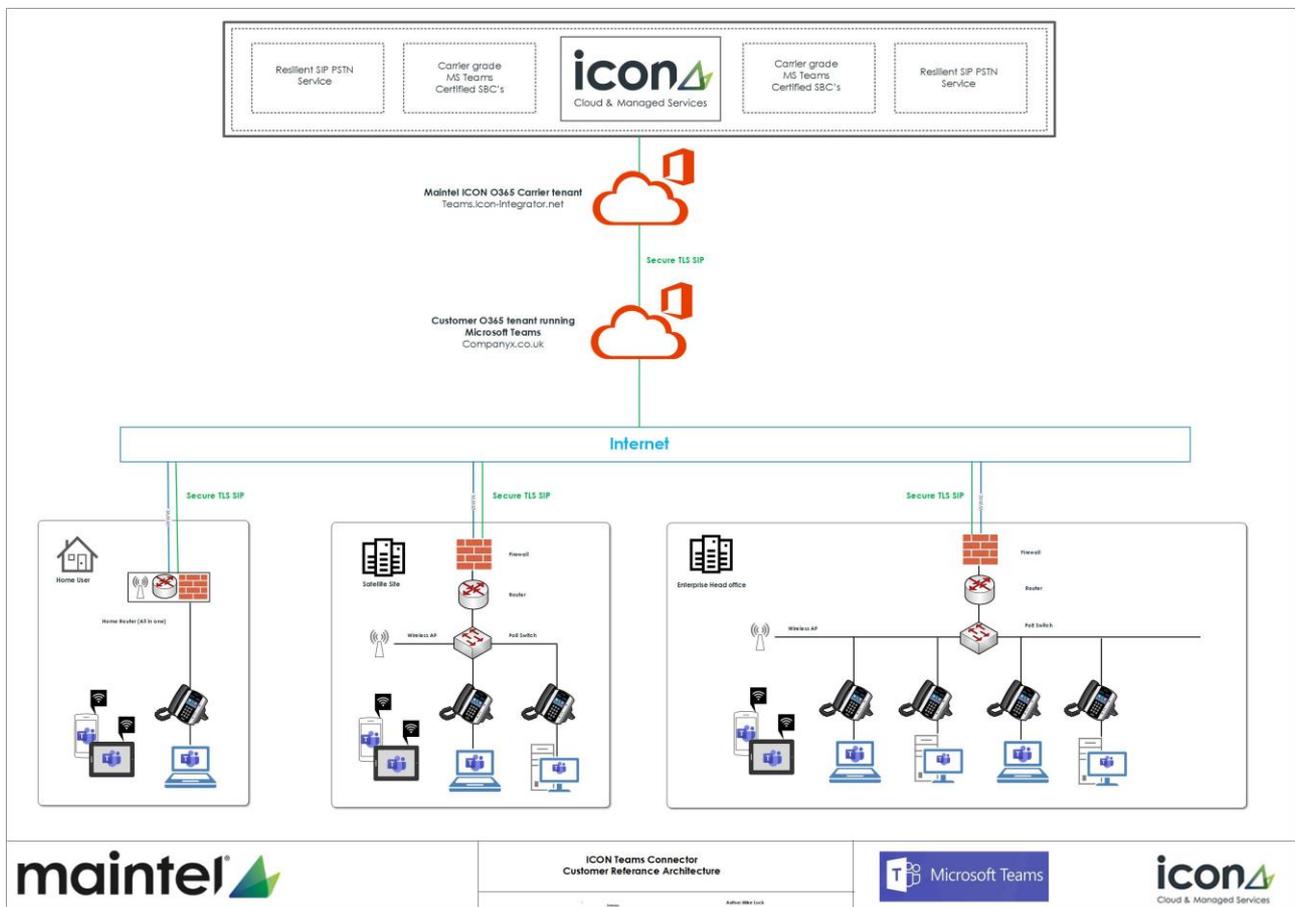
- Provide an overview of the service and how it works
- Detail the prerequisites on the customer environment to setup direct routing
- Provide detailed configuration instructions to connect to your new service
- Detail external access and firewall ports requirements
- Provide recommendations for best practice when running VoIP on the customer's network.

1. Reference Architecture

1.1. Overview Schematic

The below diagram depicts the standard setups of customer sites connecting to ICON Teams Connector. All customer sites should be protected by firewalls when connecting to the public Internet. The configuration of these firewalls is the responsibility of the customer. A detailed list of the ports and settings required to enable Direct Routing within Teams are detailed within this document.

