What is a Bro log?

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- A stream of high level entries that correspond to lower level events.
  - An HTTP request/reply pair.
  - An email sent using SMTP.
  - A login over SSH.

Not log, but **logs**

- Bro does not have a single “alert” type log. Instead, each stream has a dedicated type with it own set of fields.
- More than one file?
  - The SMTP log has ‘from’ and ‘subject’ fields.
  - The HTTP log has ‘method’ and ‘uri’ fields.
  - The ‘from’ field would not make sense for HTTP and the ‘method’ field would not make sense for SMTP.

How many log files are there?

- By default, Bro will output about two dozen log files, depending on what types of traffic it can see.
  - A few: conn, dhcp, dns, dpd, files, http, intel, known_certs, known_hosts, known_services, modbus, notice, radius, smtp, snmp, socks, software, ssh, ssl, syslog, traceroute, weird, x509, and quite a few others.
- More in every release!

Signal to Noise ratio

- The main way that log files can be categorized is by their size and signal to noise ratio. Some logs files are large and will contain entries that can be either benign or malicious. Other files are smaller and contain more actionable information.
  - **24K** known services.log
  - **28K** software.log
  - **68K** notice.log
  - **311M** dns.log
  - **856M** conn.log

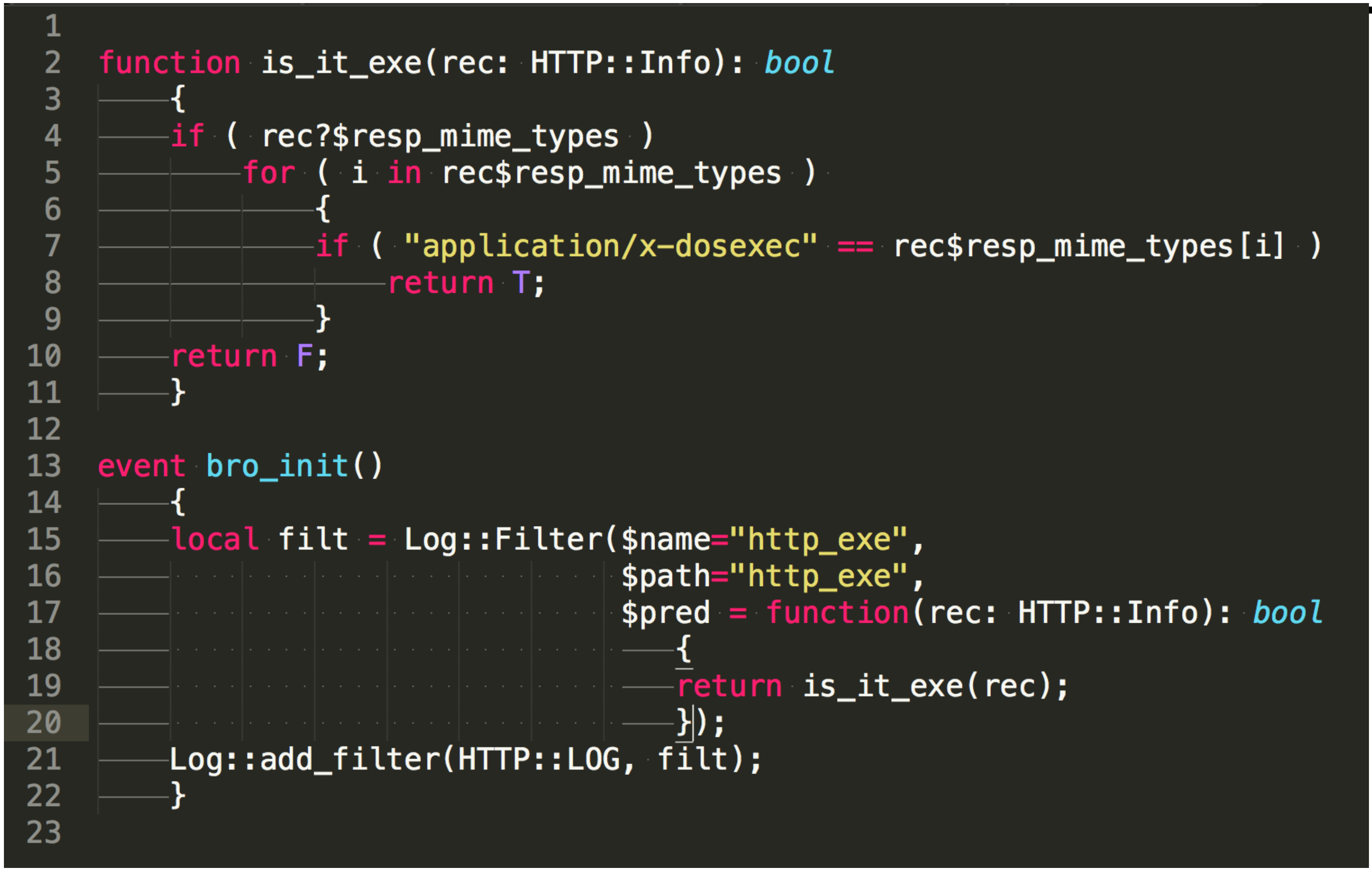
