scanning

Keiichi Shima <keiichi@iijlab.net>

Slides stolen from

Matsuzaki ‘maz’ Yoshinobu <maz@iij.ad.jp>

Basic Features of Google Search

- Automatic “AND” queries
  - By default, Google try to return pages that include all of your search terms
  - There is no need to specify any kind of “AND” operator explicitly
  - If some of the terms are missing, the result page explicitly show them
- Automatic exclusion of common words
  - Google ignores common words and characters such as ”and”, “or”, “in”, “of”, ”be”, etc. as well as certain single digits and single letters, because they tend to slow down your search without improving the results. Google will indicate if a common word has been excluded by displaying details on the results page below the search box.

Basic Features of Google Search

- Capitalization
  - Google search are NOT case sensitive. For example, searches for “APNIC”, “Apnic”, and “apnic” will all retrieve the same results
- Spell checker
  - Google’s spell checking software automatically looks at your query to see if you are using the most common version of word’s spelling. If it is likely that an alternative spelling would retrieve more relevant results, it will show as “Did you mean: (more common splling)?”

Different Search Options

- - Searches
- “” Phrase searches
- Domain restrict searches
- Definition searches
- Filetype searches
- OR searches
- # Trend searches
- @ Social tag searches
- Fill in the blank (wildcard)
- Currency conversion
- Calculator function
- Unit conversion
- Time check
- Flight check

Advanced Searches

- Google advanced operators help refine searches
- They are included as part of a standard Google query
- Advanced operators use a syntax such as following

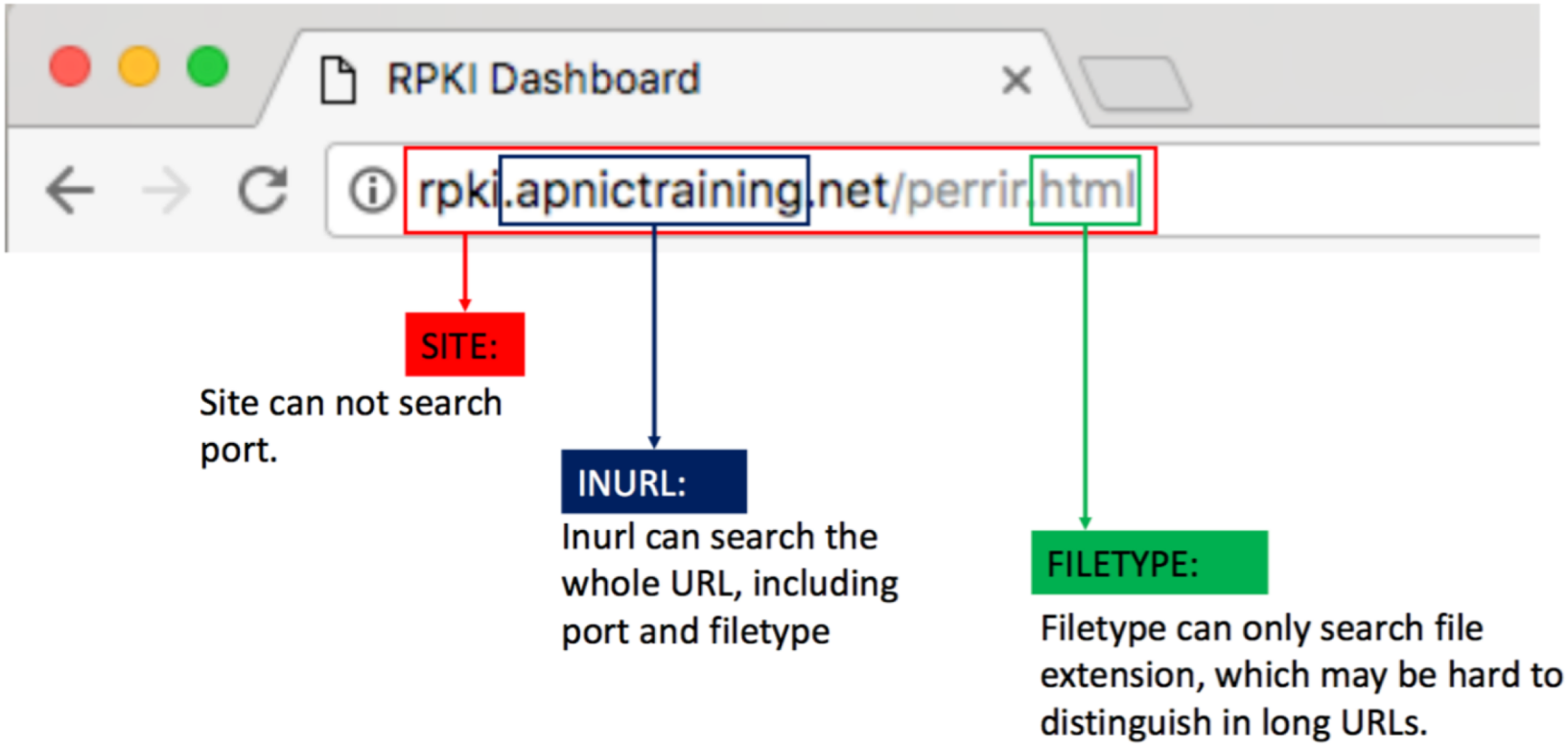
  operator:search_term
- There’s no space between the operator ,the colon, and the search term

