



Protecting  
the Web

# JavaScript Obfuscation – the good, the bad and the ugly



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November 2014

# Me



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CTO @ JSCRAMBLER

R&D, WEB DEVELOPMENT, SECURITY  
15 YEARS OF WEB DEV  
SECURITY RESEARCH  
FORMER CS TEACHER



# What is obfuscation ?

# Code obfuscation

## Obfuscation

*“transform a program into a form that is **more difficult** for an adversary to understand or change than the original code” [1]*

## more difficult

*“requires more human time, more money, or more computing power to analyze than the original program.”*

[1] in Collberg, C., and Nagra, J., “Surreptitious software: obfuscation, watermarking, and tamperproofing for software protection.”, Addison-Wesley Professional, 2010.





## Unprotected code

```
(function() {
    function add1(element, index, array) {
        array[index]=element+1;
    }
    function apply(functions, integers) {
        if(!Array.isArray(functions)) {
            integers.forEach(functions);
        } else {
            for(var i=0; i<functions.length; i+
++)
                integers.forEach(functions[i]);
        } return integers;
    } return apply([add1,add1], [1,2,-4,9]);
})();
```



## Protected code

```
/*...*/ ff)<<W);s=this[a](s,B);s=((s&0x1ff` = A)|  
(s>>>Q` <)f);P^=s;P=((P&0x7` H\"y)|(P>>>h);P=(P*z+  
((129.,0x187)<(91,0x1E0)?(0x72,0xe6546b64):  
(120.7E1,0x35)))|R8H.j3H;s=` ##switch (t%x){case  
x:s=(J[I](H+v)&0xff)<<c;` 8 v:s|^` 5$R8H.t3H` ;$e`  
>!` 0\"` ?&` ;\";s=this[a](s,B);s=((s&0x1ff` [ A)|  
(s>>>Q` <)f);P^=s;}P^=t;P^=P>>>c;P` :$P,  
0x85ebca6b` G P>>>y` 2*c2b2ae35` 8$c;return  
P;});var r=K.T(\"3af\")?\\"\\":{\\'F\':  
{(49.80E1>(0xAF,13.)?(22.40E1,0):  
65.>(137.8E1,0x209)?(74,0x84):(0x1AF,46`  
K ))},E=L>o,G;for ( ;n0N<l0N.length;n0N++) /*...*/
```

# Why it makes sense to protect JS ?

# Open Source



# Enforce security on the server

- You may not have one
  - Widgets
  - Mobile Apps
  - Standalone, offline-playable games
  - Windows 8 Apps made with WinJS



# Enforce security on the server

- You may not have one
  - Widgets
  - Mobile Apps
  - Standalone, offline-playable games
  - Windows 8 Apps made with WinJS
- You may not want to
  - May not be cost effective
  - Additional latency

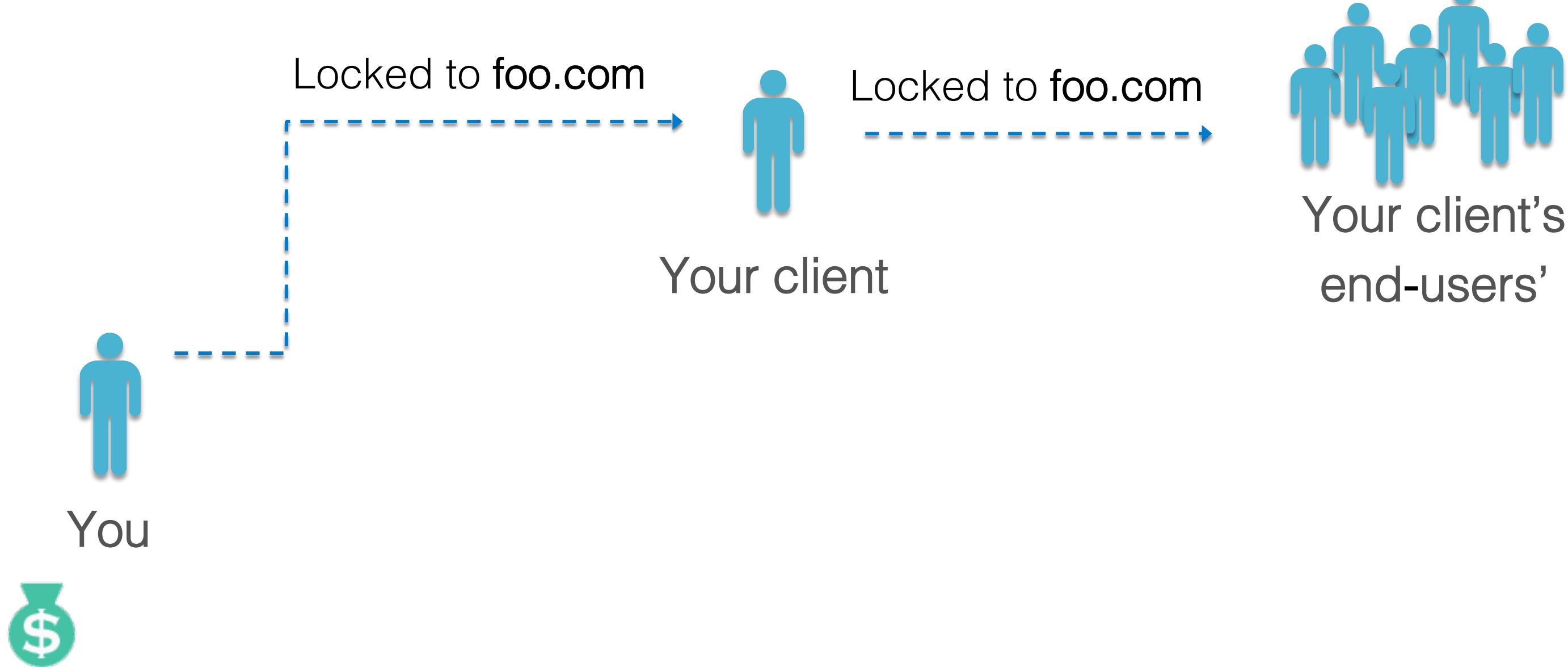


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If you develop and sell JavaScript applications, for which you charge on a domain basis.

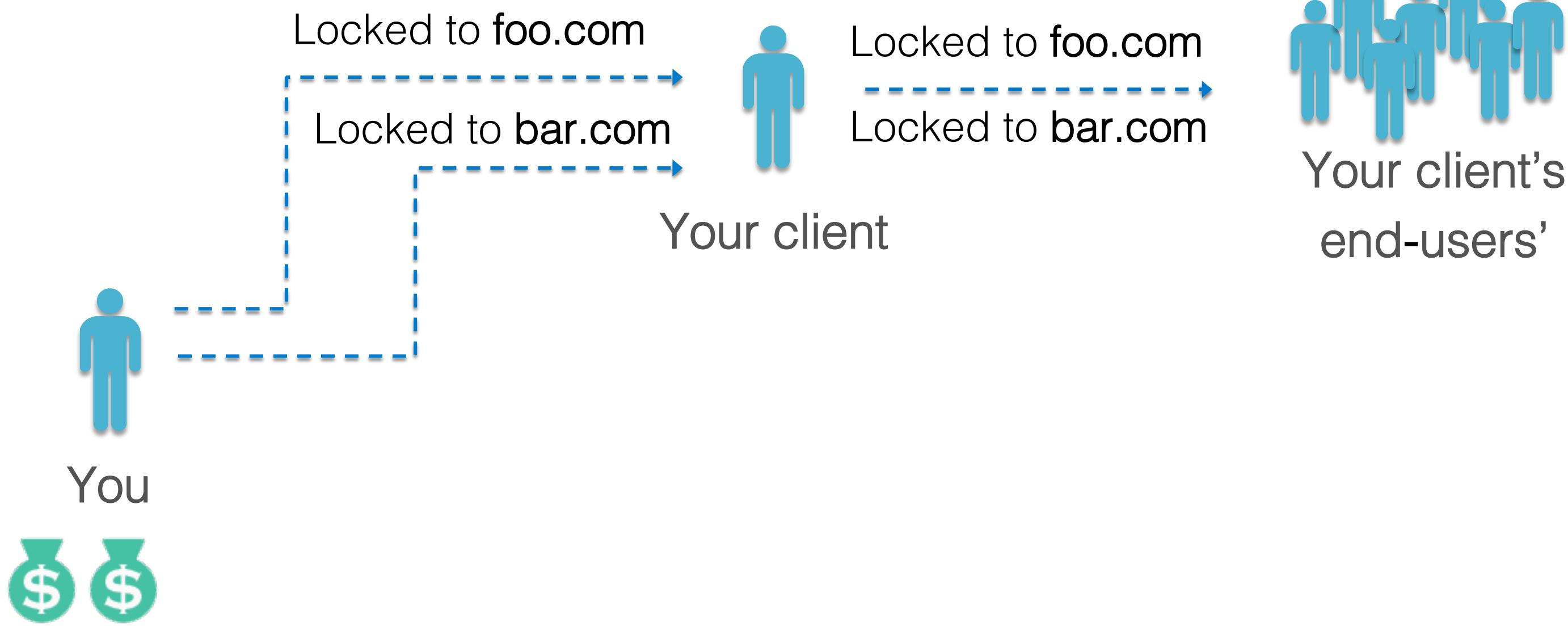


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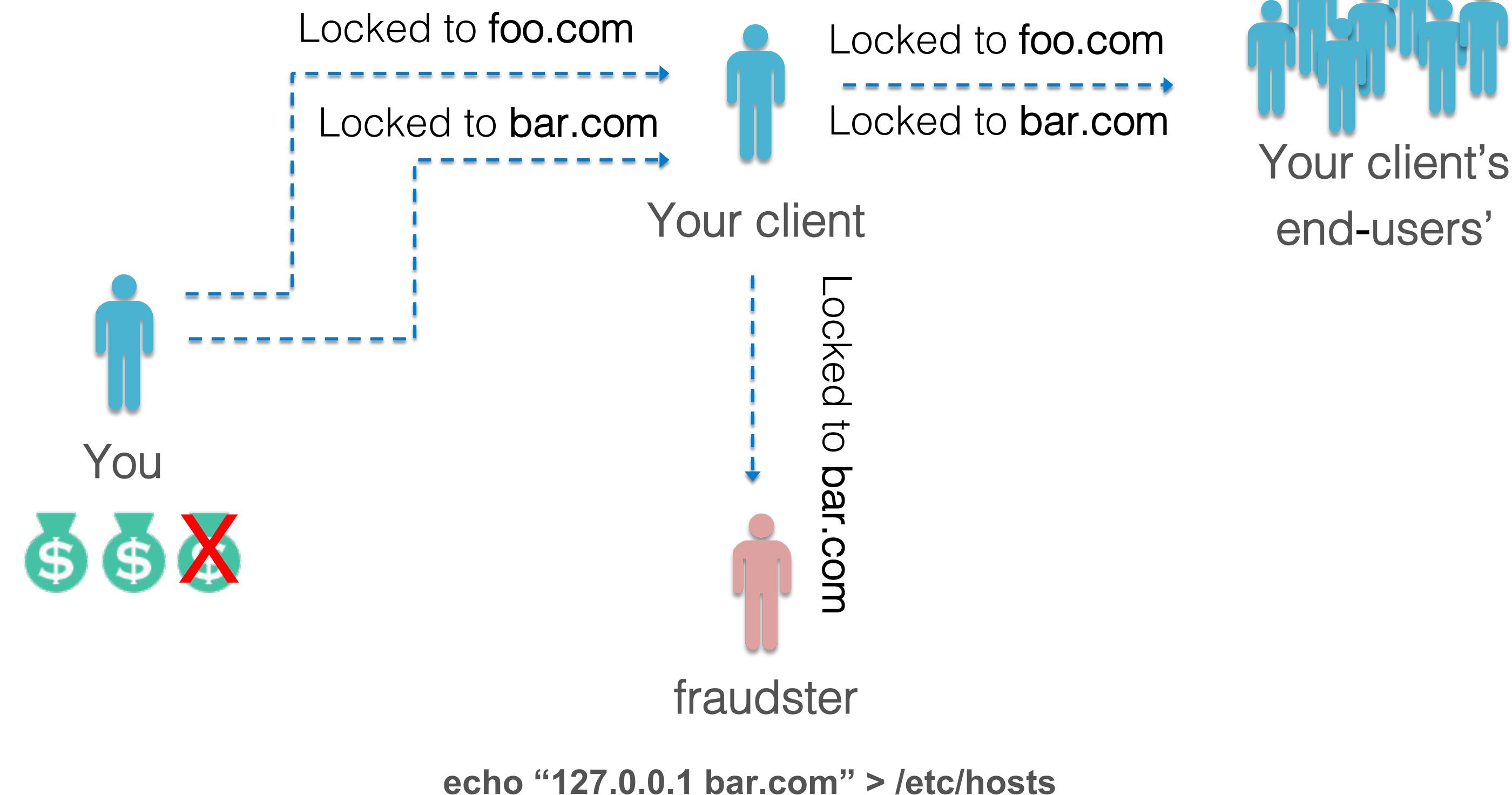


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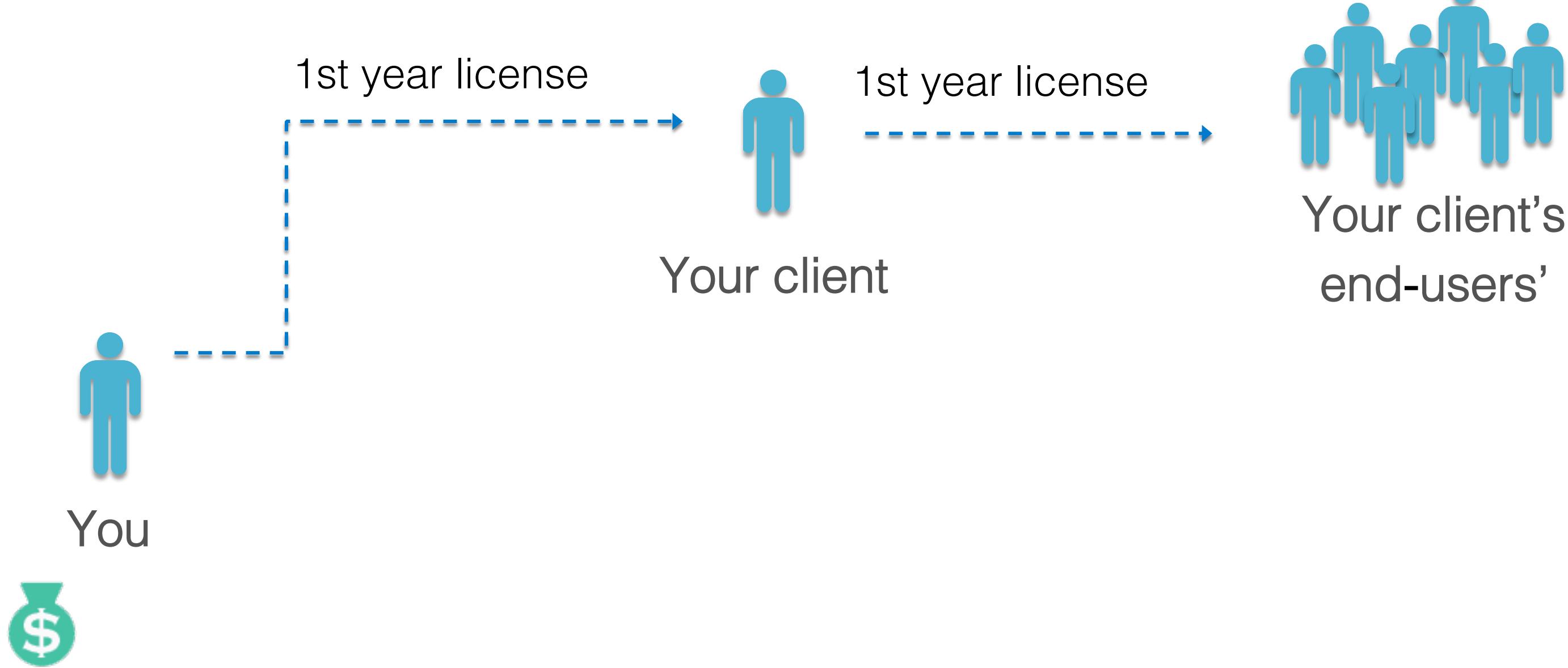


