SMB

Small and Medium Business Solutions Overview and Configuration Guide

ATTENTION

Clicking on a PDF hyperlink takes you to the appropriate page. If necessary, scroll up or down the page to see the beginning of the referenced section.

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Contents

How to get help

This section explains how to get help for Nortel products and services.

Getting help from the Nortel Web site

The best way to get technical support for Nortel products is from the Nortel Technical Support Web site:

www.nortel.com/support

This site provides quick access to software, documentation, bulletins, and tools to address issues with Nortel products. More specifically, the site enables you to:

- download software, documentation, and product bulletins
- search the Technical Support Web site and the Nortel Knowledge Base for answers to technical issues
- sign up for automatic notification of new software and documentation for Nortel equipment
- open and manage technical support cases

Getting help over the phone from a Nortel Solutions Center

If you do not find the information you require on the Nortel Technical Support Web site, and have a Nortel support contract, you can also get help over the phone from a Nortel Solutions Center.

In North America, call 1-800-4NORTEL (1-800-466-7835).

Outside North America, go to the following Web site to obtain the phone number for your region:

www.nortel.com/callus

Getting help from a specialist by using an Express Routing Code

To access some Nortel Technical Solutions Centers, you can use an Express Routing Code (ERC) to quickly route your call to a specialist in your Nortel product or service. To locate the ERC for your product or service, go to:

www.nortel.com/erc

Getting help through a Nortel distributor or reseller

If you purchased a service contract for your Nortel product from a distributor or authorized reseller, contact the technical support staff for that distributor or reseller.

New in this release

The following section details what is new in the *Nortel Small and Medium Business (SMB) Solutions Overview and Configuration Guide* for SMB (Small and Medium Business) portfolio Release 2.0.

New products

See the following sections for information about new products.

New products in this document

Product	Section
BES50 Series Ethernet switches	"New products " (page 13)
BES200 Series Ethernet switches	"New products " (page 13)
BES1000 Series Ethernet switches	"New products " (page 13)

Getting started

Overview

This document provides the steps to configure three reference topologies and their interconnections for the Small and Medium Business (SMB) portfolio.

Use these example topologies only as a reference when you configure your unique solution.

To reduce redundant documentation, reference the specific quick install guides, configuration guides, and release notes.

Configuring each of the SMB reference topologies consists of individual device configuration and solution-level configuration. All devices (Business Secure Router [BSR222], Business Ethernet Switches [BES50, BES100/200, BES1000], and Business Access Point [BAP120]) include a Web interface to configure the device. The Element Manager provides a centralized management application for launching these Web interfaces. The Element Manager also provides integrated configuration panels for the Business Communications Manager (BCM) and for the Business Ethernet Switch (BES) devices.

The Business Element Manager (EM) provides a computer-based client interface that can connect to devices over an IP network and display the programming interface for that device. You can manage SMB devices using the Web-based user interface that you launch from the Element Manager.

Through the Element Manager, you can configure necessary device parameters and all the parameters for each of the reference topologies.

How to use this guide

Use this document to guide you through the steps that are required to configure your site.

First step

Assemble all tools and documentation required to configure your SMB network. See "SMB Preconfiguration checklist" (page 12).

Second step

Determine which reference topologies and interconnected topologies most closely resemble your unique solution.

Then read the following sections of this guide for more detail:

- "New products" (page 13)
- "Existing products" (page 15)
- "Reference topologies and assumptions" (page 18)

  The reference topologies do not represent a definitive solution for your network but do offer detailed procedures that can provide a guideline for your implementation.
- "IP addressing for SMB devices and DHCP" (page 19)
- "Installing the Business Element Manager" (page 21)

Stand-alone SMB sites

If your requirement is

- solely for data connectivity with no requirement for voice solutions, then configure your site based on the "Smaller converged site (Greenfield and infrastructure replacement)—reference topology 2" (page 37).
- IP or traditional telephony or both, and data connectivity, then configure your site based on the "Smaller converged site (Greenfield and infrastructure replacement)—reference topology 2" (page 37).
- IP or traditional telephony or both, and data connectivity, and Guest Access application service, then configure your site based on the "Converged small site (mixed-vendor environment)—reference topology 1" (page 23).

Linked SMB sites

Linked SMB sites offer two main types of solutions:

- IP trunk linked sites
- main and remote linked sites

In IP trunk linked site scenarios, both sites have a BCM telephony call server and hence are independent. An H.323 IP trunk links the sites for harmonized private dialing plans through branch office virtual private

network (VPN) tunnels. The linked SMB sites described in this guide are verified for small deployment using BCM50 and larger deployment using BCM200/400 in the following interconnected reference topologies:

- "Interconnection of peer sites with incumbent routers (topology 1 with topology 1)" (page 53)
- "Interconnection of peer sites using BSR222 (topology 2 with topology 2)" (page 54)
- "Interconnection of main and remote sites using BSR222 and BCM200/400 (topology 2 with BCM 200/400)" (page 55)

In main and remote linked site scenarios, the main office hosts a BCM telephony call server and is linked to remote offices where IP telephony service is provided from the main office through branch office VPN tunnels. Generally, these remote sites are very small offices where the cost of deploying a locally hosted BCM telephony call server cannot be justified. The linked SMB sites described in this guide are verified for small deployment using BCM50 and larger deployment using BCM200/400 in the following interconnected reference topologies:

- "Interconnection of BSR222 and an incumbent router (topology 1 with topology 3)" (page 56)
- "Interconnection of main and remote sites using BSR222 (topology 2 with topology 3)" (page 58)

Third step

After you determine which topology you are configuring, proceed to the associated section of this guide, as follows:

- If you are configuring a smaller converged site—mixed vendor environment, proceed to "Converged small site (mixed-vendor environment)—reference topology 1" (page 23).
- If you are configuring a smaller converged site—Greenfield and infrastructure replacement, proceed to "Smaller converged site (Greenfield and infrastructure replacement)—reference topology 2" (page 37).
- If you are configuring a smaller remote site—Greenfield and infrastructure replacement, proceed to "Smaller remote site (Greenfield and infrastructure replacement)—reference topology 3" (page 43).
- If you are interconnecting multiple sites, proceed to "WAN interconnected LAN reference topologies" (page 49).

Preconfiguration checklist

The following table lists the production documentation that you need to configure your network. Ensure you have all the applicable items prior to configuring your SMB network.

Download the latest version from

www.nortel.com/support

SMB preconfiguration checklist

Document title	Check
BAP120 1.0	
Quick Installation for the Nortel Business Access Point 120 (NN47921-300)	
Using the Nortel Business Access Point 120 (NN47921-301)	
Business Access Point 120 Release Notes (NN47921-400)	
BES50 1.0	
Quick Installation for the Nortel Business Ethernet Switch 50 Series (NN47924-301)	
Using the Nortel Business Ethernet Switch 50 Series (NN47924-300)	
Business Ethernet Switch 50 Release Notes (NN47924-400)	
BES100/200	
Quick Installation for the Nortel Business Ethernet Switch 100/200 Series (NN47925-301)	
Using the Nortel Business Ethernet Switch 100/200 Series (NN47925-300)	
Business Ethernet Switch 100/200 Release Notes (NN47925-400)	
BES1000 1.0	
Quick Installation for the Nortel Business Ethernet Switch 1000 Series (NN47927-301)	
Using the Nortel Business Ethernet Switch 1000 Series (NN47927-300)	
BSR222	
Quick Installation for the Nortel Business Secure Router 222 (NN47922-300)	
Nortel Business Secure Router 222 Fundamentals (NN47922-301)	
Nortel Business Secure Router 222 Configuration – Basics (NN47922-500)	
Nortel Business Secure Router 222 Configuration – Advanced (NN47922-501)	
Business Secure Router 222 Release Notes (NN47922-400)	
BEM 1.0	
Business Element Manager 1.0 Release Notes (NN47926-400)	
BCM	

Document title	Check
Keycode Installation Guide (N40010-301)	
BCM50 1.0	
Networking Configuration Guide (N0027156)	
First Time Installation and Configuration Guide (N0027149)	
BCM50 2.0	
Installation Checklist and Quick Start Guide (NN40020-308)	
BCM 4.0	
Networking Configuration Guide (N0060606)	
Other	
IP Telephony Client Deployment Technical Solutions Guide (January 2006)	

New products

SMB portfolio 2.0 includes the following new products.

Model number	Description
Business Ethernet Switches	
BES50FE-12T PWR	12 Port 10/100BASE-TX Fast Ethernet ports with PoE
BES50FE-24T PWR	24 Port 10/100BASE-TX Fast Ethernet ports with PoE
BES50GE-12 PWR	12 Port 10/100/1000BASE-T Gig Ethernet ports with PoE
BES50GE-24T PWR	24 Port 10/100/1000BASE-T Gig Ethernet ports with PoE
BES210-24T	24 Fast Ethernet ports, stackable
BES210-48T	48 Fast Ethernet ports, stackable
BES220-24T PWR	24 Fast Ethernet ports with PoE, stackable
BES220-48T PWR	48 Fast Ethernet ports with PoE, stackable
BES1010-24T	24 10/100/1000 autosensing ports with two shared SFP ports
BES1010-48T	48 10/100/1000 autosensing ports with two shared SFP ports
BES1020-24T PWR	24 10/100/1000 autosensing ports with two shared SFP ports and PoE
BES1020-48T PWR	48 10/100/1000 autosensing ports with two shared SFP ports and PoE

Business Ethernet Switches

The BES consist of three series:

- BES50 series
- BES100/200 series

- BES1000 series

BES50 series

The BES50 series is configurable with the BCM50 and other BES50s for desktop or wall-mount installation.

- BES50FE: The BES50FE-12T PWR offers 12 full-duplex 10/100BASE-TX Fast Ethernet ports, all of which support PoE, and the BES50FE-24T PWR offers 24 full-duplex 10/100BASE-TX Fast Ethernet ports, 12 of which support PoE.
- BES50GE: The BES50GE-12T PWR offers 12 full-duplex 10/100/1000BASE-T Gigabit Ethernet ports, all of which support PoE, and the BES50FE-24T PWR offers 24 full-duplex 10/100/1000BASE-T Gig Ethernet ports, 12 of which support PoE.
- Maximum power on any port is 15.4 Watts.

BES50 series switches are equipped with a dynamic host configuration protocol (DHCP) client (configurable to BOOTP server or static IP address) and support a Web management interface compatible with the Element Manager (BEM).

BES100/200 series

The BES100/200 series is a family of 1U rack-mountable Ethernet switches capable of supporting wire-speed connections on 24 or 48 Fast Ethernet ports. These products can be either rack-mounted or physically stacked on a bench.

- BES110 (previously available in SMB portfolio release 1.0): The BES110-24T offers 24 unpowered Fast Ethernet ports and the BES110-48T offers 24 unpowered Fast Ethernet ports.
- BES120 (previously available in SMB portfolio release 1.0): The BES120-24T PWR offers 12 of 24 Fast Ethernet ports as powered ports and the BES120-48T offers 24 of 48 Fast Ethernet ports as powered ports.
- BES210: The BES210-24T offers 24 unpowered Fast Ethernet ports and the BES210-48T offers 48 unpowered Fast Ethernet ports.
- BES220: The BES220-24T offers 12 of 24 Fast Ethernet ports as powered ports and the BES220-48T offers 24 of 48 Fast Ethernet ports as powered ports.
- Maximum power on any port is 15.4 Watts.
- All BES100/200 series switches are equipped with two 10/100/1000 Mb/s copper ports, a serial port, and SNMP and Web management interfaces compatible with both the BEM and a simple Web browser.

- Up to four BES200 Series switches can be connected together using stacking ports and accessed through a single Web user interface screen.

BOOTP is invoked at startup to obtain an IP address for the management interface as the switches are not equipped with a host DHCP client. If the solution provider wants to configure the management interface IP address manually, they can power the BES without a DHCP/BOOTP server present and browse to the factory default address for the management interface.

BES1000 series

The BES1000 series is a family of 1U rack-mountable Ethernet switches supporting autosensing ports and small form factor pluggable (SFP) shared gigabit interface converter (GBIC) slots.

- BES1010: The BES1010-24T offers 24 10/100/1000 Mb/s autosensing ports, including two shared SFP ports, and the BES1010-48T offers 48 10/100/1000 Mb/s autosensing ports, including two shared SFP ports.
- BES1020: The BES 1020-24T PWR offers 24 10/100/1000 Mb/s autosensing ports of which 12 are PoE ports, including two shared SFP ports, and the BES 1020-48T PWR offers 48 10/100/1000 Mb/s autosensing ports of which 24 are PoE ports, including two shared SFP ports.
- Maximum power on any port is 15.4 Watts.
- All BES1000 series switches are equipped with a serial port and SNMP and Web management interfaces compatible with both the BEM and a simple Web browser.