Advanced Operators at a Glance

Operators	Purpose
site:	Search specific site
related:	Search similar pages
info:	Domain information
intext:	Search in text part
allintext:	Search in text part
inanchor:	Search anchor text
allinanchor:	Search anchor text
intitle:	Search title
allintitle:	Search title

Operators	Purpose
inurl:	Search URL
allinurl:	Search URL
filetype:	Filetype filter
define:	Definition search
OR	“or” operator

Advanced Google Searching



- Some operators search overlapping areas. Consider site: and fileype:

Exercise

- Find web servers of your organization
- Can you find any admin login page in your organization site?
- Can you find any .doc or .pdf files contains the word “Confidential”?

nmap

- nmap https://nmap.org/
- nmap is a free and open source network exploration and security auditing tool
- nmap was created by Gordon Lyon, a.k.a. Fyodor Vaskovich, and first published in 1997
- Working cross-platform although best working on Linux-type environments
- It uses raw IP packet to determine
  - What hosts are available on the network
  - What services (application name and version)
  - Guesses the operating system, uptime and other characteristics

Ethical Issues

- Can be used for hacking to discover vulnerable servers
- System admins can use it to check that their systems meet security requirements
- Unauthorized use of nmap on a foreign system could be illegal
- Make sure if you have permission to nmap before using this tool
- Do not abuse nmap, do not excuse

How it works

- DNS lookup and list target IP addresses
- Try to call connect() system call to check if target ports open
- Try to send TCP SYN and wait for SYN/ACK
- Try to send a UDP packet and wait for ICMP DST UNREACH
- Many artistic mechanisms to scan hosts are implemented
  - See more info at https://nmap.org/nmap_doc.html

Scanning Techniques

- Host discovery with in a specific subnet
- Port scanning specifying protocol types, port ranges
- OS detection
- Service version detection
- Scripting engine support for advanced scanning
- Scan timing and performance control
- Firewall, IDS evasion, and spoofing
- Report the result

Scan Options

```
Nmap 7.70 ( https://nmap.org )
Usage: nmap [Scan Type(s)] [Options] {target specification}
TARGET SPECIFICATION:
  Can pass hostnames, IP addresses, networks, etc.
  Ex: scanme.nmap.org, microsoft.com/24, 192.168.0.1; 10.0.0-255.1-254
  -iL <inputfilename>: Input from list of hosts/networks
  -iR <num hosts>: Choose random targets
  --exclude <host1[,host2][,host3],...>: Exclude hosts/networks
  --excludefile <exclude_file>: Exclude list from file
PORT SPECIFICATION AND SCAN ORDER:
  -p <port ranges>: Only scan specified ports
    Ex: -p22; -p1-65535; -p U:53,111,137,T:21-25,80,139,8080,S:9
  --exclude-ports <port ranges>: Exclude the specified ports from scanning
  -F: Fast mode - Scan fewer ports than the default scan
  -r: Scan ports consecutively - don't randomize
  --top-ports <number>: Scan <number> most common ports
  --port-ratio <ratio>: Scan ports more common than <ratio>
```

