DNS & BIND Cookbook

The *DNS & BIND Cookbook* collects solutions to many of the problems faced by nameserver administrators. It’s an indispensable companion to *DNS & BIND*, 4th Edition, the definitive guide to the critical task of name server administration. The cookbook contains dozens of recipes showing solutions to everything from simple problems like “How do I get BIND?” to advanced topics like providing name service for IPv6 addresses. It’s full of BIND configuration files that you can adapt to your site’s requirements.

The topics covered by the recipes in this book include:

- Checking whether a domain name is registered
- Registering your domain name and name servers
- Creating zone files for your domains
- Round-robin load distribution
- Resetting serial numbers
- Protecting your name server from abuse
- Allowing dynamic updates
- Setting up backup mail servers and virtual email addresses
- Making your name server pass anti-SPAM tests
- Delegating subdomains and checking delegation
- Moving a name server
- Setting up slave servers and caching-only name servers
- Using incremental zone transfer
- Restricting the queries a server answers
- Upgrading to BIND 9 from earlier versions
- Using IPv6
- Interoperability between BIND versions
- Interoperability between BIND and the Microsoft DNS Server
- Automatic updates from a DHCP server to a BIND server
- Resolver programming
- Logging and troubleshooting
- Name server security
- Secure zone transfers

These recipes encompass the day-to-day tasks you face when you are responsible for managing a name server, and many of the other tasks you will encounter as your site grows and adjusts to new requirements. The *DNS & BIND Cookbook* belongs in the library of anyone who is responsible for system or network administration.

**Cricket Liu** is one of the leading authorities on DNS, and is the author of bestselling books *DNS & BIND* and *DNS on Windows 2000*. 

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DNS and BIND Cookbook™

Cricket Liu
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Preface

I’m a pretty good casual Scrabble® player. Not a great one, mind you, but good enough so that close friends and family don’t much like playing with me. (My sister claims that she doesn’t like to play with me because I always cheated when we played games as kids, but I have no recollection of that.) I have a decent-sized vocabulary, I’m a good speller, and I’ve been doing the New York Times Crossword since I worked at HP and my manager, Lee, taught me the basics, so I now know all kinds of otherwise-useless crossword-puzzle words. But I’m still far from a great player.

A friend of mine, who’s among the brightest people I know, told me about a friend of his who’s a top competitive Scrabble player. He’d never played him before, so he challenged him to a game one day. On his second turn, my friend had six common letters in his rack, UDINTS, plus the blank (which, for those of you uninitiated in the ways of Scrabble, can be used as any letter). He was sure there were plays that would let him bingo—play all seven of his letters and earn a coveted 50 point bonus.

He told his opponent as much, who replied, “Well, let me see!” After looking over the tiles for a moment, he said, “Oh, yeah, there are at least 15 bingos there.” Somewhat incredulously, my friend said, “Yeah, right. What are they?” To which his opponent replied, “You could make your blank any of AEFILMQG, and make any of the following across the E:

Making it an “A”: AUDIENTS
Making it an “E”: DETINUES
Making it an “F”: UNSIFTED
Making it an “I”: NUDITIES, DISUNITE, or UNTIDIES
Making it an “L”: UNLISTED, INSULTED, or DILUENTS
Making it an “M”: MISTUNED
Making it a “Q”: SQUINTED
Making it an “R”: INTRUDES
Making it an “G”: DUNGIEST
Making it an “N”: DUNNITES
Making it a “U”: UNSUITED
Now, this guy wasn’t so quick with anagrams that he came up with all of these on the fly. No, he knew a Scrabble mnemonic device—a recipe, if you will—for remembering them all: finding the anagram DUNNITES, he remembered the magic sentence “A fire quelling material,” any of whose letters can be added to UDINTS and E to make a bingo. Of course, he did have to come up with the anagrams of each combination of letters, which is no mean feat. (Dunnite, ironically, is the name of a high explosive—not exactly the stuff to be smothering the ol’ campfire with.)

You’d think that all you’d need to play a wicked game of Scrabble is an outsized vocabulary, but there’s much more to it than that. To become a competitive Scrabble player, you need to devote hundreds of hours to memorization: all of the English words you can spell with a “Q” but no “U”; all the two-letter words; all the three-letter words.* In my brain, too much valuable space is wasted remembering which country the ccTLD fm belongs to (the Federated States of Micronesia, and I swear I didn’t have to look it up) to commit stuff like that to memory.

Now, many name server administrators have a good grasp of the basics of DNS theory and name server configuration—they’re fluent. But to be a complete administrator, you also need a set of commonly (and not-so-commonly) used BIND configurations. Then, when the occasion arises, you can bingo and impress the boss. Or go home early. Whichever.