High signal log files

- Inventory related log files
  - known_hosts
  - known_services
  - known_certs
  - software
- Other high signal log files
  - notice: When Bro detects something that it thinks is exceptional it raises a notice.
  - intel: Traffic that matches a list of known bad indicators is logged here.

Increasing signal to noise!

- Bro makes it easy to take a large log file and filter a subset of the entries to a smaller file with a higher signal to noise ratio.
  – Filtering the http.log to http_exe.log
  – Filtering the http.log to http_wget.log
  – Filtering the http.log to http_java.log
  – Filtering the conn.log to conn_cn.log
  – Filtering the ssh.log to ssh_non_us.log

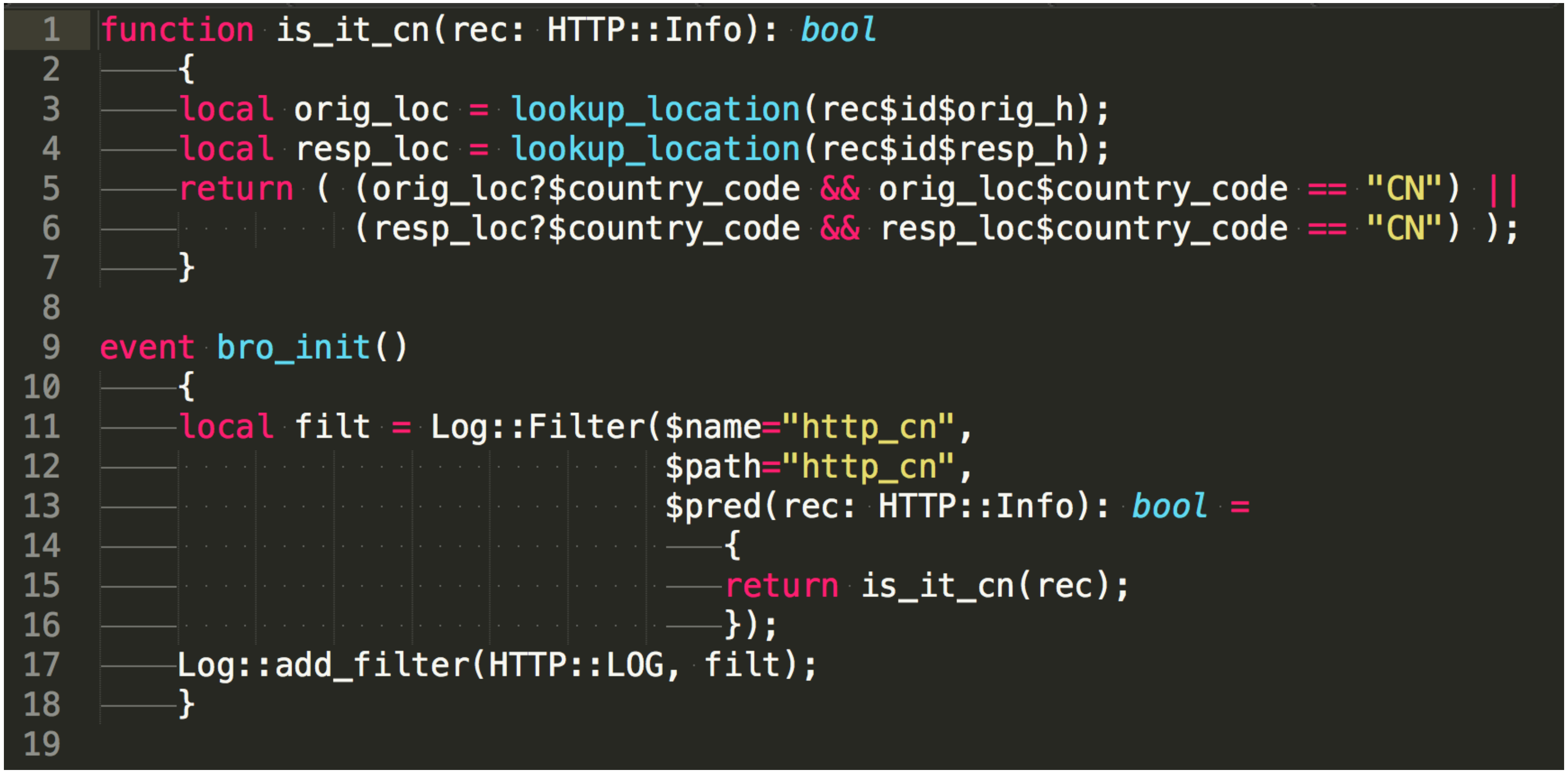
http_exe



```
function is_it_exe(rec: HTTP::Info): bool
    {
    if ( rec?$resp_mime_types )
        for ( i in rec$resp_mime_types )
            {
            if ( "application/x-dosexec" == rec$resp_mime_types[i] )
                return T;
            }
    return F;
    }

event bro_init()
    {
    local filt = Log::Filter($name="http_exe",
                             $path="http_exe",
                             $pred = function(rec: HTTP::Info): bool
                                 {
                                 return is_it_exe(rec);
                                 });
    Log::add_filter(HTTP::LOG, filt);
    }
```