For a full list of all ports required to setup Office 365 and Microsoft Teams, please visit the following link on the Microsoft website <https://docs.microsoft.com/en-us/office365/enterprise/urls-and-ip-address-ranges>



2. Service details

2.1. Overview

Businesses of all sizes are adopting Teams and now want to add simple calling to their existing Teams deployment without any effect on their existing traditional telephony deployment.

The Maintel Service allows the customer to leverage their investment in Teams for improved collaboration and enables users to make and receive calls to landlines and mobile phones using Microsoft Teams on their PC or mobile devices.

- Enable Teams users with enterprise voice functionality. Works on desktop and mobile – make and receive business calls in Teams while at home or on the road
- Implement to only users or groups of users that need it – – brings together collaboration and calls without any additional software to confuse users
- Use existing telephone numbers
- Simple deployment without a large project and cost overhead
- Only pay for the maximum number of concurrent calls you need, as opposed to paying for each user
- Calls included – all our pricing includes bundled fully inclusive UK minutes for local, national, and mobile calls

2.2. What is Direct routing

Direct routing allows organisations to route calls to and from their own SIP trunk provider directly into Office 365 Teams through a Microsoft-certified Session Border Controller (SBC). This removes a major obstacle to Teams telephony adoption and allows users of Microsoft Teams to make calls through Maintel as the telecom's provider rather than Microsoft. Rates for all calls are provided by Maintel without requiring Microsoft Calling Plan licenses or on-premise equipment. Our call costs are typically more cost effective per month than Microsoft's own Calling Plans.

