

---

# INDEX

---

- Absolute zone transfer (AXFR), 151, 330
- Access control lists (ACLs), 228, 230, 309
- Access control server (ACS), 135, 136
- Add hold down timer, 301
- Address block allocation, 308
- Address family translation router (AFTR), 376
- Address Mapper, 372
- Address resolution protocol (ARP), 336
- Ad hoc internal-to-internet connections, 13
- Advanced Research Projects Agency (ARPA), 4
- ADVERTISE packet, 92
- Allocation efficiency, 61
- Allow pool, 131
- American Registry of Internet Numbers (ARIN), 57, 59, 60, 348
- Anycast addresses, 57, 249
  - anycast caveats, 251–252
  - master configuration, 251
- Anycast configurations, 252
- Anycast routing, 250
- API-accessible System Health Agents (SHAs), 136
- Application layer gateway (ALG), 373–374
- Application programming interface (API), 145, 374
- ASCII-based IP protocols, 164
- ASCII-encoded domain, 164
- As-needed allocation approach, 309
- Assignment window (AW), 59
- AT&T Bell laboratories, 3
- Authentication, authorization, and accounting (AAA) service, 89
- Authentication server, 134
- Authentic data (AD) bit, 292, 331
- Automatic tunneling technique, 355
  - intrasite automatic tunneling addressing protocol (ISATAP), 358–359
  - NAT types, 362–365
    - 6over4, 359–360
    - teredo, 361–362
    - 6to4, 355–358
    - tunnel brokers, 360–361
- Availability management, 343
- Basic DHCP captive portal flow, 129
- Best-fit allocation approach, 49
- BIND 9, feature of, 243
- BIND 9.7.0, date/offset based options, 271
- BIND 9.6.0 distribution, 271
- BIND implementations, 255
- BIND methods, 268
- BIND server-id option, 252
- BIS host, 370
- BOOTP. *See* Bootstrap protocol
- Bootstrap protocol, 68
- Broadband access scenario, 112
- Brute force method, 308
- Bubble packet, 364
- Buffer overflows, 257

- Bump-in-the-API (BIA) techniques, 368
- Bump-in-the-stack (BIS), 368
  - components, 371
- Cache information, 255
- Cache poisoning, 256
- Caching servers
  - addition, for external resolution, 239
  - configuration, 240, 241
- Captive portal network, 130, 131
- Captive portal VLAN, 132
- Centralized DHCP server
  - deployment for IPAM Worldwide, 119, 120
- CGI script, 130
- Change management, 345
- Chroot configuration, 230
- Circuit ID, 115
- Cisco Network Admission Control (NAC), 134, 135
- Class-based addressing, 7–9
  - benefit of, 7
  - key points, 8–9
- Classless interdomain routing (CIDR), 11, 14, 15, 347
  - allocation example, 13
  - network notation, 39
- Client-based address assignment concept, 90
- Client identifier (client ID) option, 76
- Client–server protocol, 68
- Configuration errors, 257
- Configuration management, 306
  - within context of IPAM, 307
  - function, 307
  - within ITIL, 345
- Configuration management database (CMDB)
  - component, 345
- Continuity management, 343
- CPE for initialization, 111
- Cryptographic hardware device, 271
- Customer premises equipment (CPE), 111
- Data link connection identifier (DLCI), 112
- Data Over Cable Service Interface Specifications (DOCSIS<sup>®</sup>), 111
- db.dot file, administrator modification of, 235
- db.hr.ipamworldwide.com.hr file, 244
- DDNS mechanism, 322
- de facto* application programming interface (API), 374
- Delegation signer (DS) record, 267
- Denial of service (DOS), 137, 138, 230, 251, 257
  - attacks, 258
- Deployment
  - centralized DHCP server, 119–120
  - DHCP, on edge devices, 125–126
    - advantages, 125
    - disadvantages, 125–126
  - distributed DHCP server, 120–122
  - server, design considerations, 122–125
  - virtual machine DHCP, 119
- Device fail authentication, 131
- Device Unique ID (DUID), 95, 97–99, 128, 187
  - enterprise number formatted, 98
  - forms of, 98
  - link layer address formatted, 98
  - link layer address plus time, 97
- DHCP administrator, 109
- DHCP appliances, 119
- DHCP authentication, 113, 124, 138–139
- DHCP-based access control, 128
- DHCP-based approach, 132
- DHCP-based secure access, 131
- DHCP clients, configuration information for, 111
- DHCP deployments, 223
- DHCPDISCOVER packet, 112, 117, 121
- DHCP D-O-R-A process, 117
- DHCP failover servers, 120
- DHCP information, 127
- DHCP LeaseQuery, 133
- DHCP packets, 112, 115, 116, 124, 128
- DHCP process, 129, 131
- DHCP Relay agent, 112
- DHCPRENEW packets, 114
- DHCP server, 109, 110, 112, 114–116, 118, 119, 121, 122, 124, 128–131, 137, 255
  - administrators, 139
  - deployment design, 122
    - availability requirements, 122–125
    - load requirements, 122
    - response time requirements, 122
    - traffic expectations, 122
  - discriminatory address assignment with, 128–132

