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Secure PostgreSQL Deployments

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There's much to security

- Identify the threats
- Apply the *correct* measures
  - Don't do things just because you can

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Not in this talk

- Application security
- Data Access Control
- Data Encryption
- etc
- etc

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Definitely not in this talk

- Unix vs Windows
- Linux vs BSD
- SELinux/SEPostgreSQL
- Any other religion

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In this talk!

- Authentication methods
- Connection security

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Authentication methods

- How do we determine who the user is
- *When* do we determine who the user is

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pg_hba.conf

- Lets you use different auth methods from different clients
- Not just limited to username/password
- For convenience or security
- Internal or external

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pg_hba.conf

```
local     all     all                              trust
host      all     all     127.0.0.1/32             trust
host      webdb   webuser 10.0.0.0/24              md5
host      all     @dba    192.168.0.0/24 gss
```

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Trust Authentication

- Any user can be anyone he/she claims to be!

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Trust Authentication

- Any user can be anyone he/she claims to be!
- Anyone think this is a bad idea?

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Username/password

- Normally, use *md5* method
  - crypt has been removed, avoid plaintext
- What everybody does
- What everybody *expects*

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LDAP authentication

- To the client, username/password
- Backend verification is off-loaded to directory server
- Common in enterprise deployments
- Password policies, expiry, etc

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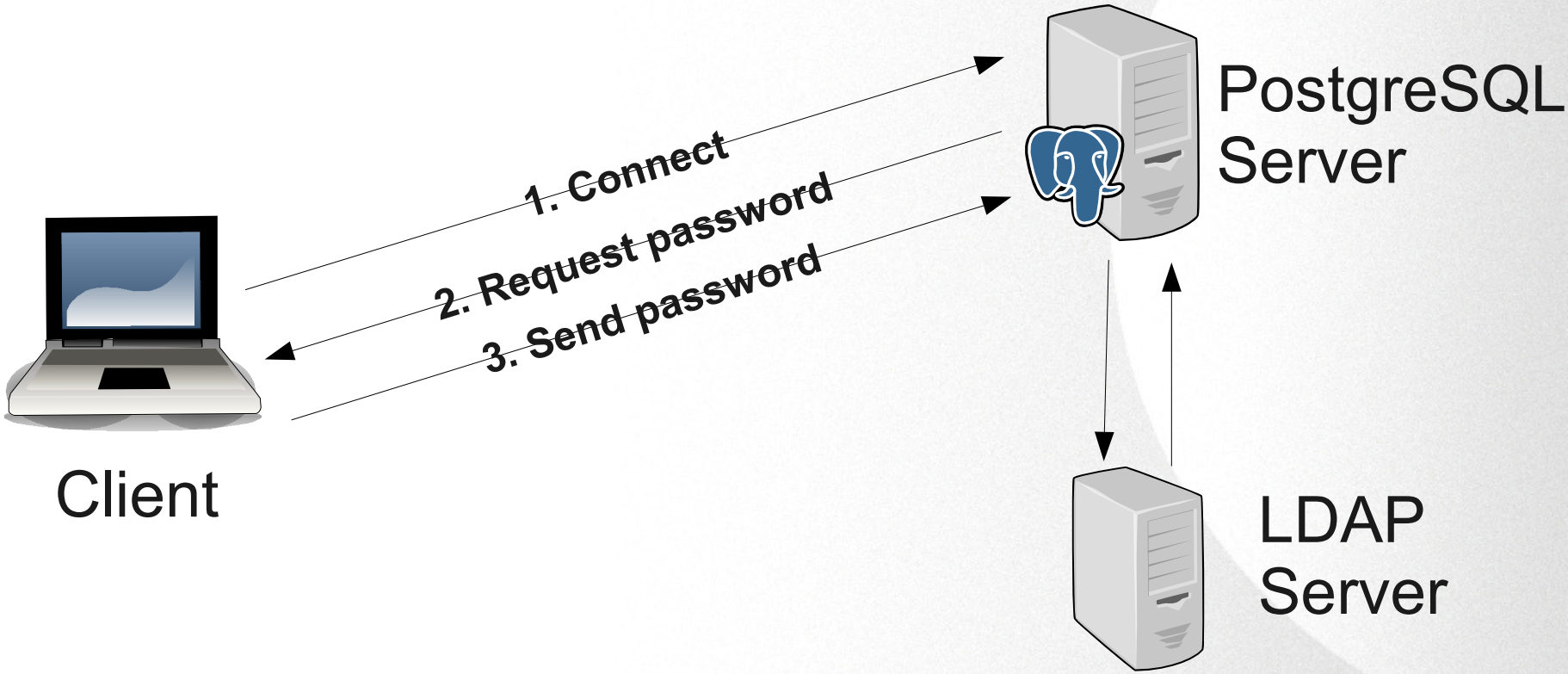
LDAP authentication