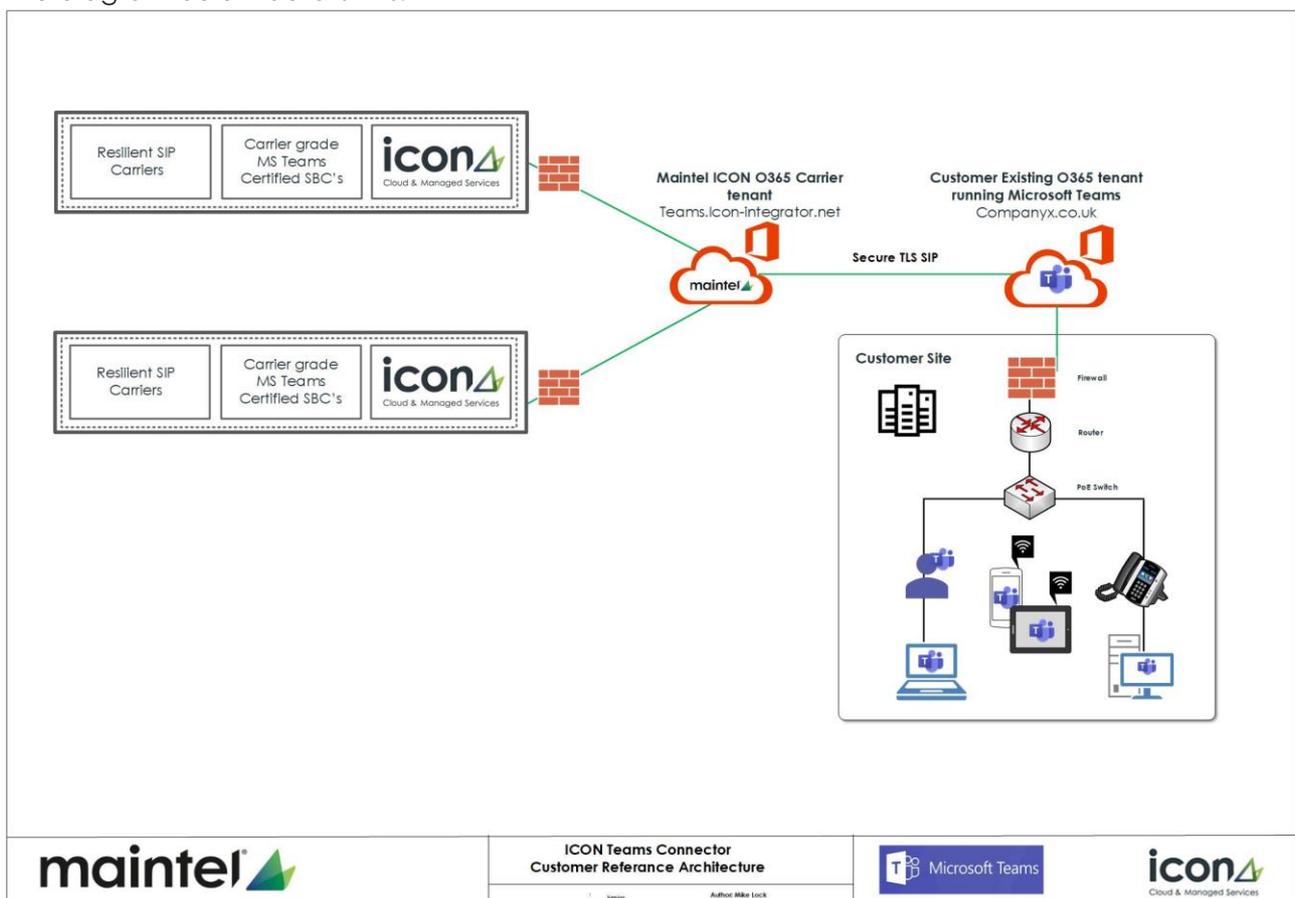
2.3. How it works

Maintel have provisioned carrier grade, highly available SBC's within our ICON core providing resilient SIP services. These SBC's connect into our own ICON Teams Connector tenant. This Maintel tenant we will refer to in this document as the "Carrier O365 Tenant".

The customer must then configure their tenant to connect to this "Carrier tenant" in order to route calls. This is known as a "Derived Trunk", thus the trunk configured within the customer tenant is derived from the Carrier tenant.

The carrier tenant is providing a proxy back to the ICON core SBC's. Maintel will then provide each customer with active, passive SIP trunks from the ICON Core SBC's out to the PSTN.

The diagram below details this.



3. Prerequisites

3.1. Overview

The following sections outlines the minimum mandatory requirements on the customer's setup, to successfully configure and implement Maintel's ICON Teams Connector Service.

Please note that the information provided here is the minimum that you will require in order to enable Maintel Teams Connector service within your O365 tenant. Microsoft have many different licencing models and packages for different enterprises. Please contact your Microsoft licence provider to check that you have the appropriate licences to meet your requirements.

3.2. Licencing

The minimum licencing that is required to enable Direct Routing functionality within the customers Office 365 tenant, is one E3 licence with the addition of the bolt on "Phone System" licence. This licence is required to turn on the Direct Routing functionality within your Teams setup. Without this you will not be able to configure a trunk within the Teams admin page.

You will then need one additional phone system licence for each user that you wish to configure with a DDI (Direct Dial In) number as a minimum.

3.3. Internet bandwidth

The customer will need to calculate the appropriate bandwidth requirements for each site that is going to connect to their O365 tenant, and the number of users.

This bandwidth calculation is from the customers network to the Microsoft Office 365 cloud. Maintel have already allocated the appropriate bandwidth from our ICON core, to Office 365 "Carrier Tenant" based on the amount of channels you have purchased for your ICON Teams Connector service.

The customers calculation should be calculated based on the amount of concurrent calls that are required at anyone time.

Maintel recommends that the calculation for Direct Routing should be based on 100Kbps for each concurrent call required.

It should be noted that this recommendation is just for the direct routing element that Maintel are providing, and the customer should calculate the bandwidth based on all of the functionality that they are utilising within Microsoft Teams, such as video and collaboration for example, as well as any other functionality and services that they are consuming with Microsoft Office 365 Cloud.

3.4. Voice Routing

Once you have followed the setup steps below, you will need to setup PSTN Usage settings and Voice routes. It should be noted that all voice routes (inbound and outbound) will need to be configured in E164 format (+442074326789) for example.

4. Customer Configuration

The following section details the configuration steps that the customer will need to set-up within their Office365 tenant to connect to the ICON Teams Connector service.

4.1. Overview

In order for the customer to create the association from their O365 tenant, to the Maintel Carrier tenant, the customer will need to do the following:

- Connect to their Office 365 tenant with the appropriate permissions
- Add a new sub domain within the Office 365 admin centre
- Create a new user to enable the direct routing function within Teams (minimum licences for this user is detailed within the prerequisites section above)
- Create a PSTN trunk back to the Maintel carrier tenant
- Assign DDI's, policies and voice routes to users

4.2. Adding a sub domain to your O365 Tenant

4.2.1. *Permissions*

Ensure that you have appropriate rights in the customer tenant. You can only add new domains if you are signed into the Microsoft 365 admin centre as a Global Administrator.

To validate you have the correct role assigned to your account, please sign into the Microsoft 365 admin centre (<https://portal.office.com>), go to Users > Active Users, and then verify that you have a Global Administrator role.

