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Finding Information Leaks in JavaScript

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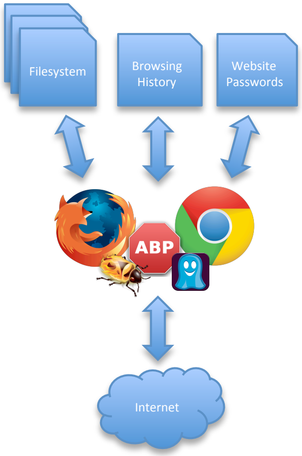
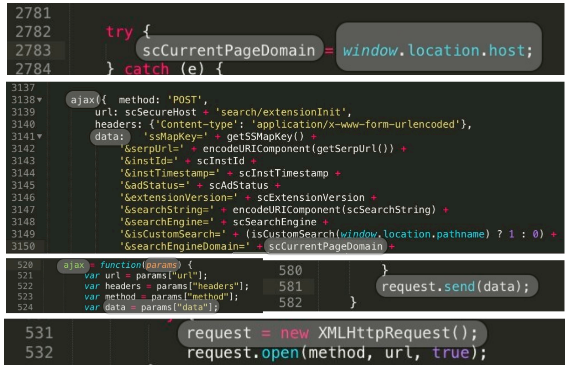
Can browser add-ons leak your personal information?



Yes, some do!



```
    try {
        scCurrentPageDomain = window.location.host;
    } catch (e) {
```

```
    ajax({  method: 'POST',
        url: scSecureHost + 'search/extensionInit',
        headers: {'Content-type': 'application/x-www-form-urlencoded'},
        data:   'ssMapKey=' + getSSMapKey() +
            '&serpUrl=' + encodeURIComponent(getSerpUrl()) +
            '&instId=' + scInstId +
            '&instTimestamp=' + scInstTimestamp +
            '&adStatus=' + scAdStatus +
            '&extensionVersion=' + scExtensionVersion +
            '&searchString=' + encodeURIComponent(scSearchString) +
            '&searchEngine=' + scSearchEngine +
            '&isCustomSearch=' + (isCustomSearch(window.location.pathname) ? 1 : 0) +
            '&searchEngineDomain=' + scCurrentPageDomain +
```

```
    ajax = function(params) {
        var url = params["url"];
        var headers = params["headers"];
        var method = params["method"];
        var data = params["data"];
```

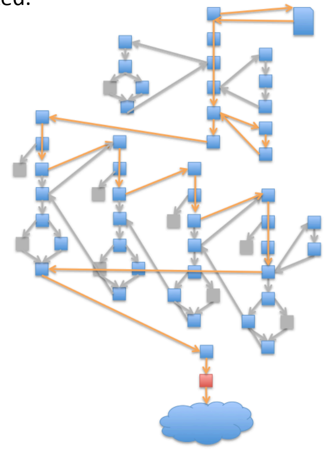
```
            }
            request.send(data);
        }
```

```
            request = new XMLHttpRequest();
            request.open(method, url, true);
```

How can we detect information leaks?

Currently, Mozilla volunteers manually inspect the source of popular addons for leaks. Our tool helps automate this process.

We create a graph of information flow between program statements. By tracing backwards from a call that sends data to the internet, we can determine whether sensitive information may be leaked.

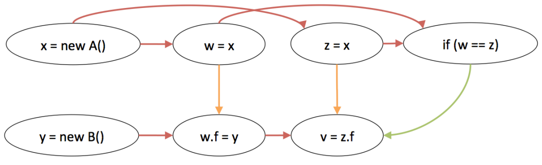


The analysis requires us to approximate the program's behavior. We use abstract interpretation to determine when two pointers could reference the same memory location.

	Read	Write
x = new A()		x
z = x	x	z
y = new B()		y
w = x	x	w
w.f = y	w, y	o.f
if (w == z) {	w, z	
v = z.f	z, o.f	v
}		

Can the tool be improved?

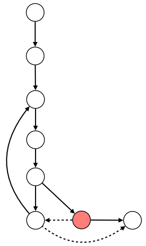
Our analysis often reports potential leaks where none exist. We can help users identify false positives by classifying different types of data dependence.



Exceptions and goto statements alter the order of statement execution. It's tricky to determine how they affect data flow. Our current method could be improved.

```
i = 10
sum = 0

while (true) {
    sum += i
    if (i == 0)
        break
    i--
}
print(sum)
```



Acknowledgements & Citations

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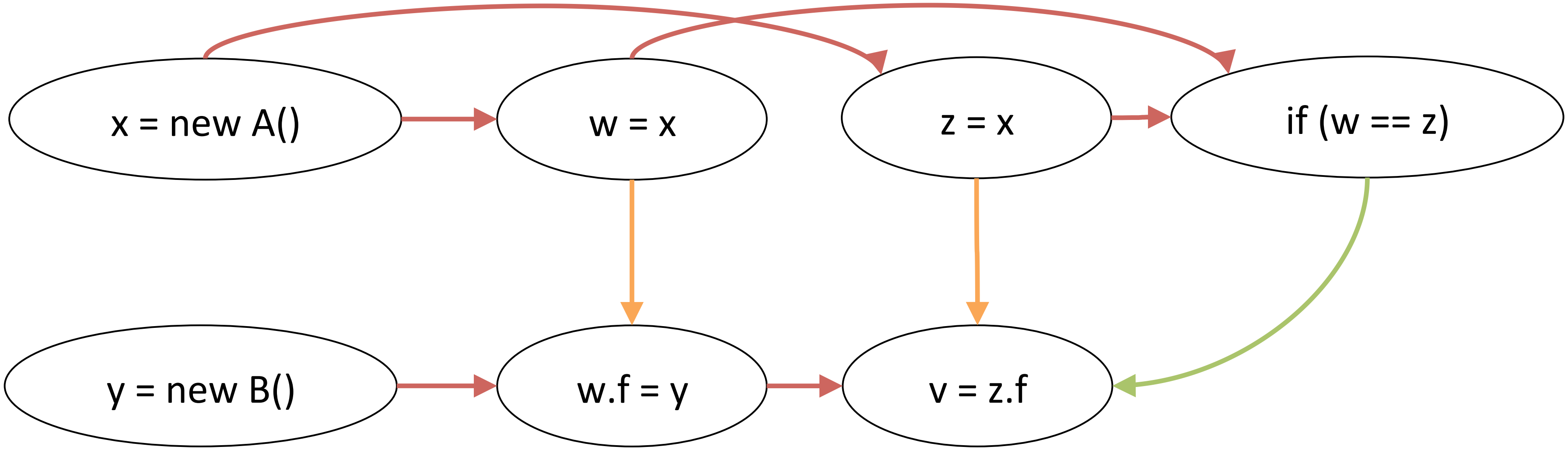

x = new A()
w = x
z = x
if (w == z)
y = new B()
w.f = y
v = z.f