- DHCP server (*Continued*)
  - hardware, 120
  - map to pool definitions on, 131–132
  - use of, 233
- DHCP services, 120, 125, 128
  - software, 119
- DHCP solutions, 128
- DHCP transactions, 124
- DHCPv6 device, 114, 128
- DHCP vendor, 120
  - deployment, 119
- DHCPv4 packet, 128
- DHCPv6 protocol, 366
- DHCPv6 server, 122
- Differentiated services code point (DSCP), 6
- Differentiated services field (DS Field),
  - definition, 6
- Diffie–Hellman keys, 262
- Diffie–Hellman mode, 262
- Digital signatures
  - and verification process, 265
- Digital subscriber line (DSL), 111
- Disparate networking protocols,
  - deployment, 3
- Distributed denial of service (DDoS), 251
  - attack, 258
- DLV chain, of trust, 296
- DLV registry, 296, 297
  - benefit, 296
  - identification, 297
  - parent zone administrator and, 299
  - as trust anchor, 296
  - to validate “delegation” for zone, 276
  - validation, trust anchor zone and, 302
- DLV resource record, 290, 296
- DMZ internal firewall, 227
- DNS administrators, 148, 233
- DNS database, 145
- DNS data stores
  - and update sources, 255
- DNS diagnostic tools, 327
- DNS extensions (EDNS0), 173–175
- DNSKEY Flags field, 301
- DNSKEY queries, 293, 300, 301
- DNSKEY resource records, 273, 274, 287
- DNSKEY RRSset, 271, 275, 277, 287, 294, 300, 301
  - signature of, 288
- DNS message format
  - answer section format, 171
  - basic format, 165
  - classes, 170
  - DNS QTypes, 170
  - zone file for query, 176
  - encoding of domain names, 161–162
  - extensions (EDNS0), 173–175
  - international domain names, 164–165
  - labels, 162
  - name compression, 162–163
    - with pointers, 163
  - question section format, 169
  - resource records, 175
- DNS messages. *See also* DNS message format
  - fields, 165
  - header, 166
  - inside firewall rules, 229
  - options, 332
  - outside firewall rules, 228
  - response codes, 168–169
  - updated inside firewall configuration, 240
  - updated outside firewall configuration, 240
- DNS protocol, 256, 267, 300
  - and information integrity, 256
  - key transactions communicated using, 300
  - message, 255
  - ongoing key updates using, 267
  - on-the-wire format dictated by, 177
  - operational record types, 185
- DNS queries, 228
- DNS resource records, 317, 334, 335, 349
  - and devices with IP, 313
  - and DHCP lease files, 334
  - format
    - within the RData field, 177
    - resource records in zone files, 177
    - wire format, 177
    - zone file as fully qualified (FQDN), 178
  - geographical location lookup
    - GPOS resource record, 214
    - LOC record, 214
  - non-IP host-address lookups, 214
    - ISDN address, 214–215
    - NSAP-PTR record, 215
    - NSAP resource record, 215
    - PX resource record, 215–216
    - route through resource record, 216
    - X25—X.25 PSDN address record, 216

