



Cisco on Cisco Best Practices Global Remote Office Design



GLOBAL REMOTE OFFICE DESIGN GUIDE

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Overview

This document describes in detail Cisco IT remote office standards. This standard is the basic building block for all other remote office implementations. It presents a global set of standards for consistent implementation of more than 300 branch offices in the Cisco IT network. These standards were agreed upon by Cisco IT global network engineers to provide a consistent and repeatable implementation process, and to maximize the supportability of these remote offices.

Cisco IT has found that the more closely a limited number of agreed-upon best practice standards are followed, the easier it is to deploy, manage, and maintain sites. Cisco IT network engineers can travel to or remotely connect to equipment at any remote site around the world, and the equipment and configurations are the same across all Cisco offices. This reduces the possible number of problems that can arise, and increases the chances that each Cisco IT network engineer is sufficiently trained in dealing with most potential problems.

It should be noted that the classification described here is based only on Cisco Information Technology and Networking team requirements and does not apply to similar branch office classification schemes by other Cisco teams like Workplace Resources or Facilities. Cisco IT classifies sites by the number of switch ports it needs to support, and by the type of network maintenance support required by the site, while Cisco Workplace Resources groups classify sites according to the number of people and type of work supported at each site. There is often an overlap between these methods of classifying sites—the number of people at a site often dictates the number of switch ports to be supported at that site—but there are significant differences between the two classification schemes. This document describes the Cisco IT site classifications, and describes the Cisco IT remote office standard at these sites.

Note: This document provides the design guidelines for the basic network design at the remote sites. The designs were developed with an understanding that real-time applications like voice and video travel across the network. The configurations covered in this guide include detailed Layer 1 and Layer 2 design, and some Layer 3 design recommendations. Other configurations that overlay on the network like quality of service (QoS), Multicast, access control lists (ACLs), Survivable Remote Site Telephony (SRST), network management, NetFlow, Layer 2 technologies like root guard and loop guard, and any other site-specific configurations are not included in this document. Separate design guides focused on particular technologies will address those configurations.

Cisco IT Remote Office Network Site Classification

Cisco IT has developed six topologies to meet remote office requirements. Each design is based on a set of requirements—size, service level and the number of wiring closets. Sites with multiple buildings are not catered for in this standard. Please refer to the Campus Network Standards for design specifics.

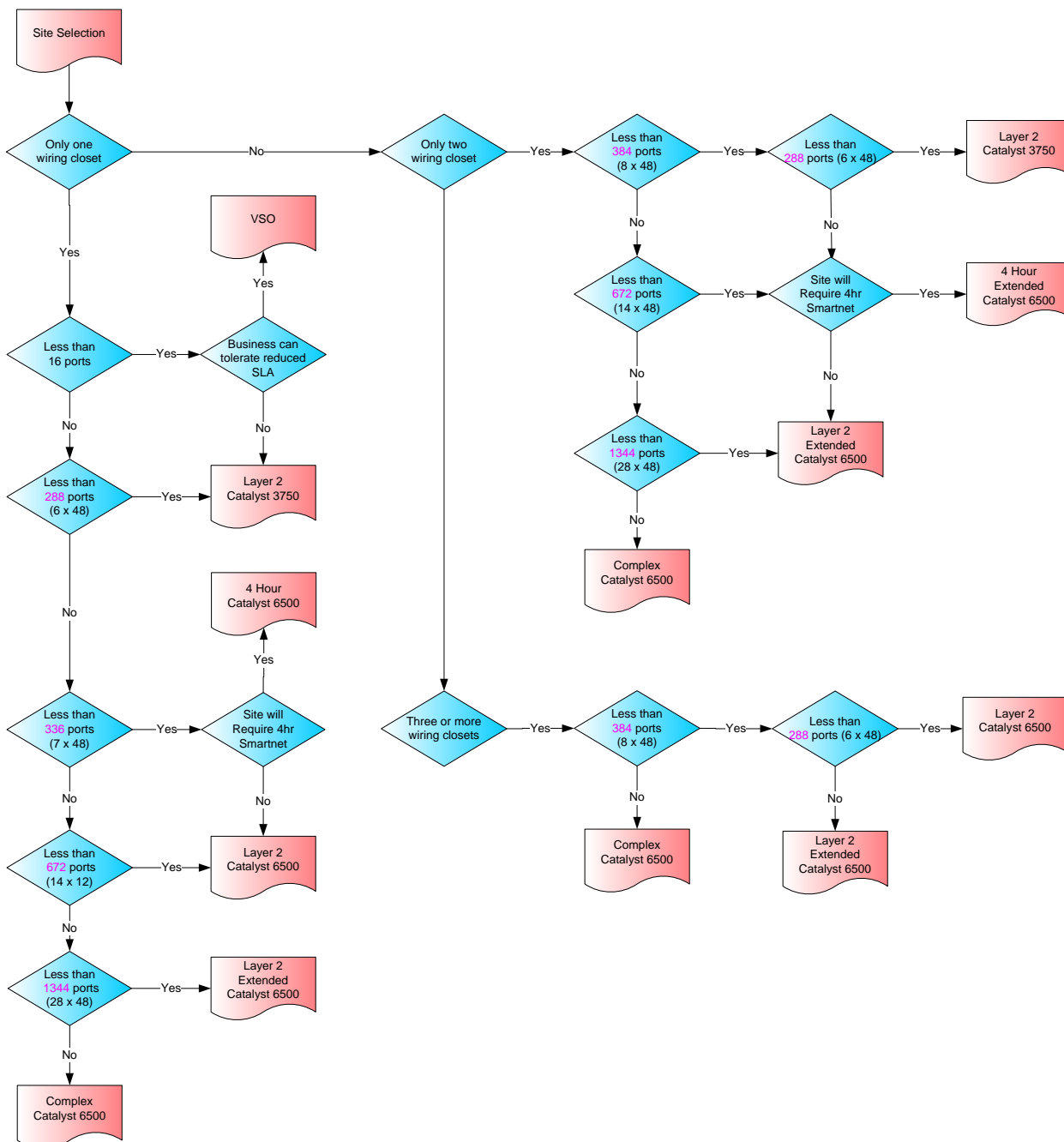


Figure 1. Decision Tree for Cisco remote office classification

Size: The primary classification criterion is the size of the remote site. The size of the remote site is based on the number of ports required, which is dependent on the number of employees at the site and any special applications supported in the remote site. Some sites allocate 2–4 ports per employee, while others allocate fewer than one port per employee (where shared wireless is the primary access technology). In addition to headcount, other factors that may impact the total port count such as meeting rooms, public areas, reception, touchdowns, other IT devices (APs, console servers etc) and security cameras.

Wiring closets: Different buildings may require only one, or more than one, wiring closet. Since Category 5e cable can only carry 100 Mbps Fast Ethernet for about 100 meters, any building longer than 200 meters should have more than one wiring closet. Multi-storied buildings should also have more than one wiring closet. Note: While large and multi-storied buildings often house more users and more ports, this is not always the case.

4 Hour Smartnet: The next classification criterion is whether the core site switches should be deployed in redundant pair or if the site will be serviced by a 4 hour Smartnet contract. Core switches are deployed in pairs in sites that are critical to Cisco, or in sites that have no onsite (or nearby) maintenance teams

Plan for the future. Cisco IT has experienced rapid change in office sizes, and has found it useful to work with the clients that will be occupying the site, and with Workplace Resources, to determine the current and future requirements of the location. Whenever possible, Cisco IT asks these experts to consider a site's possible growth or changes in size (in terms of number of employees and access ports) and user needs over the next 18 months (it is difficult to project beyond 18 months). Cisco IT builds out each site based on this 18-month growth estimate.

1. Very Small Office

The Very Small Office (VSO) model covers offices servicing approximately 1 to 5 people where Service Level Agreements (SLA) can be negotiated around the lack of redundancy for data and voice networking. Examples of small offices include:

- Convenience office (a small office within a client's company).
- Small Cisco leased offices with shared facilities such as phones and an Internet connection.