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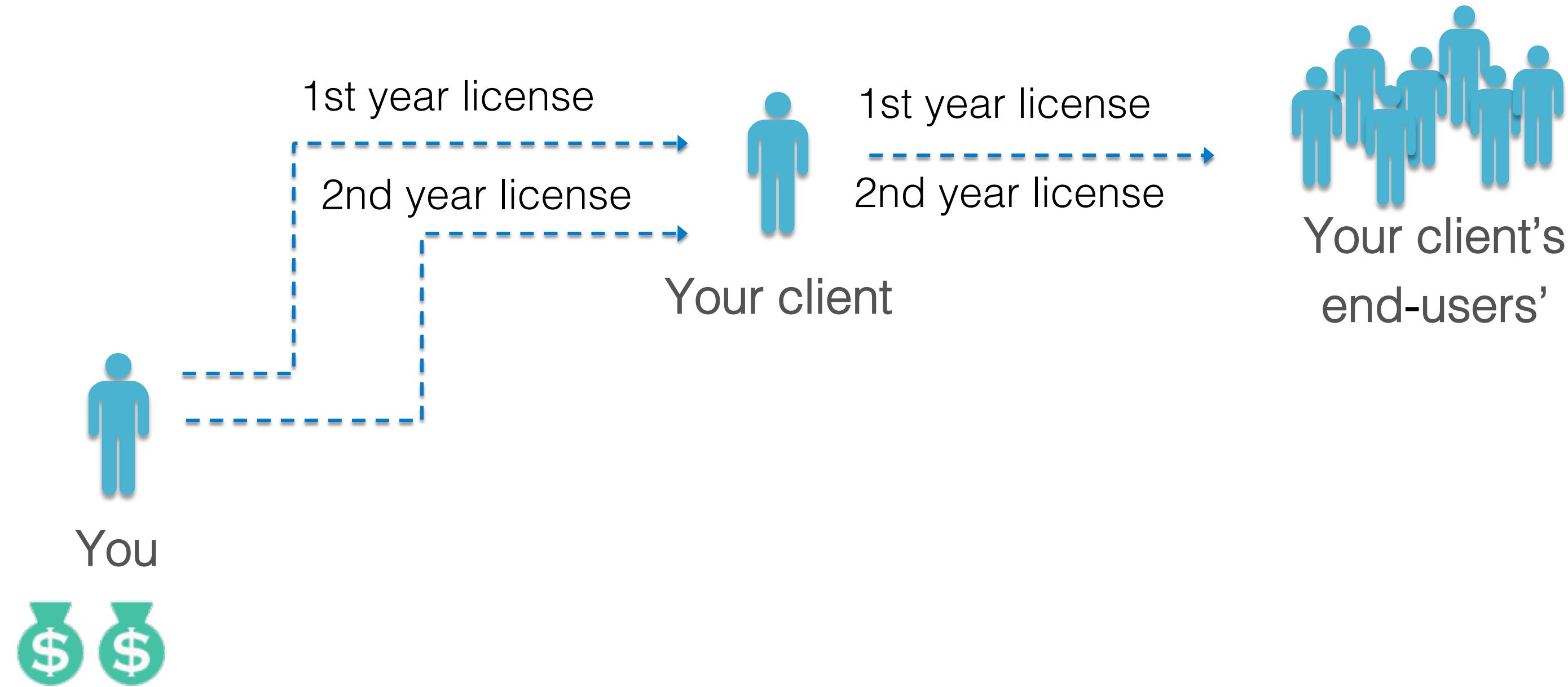


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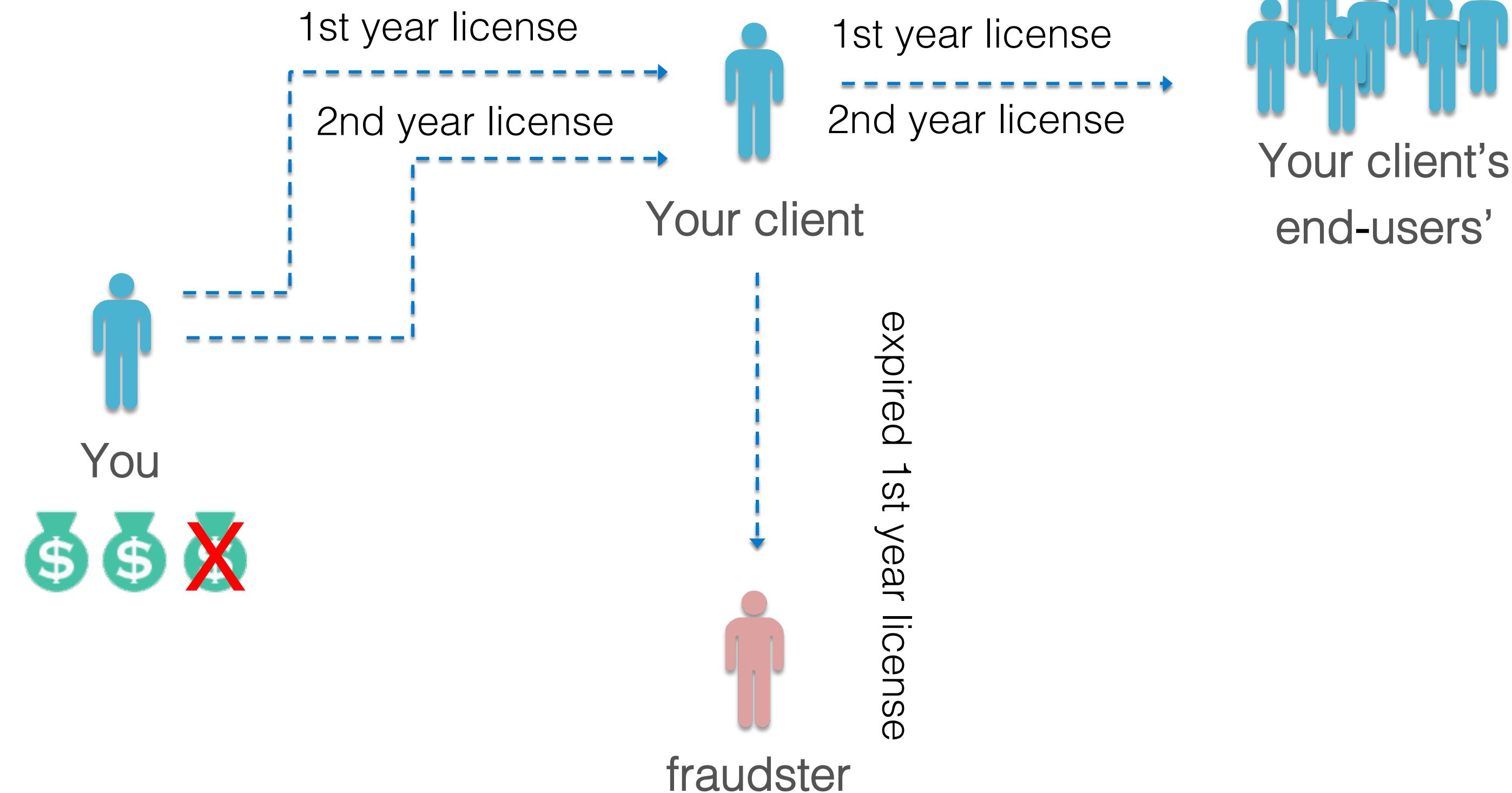


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**date -s “11/20/2003 12:48:00”**

# Drive away copycats



**PROTECT YOUR  
INTELLECTUAL  
PROPERTY**

You've developed a new product using JS-based technologies. Advanced JavaScript obfuscation delays program understanding and frustrates competitors that try to steal your code.



You

# Drive away copycats



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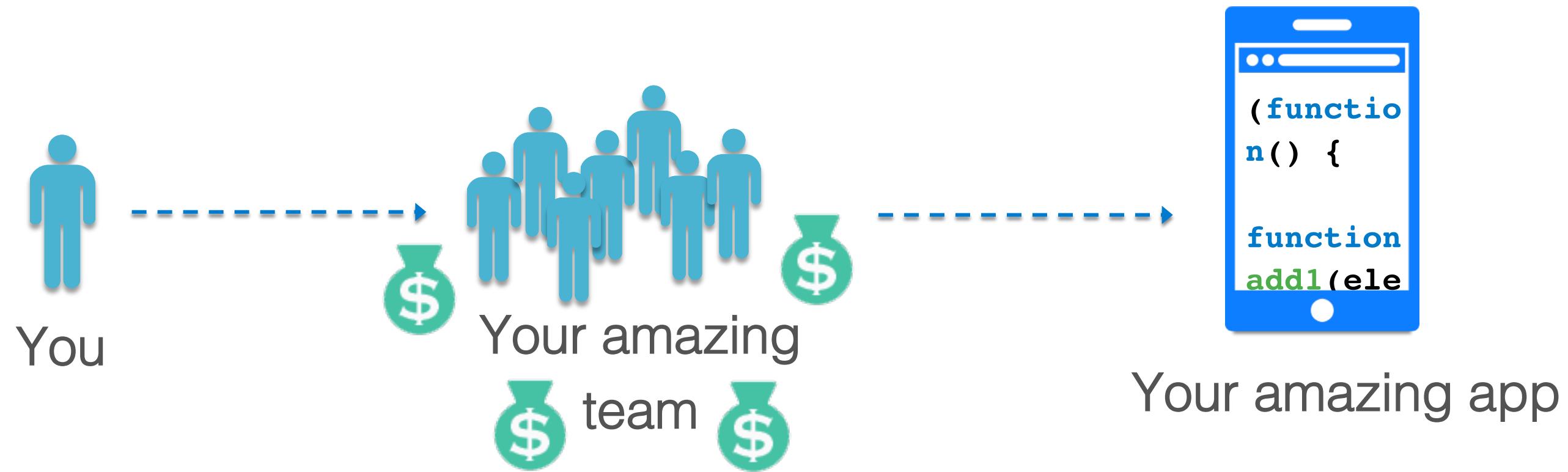


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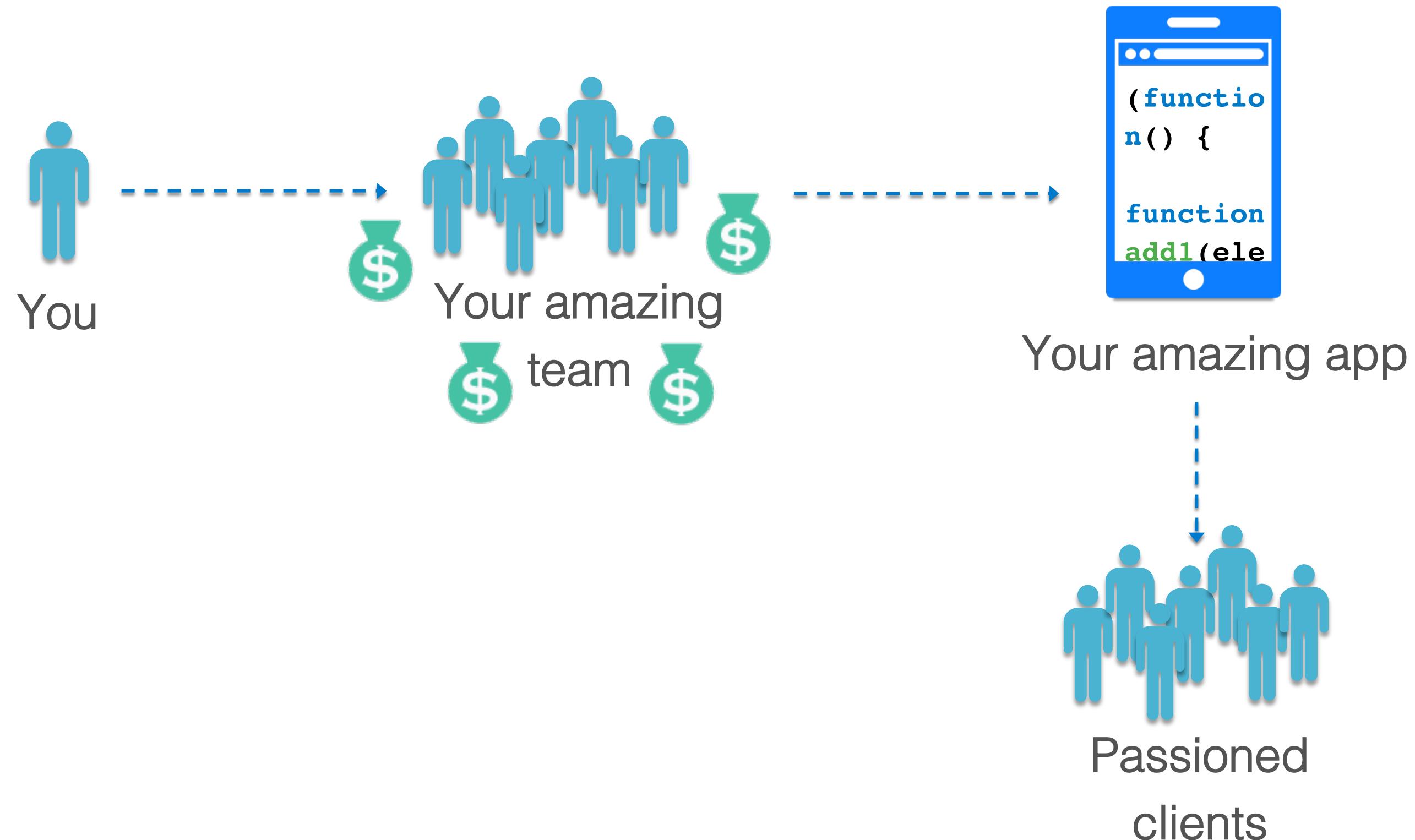


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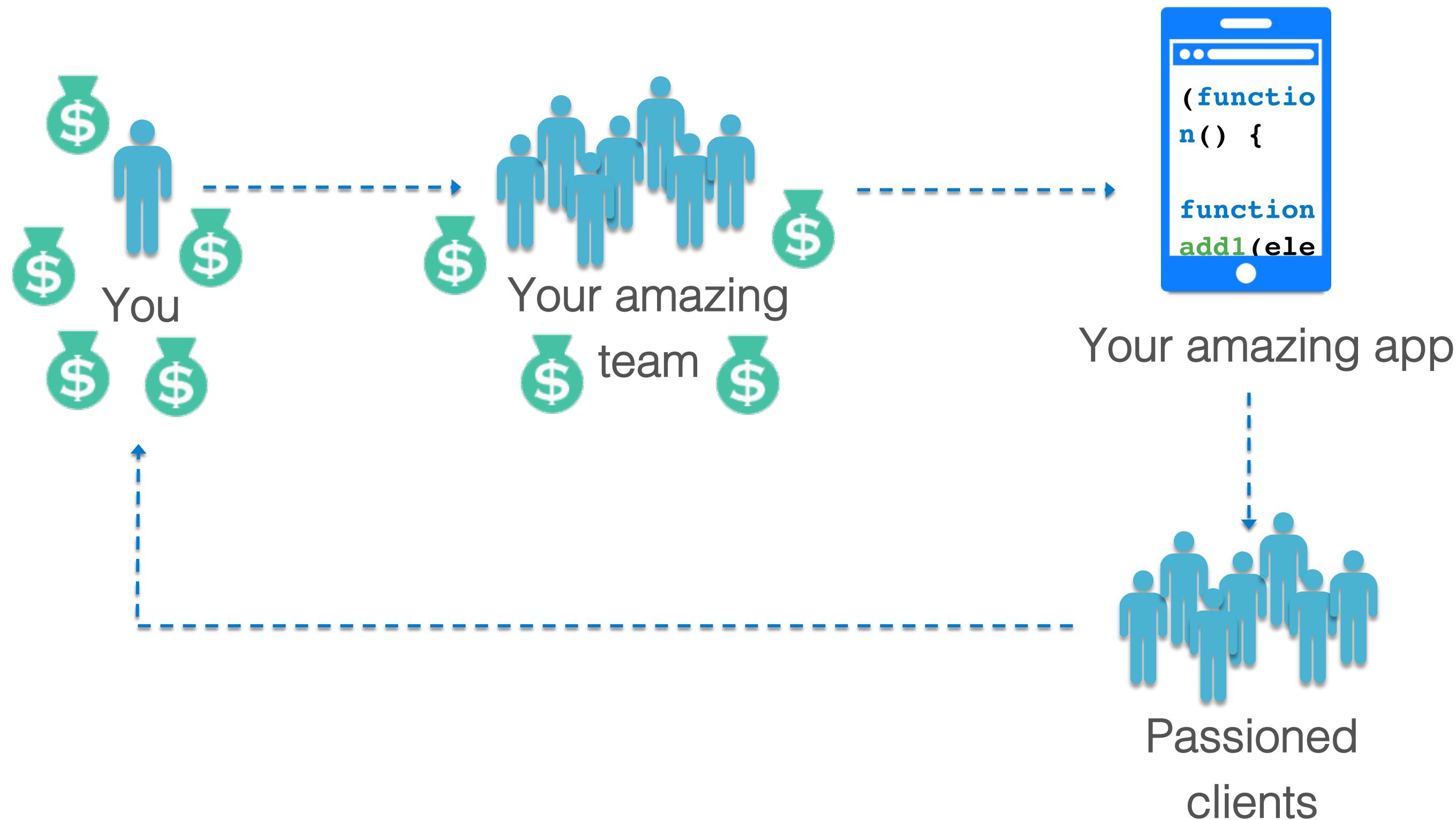