Unlike Scrabble players, you don’t need to hold all this in your head. I often pop open DNS and BIND (O’Reilly & Associates) to check the syntax of some less-common named.conf substatements, so I certainly don’t expect everyone to remember all of the nuances of BIND configuration. And while I think DNS and BIND is a good book for learning about DNS theory and BIND configuration, I must admit it’s somewhat less useful as a reference than as a tutorial. Sometimes you just don’t feel up to slogging through a whole chapter to figure out how to set up classless in-addr.arpa delegation, and you can’t find the answer you’re looking for in the relevant mailing lists—or you’re uncertain of the answer you do find.

This book is designed to “round you out” as a name server administrator by showing you just what you can do with BIND and how to do it, from the straightforward (the 10 English words with a “Q” but no “U”) to the intricate (all the bingos you can make with SATINE plus a blank).

This book expressly doesn’t concentrate on DNS theory. For that, I’d (not surprisingly) recommend DNS and BIND. Without an understanding of the theory behind DNS, you’re like the Southeast Asian Scrabble players who memorize the spelling—but not the meaning or pronunciation—of tens of thousands of English words: all syntax, no semantics.

* For a fascinating account of the process of becoming a competitive Scrabble player, see Stefan Fatsis’s excellent book, Word Freak.
As in other O’Reilly Cookbooks, the chapters in this book begin with simpler recipes and progress toward the more complex. The simpler recipes should be useful to anyone with a basic knowledge of DNS, while the more advanced may come in handy to even seasoned hostmasters. Each recipe starts with an explanation of a problem and a concise solution to that problem, followed by a more detailed explanation of the solution and, often, variations. At the end, you’ll find references to other, related recipes and more complete coverage of the topics in DNS and BIND and elsewhere.

Platform and Version

This book covers both BIND 8 and 9 name servers. The latest versions of these name servers as of this book’s publication were 8.3.3 and 9.2.1. Thanks to the availability of early snapshots of BIND 9.3.0, I’ve been able to include a few peeks at its features. When a feature I’ve described is only available in a particular version of BIND, I’ve tried to note that in the recipe. In general, however, I’d recommend running the latest released version of BIND 8 or 9.

I run my name servers on FreeBSD (currently the 4.5 release), so many of the examples are drawn from that operating system.

Organization

Chapter 1, Getting Started, covers what you need to know to get started with a BIND name server: downloading and compiling BIND, registering a new domain name and configuring a name server. Chapter 2, Zone Data, describes how to create a zone data file and add records to it. Chapter 3, BIND Name Server Configuration, covers configuring BIND 8 and 9 name servers, from setting a name server’s working directory to serving multiple views of a single zone.

Chapter 4, Electronic Mail, describes how to set up email destinations, while Chapter 5, BIND Name Server Operations, covers topics in name server control and management. Chapter 6, Delegation and Registration, describes both how to establish and police delegation from your zone to its subzones, and how to manage the delegation to your zone from its parent.

The last five chapters deal with more specialized topics. Chapter 7, Security, contains recipes on securing your name server against various types of attacks. Chapter 8, Interoperability and Upgrading, describes the pitfalls of running multiple versions of BIND name servers or heterogeneous name server environments, and warns of gotchas when upgrading from one version of BIND to another. Chapter 9, Resolvers and Programming, describes both basic resolver configuration and simple resolver programming using Perl’s Net::DNS module. Chapter 10, Logging and Troubleshooting, provides troubleshooting tips. Finally, Chapter 11, IPv6, covers
IPv6: setting up a name server to respond to IPv6-based queries, and handling the forward- and reverse-mapping of hosts with IPv6 addresses.

**Audience**

This book is intended primarily for system and network administrators who manage zones and one or more BIND name servers. However, the recipes in certain chapters may be of interest to a broader audience:

- Postmasters working with DNS may benefit from the recipes in Chapter 4.
- Programmers (particularly Perl programmers) may find the recipes in the second half of Chapter 9 useful for learning how to send DNS queries and updates.

**Other Books and Resources**

Many of the recipes in this book include references to other books and a few web-based resources. Here’s a list of those:

*Apache, The Definitive Guide*, Peter Laurie and Ben Laurie (O’Reilly & Associates)
  For coverage of how to configure virtual hosts in Apache.

  Nicknames “the ARM,” this is the standard configuration reference for BIND 9 name servers, invaluable for name server administrators.