- NULL record type
  - NULL resource record type, 216
  - types, security-oriented, 210–214
- DNSSEC chain, of trust traversal, 295
- DNSSEC dual-signature key rollover strategy, 299
- DNSSEC implementation process, 301
- dnssec-keygen command, 268, 272, 274
- DNSSEC keys, 268
- DNSSEC Lookaside Validation, 267, 296
- DNSSEC OK (DO), 290, 331
- DNSSEC pre-seed key rollover strategy, 298
- DNSSEC signature validation, 332
- dnssec-signzone command, 275–277
- DNS security, 264
  - digital signatures, 265–266
  - DNSSEC configuration
    - add keys to zone file, 274–275
    - chain of trust, 287–290
    - generate keys, 268–274
    - zone signature process, 275–287
  - DNSSEC overview, 266–268
  - DNSSEC resolution process, 290
    - authenticated denial of existence, 294
    - chain of trust, 294–297
    - signature verification, 291–294
  - key rollover
    - automated trust anchor rollover, 300–301
    - DNSSEC and dynamic updates, 301
    - DNSSEC deployment considerations, 301–302
    - DNSSEC dual-signature, 299
    - KSK rollover, 297
    - ZSK rollover, 298
  - mitigation approaches, 258–259
  - non-DNSSEC security records
    - KEY record, 261
    - SIG(0)—signature record, 261
    - TKEY—transaction key record, 262–263
    - TSIG—transaction signature record, 259–261
  - vulnerabilities, 254
    - BIND implementations, 255
    - configuration and server attacks, 257
    - denial of service attacks, 258
    - email notifications, 231
    - information and communications model, 256
    - resolution attacks, 256–257
- DNS server response, 256
- DNS servers, 19, 29, 37, 145, 148, 233, 307, 312, 318, 322, 328, 329, 335
  - address(es), 239
    - within organization, 239
    - provided by DHCP transactions and preferences of IPv4, 352
  - anycast address, 250
    - configuration, 251
  - configuration, 249
  - cross-role category
    - split view DNS servers, 243–249
  - deployment of, 223
    - with anycast addresses, 249–252
    - building blocks, categories, 224–226
    - external, 225
    - guidelines, 224
    - strategy, 309
  - ftp hostname, 231
  - master servers, 227, 237
  - mitigating attacks, 258–259
  - options, 110
  - outage of, 250
  - role in, 322
  - routing, 250–251
    - infrastructure, 250
    - stealth slave, 237
- DNS update messages. *See also* DNS message
  - format
    - format, 172
- DOCSIS device, 113
- DOCSIS specifications, 111
- Domain name system (DNS)
  - domain hierarchy, 144–145
  - domain tree mapping to, 144
- DS/DLV records, 299
- DS/DLV resource record, 297
- DSL connections, 117
- DS resource record, 289
- DSTM gateway, 366
- DSTM tunnel setup, 366
- Dual-signature rollover method, 299
- Dual-stack transition mechanism (DSTM), 365
- Duplicate address detection (DAD)
  - process, 26, 31, 32

- Dynamic Host Configuration Protocol (DHCP), 67–68
  - DHCPDISCOVER packet, 69, 70, 78, 315
  - DHCPRENEW message, 72
  - “DORA” process, 69, 129, 131
  - IP address allocation, types of, 68
  - means of dynamic address assignment, 89
  - options, 78–89
  - overview, 68–75
    - DHCP message types, 70–73
    - DHCP packet format, 73–75
  - packet fields, 74
  - pools, definition, 320
  - relay, 70
    - packet format, 96
  - servers and address assignment, 75–78
    - device identification by class, 76–78
  - state transitions, 73
- Dynamic host configuration protocol for IPv6 (DHCPv6), 30, 90
  - address assignment, 92–93
  - device unique identifiers, 97–99
    - DUID-EN, 98
    - DUID-LL, 98–99
    - DUID-LLT, 97–98
  - identity associations, 99
  - IPv4 vs. IPv6, 91
  - options, 99–109
    - format, 100
  - packet format, 96
  - prefix delegation, 93–94
  - relay, 93
  - support of address
    - autoconfiguration, 94–96
    - message types, 94–96
    - packet format, 96
- EAP traffic
  - to authentication server, 134
  - to Cisco NAC appliance, 135
- Email/antispam management
  - domain keys identified mail (DKIM), 201–202
    - DKIM-signature field, 202–203
    - DKIM TXT record, 203–204
  - email and DNS, 191
    - email relay, 194
    - mail exchanger record, 191–195
    - simple SMTP transaction, 193
  - historic email resource record types, 204
    - MB record, 204
    - MG resource record, 204
    - MINFO record, 204–205
    - MR resource record, 204
  - Sender ID, 200–201
  - sender policy framework (SPF), 195–196
    - macros, 199–200
    - mechanisms, 196–198
    - modifiers, 198–199
    - SPF record, 196
    - white/black listing, 195
- Encryption algorithm, 266
- EUI-64 algorithm, 31, 33
- Experimental name–address lookup records
  - APL record, 217
  - IPv6 address chaining, 217
    - A6 record, 217
    - Iterative derivation, of IPv6 address, 218
- Extensible authentication protocol (EAP)
  - connection, 89
  - over 802.1X, 134, 135
- External DNS building block, 227
- External DNS servers
  - in multihomed scenario, 229
  - security of, 230
- Extranet DNS deployment, 231
- FCAPS model, 306, 343
  - practice of network management:, 306
- forward only, statement, 242, 243
- FQDN column, 322
  - sample inventory table with, 323, 324
- Fully qualified domain name (FQDN), 145, 154, 158, 178, 179, 187, 215, 322, 360
- Global DNS data hierarchy, 145
- Global domain name system, 144, 145
- Global unicast address format, 23
- Glue records, 149, 186, 227, 228, 255
- Graphical user interface (GUI), 78
- Hash algorithms, 187, 202, 203, 208, 261, 266
- Header and packet concept
  - IP commonality in, 16
- Hop counts, 96, 250

