



# FERRARI ELECTRONIC OFFICEMASTER / MICROSOFT TEAMS DIRECT ROUTING

## SETUP AND CONFIGURATION GUIDE

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No. 2020-02

Revision 0.9.3

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Ferrari electronic AG

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## I. Revision History

Revision	Date	Author	Changes
0.7	01.08.2018	Johann Deutinger	Initial Preview Version
0.8	10.09.2018	Johann Deutinger	Parameter names changed
0.9	28.11.2018	Johann Deutinger	sipmodifier.lua not needed anymore, more details on SBC configuration
0.9.1	18.02.2019	Johann Deutinger	settings in VoIP Parameters
0.9.2	20.08.2019	Johann Deutinger	Configuration for 4.2/5.0 firmware
0.9.3	18.02.2020	Chris Helbing	Firmware 5.0 only, prepare to release

Table 1: Revision history

# Preface

## Content

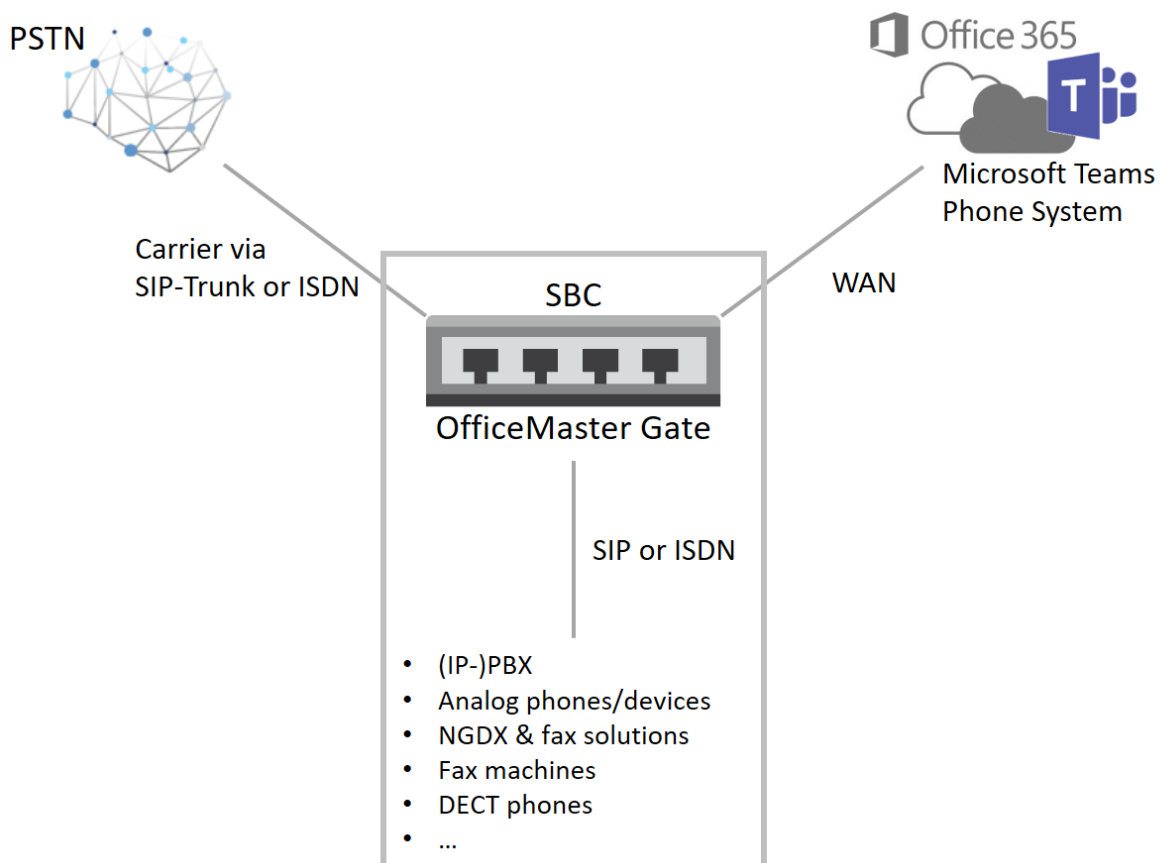
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# 1. Introduction

Microsoft Phone System Direct Routing is an elegant solution to support cloud-based telephony using Microsoft Teams together with PSTN connectivity provided on premises. Therefore, customers can not only use their existing SIP- or ISDN-Trunks but are also able to integrate all kind of local communications infrastructure, including:

- Analog devices
- Emergency phones in elevators
- Fax machines and fax servers
- Existing PBX systems
- Contact center solutions
- DECT phones
- ...

