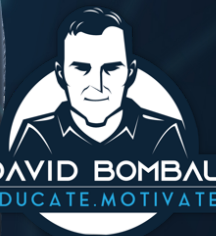




JSON

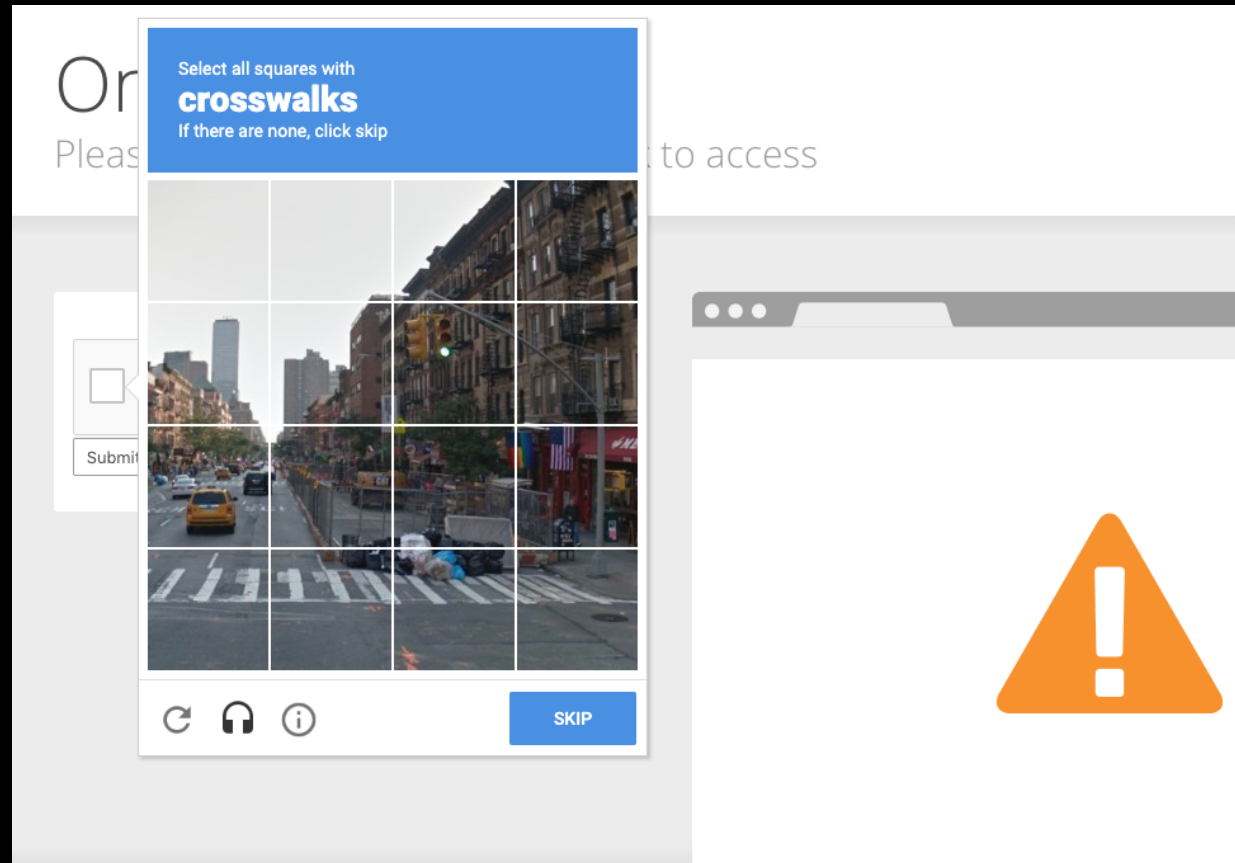
JavaScript Object Notation

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Human?

- Are you a human or a robot?
- Machines struggle with unformatted data



Why do I have to complete a CAPTCHA?

Completing the CAPTCHA proves you are a human and gives you temporary access to the web property.

What can I do to prevent this in the future?

If you are on a personal connection, like at home, you can run an anti-virus scan on your device to make sure it is not infected with malware.