BOOTP is invoked at startup to obtain an IP address for the management interface as the switches are not equipped with a DHCP client. If the solution provider wants to configure the management interface IP address manually, they can power the BES without a DHCP/BOOTP server present and browse to the factory default address for the management interface.

Existing products

The following existing Nortel products integrate with new SMB portfolio release 2.0 products.

SMB Portfolio 1.0 products

Model number	Order code	Description
Element Manager		
BEM1.0	NT5S80AA	Element Manager
Wireless LAN		

Model number	Order code	Description
BAP120	NT5S40CAE6	802.11a/b/g Indoor Access Point (AP) with Bridging and Repeater Modes (PoE)
Secure Router		
BSR222	NT5S20AAE6	Secure Broadband Router
Ethernet Switching		
BES110-24T	NT5S01AEE5	24 Port 10/100 Rack Mount Switch
BES110-48T	NT5S01BEE5	48 Port 10/100 Rack Mount Switch
BES120-24T-PWR	NT5S01MEE5	24 Port 10/100 Rack Mount Switch with PoE
BES120-48T-PWR	NT5S01NEE5	48 Port 10/100 Rack Mount Switch with PoE
Accessories		
Optional power supplies and cords		
Optional Antennas for BAP120		

Other Nortel products

Business Communications Manager	Description
BCM50	release 1.0
BCM50 Expansion and Media Bay Modules	
BCM400	release 4.0
BCM200	release 4.0
BCM200/400 Expansion and Media Bay Modules	
Landline IP telephones	**Description**
IP Phone 1120E	Supported by BCM software release 4 and BCM50 2.0
IP Phone 1140E	Supported by BCM software release 4 and BCM50 2.0
IP Phone 2001	3 x 24 character display, PoE
IP Phone 2002	4 x 24 character display, PoE
IP Phone 2004	8 x 24 character display, PoE
IP Audio Conference Phone 2033	Supported by BCM 4.0 and BCM50 2.0
Soft clients	**Description**
IP Softphone 2050	Windows Soft Client
Mobile Voice Client 2050	Pocket PC Soft Client
VPN Client	Windows Soft Client

Accessories	Description
Mobile USB Headset Adaptor for IP soft phones	For soft clients
IP Phone Key Expansion Module	For 2000 series telephones

Business Element Manager

The Business Element Manager is a Windows application that integrates a Windows-like navigation panel with a simple network management protocol (SNMP)-based discovery mechanism and various means of product configuration depending on what features are supported by the target product.

The Element Manager enables streamlined access to BES devices, BAP120, and the BSR222 Web management screens. It also enables the BES series management interface to support and access active content such as port statistics measurement. These interfaces appear in the Element Manager client window when you double-click the respective devices from the Element Manager navigation panel.

A Web management interface also exists for the BCM50 and BCM200/400, making seamless management of a converged SMB network possible.

Element Manager software can reside on any local area network (LAN)-connected PC and be launched when required. Alternatively, a remote PC running the Element Manager client located anywhere on the Internet can securely manage devices on a target LAN through the BSR222 and VPN soft client.

The Element Manager is not required to manage individual products. You can manage each product independently through its Web management interface. The Element Manager simplifies access to multiple products and enables active content where available.

Business Access Point 120 (BAP120)

The BAP120 is an IEEE 802.11a, 802.11b/g-compatible product that provides transparent, wireless high-speed data communications between the wired LAN and fixed or mobile devices equipped with either an 802.11a or 802.11 b/g wireless adapter, or both. Any number of BAP120 products can operate together in a network. This product can sit on a desktop or mount inconspicuously on a wall or ceiling. The BAP120 is equipped with a serial port, SNMP, and Web management interfaces compatible with the Element Manager.

Business Secure Router 222 (BSR222)

The BSR222 is a two-port router with a Cat5 wide area network (WAN) connection and four 10/100 Mb/s LAN ports. It has roughly one-fourth the footprint of a BCM50 and is powered by a local power adaptor through a barrel plug. The router provides WAN connectivity to one or more Ethernet switches and to the necessary client and branch tunnels to enable secure remote access. The BSR222 is equipped with a serial port, SNMP, and Web management interfaces compatible with the Element Manager.

Reference topologies and assumptions

This section outlines the assumptions for the reference topologies described in this guide.

Small and medium-sized businesses typically use a third-party cable or asymmetric digital subscriber line (ADSL) modem for high-speed Internet access. The ISP must be able to provide a single static IP address to each site. The BSR222 uses network address translation (NAT) to a private IP address space and provides a firewall between the resultant private LAN and the Internet. An internal DHCP server faces the private LAN. All connected network equipment (BCM, BAP120, and BES) obtains the associated IP address using DHCP from the router DHCP server.

Personal computers (PC), personal digital assistants (PDA), laptops, and Nortel IP phones obtain private IP addresses from the same DHCP server. Voice support is provided with Nortel IP phones, Voice Soft-Clients, and the BCM communications server. IP phones receive IP addresses from the BSR222. However, in a topology where a third-party router is present, IP phones receive IP addresses from the BCM.

Nortel IP phones and soft phones run a proprietary stimulus protocol that is terminated at the BCM. The BCM presents H.323 trunks to other sites encapsulated inside VPN branch tunnels that are established between pairs of sites. The BCM also mediates control and voice flows destined for the local public switched telephone network (PSTN). A Nortel 2050 Voice Soft-Client runs on an IEEE 802.11e EDCA WMM-compatible notebook computer or PDA connected by a wireless local area network (WLAN) (BAP120). A second voice soft client (the Nortel MVC 2050) tailored for a PDA also connects through a standard 802.11b WLAN. The BAP120 supports IEEE 802.11e Quality of Service (QoS) tagging (for example, EDCA/WMM interim QoS for multimedia) and traffic segregation (SSID-to-VLAN mapping) for enhanced voice quality and security. Roaming, such as handoff of data connections between access points, is supported. The BSR222 performs secure routing functions and supports a combination of 10 client and branch tunnels. The BCM50, Business Ethernet Switches, BAP120, and BSR222 are all manageable using the Element Manager application.

All reference topologies assume that each device on the subnet has its SNMP client enabled.

IP addressing for SMB devices and DHCP

Nortel recommends using DHCP to obtain IP addresses for SMB devices and end nodes (such as PCs and IP phones).

The SMB reference topologies 2 and 3 rely on a DHCP server running on the BSR222 in the subnet (typically occupying address 192.168.1.1). SMB reference topology 1 relies on a DHCP server running on a third-party router.

DHCP serves IP addresses dynamically to all devices and end nodes connected to the subnet. As devices are connected to the subnet, they take IP addresses from the DHCP pool from 192.168.1.2 to 192.168.1.127 inclusive.

If DHCP is not running on the subnet, all SMB devices are shipped with factory-default IP addresses that exist within ranges of the subnet that minimize IP address conflict.

The following table lists the default IP addresses, valid IP ranges, and default DHCP status for all SMB devices.

IP addressing for SMB devices and DHCP

Device type	Default IP address	IP address range	DHCP/BOOTP	Notes
BSR222	192.168.1.1	None	DHCP server enabled. IP address pool starting address = 192.168.1.2, pool size = 126.	This is the default gateway. This is the DHCP server. Pool size is currently set at 126.
BCM50 1.0	192.168.1.2	None	DHCP client enabled	Only one BCM50 recommended in an SMB network.
BCM50 2.0	192.168.1.2	None	DHCP client enabled	Only one BCM50 recommended in an SMB network.

Device type	Default IP address	IP address range	DHCP/BOOTP	Notes
BCM 4.0	192.168.1.2	None	DHCP client enabled	Only one BCM50 recommended in an SMB network.
BES50	192.168.1.128	None	DHCP client enabled	Also supports BOOTP and static IP addressing.
BES100/200	192.168.1.132	192.168.1.132 through 192.168.1.135	BOOTP mode set to BOOTP or default IP (BOOTP timeout is set at 60 seconds)	If DHCP is not used and more than one BES device is deployed, you must manually configure the addresses to be consecutive within this range.
BES1000	192.168.1.132			
BAP120	192.168.1.136	192.168.1.136 through 192.168.1.151	DHCP client enabled	If DHCP is not used and more than one BAP120 is deployed, you must manually configure the addresses to be consecutive within this range.
IP Phones	192.168.1.152	192.168.1.152 through 192.168.1.254	DHCP client enabled	If DHCP is not used and more than one IP Phone is deployed, you must manually configure

Device type	Default IP address	IP address range	DHCP/BOOTP	Notes
				the addresses to be consecutive within this range.

Installing the Element Manager

The Element Manager 1.0 supports all SMB data products (BSR222, BES50/100/200/1000, and BAP120) as well as BCM50 1.0 and 2.0, and BCM 4.0. However, the BCM Element Manager does not support SMB devices.

ATTENTION

The Element Manager 1.0 must be installed on your computer if you want to manage both SMB data products and existing BCM devices.

Prerequisites

The following items are required before you can install the Element Manager.

- System requirements:
  - Windows: Windows 98 SE™, Windows 2000™, Windows XP™
  - RAM: minimum 256 MB, recommended 512 MB
  - Free space: 150 MB
- Element Manager software downloaded from www.nortel.com/support.

Procedure steps

Step	Action
1	Double-click the Element Manager Installer icon and click **Run**.
2	In the Install Wizard a. Read through the Introduction page and click **Next**. b. Read through the License Agreement page and click **Next**. c. Choose the install folder and click **Next**. d. Click **On the Desktop** to choose the shortcut folder. e. Review the Pre-Installation Summary and click **Install**.

—End—

Converged small site (mixed-vendor environment): reference topology 1

The converged small site (mixed-vendor environment)—reference topology 1 consists of a third-party router providing routing capabilities with one or more Business Ethernet Switches. Each Business Ethernet Switch (BES) provides traditional and Power over Ethernet (PoE) port-expansion capabilities to accommodate up to 48 node devices. A maximum of four Business Access Point (BAP120) devices can be connected to each BES to provide wireless access capability to node devices on the subnet. A local BCM50 supplies telephony support. See the figure Converged small site (mixed-vendor environment).

This reference topology

- uses the dynamic host configuration protocol (DHCP) server on the third-party router to serve IP addresses to the BES100/200, BCM50, and BAP120 devices as they are connected
- uses the DHCP server on the BCM50 to serve IP addresses to IP phones running on laptops and personal digital assistants (PDA)
- illustrates a fully managed and converged Nortel subsystem for a mixed environment
- provides virtual local area network (VLAN) traffic segregation and Guest Access support on an incumbent router compliant to the parameters listed in "Installing and configuring the third-party router" (page 28)

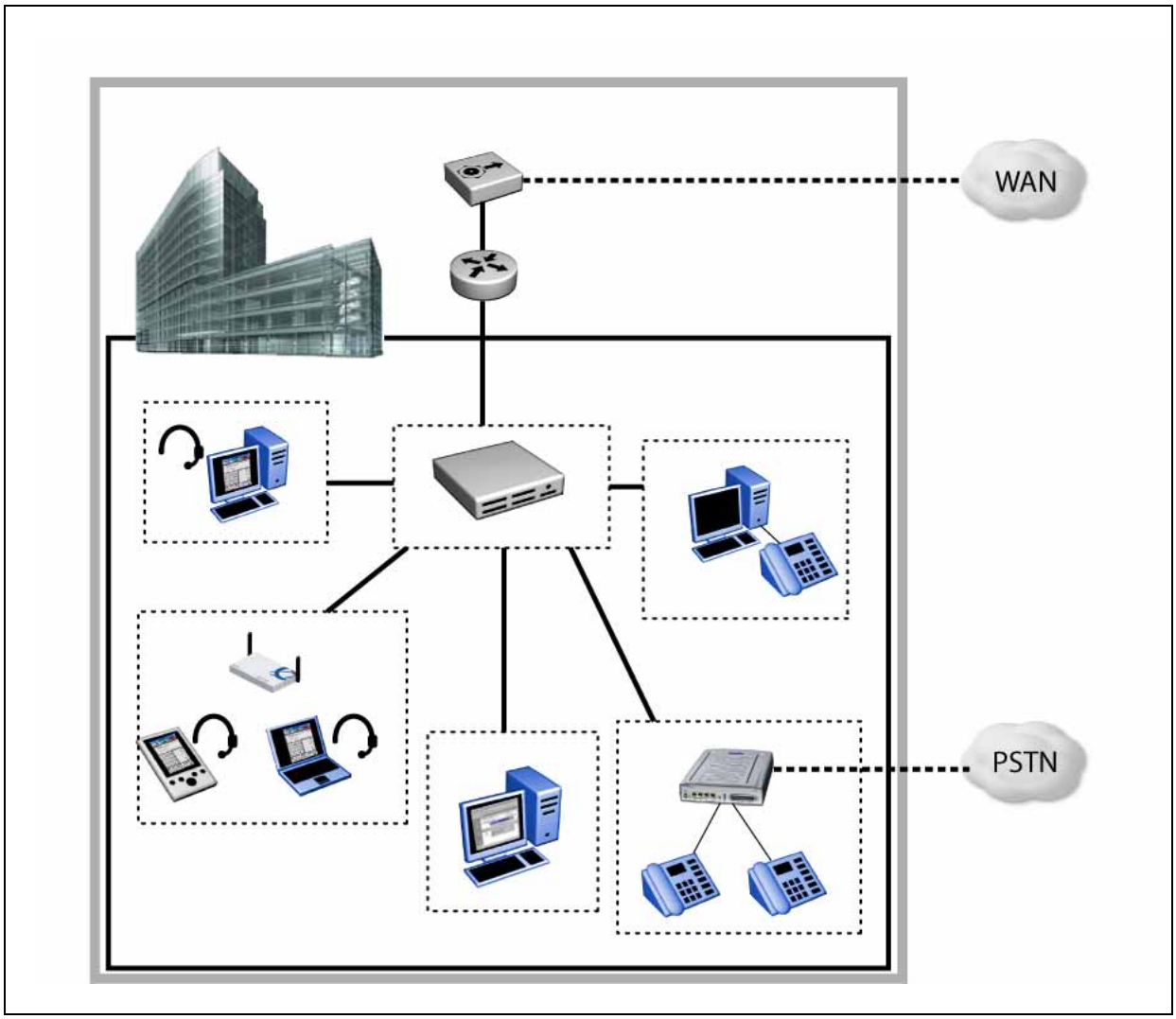
This guide describes how to enable VLAN and Guest Access support on an incumbent router included in this reference topology.