*DNS and BIND*, by Paul Albitz and Cricket Liu (O’Reilly)
  Textbook-style coverage of the Domain Name System and its BIND implementation, organized to follow the maturation of an administrator.

*DNS on Windows 2000*, by Matt Larson and Cricket Liu (O’Reilly)
  A special edition of *DNS and BIND* that substitutes the Microsoft DNS Server for the BIND name server.

**Conventions Used in This Book**

The following typographic conventions are used in this book:

*Italic*
  Used for filenames, directories, domain names, variables, and URLs.

*Constant Width*
  Used for code examples.

*Constant Width Italic*
  Used to indicate replaceables in examples.
This book uses one terminological convention that merits special note. There are many BIND configuration substatements that you can use within several different statements. For example, you can specify `allow-transfer` within a `zone` statement, within an `options` statement, and within a `view` statement. When I’m referring only to the first use, I call it the `allow-transfer zone` substatement. When referring to any of the three, I just call it the `allow-transfer` substatement. While I’m not sure this convention is common, it seemed like a natural, compact way of expressing the idea.

Comments and Questions

Please address comments and questions concerning this book to the publisher:

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bookquestions@oreilly.com

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Acknowledgments

First, I’d like to thank this book’s reviewers, Robbie Allen, Nate Campi and Jay Kreibich, whose close reading of the text caught more errors than I’d like to admit to, and whose suggestions improved nearly every recipe. I’d also like to thank the Internet Software Consortium and Nominum, for their hard work on the development of BIND 8 and 9, without which I imagine my career would have veered in a wildly different direction.

While I’m up on this podium, let me acknowledge the unsung heroes of the BIND Users and BIND 9 Users mailing lists, who do a tremendous job of answering dozens of DNS and BIND questions each week—some of them for the nth time. I hope this book helps alleviate their workload a little bit. How about you? Maybe we’ll be able to use it
like the longtime regulars in the bar, telling each other jokes by calling out each joke’s number: “How do I point my domain name at a particular URL?” “Recipe 2.6!”

I’m grateful to my friend Paul Phillips, for the use of his Scrabble anecdote, and for his occasional—but always entertaining—dispatches from the world of professional poker. And I am, as ever, indebted to my friend Paul Albitz, under whose wing I got my start, and who sets a sterling example as a patient teacher, selfless coauthor and methodical engineer.

The folks at O’Reilly, as always, have been wonderful to work with, especially my editor, Mike Loukides.

Finally, my love and thanks to my family: to my mom, my first reviewer, whose voice you undoubtedly hear in my writing; to my dad, for hours of academic tutelage; to my sister (“You shut up!”) for her good humor; and of course to my wife, Paige, and son, Walt, and my dogs, Dakota and Annie, for their love and for lost hours.

* For a variation on this joke, see http://www.awpi.com/Combs/Shaggy/929.html.
1.0 Introduction

All first moves in a Scrabble game have a few things in common: you play across the star, the opening square. You try to score high without opening up a premium square, particularly a Triple Word Score, for your opponent.

Most DNS setups start in very similar ways, too: you register a new domain and maybe a reverse-mapping domain; choose a version of BIND; download the BIND source code, if you need to, and build it; configure a primary master and slave name server; and make sure both name servers start at boot time.

This chapter will guide you through those opening moves and help you get your DNS infrastructure established.

1.1 Finding More Information About DNS and BIND

Problem
You can’t find information you need about the Domain Name System or BIND in this book.

Solution
For much more complete coverage of DNS theory and a step-by-step approach to setting up BIND name servers, pick up a copy of DNS and BIND, this book’s close cousin.

For BIND configuration or operational problems, search the archives of one of the newsgroups or mailing lists on BIND.
• For BIND 4 or 8, Google’s archive of the newsgroup comp.protocols.dns.bind, at http://groups.google.com/groups?q=comp.protocols.dns.bind&hl=en.

• The archive of bind-users, the mailing list equivalent of comp.protocols.dns.bind, at http://marc.theaimsgroup.com/?l=bind-users.

• And for BIND 9, the archive of the bind9-users mailing list is located at http://marc.theaimsgroup.com/?l=bind-users.

For information on the Domain Name System, you should look for relevant RFCs at http://www.rfc-editor.org/rfcsearch.html or you can search Google’s archive of the newsgroup comp.protocols.std.dns, which is located at http://groups.google.com/groups?q=comp.protocols.std.dns&hl=en. You might also check the BIND section of the Internet Software Consortium’s web site, at http://www.isc.org/products/bind/.

Discussion

This list is far from comprehensive; there’s lots of information about DNS and BIND available on the Internet. If you don’t find what you’re looking for at one of the places mentioned here, use a good search engine to track down what you’re looking for.