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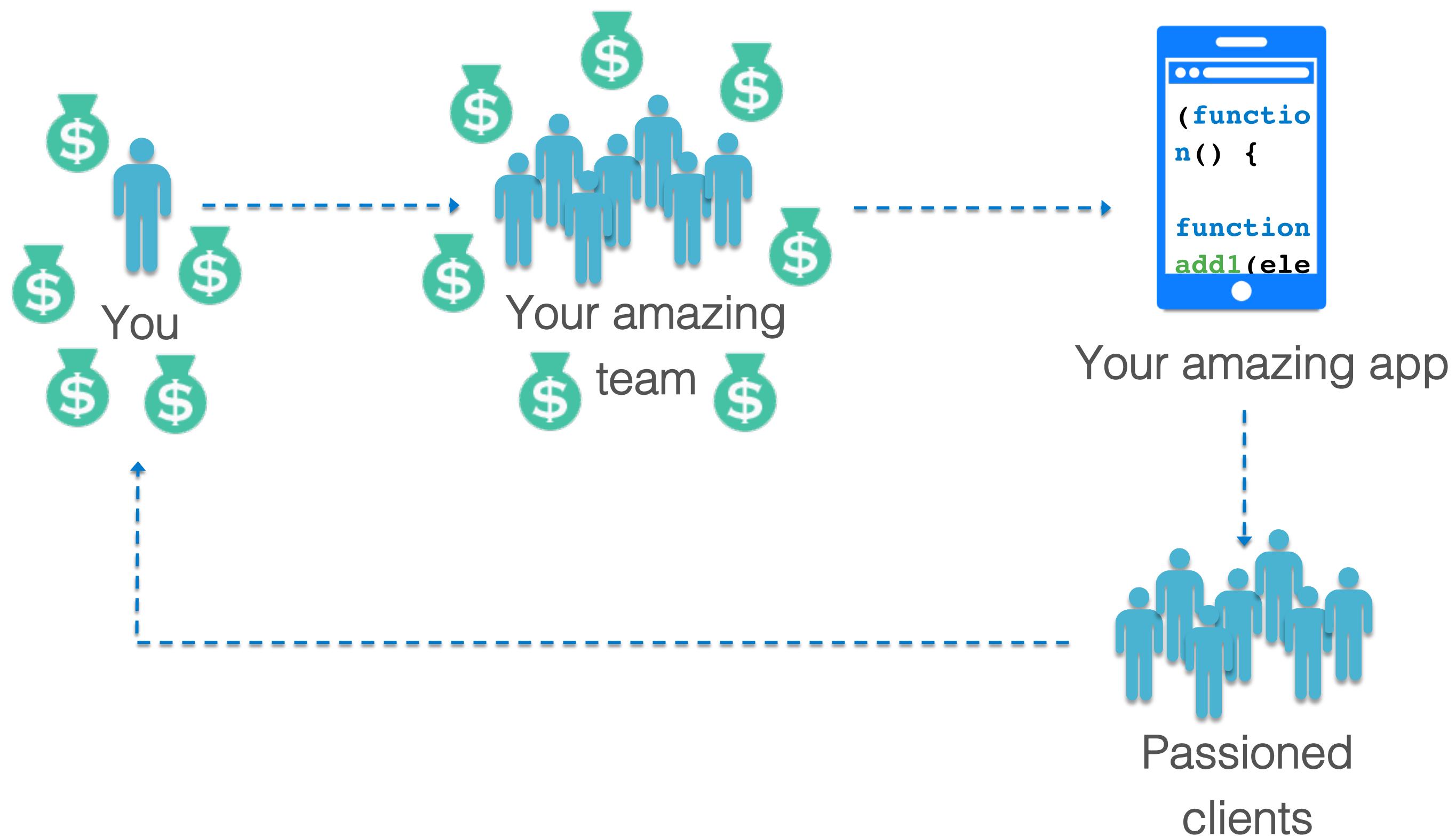


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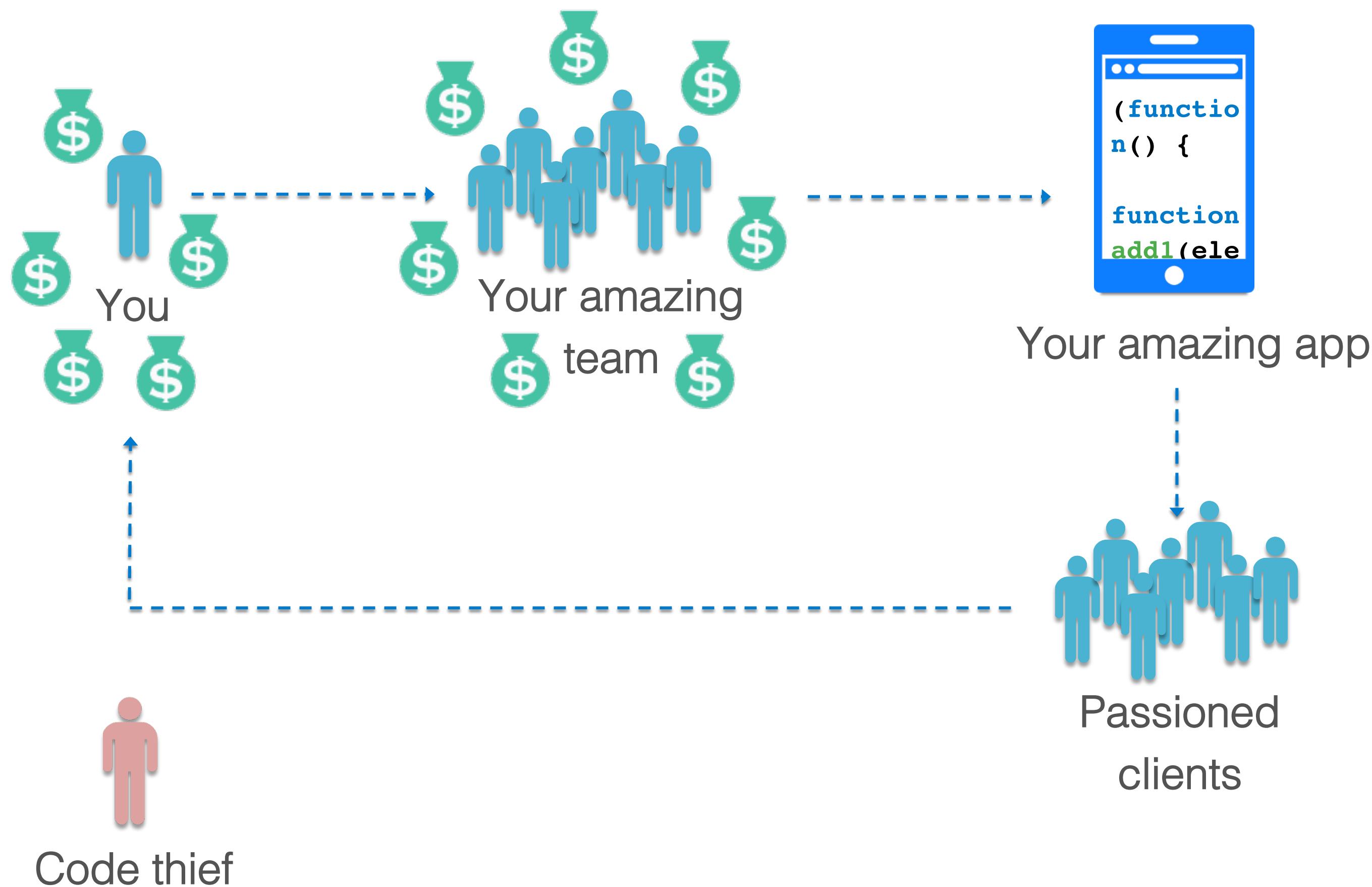


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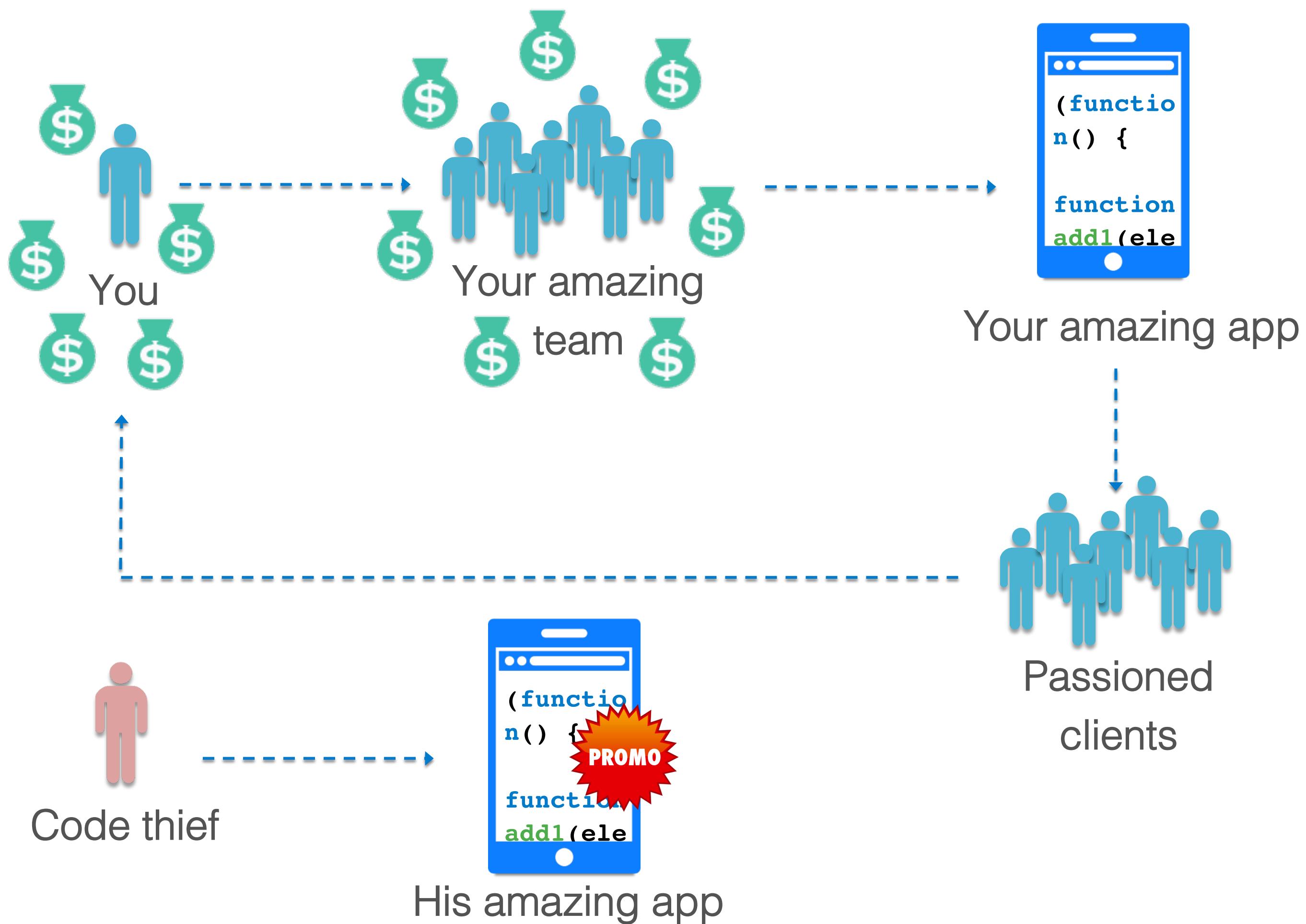


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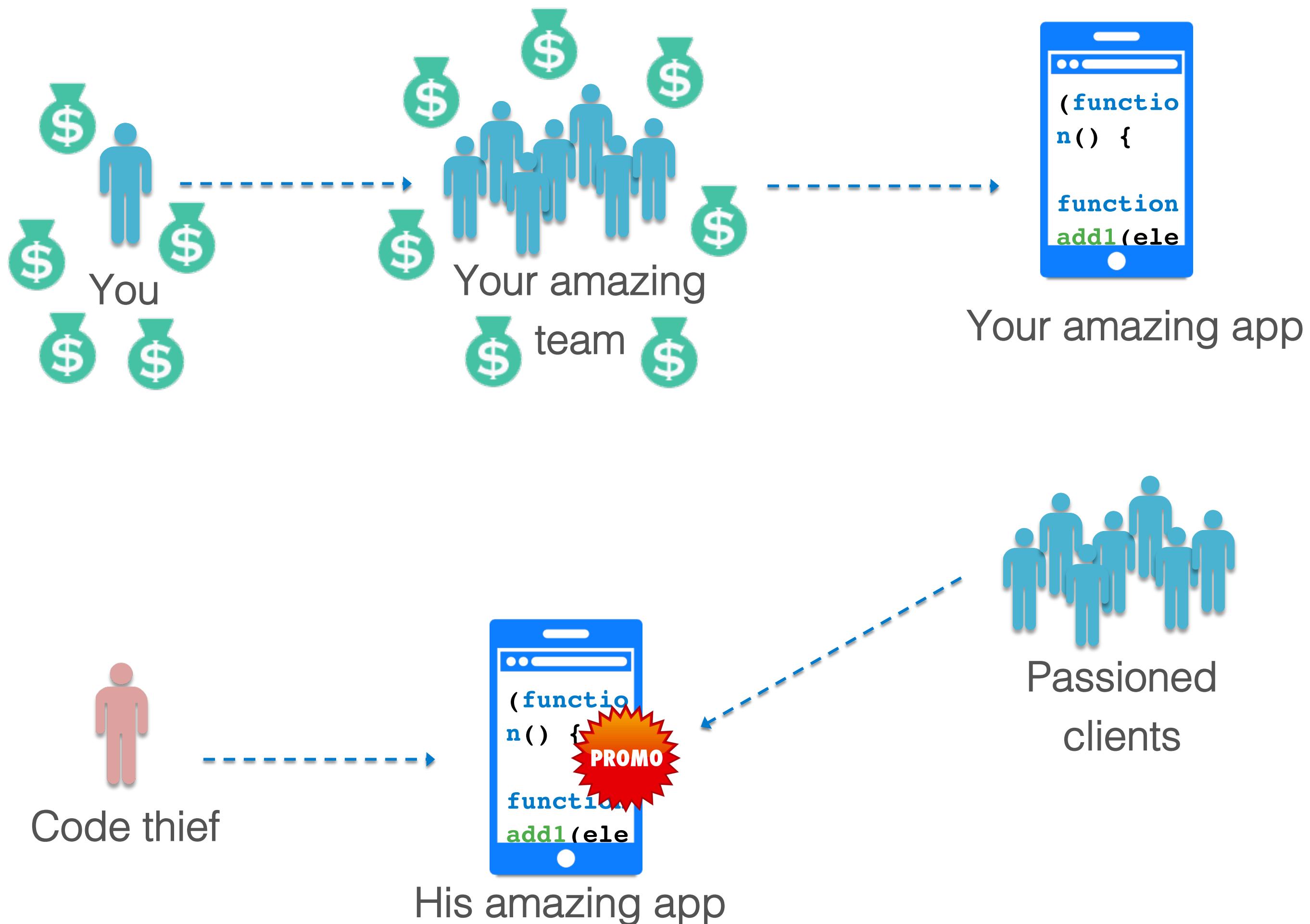