The BCM50 1.0 enables enhanced telephony features including Auto Attendant, Unified Messaging, Contact Center, custom dialing plans, and dozens of powerful call features.

The Guest Access application enables the SMB business site to offer high-speed Internet access to visiting customers. This application uses a WiFi BAP120 communication infrastructure to isolate external traffic

from the private SMB subnets using access control list (ACL) rules that are configured on the third-party router. A dedicated VLAN 2 for Guest Access traffic is mapped to a dedicated service set identifier (SSID) on the BAP120. The result is a high-performance Internet-access courtesy service for individuals visiting SMB-configured sites that is secure and completely isolated from mission-critical SMB private networks.

Converged small site (mixed-vendor environment)



Configuring a converged small site (mixed-vendor environment)

This section details the steps required to connect, install, and configure a converged small site (mixed-vendor environment). For details see

- "Connecting network devices for a converged small site (mixed-vendor environment)" (page 25)

- "Installation and configuration workflow for a converged small site (mixed-vendor environment)" (page 26)

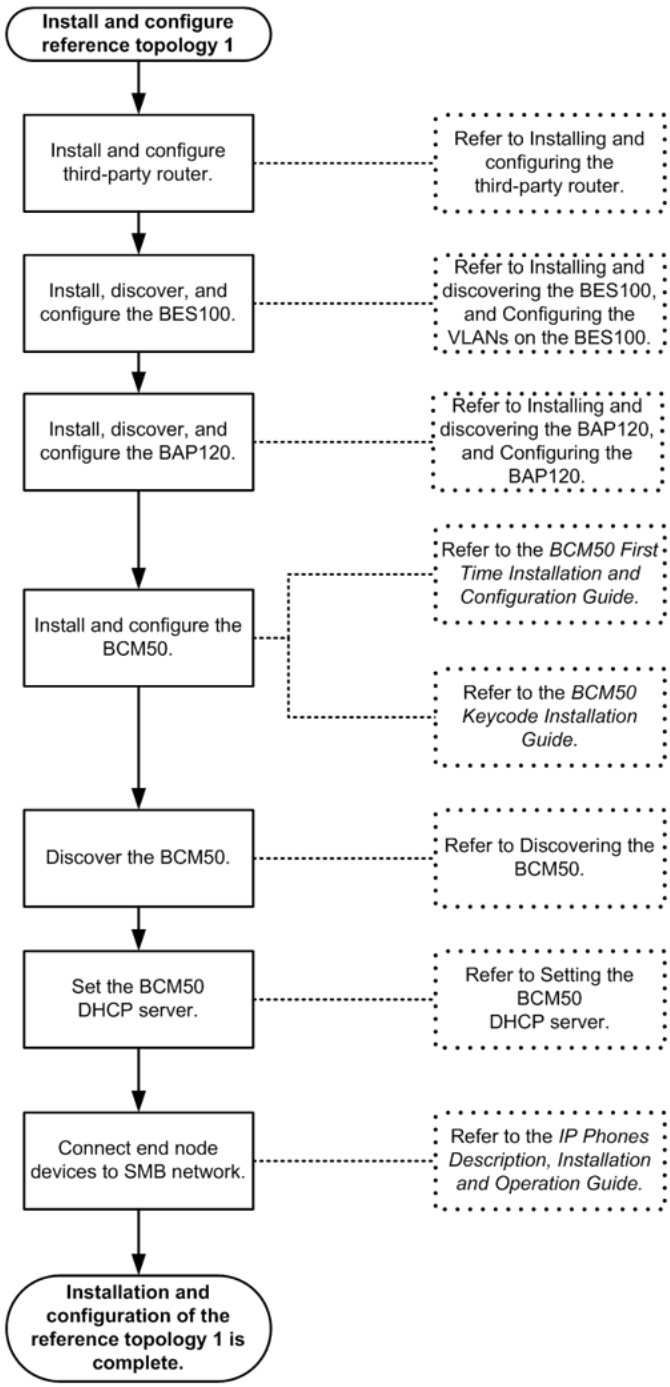
The installation sequence is a critical component of this minimal configuration scenario. Nortel recommends that you wait a few minutes between configuring and installing each device to allow each device to complete the boot cycle.

Connecting network devices for a converged small site (mixed-vendor environment)

Step	Action
1	Connect the WAN port of the third-party router to the Internet provider.
2	Connect the BES100/200 to the LAN port on the third-party router.
3	Connect the BCM50 to one of the VLAN 1 LAN ports on the BES100/200.
4	Connect BAP120s to PoE ports on the BES100/200 if PoE ports are available. If not, connect BAP120s to LAN ports on the BES100/200.
5	If Guest Access is required, connect the BAP120s that supply wireless Guest Access to one or more of the ports designated to VLAN 2 (guest) on the BES100/200.

—End—

Installation and configuration workflow for a converged small site (mixed-vendor environment)

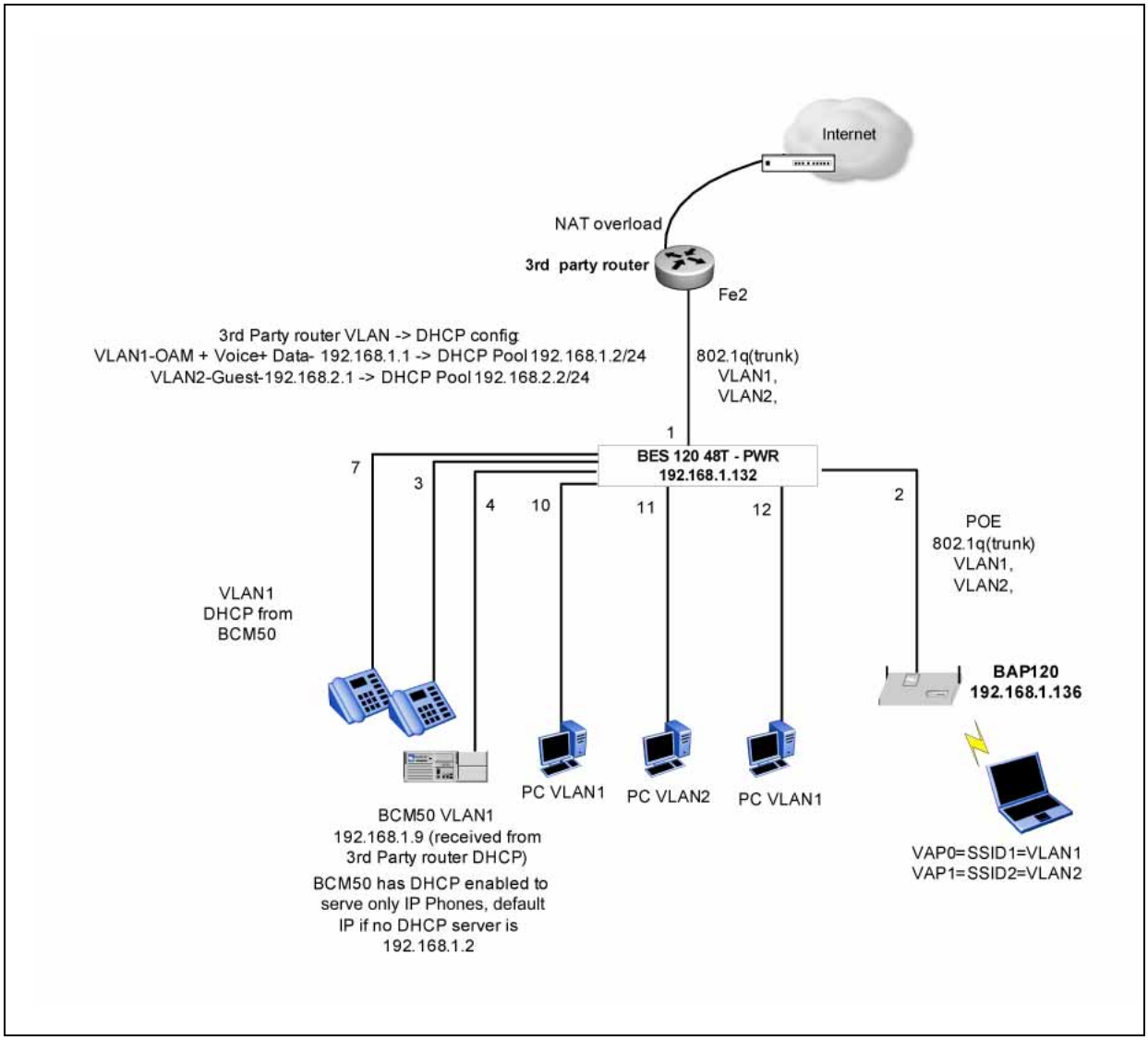


Autodiscovering and configuring SMB devices to support the converged small site (mixed vendor environment) (topology 1)

This reference topology uses the DHCP server on the third-party router to serve IP addresses to the BES100/200, BCM50, and BAP120 devices as they are connected. The IP phones receive their IP address from the BCM50 server set to IP phones only. The installation sequence is a critical component of this minimal configuration scenario.

The "Topology 1: Network connectivity diagram" (page 27) illustrates an implementation example of topology 1 using two VLANs. VLAN 1 has data, voice, and operations, administration and maintenance (OAM) while VLAN 2 is used for Guest Access.

Topology 1: Network connectivity diagram



In this example, two port-based VLANs are established on the BES100/200. VLAN 1 is the default VLAN with a port membership of 1 through 10 and 12 through 50, leaving port 11 out of the VLAN. VLAN 2 is also a port-based VLAN with port membership of 1, 2, and 11. VLAN 2 allows ports 1 and 2 to be members of the guest and default management VLANs, but keeps port 11 separated as a wired port dedicated to the guest VLAN only.

This reference topology describes a simple example; however, port selection for VLANs must reflect the specific needs of the installation.

Installing and configuring the third-party router

Step	Action
1	Install the third-party router, referring to the manufacturer's documentation and procedures.
2	Set the following parameters on the third-party router: a. support of network address translation (NAT) b. support of the static routing function c. support of four at a minimum, but preferably eight LAN-based routings for each physical port d. support of VPN gateway static and dynamic tunnels (IPSec data encryption standard (DES) and 3DES encryption) e. support of multiscope DHCP server function: four subnets at a minimum, but preferably eight f. support of Stateful firewall functions
3	Configure the NAT IP address translation by using the many-to-one port-based method. **ATTENTION** For the Voice VLAN, two DHCP servers exist: one on the third-party router and one on the BCM50. You must configure the IP address pools for each of these DHCP servers so that IP addresses for the third-party router are not duplicated in the BCM50 IP address range and vice versa.
4	Configure the third-party router DHCP server with mapping of subnet to VLAN-tagged traffic as follows: a. DHCP server pool-1 = 192.168.1.2 to 192.168.1.127, mask 255.255.255.0, default gateway 192.168.1.1 b. DHCP server pool-2 = 192.168.2.2 to 192.168.2.127, mask 255.255.255.0, default gateway 192.168.2.1

c. Routing subnet1 (192.168.1.x/255.255.255.0, gateway 192.168.1.1) maps to VLAN 1

d. Routing subnet2 (192.168.2.x/255.255.255.0, gateway 192.168.2.1) maps to VLAN 2

5 Configure the Guest Access application (access control list [ACL]) as follows:

a. Configure the third-party router to isolate the VLAN 2-tagged traffic (for example, the 192.168.2.x pool of addresses) from the SMB private network (for example, the 192.168.1.x pool of addresses).

b. Use the ACL feature to deny the 192.168.2.x subnet to access and route to the 192.168.1.x pool of IP addresses, and to enable the 192.168.2.x to route through the firewall/NAT to access the Internet.

