Codaisseur

The Secure Web

SSL, Certificates, and Hostnames

What does this mean?

🤔 Why do we need SSL?

Encrypt data sent between client and server.

🤔 Why do we need a certificate?

Am I connected to the right server?

A Certificate Says:

- Company owns the domain
- Network traffic is encrypted

🤔 Who owns reader.codaisseur.com?

Ownership

- Has the root domain (codaisseur.com)
- Manages the DNS for that root domain
- Verified by a signing authority (CA)
- CA’s are trusted by browser vendors

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Certificate

-----BEGIN CERTIFICATE-----

MIIFXjCCBEagAwIBAgIRAL4eUiD500amUEJVQyNnr38wDQYJKoZIhvcNAQELBQAw

gZAxCzAJBgNVBAYTAkdCMRswGQYDVQQIExJHcmVhdGVyIE1hbmNoZXN0ZXIxEDAO

BgNVBAcTB1NhbGZvcmQxGjAYBgNVBAoTEUNPTU9ETyBDQSBMaW1pdGVkMTYwNAYD

VQQDEy1DT01PRE8gUlNBIERvbWFpbiBWYWxpZGF0aW9uIFNIY3VyZSBTZXJ2ZXIg

Q0EwHhcNMTcwNzE4MDAwMDAwWhcNMTgwNzMxMjM1OTU5WjBfMSEwHwYDVQQLExhE

b21haW4gQ29udHJvbCBWYWxpZGF0ZWQxHTAbBgNVBAsTFFBvc2l0aXZlU1NMIFdp

....

sDx4/Q7lsTIMzt9WQeLJcJMzK9IQrQqrOmxxUx+Q6Mx1qA==

-----END CERTIFICATE-----

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Signed Certificate (by a CA)

-----BEGIN CERTIFICATE-----

MIIFXjCCBEagAwIBAgIRAL4eUiD500amUEJVQyNnr38wDQYJKoZIhvcNAQELBQAw

gZAxCzAJBgNVBAYTAkdCMRswGQYDVQQIExJHcmVhdGVyIE1hbmNoZXN0ZXIxEDAO

BgNVBAcTB1NhbGZvcmQxGjAYBgNVBAoTEUNPTU9ETyBDQSBMaW1pdGVkMTYwNAYD

VQQDEy1DT01PRE8gUlNBIERvbWFpbiBWYWxpZGF0aW9uIFNIY3VyZSBTZXJ2ZXIg

Q0EwHhcNMTcwNzE4MDAwMDAwWhcNMTgwNzMxMjM1OTU5WjBfMSEwHwYDVQQLExhE

b21haW4gQ29udHJvbCBWYWxpZGF0ZWQxHTAbBgNVBAsTFFBvc2l0aXZlU1NMIFdp

....

sDx4/Q7lsTIMzt9WQeLJcJMzK9IQrQqrOmxxUx+Q6Mx1qA==

-----END CERTIFICATE-----

-----BEGIN CERTIFICATE-----

MIIENjCCAx6gAwIBAgIBATANBgkqhkiG9w0BAQUFADBvMQswCQYDVQQGEwJTRTEU

...

-----END CERTIFICATE-----

-----BEGIN CERTIFICATE-----

MIIFdDCCBFygAwIBAgIQJ2buVutJ846r13Ci/ITeljANBgkqhkiG9w0BAQwFADBv

...

-----END CERTIFICATE-----

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Certificate “Chain”

```
-----BEGIN CERTIFICATE-----
MIIFXjCCBEagAwIBAgIRAL4eUiD500amUEJVQyNnr38wDQYJKoZIhvcNAQELBQAw
gZAxCzAJBgNVBAYTAkdCMRswGQYDVQQIExJHcmVhdGVyIE1hbmNoZXN0ZXIxEDAO
BgNVBAcTB1NhbGZvcmQxGjAYBgNVBAoTEUNPTU9ETyBDQSBMaW1pdGVkMTYwNAYD
VQQDEy1DT01PRE8gUlNBIERvbWFpbiBWYWxpZGF0aW9uIFNIY3VyZSBTZXJ2ZXIg
Q0EwHhcNMTcwNzE4MDAwMDAwWhcNMTgwNzMxMjM1OTU5WjBfMSEwHwYDVQQLExhE
b21haW4gQ29udHJvbCBWYWxpZGF0ZWQxHTAbBgNVBAsTFFBvc2l0aXZlU1NMIFdp
....
sDx4/Q7lsTIMzt9WQeLJcJMzK9IQrQqrOmxxUx+Q6Mx1qA==
-----END CERTIFICATE-----
-----BEGIN CERTIFICATE-----
MIIENjCCAx6gAwIBAgIBATANBgkqhkiG9w0BAQUFADBvMQswCQYDVQQGEwJTRTEU
...
-----END CERTIFICATE-----
-----BEGIN CERTIFICATE-----
MIIFdDCCBFygAwIBAgIQJ2buVutJ846r13Ci/ITeljANBgkqhkiG9w0BAQwFADBv
...
-----END CERTIFICATE-----
```