- Single *password* not single *signon*



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LDAP news in 9.0

- search/bind combination
- Can use non-cn fields in login
  - Anything that's LDAP searchable
  - Common choice: uid

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RADIUS (new in 9.0)

- Remote Authentication Dial In User Service
- Simple single-packet UDP service
- Original use-case: ISP dialup
- Common for one-time passwords, etc
- Good policy frameworks

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Kerberos/GSSAPI/SSPI

- Single *signon*
- Same benefits as LDAP (mostly)
- Most common: Active Directory

- («krb5» is deprecated)

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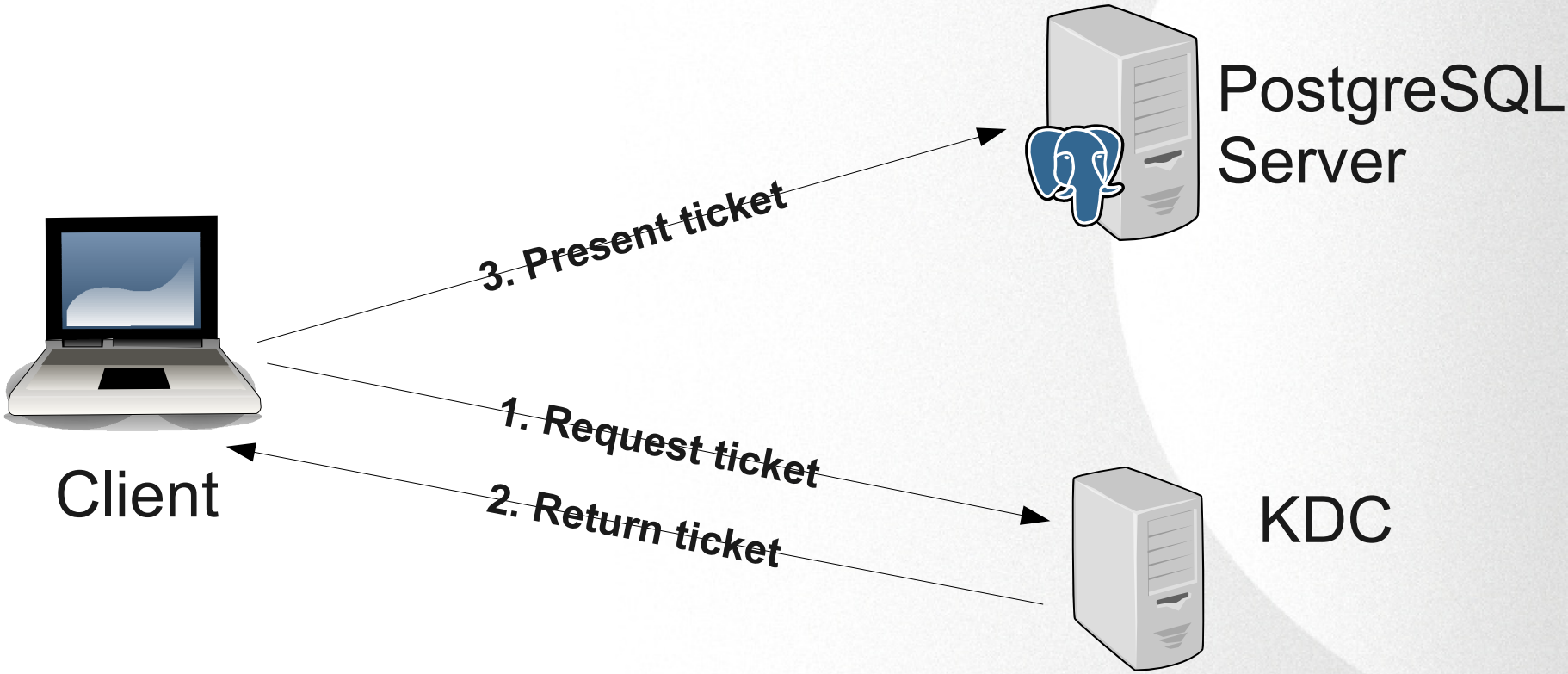
Kerberos/GSSAPI/SSPI