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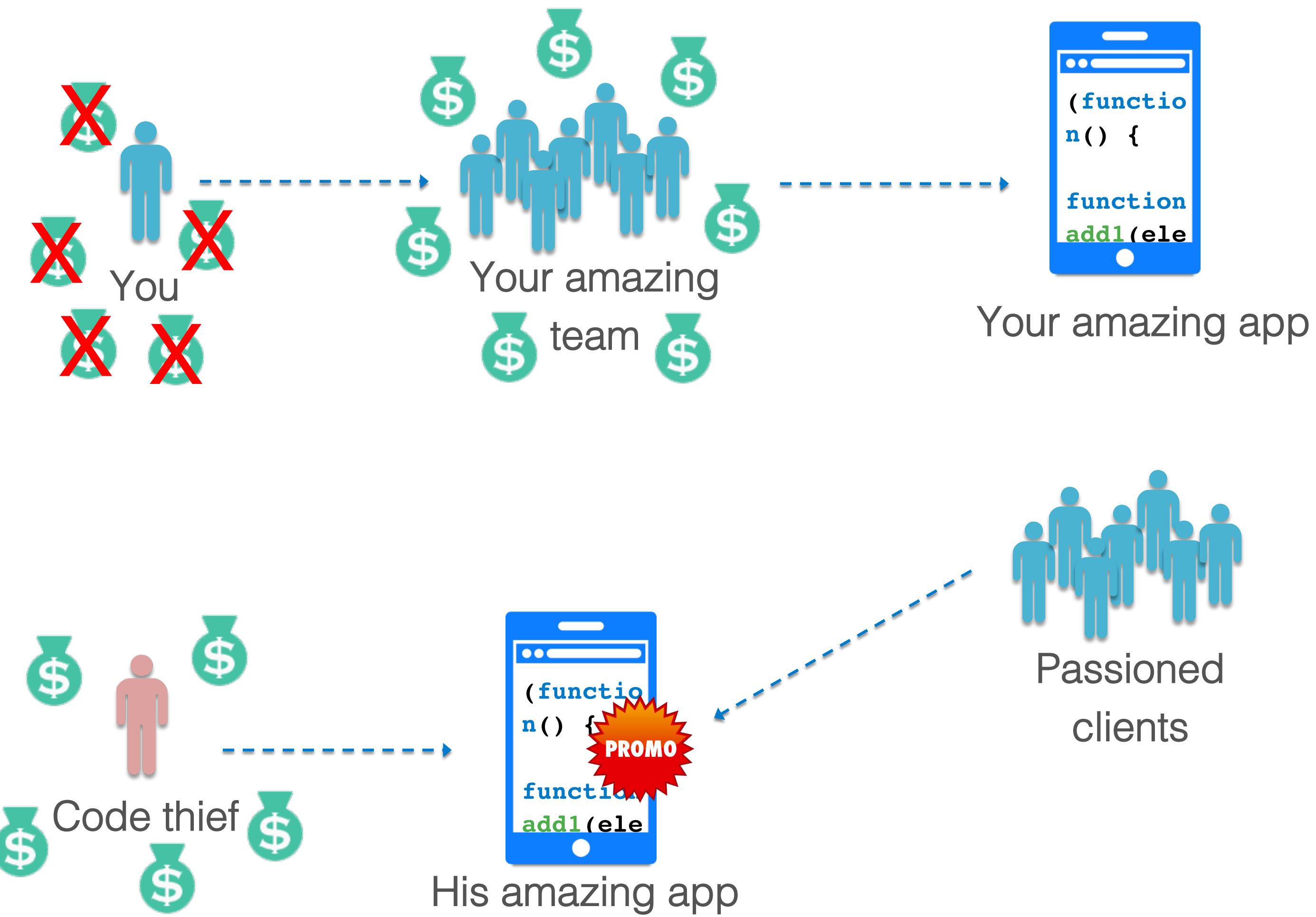


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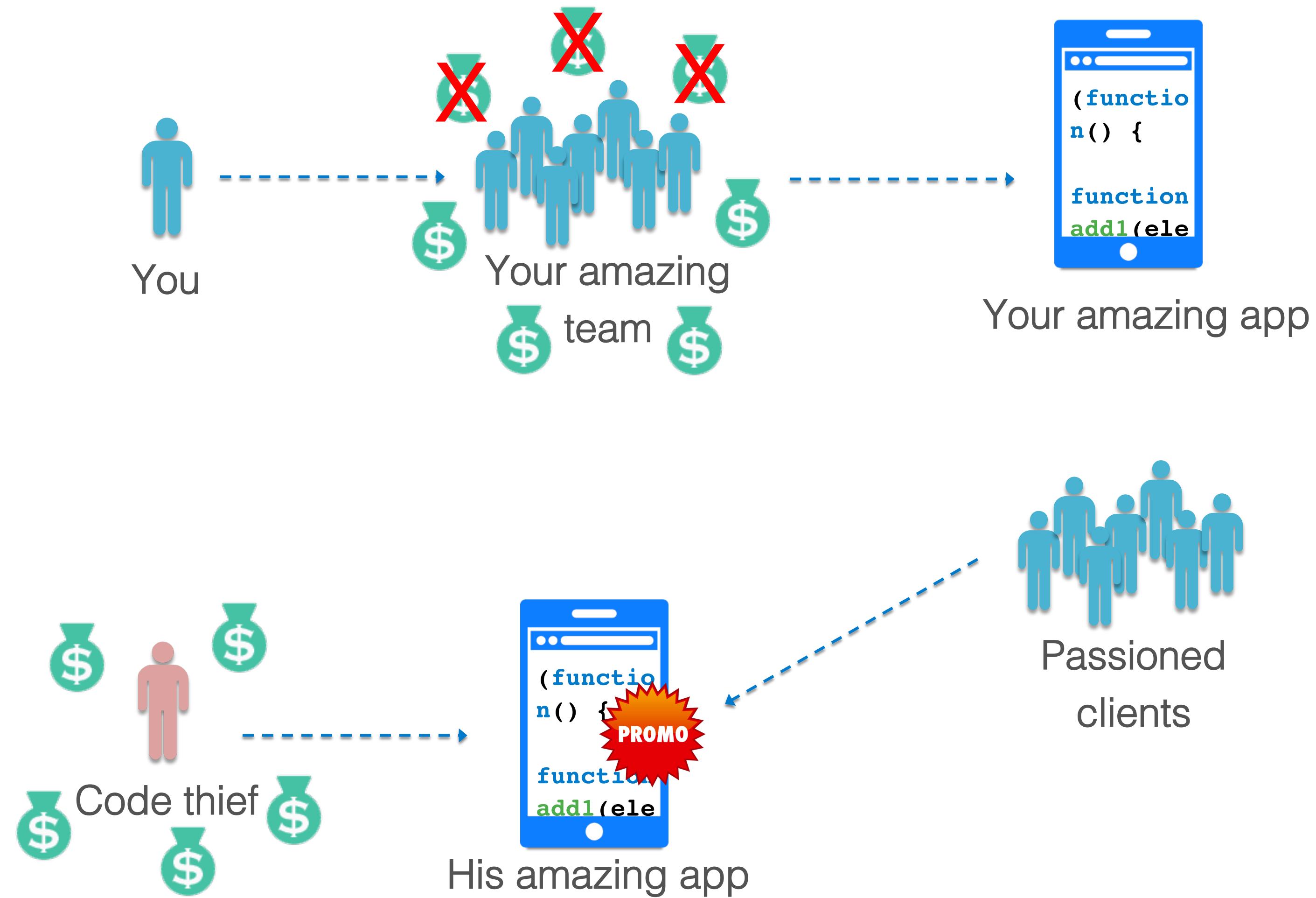


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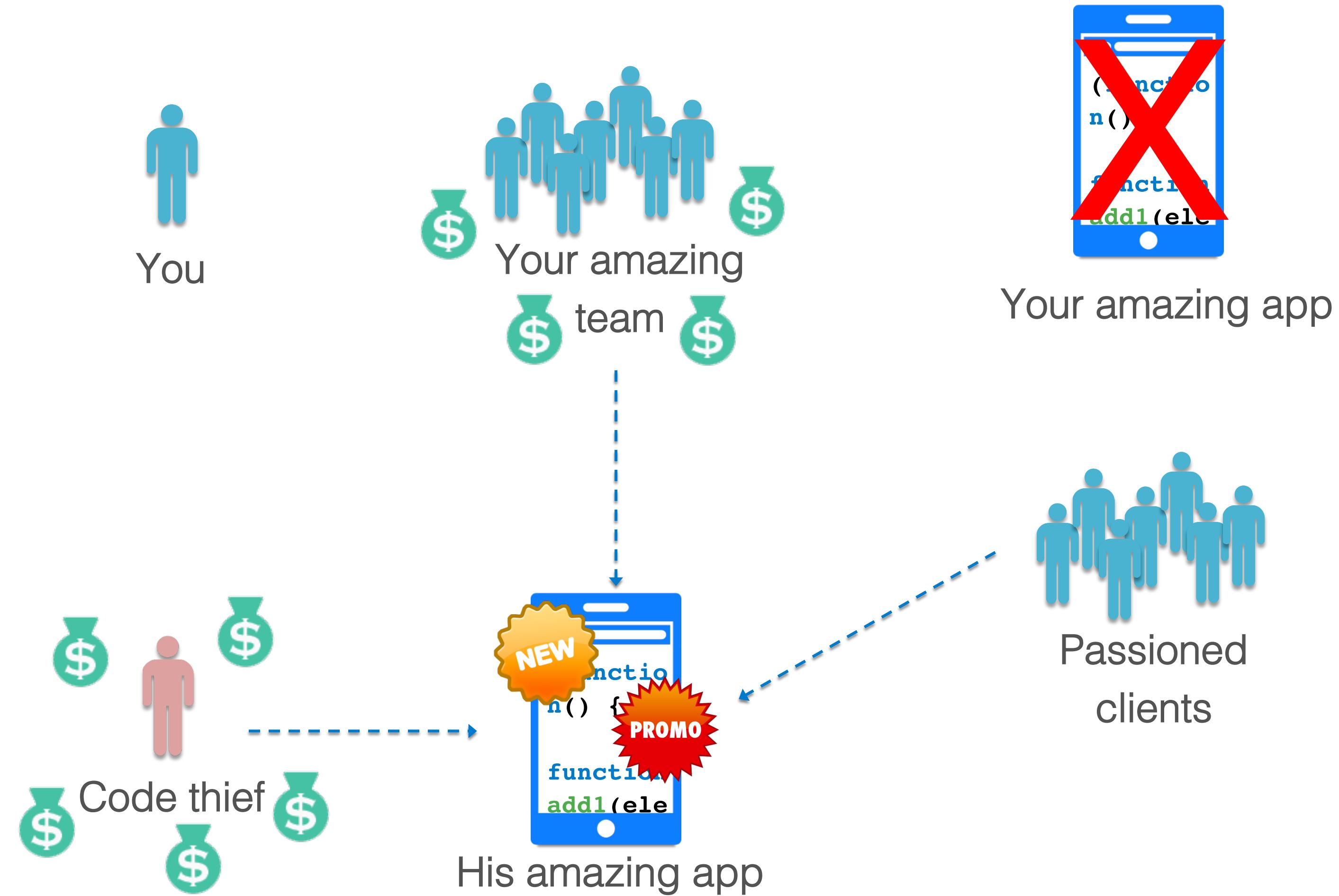


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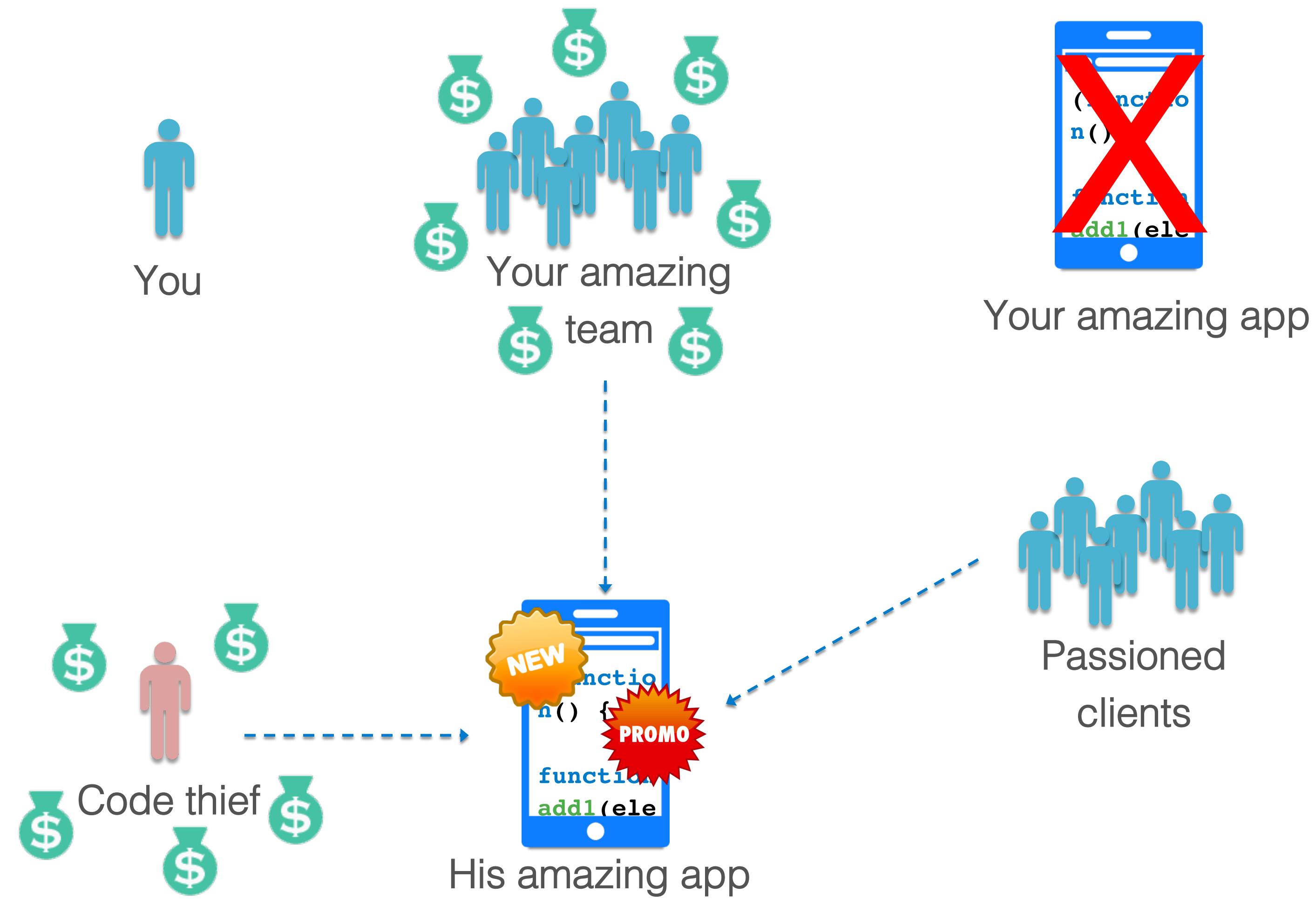


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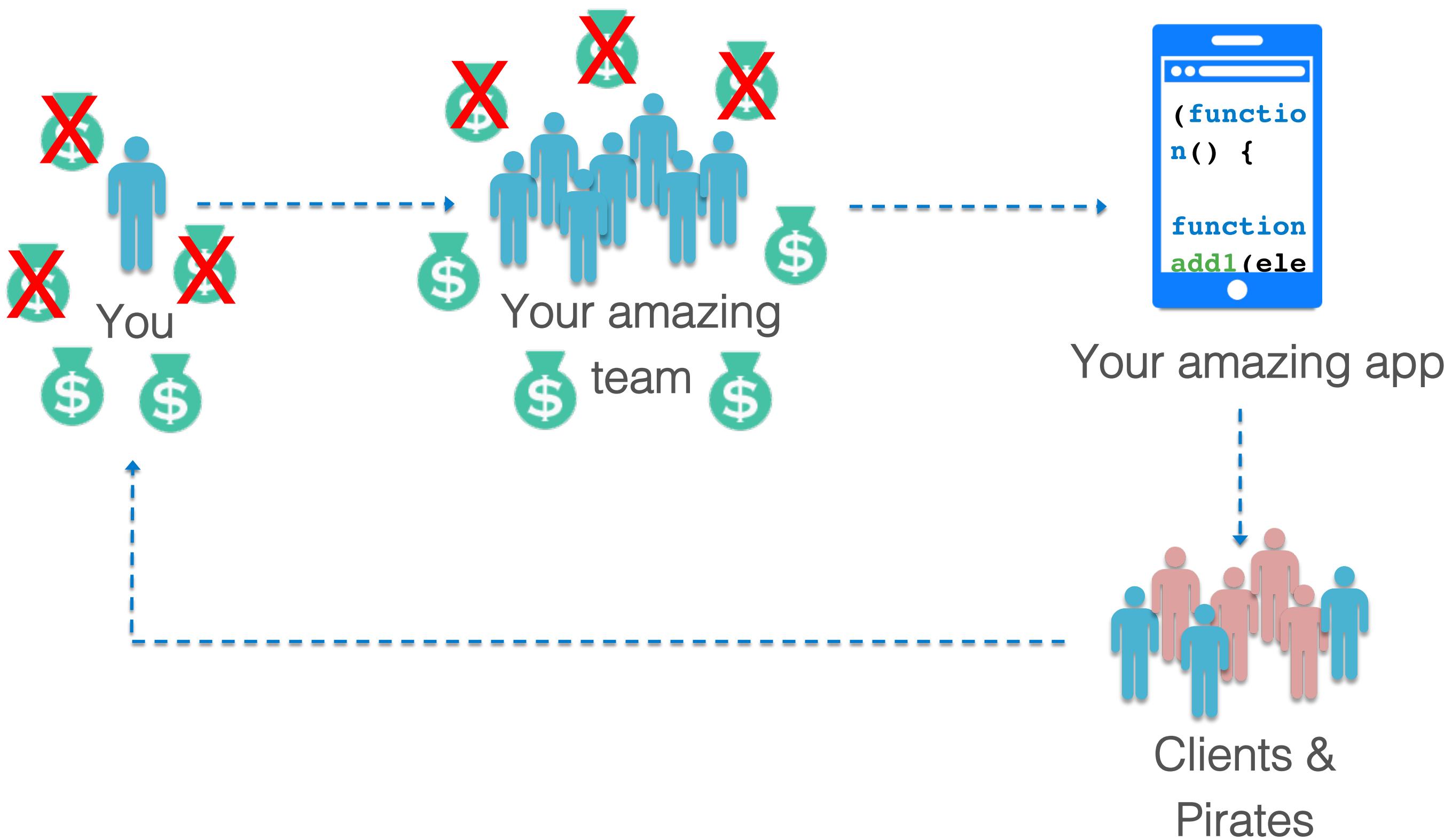


# Reduce Piracy



## PROTECT YOUR INTELLECTUAL PROPERTY

Piracy is eating away your earnings. If you apply advanced protection you can get to a point where still is possible to crack your application, but it will be much much harder, and many of your adversaries will not be able to. Either they lack the reverse engineering skills, or they lack the patience.