http_cn



```
function is_it_cn(rec: HTTP::Info): bool
	{
	local orig_loc = lookup_location(rec$id$orig_h);
	local resp_loc = lookup_location(rec$id$resp_h);
	return ( (orig_loc?$country_code && orig_loc$country_code == "CN") ||
	         (resp_loc?$country_code && resp_loc$country_code == "CN") );
	}

event bro_init()
	{
	local filt = Log::Filter($name="http_cn",
	                         $path="http_cn",
	                         $pred(rec: HTTP::Info): bool =
	                         	{
	                         	return is_it_cn(rec);
	                         	});
	Log::add_filter(HTTP::LOG, filt);
	}
```

What does the stream of events look like?

- A key-value mapping. Like a CSV file or a relational database table.
  - We can create some log files by starting Bro and running the following command line:
    - curl www.google.com
  - This will request the google home page, but not any of the associated javascript or image files.
  - Bro will write an entry in the http.log describing this event. The http.log contains 27 columns which can be a bit daunting. We can transpose the columns into rows to make this single line from http.log easier to understand.

Field	Type	Value
ts	time	1408828734.304076
uid	string	CZceY8wvnES5foJp4
id.orig_h	addr	192.168.43.222
id.orig_p	port	65032
id.resp_h	addr	74.125.226.50
id.resp_p	port	80
trans_depth	count	1
method	string	GET
host	string	www.google.com
uri	string	/
referrer	string	-

Field	Type	Value
user_agent	string	curl/7.30.0
request_body_len	count	0
response_body_len	count	21232
status_code	count	200
status_msg	string	OK
info_code	count	-
info_msg	string	-
filename	string	-
tags	set[enum]	(empty)

Field	Type	Value
username	string	-
password	string	-
proxied	set[string]	-
orig_fuids	vector[string]	-
orig_mime_types	vector[string]	-
resp_fuids	vector[string]	FvwPGj436gbcfXpCGf
resp_mime_types	vector[string]	text/html

Not just HTTP!

- This one HTTP download caused Bro to write entries to 6 log files:
  - **http.log** has the above entry
  - **dns.log** has an entry from the dns query for www.google.com
  - **files.log** has an entry from the html file that was downloaded
  - **conn.log** has an entry for both the dns an http connections
  - **known_hosts.log** has an entry for 192.168.43.222
  - **software.log** has an entry for an HTTP::BROWSER of curl/7.30.0 seen on 192.168.43.222

known_hosts

Field	Type	Value
ts	time	1408828734.303825
host	addr	192.168.43.222

This means 192.168.43.222 was seen for the first time at 1408828734.3038

software

Field	Type	Value
ts	time	1408828734.304076
host	addr	192.168.43.222
software_type	enum	HTTP::BROWSER
name	string	curl
version.major	count	7
version.minor	count	30
version.minor2	count	0
unparsed_version	string	curl/7.30.0

This means curl/7.30.0 was seen for the first time on 192.168.43.222 at 1408828734.304076