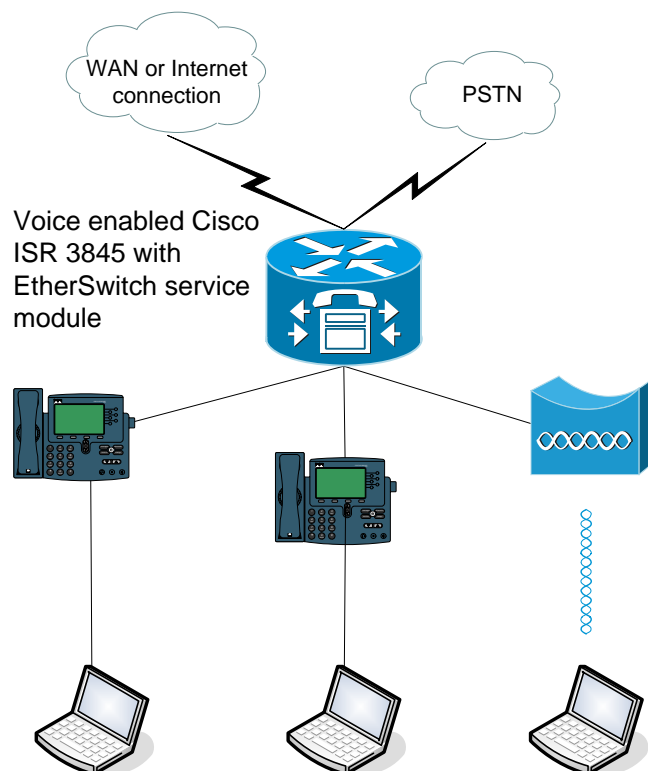


Figure 2. Very Small Office

A very small office is defined as one that has the following characteristics:

Port capacity	The maximum number of access ports to be supported at the remote site is 23.
Redundancy	The site does not require any redundancy in terms of leased circuits or devices on the network.
Hardware	Voice enabled Cisco ISR 3845 router, EtherSwitch Service Module, IP Phones and Access Points.
WAN	The site can be supported by a traditional leased-line based WAN or VPN connection over the public Internet with reduced SLA.

Very Small Office Configuration Templates

Note: This is a sample configuration that can be used to understand Cisco IT best practices. Each and every customer requirement would be different and hence thorough analysis and research should be done before applying any design standard.

WAN Router Configuration

```
<snip>
!
! Standard naming conversions allows common entry point to site
! without requiring site knowledge
!
hostname <site-prefix>-wan-gw1

!
! Every Device is monitored and managed via its loopback address
!
interface Loopback0
    ip address <gw1-l-0-ip-address> 255.255.255.255

!
! Configure VLANs for data and voice - gateway is using an
! etherswitch service module
!
interface GigabitEthernet1/0
    no ip address
    no shutdown
!
interface GigabitEthernet1/0.<data-vlan>
    description <site-prefix> data VLAN <data-vlan>
    encapsulation dot1Q <data-vlan>
    ip address <gw1-ge-1-0-data-vlan-ip> <data-vlan-mask>
    ip helper-address <primary-dhcp-server>
    ip helper-address <secondary-dhcp-server>
    arp timeout 1740
    no ip directed broadcast
    ntp broadcast
!
interface GigabitEthernet1/0.<voice-vlan>
    description <site-prefix> voice VLAN <voice-vlan>
    encapsulation dot1Q <voice-vlan>
    ip address <gw1-ge-1-0-voice-vlan-ip> <voice-vlan-mask>
    ip helper-address <primary-dhcp-server>
    ip helper-address <secondary-dhcp-server>
    arp timeout 1740
    no ip directed broadcast

!
! WAN-GW1 WAN interface should summarize locally used address
! blocks out
!
interface <gw-wan-interface>
    description to <hub-router-gw> : <service-provider> : <circuit-number-
    gw>
    bandwidth <gw-bandwidth>
    ip address <ip-address> <mask>
    ip summary-address eigrp <as> <network1> <mask>
```



```
ip summary-address eigrp <as> <network2> <mask>
...

!
! Guarantee only those networks originating at the remote site are
! advertised out. This ACL is applied to a distribute list
!
ip access-list standard local_nets
  permit <network1> <inverse mask>
  permit <network2> <inverse mask>

!
! EIGRP
!
router eigrp <as>
  no auto-summary
  eigrp log-neighbor-changes
  passive-interface default
  no passive-interface <gw-wan-interface>
  network <network1>
  network <network2>
  distribute-list local_nets out <gw-wan-interface>
```

EtherSwitch Service Module Configuration

```
hostname <site-prefix>-sw1
!
no ip routing
ip default-gateway <gw1-ge-1-0-data-vlan-ip>
!
vtp domain <site-prefix>-sw1
vtp mode transparent
vtp password <site-prefix>-sw1
!
vlan <trunk-vlan>
  name trunk-native
!
vlan <data-vlan>
  name data<data-vlan>
!
vlan <voice-vlan>
  name voice<voice-vlan>
!
spanning-tree vlan <trunk-vlan> root primary
spanning-tree vlan <data-vlan> root primary
spanning-tree vlan <voice-vlan> root secondary
spanning-tree portfast bpduguard
!
mac address-table aging-time 1800

!
! Management interface is placed on the data VLAN
!
interface Vlan1
  no ip address
!
interface Vlan<data-vlan>
```

```
ip address <sw1-data-vlan-ip> <data-vlan-mask>

!
! Trunk between the EtherSwitch service module and the router
!
interface GigabitEthernet1/0/1
  description - spare -
  shutdown
!
interface GigabitEthernet1/0/2
  description trunk to <site-prefix>-wan-gw1
  switchport
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan <trunk-vlan>,<data-vlan>,<voice-vlan>
  switchport trunk native vlan <trunk-vlan>
  switchport mode trunk
  no ip address
!

!
! First port always reserved for console server
!
interface FastEthernet1/0/1
  description connection to <site-prefix>-cs1
  no ip address
  switchport
  switchport access vlan <data-vlan>
  duplex full
  speed 100
  uddl enable

!
! Define access ports with both data and voice vlans
!
interface range FastEthernet1/0/2 - 22
  no ip address
  switchport
  switchport access vlan <data-vlan>
  switchport mode access
  switchport voice vlan <voice-vlan>

!
! Reserve the last two ports for APs
!
interface range FastEthernet1/0/23 - 24
  description reserved for wireless AP
  switchport
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan <data-vlan>,<voice-vlan>
  switchport trunk native vlan <data-vlan>
  switchport mode trunk

spanning-tree guard loop
  no ip address
  duplex full
  speed 100
  uddl enable
```

2. Small Office (Layer 2 – Catalyst 3750)

The Small Office model is designed to support offices with a total port count not exceeding 288. The design is flexible enough to be used in implementations where either all access ports are aggregated into a single wiring closet or where the access port wiring is distributed in up to 5 wiring closets. Within Cisco IT, this model is referred to as a Layer 2 – Catalyst 3750.

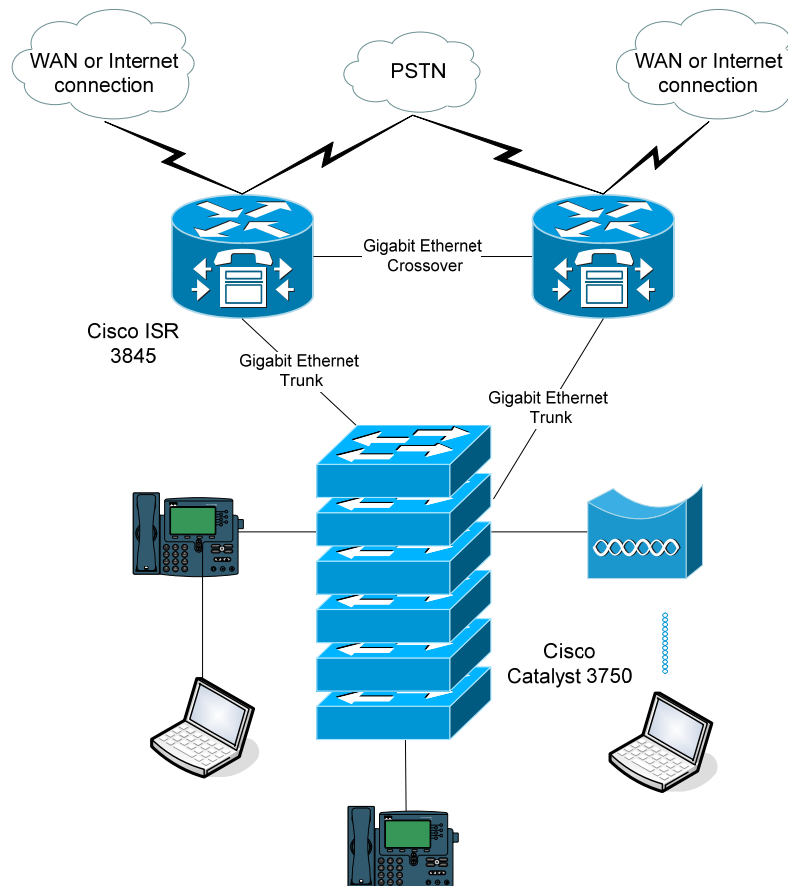


Figure 3. Medium-Sized Office (with Backup Switches) Design

A small office (layer 2 – Catalyst 3750) is defined as one that has the following characteristics:

- Port capacity** The maximum number of access ports to be supported at the remote site is 288. The ports can be distributed in up to 5 wiring closets.
- Redundancy** Redundancy is achieved by deploying dual WAN gateways each with their own WAN circuit. Where more than one switch is present in the same wiring closet, the switches are deployed in a stack. At minimum, two switches should be stacked together in the core.