- Single *password* not single *signon*



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PAM

- Provided by OS
- Can do password, LDAP, etc
- Can also do Kerberos & friends
- One-time passwords
  - RSA SecurID, Vasco, etc
  - RADIUS (no need in 9.0)

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SSL

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SSL secured connections

- Encryption
- Man-in-the-middle protection
- Authentication

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SSL secured connections

- Enabled on the server (ssl=yes)
  - Platform quirks!
- Optionally required through pg_hba
- Optionally required in libpq

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SSL secured connections

- Need to protect data in *both* directions
- For example username/password
- Must *know* before connection is started
  - Unknown equals unprotected

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SSL encryption

- SSL *always* requires a server certificate
- Can be self-signed
- Does not need to be known by client

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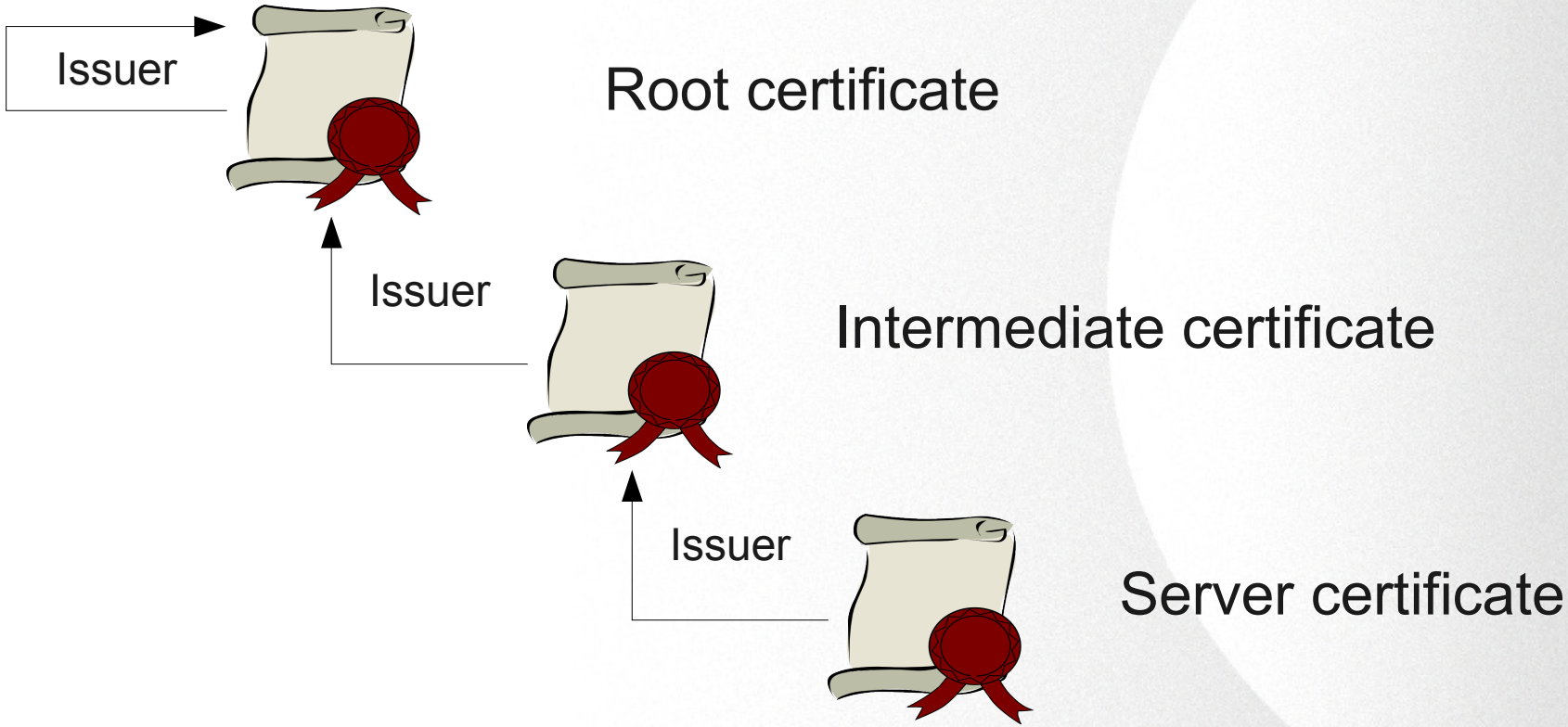
Certificate chains