—End—

Installing the Element Manager

Step	Action
1	Install the Element Manager software on a local PC.
2	Launch the Element Manager application.

—End—

Installing and discovering the BES100/200

Step	Action
1	Install and power up the BES100/200. For details, see the *Business Ethernet Switch 100/200 Series Quick Install Guide*.
2	Connect the management PC to one of the BES100/200 RJ-45 ports.
3	In the Element Manager, Element Navigation Panel, click **Network > Find Network Element > Business Ethernet Switch**. The Network Device Search dialog box appears.
4	Select the default IP address range.
5	Click **OK**. The device is added to the Element Navigation Panel.

—End—

Configuring the VLANs on the BES100/200

Step	Action
1	In the Element Manager, Element Navigation Panel, select the BES100/200, and either click **Web Page** on the toolbar, or right-click the BES100/200 and then click **Web Page**.
2	On the BES100/200 Web UI, select **Application > VLAN > VLAN Configuration** to access the VLAN table. The default VLAN 1 port is listed.
3	Click **Create VLAN**. The VLAN Configuration: Port based page appears.
4	Type the VLAN number (2), and optionally, a VLAN name, and then click **Submit**. VLAN 2 is added to the VLAN table.
5	To configure VLAN 1 a. Click the **Action** button for VLAN 1, located on the left of the VLAN table. The VLAN—Port Based Setting table appears for VLAN 1. b. Clear the port 11 **Port Membership** check box. c. Click **Submit**.
6	To configure the VLAN trunking on the BES100/200: a. Click **Application > VLAN > Port Configuration** to access the VLAN Port Setting table. b. From the Egress Tagging list, select **ON** for port 1 and port 2.
7	To configure VLAN 2: a. Click **Application > VLAN > VLAN Configuration** to access the VLAN table. b. Click the **Action** button for VLAN 2. The VLAN – Port Based Setting table appears for VLAN 2. c. Select the 1, 2, and 11 **Port Membership** check boxes. d. Click **Submit**.

—End—

Installing and discovering the BAP120

Step	Action
1	Install and power up the BAP120. For details, see the *Business Access Point 120 Quick Install Guide*.
2	Connect the BAP120 to one of the VLAN 1 ports on the BES100/200. For this example, use port 3.
3	In the Element Manager, Element Navigation Panel, click **Network > Find Network Element > Business Ethernet Switch**. The Network Device Search dialog box appears.
4	Select the default IP address range.
5	Click **OK**. The device is added to the Element Navigation Panel.

—End—

Configuring the BAP120

Step	Action
1	In the Element Manager, Element Navigation Panel, select the BAP120, and either click **Web Page** on the toolbar, or right-click the BAP120 and then click **Web Page**.
2	To set the default VLAN ID on BAP120—802.11a radio a. Click **Configuration > SLOT 0 – Radio A > Radio Settings** to access the Default VLAN ID (1~4094) table. b. Enter the following individual settings for the VLAN IDs: i. VAP0—1 ii. VAP1—2 iii. VAP3—1 iv. VAP4—1 c. Click **Submit**.
3	To enable Guest Access SSID on BAP120 – 802.11a radio

a. Click **Configuration > SLOT 0 – Radio A > Security**.

b. Select the **Enable** check boxes for VAP0 and VAP1.

c. Click **Submit**.

4 To set the default VLAN ID on BAP120—802.11b/g radio

a. Click **Configuration > SLOT 1 – Radio G > Radio Settings** to access the Default VLAN ID (1~4094) table.

b. Enter the following individual settings for the VLAN IDs:

i. VAP0—1

ii. VAP1—2

iii. VAP3—1

iv. VAP4—1

c. Click **Submit**.

5 To enable Guest Access SSID on BAP120 – 802.11b/g radio

a. Click **Configuration > SLOT 1 – Radio G > Security**.

b. Select the **Enable** check boxes for VAP0 and VAP1.

c. Click **Submit**.

6 To enable the VLAN on BAP120

a. Click **System > VLAN** to access the VLAN Configuration table.

b. For the VLAN Classification, select **Enable**.

c. Enter **1** as the Native VLAN ID.

d. Click **Submit**.

A confirmation dialog box appears, asking you to confirm changes and informing you that you may lose connectivity to the BAP120.

e. In the confirmation dialog box, click **OK**, and then wait for approximately 30 seconds before you proceed.

7 Disconnect the BAP120 from the VLAN #3 port, and then connect it to one of the VLAN 2 ports on the BES100/200. For this example, use port 2.

—End—

Installing the BCM50

Step	Action
1	Install and power up the BCM50. For details, see the BCM50 *First Time Installation and Configuration Guide*.
2	Obtain and apply the necessary keycodes to enable the required BCM features. For details see the BCM50 *Keycode Installation Guide*.
3	Connect the BCM50 (LAN port) to a VLAN 1 port on the BES. For this example, use port 4.
4	In the Element Manager, Element Navigation Panel, click **Network > Find Network Element > Business Ethernet Switch**. The Network Device Search dialog box appears.
5	Select the default IP address range. Because the DHCP client on the BCM50 is active, the BCM50 gets the next available IP address from the third-party router. For this example, the IP address is 192.168.1.19.
6	Click **OK**. The device is added to the Element Navigation Panel.

—End—

Configuring the BCM50

Step	Action
1	In the Element Manager, Element Navigation Panel, select the BCM50 and either click **Connect** on the toolbar, or right-click the BCM50 and then click **Connect**.
2	In the **Task Navigation Panel**, click the **Configuration** tab.
3	Click **Data Services > DHCP Server** to access the DHCP Server window.

ATTENTION

For the Voice VLAN, two DHCP servers exist—one on the third-party router and one on the BCM50. You must configure the IP address pools for each of these DHCP servers so that IP addresses for the third-party router are not duplicated in the BCM50 IP address range and vice versa.

4 From the **DHCP server is** list, select **Enabled—IP Phones Only**.

5 In the **Task Navigation Panel**, click the **Configuration** tab, and click **Resources > Telephony Resources** to access the Telephony Resources window.

6 Click the **IP Terminal Global Settings** tab.

7 Select the check boxes for **Enable registration**, **Enable global registration password**, and **Auto-assign DN**.

ATTENTION
Because Enable global registration password is selected, a password is requested when the IP phones register with the BCM50. The default password is BCMI.

8 Leave the remaining default values.

—End—

Connecting the IP phones

Nortel IP phones are fully DHCP-enabled, and require no setup. Each IP Phone receives a DHCP address from the BCM50. After the IP Phones are connected to the BCM50, the details appear in the IP Terminal Details tab in the Telephony Resources window.

Procedure steps

Step	Action
1	Connect the Ethernet port of the IP Phone to a VLAN 1 port on the BES. For this example, two IP 2004 phones are connected to the PoE ports.
2	In the Element Manager, Element Navigation Panel, click **Configuration > Telephony Resources > IP Terminal Details** to view the settings.

—End—

Summary of topology 1

Using the preceding configuration example, wireless Guest Access is enabled on port 2 using VLAN 2, and single dedicated wired Guest Access is enabled on port 11 of the BES100/200. A typical Guest-Access scenario follows:

1. A wireless Guest Access user associates their laptop wireless client card to SSID vlan2-dot11bg.
2. The wireless client DHCP client requests an IP address from the DHCP server on the third-party router. The DHCP request flows through SSID vlan2-dot11bg and is mapped by the BAP120 onto VLAN 2. Port 2 has VLAN trunking enabled and passes the tagged frame on the BES100/200, which broadcasts the frame to the entire VLAN 2 domain.
3. The third-party router connected on port 1 sees all VLAN traffic. The router provides a response to the wireless client DHCP request on the VLAN 2 domain and allocates an IP address from the 192.168.2.x DHCP server pool.
4. Because the entire 192.168.2.x subnet is configured with ACL on the third-party router, it can access only the Internet and, hence, is totally isolated from the other private subnet (192.168.1.x).

Smaller converged site (Greenfield and infrastructure replacement): reference topology 2

The smaller converged site (Greenfield and infrastructure replacement) reference topology 2 enables secure converged telephony and Internet access. This topology consists of a Business Secure Router (BSR) 222 providing routing capabilities with one or more Business Ethernet Switches. Each Business Ethernet Switch (BES) provides traditional and Power over Ethernet (PoE) port-expansion capabilities to accommodate up to 48 node devices. A maximum of four Business Access Point (BAP120) devices can be connected to each BES to provide wireless access capability to node devices on the subnet. A local BCM50 supplies telephony support. See the figure "Smaller converged site (Greenfield and infrastructure replacement)" (page 38).

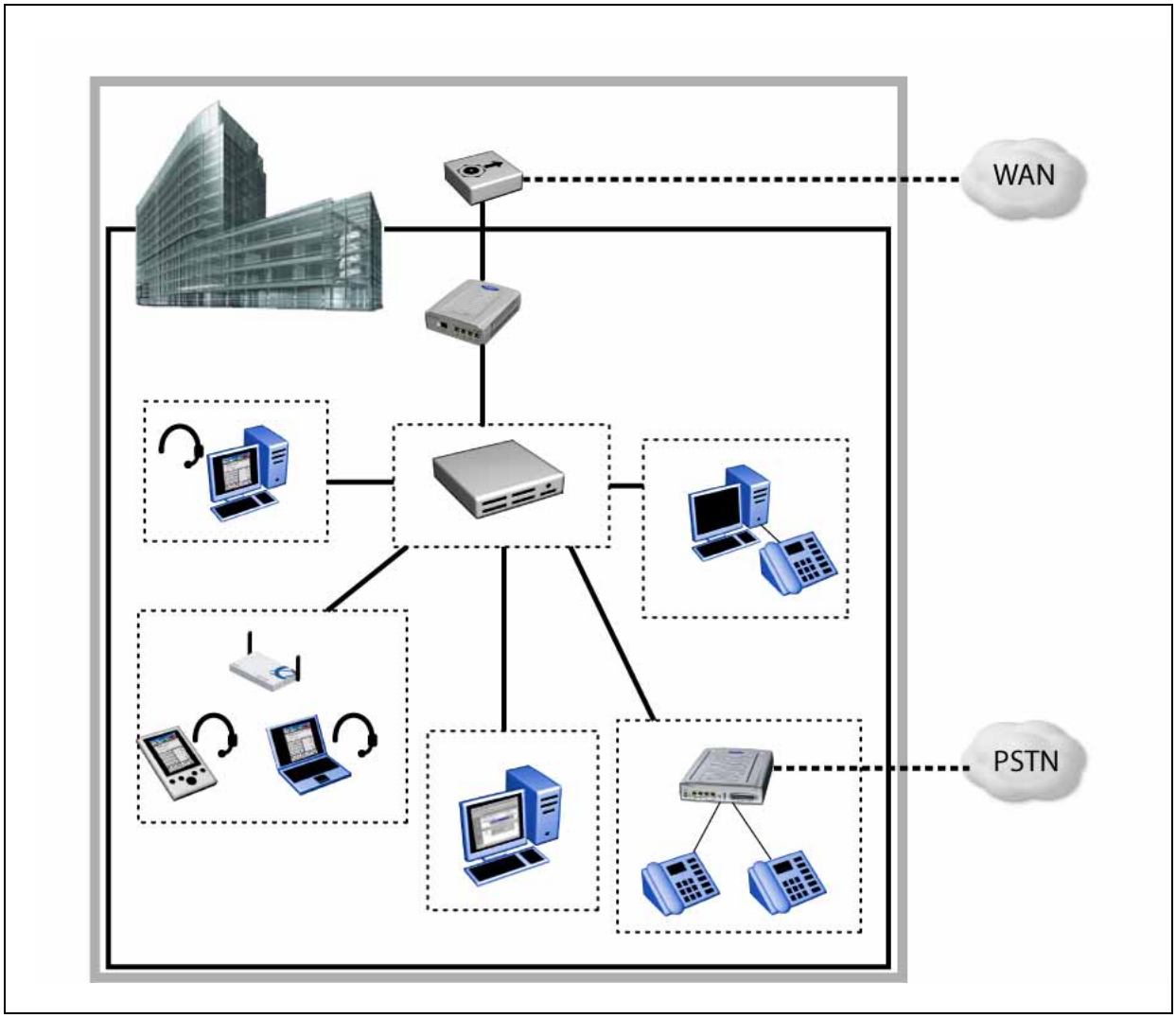
This reference topology

- assumes that dynamic host configuration protocol (DHCP) is running on the BSR222 internal router to provide IP addressing to devices connected to the subnet
- illustrates an example that applies to Greenfield deployment and infrastructure replacement

The Element Manager 1.0 enables discovery and configuration of connected devices.

