



# NoSQL, But Even Less Security

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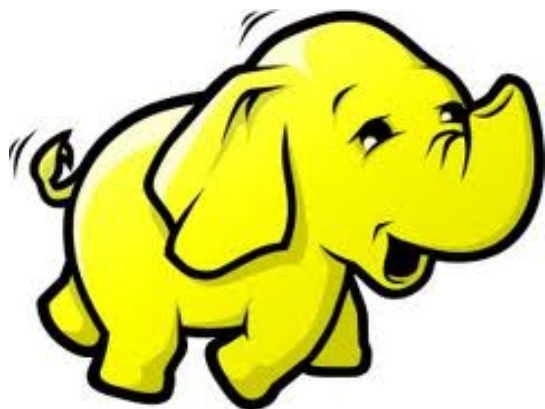


# Agenda

Eventual Consistency  
REST APIs and CSRF  
NoSQL Injection  
SSJS Injection



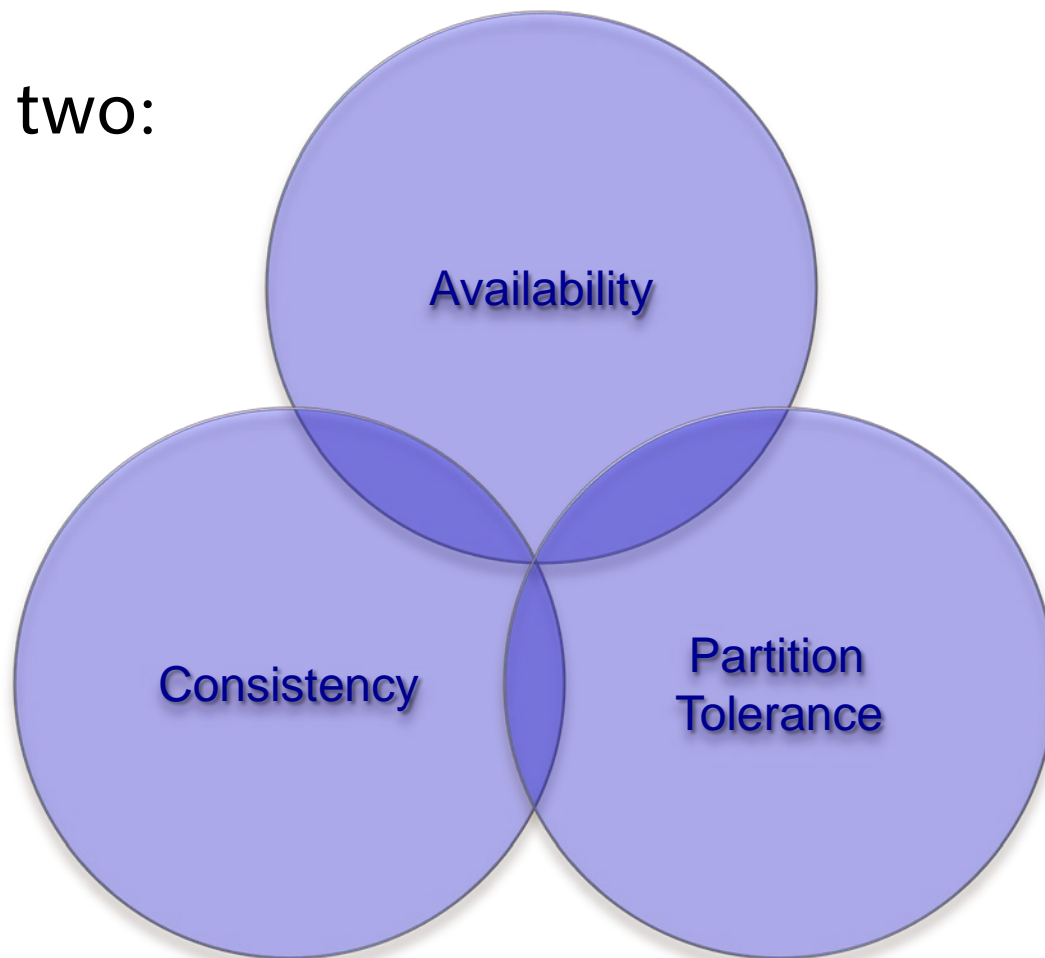