- Hostname portal, 244
- Hostnames, 243
- Host-to-host ISATAP tunnels, 359
- hr.ipamworldwide.com, 244
  
- IANA-registered enterprise number, 113
- ICMP echo request, 326
- ICMPv6 packet, 18, 361, 362
- Identified by an IA identifier (IAID), 99
- Identity associations (IAs), 99, 128
- ID guessing, 256, 258, 265
- IEEE 802.1X, 134
- IETF, 11, 12, 15
  - Addresses within, 21
    - status, 218–222
- IETF RFC process, 177
- Incident management, 344
- Incremental zone transfer (IXFR), 151, 170, 330
- Information Technology Infrastructure Library (ITIL<sup>®</sup>), 306, 342
- Internal DNS servers, 233
  - BIND-based, 233
  - for internal clients, 232, 233
  - internal TLD, 232, 233
- Internal–Internal Category server configurations, 241
- Internal name space delegation, 234
- Internal root servers, 226, 234–236
- Internationalizing Domain Names in Applications (IDNA), 164
- International processing and materials (IPAM) worldwide, 35
  - centralized DHCP server deployment for, 120
  - distributed DHCP server deployment for, 121
  - DNS server deployments, 252
  - external DNS servers accessible via, 228
  - global locations and offices, 36
  - IPv6 allocations, 53–57
  - IPv4 block allocations (partial), 47, 48
  - network topology (partial), 37
  - public address space, 49
  - sparse allocation, use of, 52
  - spreadsheet, 64
  - topology, 37
- Internet access, 234
  - broadband and wireless service, 348
  - restricted by organizational policy, 159
- Internet Assigned Numbers Authority (IANA), 21, 24, 25, 57, 98
- Internet caching servers, 242
- Internet DNS queries, 239
- Internet hosts, growth of, 4
- Internet protocol (IP), 3
  - addressing, 7–13
    - class-based addressing, 7–9
      - Internet growing pains, 9–11
      - private address space, 11–13
    - classless addressing, 13–14
      - and fragmentation, 4–5
    - highlights of history, 3–7
      - IP header, 5–7
  - IPv4 address, 14
  - IPv4 header fields, 5
  - packets, 4
  - special use addresses, 14
- Internet protocol version 6 (IPv6), 15
  - address allocations, 21–30
    - :: /3-reserved space, 21–22
    - 2000:: /3-global unicast address space, 22–23
    - FC00:: /7—unique local address space, 23–24
    - FE80:: /10—link local address space, 24
    - FF00:: /8—multicast address space, 24–27
    - IPv6 addresses with embedded IPv4 addresses, 29–30
      - special case multicast addresses, 27–29
  - address autoconfiguration, 30
  - addressing, 18–19
  - address notation, 19–20
  - address structure, 20–21
  - development of, 61
  - evolution, 16
  - features, 17, 54
  - header, 17–18
  - key features, 16–17
  - neighbor discovery, 30–33
    - duplicate address detection, 32–33
    - modified EUI-64 interface identifiers, 31–32
  - required host IPv6 addresses, 34
  - reserved subnet anycast addresses, 33–34
- Internet-reachable resolution data, 224