The certificate itself

The intermediate certificate

The root certificate

Creating a Certificate

```
openssl req -utf8 -nodes -sha256 -newkey rsa:2048 -keyout www.example.com.key -out www.example.com.csr
```

Creating a Certificate

- Create a Certificate Signing Request (CSR) and an encryption key
- Find a certificate vendor and provide the CSR
- Prove that you own the domain, entity exists, etc.
- Get a certificate
- Get the intermediate and root certificates from the vendor
- Provide your server with the certificates and the key file

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A Self-Signed Certificate

- Create a Certificate Signing Request (CSR) and an encryption key
- ~~Find a certificate vendor and provide the CSR~~
- Prove that you own the domain, entity exists, etc.
- Get a certificate
- ~~Get the intermediate and root certificates from the vendor~~
- Provide your server with the certificate~~s~~ and the key file
- **Accept that the certificate's authority is not trusted by browsers etc.**

🤔 Why would you use a self-signed certificate?

```
$ openssl \
  req -x509 \
  -newkey rsa:4096 \
  -keyout key.pem
  -out cert.pem \
  -days 365 \
  -nodes
```

🤔 Why would you NOT use a self-signed certificate?

 Use LetsEncrypt instead

Common Practice

SSL Termination

Here is a typical setup

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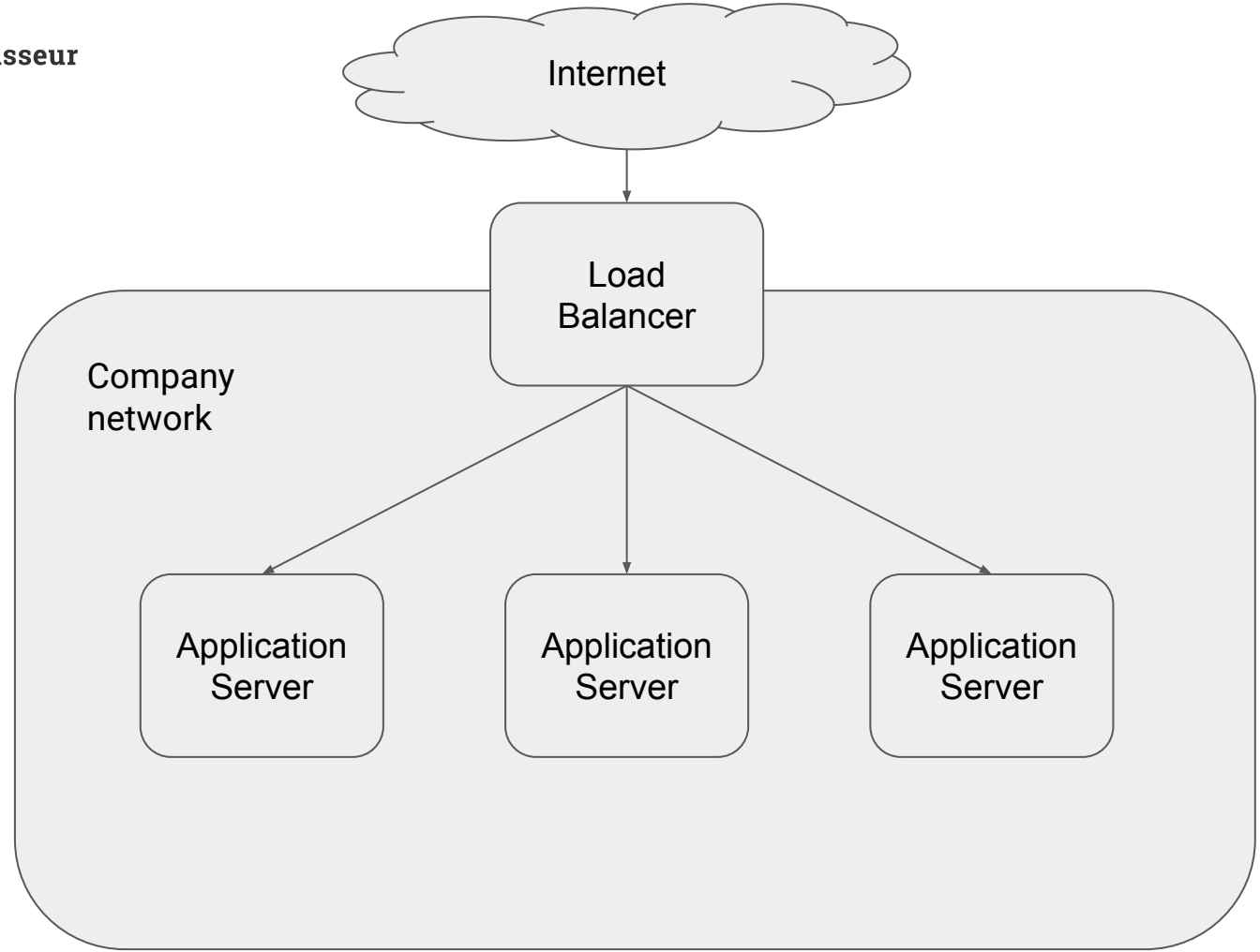
Internet
Load Balancer
Company network
Application Server
Application Server
Application Server