Hardware	Voice enabled 3845 router, up to 6 3750 switches, IP Phones and Access Points.
WAN	It is the preference for this site to be deployed using by a permanent WAN service. If it is not possible to provision a permanent service (for example excessive lead-time, availability or cost prohibitive) a VPN connection over the public Internet can be used.

Small Office (Layer 2 – Catalyst 3750) Configuration Templates

Note: This is a sample configuration that can be used to understand Cisco IT best practices. Each and every customer requirement would be different and hence thorough analysis and research should be done before applying any design standard.

WAN Router Gateway 1 Configuration

```
<snip>
!
! Standard naming conversions allows common entry point to site
! without requiring site knowledge
!
hostname <site-prefix>-wan-gw1

!
! Every Device is monitored and managed via its loopback address
!
interface Loopback0
    ip address <gw1-l-0-ip-address> 255.255.255.255

!
! Configure trunking sub-interfaces
!
interface GigabitEthernet0/0
    description to <site-prefix>-sw1
    no ip address
    speed 1000
    full-duplex
    no shutdown
!
interface GigabitEthernet0/0.<data-vlan>
    description <site-prefix> data VLAN <data-vlan>
    encapsulation dot1Q <data-vlan>
    ip address <gw1-ge-0-0-data-vlan-ip> <data-vlan-mask>
    ip helper-address <primary-dhcp-server>
    ip helper-address <secondary-dhcp-server>
    arp timeout 1740
    no ip directed broadcast
    ntp broadcast
    standby 1 ip <data-vlan-hsrp-ip>
    standby 1 priority 110
    standby 1 preempt
!
```

```
interface GigabitEthernet0/0.<voice-vlan>
description <site-prefix> voice VLAN <voice-vlan>
encapsulation dot1Q <voice-vlan>
ip address <gw1-ge-0-0-voice-vlan-ip> <voice-vlan-mask>
ip helper-address <primary-dhcp-server>
ip helper-address <secondary-dhcp-server>
arp timeout 1740
no ip directed broadcast
standby 2 ip <voice-vlan-hsrp-ip>
standby 2 priority 105
standby 2 preempt
!
interface GigabitEthernet0/0.<services-vlan>
description <site-prefix> services VLAN <service-vlan>
encapsulation dot1Q <services-vlan>
ip address <gw1-ge-0-0-services-vlan-ip> <services-vlan-mask>
arp timeout 1740
no ip directed broadcast
standby 3 ip <services-vlan-hsrp-ip>
standby 3 priority 110
standby 3 preempt

!
! WAN-GW1 WAN interface should summarize locally used address
! blocks out
!
interface <gw-wan-interface>
description to <hub-router-gw> : <service-provider> : <circuit-number-
gw>
bandwidth <gw-bandwidth>
ip address <ip-address> <mask>
ip summary-address eigrp <as> <network1> <mask>
ip summary-address eigrp <as> <network2> <mask>
...

!
! Guarantee only those networks originating at the remote site are
! advertised out. This ACL is applied to a distribute list
!
ip access-list standard local_nets
permit <network1> <inverse mask>
permit <network2> <inverse mask>

!
! EIGRP
!
router eigrp <as>
no auto-summary
eigrp log-neighbor-changes
passive-interface default
no passive-interface <gw-wan-interface>
no passive-interface GigabitEthernet0/0.<services-vlan>
network <network1>
network <network2>
distribute-list local_nets out <gw-wan-interface>
```

WAN Router Gateway 2 Configuration

```
<snip>
!  
! Configuration for GW1 and GW2 is very similar. IP addresses will  
! differ as will the HSRP priorities.  
!  
interface GigabitEthernet0/0.<data-vlan>  
    standby 1 priority 105  
!  
interface GigabitEthernet0/0.<voice-vlan>  
    standby 2 priority 110  
!  
interface GigabitEthernet0/0.<services-vlan>  
    standby 3 priority 105
```

Catalyst 3750 Switch Stack

```
hostname <site-prefix>-sw1  
!  
no ip routing  
ip default-gateway <data-vlan-hsrp>  
!  
vtp domain <site-prefix>-sw1  
vtp mode transparent  
vtp password <site-prefix>-sw1  
!  
vlan <services-vlan>  
    name services  
!  
vlan <trunk-vlan>  
    name trunk-native  
!  
vlan <data-vlan>  
    name data<data-vlan>  
!  
vlan <voice-vlan>  
    name voice<voice-vlan>  
!  
mac address-table aging-time 1800  
!  
interface Vlan1  
    no ip address  
!  
interface Vlan<data-vlan>  
    ip address <sw1-data-vlan-ip> <data-vlan-mask>!  
  
! define switch priorities so that master switch selection is  
! deterministic  
switch 1 priority 10  
switch 2 priority 5  
  
! The first uplink to the gateways is from the first switch  
! The second uplink to the gateways is from the second switch  
! Switch 1
```

```
interface GigabitEthernet1/0/1
  description trunk to <site-prefix>-wan-gw1
  switchport
  switchport trunk encapsulation dot1q
  switchport trunk native vlan <trunk-vlan>
  switchport mode trunk
  duplex full
  speed 1000
!

! Port reservation for trunks should the site need to expand
interface GigabitEthernet1/0/2
  description reserved for L2 extended trunk to sw2
  switchport
  switchport trunk encapsulation dot1q
  switchport trunk native vlan <trunk-vlan>
  switchport mode trunk
  duplex full
  speed 1000
  shutdown
!
interface GigabitEthernet1/0/3
  description reserved for L2 extended trunk to sw3
  switchport
  switchport trunk encapsulation dot1q
  switchport trunk native vlan <trunk-vlan>
  switchport mode trunk
  duplex full
  speed 1000
  shutdown
!
interface range GigabitEthernet1/0/4
  description spare
  shutdown
!

! Port reservation for console server
interface FastEthernet1/0/1
  description connection to <site-prefix>-cs1
  no ip address
  switchport
  switchport access vlan <data-vlan>
  duplex full
  speed 100
  spanning-tree portfast

! Port reservation for content engine
interface FastEthernet1/0/2
  description connection to CE (primary link)
  no ip address
  switchport
  switchport access vlan <services-vlan>
  duplex full
  speed 100
  spanning-tree portfast
!
```

```
interface range FastEthernet1/0/3 - 46
  no ip address
  switchport
    switchport access vlan <data-vlan> switchport mode access
  switchport voice vlan <voice-vlan>
  spanning-tree portfast
!
interface range FastEthernet1/0/47 - 48
  description reserved for wireless AP
  switchport
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan <data-vlan>,<voice-vlan>
  switchport trunk native vlan <data-vlan>
  switchport mode trunk
  spanning-tree guard loop
  no ip address
  duplex full
  speed 100
  shutdown
!

! The first uplink to the gateways is from the first switch
! The second uplink to the gateways is from the second switch
! Switch 2
interface GigabitEthernet2/0/1
  description trunk to <site-prefix>-wan-gw2
  switchport
  switchport trunk encapsulation dot1q
  switchport trunk native vlan <trunk-vlan>
  switchport mode trunk
  duplex full
  speed 1000
!
interface GigabitEthernet2/0/2
  description reserved for L2 extended trunk to sw2
  switchport
  switchport trunk encapsulation dot1q
  switchport trunk native vlan <trunk-vlan>
  switchport mode trunk
  duplex full
  speed 1000
  shutdown
!
interface GigabitEthernet2/0/3
  description reserved for L2 extended trunk to sw3
  switchport
  switchport trunk encapsulation dot1q
  switchport trunk native vlan <trunk-vlan>
  switchport mode trunk
  duplex full
  speed 1000
  shutdown
!
interface range GigabitEthernet2/0/4
  description spare
  shutdown
```



```
!  
interface range FastEthernet2/0/1 - 46  
  no ip address  
  switchport  
  switchport access vlan <data-vlan>  
  switchport mode access  
  switchport voice vlan <voice-vlan>  
  spanning-tree portfast  
!  
interface range FastEthernet2/0/47 - 48  
  description reserved for wireless AP  
  switchport  
  switchport trunk encapsulation dot1q  
  switchport trunk allowed vlan <data-vlan>,<voice-vlan>  
  switchport trunk native vlan <data-vlan>  
  switchport mode trunk  
  spanning-tree guard loop  
  no ip address  
  duplex full  
  speed 100  
  shutdown  
  
! For each additional switch in the stack the configuration is as  
! follows  
! Switch <switch>  
!  
interface range FastEthernet<switch>/0/1 - 46  
  no ip address  
  switchport  
  switchport access vlan <data-vlan>  
  switchport mode access  
  switchport voice vlan <voice-vlan>  
  spanning-tree portfast  
!  
interface range FastEthernet<switch>/0/47 - 48  
  description reserved for wireless AP  
  switchport  
  switchport trunk encapsulation dot1q  
  switchport trunk allowed vlan <data-vlan>,<voice-vlan>  
  switchport trunk native vlan <data-vlan>  
  switchport mode trunk  
  spanning-tree guard loop  
  no ip address  
  duplex full  
  speed 100  
  shutdown
```

3. Medium-sized office with 4 hour SMARTNet (4 Hour/Extended)

This design covers medium sized offices where a four-hour service is required and which can be covered by a four hour SMARTNet contract. The criticality is determined by the business requirements supported at the remote site.