- Internet root DNS servers, 241
- Internet-root-hints.file, 241
- Internet root servers, 158, 159, 225, 234–237, 251
  - BGP, 252
- Internet Systems Consortium (ISC), 4, 76, 110
- Interserver communications
  - configuration for, 246
  - funneled to correct view, 246
- Intrasite automatic tunneling addressing
  - protocol (ISATAP), 355, 358, 359, 367, 380
- IP address allocation, 35
  - address allocation logic, 38–49
    - address allocation part 3, 44–46
    - allocation trade-offs and tracking, 46–48
    - IPAM Worldwides public address space, 49
    - second-level allocation logic, 39–44
    - top-level allocation logic, 39
  - block allocation and IP address management, 63–64
  - global locations and offices, 36
  - internet registries, 57–62
    - address allocation efficiency, 61–62
    - RIR address allocation, 59–61
  - IPAM Worldwides IPv6 allocations, 53–57
  - IPv6 address allocation, 49–53
    - best-fit allocation, 49–50
    - random allocation, 53
    - sparse allocation method, 50–53
    - unique local address space, 53
  - multihoming and IP address space, 62–63
  - pie chart view, 41
  - from top-down, 58
- IP addresses, 112, 128–131, 143, 145, 227, 337
  - assignment, 312
  - default view, 247
  - Internet Caching name servers, 239
  - management system, 38, 77
  - sample inventory table for, 321
  - source addresses, 247
  - space, 63
- IP address management (IPAM) practices, 305
  - accounting management, 334–338
    - address reclamation, 337–338
    - inventory assurance, 334–337
  - common IP management tasks, 307
  - configuration management, 307–324
    - address allocation tasks, 308–314
    - address deletion tasks, 314–315
    - address renumbering/movement tasks, 315–318
    - block/subnet splits, 318–319
    - DHCP server configuration, 319–320
    - DNS server configuration, 320–322
    - server upgrades management, 323–324
  - database, 341
  - disaster recovery/business continuity, 340–341
  - fault management, 324–334
    - fault detection, 325–326
    - troubleshooting and fault resolution, 326–334
  - FCAPS summary, 306
  - feature of, 335
  - ITIL process mappings, ITIL process areas, 342–346
  - performance management, 338–340
    - address capacity management, 339
    - auditing and reporting, 339–340
    - services monitoring, 338–339
  - security management, 340
  - worldwide team, 320
- IP-address-to-host domain, resolution
  - of, 351
- IPAM administrator, 345
- IPAM databases, 341, 343, 345
- IPAM system, 78, 254, 255, 257, 308, 320, 343, 344, 346, 381
- IPAM-to-DNS server communications, 257
- IPAM Worldwide, 120
- ipamworldwide.com, 242
- IPAM Worldwide DNS server
  - deployments, 252
- IP communications, 145
- IP management systems, 47, 326, 339
- IP mobility support, 117
- IP network, 253
  - deployment of, 35
- IP packet headers, 143
- IP packets, 111
- IP PBXs, 67
- IPSec, 136, 211, 212
- IP traffic, 9, 12, 58, 70, 133, 239
- IPv4, 112, 117
  - addresses, 227

- address space, 348
- DHCPv6 server, 352
- DNS server, 352
- dual-stack approach, 349–353
  - deployment of, 350–351
  - DHCP considerations, 352–353
  - DNS considerations, 351–352
  - implementation, 349–350
  - in Microsoft Vista and 7, 350
- dual-stack destination, 367
- hosts, 354
- IPv6 translation techniques, 368
- IPv6 Coexistence technologies, 349
  - NAT function, 376
  - network—initial state prior to migration, 377
  - over IPv6, 353
  - potential router list, 358
  - routers, 350
  - translated address format, 369
  - UDP headers, 362, 364
  - vs. IPv6, 350
- IPv6, 117, 122
  - address, to reverse domain mapping, 156
  - addresses, 227
  - application migration, 374
  - automatic tunneling techniques, 355
  - client side migration scenario, 380
  - coexistence technologies, 349
  - core migration scenario, 378
  - development of, 347
  - DHCP transactions, 352
  - DHCPv6 protocol, 366
  - dual-stack approach, 349–353
    - deployment of, 350–351
    - DHCP considerations, 352–353
    - DNS considerations, 351–352
    - in Microsoft Vista and 7, 350
  - dual-stack deployment scenario, 381
  - implementation, 348–349
  - ISATAP host, 359
  - mapped address format, 369
  - packets, 360
    - tunneling of, 353
  - rapid deployment, 375
  - 6over4, 359–360
  - server side migration scenario, 379
  - stateless autoconfiguration, 132
  - 6to4 address prefix derivation, 355
  - 6to4 tunneling, 356
  - translation approaches
    - application layer gateway (ALG), 373–374
    - bump-in-the-API (BIA), 371–372
    - bump-in-the-stack (BIS), 370–371
    - network address port translation with protocol translation, 372–373
    - network address translation with protocol translation, 372
  - SIIT algorithm, 370
  - SOCKS, 373
    - SOCKS IPv6/IPv4 gateway, 373
    - stateless IP/ICMP translation (SIIT) algorithm, 368–370
    - transport relay translator (TRT), 373
  - tunneling approaches
    - for IPv4 packets over IPv6 networks, 365–366
    - over IPv4 networks, 353–354
  - Teredo server, 365
  - Teredo tunnels, 362
  - 6to4 router, 356, 358
    - tunneling summary, 366–368
    - tunnel types, 355–365
  - ULA, 55, 56
- IPv6 deployment process, planning
  - client–server migration, 380–381
  - client side migration, 380
  - core migration scenario, 378
  - enterprise deployment scenarios, 377–378
  - implementation planning, 381–382
  - server side migration, 378–380
  - service providers, 374–377
- IPv4-in-IPv6 tunnel, 376
- IPv4-IPv4 NAT function, 376
- IPv6 ISP network, 378
- IPv6 rapid deployment, 375
- IPv6 reverse domains, 155–158. *See also* Zones
  - notation, 156
- IPv6 routing, 378
- IPv6 VLAN, 351
- ISATAP host-to-router, 359
- ISATAP Interface IDs, 359
- ISATAP IPv6 address, 359
- ISC DHCP implementation, 115
- ISC DHCP server, 110, 115, 121, 132
- ISC DHCP services, 119