The BCM50 1.0 enables enhanced telephony features including Auto Attendant, Unified Messaging, Contact Center, custom dialing plans, and dozens of powerful call features.

Smaller converged site (Greenfield and infrastructure replacement)



Configuring a smaller converged site (Greenfield and infrastructure replacement)

This section details the steps required to connect, install, and configure a smaller converged site (Greenfield and infrastructure replacement). For details see:

- "Connecting network devices for a Smaller converged site (Greenfield and infrastructure replacement)" (page 39)
- "Installation and configuration workflow for a Smaller converged site (Greenfield and infrastructure " (page 40)

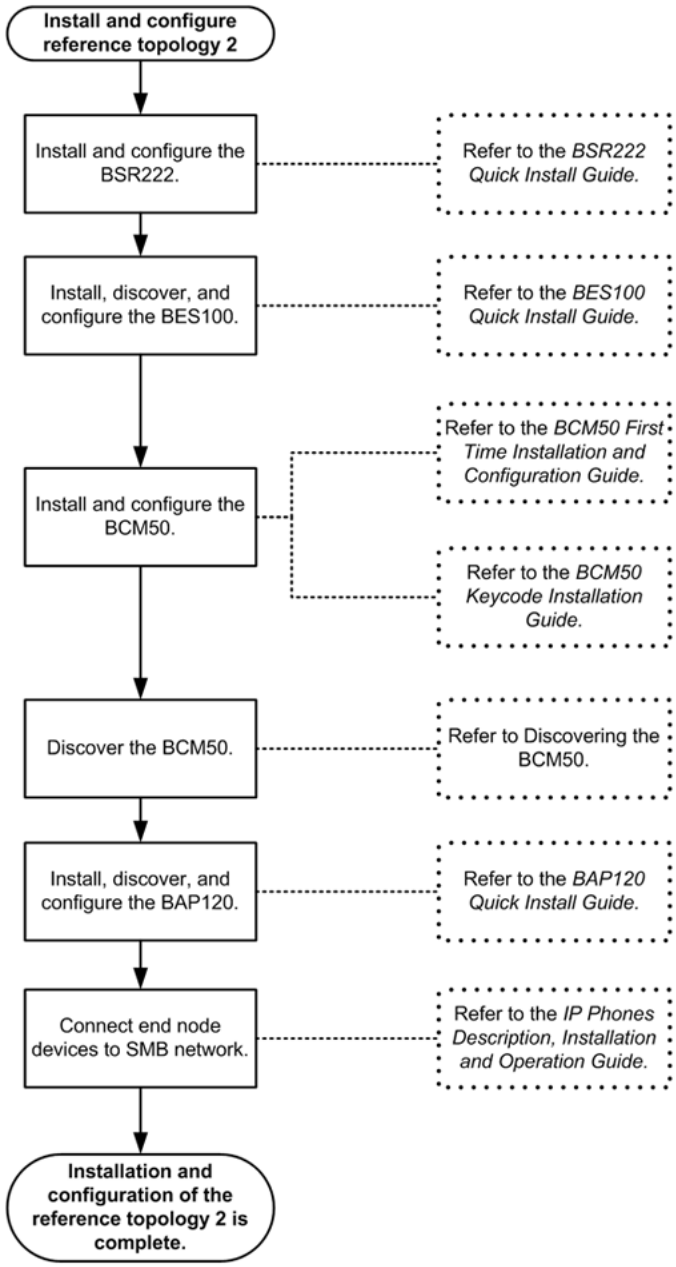
The installation sequence is a critical component of this minimal configuration scenario. Nortel recommends that you wait a few minutes between configuring and installing each device to allow each device to complete the boot cycle.

Connecting network devices for a smaller converged site (Greenfield and infrastructure replacement)

Step	Action
1	Connect the network devices as follows: a. Connect the WAN port of the BSR222 to the Internet provider. b. Connect the BES100/200 to the LAN port on the BSR222. c. Connect the BCM50 to one of the LAN ports on the BES100/200. d. Connect BAP120s to PoE ports on the BES100/200 if PoE ports are available. If not, connect the BAP120s to LAN ports on the BES100/200.

—End—

Installation and configuration workflow for a smaller converged site (Greenfield and infrastructure replacement)



Discovering the BCM50

Step	Action
1	Start the Element Manager.
2	In the Element Manager, Element Navigation Panel, right-click the **Network Element** folder.
3	Click **Network > Find Network Element > Business Communication Manager**. The Network Device Search dialog box appears.
4	Check the starting and ending IP addresses. a. If the IP addresses match those of your subnet, click **OK**. b. If the IP addresses do not match, change the IP addresses to match your subnet and then click **OK**.
5	Enter your user ID and password.
6	Click **OK**. The device is added to the Element Navigation Panel.

—End—

The installation and configuration of the network devices in the smaller converged site (Greenfield and infrastructure replacement)—reference topology 2 is complete. You can now connect network element nodes such as PCs, IP phones, wireless laptops, and personal digital assistants (PDAs) to the BES100/200 and BAP120 switches. The DHCP server on the BSR222 serves IP addresses dynamically to these devices as they are connected.

Smaller remote site (Greenfield and infrastructure replacement): reference topology 3

The smaller remote site (Greenfield and infrastructure replacement) reference topology 3 enables secure converged telephony and Internet access for very small deployments. This topology allows the site to be served with telephony by a larger site that is linked through a branch office VPN tunnel. This topology consists of a BSR222 providing routing capabilities with one or more Business Ethernet Switches. Each Business Ethernet Switch (BES) provides traditional and Power over Ethernet (PoE) port-expansion capabilities to accommodate up to 48 node devices. You can connect a maximum of four BAP120 devices to each BES to provide wireless access capability to node devices on the subnet. A remote BCM50, BCM200, or BCM400 supplies telephony support. See the figure "Smaller remote site (Greenfield and infrastructure replacement)" (page 44).

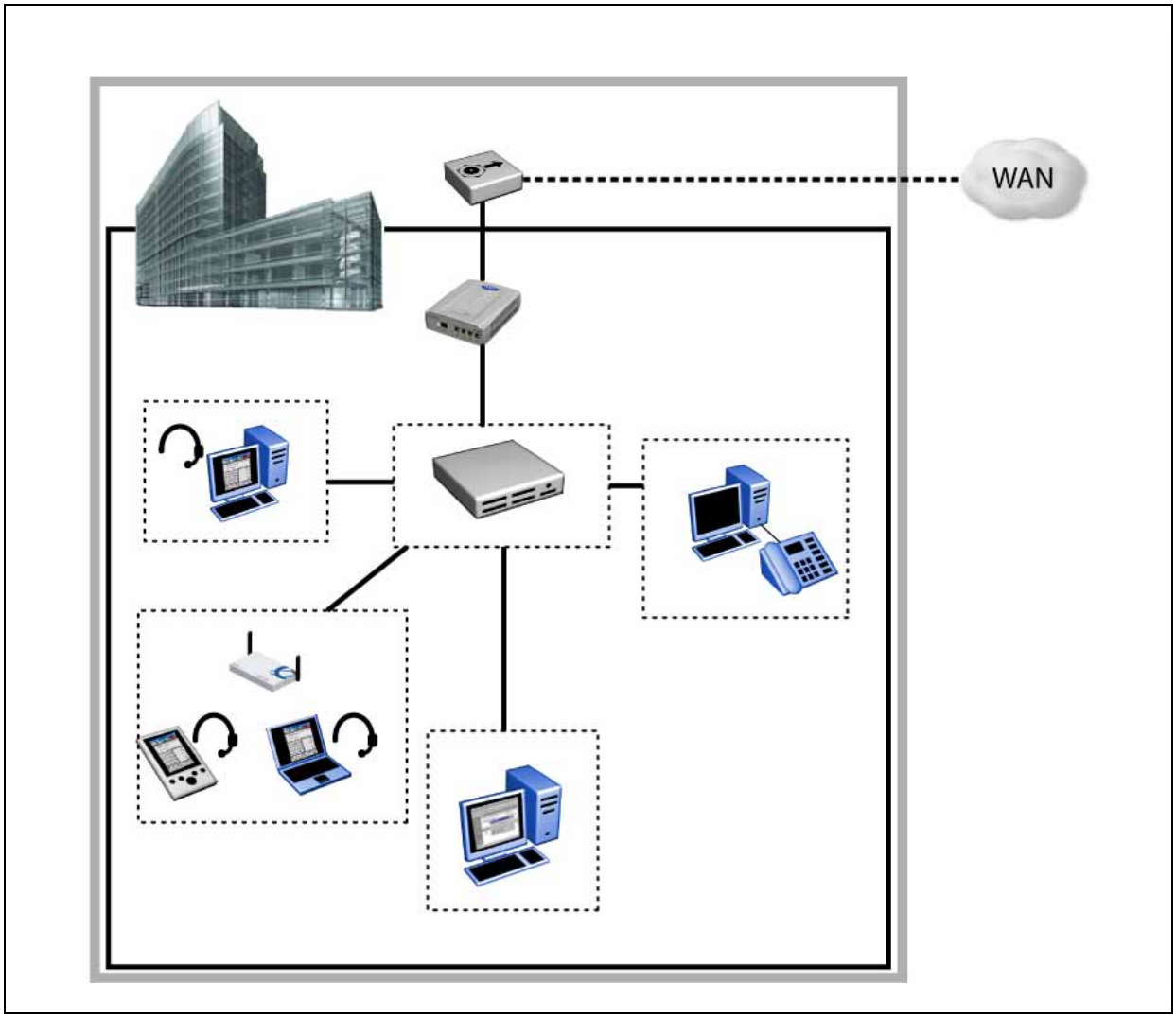
This reference topology

- assumes that DHCP is running on the BSR222 to provide IP addressing to the BES100/200 and BAP120 devices connected to the subnet
- illustrates an example that applies to Greenfield deployment and infrastructure replacement

The Element Manager 1.0 enables discovery and configuration of connected devices.

A remote BCM 50/200/400 enables enhanced telephony features including Auto Attendant, Unified Messaging, Contact Center, custom dialing plans, and dozens of powerful call features.

Smaller remote site (Greenfield and infrastructure replacement)



Configuring a smaller remote site (Greenfield and infrastructure replacement)

This section details the steps required to connect, install and configure a smaller remote site (Greenfield and infrastructure replacement). For details see

- "Connecting network devices for a Smaller remote site (Greenfield and infrastructure replacement)" (page 45)
- "Installation and configuration workflow for a Smaller remote site (Greenfield and infrastructure rep" (page 46)

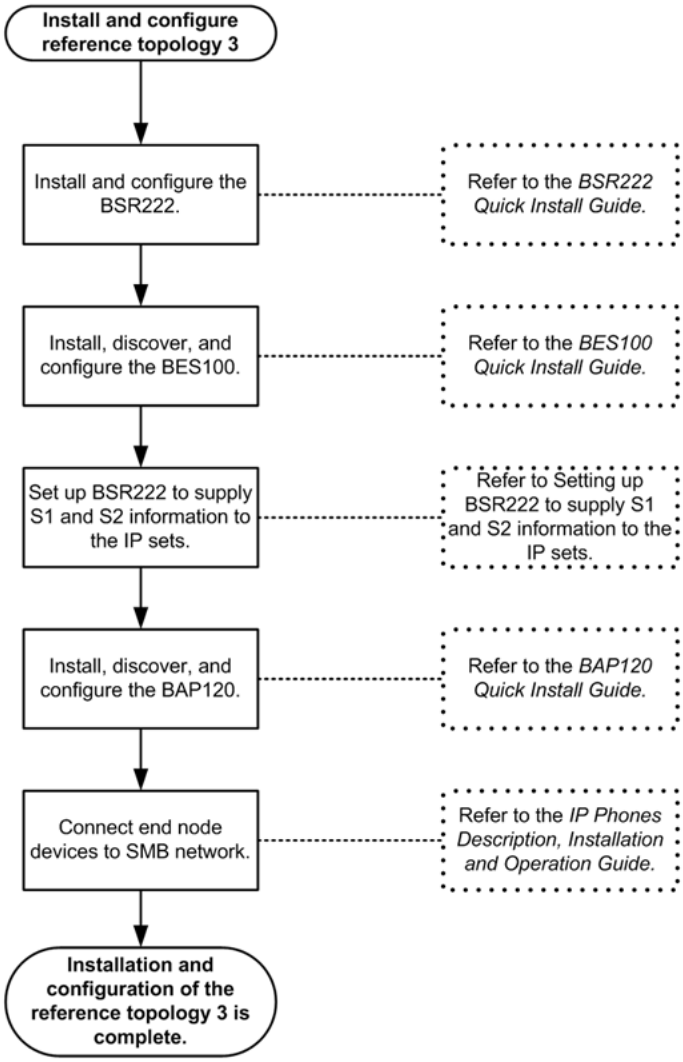
The installation sequence is a critical component of this minimal configuration scenario. Nortel recommends that you wait a few minutes between configuring and installing each device to allow each device to complete the boot cycle.