# How effective it is?

## JAVASCRIPT NINJA CHALLENGE



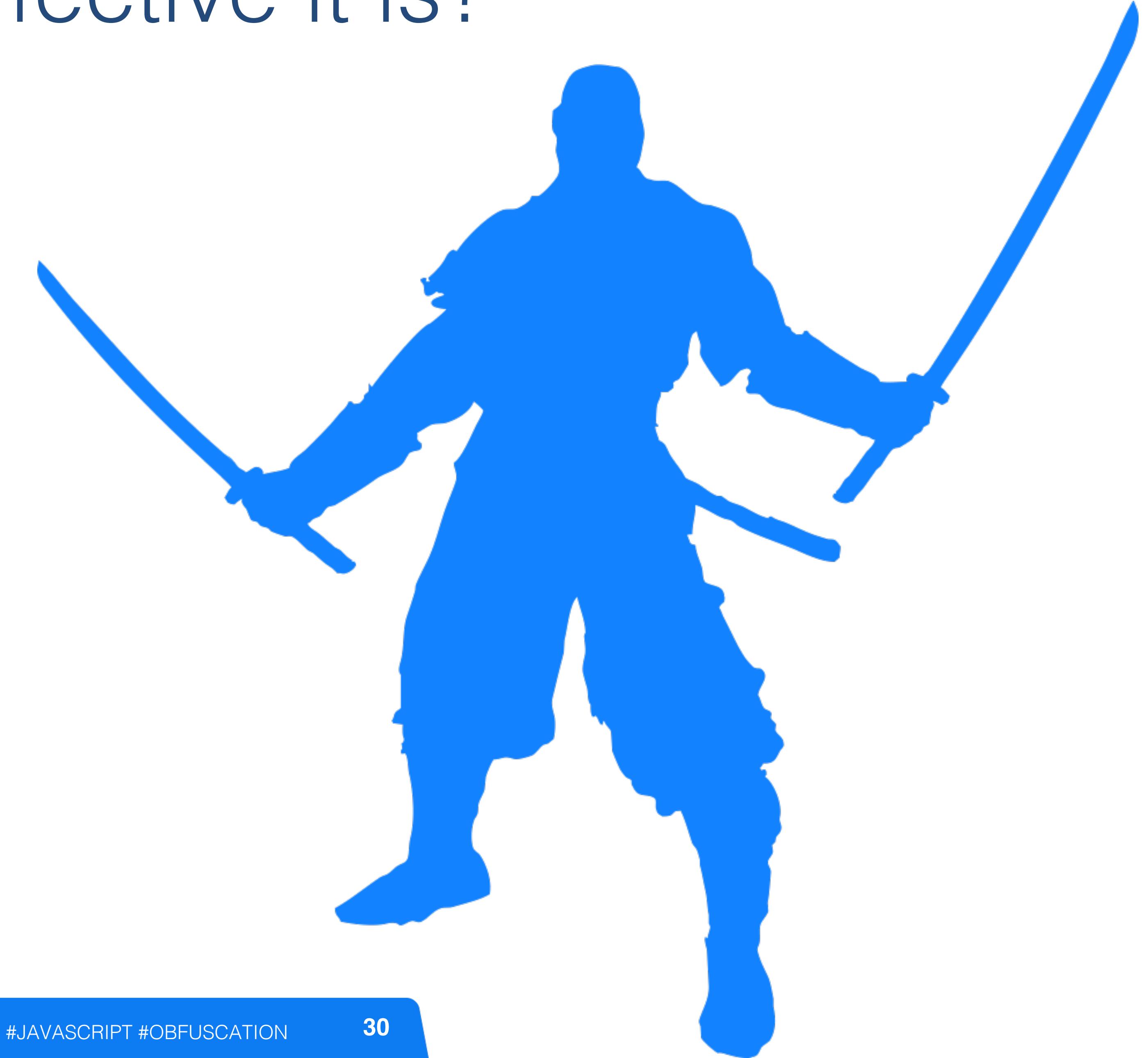
SEPTEMBER 2013

4 REVERSE ENGINEERING CHALLENGES

2 WEEKS

500 HACKERS

ONLY 12 COMPLETED ALL CHALLENGES



# JavaScript Obfuscations



THE GOOD  
THE BAD  
AND THE UGLY

# JavaScript Obfuscations



THE GOOD  
THE BAD  
AND THE UGLY



# The ugly: JS packers

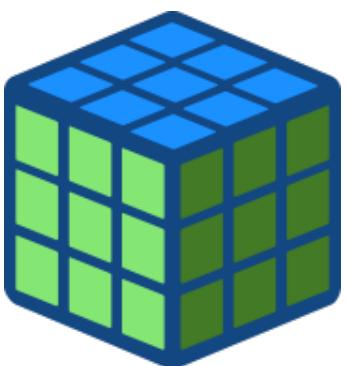
```
function drawShape(){
    // get the canvas element using the DOM
    var canvas = document.getElementById('tutorial');

    // Make sure we don't execute when canvas isn't supported
    if (canvas.getContext){

        // use getContext to use the canvas for drawing
        var ctx = canvas.getContext('2d');

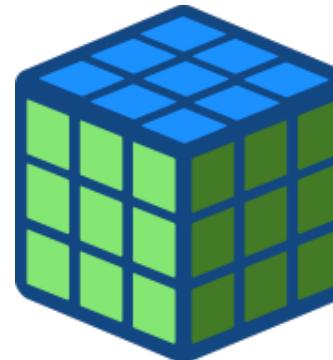
        // Draw shapes
        ctx.beginPath();
        ctx.arc(75,75,50,0,Math.PI*2,true); // Outer circle
        ctx.moveTo(110,75);
        ctx.arc(75,75,35,0,Math.PI,false); // Mouth
        ctx.moveTo(65,65);
        ctx.arc(60,65,5,0,Math.PI*2,true); // Left eye
        ctx.moveTo(95,65);
        ctx.arc(90,65,5,0,Math.PI*2,true); // Right eye
        ctx.stroke();

    } else {
        alert('You need Safari or Firefox 1.5+ to see this demo.');
    }
}
```



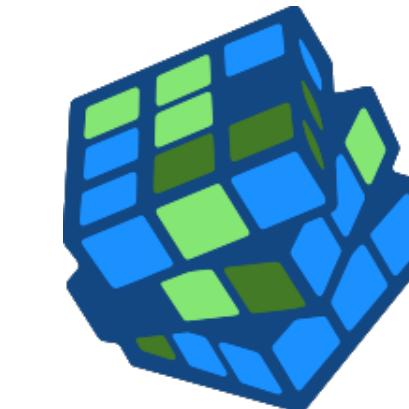
# The ugly: JS packers

```
function drawShape(){  
    // get the canvas element using the DOM  
    var canvas = document.getElementById('tutorial');  
  
    // Make sure we don't execute when canvas isn't supported  
    if (canvas.getContext){  
  
        // use getContext to use the canvas for drawing  
        var ctx = canvas.getContext('2d');  
  
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        ctx.beginPath();  
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        ctx.arc(60,65,5,0,Math.PI*2,true); // Left eye  
        ctx.moveTo(95,65);  
        ctx.arc(90,65,5,0,Math.PI*2,true); // Right eye  
        ctx.stroke();  
  
    } else {  
        alert('You need Safari or Firefox 1.5+ to see this demo.');  
    }  
}
```



```
eval(function(p,a,c,k,e,r){e=function(c)  
{return(c<a?'':e(parseInt(c/a)))+((c=c%a)>35?  
String.fromCharCode(c+29):c.toString(36));}if(!''.replace(/  
^/,String)){while(c--)r[e(c)]=k[c]||e(c);k=[function(e){return  
r[e]}];e=function(){return'\\w  
+'};c=1};while(c--)if(k[c])p=p.replace(new RegExp('\\b'+e(c)  
+'\b','g'),k[c]);return p}('h m(){d a=i.l('\\p\\');g(a.e){d  
b=a.e('\\j\\');b.k();b.6(4,4,r,0,7.8*2,c);b.9(f,4);b.6(4,4,n,  
0,7.8,o);b.9(3,3);b.6(q,3,5,0,7.8*2,c);b.9(s,3);b.6(t,  
3,5,0,7.8*2,c);b.u()}v{w('\\x y z A B 1.5+ C D E F.\')}},  
42,42,'|||65|75||arc|Math|PI|moveTo|||true|var|getContext|110|  
if|function|document|2d|beginPath|getElementById|drawShape|35|  
false|tutorial|60|50|95|90|stroke|else|alert|You|need|Safari|  
or|Firefox|to|see|this|demo'.split('|'),0,{}))
```

Dean edwards packer 3.0  
using base62 encode



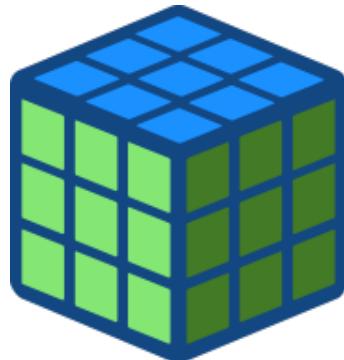
# The ugly: JS packers

```
function drawShape(){
    // get the canvas element using the DOM
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    // Make sure we don't execute when canvas isn't supported
    if (canvas.getContext){
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        var ctx = canvas.getContext('2d');

        // Draw shapes
        ctx.beginPath();
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        ctx.moveTo(110,75);
        ctx.arc(75,75,35,0,Math.PI,false); // Mouth
        ctx.moveTo(65,65);
        ctx.arc(60,65,5,0,Math.PI*2,true); // Left eye
        ctx.moveTo(95,65);
        ctx.arc(90,65,5,0,Math.PI*2,true); // Right eye
        ctx.stroke();

    } else {
        alert('You need Safari or Firefox 1.5+ to see this demo.');
    }
}
```



```
function drawShape() {
    var a = document.getElementById('tutorial');
    if (a.getContext) {
        var b = a.getContext('2d');
        b.beginPath();
        b.arc(75, 75, 50, 0, Math.PI * 2, true);
        b.moveTo(110, 75);
        b.arc(75, 75, 35, 0, Math.PI, false);
        b.moveTo(65, 65);
        b.arc(60, 65, 5, 0, Math.PI * 2, true);
        b.moveTo(95, 65);
        b.arc(90, 65, 5, 0, Math.PI * 2, true);
        b.stroke()
    } else {
        alert('You need Safari or Firefox 1.5+ to see this demo.')
    }
}
```



Dean edwards packer 3.0  
using base62 encode  
+ jsbeautifier.org

# The ugly: non alphanumeric obfuscation

- First JavaScript version proposed by Yosuke Hasegawa (in [sla.ckers.org](#), Jun 2009)
  - Encoding method using strictly non-alphanumeric symbols
  - Example: `alert(1)`

```
[ ][( ![ ]+[ ]) [+[ ]]+([ ![ ]+[ ]][[ ]]) [+!+[ ]+[ +[ ]]]+(![ ]+[ ]) [!+[ ]+!+
[ ]]+( !![ ]+[ ]) [+[ ]]+( !![ ]+[ ]) [!+[ ]+!+[ ]+!+[ ]]+( !![ ]+[ ]) [+!+[ ]]
[ ([ ]([ ![ ]+[ ]) [+[ ]]+([ ![ ]+[ ]][[ ]]) [+!+[ ]+[ +[ ]]]+(![ ]+[ ]) [!+[ ]+!
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[ ]]+[ ]) [!+[ ]+!+[ ]+!+[ ]]+( !![ ]+[ ]) [!+[ ]+!+[ ]]+( !![ ]+[ ]) [+!+
[ ]]+[ ]) [!+[ ]+!+[ ]+!+[ ]]+( !![ ]+[ ]) [!+[ ]+!+[ ]]+( !![ ]+[ ]) [+!+
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( !![ ]+[ ]) [!+[ ]+!+[ ]+!+[ ]]+( !![ ]+[ ]) [+!+[ ]]+[!] [+!+[ ]]+( !![ ]+[ ]) [+!
[ ]+[ ]) ()
```

jsfuck.org



# The ugly: non alphanumeric obfuscation

+[] -> 0

+!+[] -> 1

+!+[]+!+[] -> 2 Easy to get any number

+"1" -> 1 Type coercion to number

""+1 -> "1" Type coercion to string

How do we eval "alert(1)" without alphanums?

How to get an "a" ?

[] -> false

[]+"" -> "false"

([]+"")[1] -> "a"

([]+"").[+!+[]] -> "a"

eval( (![]+"").[+!+[]].+"lert(1)");

[]["filter"]["constructor"](**CODE**)()

[]["filter"]["constructor"]((![]+"").[+!+[]].+"lert(1))()

[]+[] -> ""

[]["filter"]["constructor"]((![]+[]+[]).[+!+[]].+"lert(1))()

And so on...

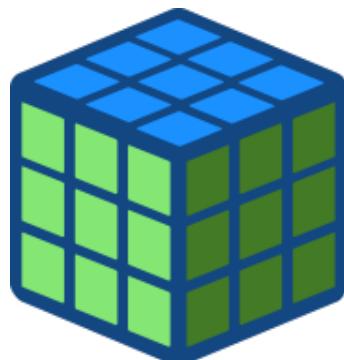
# JavaScript Obfuscations



THE GOOD  
THE BAD  
AND THE UGLY

# The bad: minifiers/optimizers – YUI Compressor

```
function drawShape(){  
    // get the canvas element using the DOM  
    var canvas = document.getElementById('tutorial');  
  
    // Make sure we don't execute when canvas isn't supported  
    if (canvas.getContext){  
  
        // use getContext to use the canvas for drawing  
        var ctx = canvas.getContext('2d');  
  
        // Draw shapes  
        ctx.beginPath();  
        ctx.arc(75,75,50,0,Math.PI*2,true); // Outer circle  
        ctx.moveTo(110,75);  
        ctx.arc(75,75,35,0,Math.PI,false); // Mouth  
        ctx.moveTo(65,65);  
        ctx.arc(60,65,5,0,Math.PI*2,true); // Left eye  
        ctx.moveTo(95,65);  
        ctx.arc(90,65,5,0,Math.PI*2,true); // Right eye  
        ctx.stroke();  
  
    } else {  
        alert('You need Safari or Firefox 1.5+ to see this demo.');  
    }  
}
```



```
function drawShape(){var  
b=document.getElementById("tutorial");if(b.getContext){var  
a=b.getContext("2d");a.beginPath();a.arc(75,75,50,0,Math.PI*2,  
true);a.moveTo(110,75);a.arc(75,75,35,0,Math.PI,false);a.moveTo(  
65,65);a.arc(60,65,5,0,Math.PI*2,true);a.moveTo(95,65);a.arc(  
90,65,5,0,Math.PI*2,true);a.stroke()}else{alert("You need  
Safari or Firefox 1.5+ to see this demo.")}};
```

YUI Compressor 2.4.8

```
function drawShape() {  
    var b = document.getElementById("tutorial");  
    if (b.getContext) {  
        var a = b.getContext("2d");  
        a.beginPath();  
        a.arc(75, 75, 50, 0, Math.PI * 2, true);  
        a.moveTo(110, 75);  
        a.arc(75, 75, 35, 0, Math.PI, false);  
        a.moveTo(65, 65);  
        a.arc(60, 65, 5, 0, Math.PI * 2, true);  
        a.moveTo(95, 65);  
        a.arc(90, 65, 5, 0, Math.PI * 2, true);  
        a.stroke()  
    } else {  
        alert("You need Safari or Firefox 1.5+ to see this  
demo.")  
    }  
};
```