Scan Options

- Target Specification
  - CIDER
    - 10.0.0.0/24 => 10.0.0.0 to 10.0.0.255, 256 hosts
    - somehost.somedomain.org/24 => resoves somehosts.somedomain.org to IP address and scan 256 hosts of that range
  - Octed range addressing
    - 192.168.0-255.1-254

      => 192.168.0.1 to 192.168.0.254

      192.168.1.1 to 192.168.1.254

      ….

      192.168.255.1 to 192.168.255.254
    - 192.168.3-5,7.1

      => 192.168.3.1, 192.168.4.1, 192.168.5.1, and 192.168.7.1

Scan Options

- Port specification
  - Port range
    - -p 22 => scans port 22 only
    - -p 1-1024 => scans 1 to 1024, 1024 ports
    - -p 23,80,443 => scans 22, 80, and 443 ports
    - -p U:53,111,137,T:21-23,80,443
      => scans UDP 53, 111, 137, TCP 21, 22, 23, 80, and 443

Scan Options

```
HOST DISCOVERY:
  -sL: List Scan - simply list targets to scan
  -sn: Ping Scan - disable port scan
  -Pn: Treat all hosts as online -- skip host discovery
  -PS/PA/PU/PY[portlist]: TCP SYN/ACK, UDP or SCTP discovery to given ports
  -PE/PP/PM: ICMP echo, timestamp, and netmask request discovery probes
  -PO[protocol list]: IP Protocol Ping
  -n/-R: Never do DNS resolution/Always resolve [default: sometimes]
  --dns-servers <serv1[,serv2],...>: Specify custom DNS servers
  --system-dns: Use OS's DNS resolver
  --traceroute: Trace hop path to each host
```

Scan Options

- Host discovery
  - -sn => list active hosts, without doing any port scanning
  - -Pn => skip host discovery, treat all the target hosts are active

Scan Options

```
SCAN TECHNIQUES:
  -sS/sT/sA/sW/sM: TCP SYN/Connect()/ACK/Window/Maimon scans
  -sU: UDP Scan
  -sN/sF/sX: TCP Null, FIN, and Xmas scans
  --scanflags <flags>: Customize TCP scan flags
  -sI <zombie host[:probeport]>: Idle scan
  -sY/sZ: SCTP INIT/COOKIE-ECHO scans
  -sO: IP protocol scan
  -b <FTP relay host>: FTP bounce scan
```

Scan Options

- UDP is not scanned by default
  - Use –sU option to perform UDP port scan
  - UDP port scan takes much time than TCP scan
- Port scan report
  - open — Port is open, application is actively running
  - close — Port is accessible but no application responds
  - filtered — Didn’t get any response
  - open/filtered — Cannot determine if the port is open or filtered

Scan Options

```
SERVICE/VERSION DETECTION:
  -sV: Probe open ports to determine service/version info
  --version-intensity <level>: Set from 0 (light) to 9 (try all probes)
  --version-light: Limit to most likely probes (intensity 2)
  --version-all: Try every single probe (intensity 9)
  --version-trace: Show detailed version scan activity (for debugging)

OS DETECTION:
  -O: Enable OS detection
  --osscan-limit: Limit OS detection to promising targets
  --osscan-guess: Guess OS more aggressively
```

Scan Options

```
MISC:
  -6: Enable IPv6 scanning
  -A: Enable OS detection, version detection, script scanning, and
traceroute
  -T<0-5>: Set timing template (higher is faster)
```

Hands on