4.2.2. *Adding a Subdomain and verifying it*

1. In the Microsoft 365 admin centre, go to Setup > Domains > Add domain.
2. In the "Enter a domain you own box", type the FQDN of the subdomain given to you by your Maintel project coordinator. This FQDN's is unique to each customer and will be in the following format.

[customer name].teams.icon-integrator.net

In this example, the subdomain is **companyx.teams.icon-integrator.net**

Add a domain

If you already own a domain like contoso.com, you can add it to your account here.

Domain name

companyx.teams.icon-integrator.net

3. Click "use this domain"
4. Next the [company name].teams.icon-integrator.net FQDN will now need to be verified in public DNS. Select the "Add a TXT record to the domain's DNS records" option and click "continue."

How do you want to verify your domain?

Before we can set up your domain, we need to verify that you are the owner of companyx.teams.icon-integrator.net.

- Add a TXT record to the domain's DNS records**
Recommended if you can create new DNS records at your registrar or DNS hosting provider. [Learn more about DNS](#)
- If you can't add a TXT record, add an MX record to the domain's DNS records**
Recommended only if TXT records aren't supported by your domain host or registrar.
- Add a text file to the domain's website**
Recommended if you've already set up a website using this domain, for example, www.companyx.teams.icon-integrator.net

5. Next copy and paste the information provided and send this to your Maintel Project Coordinator who will get this record created within Maintel public DNS services within AWS.

Verify you own this domain

Your host is [Amazon Web Services \(AWS\)](#) 

Go to your domain's registrar or DNS hosting provider, go to DNS management page for companyx.teams.icon-integrator.net, and add a TXT record that uses the values below. When finished, come back here and select **Verify** and we'll confirm you own the domain by finding the new record.

This won't affect your existing services like email, and you can remove the record as soon as your domain is verified.

[Step-by-step instructions](#)

TXT name

 companyx.teams (or skip if not supported by provider)

TXT value

 MS=ms37861482

TTL

 3600 (or your provider default)

6. Once you have had confirmation back that this record has been created, click "Verify". If there any issues with this verification, please contact your project coordinator.
7. If your verification was successful, you will be presented with the following screen

How do you want to connect your domain?

Connect your domain to your Microsoft services so you can use email and instant messaging. There are a couple of options to consider, depending on how you'd like to manage domain name service (DNS) records for your domain **companyx.teams.icon-integrator.net**.

[Learn more about DNS records](#)

Add your own DNS records
We'll provide a list of DNS records that you'll need to add for your domain at your DNS host.

Skip and do this later (not recommended)
Your Microsoft services won't be connected to this domain. When you are ready, go to the [Domains](#) page to finish setting it up

Select "Add your own DNS records" and click continue.

- On the "Add DNS records" page the "Exchange and Exchange Online Protection" will be selected by default. You need to **Un check** this box.
 - This option is not required as the new domain we are adding is solely for direct routing and not for any other O365 services that the customer may be using

Add DNS records

To add these records for **companyx.teams.icon-integrator.net**, go to [Amazon Web Services \(AWS\)](#).

The DNS records are grouped by the services that the DNS records support. We recommend copy and paste to avoid errors, but you can also download or print this information.

[Download CSV file](#) [Download Zone file](#) [Print](#)

Exchange and Exchange Online Protection

Email, contacts, and scheduling are all provided by Exchange. Set up this service to enable all the functionality of Outlook and other email clients. Exchange services need 3 records to work right: an MX record tells where to deliver email messages, a TXT to prevent someone from spoofing your domain to send spam, and a CNAME record for client-side Autodiscover, helping mail clients connect users to their respective mailboxes.

> **MX Records (1)**

> **CNAME Records (1)**

> **TXT Records (1)**

Advanced Options

Back

Continue

Close

- Once the screen is as below, select continue.

Add DNS records

To add these records for **companyx.teams.icon-integrator.net**, go to [Amazon Web Services \(AWS\)](#).

The DNS records are grouped by the services that the DNS records support. We recommend copy and paste to avoid errors, but you can also download or print this information.

[Download CSV file](#) [Download Zone file](#) [Print](#)

Exchange and Exchange Online Protection

Advanced Options

Microsoft Teams and Skype for Business

Intune and Mobile Device Management for Microsoft 365

- Your new subdomain has now been added and verified within your Office 365 tenant.

✔ Domain setup is complete

companyx.teams.icon-integrator.net is all set up and you can now manage it from your domains list.