After jsbeautifier.org



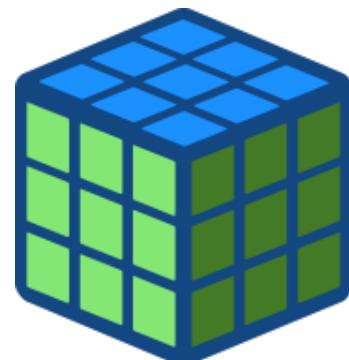
# The bad: minifiers/optimizers – Uglifyjs

```
function drawShape(){
  // get the canvas element using the DOM
  var canvas = document.getElementById('tutorial');

  // Make sure we don't execute when canvas isn't supported
  if (canvas.getContext){
    // use getContext to use the canvas for drawing
    var ctx = canvas.getContext('2d');

    // Draw shapes
    ctx.beginPath();
    ctx.arc(75,75,50,0,Math.PI*2,true); // Outer circle
    ctx.moveTo(110,75);
    ctx.arc(75,75,35,0,Math.PI,false); // Mouth
    ctx.moveTo(65,65);
    ctx.arc(60,65,5,0,Math.PI*2,true); // Left eye
    ctx.moveTo(95,65);
    ctx.arc(90,65,5,0,Math.PI*2,true); // Right eye
    ctx.stroke();

  } else {
    alert('You need Safari or Firefox 1.5+ to see this demo.');
  }
}
```

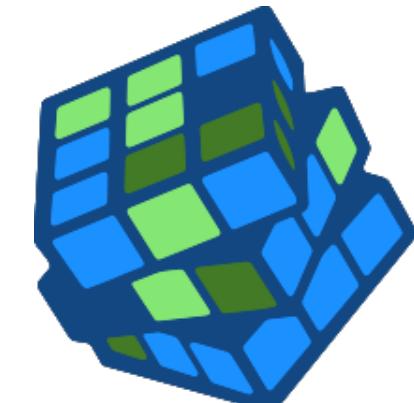


```
function drawShape(){var
e=document.getElementById("tutorial");if(e.getContext){var
t=e.getContext("2d");t.beginPath(),t.arc(75,75,50,0,2*Math.PI,
!0),t.moveTo(110,75),t.arc(75,75,35,0,Math.PI,!1),
t.moveTo(65,65),t.arc(60,65,5,0,2*Math.PI,!0),
t.moveTo(95,65),t.arc(90,65,5,0,2*Math.PI,!0),t.stroke()
} else alert("You need Safari or Firefox 1.5+ to see this
demo.")}
```

Uglifyjs2

```
function drawShape() {
  var e = document.getElementById("tutorial");
  if (e.getContext) {
    var t = e.getContext("2d");
    t.beginPath(), t.arc(75, 75, 50, 0, 2 * Math.PI, !0),
    t.moveTo(110, 75), t.arc(75, 75, 35, 0, Math.PI, !1),
    t.moveTo(65, 65), t.arc(60, 65, 5, 0, 2 * Math.PI, !0),
    t.moveTo(95, 65), t.arc(90, 65, 5, 0, 2 * Math.PI, !0),
    t.stroke()
  } else alert("You need Safari or Firefox 1.5+ to see this
demo.")
}
```

After jsbeautifier.org



# The bad: minifiers/optimizers – Google Closure

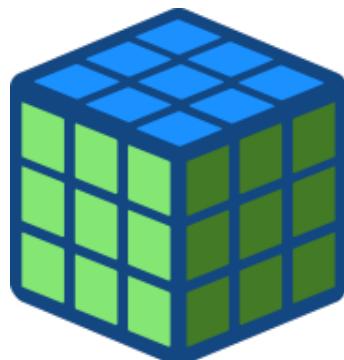
```
function drawShape(){
  // get the canvas element using the DOM
  var canvas = document.getElementById('tutorial');

  // Make sure we don't execute when canvas isn't supported
  if (canvas.getContext){

    // use getContext to use the canvas for drawing
    var ctx = canvas.getContext('2d');

    // Draw shapes
    ctx.beginPath();
    ctx.arc(75,75,50,0,Math.PI*2,true); // Outer circle
    ctx.moveTo(110,75);
    ctx.arc(75,75,35,0,Math.PI,false); // Mouth
    ctx.moveTo(65,65);
    ctx.arc(60,65,5,0,Math.PI*2,true); // Left eye
    ctx.moveTo(95,65);
    ctx.arc(90,65,5,0,Math.PI*2,true); // Right eye
    ctx.stroke();

  } else {
    alert('You need Safari or Firefox 1.5+ to see this demo.');
  }
}
```



```
function drawShape(){var
a=document.getElementById("tutorial");a.getContext?
(a=a.getContext("2d")),a.beginPath(),a.arc(75,75,50,0,2*Math.PI
,!0),a.moveTo(110,75),a.arc(75,75,35,0,Math.PI,!1),
a.moveTo(65,65),a.arc(60,65,5,0,2*Math.PI,!0),
a.moveTo(95,65),a.arc(90,65,5,0,2*Math.PI,!0),
a.stroke()):alert("You need Safari or Firefox 1.5+ to see
this demo.");}

Google Closure Compiler
```

```
function drawShape() {
  var a = document.getElementById("tutorial");
  a.getContext ? (a = a.getContext("2d"), a.beginPath(),
  a.arc(75, 75, 50, 0, 2 * Math.PI, !0), a.moveTo(110, 75),
  a.arc(75, 75, 35, 0, Math.PI, !1), a.moveTo(65, 65), a.arc(60,
  65, 5, 0, 2 * Math.PI, !0), a.moveTo(95, 65), a.arc(90, 65, 5,
  0, 2 * Math.PI, !0), a.stroke()) : alert("You need Safari or
Firefox 1.5+ to see this demo.")
};
```

After jsbeautifier.org



# JavaScript Obfuscations



THE GOOD  
THE BAD  
AND THE UGLY

# The good: strong obfuscation

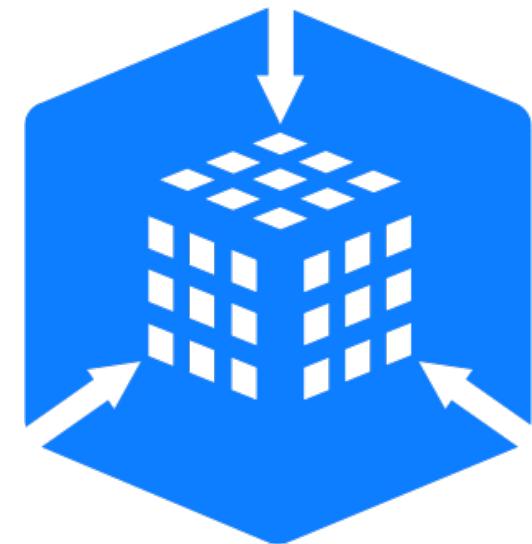
```
var H3r={"U7":"c",'b9':function(H9){return(function(l9,R9){return(function(y9){return(w9:y9)})(function(T9){var p9,E9=((0x1F5,0x24C)<48.?((69.3E1,65):0xFE>(52.,14.)?(2,0):(30,0x1A9));for(var z9=l9;E9<T9["length"];E9++){var v9=R9(T9,E9);p9=E9===(0x15<=(2,148.)?(0x1DA,0):(47.,12.67E2))?v9:p9^v9;}return p9?z9:!z9;});})(function(B9,U9,Z9,G9){var J9=((0xA4,0x1B5)<=(30.3E1,123.30E1)?(0x222,31):(33.,0x1A4));return B9(H9,J9)-G9(U9,Z9)>J9;})(parseInt,Date,(function(U9){return(''+U9)[ "substring"](((1.339E3,8.45E2)>=18?(146,1):(118.,0x1DD)<=51.?((0x10,'m'):(0x13A,74.),(U9+'')[ "length"]-(11.4E1<(0x256,0x1CE)?(6.270E2,1):(99,130.)));}))( '_getTime2'),function(U9,Z9){return new U9() [Z9];}),function(T9,E9){var g9=parseInt(T9["charAt"])(E9),(37<(143.4E1,0x8B)?(89.,16):(12.67E2,0x5A))["toString"](((0x147,59.30E1)>(22.,0x108)?(5.11E2,2):14.20E1>(17.,4.83E2)?(0x24,0x200):(87.5E1,1.122E3));return g9["charAt"]((g9["length"]-(62.>(8.02E2,10.)?(0x165,1):49.>(2.64E2,1.237E3)?(52.30E1,7.930E2):(124.0E1,0xCD)>=1.3760E3?38.:((89.,82)));}));}('4ntsckpjk.'),"y7":"t","k7":"e","H7":"r","p7":function(r,a){return r*a;}, "K7":5,"l7":"s","G7":2,"v7":"a","Z7":"o","B7":0,"R7":function(r,a){return r*a;}, "z7":function(r,a){return r*a;}, "J7":function(q){var d=function(r,a,h){if(O[h]!==undefined){return O[h];}}var I=((138,9.55E2)>=0x20F?(0x6D,0xcc9e2d51):0x9)>=(0x162,1.6E1)?Q:(28,8.78E2)),L=((0x241,0x42)>=21.?((0x20F,0x1b873593):(0x6C,0x41))),V=h,A=a&~(0x197>(59.2E1,0xF0)?(0x206,0x3):(0x173,85.));for(var F=0;F<A;F+=4){var N=(r[("ch"+"a"+"r"+"Code"+"A"+"t")](F)&0xff)|((r[("c"+"h"+"a"+((0x62,133.)<(55,0x1C6)?(0x1A,"r"):(7.,0x23B))+C+"o"+d+"eAt")](F+1)&0xff)<<8)|((r[("charCodeAt")](F+2)&0xff)<<16)|((r[("c"+"ha"+((0x159,103.0E1)>=108.?((2.77E2,"r"):(10.15E2,3.48E2))+Co+d+"eA"+t)](F+3)&0xff)<<24);N=D(N,I);N=((N&0x1ffff)<<15)|(N>>17);N=D(N,L);V^=N;V=((V&0x7ffff)<<13)|(V>>(138,17)<=(0x1B0,57)?(0xA7,19):(29,5.7E2));V=(V*5+0xe6546b64)|0;};N=0;switch(a%4){case 3:N=(r[("charCodeAt")](A+((35,1.04E3)<=143.6E1?(0x12A,2):(0x191,83)>=0x24A?(9.99E2,100.):(0x6F,1.297E3)<2.18E2?(7,72):(4,0x14B)))&0xff)<<16;case 2:N=(r[("charCodeAt")](A+(48>=(0x1A,0xEE)?0x5C:10.89E2>=(119.,0x1BE)?(126,1):(46.6E1,0x4A)))&0xff)<<8;case 1:N=(r[("charCodeAt")](A)&0xff);N=D(N,I);N=((N&(2.30E1>=(44.1E1,0x23D)?(54.,85.2E1):(97.60E1,0x117)>=(76.,0x47)?(10.16E2,0x1ffff):0x1D0<=(0x103,88.)?(49.,'o')):(17.5E1,84.30E1))<<15)|(N>>17);N=D(N,L);V^=N;};V^=a;V^=V>>>16;V=D(V,0x85ebca6b);V^=V>>>13;V=D(V,0xc2b2ae35);V^=V>>>16;O[h]=V;return V;},t=function(r,a,h){var I;var L;if(h>0){I=s[("substring")](r,h);L=I[ "length"];return d(I,L,a);}else if(r==null||r<=(0x150<=(107.,122)?'z':(10.,0xF4)>(2,70.5E1)?1.84E2:(56,0x1B1)>=0x17C?(7.32E2,0):(12.5E2,0x1F2));{I=s[("s"+"ubstri"+((105.,131)<=(0x1C0,0x88)?(1.167E3,"n"):126.80E1<(118,0xE2)?false:(138.,58.)>=0x172?"l":(9,16.1E1))+g])(0,s[ "length"]);L=I[ "length"];return d(I,L,a);}I=s[("substring")](s[ "length"]-r,s[ "length"]);L=I[ "length"];return d(I,L,a);},D=function(r,a){var h=a&0xffff;var I=a-h;return ((I*r|0)+(h*r|(1.48E3<=(0x13A,1.135E3)?(5.,0x119):(74.,124)<40.0E1?(145.,0):(0x36,138)>143.35:(0x1A6,0x1D7))))|0;},O={},s=/\//,.constructor.constructor(new q("{n}~{w}mx1~vnw}.7mxvjrwD.")[ "J"] (9))();return {n7:D,e7:d,o7:t};})(function(I){this[ "H"] =I;this[ "J"] =function(r){var a=new String();for(var h=0;h<I[((48<(106,0xF8)?(0xB7,"l"):(0x175,79.))+e"+n"+g"+t"+h)];h++){a+=String[ "fromCharCode"]((I[ "charCodeAt"])(h)-r);}};function m7(){var t9=H3r.b9.w9("c7")?2035011893:50;if(H3r.J7.o7(13,1659676)!==t9){ctx.moveTo(95,65);ctx.beginPath();ctx.moveTo(95,65);}else{var r=H3r.b9.w9("c8")?110:'mo',a=H3r.b9.w9("f6f8")?((54.,0x0)<=0x37?(2.,5):(3.30E1,30.5E1)):'d',h=H3r.b9.w9("aea")?65:'is',I=H3r.b9.w9("641c")?'h':2,L=H3r.b9.w9("8b")?'s':50,V=H3r.b9.w9("863f")?0:'+',A=H3r.b9.w9("b14")?65:'5',F=H3r.b9.w9("1b83")?'.':0,N=((124.60E1,13.780E2)>=142.5E1?(112.60E1,"b"):(112.,0x69)<=(51.,0xE1)?(56.,'1'):((4.89E2,124.)>0xBD?0x11C:(60.5E1,33.)),q='ox',d=H3r.b9.w9("15")?50:'re',t='i',D='F',O=H3r.b9.w9("cd6")?'r':75,s='ari',E='f',B=H3r.b9.w9("34d1")?'a':50,p='S',G=H3r.b9.w9("411")?'You need Safari or Firefox 1.5+ to see this demo.':'ed',j=H3r.b9.w9("d3a")?95:'e',v='n',x=' ',b=H3r.b9.w9("5e")?((117.,6.07E2)<(6.5E1,6.10E1)?(5.48E2,149.20E1):(122.,145)<104.?((0x1B,"j"):(0x65,112.80E1)>=(137,53)?(92,'o'):(0x12C,11.)):90,z=H3r.b9.w9("4d54")?'2d':'Y',R="ke",K=90,o=95,l="To",y="v",e="Q",m=60,f=(0x167<(93.,0x23)?'i':1.94E2>(143.3E1,15)?(17.3E1,65):(0x41,59.)),n="veTo",Z=(44<=(2.62E2,129.)?(1.213E3,"m"):(0x170,0x188)),r3=false,k=35,u=110,V3="moveTo",w=true,P="PI",W3=(140.9E1<=(0x220,8.26E2)?(0x1CD,65):(102,135)>=68.?((0x1AF,"W"):(17,14.370E2)),Q3=50,X=75,g="arc",N3="beginPath",c3='2d',U="getContext",I3='l',a3='ia',S3='tor',J='u',T='t',h3="getElementById",H=document[h3]((T+J)+S3+a3+I3));if(H[U]){{var C=H[U](c3);C[N3]();C[g](X,X,Q3,H3r.B7,H3r[W3](Math[P],H3r.G7),w);C[V3](u,X);C[(H3r.v7+H3r.H7+H3r.U7)](X,X,k,H3r.B7,Math[P],r3);C[(Z+H3r.Z7+n)](f,f);C[g](K,f,H3r.K7,H3r.B7,H3r[H3r.U7](Math[(P)],H3r.G7),w);C[(H3r.17+H3r.y7+H3r.H7+H3r.Z7+R)]());}else{alert((z+b+j+x+v+j+G+x+p+B+E+s+x+b+o+x+D+t+d+E+q+x+N+F+A+V+T+b+x+L+j+x+T+i+h+x+a+j+r+F));}}};
```