See Also

“Handy Mailing Lists and Usenet Newsgroups” in Chapter 3 of DNS and BIND.

1.2 Asking Questions You Can’t Find Answers To

Problem

You have a pressing question about DNS or BIND and can’t find the answer in this book.

Solution

Check one of the relevant mailing lists or newsgroups:

• The BIND Users mailing list, at bind-users@isc.org, discusses the operation and configuration of BIND name servers and resolvers. BIND Users is bidirectionally gatewayed to the Usenet newsgroup comp.protocols.dns.bind.

• The BIND 9 Users mailing list, at bind9-users@isc.org, discusses the operation and configuration of BIND 9 name servers.

You can also try asking me at Cricket’s Corner: http://www.menandmice.com/9000/9300_DNS_Corner.html. I can’t answer every question, but I answer as many as I can.
Discussion

Before asking a question on either of these mailing lists or the newsgroup, be sure to check their archives. See Recipe 1.1 for their locations. If everyone did this, the volume of messages on the mailing lists would drop precipitously, and newbies would get fewer curt or exasperated answers from cranky old-timers like me. (And we’d all live happily ever after.)

You may want to subscribe to one of the mailing lists or the newsgroup above, rather than just posing your question, getting an answer and disappearing until the next question pops into your head. Subscribing guarantees that you’ll see any replies (since some folks won’t copy you on responses) and will expose you to a wealth of DNS and BIND knowledge.

To subscribe to BIND Users or BIND 9 Users, send a message with the word “subscribe” in the body to bind-users-request@isc.org or bind9-users-request@isc.org, as appropriate.

See Also

Recipe 1.1 and “Handy Mailing Lists and Usenet Newsgroups” in Chapter 3 of DNS and BIND.

1.3 Getting a List of Top-Level Domains

Problem

You need a list of top-level domains (TLDs), possibly to figure out which one your organization belongs in.

Solution

See http://www.norid.no/domreg.html for an alphabetical list of top-level domains. See http://www.norid.no/domreg-alpha.html for a list of top-level domains alphabetized by country name (instead of the top-level domain label). Each list includes links to the registration authority for each TLD.

Discussion

The most recent edition of DNS and BIND, as of this writing, also contains a list of top-level domains as its Appendix A. However, that list does not include the new generic top-level domains (e.g., biz and info), as they were introduced after that edition’s publication.
1.4 Checking Whether a Domain Name Is Registered

Problem
You want to check whether a particular domain name is already registered, or who has registered that domain name.

Solution
Use the whois service offered by the appropriate registration authority, or use a command-line version of whois to look up registration information about the domain name you’re interested in.

The Internet Assigned Numbers Authority, or IANA, maintains a list of country-code top-level domains (ccTLDs) at http://www.iana.org/cctld/cctld-whois.htm, which includes links to the web pages of those ccTLDs registration authorities. Many of these web pages offer online whois lookups. The web site http://www.allwhois.com/ also includes links to many whois lookup facilities.

If your host’s operating system includes a command-line whois client, you can use that to look up to look up registration information about the domain name. Newer whois clients automatically determine which whois server to query, so you can simply run:

```
$ whois domain-name
```

Older whois clients may require you to specify the whois server to use. For these, you can try tld.whois-servers.net. For example:

```
$ whois -h ca.whois-servers.net risq.ca
```

The whois output usually contains information about the registrant (the person or organization that registered the domain name). For example:

```
$ whois isc.org
```

produces output that includes:

```
Registrant:
Internet Software Consortium (ISC2-DOM)
950 Charter Street
Redwood City, CA 94062
US
```
Discussion

If the registration authority for your prospective top-level domain doesn’t offer a whois server, or you can’t find it, you can look up NS records for the domain name you’re interested in. For example:

$ dig ns domain-name

If the domain name has NS records, it’s very likely registered. On the other hand, if a domain name lacks NS records, it may still be registered: some TLDs take a day or more to process a new registration and add the corresponding NS records.

See Also

“Using whois” in Chapter 3 of DNS and BIND.

1.5 Registering a Domain Name

Problem

You want to register a new domain name.
Solution

First, find out which registrars can register your domain name. For the generic top-level domains, this is easy: there’s a list of registrars accredited by ICANN, the Internet Corporation for Assigned Names and Numbers, at http://www.icann.org/registrars/accredited-list.html. For other domains, start at http://www.norid.no/domreg.html: each entry is a link to the registry for that particular top-level domain. While the registry may not process registration requests, most registries provide links to their registrars on their web sites.