Click done and verify that the “health status” is Healthy on the domain page

companyx.teams.icon-integrator.net ⋮ ✔ Healthy

4.3. Activate the Subdomain for Teams

4.3.1. Overview

After you register a new domain name (sub domain) within O365 , you need to activate it by adding at least one user and assign a SIP address with the FQDN portion of the SIP address matching the newly created subdomain in the customer tenant.

4.3.2. Configuration Steps

1. Within your Office 365 admin centre, click, Users > Active Users and select “add a user”.
2. Create a new user which will act as a service account. We will use this user account to enable the Direct Routing functionality within Teams. Make sure you name this account appropriately to make it easily identifiable in the future. In this example we have called the user “Maintel TeamsConnector”.

Note: make sure you select the new subdomain name space we have created for the “users name” (company.teams.icon-integrator.net)

Add a user

- Basics
- Product licenses
- Optional settings
- Finish

Set up the basics

To get started, fill out some basic information about who you're adding as a user.

First name Last name

Display name *

Username * @

Password settings

Auto-generate password

Let me create the password

Password * Strong

Require this user to change their password when they first sign in

Send password in email upon completion

[Next](#)

3. Next, we will assign licences to the account. Note that the licences we have assigned to the account, are the same as the minimum requirements detailed above in this document

Note: you will see that there is a warning message from Microsoft detailing that although you are creating a user within O365, it may not be available (or activated) within Teams for up to 24 hours. The enablement of the user into teams is processed by Microsoft within O365

Add a user

- Basics
- Product licenses
- Optional settings
- Finish

Assign product licenses

Assign the licenses you'd like this user to have.

ⓘ Due to increased demand, it might take up to 24 hours to fully set up user in Teams. Until then, you won't be able to assign Teams policies to them, and they might not have access to Teams features like calling and audio conferencing.

Select location *

United Kingdom

Licenses (2) *

Assign user a product license

- Microsoft 365 Phone System**
You're out of licenses. If you turn this on, we'll try to buy an additional license for you.
- Microsoft 365 Phone System - Virtual User**
9 of 10 licenses available
- Office 365 E3**
11 of 100 licenses available
- Power BI (free)**
Unlimited licenses available
- Power BI Pro**
91 of 100 licenses available
- Skype for Business Online (Plan 2)**
1 of 2 licenses available

Create user without product license (not recommended)
They may have limited or no access to Office 365 until you assign a product license.

Back Next

- Select next, verify the details you have added are correct. You will then get confirmation that your user has been created and is an active user.

Add a user

- Basics
- Product licenses
- Optional settings
- Finish

Maintel TeamsConnector added to active users

Maintel TeamsConnector will now appear in your list of active users.

User details

Display name: Maintel TeamsConnector
Username: maintel.teamsconnector@companyx.teams.icon-integrator.net
Password: ***** [Show](#)

Licenses bought
None

Licenses assigned
Office 365 E3

4.4. Creating a Trunk within Teams

4.4.1. Overview

With the initial release of Direct Routing, Microsoft required a trunk to be added to each served

tenant (customer tenant) using PowerShell. However, this has not proved to be optimal. Based on this feedback, Microsoft has brought in a new concept of “Derived trunks”.

A derived trunk does not require registration within PowerShell. It is simply an association between the “customer trunk”, and the “carrier trunk”. It derives all configuration parameters from the carrier trunk. The association between the carrier trunk and the customer trunk is based on the FQDN name.

Maintel Trunk FQDN = *.teams.icon-integrator.net

Customer Trunk FQDN = [customer name].teams.icon-integrator.net

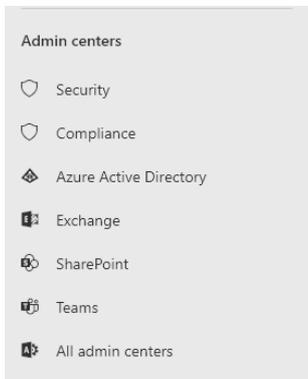
The derived trunk within a customer tenant does not need to be created in PowerShell. You can simply add the name of the derived trunk in the customer tenant in the online voice routing policy. The steps below detail how to do this.