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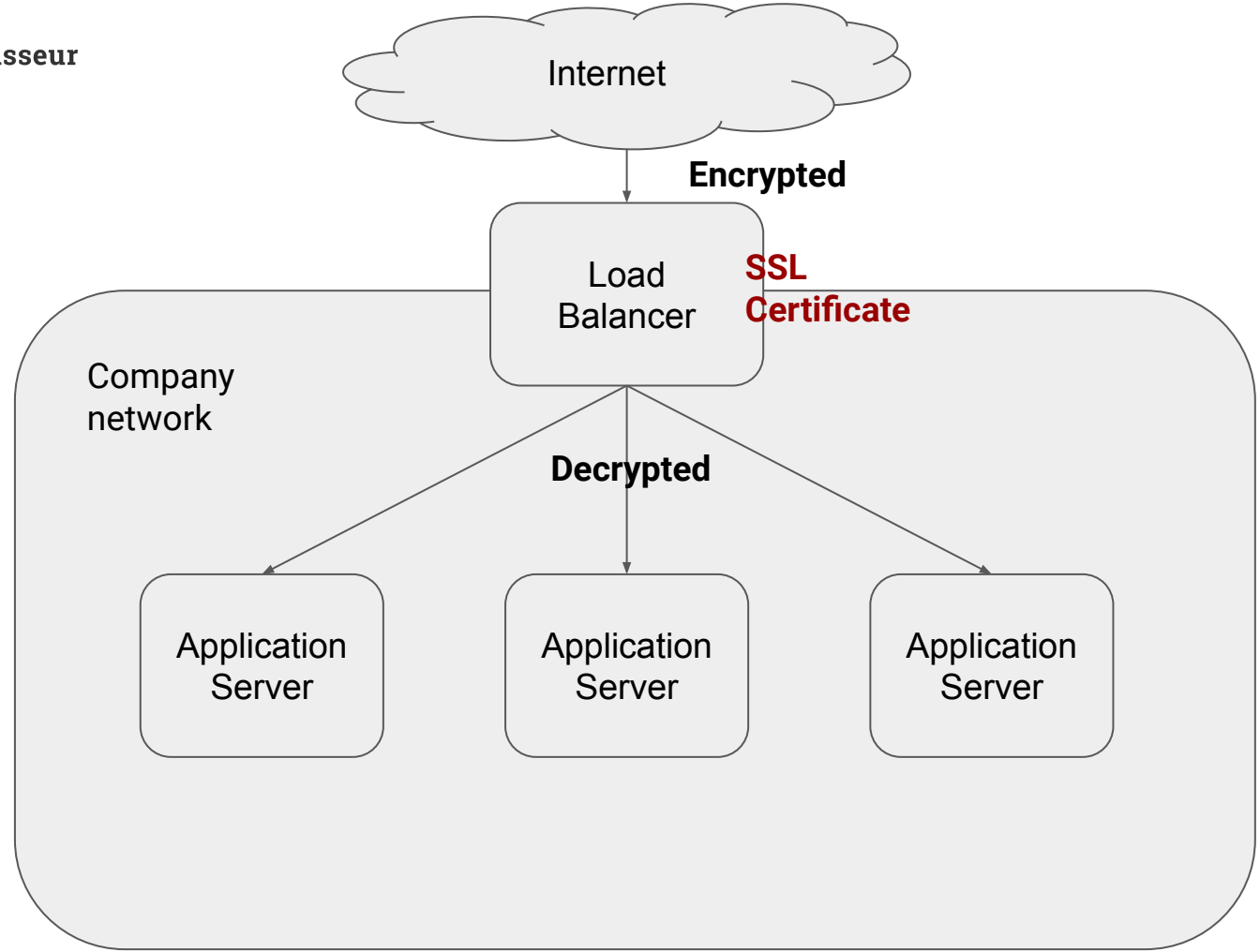
Internet
Encrypted
Load Balancer
SSL Certificate
Company network
Decrypted
Application Server
Application Server
Application Server