- ISC DHCP syntax, 114, 115
- ISC failover configuration, 124
- ISC server configuration, 131
- ISPs process, 49
  
- Kaminsky DNS vulnerability, 256
- Key-generation algorithm, 299
- KEY record, 261
- Key signing key (KSK), 267
- KSK DNSKEY data, 295
- KSK DNSKEY resource record, 289
- KSK matches, 297
- KSK rollover, 298
  
- Layer 2 Switch Alerting, 133–134
- LDAP server, 130
- Limited configuration DNS server, 129
- Limited function IP address, 128
- Link local address format, 24
- Link-scoped multicast address format, 26
- Linux VMs, 119
- Local Internet Registry (LIR), 51
  
- MAC address, 110, 111, 116, 128, 130, 131
- managed-keys statement, 288
- Master DNS server, 245
- Maximum transmission unit (MTU), 6
- Microsoft Access, 64
- Microsoft DHCP servers, 124
- Microsoft Management Console (MMC), 254, 320
- Microsoft NAP components, 136, 137
- Microsoft network access protection, 136
  - key functions, 136
- Microsoft split scopes configuration, 124
- Microsoft VMs, 119
- Microsoft Windows, 333
  - configuration of IP address DNS servers to query, 160
  - DNS server deployments, 224
  - enable entry of multiple DNS servers to, 159
  - Server 2008, 136
  - using ipconfig on, 333
- Mobile IP, 117
- Multicast address format, 24
  - enables IPv6 address to, 29
  - with flag, 25
- Multicast scope field interpretation, 28
  
- Multihoming architecture, 62
  - benefits, 62
  - link outage recovery, 64
- Multiple management systems, 307
  
- NAC appliance, 135, 136
- NAK'd address attempts, 131
- Name-address lookup applications
  - alias host/domain name resolutions, 180
    - CNAME record, 180
    - DNAMERESOURCE record, 180–181
  - DNS protocol operational record types, 185
    - NS record, 186
    - SOA record, 185–186
  - dynamic DNS update uniqueness validation, 186
    - DHCID record, 187
  - dynamic DNS record, 186–187
  - hostname/IP address resolution, 178
    - AAAA—IPv6 address record, 179
    - A—IPv4 address record, 179
    - PTR—pointer record, 179–180
  - host/textual information lookup, 183
    - HINFO resource record, 183
    - HIP resource record, 183–184
    - RP resource record, 184–185
    - text record, 183
  - network services location, 181–183
    - AFSDB record, 182
    - SRV record, 181–182
    - WKS record, 183
  - telephone number resolution, 187–189
    - NAPTR record, 189–191
    - telephone number mapping, 189
- Named-checkconf command performs syntax, 326
- Name resolution, 145–148
  - answer to query on behalf of resolver, 146–148
  - recursive and iterative queries in, 146
- NAP Enforcement Clients (ECs), 136
- NAP Enforcement Server (ES), 136
- NAP policies, 137
- NAP Policy Server (NPS), 136, 137
- NAT mapping, 364, 377
- NAT-PT deployment, 372
- NAT types, 363
- Neighbor advertisement packet, 32