# NoSQL databases



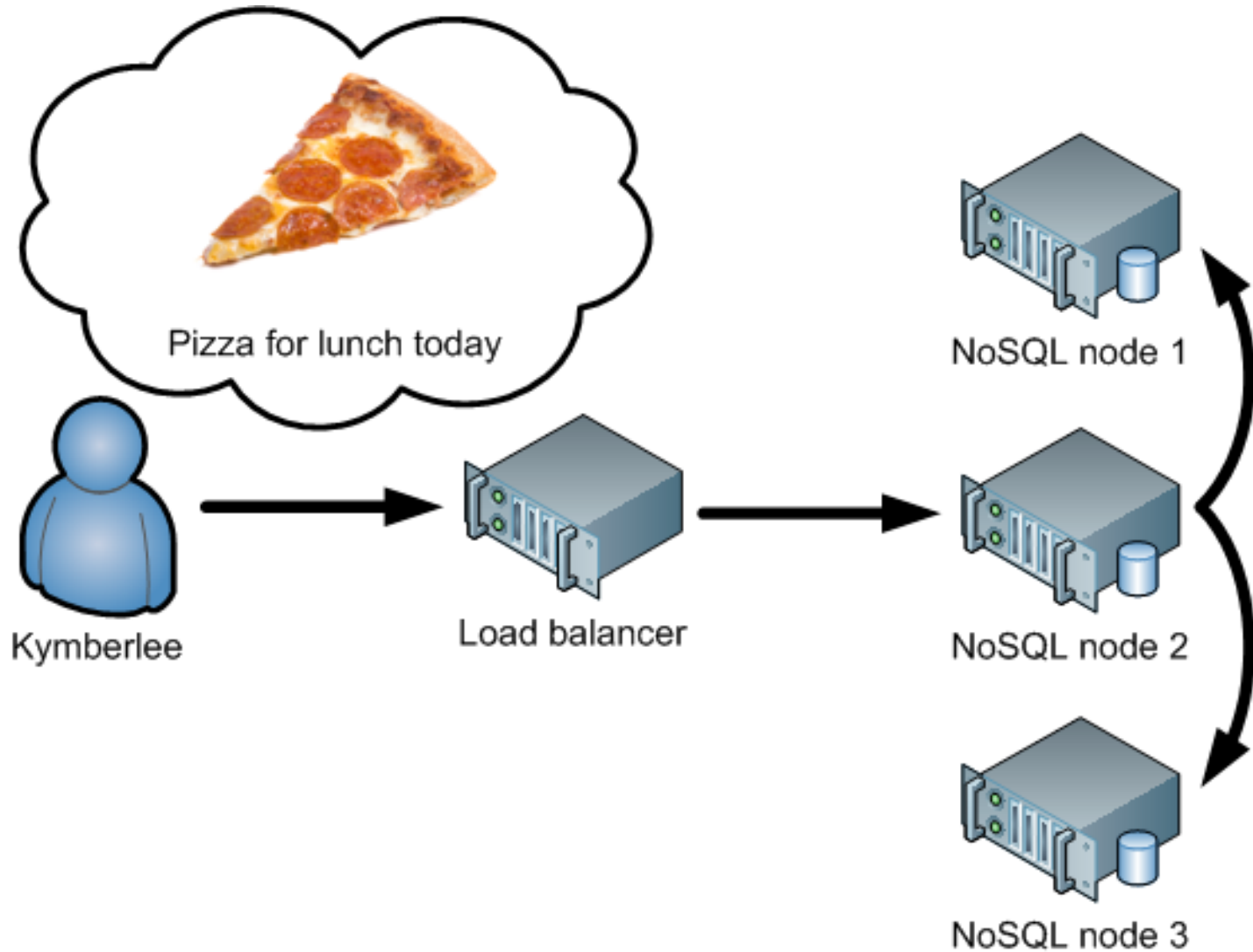


# Eric Brewer's CAP Theorem

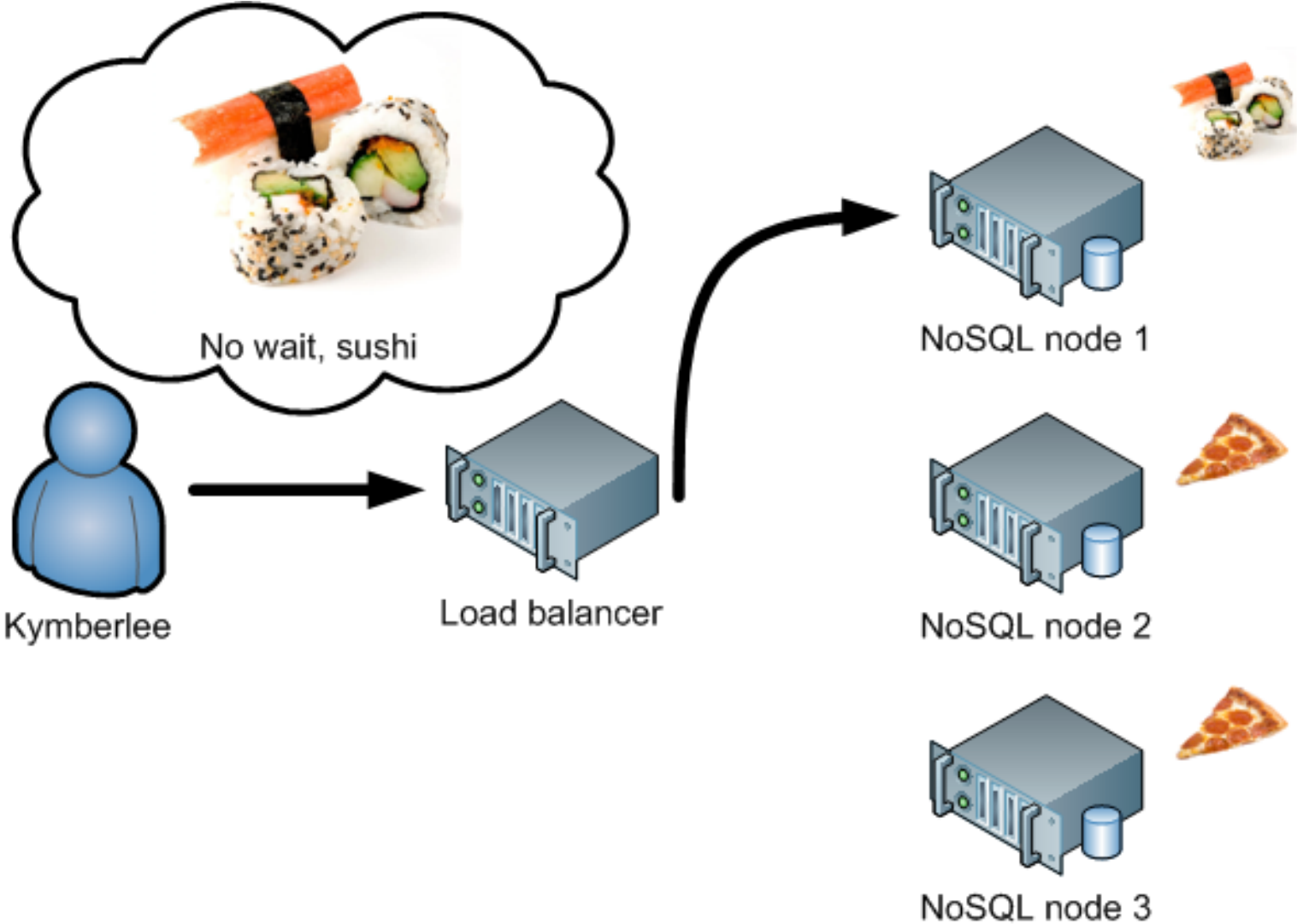
Choose any two:



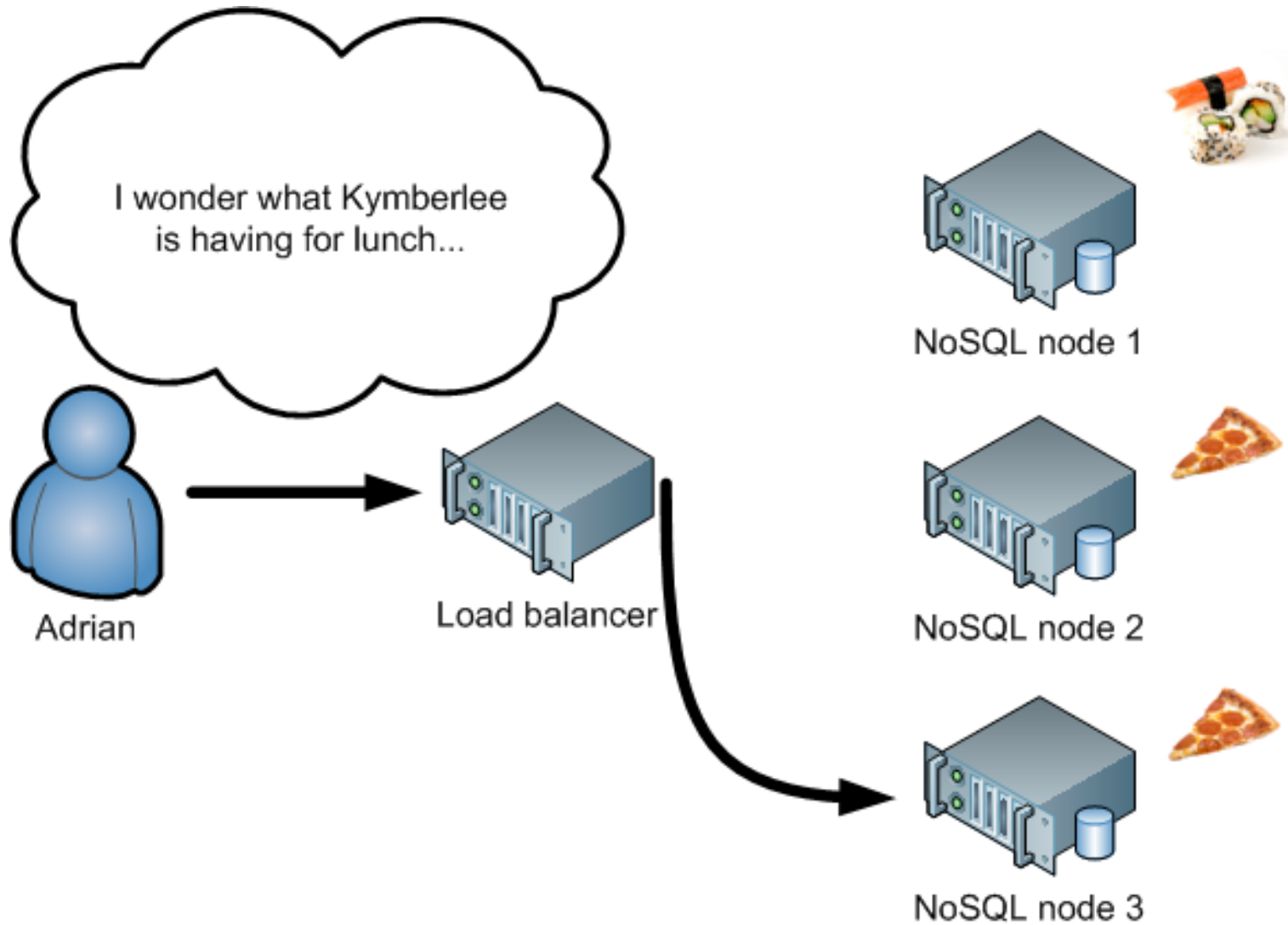
# Eventual consistency in social networking