Connecting network devices for a smaller remote site (Greenfield and infrastructure replacement)

Step	Action
1	Connect the network devices as follows: a. Connect the WAN port of the BSR222 to the Internet provider. b. Connect the BES100/200s to the LAN ports on the BSR222. c. Connect BAP120s to PoE ports on the BES100/200 if PoE ports are available. If not, connect BAP120s to LAN ports on the BES100/200.

—End—

Installation and configuration workflow for a smaller remote site (Greenfield and infrastructure replacement)



Setting up the BSR222 to supply S1 and S2 information to the IP Phones

As this is a remote site, use a command line interface (CLI) command to manually set the S1 and S2 addresses pointing to the BCM at the main site.

Prerequisites

- Telnet or secure shell (SSH) must be enabled on the router.

Setting up the BSR222 to supply S1 and S2 information to the IP sets

Step	Action
1	Connect to the router through Telnet or SSH.

2 Select menu 24, select menu 8, and enter the following commands:

a. **ip dhcp enif0 server voipserver 1 <BCM50_IP_Address > 7000 1**

b. **ip dhcp enif0 server voipserver 2 <BCM50_IP_Address> 7000 1**

3 Add the IP phones configured for full DHCP client mode to the remote site.

—End—

The installation and configuration of the network devices in the smaller remote site (Greenfield and infrastructure replacement)—reference topology 3 is complete. You can now connect network element nodes such as PCs, IP phones, wireless laptops, and PDAs to the BES100/200 and BAP120 switches. The DHCP server on the BSR222 serves IP addresses dynamically to these devices as they are connected.

WAN interconnected LAN reference topologies

This section describes possible interconnection scenarios of the reference topologies described earlier in the guide. These scenarios are produced by combining the different reference topologies as end points on the branch tunnel. The sequence for interconnecting the reference topologies is essentially the same:

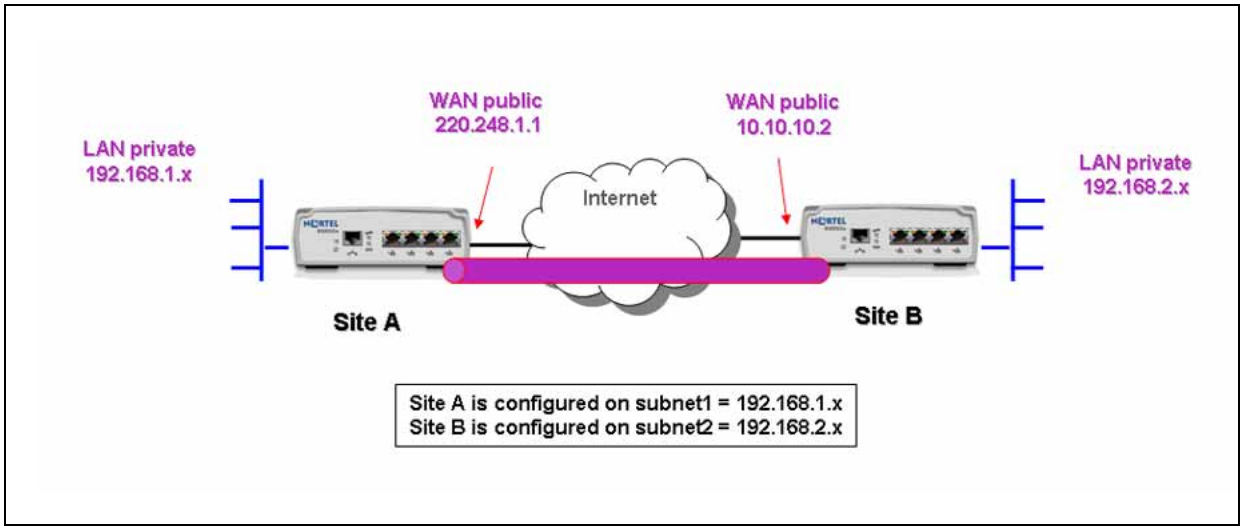
- Configure each remote or converged site.
- Configure the required branch tunnels.
- Configure the required client tunnels.

This section describes the following reference interconnected topologies:

Configuring tunnels

After the sites are configured, configure the branch and client tunnels as required by the site. See the figures "Branch tunnel configuration diagram" (page 50) and "Client tunnel configuration diagram" (page 51).

Branch tunnel configuration diagram



Configuring a branch tunnel

Step	Action
1	Start the Element Manager, and access the BSR222 Web page.
2	In the Element Manager, Element Navigation Panel, click **VPN** to access the VPN page and click the **Summary** tab.
3	From the Contivity VPN Client list, select an open item.
4	Click **Edit** to access the VPN—Branch Office page.
5	On the VPN—Branch Office page a. Select **Branch Office** as the connection type. b. Select the **Active** check box and the **Nailed Up** check box. c. Type a name for the tunnel. d. Type the key that was previously shared and retype to confirm. **ATTENTION** This key must be identical at both ends of the tunnel. e. Type the secure gateway address for the far end of the tunnel.
6	Click **Add** to save the settings and access the VPN—Branch Office—IP Policy page.

7 On the **VPN—Branch Office—IP Policy** page

a. In the **Address type**, **Starting IP address**, **Ending IP address/subnet mask**, and **Port** fields, type the required information for the local site.

b. In the **Address type**, **Starting IP address**, **Ending IP address/subnet mask**, and **Port** fields, type the required information for the remote site.

8 Click **Apply** to save the settings and return to the VPN—Branch Office page.

9 On the VPN Branch Office page, click the down arrows to move the new policy into the **Select IP Policy** list.

10 In the navigation pane, choose **VPN** to access the VPN page.

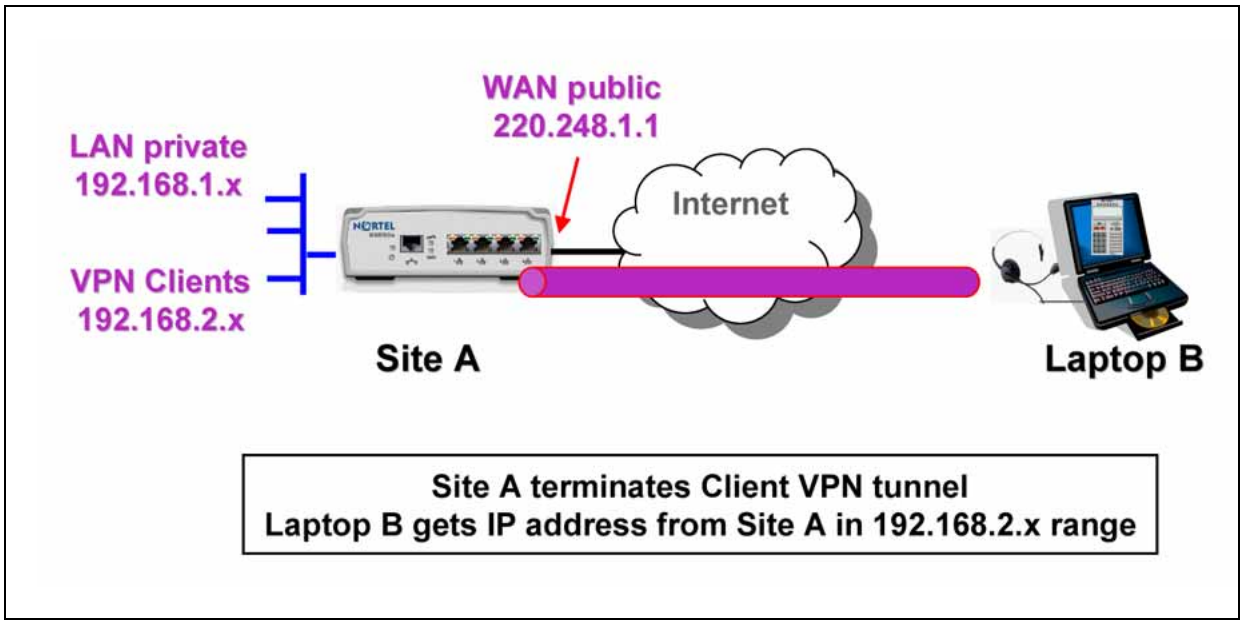
11 Click the **SA Monitor** tab.

12 On the VPN—SA Monitor page, ping the far-end LAN IP address of the router or another known network device.

When the tunnel is set up, the connection appears on the SA Monitor table.

—End—

Client tunnel configuration diagram



Configuring a client tunnel

Step	Action
1	Start the Element Manager, and access the BSR222 Web page.
2	In the Element Manager, Element Navigation Panel, click **VPN > Client Termination** .
3	Click the **Local User Database** link to access the Local User Database page.
4	Scroll to the bottom of the page.
5	Click **Edit** to access the User Edit page.
6	On the User Edit page a. Select the **Active** check box. b. In the User Type box, select **IPSec**. c. Type the user name and password, and retype to confirm the password. d. Type an account name. e. In the **Remote User—Static IP Address** box, type an unused IP address that is from a different network than the LAN interface. You are essentially creating a new network for the VPN users. f. In the Static Subnet Mask box, type **255.255.255.255**. **ATTENTION** If you do not enter this value in the Static Subnet Mask field an invalid IP address error results. g. Click **Apply**.
7	Repeat steps 1 - 6 to add more users. Remember to increment the static IP address when you add new users.
8	In the navigation pane, click **VPN** to access the VPN page. and .
9	Click the **Client Termination** tab.
10	On the **Client Termination** page: a. Select the **Enable Client Termination**check box. b. Select the **Local User Database**check box. c. Select the **User Name and Password/Pre-Shared Key** check box.

d. Select the appropriate **Encryption** check box.

e. Select the appropriate **IKE Encryption** check box.

f. Select the **Use Static Address** check box.

g. Click **Apply**.

h. Click **Advanced** to access the VPN—Client Termination—Advanced page.

11 Scroll down the VPN—Client Termination—Advanced page and if required, enable the **Display Banner** and enter the banner text.

12 Click **Apply** to return to the VPN—Client Termination page.

13 Click **Apply** to save your settings.

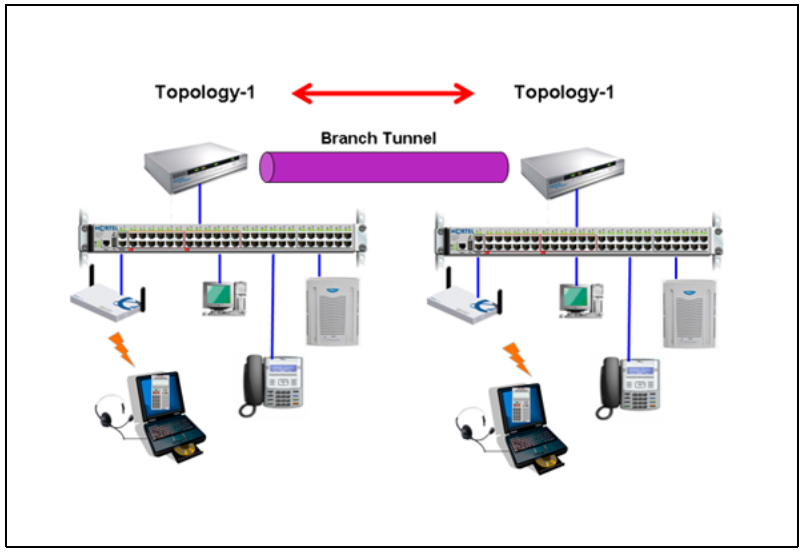
When the tunnel is set up, the connection appears on the SA Monitor table.

—End—

Interconnection of peer sites with incumbent routers (topology 1 with topology 1)

This reference interconnection illustrates the connection of identical sites using two incumbent routers. In this instance, a branch tunnel is set up between the two sites. See the figure, "Interconnection of peer sites with incumbent routers" (page 53).