Compared to previous offerings, Direct Routing is much simpler – it just needs an SBC to connect between the infrastructure of Microsoft Teams in Office 365 and local devices and trunks.



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## 1.1. Requirements in Office 365

Important information about planning Direct Routing can be found here:

<https://docs.microsoft.com/en-us/MicrosoftTeams/direct-routing-plan>

Configuration is documented in detail here:

<https://docs.microsoft.com/en-us/MicrosoftTeams/direct-routing-configure>

In general, the requirements are:

- Office 365 tenant with proper licensing
  - Phone System license required (included in E5, optional for E3), Skype for Business Online (Plan 2)
- User registrar
  - User must be homed in Office 365
- Domains
  - One of the domains registered in the Office 365 tenant builds the base for the SBC FQDN. Example: *teamssbc.contoso.com*. Note: onmicrosoft.com is not a valid domain for this purpose! The domain may differ from the SIP-domains assigned to the users.

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## 1.2. Requirements for local SBC configuration

Prerequisites for SBC deployment and configuration are:

- Session Border Controller (SBC) – as documented in this paper
- Telephony trunks connected to the SBC – either directly or through an existing PBX
- Public IP address and FQDN with DNS entry for the SBC
- Public trusted certificate for the SBC from the list of supported authorities (wildcard certificates are supported)
- Connection points for Direct Routing (geographically mapped):
  - sip.pstnhub.microsoft.com (highest priority)
  - sip2.pstnhub.microsoft.com (secondary FQDN)
  - sip3.pstnhub.microsoft.com (tertiary FQDN)
- Firewall IP addresses and ports for Direct Routing media (SIP Proxy and media)
- Media Transport Profile (RTP/SAVP)
- Firewall IP addresses and ports for Microsoft Teams media

## 2. Configure Office 365 Tenant for Microsoft Teams Direct Routing

The required steps are documented in detail here: <https://docs.microsoft.com/en-us/MicrosoftTeams/direct-routing-configure>

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### 2.1. Connect to Skype for Business Online via PowerShell

After connection has been established successfully the list of commands to manage the SBC can be found by executing the command “*gcm \*onlinePSTNGateway*” in the PowerShell session.

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### 2.2. Pair the SBC with the tenant

The PowerShell cmdlet “*New-CsOnlinePSTNGateway*” associates the SBC with the tenant.

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### 2.3. Validate the pairing

Use “*Get-CsOnlinePSTNGateway*” to see if the SBC is present in the list of paired SBC’s. Enable SIP OPTIONS in OfficeMaster VoIP Parameters (set interval to 60 seconds) and check logs written by syslog service if OPTIONS are sent and confirmed successfully. In that case incoming OPTIONS requests should be seen also.

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### 2.4. Enable users for Direct Routing Service

The necessary steps are:

- Create user in Office 365 and assign the license
- Ensure that the user is homed in Skype for Business Online
- Configure phone number and enable enterprise voice and voicemail
- Configure voice routing

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### 2.5. Enable Calling for Microsoft Teams

If the Calls tab does not appear in Microsoft Teams, ensure that “*Allow private calling*” is set to “*On*” in Microsoft Teams Settings and Services on the tenant.

## 3. OfficeMaster Gate SBC Configuration

### 3.1. Requirements for OfficeMaster Gate

All hardware and virtual versions of OfficeMaster Gate, which are compatible with firmware 5 and higher, can be used. Firmware versions starting with 5.0 and higher are supported (including media bypass!). In addition, SIP-Line licenses are needed. OfficeMaster Gate Configuration tool 6.26.1474 or newer is required for configuration!

### 3.2. Network and firewall configuration

The first interface should get a local IP address from the internal network. In addition, the DNS and the default gateway should point to internal resources.

To connect with Microsoft Teams SBC the second interface (“*Adapter #2...*”) needs to be configured with a public IP address.