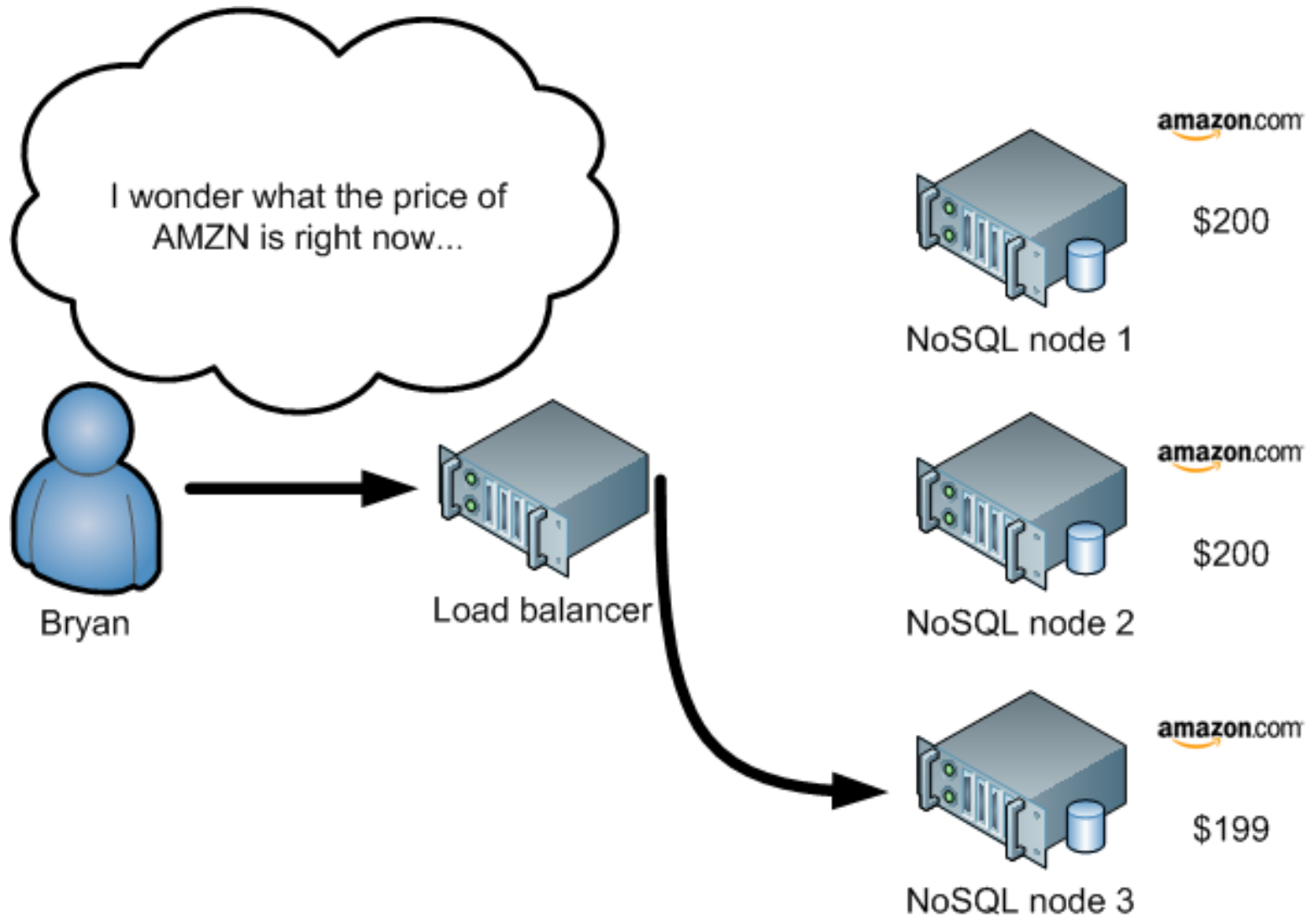
# Writes don't propagate immediately



# Reading stale data



# Reading stale data – a more serious case





# Agenda

Eventual Consistency

**REST APIs and CSRF**

NoSQL Injection

SSJS Injection

# Authentication is unsupported or discouraged

- From the MongoDB documentation
  - “One valid way to run the Mongo database is in a trusted environment, with no security and authentication”
  - This “is the default option and is recommended”
- From the Cassandra Wiki
  - “The default AllowAllAuthenticator approach is essentially pass-through”
- From CouchDB: The Definitive Guide
  - The “Admin Party”: Everyone can do everything by default
- Riak
  - No authentication or authorization support



# Port scanning

- If an attacker finds an open port, he's already won...