This design is classified into two separate models which Cisco IT typically refer to as four hour and four hour extended. The four hour extended model includes an additional switch to support sites with a secondary communication room or wiring closet.

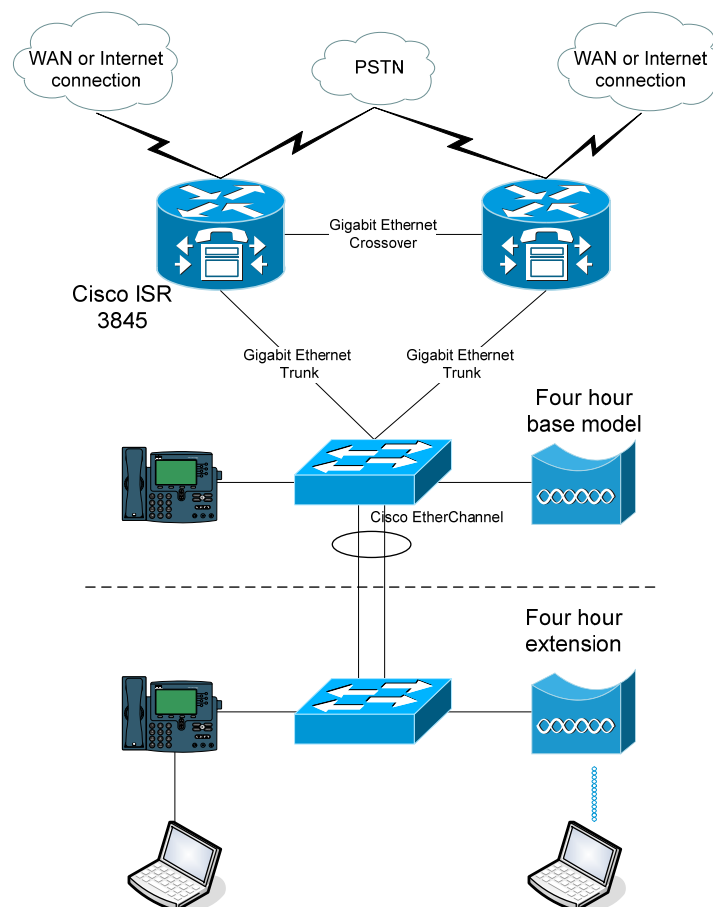


Figure 4. Medium-Sized Office (4 hour model)

A medium office (4 hour/extended) is defined as one that has the following characteristics:

- Port capacity** Up to 336 switch ports for Four-Hour model and 672 ports for the extended model.
- Physical size** One or two communication rooms or wiring closets.

Redundancy	Redundancy is achieved by deploying dual WAN gateways each with their own WAN circuit. Each LAN Switch is deployed with dual supervisors and dual power supplies.
Hardware	Voice enabled Cisco ISR 3845 router, EtherSwitch Service Module, IP Phones and Access Points
WAN	It is the preference for this site to be deployed using by a permanent WAN service. If it is not possible to provision a permanent service (for example excessive lead-time, availability or cost prohibitive) a VPN connection over the public Internet can be used.

Medium-sized office with 4 hour SMARTNet (4 Hour/Extended) Configuration Templates

Note: This is a sample configuration that can be used to understand Cisco IT best practices. Each and every customer requirement would be different and hence thorough analysis and research should be done before applying any design standard.

WAN Router Gateway 1 Configuration

```
<snip>
!
! Standard naming conversions allows common entry point to site
! without requiring site knowledge
!
hostname <site-prefix>-wan-gw1

!
! Every Device is monitored and managed via its loopback address
!
interface Loopback0
    ip address <gw1-l-0-ip-address> 255.255.255.255

!
! Configure trunking sub-interfaces
!

interface GigabitEthernet0/0
    description to <site-prefix>-sw1
    no ip address
    speed 1000
    full-duplex
    no shutdown
!
interface GigabitEthernet0/0.<data-vlan>
    description <site-prefix> data VLAN <data-vlan>
    encapsulation dot1Q <data-vlan>
    ip address <gw1-ge-0-0-data-vlan-ip> <data-vlan-mask>
    ip helper-address <primary-dhcp-server>
    ip helper-address <secondary-dhcp-server>
    arp timeout 1740
```

```
no ip directed broadcast
ntp broadcast
standby 1 ip <data-vlan-hsrp-ip>
standby 1 priority 110
standby 1 preempt
!
interface GigabitEthernet0/0.<voice-vlan>
description <site-prefix> voice VLAN <voice-vlan>
encapsulation dot1Q <voice-vlan>
ip address <gw1-ge-0-0-voice-vlan-ip> <voice-vlan-mask>
ip helper-address <primary-dhcp-server>
ip helper-address <secondary-dhcp-server>
arp timeout 1740
no ip directed broadcast
standby 2 ip <voice-vlan-hsrp-ip>
standby 2 priority 105
standby 2 preempt
!
interface GigabitEthernet0/0.<services-vlan>
description <site-prefix> services VLAN <service-vlan>
encapsulation dot1Q <services-vlan>
ip address <gw1-ge-0-0-services-vlan-ip> <services-vlan-mask>
arp timeout 1740
no ip directed broadcast
standby 3 ip <services-vlan-hsrp-ip>
standby 3 priority 110
standby 3 preempt

!
! WAN-GW1 WAN interface should summarize locally used address
! blocks out
!
interface <gw-wan-interface>
description to <hub-router-gw> : <service-provider> : <circuit-number-
gw>
bandwidth <gw-bandwidth>
ip address <ip-address> <mask>
ip summary-address eigrp <as> <network1> <mask>
ip summary-address eigrp <as> <network2> <mask>
...

!
! Guarantee only those networks originating at the remote site are
! advertised out. This ACL is applied to a distribute list
!
ip access-list standard local_nets
permit <network1> <inverse mask>
permit <network2> <inverse mask>

!
! EIGRP
!
router eigrp <as>
no auto-summary
eigrp log-neighbor-changes
passive-interface default
no passive-interface <gw-wan-interface>
```

```
no passive-interface GigabitEthernet0/0.<services-vlan>
network <network1>
network <network2>
distribute-list local_nets out <gw-wan-interface>
```

WAN Router Gateway 2 Configuration

```
<snip>
!
! Configuration for GW1 and GW2 is very similar. IP addresses will
! differ as will the HSRP priorities.
!

interface GigabitEthernet0/0.<data-vlan>
    standby 1 priority 105
!
interface GigabitEthernet0/0.<voice-vlan>
    standby 2 priority 110
!
interface GigabitEthernet0/0.<services-vlan>
    standby 3 priority 105
```

Catalyst 6500 Switch 1 running Cisco Catalyst OS

```
<snip>
!
! Supervisors are placed in slots 5 & 6
!

set system name <site-prefix>-sw1
#
set vtp domain <site-prefix>-sw1
set vtp mode transparent
set vtp passwd <site-prefix>-sw1
#
set vlan <trunk-vlan>    name trunk-native
set vlan <data-vlan>    name data<data-vlan>
set vlan <voice-vlan>   name voice<voice-vlan>
set vlan <services-vlan> name services
#
set interface sc0 <data-vlan> <sw1-data-vlan-ip> <data-vlan-mask>
#
set ip route default <data-vlan-hsrp>
#
set spantree enable all
set spantree root <trunk-vlan>
set spantree root <data-vlan>
set spantree root <voice-vlan>
set spantree root <services-vlan>
#

# Line card 1
set port auto-mdix 1/1-48 disable
#
```

```
set port name 1/1 <site-prefix>-cs1
set spantree portfast 1/1 disable
set vlan <data-vlan> 1/1
set trunk 1/1 nonegotiate dot1q
set port speed 1/1 100
set port duplex 1/1 full
set port channel 1/1 off
#
set port name 1/2 reserved for content engine
set port host 1/2
set vlan <services-vlan> 1/2
set port speed 1/2 1000
set port duplex 1/2 full
set port trap 1/2 disable
#
set port host 1/3-46
set vlan <data-vlan> 1/3-46
set port auxiliaryvlan 1/3-46 <voice-vlan>
set port speed 1/3-46 auto
#
set port name 1/47 reserved for AP
set spantree portfast 1/47 disable
set vlan <data-vlan> 1/47
set trunk 1/47 nonegotiate dot1q
#
set port name 1/48 reserved for AP
set spantree portfast 1/48 disable
set vlan <data-vlan> 1/48
set trunk 1/48 nonegotiate dot1q

# All remaining provisioned line cards
set port auto-mdix <module>/1-48 disable
#
set port host <module>/1-46
set vlan <data-vlan> <module>/1-46
set port auxiliaryvlan <module>/1-46 <voice-vlan>
set port speed <module>/1-46 auto
#
set port name <module>/47 reserved for AP
set spantree portfast <module>/47 disable
set vlan <data-vlan> <module>/47
set trunk <module>/47 nonegotiate dot1q
#
set port name <module>/48 reserved for AP
set spantree portfast <module>/48 disable
set vlan <data-vlan> <module>/48
set trunk <module>/48 nonegotiate dot1q

# Line card 5 - Supervisor
set port name 5/1 <site-prefix>-wan-gw1
set spantree portfast 5/1 disable
set vlan <trunk-vlan> 5/1
set trunk 5/1 nonegotiate dot1q
set port speed 5/1 1000
set port duplex 5/1 full
```

```
set port channel 5/1 off
#
set port name 5/2 reserved for sw2 expansion

# Line card 6 - Supervisor

set port name 6/1 <site-prefix>-wan-gw2
set spantree portfast 6/1 disable
set vlan <trunk-vlan> 6/1
set trunk 6/1 nonegotiate dot1q
set port speed 6/1 1000
set port duplex 6/1 full
set port channel 6/1 off
#
set port name 6/2 reserved for sw2 expansion

# The following configuration is only required for the four hour
# extended model
set port channel 5/2,6/2 1
set port channel 5/2,6/2 mode desirable
#
set port name 5/2 <site-prefix>-sw2
set spantree portfast 5/2 disable
set vlan <trunk-vlan> 5/2
set trunk 5/2 nonegotiate dot1q
#
set port name 6/2 <site-prefix>-sw2
set spantree portfast 6/2 disable
set vlan <trunk-vlan> 6/2
set trunk 6/2 nonegotiate dot1q
```

Catalyst 6500 Switch 2 running Cisco Catalyst OS

```
! This switch is only required if deploying the four hour extended model
!
! Configuration of switch 2 is very similar to switch with the exception
! that there are no ports reserved for services or gateways
!

set system name <site-prefix>-sw
#
set vtp domain <site-prefix>-sw2
set vtp mode transparent
set vtp passwd <site-prefix>-sw2
#
set vlan <trunk-vlan> name trunk-native
set vlan <data-vlan> name data<data-vlan>
set vlan <voice-vlan> name voice<voice-vlan>
set vlan <services-vlan> name services
#
set interface sc0 <data-vlan> <sw2-data-vlan-ip> <data-vlan-mask>
```

```
#
set ip route default <data-vlan-hsrp>

# All remaining provisioned line cards
set port auto-mdix <module>/1-48 disable

#
set port host <module>/1-46
set vlan <data-vlan> <module>/1-46
set port auxiliaryvlan <module>/1-46 <voice-vlan>
set port speed <module>/1-46 auto
#
set port name <module>/47 reserved for AP
set spantree portfast <module>/47 disable
set vlan <data-vlan> <module>/47
set trunk <module>/47 nonegotiate dot1q
#
set port name <module>/48 reserved for AP
set spantree portfast <module>/48 disable
set vlan <data-vlan> <module>/48
set trunk <module>/48 nonegotiate dot1q

# Line cards 5 & 6 - Supervisors
set port channel 5/1,6/1 1
set port channel 5/1,6/1 mode desirable
#
set port name 5/1 <site-prefix>-sw1
set spantree portfast 5/1 disable
set vlan <trunk-vlan> 5/1
set trunk 5/1 nonegotiate dot1q
#
set port name 6/1 <site-prefix>-sw1
set spantree portfast 6/1 disable
set vlan <trunk-vlan> 6/1
set trunk 6/1 nonegotiate dot1q
```


4. Medium-Sized Office (Layer 2 – Catalyst 6500/Extended)

This design caters for medium sized offices where the total port count does not exceed 1344 and where there are no more than three wiring closets. Dual Catalyst 6500 switches are deployed in the core even though they have dual power supplies and dual processors. This has been done for offices where shipping and local customs may cause replacement equipment to be delayed, or where the potential impact to the client base is too great to implement the 4 hour model.

This design is classified into two separate models which Cisco IT typically refer to Layer 2 Catalyst 6500 and Layer 2 Catalyst 6500 extended. The extended model includes an additional two switches to support sites with an extra one or two wiring closets or if additional capacity is required in the primary wiring closet.

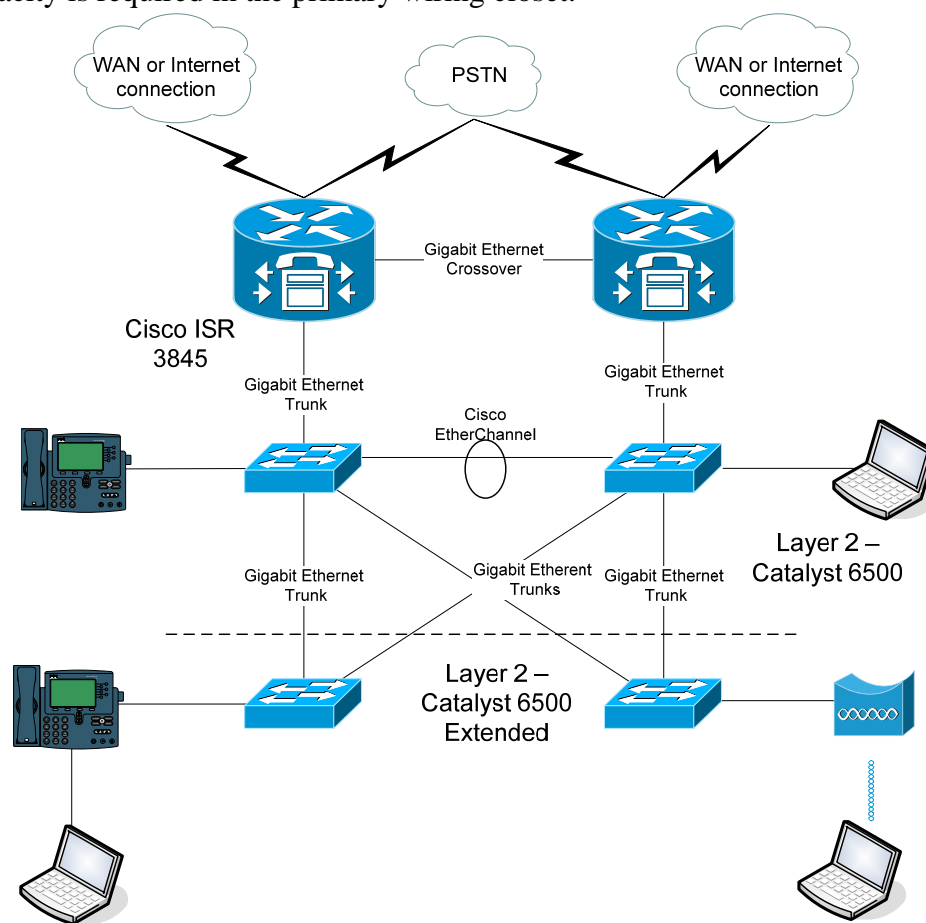


Figure 5. Medium-Sized Office (Layer 2 – C6k/Extended)

A medium-sized office (Layer 2 – Catalyst 6500/extended) is defined as one that has the following characteristics:

Port capacity Up to 672 switch ports for Layer 2 Catalyst 6500 model and 1344 ports for the extended model.

Physical size	Between one and three wiring closets.
Redundancy	Redundancy is achieved by deploying dual WAN gateways each with their own WAN circuit. Each LAN Switch is deployed with dual supervisors and dual power supplies.
Hardware	Voice enabled ISR 3845 router, up to 4 Catalyst 6509s with dual Supervisors and dual power supplies, IP Phones and Access Points
WAN	It is the preference for this site to be deployed using by a permanent WAN service. If it is not possible to provision a permanent service (for example excessive lead-time, availability or cost prohibitive) a VPN connection over the public Internet can be used.

Medium-Sized Office (Layer 2 – Catalyst 6500/extended) Configuration Templates

Note: This is a sample configuration that can be used to understand Cisco IT best practices. Each and every customer requirement would be different and hence thorough analysis and research should be done before applying any design standard.