- Neighbor discovery, in IPv6, 30
- Neighbor solicitation and advertisement process, 32
- NetReg, 128
- Network access control (NAC), 127–128
- Network access protection (NAP), 136, 137
- Network address translation (NAT), 12, 13, 37, 49, 63, 348, 355, 361–365
  - firewalls, 348
  - gateways, 63
  - mapping table, 377
  - use of, 13
- Network address translation with protocol translation (NAT-PT), 372
- Network admission control (NAC), 117, 127, 128, 132, 134–136, 340
- Network mask, 9, 10, 41
- Network server-based address assignment, 90
- Network time protocol (NTP), 23, 30, 352
- Next SECure (NSEC) resource record, 294
- NSEC3PARAM resource record, 275
- NSEC record, 206, 208, 275, 287, 294, 302
- NS/glue record, 228, 237
- Number Resource Organization (NRO), 356
  
- 16-octet globally unique identifier (GUID), 116
- Operating system (OS), 118, 119, 179, 183, 230, 254, 257, 323, 335, 345, 346, 377
- Option 97—client machine identifier, 116
- Option 94—client network interface identifier, 116
- Option 93—client system, 116
- Option 6 in DHCP, 145
- Option 23 in DHCPv6, 145
- Options 128–135 client machine identifier, 116
  
- Packet interception/spoofing, 256
- Partners domain, 243
- Personal digital assistant (PDA) device, 117
- Point-to-point (PPP) connection, 89
- Point-to-Point Protocol (PPP), 111
- Potential router list (PRL), 358
- PPP connection, 117
- PPP/RADIUS Environments, 116–117
- Preboot Execution Environment (PXE or “Pixie”) clients, 115
- Prefix delegation process, 93, 94
- Problem management, 344
- Production network 1, 131
- Production network 2, 131, 132
- PTR domain, 356
- Public key distribution system, 266
- Public key infrastructure (PKI), 266
- PXE client, 116
- PXE device, 116
  
- Quality of service (QoS), 6, 38
- Query prediction, 256
- Query-source, 247
  - configuration, 246
  - definition, 224
  - use of, 246
  
- RADIUS servers, 89, 130, 134
  - hardware, 117
- Radius services, 135
- Random allocation method, 53
- RData
  - algorithm, 274
  - field, 176
  - flags, 273
  - protocol, 273
- 6rd deployment. *See* IPv6 rapid deployment
- Recursive BIND server, 300
- Recursive server, 145, 147, 148, 234, 256, 267, 292
  - configuration, 288
  - DLV registry identification in, 297
  - validate DNSKEY RRSets with, 294
  - validate RRSIG with, 295
- Regional internet registries (RIR) system, 15, 49, 60
  - allocation guidelines for, 58
  - allocation policy summary, 60
  - goals of, 57
  - LIR/ISP layer, 58
- Relay Agent Information, 117
  - configuration of routers and, 307
  - option, 112
  - updating of, 309
- Release management, 345, 346
- Remote Access Dial In User Service (RADIUS) protocol, 113, 116–117
- Remove hold down timer, 301
- Rendezvous point (RP), 26, 27