Next, choose a registrar. The registrars for a single top-level domain may offer different prices for registration and various associated services, such as hosting your zone on their name servers. For the gTLDs (com, net, and org), the cost of registration is usually between $15 and $35 annually (the wholesale price—which you can’t get, even if you “know someone in the business”—is $6 per year). For other TLDs, the cost varies considerably.

Finally, register your domain name with the registrar. This is almost invariably a web-based process that involves specifying the domain name you want to register: personal information, such as your name, address, phone number and email address, and the domain names of the name servers you’ll use (and possibly their IP addresses). Oh, and some means of allowing the registrar to bill you.

Discussion

Choose your registrar wisely, and not solely on the basis of price. Some registrars offer notoriously poor customer service, and transferring to a different registrar is much more difficult than simply making the right decision the first time. Ask for recommendations from friends and colleagues, check newsgroups for sad tales of woe and, hypothetically, laudatory postings. And make sure you can work with the registrar the way you want to: using a web-based interface, if that’s what you prefer, or via fax or a toll-free number (that they answer promptly).

See Also

Recipes 1.6 and 1.8, for registering name servers and changing registrars; and “Registering Your Zones” in Chapter 3 of DNS and BIND.

* Think of a registrar as a domain name retailer. The registrars are the registration authorities, or registries, the organizations that manage the registration data. Each single registrar may handle registration in many different top-level domains.
About the Author

Cricket Liu matriculated at the University of California’s Berkeley campus, that great bastion of free speech, unencumbered Unix, and cheap pizza. He joined Hewlett-Packard after graduation and worked for HP for nine years.

Cricket began managing the hp.com zone after the Loma Prieta earthquake forcibly transferred the zone’s management from HP Labs to HP’s Corporate Offices (by cracking a sprinkler main and flooding Labs’ computer room). Cricket was hostmaster@hp.com for over three years, and then joined HP’s Professional Services Organization to co-found HP’s Internet consulting program.

Cricket left HP in 1997 to form Acme Byte & Wire, a DNS consulting and training company, with his friend (and now co-author) Matt Larson. Network Solutions acquired Acme in June 2000, and later the same day merged with VeriSign. Cricket worked for a year as Director of DNS Product Management for VeriSign Global Registry Services.

In September 2001, Cricket joined Men & Mice, an Icelandic company specializing in DNS software and services. He is currently their Vice President of Research and Development.

Cricket, his wife, Paige, and their son, Walt, live in Colorado with two Siberian Huskies, Annie and Dakota. On warm weekend afternoons, you’ll probably find them on the flying trapeze or wakeboarding behind Betty Blue.

Colophon

Our look is the result of reader comments, our own experimentation, and feedback from distribution channels. Distinctive covers complement our distinctive approach to technical topics, breathing personality and life into potentially dry subjects.

The animal on the cover of DNS and BIND Cookbook is an opossum. Opossums are solitary, nocturnal mammals. They can be found in forests, fields, marshes, and farmlands, living in hollow trees, old buildings, and the abandoned dens of other animals. Opossums have clawless opposable toes on their hind feet that they can use like thumbs to grasp and hold onto branches. They can also hang by their tails for short periods of time. Opossums are the only North American marsupial: their young are born partially developed, and then carried by the female in a pouch called a marsupium for seven to ten weeks. The North American opossum is called the Virginia opossum (Didelphis virginiana).

Opossums are not aggressive. The phrase “playing possum” comes from an involuntary behavior the opossum exhibits when frightened: it rolls over, closes its eyes, and lays still. As its heartbeat slows, the opossum gives the appearance of death, causing many predators to lose interest. When the opossum recovers from its shock, it wakes up and walks away. Opossum predators include foxes, coyotes, owls, and cars.
Colleen Gorman was the production editor and the proofreader for *DNS and BIND Cookbook*. Linley Dolby and Jane Ellin provided quality control. Lucie Haskins wrote the index.

Ellie Volckhausen designed the cover of this book, based on a series design by Edie Freedman. The cover image is a 19th-century engraving from the Dover Pictorial Archive. Emma Colby produced the cover layout with QuarkXPress 4.1 using Adobe’s ITC Garamond font.

David Futato designed the interior layout. This book was converted to FrameMaker 5.5.6 with a format conversion tool created by Erik Ray, Jason McIntosh, Neil Walls, and Mike Sierra that uses Perl and XML technologies. The text font is Linotype Birka; the heading font is Adobe Myriad Condensed; and the code font is LucasFont’s TheSans Mono Condensed. This colophon was written by Colleen Gorman.