Database	Default Port
MongoDB	27017 28017 27080
CouchDB	5984
Hbase	9000
Cassandra	9160
Neo4j	7474
Riak	8098

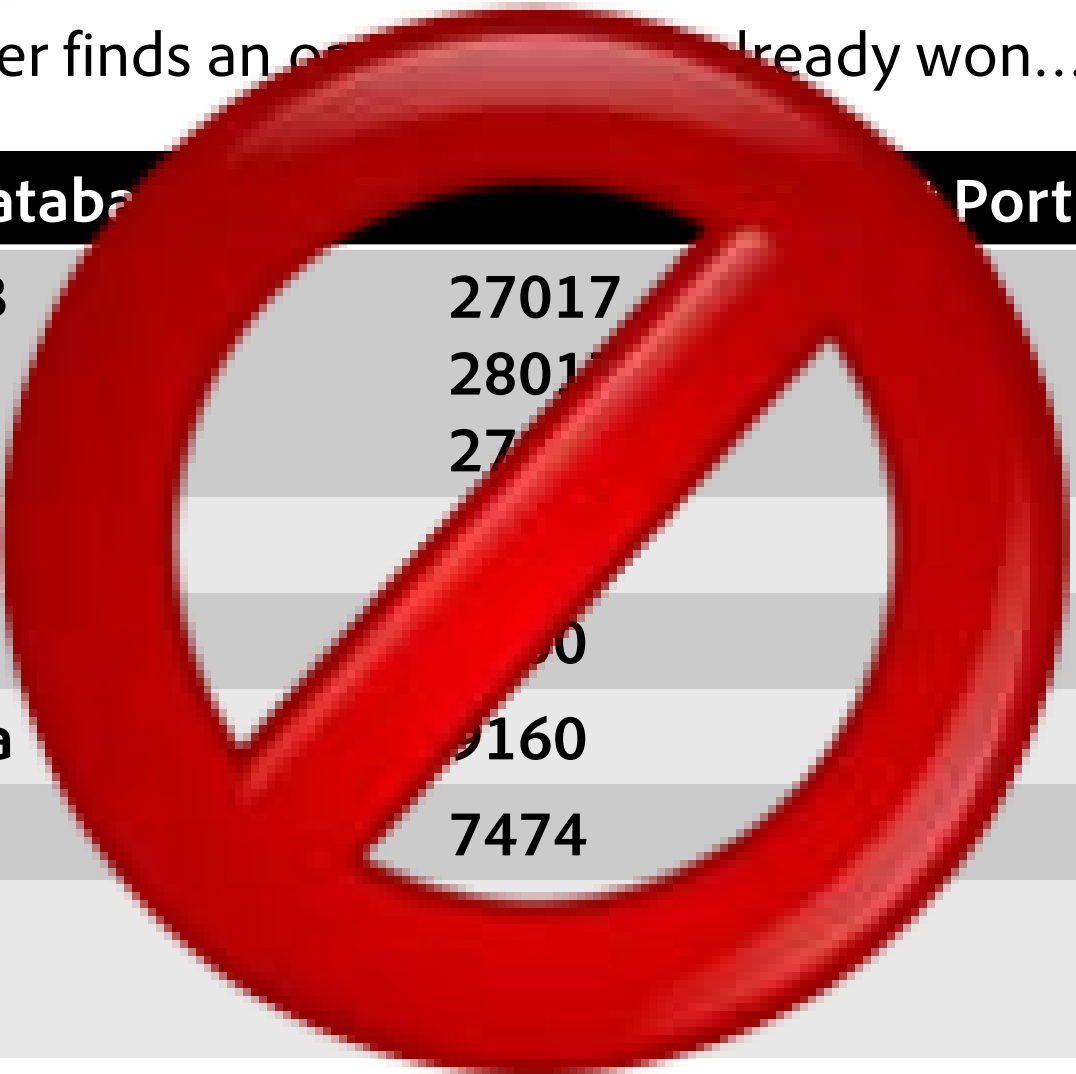
# Port Scanning Demo



# Port scanning

- If an attacker finds an open port, they've already won...