WAN Router Gateway 1 Configuration

```
<snip>
!
! Standard naming conversions allows common entry point to site
! without requiring site knowledge
!
hostname <site-prefix>-wan-gw1

!
! Every Device is monitored and managed via its loopback address
!
interface Loopback0
    ip address <gw1-l-0-ip-address> 255.255.255.255

!
! Configure trunking sub-interfaces
!
interface GigabitEthernet0/0
    description to <site-prefix>-sw1
    no ip address
    speed 1000
    full-duplex
    no shutdown
!
interface GigabitEthernet0/0.<data-vlan>
    description <site-prefix> data VLAN <data-vlan>
    encapsulation dot1Q <data-vlan>
    ip address <gw1-ge-0-0-data-vlan-ip> <data-vlan-mask>
    ip helper-address <primary-dhcp-server>
    ip helper-address <secondary-dhcp-server>
    arp timeout 1740
```

```
no ip directed broadcast
ntp broadcast
standby 1 ip <data-vlan-hsrp-ip>
standby 1 priority 110
standby 1 preempt
!
interface GigabitEthernet0/0.<voice-vlan>
description <site-prefix> voice VLAN <voice-vlan>
encapsulation dot1Q <voice-vlan>
ip address <gw1-ge-0-0-voice-vlan-ip> <voice-vlan-mask>
ip helper-address <primary-dhcp-server>
ip helper-address <secondary-dhcp-server>
arp timeout 1740
no ip directed broadcast
standby 2 ip <voice-vlan-hsrp-ip>
standby 2 priority 105
standby 2 preempt
!
interface GigabitEthernet0/0.<services-vlan>
description <site-prefix> services VLAN <service-vlan>
encapsulation dot1Q <services-vlan>
ip address <gw1-ge-0-0-services-vlan-ip> <services-vlan-mask>
arp timeout 1740
no ip directed broadcast
standby 3 ip <services-vlan-hsrp-ip>
standby 3 priority 110
standby 3 preempt

!
! WAN-GW1 WAN interface should summarize locally used address
! blocks out
!
interface <gw-wan-interface>
description to <hub-router-gw> : <service-provider> : <circuit-number-
gw>
bandwidth <gw-bandwidth>
ip address <ip-address> <mask>
ip summary-address eigrp <as> <network1> <mask>
ip summary-address eigrp <as> <network2> <mask>

!
! Guarantee only those networks originating at the remote site are
! advertised out. This ACL is applied to a distribute list
!
ip access-list standard local_nets
permit <network1> <inverse mask>
permit <network2> <inverse mask>

!
! EIGRP
!
router eigrp <as>
no auto-summary
eigrp log-neighbor-changes
passive-interface default
no passive-interface <gw-wan-interface>
no passive-interface GigabitEthernet0/0.<services-vlan>
```

```
network <network1>
network <network2>
distribute-list local_nets out <gw-wan-interface>
```

WAN Router Gateway 2 Configuration

Configuration for GW1 and GW2 is very similar. IP addresses will differ as will the HSRP priorities.

```
interface GigabitEthernet0/0.<data-vlan>
  standby 1 priority 105
!
interface GigabitEthernet0/0.<voice-vlan>
  standby 2 priority 110
!
interface GigabitEthernet0/0.<services-vlan>
  standby 3 priority 105
```

Catalyst 6500 Switch 1 running Cisco Catalyst OS

```
<snip>
!
! Supervisors are placed in slots 5 & 6
!

set system name <site-prefix>-sw1
#
set vtp domain <site-prefix>-sw1
set vtp mode transparent
set vtp passwd <site-prefix>-sw1
#
set vlan <trunk-vlan>    name trunk-native
set vlan <data-vlan>    name data<data-vlan>
set vlan <voice-vlan>   name voice<voice-vlan>
set vlan <services-vlan> name services
#
set interface sc0 <data-vlan> <sw1-data-vlan-ip> <data-vlan-mask>
#
set ip route default <data-vlan-hsrp>
#
set udld enable
set ip redirect disable
set option errport enable
set spantree portfast bpdu-guard enable
set errdisable
set errdisable-timeout disable udld
set errdisable-timeout disable channel-misconfig
set errdisable-timeout enable duplex-mismatch
set errdisable-timeout enable bpdu-guard
set errdisable-timeout disable other
set errdisable-timeout interval 2880
set errordetection portcounter enable
```

```
#
set spantree enable all
set spantree root <trunk-vlan>
set spantree root <data-vlan>
set spantree root <voice-vlan>
set spantree root <services-vlan>
#

# Line card 1
set port auto-mdix 1/1-48 disable
#
set port name 1/1 <site-prefix>-cs1
set spantree portfast 1/1 disable
set vlan <data-vlan> 1/1
set trunk 1/1 nonegotiate dot1q
set port speed 1/1 100
set port duplex 1/1 full
set port channel 1/1 off
#
set port name 1/2 reserved for content engine
set port host 1/2
set vlan <services-vlan> 1/2
set port speed 1/2 1000
set port duplex 1/2 full
set port trap 1/2 disable
#
set port host 1/3-46
set vlan <data-vlan> 1/3-46
set port auxiliaryvlan 1/3-46 <voice-vlan>
set port speed 1/3-46 auto
#
set port name 1/47 reserved for AP
set spantree portfast 1/47 disable
set vlan <data-vlan> 1/47
set trunk 1/47 nonegotiate dot1q
#
set port name 1/48 reserved for AP
set spantree portfast 1/48 disable
set vlan <data-vlan> 1/48
set trunk 1/48 nonegotiate dot1q

# All remaining provisioned line cards
set port auto-mdix <module>/1-48 disable
#
set port host <module>/1-46
set vlan <data-vlan> <module>/1-46
set port auxiliaryvlan <module>/1-46 <voice-vlan>
set port speed <module>/1-46 auto
#
set port name <module>/47 reserved for AP
set spantree portfast <module>/47 disable
set vlan <data-vlan> <module>/47
set trunk <module>/47 nonegotiate dot1q
#
```

```
set port name <module>/48 reserved for AP
set spantree portfast <module>/48 disable
set vlan <data-vlan> <module>/48
set trunk <module>/48 nonegotiate dot1q
```

Line card 5 - Supervisor

```
set port name 5/1 <site-prefix>-wan-gw1
set spantree portfast 5/1 disable
set vlan <trunk-vlan> 5/1
set trunk 5/1 nonegotiate dot1q
set port speed 5/1 1000
set port duplex 5/1 full
set port channel 5/1 off
#
set port name 5/2 <site-prefix>-sw2
set spantree portfast 5/2 disable
set vlan <trunk-vlan> 5/2
set trunk 5/2 nonegotiate dot1q
#
set port name 5/3 <site-prefix>-sw3
set spantree portfast 5/3 disable
set vlan <trunk-vlan> 5/3
set trunk 5/3 nonegotiate dot1q
#
set port name 5/4 <site-prefix>-sw4
set spantree portfast 5/4 disable
set vlan <trunk-vlan> 5/4
set trunk 5/4 nonegotiate dot1q
```

Line card 6 - Supervisor

```
set port name 6/1 spare
set port disable
#
set port name 6/2 <site-prefix>-sw2
set spantree portfast 6/2 disable
set vlan <trunk-vlan> 6/2
set trunk 6/2 nonegotiate dot1q
#
set port name 6/3 <site-prefix>-sw3
set spantree portfast 6/3 disable
set vlan <trunk-vlan> 6/3
set trunk 6/3 nonegotiate dot1q
#
set port name 6/4 <site-prefix>-sw4
set spantree portfast 6/4 disable
set vlan <trunk-vlan> 6/4
set trunk 6/4 nonegotiate dot1q
```

EtherChannel between sw1 and sw2

```
set port channel 5/2,6/2 1
set port channel 5/2,6/2 mode desirable
```