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- **Manufacturer: Telsa**
- **Model: X**
- **Color: White**
- **Fuel: Electric**
- **MPG city: 99**
- **MPG highway: 93**

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JSON Data

- JSON data is written as name/value pairs:
 - A name / value pair consists of a field name (in double quotes), followed by a colon, followed by a value:
 - "firstname" : "David"
 - Or, "lastname" : "Bombal"



JSON Data types: Object

- Object
 - Unordered collection of key:value pairs
 - Data surrounded by curly braces { }
 - Key and value are separated by a colon
 - Each key/value pair is separated by a comma (not the last!). Trailing commas must not be used.
 - Use double quotes, not single quotes.
 - Boolean values must be lowercase (different to Python)
 - Example:
 - `{"firstName": "David", "lastName": "Bombal"}`



JSON Data types: Object

- Object
 - Another example:

```
{  
    "firstName" : "David",  
    "lastName"  : "Bombal",  
    "website"   : "davidbombal.com"  
}
```



JSON Data types

- Array
 - Ordered list of values
 - Uses square brackets []
 - Can store multiple types:
 - JSON array can store valid JSON data types such as string, number, Boolean, object, null or another array
 - Values must be separated by comma.



Practical

- Use the DevNet Nexus always on sandbox
 - DNS name: sbx-nxos-mgmt.cisco.com
 - Protocol: SSH
 - Port: 8181
 - Username: admin
 - Password: Admin_1234!
- Example:
 - Mac: `ssh -p 8181 admin@sbx-nxos-mgmt.cisco.com`
 - Windows: Use Putty to connect



JSON Data types

- Object
 - Unordered collection of key:value pairs
 - Data surrounded by curly braces { }
- show version | json-pretty

```
{  
  "chassis_id": "Nexus9000 9000v Chassis",  
  "cpu_name": "Intel(R) Xeon(R) CPU E5-4669 v4 @ 2.20GHz",  
  "manufacturer": "Cisco Systems, Inc."  
}
```



JSON Data types

- Object
 - Unordered collection of key:value pairs
 - Data surrounded by curly braces { }

```
sbx-n9kv-ao# show int vlan 100 | json-pretty
{
  "TABLE_interface": {
    "ROW_interface": {
      "interface": "Vlan100",
      "svi_admin_state": "up",
      "svi_line_proto": "up",
      "svi_mac": "0050.56bb.ab06",
      "svi_ip_addr": "172.16.100.1",
      "svi_ip_mask": "24",
      "svi_mtu": "1500",
      "svi_bw": "1000000",
      "svi_delay": "10",
      "svi_tx_load": "1",
      "svi_rx_load": "1",
      "svi_arp_type": "ARPA",
      "svi_time_last_cleared": "never",
      "svi_ucast_pkts_in": "0",
      "svi_ucast_bytes_in": "0"
    }
  }
}
sbx-n9kv-ao#
```



```
sbx-n9kv-ao# show int eth1/5 | json-pretty
{
  "TABLE_interface": {
    "ROW_interface": {
      "interface": "Ethernet1/5",
      "state": "up",
      "admin_state": "up",
      "share_state": "Dedicated",
      "eth_hw_desc": "100/1000/10000 Ethernet",
      "eth_hw_addr": "0050.56bb.ab06",
      "eth_bia_addr": "0050.56bb.ab0b",
      "desc": "L3 Link",
      "eth_ip_addr": "172.16.1.1",
      "eth_ip_mask": "30",
      "eth_ip_prefix": "172.16.1.0",
      "eth_mtu": "1500",
      "eth_bw": "1000000",
      "eth_dly": "10",
      "eth_reliability": "255",
      "eth_txload": "1",
      "eth_rxload": "1",
      "encapsulation": "ARPA",
      "medium": "broadcast",
      "eth_duplex": "full",
      "eth_speed": "1000 Mb/s",
      "eth_beacon": "off",
      "eth_autoneg": "on",
      "eth_in_flowctrl": "off",
      "eth_out_flowctrl": "off",
      "eth_mdix": "off",
      "eth_swt_monitor": "off",
      "eth_ethertype": "0x8100",