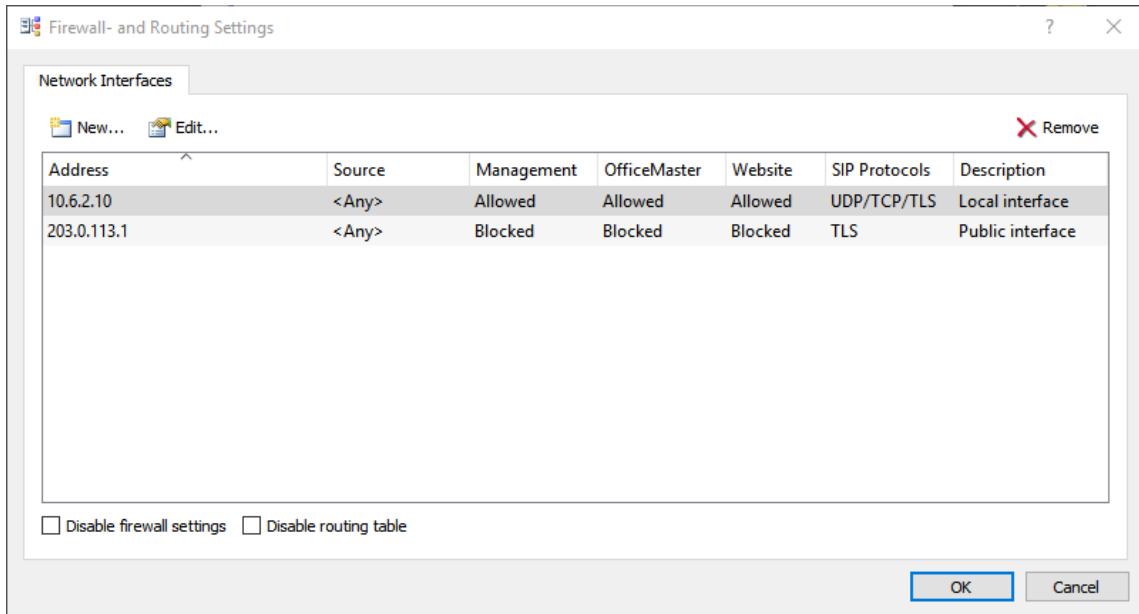
Example:

The screenshot shows the 'Network Settings (Adapter #2)' dialog box with the 'IPv6' tab selected. The configuration is as follows:

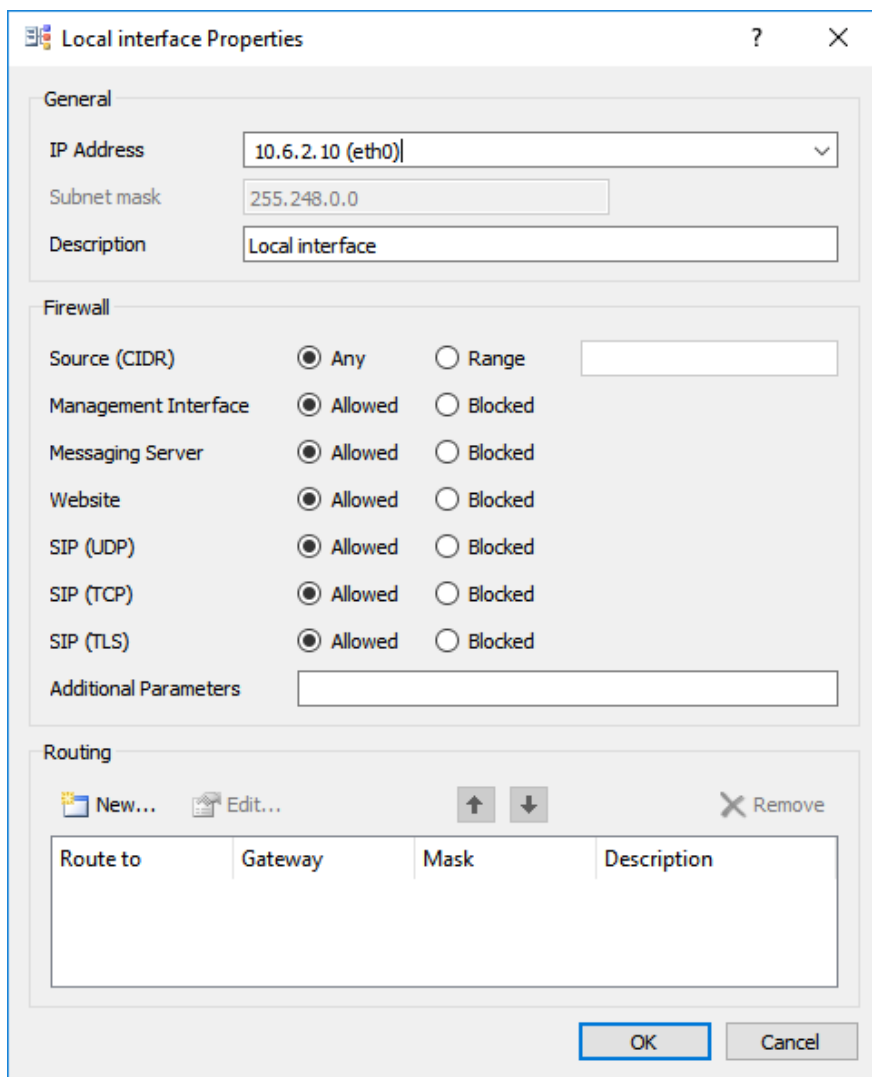
Field	Value
Name:	VGateTeams
Serial Number:	OMGV00660
Mode:	Static IP address
Use the following IP address:	
IP address:	203 . 0 . 113 . 1
Subnet mask:	255 . 255 . 255 . 0
Default gateway:	0 . 0 . 0 . 0
Use the following DNS server addresses:	
Preferred DNS server:	0 . 0 . 0 . 0
Alternate DNS server:	0 . 0 . 0 . 0
Search Domain:	