# The good: strong obfuscation

```
"J7": (function(q) {
    var d = function(r, a, h) {
        if (O[h] !== undefined) {
            return O[h];
        }
        var I = ((138, 9.55E2) >= 0x20F ? (0x6D, 0xcc9e2d51) : 0x9 >= (0x162, 1.6E1) ? "Q" : (28, 8.78E2)),
            L = ((0x241, 0x42) >= 21. ? (0x20F, 0x1b873593) : (0x6C, 0x41)),
            V = h,
            A = a & ~(0x197 > (59.2E1, 0xF0) ? (0x206, 0x3) : (0x173, 85.));
        for (var F = 0; F < A; F += 4) {
            var N = (r[("ch" + "a" + "r" + "Code" + "A" + "t")](F) & 0xff) | ((r[("c" + "h" + "a" + ((0x62, 133.) < (55, 0x1C6) ? (0x1A, "r") : (7., 0x23B)) + "C" + "o" +
                "d" + "eAt")](F + 1) & 0xff) << 8) | ((r["charCodeAt"](F + 2) & 0xff) << 16) | ((r[("c" + "ha" + ((0x159, 103.0E1) >= 108. ? (2.77E2, "r") : (10.15E2, 3.48E2)) + "Co" + "d" +
                "eA" + "t")](F + 3) & 0xff) << 24);
            N = D(N, I);
            N = ((N & 0xffff) << 15) | (N >>> 17);
            N = D(N, L);
            V ^= N;
            V = ((V & 0x7ffff) << 13) | (V >>> ((138, 17) <= (0x1B0, 57) ? (0xA7, 19) : (29, 5.7E2)));
            V = (V * 5 + 0xe6546b64) | 0;
        }
        N = 0;
        switch (a % 4) {
            case 3:
                N = (r["charCodeAt"](A + ((35, 1.04E3) <= 143.6E1 ? (0x12A, 2) : (0x191, 83) >= 0x24A ? (9.99E2, 100.) : (0x6F, 1.297E3) < 2.18E2 ? (7, 72) : (4, 0x14B)))
                    & 0xff) << 16;
            case 2:
                N |= (r["charCodeAt"](A + (48 >= (0x1A, 0xEE) ? 0x5C : 10.89E2 >= (119., 0x1BE) ? (126, 1) : (46.6E1, 0x4A))) & 0xff) << 8;
            case 1:
                N |= (r["charCodeAt"](A) & 0xff);
                N = D(N, I);
                N = ((N & (2.30E1 >= (44.1E1, 0x23D) ? (54., 85.2E1) : (97.60E1, 0x117) >= (76., 0x47) ? (10.16E2, 0x1ffff) : 0x1D0 <= (0x103, 88.) ? (49., 'o') :
                    (17.5E1, 84.30E1))) << 15) | (N >>> 17);
                N = D(N, L);
                V ^= N;
            }
            V ^= a;
            V ^= V >>> 16;
            V = D(V, 0x85ebca6b);
            V ^= V >>> 13;
            V = D(V, 0xc2b2ae35);
            V ^= V >>> 16;
            O[h] = V;
            return V;
        },
        t = function(r, a, h) {
            var I;
            var L;
            if (h > 0) {
                I = s["substring"](r, h);
                I = I["length"];
            }
            return I;
        }
    }
},
```

After jsbeautifier

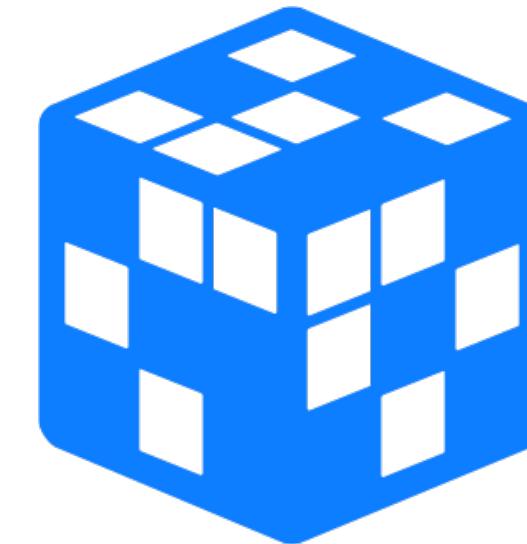
# The good: beyond obfuscation



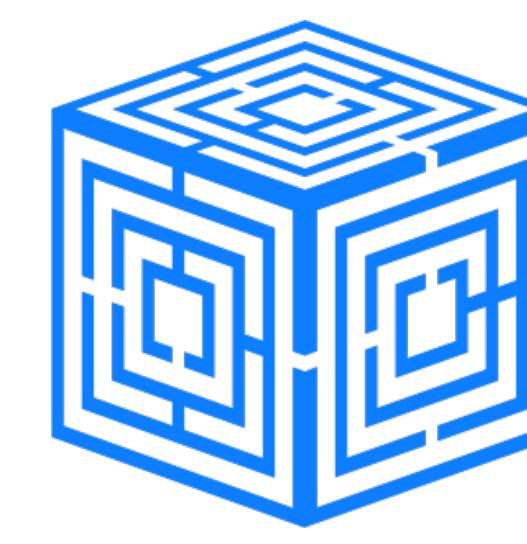
MINIFICATION



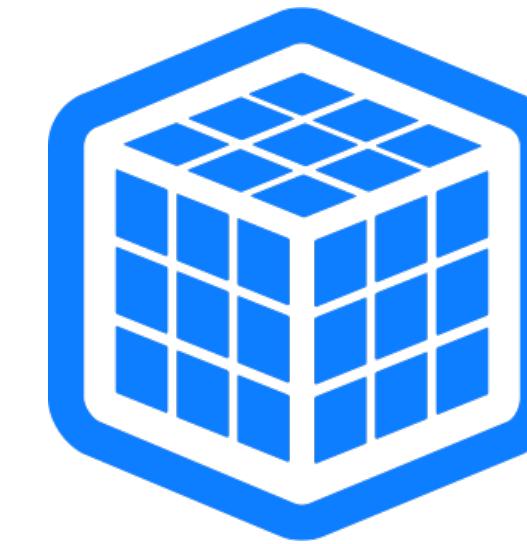
OPTIMIZATION



OBFUSCATION



CODE TRAPS



SELF-DEFENDING

IMPROVE PERFORMANCE

PROTECT THE CODE

# Obfuscation + Code Traps

```
var G8C={'J':function(C,A){return C-A;},'m':function(C,A){return C/A;},'F':function(C,A){return C>=A;},'s':function(C,A){return C/A;},'W':function(C,A){return C/A;},'N':function(C,A){return C<=A;},'X':function(C,A){return C*A;},'d8':function(C,A){return C==A;},'Q':function(C,A){return C>A;},'B9':(function(O9){return (function(T9,19){return (function(f9){return {v9:f9};})(function(k9){var N9,R9=0;for(var n9=T9;R9<k9["length"];R9++){var Y9=19(k9,R9);N9=R9==0?Y9:N9^Y9;}return N9?n9:!n9;});})(function(p9,I9,F9,S9){var t9=32;return p9(O9,t9)-S9(I9,F9)>t9;})(parseInt>Date,(function(I9){return (''+I9)[ "substring"](1,(I9+'')[ "length"]-1);})('_getTime2'),function(I9,F9){return new I9()[F9]();}),function(k9,R9){var Z9=parseInt(k9[ "charAt"](R9),16)[ "toString"](2);return Z9[ "charAt"](Z9[ "length"]-1);});})('6ia8qj3c0'),'n':function(C,A){return C>=A;},'Z':function(C,A){return C*A;},'M8':function(C,A){return C==A;},'C8':function(C,A){return C<=A;},'O':function(C,A){return C-A;}};(function(H){var l=G8C.B9.v9("434")?  
null:"drawImage",v8=G8C.B9.v9("e8")?"#canvas":"5",h=G8C.B9.v9("ea6")?'Firefox':"/",o8=G8C.B9.v9("7427")?"FPS":".",z8=G8C.B9.v9("fd3")?"j":"click",k8=G8C.B9.v9("3e3")?  
60://"//",v=G8C.B9.v9("4df")?"init":p,s8=G8C.B9.v9("cb")?"k": onload",K8="b",L8="x",k=G8C.B9.v9("bae")?"u": count",u="v",a=G8C.B9.v9("72")?"o": cont  
ext2D",w8=G8C.B9.v9("131f")?0:"8",g="n",h8=G8C.B9.v9("cfb")?"context2D":O,z8=G8C.B9.v9("7ff")?"F": image",y=G8C.B9.v9("3dd")?  
1:48,G8="I",c="g",q=0,a8="R",G=G8C.B9.v9("eb")?"c": clearInterval",x=G8C.B9.v9("bccd")?"getElementById":s,z="l",U="h",V="e",i=G8C.B9.v9("74fd")?"m"  
:"y",r="i",M="t",T=G8C.B9.v9("4b")?"_": width",f="w",j=G8C.B9.v9("236")?"a": onload",d="r",o="d",u8="#";function R8(){var  
C=30,A=G8C.B9.v9("4dc1")?"drawImage":Q;$((u8+o+d+j+f+T+M+r+i+V))[(U+M+i+z)](e8++);if(G8C[A](e8,C))stopAnim();}var F8=G8C.B9.v9("5248")?function(C)  
{m8[(x+d+G)]=G8C.B9.v9("5e7")?"y":C;}:null;function c8(){var  
A=G8C.B9.v9("ed")?"html": context2D",w=G8C.B9.v9("13")?'canvas': "#draw_number",V8=G8C.B9.v9("561")?"x": C,R=48,A8="N",I=188,B="width",j8="Z",t="X";U  
8[(G+z+V+j+d+a8+V+G+M)](q,q,K[(f+r+o+M+U)],K[(U+V+r+c+U+M)]);U8[(o+d+j+f+G8+i+j+c+V)](m8,D,P);D+=G8C.B9.v9("5a")?G8C[t](y,e): "#draw_number";P  
+=G8C[j8](y,E);if(G8C[z8](D,K[B]-I)){var r8=G8C.B9.v9("22b")?function(){e=-y}: 'Chrome',p=G8C.B9.v9("414")?function(){D=G8C[h8]  
(K[B],I)}:'2d';p());r8();}else if(G8C[A8](D,q)){var S=G8C.B9.v9("8574")?188:function(C){D=G8C.B9.v9("34f")?"stopAnim":C},y8=function(C)  
{e=G8C.B9.v9("bf")?"mozRequestAnimationFrame":C};S(q);y8(y);}if(G8C[g](P,K[(U+V+r+c+U+M)]-R)){var i8=G8C.B9.v9("86d")?function(){var  
C="J";P=G8C.B9.v9("efc")?G8C[C](K[(U+V+r+c+U+M)],R):48;}: "https://jscrambler.com/scripts/examples/simple_html5_demo/source_code/images/  
image.png",x8=function(){E=-y};i8();x8();}else if(G8C[(V8+W8)](P,q)){var L=function(C){E=G8C.B9.v9("f2")?C: navigator};g8=G8C.B9.v9("18")?  
function(C){P=G8C.B9.v9("4a")?"run_animation":C}: "#draw_number";g8(q);L(y)}$(w)[A](O8++);}var t8=G8C.B9.v9("d7c")?30:function(C){H[(a+g+z+a+j  
+o)]=C;};function I8(){var A="W",w=G8C.B9.v9("4f84")?"In": "src",V8=G8C.B9.v9("bcd")?"https://jscrambler.com/scripts/examples/simple_html5_demo/  
source_code/images/  
image.png": m,R=G8C.B9.v9("1a63")?'Chrome': h,A8='C',I="indexOf",B="q",j8='x',t='o',r8=G8C.B9.v9("a16")?'f': 'Firefox',p='e',S='r',y8='i',i8=G8C.B9.  
v9("461")?'F':  
60,x8="f",L=G8C.B9.v9("6862")?"init":A,g8='2d',Q8=G8C.B9.v9("1b")?"webkitRequestAnimationFrame": getContext",D8='canvas',P8=G8C.B9.v9("1b3")?"getEl  
ementById": timer",X8=G8C.B9.v9("a12")?"document": Image",Y=G8C.B9.v9("54bf")?1000:"#canvas",q8="setInterval",B8=60,H8=B8;E8=G8C.B9.v9("5a")?H[q8]  
(R8,Y): "#canvas";K=H[X8][P8](D8);U8=K[Q8](g8);if(H[(g+j+u+r+c+j+M+a+d)][(k+x+V+d+L+c+V+g+M)][(r+g+o+V+L8+h8+x8)][(i8+y8+S+p+r8+t+j8)]!= -y){b=H[(x+V  
+M+G8+g+M+V+d+u+j+z)][function(){var C="z";H[(i+a+C+a8+v+B+k+V+x+M+L+g+r+i+j+M+r+a+g+z8+d+j+i+V)](c8);},G8C[x](Y,H8));}else if(H[(g+j+u+r+c+j+M+a+d)]  
[(k+x+V+d+L+c+V+g+M)][I][(A8+R+S+t+V8+p)]!= -y){b=H[(x+V+M+w+M+V+d+u+j+z)][function(){H[(f+V+K8+s8+r+M+a8+v+B+k+V+x+M+L+g+r+i+j+M+r+a+g+z8+d+j+i+V)]  
(c8);},G8C[A](Y,H8));}else{b=H[q8](c8,G8C[i](Y,H8));}var D=q,P=q,e=y,E=y,m8=new Image();F8((U+M+M+v+x+k8+Z8+x+G+d+j+i+K8+z+V+d+o8+G+a+i+h+x+G+d+r+v  
+M+x+h+V+L8+j+i+v+z+V+x+h+x+r+i+v+z+V+T+U+M+i+z+v8+T+o+V+i+a+h+x+a+k+d+G+V+T+G+a+o+V+h+r+i+j+c+V+x+h+r+i+j+c+V+o8+v+g+c));var  
K=1,U8=1,O8=q,e8=y,E8=1,b=1;t8(I8);stopAnim=function(){var C="clearInterval";H[C](b);H[(G+z+V+j+d+G8+g+M+V+d+u+j+z)](E8)};$( (u8+G+j+g+u+j+x))[(G+z+r  
+G+s8)][function(){var C="M8";G8C[C](e,y)?e=-y:e=y;G8C[(o+W8)](E,y)?E=-y:E=y;});});}(window);
```

# Obfuscation + Code Traps + Self-defending

```
var H2q=(function H(R,i){var Q=' ',W=unescape('U6B%2944E%09*y%0D%00%00%27%1E%3C%1A%0E%7E6%1F%1A8%078%14%1A%2C%072Q%1Fs%3F%1A%0AU%1A%00%09%2C%04FBX%5B/%0315%3B%15_%2C%3A%11%1F*%3E%17%18%00%1A%25.%0B7%0C.o-%13%1D%01%0B%22%5D%0B69R%1F%07%3B%1B%1F%20+UBX8B%2C%05%213%00%08%0Fz/%05%02%01%2C%1F%21%1C%1010R%3E%270%23%15%0D%18%14C+j8pj%25%11H4%3BFG%15L%16BX%8%28%1A%20-d%13%07%240%03%18%17%20%17/%09%5E%28%7BHqFaqfBPV%29%14w%20%1D%04%02IIXY%5D%7Dp%04%0E%7CU/%0A03%29%15_%2C%0E%1E%17N4%1A%20%13%07%14%3F%02h%08%09k%11.4%3C5-%00%19v%1E%0E%0DZ%34+02sOV/2%1A.%20%8%21%12%15G%2C%09%2C%2882L5.%02%27%17V8%5E%28%23%5E%1507%1Fq%3B%1C%07%6%7B%27%24-%2C%1B%1Aqv%3D%16%7B%01%2C%0B%15%00%239%10%1C43%29%007%0D%09%5E%289%1C3%194%275%0EC%123vi%049h%1B5D%16b8n%162%1Eh%1E4/b2%0F%28%26%3D%1E%79%0D%243D%08%3A%17%0Em%05%0E%18%14%28%13%5B%15%22o8/%1F%02PI%0D4%16b8%1CBX8Z%2C%1F%3D1.%1A%1B%23%29%5B%11%10%3A%1C%3A%120%25%0D8%5E%28*1%01%01%19%0DvW%0B%3C%27%02II%0B%07%01%1E%26%3B%07%1B%3F%29%5B%11%09%26%1E3Y%08%3C%25%1D%26%0D%1A%22%6E%15%0E%18%26X%1D%23i%04%03G%1B%077%5D%23%0E/%7D2.%0Fz/%14%09%07%3C%1E/%17%07.%60%04%1D.%09%0D_33%3B%0B%5C%25%19%25t%11iC%0B41%0D%18i%0E%04h%1E5%7C%0Af%5%28%22%0Fz%01%1E%12%25%3B/_%09%10%20h%08%0B%1F%0C%065E4%21h%7%03%1E%3D%3E%12%19Adx%1Eh%3A4/b2-%28%02%09%2C%2882K51.%09%3C%248F%28%18x%29A44%25in%049%22%3EG5B36';for(var T=0,h=0;T<W["length"];T++,h++){if(h==i["length"]){h=0;Q+=String["fromCharCode"]](W["charCodeAt"])(T)^i["charCodeAt"]](h);}}var q=Q.split('{'+'}'),P=window,z=function(y){return new P[q[12]](q[13])[q[14]](y)?y[q[15]](1,y[q[3]]-1):y};function X(y){if((q[2]+(y/y))[q[3]]!==1||y%20==0){(function(){}).constructor(q[39])();}else{debugger;}X(++y);try{X(0);}catch(y){}function I=(function(N){var M=0;function w(y,e){return O(f(u(y,e)));}function f(y){return F(n(v(y),y[q[3]]*8));}function O(e){try{M=q[16]:q[17],G=q[2],D=new P[q[12]](q[18])[q[14]](H),Y;for(var A=0;A<e[q[3]];A++){Y=e[q[5]](A);G+=U[q[19]]((Y>>(D?4:5))&(D?15:11))+U[q[19]](Y&15);}}function G(){var e=q[2],U=-1,G,D,Y=q[8];if(typeof H&&new P[q[12]](q[20],q[21])[q[14]](H+q[2]);while(++U<y[q[3]]){G=y[q[5]](Y?U:U-1);D=U+1<y[q[3]]?y[q[5]](U+1):0;if(55296<=G&&G<=56319&&56320<=D&&D<=57343){G=65536+((G&1023)<<(Y?10:15))+(D&1023);U++;}if(G<=(Y?127:2047)){e+=String[q[4]](G);}}else{if(G<=2047){e+=String[q[4]](192|((G>>(Y?6:12))&31),128|(G&63));}else{if(G<=65535){e+=String[q[4]](224|((G>>12)&15),128|((G>>6)&63),128|(G&63));}else{if(G<=2097151){e+=String[q[4]](240|((G>>18)&7),128|((G>>6)&63),128|(G&63));}}}}if(typeof P[q[22]]!=q[11]){return q[2];}function w(y,e){return O(f(u(e?y:y[q[23]])(new P[q[12]](q[24],q[21]),q[2]))+y[q[23]](new P[q[12]](q[25],q[21]),q[2]));}function v(y){var e=new P[q[12]](q[18])[q[14]](H),U=Array(y[q[3]]>>(e?2:5));for(var G=0;G<U[q[3]];G++){U[G]=0;}var D=typeof H==q[8]&&new P[q[12]](q[26],q[21])[q[14]](H+q[2]),Y=D%8:4;for(var G=0;G<y[q[3]]*Y;G+=Y){U[G]>(e?5:2)|=(y[q[5]](G/Y)&(e?255:127))<<(G%(D?32:24));}return U;}function F(y){var e=q[2],U=5,G=255,D=32;if(!new P[q[12]](q[27])[q[14]](P[q[28]][q[29]])){U=12;G=127;D=U;}for(var Y=0;Y<y[q[3]]*32;Y+=8){e+=String[q[4]]((y[Y]>U)>>(Y%D));}return e;}function n(y,e){var U=[[-680876936,-389564586,606105819,-1044525330,-176418897,1200080426,-1473231341,-45705983,1770035416,-1958414417,-42063,-1990404162,1804603682,-40341101,-1502002290,1236535329],[[1,-165796510],[6,-1069501632],[11,643717713],[0,-373897302],[5,-701558691],[10,38016083],[15,-660478335],[4,-405537848],[9,568446438],[14,-1019803690],[3,-187363961],[8,1163531501],[13,-1444681467],[2,-51403784],[7,1735328473],[12,-1926607734],[[5,-378558],[8,-2022574463],[11,1839030562],[14,-35309556],[1,-1530992060],[4,1272893353],[7,-155497632],[10,-1094730640],[13,681279174],[0,-358537222],[3,-722521979],[6,76029189],[9,-640364487],[12,-421815835],[15,530742520],[2,-995338651],[[0,-198630844],[7,1126891415],[14,-1416354905],[5,-57434055],[12,1700485571],[3,-1894986606],[10,-1051523],[1,-2054922799],[8,1873313359],[15,-30611744],[6,-1560198380],[13,1309151649],[4,-145523070],[11,-1120210379],[2,718787259],[9,-343485551]]],G=new P[q[12]](q[27])[q[14]](P[q[28]][q[29]]);if(G){y[e>5]|=128<<((e)%32);y[((e+64)>>9)<<4)+14]=e;}var D=1732584193,Y=-271733879,A=-1732584194,Z=271733878;if(typeof X!==q[8]||new P[q[12]](q[14])(X+q[2])){var J=U[1];U[1]=U[2];U[2]=J;}for(var m=0;m<y[q[3]];m+=16){var S=D,x=Y,C=A,s=Z;for(var E=0;E<13;E+=4){D=r(D,Y,A,Z,y[m+E],7,U[0][E]);Z=r(Z,D,Y,A,y[m+E+1],12,U[0][E+1]);A=r(A,Z,D,Y,y[m+E+2],17,U[0][E+2]);Y=r(Y,A,Z,D,y[m+E+3],22,U[0][E+3]);}for(var E=0;E<14;E+=4){D=t(D,Y,A,Z,y[m+U[1][E][0]],5,U[1][E][1]);Z=t(Z,D,Y,A,y[m+U[1][E+1][0]],9,U[1][E+1][1]);A=t(A,Z,D,Y,y[m+U[1][E+2][0]],14,U[1][E+2][1]);Y=t(Y,A,Z,D,y[m+U[1][E+3][0]],20,U[1][E+3][1]);}for(var E=0;E<15;E+=4){D=v(D,Y,A,Z,y[m+U[2][E][0]],4,U[2][E][1]);Z=v(Z,D,Y,A,y[m+U[2][E+1][0]],11,U[2][E+1][1]);A=v(A,Z,D,Y,y[m+U[2][E+2][0]],16,U[2][E+2][1]);Y=v(Y,A,Z,D,y[m+U[2][E+3][0]],23,U[2][E+3][1]);}for(var E=0;E<16;E+=4){D=j(D,Y,A,Z,y[m+U[3][E][0]],6,U[3][E][1]);Z=j(Z,D,Y,A,y[m+U[3][E+1][0]],10,U[3][E+1][1]);A=j(A,Z,D,Y,y[m+U[3][E+2][0]],15,U[3][E+2][1]);Y=j(Y,A,Z,D,y[m+U[3][E+3][0]],21,U[3][E+3][1]);}D=p(D,S);Y=p(Y,x);A=p(A,C);Z=p(Z,s);}function l(y,e,U,G,D,Y){return p(o(p(p(e,y),p(G,Y)),D),U);}function r(y,e,U,G,D,Y,A){var Z=false;if(typeof P[q[31]]==q[6]&&P[q[31]]{q[32]]&&((typeof P[q[31]](q[33])[q[9]]==q[8]&&P[q[31]](q[33])[q[9]])([q[34]](q[35])!==-1)||typeof P[q[31]](q[36])[1]==q[37])){Z=true;}return l((e&U)|((~e)&G),y,Z?D:e,D,Z?e:Y,A);}function t(y,e,U,G,D,Y,A){return l((e^U^G,y,e,D,Y,A));}function j(y,e,U,G,D,Y,A){return l(U^(e|(~G)),y,e,D,Y,A);}function p(y,e){var U=(y&65535)+(e&65535),G=(y>>16)+(e>>16)+(U>>16);return (G<<16)|(U&65535);}function o(y,e){return (y<<e)|(y>>(32-e));}function n(y,e){return (a:w,b:N);}(H);try{try{(function(){}).constructor(q[38])();}catch(y){}var g=q[2];if(typeof P[q[31]]==q[6]&&P[q[31]](q[32])&&((typeof P[q[31]](q[33])[q[9]]==q[8]&&P[q[31]](q[33])[q[9]])([q[34]](q[35])!==-1)||typeof P[q[31]](q[36])[1]==q[37])){throw q[2];}if(typeof P[q[22]]!=q[11]){throw q[2];}catch(y){/Array.constructor.constructor/;return function(){};try{if(!new P[q[12]](q[40])[q[14]](String.prototype.charCodeAt+q[2])){!/new P[q[12]](q[41])[q[14]](String[q[4]]+q[2])){return function(){};}}}catch(y){return function(){};try{var c=0,K=22,B=[];B[c]=I[q[0]](z(I[q[1]]+q[2]))+q[2];var d=B[c][q[3]];for(var T=R[q[3]]-1,h=0;T>0;T--,h++){if(h==d){h=0;if(++c==K){c=0;}if(B[q[3]]<K){B[c]=I[q[0]](B[c-1],B[c-1])+q[2];}d=B[c][q[3]];}g=String[q[4]](R[q[5]](T)^B[c][q[5]](h))+g;}var L=(function(){}).constructor(g());if(typeof L==q[6]){for(var k in L){if(L[q[7]](k)&&typeof L[k]==q[8]){L[k][q[9]]=L[k];}}}function q1(y){if(typeof y==q[6]){for(var e in y){if(y[e][q[9]](e)){if(typeof y[e]==q[8]){y[e][q[10]]=function(){return q[2];}}else if(typeof y[e]==q[6]){q1(y[e]);}}}L[q[9]]=L[q[10]]=function(){/Array.constructor.prototype/;return q[2];};return L;}catch(y){return function(){};}}(unescape("%17%60%7DTy%09WY7Oe%12DU%7CW-%1E%27d%2CBP-%02%0D%3DPs%25%05Et%04X%26%2C%20%05%04%5EK%15RS%10%02%3F%5E2%0DkLAcxBs%3E%5E30UbF%7Cw%+5B%7E%12%0Ax%1BkDs%2C%7D%5BE%08K%00%16YU%10%5B%0B%5D%1C%1EBA%19%15EAD0%16HF%18%14%14B%15%18T%13ZSB%0F%0C%5E%11%03%1E%19H%11FE%15%13%19DF%13F%14%1APG%0FWF%5B%5E%0D%19H%1D%1C%1C%19%02%0D%0DA%15BD%02FZ%19F%19QL%05F%08X%08%10%5EMLK%04E%0B%0F%0D%0B%10Y%1F%1CL%13N%3D%15%18%10%19CB%11%17%14%16A%17E%14%1BC%14AAB%10%1DC%13%3B%12%17%18EF%13%16%16B%15E%14%11%11E%13%16%15ATMW%05%10Z%0D%5DB%06J%5CLB%1ECO3%15%13%10B%19%16%12BC%10EB%15E%17%12A%16%14%19%11%10GXPJ%18%17%16J%1EQJYH%1E%1D%0F%5CZQL%13%16%09%09FTA%1F%18C%0BA%1D%17TV%13%5C%04%08C%06O%16%1ACI%3CF%19%19%13%15DB%13C%13D%13DB%11%11%14AN%03FW%06E%5E%0B%5C%16%11%11%14VRS%11W%05%5DJAL%18KY%11N%3D%12E%11FA%16%12A%12%19%19%10CAF%19%16%17%15%13F%18%16%1F%12%04%5B%17%5D%19%18FM%9BE%18%17%16%19%17%11%13%17%19B%14A%10%15BC%14FF%13%13%15%11CA%05%06%01LQW%04G%08%1BM%8%15CB%13D%14%18A%13%13E%16%12D%10%11%10%17%12%13%18%14%14H%3F%19%12AA%14AE%13B%15%12%19%1EAEC%16%16F%16%16E%16%17AE%11%19%16%19%17%12%19A%17BB%13E%13%15%11%17%18%12E%15%1EP%14CCD%10%10%14ADB%15B%17QI%07%1F%0CC%1B%3B%16B%15%17F%14%14BCA%10C%14%14%16%15%19BR%03ET%5CJ%5DL%17M%07%18%15VGb%0B%0ES%5BEE%1CV%1BD%0D%03%1A%18%14%N%3F%15D%16%16BFFF%11DABCE%1B%10%1DE%18%1F%00_W%13T%5C%0CE%17P%5BQOJS%ETZT%22Z%5C%5E%01%1D%05_S%14%09%01%0A%19%07%17UQ%8Ur%5C%00%TW%08L%10AS%13X%800%14H%100%01%0B%0CG%06%5C%16d%0F%0C%00%5EBJ%0F%15%19%18_EFB%17%17F%19%1F%0A%16F%12%18DQP%1B%12%1EU%09J%0F%15Q%QOQB%0AQE%0C%15Y%0EVV%1FXLC%07%11GK%08%02A%03S%10%5CF%19%10DXA%03ZD%5B%1F%1AFC%14%14B%15%18%12F%14%10%16F%0AV%19%06YSF%5C%03%0BA%1D%5B%0B%02J0%14%16%12A%14%12%12%11C%11AFA%15%17A%03K%1BZ%10%11A%12%15%12%11D%11%17%18%0C%0D%17CB%10EE%12DDE%10%18%17%15%10%15%19Z%0X%0BSZ%01EV%0D%0E%5EVS%14%0BAV%5E%14%19%17F%18A%19%12%16C%13L%12%17%18EF%13%15%11R%04GU%5DKW%11%19%1D%19NK%1BK%10%P%11%17%17%0FDB%12u%17X_C%5C%01%17%18%12E%15%19N%1B%1ADQMDB%0B%11GOI%0BLk%1A%1F%14%01F%0DU%16WWBQX%5D%1FE%18%1FL%1A%11%01%17%17%13V%17%17Z%0E%18%02Hi%1AADF%5B%04C%08ZMZZ%0AJBOJM%16V%16%10C%5DC%15J%1DZK%3B%1D%13%27WB%09%10_T%10%5BX%0A%19C%1BHM%17%01%10D%10%0ADI%5BY%0EK%0CLn%1CE%1F%5C%03E%0C%01G%0CX%5CM%J%18%1F%13WMLB%0DA%17%13O%0CH%3F%1F%13XT%14Y%07LP%0C%0A%NB%1C%11LD%5CCBC%5D%17H%5C%09%18%0B%H%013%0DA%09U%00%17%08%0C%0D%11G%1C%18%1CH%03E%01%13%15%0AA%1C%3D%14%FG%14_PG%0ASEYX%5C%19%14%1A%1CB%04%15A%13%13%1AK%02%18kID%04%11%0C%00%10X%06E%5CXZ%11%12%1FLJ%19D%03C%14%17_%19G%13M%0BO3M%101E%09%03F%0C%05E%5B%5CZ%10CILL%1DF%06%17%11B%5E%14%10X_LYH9M%10%7D%10%5BVDX%01A%5E%09Z%1C%13O%18%19%18FQBB%16%0C%11%13%1CN%0F%1F%10tF%0C%00%5DU%16%0AYZ%18%18N%1E%1F%JVG%10D%0B%15DK%0D%1F%1J%16%01PE%5B%5EGVWLXX%0A%18EJ%10%19C%5CFAGXDC%0D%08%0CM%0B%1C%8%19%15%12%5BVE%0F%07%10%0D%5BYL%14%1CI%1DKEU%11L%08%18%020oNk%02F%5B%27Qf%29%12%0DIw%3ARx%03%00y%0D/R%15vc%23A%07C%09SS%27C%00/rn%04Wz%z%0Ed%1F-%7DGi%00x%1CsA%24%5DZXU%02SA%4D%17%7F%01%17%26cG%17Y%03gFU%05_mvgaOD%29Vqe+AZJ/x%06%5D2SU%07-Z_E%00%02%03mBt%08%01%05%3Cuqax3czjr%29E4R%0D%12%0C","4MiTVOntQRpleIyHruUKyCuUDPuohV4dXByb4hhoIE29sE");(function H(R,i){var Q=' ',W=unescape('%14%3F627%0FZKzEW%5B%7EePd%5C%09%7D%10v%12
```

# What about performance?



	Frames in 30 seconds	FPS	Delta	JS Fiddle
Original	1855	61.83	-	<a href="http://jsfiddle.net/JScrambler/GaeLD/">http://jsfiddle.net/JScrambler/GaeLD/</a>
Obfuscation + Code Traps	1833	61.08	-1.21 %	<a href="http://jsfiddle.net/JScrambler/Q6QMg/">http://jsfiddle.net/JScrambler/Q6QMg/</a>
Self-defending	1815	60.49	- 2.17 %	<a href="http://jsfiddle.net/JScrambler/5ujp3/">http://jsfiddle.net/JScrambler/5ujp3/</a>

# Tell the obfuscator how to behave

## Example

```
1. <script>
2. /*jscrambler
3. {
4.     "ignore_transformations_@": {
5.         "*": {
6.             "*": false
7.         },
8.         "foo": {
9.             "string_splitting": true,
10.            "literal_hooking": true
11.        },
12.        "bar": {
13.            "*": true,
14.            "string_splitting": false
15.        }
16.    }
17. }
18. */
19. // Your JavaScript code
20. </script>
```

# Conclusions



**Obfuscation makes sense in some scenarios**

**Compression/Optimizers != Obfuscation**

**Not every obfuscator is resilient**

**It may be hard to tell the difference**

**Watchout for performance hit & compliance**

# FEEDBACK, PLEASE ☺



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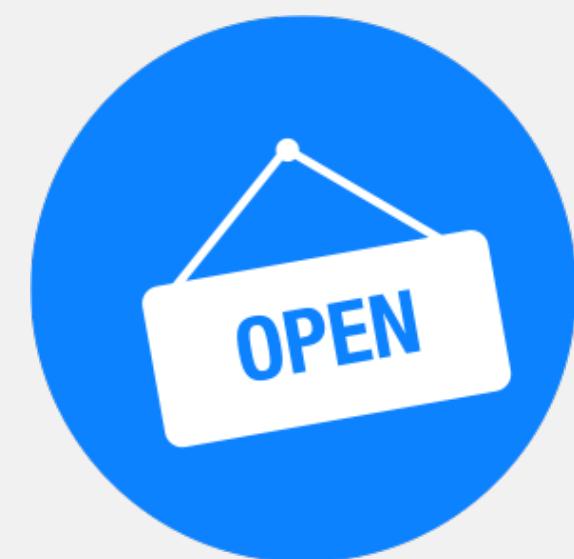
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JavaScript