Interconnection of peer sites with incumbent routers



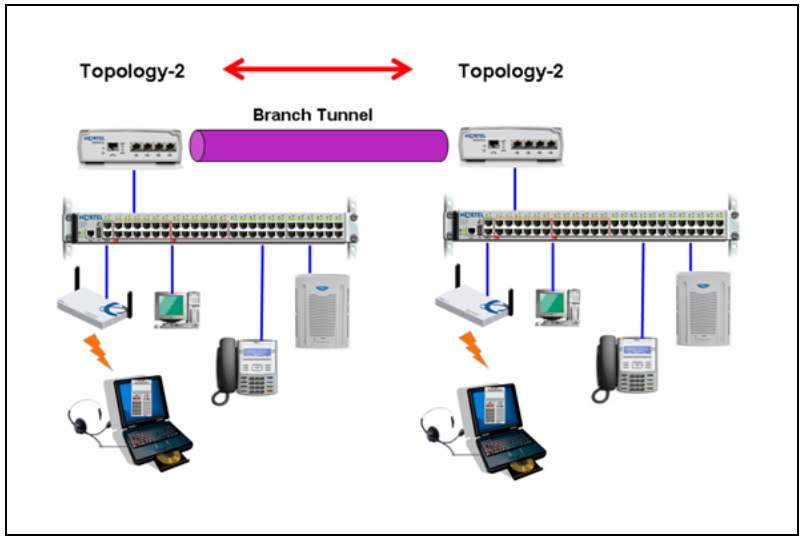
This reference interconnection has the following features:

- Two identical sites, each with an incumbent router, are connected by a branch tunnel.
- A dedicated host control protocol (DHCP) server is the incumbent router. A telephony server is located in the BCM50.
- A virtual private network (VPN) branch office tunnel connects the sites, and internal IP H.323 trunks connect the telephony servers.
- IP terminals at each site use H.323 trunks and local PSTN.
- The incumbent router enables partition of VLAN-mapped SSID traffic from BAP120 and BES100/200 to multiple subnets. Multipool DHCP enables separate voice, data, and Guest Access on a common local area network (LAN). The ability of the incumbent router to manage wide area network (WAN) egress and assert DiffServ differentiated services code point (DSCP) further enhances the solution.
- The BCM50 1.0 enables enhanced telephony features including Auto Attendant, Unified Messaging, Contact Center, custom dialing plans, and dozens of powerful call features.

Interconnection of peer sites using BSR222 (topology 2 with topology 2)

This reference interconnection illustrates the connection of identical sites using two BSR222 devices. In this instance, a branch tunnel is set up between the two sites. The BSR222 also supports client tunnel termination at either site to enable remote access, including telephony access for teleworkers and network administrators. See the figure "Interconnection of peer sites using BSR222" (page 54).

Interconnection of peer sites using BSR222



This reference interconnection has the following features:

- Each site has a BSR222 and BCM50. A branch tunnel connects the sites, and the BCM50 acts as a gateway to each site.
- Ten VPN tunnels are supported by each BSR for use by teleworkers or network administrators.
- The BSR222 or BCM50 provides a DHCP at each site.
- A telephony server for each site is located in the BCM50.
- The BCM50 1.0 enables enhanced telephony features including Auto Attendant, Unified Messaging, Contact Center, custom dialing plans, and dozens of powerful call features.

Interconnecting peer sites using BSR222

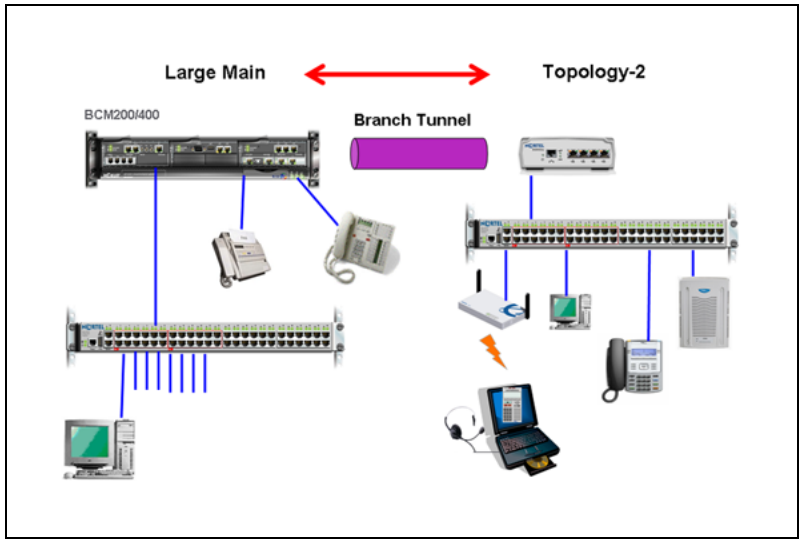
Step	Action
1	At each site a. Ensure that the DHCP server in the BCM50 is disabled, that the BCM50 is connected to the router, and that both boot. b. Add the IP phones to the site as described in the BCM50 *First Time Installation and Configuration Guide*.
2	Create a branch tunnel between the sites. See "Configuring a branch tunnel" (page 50).
3	Create an H.323 trunk between the BCM50s, as described in the BCM50 *First Time Installation and Configuration Guide*.

—End—

Interconnection of main and remote sites using BSR222 and BCM200/400 (topology 2 with BCM 200/400)

This reference interconnection illustrates the connection of a main and remote site using a BSR222 and a BCM200 or BCM400 with VPN capability. In this instance, a branch tunnel is set up between the two sites. In this example, the BCM50 and the BCM200 or BCM400 are networked using H.323 trunks in much the same way as time division multiplexing (TDM) private branch exchanges (PBX) use tie trunks. See the figure "Interconnection of main and remote sites using BSR222 and BCM200/400" (page 56).

Interconnection of main and remote sites using BSR222 and BCM200/400



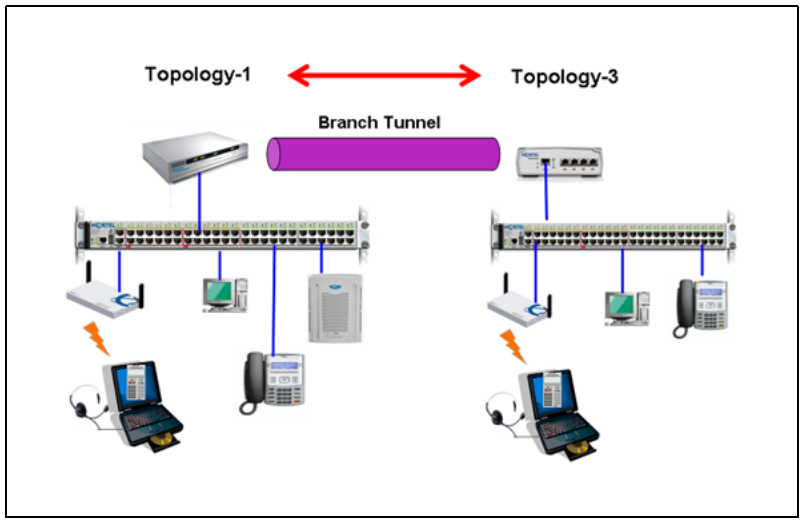
This reference interconnection has the following features:

- The remote site has one BSR222, and the main site has a BCM200/400 with VPN capability. A branch tunnel connects the sites.
- Client tunnels are supported at both sites.
- Both sites have DHCP and telephony server capability.
- A VPN branch office tunnel connects the sites, and internal IP H.323 trunks connect the telephony servers.
- IP terminals at the remote site use H.323 trunks and local PSTN.
- The BCM50 1.0 enables enhanced telephony features including Auto Attendant, Unified Messaging, Contact Center, custom dialing plans, and dozens of powerful call features.

Interconnection of BSR222 and an incumbent router (topology 1 with topology 3)

This reference interconnection illustrates the connection of a main and remote site using a BSR222 and an incumbent router. In this instance, a branch tunnel is set up between the two sites. The BSR222 also supports client tunnel termination at the remote site to enable remote access, including telephony access for teleworkers and network administrators. See the figure "Interconnection of BSR222 and an incumbent router" (page 57).

Interconnection of BSR222 and an incumbent router



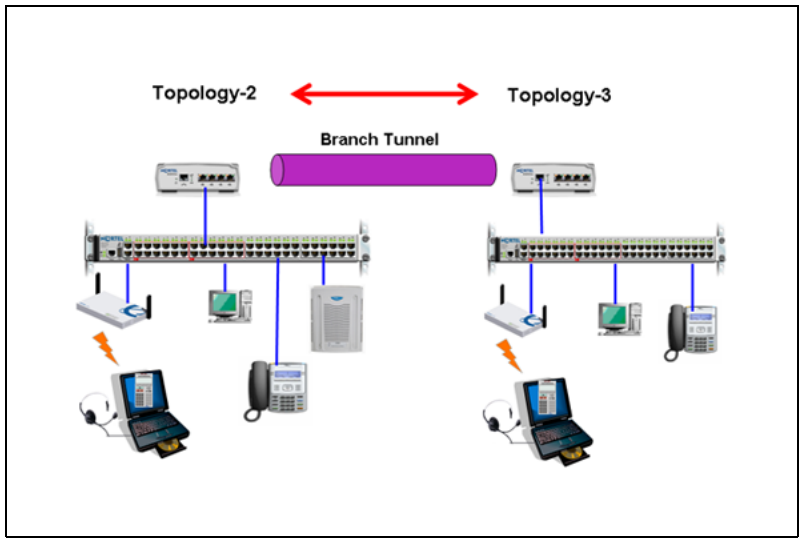
This reference interconnection has the following features:

- The remote site has a BSR222, and the main site has an incumbent router. A branch tunnel connects the sites.
- The VPN branch office tunnel is on a separate IP subnet.
- Ten VPN tunnels are supported by the BSR222 at the remote site for use by teleworkers or network administrators.
- A DHCP server is the incumbent router. A telephony server is located in the BCM50.
- An incumbent router enables partition of VLAN-mapped SSID traffic from BAP120 and BES100/200 to multiple subnets. Multipool DHCP enables separate voice, data, and Guest Access on a common LAN. The ability of the incumbent router to manage WAN egress and assert DiffServ DSCP further enhances the solution.
- IP terminals at the remote site are extensions of the BCM50 at the main site. There is no remote gateway and no dial tone if WLAN connection drops.
- The BCM50 1.0 enables enhanced telephony features including Auto Attendant, Unified Messaging, Contact Center, custom dialing plans, and dozens of powerful call features.

Interconnection of main and remote sites using BSR222 (topology 2 with topology 3)

This reference interconnection illustrates the connection of a main and remote site using two BSR222 devices. In this instance, a branch tunnel is set up between the two sites, and a client tunnel is configured at either site to enable remote access, including telephony access for teleworkers and network administrators. See the figure "Interconnection of main and remote sites using BSR222" (page 58).

Interconnection of main and remote sites using BSR222



This reference interconnection has the following features:

- Each site has a BSR222. A branch tunnel connects the sites.
- Ten VPN tunnels are supported by each BSR222 for use by teleworkers or network administrators.
- A DHCP is provided by the BSR222 at each site.
- A telephony server (BCM50) is located on the main site (topology 2).
- The BCM50 1.0 enables enhanced telephony features including Auto Attendant, Unified Messaging, Call Center, custom dialing plans, and dozens of powerful call features.
- IP terminals at the remote site are extensions of the BCM at the main site.

Interconnecting main and remote sites using BSR222

Step	Action
1	In the main site, ensure that the DHCP server in the BCM50 is disabled, that the BCM50 is connected to the router, and that both boot.

2 In the remote site, using a CLI command, set the S1 and S2 addresses to the IP address of the BCM50, identified in the router DHCP table or in the BCM50.

3 Connect to the router through Telnet or SSH. (Telnet or SSH must be enabled on that router.) Select menu 24, select menu 8, and enter the following commands:

a. **ip dhcp enif0 server voipserver 1 <BCM50_IP_Address > 7000 1**

b. **ip dhcp enif0 server voipserver 2 <BCM50_IP_Address> 7000 1**

4 Add the IP phones to the main site as described in the BCM50 *First Time Installation and Configuration Guide*.

5 Create a client tunnel to the remote site. See "Configuring a client tunnel" (page 52).

—End—

Maintenance

Security settings

This section details the following guidelines for improving the security on your network:

- "Key factory security defaults" (page 61)
- "Securing your SMB network" (page 62)

Key factory security defaults

The following tables list the key factory security defaults for each device. These defaults are intended to bring consistency to the SMB portfolio by allowing a near-zero configuration upon network deployment.

SMB device factory security defaults

Device	Web UI user ID	Web UI password	SNMP read community string	SNMP read community string	Web UI inactivity timeout
BAP120	nnadmin	PlsChgMe!	PlsChgMe!RO	PlsChgMe!RW	1 minute
BES50	nnadmin	PlsChgMe!	PlsChgMe!RO	PlsChgMe!RW	1 minute
BES100/200	nnadmin	PlsChgMe!	PlsChgMe!RO	PlsChgMe!RW	1 minute
BES1000	nnadmin	PlsChgMe!	PlsChgMe!RO	PlsChgMe!RW	1 minute
BSR222	nnadmin	PlsChgMe!	PlsChgMe!RO	PlsChgMe!RW	5 minutes

The Element Manager uses the default SNMP read/write community strings as listed in the following table to discover devices. Because the SMB devices and the Element Manager are using the same values, discovery occurs upon network deployment.

Default SNMP read/write community strings

Application	SNMP read community string	SNMP read community string
Element Manager	PlsChgMe!RO	PlsChgMe!RW

If you change the simple network management protocol (SNMP) read/write community strings, make the corresponding changes to the Element Manager.

Saving SNMP read/write community strings

Step	Action
1	In the Element Manager, Element Navigation Panel, click **View > Preferences**. The Preferences dialog box appears.
2	Click the **Network Elements** tab.
3	Select the **Store network element passwords** check box.
4	Click **OK**.

—End—

A Web user interface session times out after the designated value of time passes. For the BSR222, this value is 5 minutes. For the BES and the BAP120 devices, the timeout value is 1 minute. You can change these timeout values through the Web user interface for each device.

Securing your SMB network

The SMB factory security defaults described in "Key factory security defaults" (page 61) allow for ease of installation and efficient network deployment.

Nortel recommends that you change the factory default user IDs and that you change passwords frequently using strong password methodology.

If you have a security policy in place that prevents the use of network management protocols such as SNMP, follow the guidelines in this section to establish your network without SNMP.

The Element Manager is available as an SNMP-based network management tool in the following cases:

- Discovery of SNMP-based SMB data devices (BSR222, BES, BAP120) is completed using SNMP.
- Validation and addition of SNMP-based SMB data devices (BSR222, BES, BAP120) on the network element tree is completed using SNMP.
- Configuration of a BES device using the connect feature of the Element Manager is completed using SNMP.

If you are deploying your SMB data network without SNMP, you cannot use the Element Manager for device-configuration purposes. In these cases, use a Web browser to manage each device.

Note that IP addresses for each device may not be apparent because they are allocated by the DHCP server during deployment.

Discovering IP addresses in non-SNMP data networks

Step	Action
1	Disable SNMP on all devices.
2	Disable a BES50/100/200/1000 (BES) using the BES Web UI: a. From the Web UI navigation panel located in the left-hand pane, click **Configuration > SNMP > Agent statusRemote Access** to access the Agent Status Settings table. b. Clear the **Enable** check box. c. Click **Submit**.
3	Disable the BAP120 using the BAP120 Web UI: a. From the Web UI navigation panel located in the left-pane, click **Configuration > System > SNMP** to access the SNMP system page. b. Select **Disable**. c. Click **Submit**.
4	Disable the BSR222 using the BSR222 Web UI: a. From the Web UI main menu, click **Remote Management** and click the **SNMP** tab. b. From the Service Access pane select **Disable**. c. Click **Apply**.

5 Use your Web browser bookmark feature to save a shortcut to each device.

6 Use the BSR222 Web UI to note all the IP addresses that have been provided to your SMB network as follows:

a. From the Web UI navigation panel located in the left-hand pane, click **Maintenance**.

b. Click the **DHCP Table** tab.

A listing of all IP addresses that the DHCP server allocated appears.

You can access all SMB devices through a Web browser using the IP addresses obtained from the previous step. You can use your Web browser bookmark feature to save a shortcut to each device.

—End—

Deploying SMB networks without using DHCP

The SMB data solution uses a DHCP server running on the BSR222 to serve IP addresses to BAP120 and BES50/100/200/1000 devices using the DHCP client. This technique provides a near-zero configuration deployment. However, you can use the following steps to deploy SMB data devices without DHCP.

Procedure steps

Step	Action
1	On the BSR222 Web UI main menu, click **LAN**.
2	Click the **IP** tab.
3	From the **DHCP** list, select **None**.
4	Click **Apply** to save the changes. This action disables the dynamic host configuration protocol (DHCP) server function on the BSR222.
5	Reboot the BES100/200/1000 (BES). The BES tries unsuccessfully to obtain an IP address from the DHCP server on the BSR222. After 60 seconds, it defaults to an IP address of 192.168.1.132 (192.168.1.128 for BES50).
6	Reboot the BAP120.

The BAP120 tries unsuccessfully to obtain an IP address from the DHCP server on the BSR222. After 60 seconds, it defaults to an IP address of 192.168.1.136.

—End—

If you have more than one BES or BAP120 in your SMB network, IP addresses must be manually configured according to the ranges specified in the "IP addressing for SMB devices and DHCP" (page 19) table.

BAP120 engineering rules and guidelines

This section provides engineering guidelines to assist you in determining equipment requirements, placement devices, and third-party wireless fidelity (WiFi) compatibility for the BAP120.

Device quantities

The following three tables provide engineering guidelines around the number of PoE devices that can be supported on a given SMB site, depending on the equipment requirements.

The SMB devices such as IP phones and BAP120s use PoE powering method for ease of cabling, hence avoiding the requirement for multiple ac/dc power adapters. BES devices offer 12-port and 24-port PoE versions. These tables also account for the number of BAP120 devices deployed to a given site. Based on product engineering limits, the tables offer a quick method of determining equipment quantity requirements for IP phones, WiFi clients, and other legacy phone equipment that is supported for a given SMB equipment deployment scenario.

More IP phones for each BAP120 device can be deployed if you use AC/DC power adapters to connect equipment to BES non-PoE ports. The BAP120 also supports Wireless Bridging. Wireless bridging can be used to reduce the requirement for wired ports from BES devices and allows you to daisy-chain access points wirelessly. For engineering rules for such deployments, contact Nortel technical support.

Port count and device support table

	Available ports			
	Non-PoE	**PoE**	**Uplink**	**BAP units**
BES devices, 48 ports, 24 with PoE				
1	24	24	1	0
1	24	24	1	1
1	24	24	1	2

	Available ports			
	Non-PoE	PoE	Uplink	BAP units
1	24	24	1	3
1	24	24	1	4
BES devices, 24 ports, 12 with PoE				
1	12	12	1	0
1	12	12	1	1
1	12	12	1	2
1	12	12	1	3
1	12	12	1	4

	BAP120		BCM50		
	Associated clients per AP	Active # clients per AP	IP clients limit	TDM phones (expansion module)	Analog phones
BES devices, 48 ports, 24 with PoE					
1	32	20	32	44	4
1	32	20	32	44	4
1	32	20	32	44	4
1	32	20	32	44	4
1	32	20	32	44	4
BES devices, 24 ports, 12 with PoE					
1	32	20	32	44	4
1	32	20	32	44	4
1	32	20	32	44	4
1	32	20	32	44	4
1	32	20	32	44	4

	Wireline 2xxx IP phones	Wireless soft phones	Wireless data clients	TDM phones	Analog phones	Total
BES devices, 48 ports, 24 with PoE						
1	23	0	0	44	4	71
1	21	2	30	44	4	101
1	20	4	60	44	4	132
1	19	6	90	44	4	163
1	18	8	120	44	4	194

	Wireline 2xxx IP phones	Wireless soft phones	Wireless data clients	TDM phones	Analog phones	Total
BES devices, 24 ports, 12 with PoE						
1	11	0	0	44	4	59
1	9	2	30	44	4	89
1	8	4	60	44	4	120
1	7	6	90	44	4	151
1	6	8	120	44	4	182

BAP120 performance measurements

The following two tables illustrate the typical range and throughput measurements for the BAP120. Measurements were tested in real-life indoor office environments.

Use the data in these tables when determining the placement for your BAP120 devices to provide the optimum balance between range and throughput desired performance level for your site. To provide optimum roaming performance, place your BAP120 devices so that there is approximately 30 percent radio coverage overlap.

BAP120 performance range measurements table

BAP120 measured range		
	Indoor open space	**Physical data rate**
802.11a radio	51 meters	54 Mb/s
	56 meters	48 Mb/s
	68 meters	36 Mb/s
	80 meters	24 Mb/s
802.11b/g	60 meters	54 Mb/s
	68 meters	48 Mb/s
	80 meters	36 Mb/s

BAP120 measured range		
	Indoor open space	**Physical data rate**
Range measurements depend on regulatory domain radio-output settings and radio frequency (RF) environment conditions at the moment of measurements.		
Greater distances may be achieved at lower physical data rates.		

BAP120 performance measured throughput table

	Measured throughput	**Distances**	**User throughput (TCP)**
802.11a radio	maximum	8 meters	22 Mb/s
	typical	46 meters	17 Mb/s
802.11g radio	maximum	8 meters	22 Mb/s
	typical	46 meters	17 Mb/s
802.11b radio	maximum	8 meters	5.8 Mb/s
	typical	46 meters	5.2 Mb/s
All throughput measurements are performed using transmission control protocol (TCP).			
Different (likely higher) throughput can be observed using user datagram protocol (UDP).			

Third-party WiFi client interoperability

The BAP120 is a WiFi-certified access point (WPA/WPA2 Enterprise and WiFi multimedia (WMM) certified). This means that the BAP120 passes a set of interoperability compliance tests. The WiFi-compliance test suite involves interoperability testing evidence with a finite list of third-party vendor WiFi client devices.

Nortel has augmented this interoperability testing coverage with a longer list of vendors. The following table lists third-party WiFi clients, beyond the standard list used for testing, that have shown successful functional interoperability results.

Third-party WiFi client listing

Vendor name	**Product name**	**Model**	**Compatibility**	**Form factor**	**Driver revision**
Atheros	Atheros AR5002X + Universal 802.11a/b/g Wireless Network Adapter	AR5BSB-00035A	11 a/b/g		9.0.0.0.91

Vendor name	Product name	Model	Compatibility	Form factor	Driver revision
Broadcom	Broadcom 802.11abg CardBus Reference Design - BCM94309CB				4.10.36.0
Intel	Intel PRO /Wireless 2915 ABG Mini-PCI Adapter	WM3B2915ABGNA	11 a/b/g	mini-PCI	9.0.3.9
Realtek	RTL8185&8255				5.101.804.2004
Proxim	ORiNOCO 11a/b/g ComboCard Gold - World	8480-WD	11 b/g	CardBus	3.1.2.19
Cisco	Cisco Aironet 802.11a/b/g Wireless CardBus Adapter		11 a/b/g	CardBus	2.0.0.27
Nortel Networks	WLAN Mobile Adapter 2202	WLAN 2202	11 a/b/g (Super AG)	CardBus	3.0.0.0
SMC	EZ-Stream Universal Wireless Cardbus Adapter	SMC2336W-AG	11 a/b/g (Super AG)	CardBus	2.4.1.32
Netgear	RangeMAX Wireless PCI Adapter	WPN311	11 b/g (Super AG)	PCI	4.0.0.167
Netgear	802.11a/b/g Dual Band Wireless PC Card	WG511U	11 a/b/g (Super AG with XR)	CardBus	
Netgear	108 Mb/s Wireless PC Card	WG511T	11 b/g (Super G)	CardBus	3.3.0.156

Vendor name	Product name	Model	Compatibility	Form factor	Driver revision
Netgear	108 Mb/s Wireless PCI Adapter	WG311T	11 b/g (Super AG)	PCI	4.0.0.167
TRENDware	108 Mb/s 802.11a/g Wireless USB 2.0 Adapter	TEW-504UB	11 a/b/g (Super AG)	USB	1.1.0.25
TRENDware	108 Mb/s 802.11g MIMO Wireless PC Card	TEW-601PC	11 b/g (Super G with XR)	CardBus	1.1.0.22
TRENDware	108 Mb/s 802.11a/g Wireless PCI Adapter	TEW-503PI	11 a/b/g (Super AG)	PCI	4.1.2.56
USRobotics	Wireless MAXg PC Card	USR5411	11 b/g	CardBus	3.100.46.5
Belkin	Wireless G Notebook Card	F5D7010	11 b/g	CardBus	4.1.2.56
Belkin	Wireless G Plus Notebook Card	F5D7011	11 b/g	CardBus	3.100.64.0
Buffalo	54 Mb/s Wireless Notebook Adapter	WLI-CB-G54	11 b/g	CardBus	3.30.15.1
Microsoft	Broadband Networking Wireless Notebook Adapter	MN-720	11 b/g	CardBus	3.20.26.0
Dell	TrueMobile	TrueMobile 1450	11 a/b/g	mini-PCI	4.10.40.0

SMB

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