Buttons: OK, Cancel

Now static routes need to point to the public IP addresses for external SIP and media traffic. Before these routes can be configured, the firewall must be enabled for both internal and external interfaces. This is done by selecting “*Edit – Firewall/Routing.. – New--*”. Both interfaces must be added by selecting their IP addresses.



Usually internal services do not need to be blocked:





External services require more restrictions – just allow incoming SIP (TLS) connections. All other traffic is blocked by this setting. To allow SIP and media communications, all known destinations must be defined separately to be routed through the external interface. Therefore all other (not allowed) traffic would not go through the external interface.

**General**

IP Address: 203.0.113.1 (eth1)

Subnet mask: 255.255.255.0

Description: Public interface

**Firewall**

Source (CIDR):  Any  Range

Management Interface:  Allowed  Blocked

Messaging Server:  Allowed  Blocked

Website:  Allowed  Blocked

SIP (UDP):  Allowed  Blocked

SIP (TCP):  Allowed  Blocked

SIP (TLS):  Allowed  Blocked

Additional Parameters:

**Routing**

Route to	Gateway	Mask	Description
52.114.76.76	203.0.113.254		
52.114.148.0	203.0.113.254		
52.114.132.46	203.0.113.254		
52.114.14.70	203.0.113.254		
52.114.7.24	203.0.113.254		
52.114.75.24	203.0.113.254		
52.112.0.0	203.0.113.254	255.252.0.0	Teams media range

OK Cancel

These IP addresses for SIP and the subnet for media traffic can be found in the Microsoft Direct Routing online documentation.

### 3.3. Install Baltimore trusted root certificate

The Microsoft Teams Session Border Controllers use certificates from Baltimore for TLS communications. The root certificate of Baltimore must be added to the trusted root certificates on the SBC. First download the root CA certificate via <https://cacert.omniroot.com/bc2025.pem>

The pem-file is a base64 encoded text file starting with -----BEGIN CERTIFICATE----- and ending with -----END CERTIFICATE----- . To add this certificate, open (or create, if not existing) the file “/data/ca.pem” on the SBC (using WinSCP or similar tools) and append the text downloaded from above.

### 3.4. Install SBC certificate

To install the certificate for the SBC public FQDN you need both the certificate and the private key in base64/PEM syntax. On Windows, this data can be converted from the certificate viewer if needed. The certificate can be installed via the OfficeMaster Gate configuration tool. To import the private key, the pem-file must be copied to “/data” as “key.pem”.

### 3.5. Global configuration settings

Most settings in “*Edit/VoIP Parameters*” can be left at their default values. Options should be set to 60 seconds. Both the SBC FQDN and IP Address must be configured using the newest **version of OfficeMaster Gate configuration**:

Public Interface DNS Name	teamssbc.contoso.com
Public Interface IP Address	203.0.113.1

### 3.6. Configure routing rules

A sample configuration is provided in “*teams-sample.ofg*”. This file can be opened using the OfficeMaster Gate Config tool. At least four trunk objects must be added:

- 1 trunk to SIP provider or local IPBX
- 3 trunks to Microsoft Teams (sip, sip2 and sip3)

Calls from SIP trunk or PBX should be routed in failover mode to these destinations in the order shown in the example configuration:

