Route Processor and Line Card Memory Recommendations for the Cisco 12000 Series

Executive Summary

This document offers guidelines for choosing appropriate memory sizes for the Cisco 12000 Series route processors and line cards.

Understanding Processor Memory Usage on the Cisco 12000 Series

Both the route processor and line cards have a block of memory that is known as "processor memory." This block is used as the primary memory location for the operation of Cisco IOS® Software. The complete list of data structures and processes that use this memory is nearly impossible to detail, but some of the major consumers of this memory on the route processor are as follows:

1. The Cisco IOS image itself, which includes the actual executable code
2. Data structures used for tracking Cisco IOS interfaces and interface status (commonly referred to as Interface Descriptor Blocks [IDBs])
3. Routing information stored by the various routing protocols (Border Gateway Protocol [BGP], Open Shortest Path First [OSPF], Intermediate System-to-Intermediate System [IS-IS], etc.)
4. Routing information stored by the IP routing table
5. Forwarding information stored in the Cisco Express Forwarding (CEF) tables
6. Transient data structures used to convey forwarding information from the route processor to the line cards

The Cisco 12000 Series line cards store a subset of the information from the route processor and may have other structures that are required only on the line cards. Following is a brief list of the major consumers of processor memory on the line cards. (Note: Not all of these processes/features run on all line cards.)

1. The Cisco IOS code image itself, which includes the actual executable code
2. Data structures used for tracking Cisco IOS interfaces and interface status (commonly referred to as IDBs)
3. Forwarding information stored in the Cisco Express Forwarding (CEF) tables
4. Transient data structures used to accept forwarding information from the route processor
5. Software copies of information used to program the hardware ternary content-addressable memory (TCAM)
6. Feature-specific data structures such as tables for TurboACLs or NetFlow

Cisco Systems, Inc.
All contents are Copyright © 1992–2002 Cisco Systems, Inc. All rights reserved. Important Notices and Privacy Statement.

Recommendations for Selecting Memory for the Cisco 12000 Series

Sufficient processor memory is critical to the operation of Cisco IOS Software. Insufficient memory may result in poor or incomplete routing convergence, incorrect packet forwarding, general software instability, and errors in statistics/accounting. For these reasons, Cisco recommends the following memory selections for networks of the given sizes. For Multiprotocol Label Switching virtual private network (MPLS-VPN) environments, VPNv4 routes should also be counted against these recommendations in combination with the IPv4 routes in the default routing table.

For networks with 120,000 or fewer routes, Cisco recommends at least 256 MB of route processor memory and at least 128 MB of line card memory. For networks with more than 120,000 routes but fewer than 250,000 routes, Cisco recommends at least 512 MB of route processor memory and at least 256 MB of line card memory. For networks with more than 250,000 routes, Cisco recommends using the Performance Route Processor-1(PRP-1) with at least 1 GB of memory and configuring all line cards with the maximum amount of route memory available.

Using the PRP-1 should be considered for all networks, because the increased processing power and wider data path to and from the line cards offers significant improvement to routing convergence times.

Table 1 Default and Maximum Processor Memory Sizes for the Cisco 12000 Series

Card type	Default processor memory	Maximum processor memory
Performance Route Processor-1 (PRP-1)	512 MB	2 GB (2048 MB)
Gigabit Route Processor-B (GRP-B)	256 MB	512 MB
Gigabit Route Processor (GRP)	256 MB	256 MB
8-Port OC-3 ATM with traffic shaping	256 MB	256 MB
Cisco 12400 Internet Router 10 Gbps line cards	256 MB	256 MB (soon to be 512 MB)
Cisco IP Services Engine (ISE) line cards	256 MB	512 MB
All other line cards	128 MB	256 MB

Route Processor Flash Memory Options

In addition to processor memory options, Cisco provides options for Flash-card (or Flash-disk) storage on the route processor. Today, PCMCIA Flash cards/disks available for ordering on the GRP include the following: 16, 20, 48, and 128 MB. PRP-1 Flash memory options are 64 MB(default), 128 MB and 1 GB. With the increasing size of Cisco IOS images, it is recommended to use at least a 48 MB Flash disk in the route processor. This Flash space will allow for multiple Cisco IOS images and/or large configurations to be stored locally on the route processor.

Important Information

These recommendations are based on analysis of existing networks as well as significant laboratory testing. It is possible that networks with larger numbers of routes than those recommended here will run without memory problems. However, these recommendations are set out as conservative guidelines, and they consider numerous factors, such as the growth of the Cisco IOS images, addition of future data structures to support new features, as well as providing a block of free memory to guard against transient increases in the global routing table. The amount of used memory, free memory, and the low-water mark for free memory may be seen by executing the show memory summary command on the route processor and on all line cards.

All contents are Copyright © 1992–2002 Cisco Systems, Inc. All rights reserved. Important Notices and Privacy Statement.

Corporate Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters
Cisco Systems Europe
11, Rue Camille Desmoulins
92782 Issy-les-Moulineaux
Cedex 9
France
www-europe.cisco.com
Tel: 33 1 58 04 60 00
Fax: 33 1 58 04 61 00

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-7660
Fax: 408 527-0883

Asia Pacific Headquarters
Cisco Systems, Inc.
Capital Tower
168 Robinson Road
#22-01 to #29-01
Singapore 068912
www.cisco.com
Tel: 65 317 7777
Fax: 65 317 7799

Cisco Systems has more than 200 offices in the following countries and regions. Addresses, phone numbers, and fax numbers are listed on the

Cisco Web site at www.cisco.com/go/offices

Argentina • Australia • Austria • Belgium • Brazil • Bulgaria • Canada • Chile • China PRC • Colombia • Costa Rica • Croatia
Czech Republic • Denmark • Dubai, UAE • Finland • France • Germany • Greece • Hong Kong SAR • Hungary • India • Indonesia • Ireland
Israel • Italy • Japan • Korea • Luxembourg • Malaysia • Mexico • The Netherlands • New Zealand • Norway • Peru • Philippines • Poland
Portugal • Puerto Rico • Romania • Russia • Saudi Arabia • Scotland • Singapore • Slovakia • Slovenia • South Africa • Spain • Sweden
Switzerland • Taiwan • Thailand • Turkey • Ukraine • United Kingdom • United States • Venezuela • Vietnam • Zimbabwe

Copyright © 2002 Cisco Systems, Inc. All rights reserved. Cisco, Cisco IOS, Cisco Systems, and the Cisco Systems logo are registered trademarks or trademarks of Cisco Systems, Inc. and/or its affiliates in the U.S. and certain other countries.

All other trademarks mentioned in this document or Web site are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (0208R)

LS/JSI/09.02