Database	Port
MongoDB	27017 28017 27020
CouchDB	
Hbase	9090
Cassandra	9160
Neo4j	7474
Riak	



- Retrieve a document

```
GET /mydb/doc_id HTTP/1.0
```

- Update a document

```
PUT /mydb/doc_id HTTP/1.0
{
  "album" : "Brothers",
  "artist" : "The Black Keys"
}
```

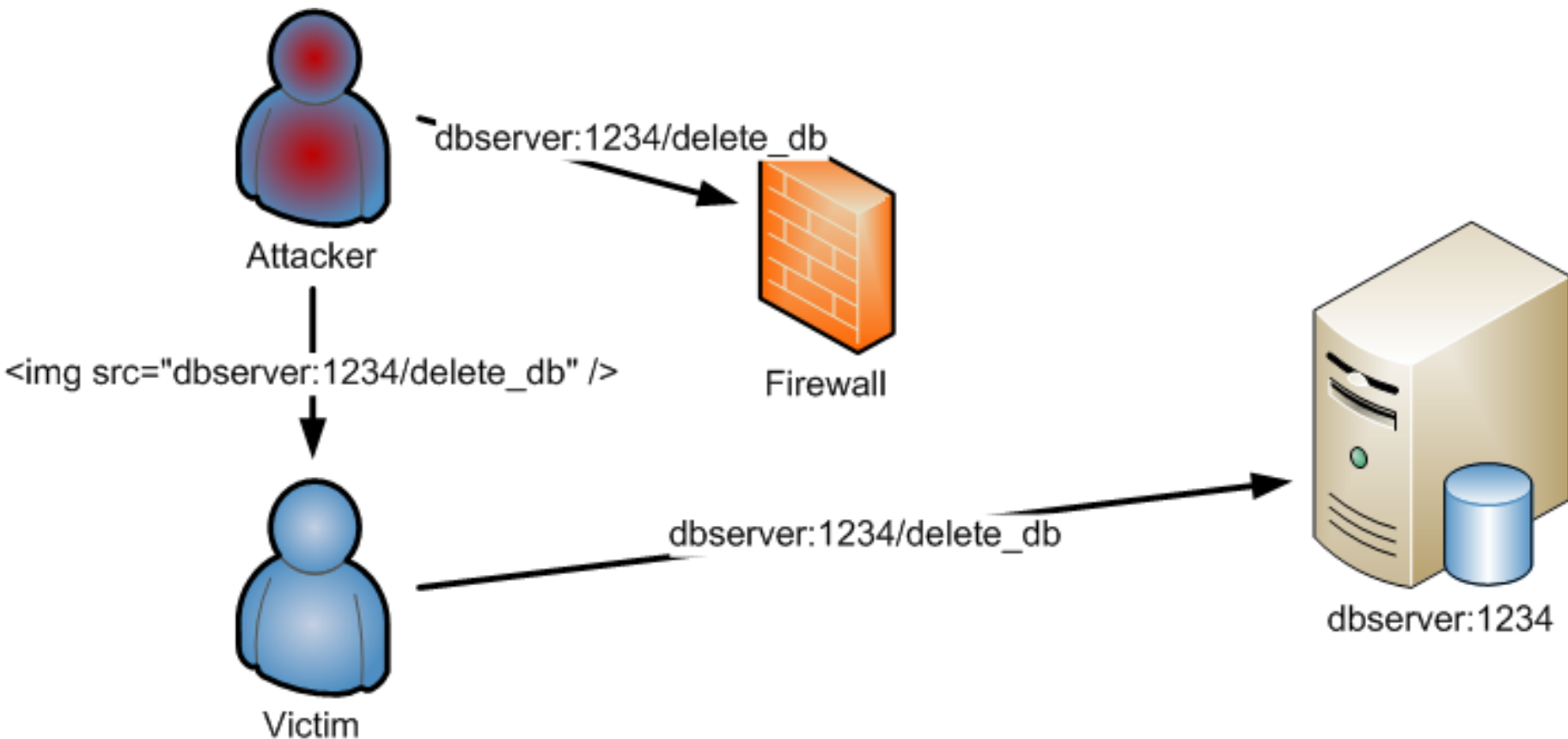
- Create a document

```
POST /mydb/ HTTP/1.0
{
  "album" : "Brothers",
  "artist" : "Black Keys"
}
```