🤔 When might this turn into a security issue?

🤔 Why is this common practice?

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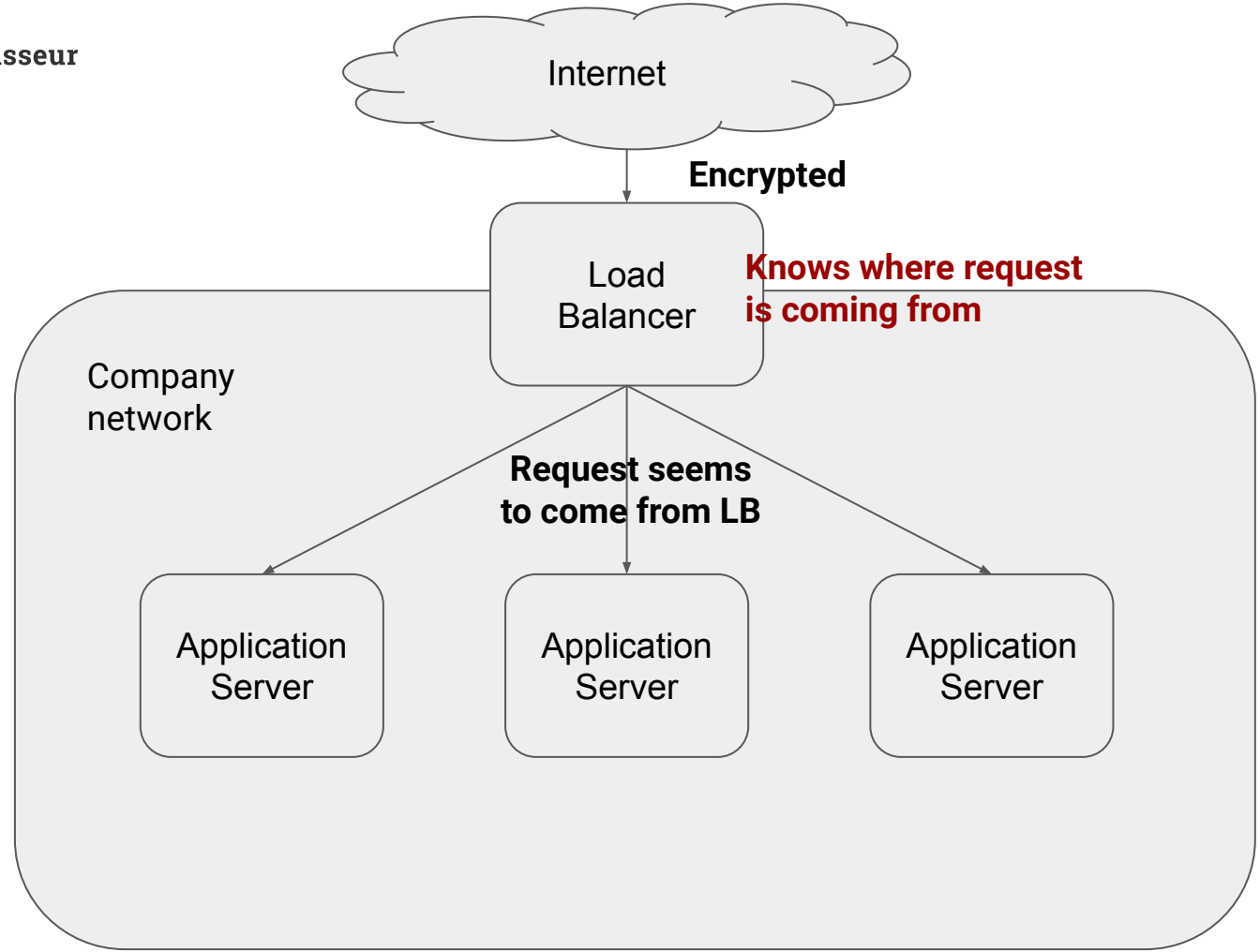
Internet
Encrypted
Load Balancer
Knows where request is coming from
Company network
Request seems to come from LB
Application Server
Application Server
Application Server