4.4.2. Permissions

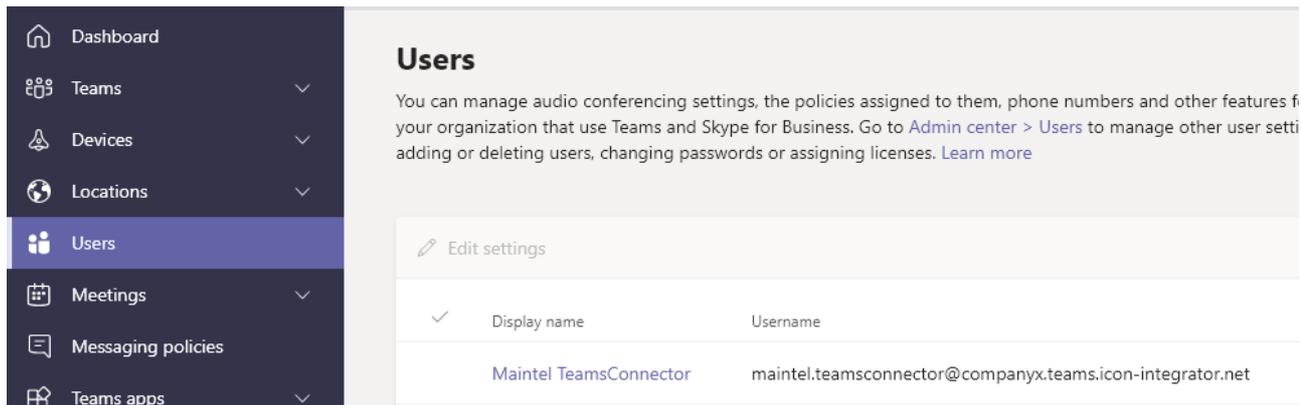
To configure a Trunk within Teams, you will need to login to the “Teams admin centre” within O365 with the appropriate permissions. Make sure that your account has the “Teams admin” permission in order to do this.

4.4.3. Configuration Steps

1. In the Microsoft 365 admin centre, go to Admins > Show all >
2. Under “Admin Centre” in the bottom left hand side, select Teams

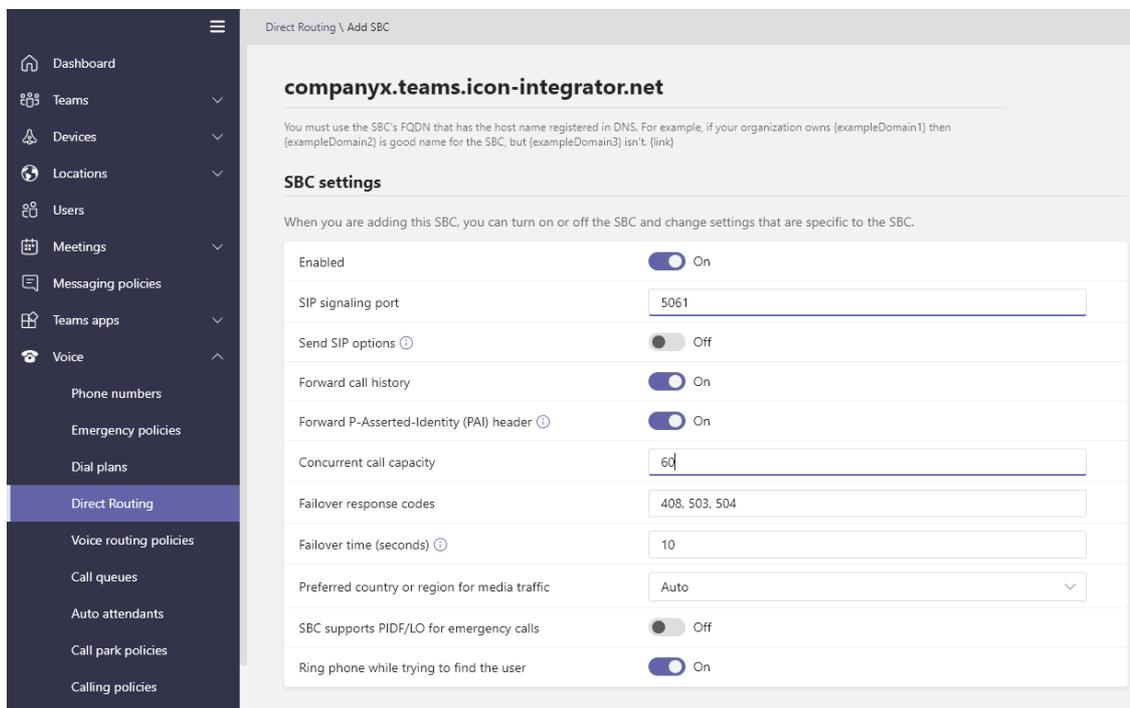


3. Once you are logged in to the Teams admin page, verify that your “Service Account User” has been activated in teams. Select the “User” tab, and search for you user (Maintel.TeamsConnector) in this example.