Catalyst 6500 Switch 2 running Cisco Catalyst OS

```
<snip>
!  
! Supervisors are placed in slots 5 & 6  
!  
  
set system name <site-prefix>-sw2  
  
#  
set vtp domain <site-prefix>-sw2  
set vtp mode transparent  
set vtp passwd <site-prefix>-sw2  
#  
set vlan <trunk-vlan>      name trunk-native  
set vlan <data-vlan>      name data<data-vlan>  
set vlan <voice-vlan>     name voice<voice-vlan>  
set vlan <services-vlan> name services  
#  
set interface sc0 <data-vlan> <sw2-data-vlan-ip> <data-vlan-mask>  
#  
set ip route default <data-vlan-hsrp>  
#  
set spantree enable all  
set spantree root secondary <trunk-vlan>  
set spantree root secondary <data-vlan>  
set spantree root secondary <voice-vlan>  
set spantree root secondary <services-vlan>  
#  
  
# All remaining provisioned line cards  
set port auto-mdix <module>/1-48 disable  
#  
set port host <module>/1-46  
set vlan <data-vlan> <module>/1-46  
set port auxiliaryvlan <module>/1-46 <voice-vlan>  
set port speed <module>/1-46 auto  
#  
set port name <module>/47 reserved for AP  
set spantree portfast <module>/47 disable  
set vlan <data-vlan> <module>/47  
set trunk <module>/47 nonegotiate dot1q  
#  
set port name <module>/48 reserved for AP  
set spantree portfast <module>/48 disable  
set vlan <data-vlan> <module>/48  
set trunk <module>/48 nonegotiate dot1q  
  
# Line card 5 - Supervisor  
set port name 5/1 <site-prefix>-wan-gw2  
set spantree portfast 5/1 disable  
set vlan <trunk-vlan> 5/1  
set trunk 5/1 nonegotiate dot1q  
set port speed 5/1 1000
```

```
set port name 5/2 <site-prefix>-sw1
set spantree portfast 5/2 disable
set vlan <trunk-vlan> 5/2
set port duplex 5/1 full
set port channel 5/1 off
#
set trunk 5/2 nonegotiate dot1q
#
set port name 5/3 <site-prefix>-sw3
set spantree portfast 5/3 disable
set vlan <trunk-vlan> 5/3
set trunk 5/3 nonegotiate dot1q
#
set port name 5/4 <site-prefix>-sw4
set spantree portfast 5/4 disable
set vlan <trunk-vlan> 5/4
set trunk 5/4 nonegotiate dot1q

# Line card 6 - Supervisor
set port name 6/1 spare
set port disable
#
set port name 6/2 <site-prefix>-sw1
set spantree portfast 6/2 disable
set vlan <trunk-vlan> 6/2
set trunk 6/2 nonegotiate dot1q
#
set port name 6/3 <site-prefix>-sw3
set spantree portfast 6/3 disable
set vlan <trunk-vlan> 6/3
set trunk 6/3 nonegotiate dot1q
#
set port name 6/4 <site-prefix>-sw4
set spantree portfast 6/4 disable
set vlan <trunk-vlan> 6/4
set trunk 6/4 nonegotiate dot1q

# EtherChannel between sw1 and sw2
set port channel 5/2,6/2 1
set port channel 5/2,6/2 mode desirable
```

Catalyst 6500 Switch 3 & 4 running Cisco Catalyst OS

```
! This switch is only required if deploying the extended model
!
```

```
set system name <site-prefix>-sw<switch>
#
set vtp domain <site-prefix>-sw<switch>
set vtp mode transparent
set vtp passwd <site-prefix>-sw<switch>
#
set vlan <trunk-vlan> name trunk-native
```



```
set vlan <data-vlan>      name data<data-vlan>
set vlan <voice-vlan>     name voice<voice-vlan>
set vlan <services-vlan> name services
#
set interface sc0 <data-vlan> <sw<switch>-data-vlan-ip> <data-vlan-mask>

#
set ip route default <data-vlan-hsrp>
#

# All remaining line cards
set port auto-mdix <module>/1-48 disable
#
set port host <module>/1-46
set vlan <data-vlan> <module>/1-46
set port auxiliaryvlan <module>/1-46 <voice-vlan>
set port speed <module>/1-46 auto
#
set port name <module>/47 reserved for AP
set spantree portfast <module>/47 disable
set vlan <data-vlan> <module>/47
set trunk <module>/47 nonegotiate dot1q
#
set port name <module>/48 reserved for AP
set spantree portfast <module>/48 disable
set vlan <data-vlan> <module>/48
set trunk <module>/48 nonegotiate dot1q

# Line cards 5 & 6 - Supervisors
set port name 5/1 <site-prefix>-sw1
set spantree portfast 5/1 disable
set vlan <trunk-vlan> 5/1
set trunk 5/1 nonegotiate dot1q
#
set port name 6/1 <site-prefix>-sw2
set spantree portfast 6/1 disable
set vlan <trunk-vlan> 6/1
set trunk 6/1 nonegotiate dot1q
```

5. Large-sized Office (Complex)

The large office model caters for all remaining sites exceeding the specifications for the preceding models. Typically the sites have a requirement of great than 1344 ports and/or more than 3 wiring closets. The large-sized office has a distribution layer to support the extended network. These sites differ from earlier topologies because the switches are redundant, the port capacity is larger, and the business supported at these sites is critical. Within Cisco IT, this model is typically referred to as the Complex model.

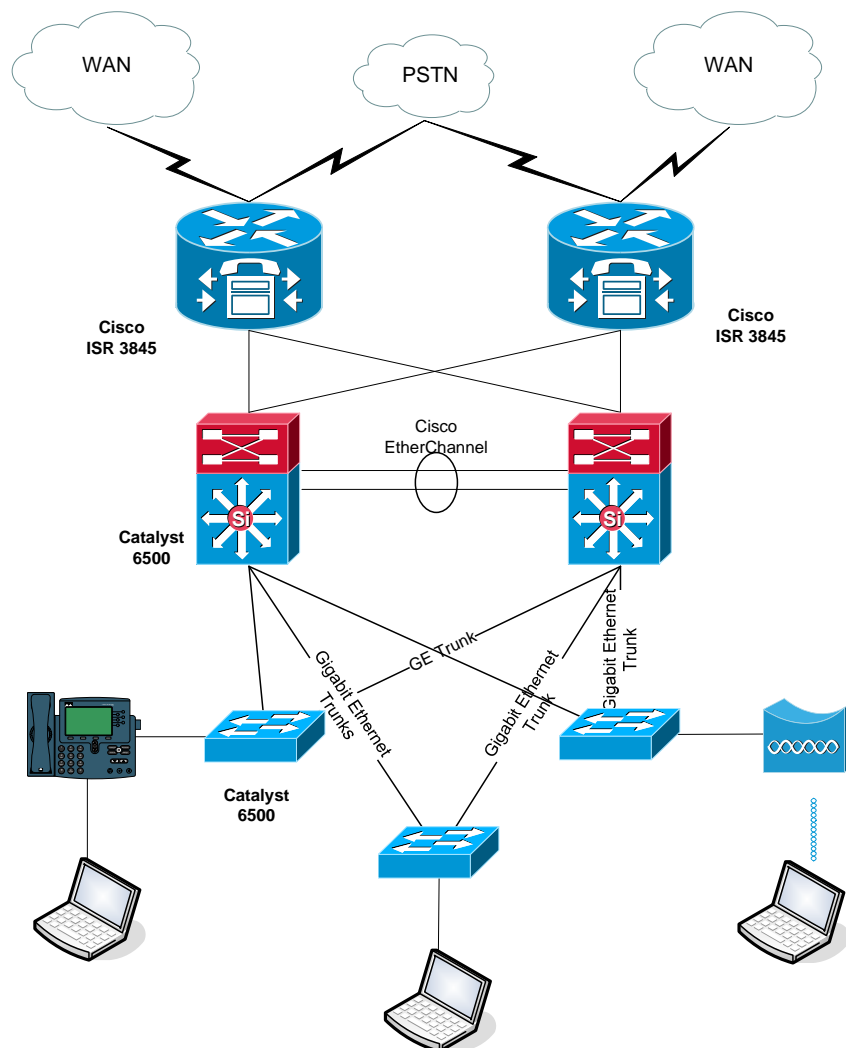


Figure 6. Large Complex Office Design

A large-sized office (Complex) is defined as one that has the following characteristics:

- Port capacity** From 1344 access ports and beyond.
- Physical size** No restriction on the number of wiring closets.

Redundancy	Redundancy is achieved by deploying dual WAN gateways each with their own WAN circuit. Each LAN Switch is deployed with dual supervisors and dual power supplies.
Hardware	Voice enabled Cisco ISR 3845 router, Catalyst 6509s with dual Supervisors and dual power supplies, IP Phones and Access Points
WAN	It is requirement for a site of this type to be deployed using a permanent WAN service.

Large Complex Office Configuration Templates

Note: This is a sample configuration that can be used to understand Cisco IT best practices. Each and every customer requirement would be different and hence thorough analysis and research should be done before applying any design standard.