- Delete a document

```
DELETE /mydb/doc_id?
rev=12345 HTTP/1.0
```

# Cross-Site Request Forgery (CSRF) firewall bypass



- Retrieve a document

```
GET /mydb/doc_id HTTP/1.0
```

- Update a document

```
PUT /mydb/doc_id HTTP/1.0
{
  "album" : "Brothers",
  "artist" : "The Black Keys"
}
```

- Create a document

```
POST /mydb/ HTTP/1.0
{
  "album" : "Brothers",
  "artist" : "Black Keys"
}
```

- Delete a document

```
DELETE /mydb/doc_id?
rev=12345 HTTP/1.0
```



```

```

- Easy to make a potential victim request this URL
- But it doesn't do the attacker any good
- He needs to get the data back out to himself

```
<script>
```

```
    var xhr = new XMLHttpRequest();  
    xhr.open('get', 'http://nosql:5984/_all_dbs');  
    xhr.send();
```

```
</script>
```

- Just as easy to make a potential victim request this URL
- Same-origin policy won't allow this (usually)
- Same issue for PUT and DELETE

```
<form method=post action='http://nosql:5984/db'>  
  <input type='hidden' name='{ "data" }' value="" />  
</form>  
<script>  
  // auto-submit the form  
</script>
```

- Ok by the same-origin policy!



# REST-CSRF Demo

Insert arbitrary data



Insert arbitrary script data



Execute any REST command from  
inside the firewall

# Agenda

Eventual Consistency

REST APIs and CSRF

**NoSQL Injection**

SSJS Injection



- Most developers believe they don't have to worry about things like this

“...with MongoDB we are not building queries from strings, so traditional SQL injection attacks are not a problem.”

-MongoDB Developer FAQ

- They're *mostly* correct

- MongoDB expects input in JSON array format

```
find( { 'artist' : 'The Black Keys' } )
```

- In PHP, you do this with associative arrays

```
$collection->find(array('artist' => 'The Black Keys'));
```

- This makes injection attacks difficult
- Like parameterized queries for SQL



- You also use associative arrays for query criteria

```
find( { 'album_year' : { '$gte' : 2011 } } )
```

```
find( { 'artist' : { '$ne' : 'Lady Gaga' } } )
```

- But PHP will automatically create associative arrays from querystring inputs with square brackets

```
page.php?param[foo]=bar
```

```
param == array('foo' => 'bar');
```



# NoSQL Injection Demo

- The \$where clause lets you specify script to filter results

```
find( { '$where' : 'function() { return artist == "Weezer"; } }' )
```

```
find ( '$where' : 'function() {  
    var len = artist.length;  
    for (int i=2; i<len; i++) {  
        if (len % i == 0) return false;  
    }  
    return true; }')
```



# NoSQL Injection Demo #2



# Agenda

Eventual Consistency

REST APIs and CSRF

NoSQL Injection

**SSJS Injection**

# Browser war fallout

- Browser wars have given us incredibly fast and powerful JS engines



V8



WebKit  
Nitro



SpiderMonkey  
Rhino

- Used for a lot more than just browsers
- Like NoSQL database engines...

# Server-side JavaScript injection vs. XSS

- Client-side JavaScript injection (aka XSS) is #2 on OWASP Top Ten
- Use it to steal authentication cookies
- Impersonate victim
- Create inline phishing sites
- Self-replicating webworms ie Samy
- It's really bad.
- But server-side is much worse.





# Server-Side Javascript Injection (SSJI)



# SSJI red flags

- \$where clauses
  - Built with user input
  - Injected from querystring manipulation
- eval() clauses
- Map/Reduce
- Stored views/design docs
  - More CSRF possibilities here



# Wrapping Up

1. Always use authentication/authorization.
  - Firewalls alone are not sufficient
  - Sometimes you may have to write your own auth code
  - This is unfortunate but better than the alternative
2. Be extremely careful with server-side script.
  - Validate, validate, validate
  - Escape input too

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