```

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```

      "eth_storm_supp": "0",
      "eth_runts": "0",
      "eth_giants": "0",
      "eth_crc": "0",
      "eth_nobuf": "0",
      "eth_inerr": "0",
      "eth_frame": "0",
      "eth_overrun": "0",
      "eth_underrun": "0",
      "eth_ignored": "0",
      "eth_watchdog": "0",
      "eth_bad_eth": "0",
      "eth_bad_proto": "0",
      "eth_in_ifdown_drops": "0",
      "eth_dribble": "0",
      "eth_indiscard": "0",
      "eth_inpause": "0",
      "eth_outucast": "0",
      "eth_outmcast": "0",
      "eth_outbcast": "0",
      "eth_outpkts": "0",
      "eth_outbytes": "0",
      "eth_jumbo_outpkts": "0",
      "eth_outerr": "0",
      "eth_coll": "0",
      "eth_deferred": "0",
      "eth_latecoll": "0",
      "eth_lostcarrier": "0",
      "eth_nocarrier": "0",
      "eth_babbles": "0",
      "eth_outdiscard": "0",
      "eth_outpause": "0"
    }
  }
}
sbx-n9kv-ao#
```



JSON Data types

- Array
 - Ordered list of values
 - Uses square brackets []

```
{
  "Interfaces": [
    {
      "intf-name": "Vlan100",
      "admin-state": "up",
      "prefix": "10.1.100.1",
    },
    {
      "intf-name": "Vlan200",
      "admin-state": "up",
      "prefix": "10.1.200.1",
    }
  ]
}
```

Python Script 1

- Run Python On-Box :

```
from cli import *  
cmd1 = 'show ip int brief | json-pretty'  
output1 = cli(cmd1)  
print(output1)
```



Python Script 2

- Run Python On-Box :
 - Extract
 - TABLE_intf dictionary
 - ROW_intf dictionary
 - Select element in the index
 - Select the key



Python Script 2

- Run Python On-Box :

```
from cli import *  
import json  
cmd1 = 'show ip int brief | json-pretty'  
json_data = cli(cmd1)  
json_final = json.loads(json_data)  
print(json_final['TABLE_intf']['ROW_intf'][0]['prefix'])
```



Python Script 3 Step 1

- Run Python remotely using Ubuntu:
 - Step 1: Install Python and Netmiko

```
sudo apt install python3-pip
```

```
sudo pip3 install -U netmiko
```



Python Script 3 Step 2

- Run Python remotely using Ubuntu VM: Print out interfaces to test our script:

```
#!/usr/bin/env python
from netmiko import ConnectHandler

nx_os = {
    'device_type': 'cisco_ios',
    'ip': 'sbx-nxos-mgmt.cisco.com',
    'username': 'admin',
    'password': 'Admin_1234!',
    'port': 8181
}

net_connect = ConnectHandler(**nx_os)
output = net_connect.send_command('show ip int brief')
print(output)
```



Python Script 4

- Print JSON output:

```
#!/usr/bin/env python
```

```
from netmiko import ConnectHandler
```

```
nx_os = {  
    'device_type': 'cisco_ios',  
    'ip': 'sbx-nxos-mgmt.cisco.com',  
    'username': 'admin',  
    'password': 'Admin_1234!',  
    'port': 8181  
}
```

```
net_connect = ConnectHandler(**nx_os)
```

```
output = net_connect.send_command('show ip int brief | json-pretty')
```

```
print(output)
```



Python Script 5

- Find some data:

```
#!/usr/bin/env python
from netmiko import ConnectHandler
import json
nx_os = {
    'device_type': 'cisco_ios',
    'ip': 'sbx-nxos-mgmt.cisco.com',
    'username': 'admin',
    'password': 'Admin_1234!',
    'port': 8181
}
net_connect = ConnectHandler(**nx_os)
output = net_connect.send_command('show ip int brief | json-pretty')
json_data = json.loads(output)
print(json_data['TABLE_intf']['ROW_intf'][0]['intf-name'])
print(json_data['TABLE_intf']['ROW_intf'][0]['prefix'])
```



Python Script 6 Part 1

- Use a loop to find IP addresses :

```
#!/usr/bin/env python
from netmiko import ConnectHandler
import json

nx_os = {
    'device_type': 'cisco_ios',
    'ip': 'sbx-nxos-mgmt.cisco.com',
    'username': 'admin',
    'password': 'Admin_1234!',
    'port': 8181
}
```



Python Script 6 Part 2

- Use a loop to find IP addresses :

```
net_connect = ConnectHandler(**nx_os)
output = net_connect.send_command('show ip int brief | json-pretty')
json_data = json.loads(output)
int_number = len(json_data['TABLE_intf']['ROW_intf'])

for x in range(int_number):
    print(json_data['TABLE_intf']['ROW_intf'][x]['intf-name'])
    print(json_data['TABLE_intf']['ROW_intf'][x]['prefix'])
```



JSON

JavaScript Object Notation

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