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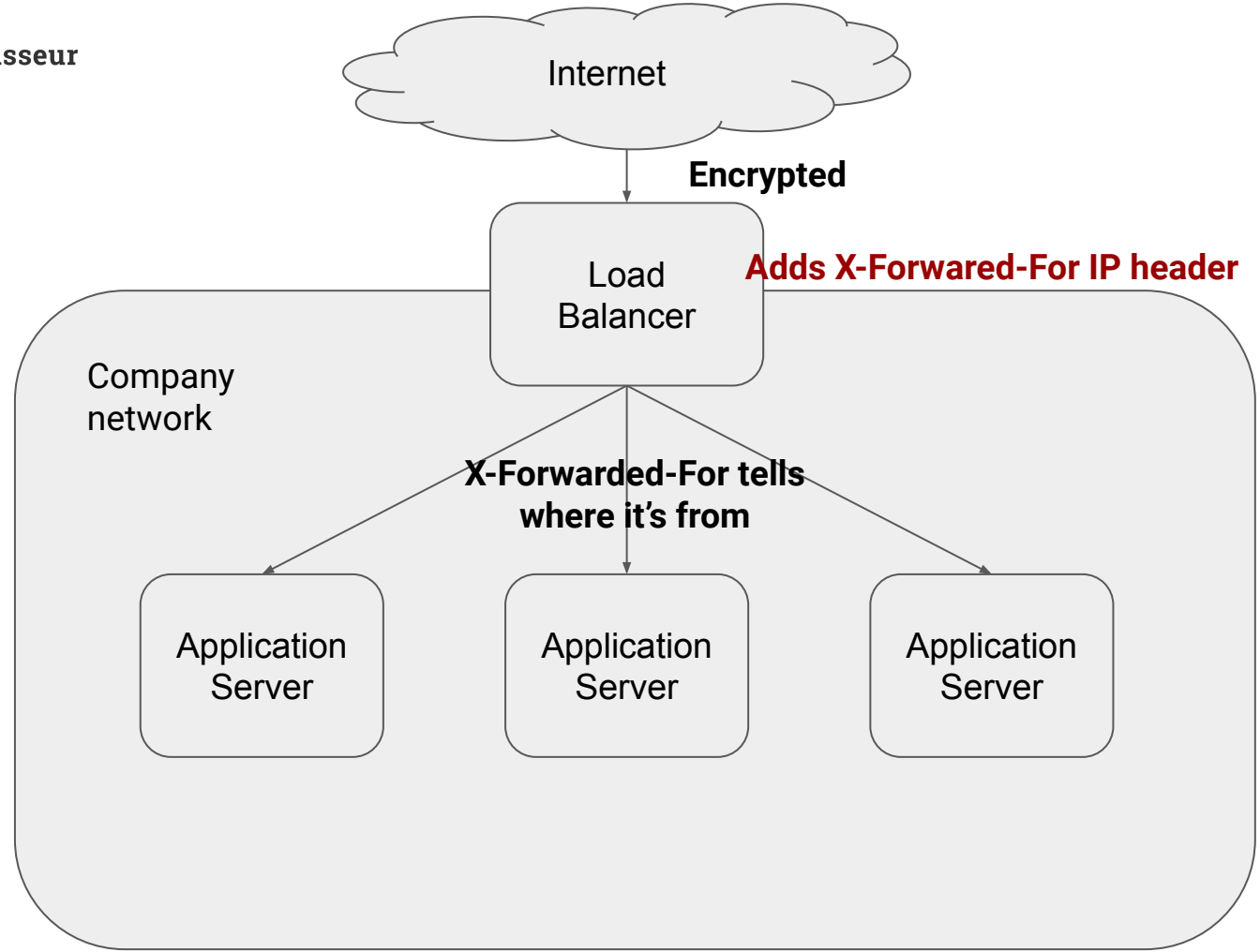
Internet
Encrypted
Load Balancer
Adds X-Forwared-For IP header
Company network
X-Forwarded-For tells where it's from
Application Server
Application Server
Application Server

Also annoying: Wireshark is blind for SSL (try this)