

# SSH Quick Reference

Connections, keys, config, tunnels, SCP, SFTP

## Connecting

### Basic Connection

```
ssh user@host # connect to host
ssh -p 2222 user@host # custom port
ssh user@host command # run remote command
ssh -t user@host "top" # force TTY allocation
```

### Connection Flags

```
-p port Connect to specific port
-i key Use specific identity (private key)
-t Force pseudo-terminal allocation
-v / -vv / -vvv Verbose debugging (increasing detail)
-q Quiet mode (suppress warnings)
-N No remote command (for tunnels)
-f Go to background before command
-J jump Jump host (ProxyJump)
```

## Key Management

### Generate Keys

```
ssh-keygen -t ed25519 -C "you@example.com"
ssh-keygen -t rsa -b 4096 -C "you@example.com"
ssh-keygen -t ed25519 -f ~/.ssh/mykey
ssh-keygen -p -f ~/.ssh/id_ed25519 # change passphrase
```

### Deploy Public Key

```
ssh-copy-id user@host
ssh-copy-id -i ~/.ssh/mykey.pub user@host
# Manual: append .pub to remote authorized_keys
cat ~/.ssh/id_ed25519.pub | ssh user@host \
"mkdir -p ~/.ssh && cat >> ~/.ssh/authorized_keys"
```

### Key Files

```
~/.ssh/id_ed25519 Private key (keep secret)
~/.ssh/id_ed25519.pub Public key (share freely)
~/.ssh/authorized_keys Remote: accepted public keys
~/.ssh/known_hosts Known host fingerprints
```

## Config File

### ~/.ssh/config Basics

```
Host myserver
  HostName 192.168.1.100
  User deploy
  Port 2222
  IdentityFile ~/.ssh/deploy_key

# Then connect with just:
# ssh myserver
```

### Useful Config Options

```
Host *
  ServerAliveInterval 60
  ServerAliveCountMax 3
  AddKeysToAgent yes
  IdentitiesOnly yes

Host bastion
  HostName bastion.example.com
  User admin
```

## Config Directives

```
Host Alias pattern for the entry
HostName Actual hostname or IP
User Login username
Port Remote port (default 22)
IdentityFile Path to private key
ProxyJump Jump through another host
ServerAliveInterval Keep-alive interval (seconds)
IdentitiesOnly Only use specified keys
```

## Port Forwarding

### Local Forwarding (-L)

```
# Access remote port 5432 via local port 5432
ssh -L 5432:localhost:5432 user@host
# Access remote-db:3306 through ssh host
ssh -L 3306:remote-db:3306 user@host
# Bind to all interfaces
ssh -L 0.0.0.0:8080:localhost:80 user@host
```

### Remote Forwarding (-R)

```
# Expose local port 3000 on remote port 8080
ssh -R 8080:localhost:3000 user@host
# Allow remote connections from any interface
ssh -R 0.0.0.0:8080:localhost:3000 user@host
```

### Dynamic Forwarding (-D)

```
# SOCKS5 proxy on local port 1080
ssh -D 1080 user@host
# Background SOCKS proxy
ssh -D 1080 -fN user@host
```

## SCP & SFTP

### SCP (Secure Copy)

```
scp file.txt user@host:/remote/path/
scp user@host:/remote/file.txt ./local/
scp -r dir/ user@host:/remote/path/
scp -P 2222 file.txt user@host:/path/
```

### SFTP (Interactive Transfer)

```
sftp user@host
# Inside sftp session:
# put local.txt - upload file
# get remote.txt - download file
# ls / lcd / cd - list / change directory
```

### Transfer Flags

```
-r Recursive (copy directories)
-P port Specify port (SCP uses -P, not -p)
-C Enable compression
-l limit Bandwidth limit in Kbit/s
-i key Use specific identity file
```

## Agent Forwarding

### SSH Agent

```
eval "$(ssh-agent -s)" # start agent
ssh-add ~/.ssh/id_ed25519 # add key to agent
ssh-add -l # list loaded keys
ssh-add -D # remove all keys
```

## Forwarding Agent

```
ssh -A user@host # forward agent
# Or in ~/.ssh/config:
# Host myserver
# ForwardAgent yes
```

### Agent Notes

```
Agent forwarding lets the remote host use your local keys without copying them. Use only with trusted hosts. Prefer ProxyJump over agent forwarding when possible.
```

## Tunnels

### Persistent Tunnel

```
# Background tunnel that stays open
ssh -fNT -L 5432:localhost:5432 user@host
# Auto-reconnecting tunnel (with autossh)
autossh -M 0 -fNT -L 5432:localhost:5432 user@host
```

### Jump Hosts / Bastion

```
ssh -J bastion user@internal-host
ssh -J user1@hop1,user2@hop2 user@target
# Config equivalent:
# Host internal
# HostName 10.0.0.5
# ProxyJump bastion
```

### Tunnel Management

```
-f Background after authentication
-N No remote command
-T Disable pseudo-terminal
~. Kill stuck SSH session (escape)
~C Open command line for forwarding
~# List forwarded connections
```

## Troubleshooting

### Debugging Connection

```
ssh -vvv user@host # max verbosity
ssh -G user@host # dump config (dry run)
ssh-keyscan host # fetch host keys
ssh-keygen -R host # remove from known_hosts
```

### Common Issues

```
Permission denied Wrong key, user, or ~/.ssh perms (700/600)
Host key changed ssh-keygen -R host, then reconnect
Connection timed out Check firewall, port, and host reachability
Too many auth failures Use -i to specify key or IdentitiesOnly
Broken pipe Add ServerAliveInterval to config
```

### File Permissions

```
chmod 700 ~/.ssh
chmod 600 ~/.ssh/id_ed25519 # private key
chmod 644 ~/.ssh/id_ed25519.pub # public key
chmod 600 ~/.ssh/authorized_keys
chmod 644 ~/.ssh/known_hosts
```

## Security Best Practices

### Server Hardening

```
PasswordAuthentication no Disable password login
PermitRootLogin no Disable root SSH access
AllowUsers deploy Whitelist allowed users
Port 2222 Non-default port (avoid scanners)
MaxAuthTries 3 Limit auth attempts
```

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## Key Practices

```
Prefer Ed25519 keys (smaller, faster, more secure).
Always set a passphrase on private keys.
Use ssh-agent to avoid retyping passphrases.
Rotate keys periodically; revoke unused keys.
Use IdentitiesOnly to control which key is offered.
```

## Multiplexing

### Connection Sharing

```
# In ~/.ssh/config
Host *
  ControlMaster auto
  ControlPath ~/.ssh/sockets/%r@%h-%p
  ControlPersist 600

# Create socket directory
mkdir -p ~/.ssh/sockets
```

### Multiplexing Benefits

```
Reuses a single TCP connection for multiple SSH
sessions to the same host. Eliminates repeated
handshakes – faster connects and lower overhead.
ControlPersist keeps the master alive (seconds).
```

## Escape Sequences

### SSH Escape Commands

```
~.    Terminate connection (kill stuck session)
~^Z   Suspend SSH session
~C    Open command line (add forwarding)
~#    List forwarded connections
~&    Background SSH (waiting for connections)
~?    Show escape help
~~    Send literal tilde
```