WAN Router Gateway 1 Configuration

```
<snip>
!
! Standard naming conversions allows common entry point to site
! without requiring site knowledge
!
hostname <site-prefix>-wan-gw1

!
! Every Device is monitored and managed via its loopback address
!
interface Loopback0
  ip address <gw1-l-0-ip-address> 255.255.255.255

interface GigabitEthernet0/0
  description to <site-prefix>-bb-gw1
  ip address <gw1-ge-0-0-ip> 255.255.255.252
  speed 1000
  full-duplex
  no shutdown
!
interface GigabitEthernet0/1
  description to <site-prefix>-bb-gw2
  ip address <gw1-ge-0-0-ip> 255.255.255.252
  speed 1000
  full-duplex
  no shutdown

!
! WAN-GW1 WAN interface should summarize locally used address
! blocks out
!
interface <gw-wan-interface>
  description to <hub-router-gw> : <service-provider> : <circuit-number-
  gw>
  bandwidth <gw-bandwidth>
```

```
ip address <ip-address> <mask>
  ip summary-address eigrp <as> <network1> <mask>
  ip summary-address eigrp <as> <network2> <mask>
  ...

!
! Guarantee only those networks originating at the remote site are
! advertised out. This ACL is applied to a distribute list
!
ip access-list standard local_nets
  permit <network1> <inverse mask>
  permit <network2> <inverse mask>

!
! EIGRP
!
router eigrp <as>
  no auto-summary
  eigrp log-neighbor-changes
  passive-interface default
  no passive-interface <gw-wan-interface>
  no passive-interface GigabitEthernet0/0
  no passive-interface GigabitEthernet0/1
  network <network1>
  network <network2>
  distribute-list local_nets out <gw-wan-interface>
```

WAN Router Gateway 2 Configuration

The configuration of gateway 2 is identical with the exception of the interface IP addresses.

6500 Backbone Gateway 1 Configuration running Cisco IOS

```
hostname <site-prefix>-bb-gw1
!
vtp domain <site-prefix>-bb-gw1
vtp mode transparent
vtp password <site-prefix>-bb-gw1
!
vlan <services-vlan>
  name services
!
vlan <trunk-vlan>
  name trunk-native
!
vlan <data-vlan>
  name data<data-vlan>
!
vlan <voice-vlan>
  name voice<voice-vlan>
```

```
!  
vlan <wireless-data-vlan>  
  name wireless-data<wireless-data-vlan>  
!  
vlan <wireless-voice-vlan>  
name wireless-voice<wireless-voice-vlan>  
!  
spanning-tree vlan <services-vlan>      priority 8192  
spanning-tree vlan <trunk-vlan>         priority 8192  
spanning-tree vlan <data-vlan>          priority 8192  
spanning-tree vlan <voice-vlan>         priority 8192  
spanning-tree vlan <wireless-data-vlan> priority 8192  
spanning-tree vlan <wireless-voice-vlan> priority 8192  
!  
  
interface Loopback0  
  ip address <bb1-loopback-0-ip> 255.255.255.255  
!  
!  
interface Vlan<services-vlan>  
  description L3 route between bb-gw1 and bb-gw2  
  ip address <bb1-vlan-10-ip> <services-vlan-mask>  
  no shutdown  
!  
interface Vlan<data-vlan>  
  description <site-prefix> data VLAN <data-vlan>  
  ip address <bb1-data-vlan-ip> <data-vlan-mask>  
  ip helper-address <primary-dhcp>  
  ip helper-address <secondary-dhcp>  
  no ip directed broadcast  
  no ip redirects  
  ntp broadcast  
  arp timeout 1740  
  standby 1 ip <data-vlan-hsrp>  
  standby 1 priority 110  
  standby 1 preempt  
!  
interface Vlan<voice-vlan>  
  description <site-prefix> voice VLAN 400  
  ip address <bb1-voice-vlan-ip> <voice-vlan-mask>  
  ip helper-address <primary-dhcp>  
  ip helper-address <secondary-dhcp>  
  no ip directed broadcast  
  no ip redirects  
  ntp broadcast  
  arp timeout 1740  
  standby 1 ip <voice-vlan-hsrp>  
  standby 1 priority 110  
  standby 1 preempt  
!  
interface Vlan<wireless-data-vlan>  
  description <site-prefix> Wireless data LAN
```

```
ip address <bb1-wireless-data-vlan-ip> <wireless-data-mask>
ip helper-address <primary-dhcp>
ip helper-address <secondary-dhcp>
no ip directed broadcast
no ip redirects
arp timeout 1740
standby 1 priority 110
standby 1 ip <v250-hsrp>
standby 1 preempt
no shutdown
!
interface Vlan<wireless-voice-vlan>
description <site-prefix> Wireless voice LAN
ip address <bb1-wireless-voice-vlan-ip> <wireless-voice-vlan-mask>
ip helper-address <primary-dhcp>
ip helper-address <secondary-dhcp>
no ip directed broadcast
no ip redirects
arp timeout 1740
standby 1 priority 110
standby 1 ip <v251-hsrp>
standby 1 preempt
no shutdown
!
interface GigabitEthernet1/1
description to <site-prefix>-wan-gw1
ip address <bb1-ge-1-1-ip> 255.255.255.252
no shutdown
!
interface GigabitEthernet1/2
description to <<site-prefix>-wan-gw2
ip address <bb1-ge-1-2-ip> 255.255.255.252
no shutdown
!
interface Port-channel1
description L2 etherchannel group comprising GE5/1 and GE6/1
no ip address
switchport
switchport trunk encapsulation dot1q
switchport trunk native vlan <trunk-vlan>
switchport mode trunk
!
interface GigabitEthernet5/1
description to <site-prefix>-bb-gw2
no ip address
switchport
switchport trunk encapsulation dot1q
switchport trunk native vlan <trunk-vlan>
switchport mode trunk
channel-group 1 mode desirable
no shutdown
!
interface GigabitEthernet 5/2
description trunk to <site-prefix> access switch 1
```

```
no ip address
switchport switchport trunk encapsulation dot1q
switchport trunk native vlan <trunk-vlan>
switchport mode trunk
no shutdown
!
interface GigabitEthernet5/3
description trunk to <site-prefix> access switch 2
no ip address
switchport
switchport trunk encapsulation dot1q
switchport trunk native vlan <trunk-vlan>
switchport mode trunk
no shutdown
!
interface GigabitEthernet5/4
description trunk to <site-prefix> access switch 3
no ip address
switchport
switchport trunk encapsulation dot1q
switchport trunk native vlan <trunk-vlan>
switchport mode trunk
no shutdown
!
interface GigabitEthernet5/5
description trunk to <site-prefix> access switch 4
no ip address
switchport
switchport trunk encapsulation dot1q
switchport trunk native vlan <trunk-vlan>
switchport mode trunk
no shutdown
!
interface GigabitEthernet6/1
description to <site-prefix>-bb-gw2
no ip address
switchport
switchport trunk encapsulation dot1q
switchport trunk native vlan <trunk-vlan>
switchport mode trunk
channel-group 1 mode desirable
no shutdown
!
router eigrp AS
no auto-summary
passive-interface default
eigrp log-neighbor-changes
no passive-interface VLAN<service-vlan>
no passive-interface GigabitEthernet1/1
no passive-interface GigabitEthernet1/2
network <network1>
network <network2>
```

Catalyst 6500 Backbone Gateway 2 Configuration running Cisco IOS

The configuration of backbone gateway 2 is identical with the exception of the interface IP addresses and the HSRP values will be 105 in lieu of 110.

Catalyst 6500 Access Switch running Cisco Catalyst OS

```
set system name <site-prefix>-sw<switch>
#
set vtp domain <site-prefix>-sw<switch>

set vtp mode transparent
set vtp passwd <site-prefix>-sw<switch>
#
set vlan <trunk-vlan>          name trunk-native
set vlan <data-vlan>          name data<data-vlan>
set vlan <voice-vlan>        name voice<voice-vlan>
set vlan <services-vlan>     name services
set vlan <wireless-data-vlan> name wireless-data<wireless-data-vlan>
set vlan <wireless-voice-vlan> name wireless-data<wireless-voice-vlan>
#
set interface sc0 <data-vlan> <sw<switch>-data-vlan-ip> <data-vlan-mask>
#
set ip route default <data-vlan-hsrp>

# All line cards
set port auto-mdix <module>/1-48 disable
#
set port host <module>/1-46
set vlan <data-vlan> <module>/1-46
set port auxiliaryvlan <module>/1-46 <voice-vlan>
set port speed <module>/1-46 auto
#
set port name <module>/47 reserved for AP
set spantree portfast <module>/47 disable
set vlan <data-vlan> <module>/47
set trunk <module>/47 nonegotiate dot1q
#
set port name <module>/48 reserved for AP
set spantree portfast <module>/48 disable
set vlan <data-vlan> <module>/48
set trunk <module>/48 nonegotiate dot1q

# Line cards 5 & 6 - Supervisors
set port name 5/1 <site-prefix>-bb-gw1
set spantree portfast 5/1 disable
set vlan <trunk-vlan> 5/1
set trunk 5/1 nonegotiate dot1q
#
set port name 6/1 <site-prefix>-bb-gw2
set spantree portfast 6/1 disable
set vlan <trunk-vlan> 6/1
set trunk 6/1 nonegotiate dot1q
```


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