- Rendezvous point interface ID (RIID)
  - field, 26
- Request for comments (RFC), 4
  - RFC 791, 5, 7, 9
    - classes of addresses, 7
  - RFC 1715, 61
  - RFC 1918, 12, 37
  - RFC 2526, 33, 34
  - RFC 3531, 52
  - RFC 4193, 23
  - RFC 4294, 34
  - RFC 4554, 350
  - RFC 4578, 116
  - RFC 4620, 29
  - RFC 5011, 300
- REQUEST message, 92
- Reserved subnet anycast address format, 33, 34
- Resolver configuration, 159–161
  - configuration of MicrosoftWindows resolver, 159, 160
  - DNS domain, 160–161
  - on Unix or Linux-based systems, 159
- Resolver configuration attack, 257
- Resource Record Set (RRSet), 176
- Resource record signature (RRSIG)
  - records, 275
- Reverse domains, 151–155. *See also* Zones
- rndc freeze command, 301
- rndc thaw command, 301
- Root zone signing, 267
- Router, 249, 358
- Router-to-host configuration, 354
- Router-to-router tunnel, 368
- Routing protocol, 252
- RRSIG RData, 293
- RRSIG record, 291–293
- RRSIG resource record, 209, 210, 213, 275–277, 279, 280, 282–287, 290–295, 302
  - RData fields, 291
- Secure shell (SSH)
  - Protocol, 213
  - use of, 257
- Securing DHCP, 137
  - DHCP authentication, 138–139
  - DHCP threats, 137–138
  - mitigation, 138
- Security applications
  - non-DNSSEC security-oriented DNS resource record types
    - CERT record, 210–211
    - IPSECKEY resource record, 211–212
    - KEY record, 212
    - KX record, 212
    - Secure Shell (SSH) Protocol, 213
    - SIG resource record, 213
    - SSHFP resource record, 213–214
    - TA resource record, 210
  - securing name resolution, record types, 205
    - DLV resource record, 206–207
    - DNSKEY resource record, 205–206
    - DS resource record, 206
    - NSEC3PARAM record, 209
    - NSEC3 record, 207–208
    - NSEC resource record, 207
    - RRSIG resource record, 209–210
- Service level agreement (SLA), 306
- Service level management, 342
- Shared Whois Process (SWIP), 59
- SIIT algorithm, 369
- SIIT stack, 370
- Slave servers, configuration of, 255
- Slave servers view configuration, 248
- Slaves transfer zone information, 255
- Slow-start allocation scheme, 59
- SMTP either, 164
- SNMP-based network management systems, 325
- SOCKS IPv6/IPv4 gateway, 373
- SOLICIT message, 92
- SOLICIT packet, 325
- Solicit packet, 110
- Sparse allocation method, 50–53
- Special case multicast addresses, 28–29
  - node information query address, 29
  - solicited node multicast address, 28
- Statement of Health (SoH), 136
- Static IP address, 132
- Suballocation window (SAW), 60
- Subnet allocation, 310
- Subnetting, 9, 10
- System Health Validators (SHVs), 136

- TCP/IP protocol, 5, 57
- TCP/IP stack, 145, 257
- TCP/IPv4 module, 370
- TCP/IPv4 stack, 377
- Teredo clients communication
  - via IPv4 internet, 365
- Teredo initialization process, 364
- Teredo prefix, 365
- Three-tiered internal server structure, 238
- TLD zone signing, 267
- Transaction Key (TKEY) meta-resource record
  - RData fields, 262
- Transaction signature (TSIG), 230
  - definition, 259
- Translation techniques, 368
- Transmission Control Protocol/Internet Protocol (TCP/IP), 3–4
- Transport relay translator (TRT), 373
  - configuration, with DNS-ALG, 374
- Trust anchor (SEP) state, 300
- TSIG key, 329
- TSIG meta-resource record, 260, 261
- Tunnel setup protocol (TSP), 360
- Type of service (ToS), 6
  
- UDP port numbers, 239
- UDP query, 330
- ULA IPv6 address allocations, 55, 56, 64
- Uniform allocation strategy, 308
- Unique local address (ULA)
  - allocation, 54
  - format, 23
  - network, 53
  - space concept, 53
  
- Valid Digest Type values, 289
- Variable length subnet masking (VLSM), 11, 14
- Vendor-specific DHCP options, 128
- Virtual machine DHCP, 119
- Virtual machine (VM) platform, 118
  
- Virtual private network (VPN), 37, 136, 151, 231
- VLAN enables IP communications, 129
- VLAN segments, 130
- Voice over IP (VoIP) devices, 110
- VoIP application configuration, 110
- VoIP devices, 76, 78
- VoIP phones, 128, 232
- VoIP phone vendors, 77
- VPN server, 137
  
- Wide area network (WAN), 37, 44
  - access device, 325
- Windows Domain Controller, 130
  
- 802.1X, 136
- 802.1X access flow, 136
- 802.1X authentication, 135
  
- Zone information propagation, 298
- Zones, 148
  - AAAA records, 149
  - additional, 158
    - localhost zones, 159
    - root hints, 158–159
  - as delegated domains, 149–150
  - dissemination of information, 150–151
  - DNSservers, configuration
    - information, 150
  - dynamic zones, 151
  - IXFR mechanisms, 151
  - NS records, 149
  - process
    - of delegation, 150
    - of zone transfers, 150, 151
- Zone signature process, 275
- Zone signing key (ZSK), 267
- ZSK 14522, 298
- ZSK 28004, 298
- ZSK DNSKEY resource record, 287
- ZSK private key, 301
- ZSK rollover, 298, 299