Note: You will not be able to configure the trunk until this user shows within Teams. Note the warning in the previous section above, that this can take up to 24 hours from creating the user within the Office 365 Admin Centre

4. On the left-hand navigation pane within the Teams Admin Centre, go to Voice > Direct Routing, and then click the SBCs tab.
5. Click Add.
6. Enter the FQDN of the trunk, [company name].teams.icon-integrator.net, in the following example we are using companyx.teams.icon-integrator.net



7. Set the following options
 - o Enabled = On
 - o SIP Signalling Port = 5061
 - o Send SIP option = Set to Off

- Forward Call History = Leave as default
- Forward P-Asserted- Identity (PAI) Header = Leave as default
- Concurrent Call Capacity = Set this to the number of channels you have purchased from Maintel
- Failover Response codes = Leave as default
- Failover time = Leave as default
- Preferred country or region for media traffic = Leave as default
- SBC supports PIDF/LO for emergency calls = Leave as default
- Ring phone while trying to find the user = Leave as default

Note: Most of these options can be left as default due to this being a “Derived Trunk”. Remember, a Derived trunk means that it takes its settings from the carrier trunk, which has been pre-configured for you within the carrier tenant.

8. Click “save”

This completes the configuration of the ICON Teams Connector service to your office 365 environment.

5. Useful links for user configuration

5.1. Overview

Now you have configured your ICON teams Connector Service, you will need to do some additional configuration to configure your Voice routes, PSTN usage records, and assign these to your users. You will also need to assign DDI numbers to your users. If you are configuring these yourself, below are some useful links to get you started.

Details on how to set this up can be found on the Microsoft web site.

- o Enable users for Direct Routing = <https://docs.microsoft.com/en-us/microsoftteams/direct-routing-enable-users>
- o Configure Voice Routing = <https://docs.microsoft.com/en-us/microsoftteams/direct-routing-voice-routing>
- o Translating numbers = <https://docs.microsoft.com/en-us/microsoftteams/direct-routing-translate-numbers>

Note: It should be noted that all voice routes (inbound and outbound) will need to be configured in E164 format (+442074326789) for example.

6. Network requirements, DNS, and certificates

6.1. Overview

The following section details firewall ports, IP address ranges, and other information that are used within ICON Teams Connector service. Although there is no direct connection between Maintel's ICON Core network and the customer network, this section lists all the details of this service.

It is the customer responsibility to enable the connectivity between their network and office 365 for direct routing.

6.2. IP address and port ranges.

6.2.1. *O365 FQDN's for Direct Routing*

The connection points for Direct Routing are the following three FQDNs:

sip.pstnhub.microsoft.com – Global FQDN
sip2.pstnhub.microsoft.com – Secondary FQDN –
sip3.pstnhub.microsoft.com – Tertiary FQDN –

The FQDNs – sip.pstnhub.microsoft.com, sip2.pstnhub.microsoft.com and sip3.pstnhub.microsoft.com – will be resolved to one of the following IP addresses:

6.2.2. *O365 signalling IP address ranges*

52.114.148.0
52.114.132.46
52.114.75.24
52.114.76.76
52.114.7.24
52.114.14.70
52.114.16.74
52.114.20.29

You need to open ports for all these IP addresses in your firewall to allow incoming and outgoing traffic to and from the addresses for signalling. If your firewall supports DNS names, the FQDN sip-all.pstnhub.microsoft.com resolves to all these IP addresses.

6.2.3. O365 Media IP address ranges

52.112.0.0/14 (IP addresses from 52.112.0.1 to 52.115.255.254).

52.120.0.0/14 (IP addresses from 52.120.0.1 to 52.123.255.254).

6.2.4. SIP Signalling: Ports

You must use the following ports for Microsoft 365 or Office 365 environments where Direct Routing is offered:

Traffic	From	To	Source port	Destination port
SIP/TLS	SIP Proxy	SBC	1024 – 65535	5061
SIP/TLS	SBC	SIP Proxy	Defined on the SBC	5061

6.2.5. SIP Media Ports

Traffic	From	To	Source port	Destination port
UDP/SRTP	Media Processor	SBC	3478-3481,49152 – 53247	5061
UDP/SRTP	SBC	Media Processor	5061	3478-3481,49152 – 53247

6.2.6. Public Certificates and DNS

Because this service uses “Derived Trunks”, and it is utilising Maintel icon-integrator.net name space, there is no requirement on the customer to provide any public DNS records or certificates. This is all provided and managed by Maintel

6.2.7. ICON Teams Connector FQDN and IP address ranges

TLD (Top Level Domain) = **icon-integrator.net**

ICON Teams SBC' FQDN and carrier tenant = **teams.icon-integrator.net**

Customer service Teams FQDN = **[customer.teams.icon-integrator.net]**

All FQDN's resolve to resiliency internet services within the ICON Core. These FQDN's resolve to the following IP.

185.181.144.181

7. Recommendations and Best Practice

7.1. Overview

The following section details some best practices and recommendations for the customer network. Although these are not mandatory, implementing these will allow your users to have the best possible voice quality and experience using this service.

7.1.1. *Physical devices on the LAN*

- Physical phones will need their own VLAN in office locations where there are multiple users. These voice VLANs should not contain any more than 250 devices as a best practice. If there are more than 250 devices within one physical location, multiple voice VLANs should be used.
- If you wish to plug PC's and laptops into the back of the physical handsets, and for these device to reside within the native data VLAN, CDP (Cisco Discovery Protocol) or LLDP (Logical Link Discovery Protocol) will need to be enabled on your LAN switches, depending on the make and model of your switches.
- CDP (Cisco) and LLDP (Industry Standard) allow phones to identify as voice devices when they boot on your network. This then tells the switches to register the phones within the voice VLAN. Data devices ignore this and boot to the native, data VLAN

7.1.2. *Internet*

- It is recommended that you use an Internet connection with dedicated upstream and downstream bandwidth in order to guard against poor voice quality when accessing the service. The bandwidth required should be calculated by the customer based on the amount of concurrent calls that will be made at any one time from the specific site.

7.1.3. *Quality of Service*

Quality of Service (QoS) should be used to configure packet prioritization. This will improve call quality in Teams and help you monitor and troubleshoot call quality. QoS should be implemented on all segments of a managed network. Even when a network has been adequately provisioned for bandwidth, QoS provides risk mitigation in the event of unanticipated network events. With QoS, voice traffic is prioritized so that these unanticipated events don't negatively affect quality.

The above will ensure that the ICON Teams Connector traffic is appropriately prioritised across the customer's private network.

8. Glossary

Term	Definition
DDI	Direct Dialling In – the number callers dial to call a specific extension or service
DISA	Direct Inward System Access – the ability to configure a DDI such that callers can be authorised and appear as local extensions
ICON	Intelligent Cloud Optimised Network – Maintel's highly resilient, private voice and data network that provides the backbone for the Managed Voice Service
IPT	Internet Protocol Telephony – the transmission of voice (telephone calls) as a data stream over the voice and data network
ITEM	Intelligent Telephone Expense Management – Maintel's feature rich telephone expense management system, included as an integral part of the Managed Voice Service
LAN	Local Area Network – customer site-based data network
MCD	Mitel Communications Director – feature rich telephony application
MOS	Mean Opinion Score – A collection of the delay, jitter and loss experienced via simulated packets which is then combined to reflect an industry standard measurement for voice quality on a scale from 1-5 (1 = Bad and 5 = Excellent).
NNI	Network-to-Network Interconnect – a connection between networks, usually at carrier level.
NOC	National Operations Centre – Maintel's 24x7 Service Desk, single point of contact for all incident, problem or change management related communication for the Managed Voice Service
PBX	Private Branch Exchange – customer telephone switch (Mitel MCD provides the PBX functionality within the Managed Voice Service infrastructure)
PSTN	Public Service Telephone Network
QOS	Quality of Service – a mechanism used to prioritise certain types of network traffic (typically voice and video) to ensure that jitter, loss and latency is reduced as far as possible. To be successful, packets must be marked as priority, and all networks and

	devices between must expedite delivery of these packets.
SBC	Session Border Controller – security devices that prevents unauthorised access to the voice and data network
SDM	Service Delivery Manager – Maintel representative who provides a key point of contact for service related communications
SIP	Session Initiation Protocol – a protocol used to set up, tear down, and control voice calls
SLA	Service Level Agreement
SOP	Sales Order Process – Maintel's order management service
UC	Unified Communications – a suite of communications applications that provide business productivity gains (presence, messaging, conferencing, etc)
VoIP	Voice over Internet Protocol – the mechanism for transmitting voice over a data network
WAN	Wide Area Network – a network that spans multiple locations