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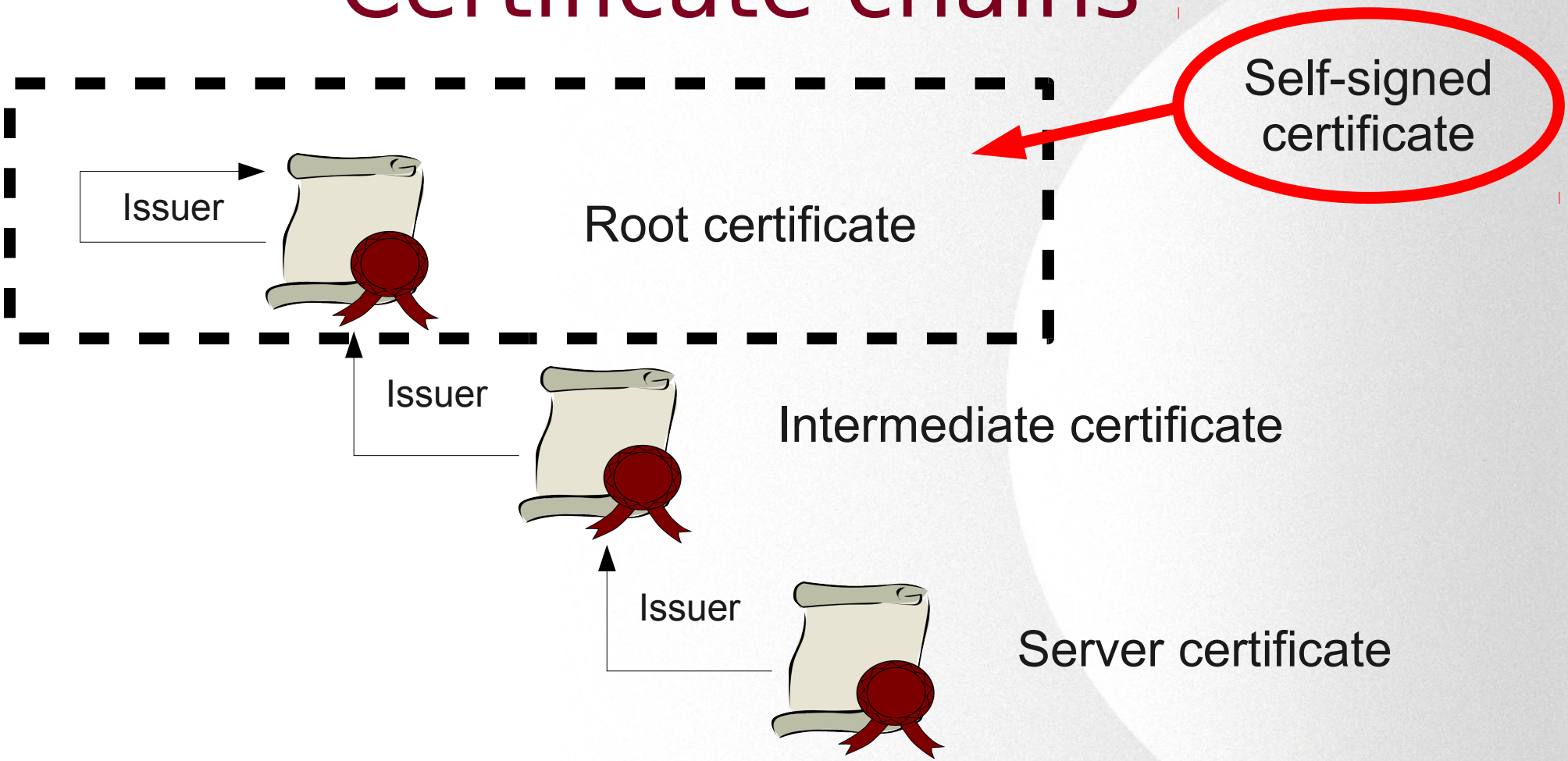
Certificate chains



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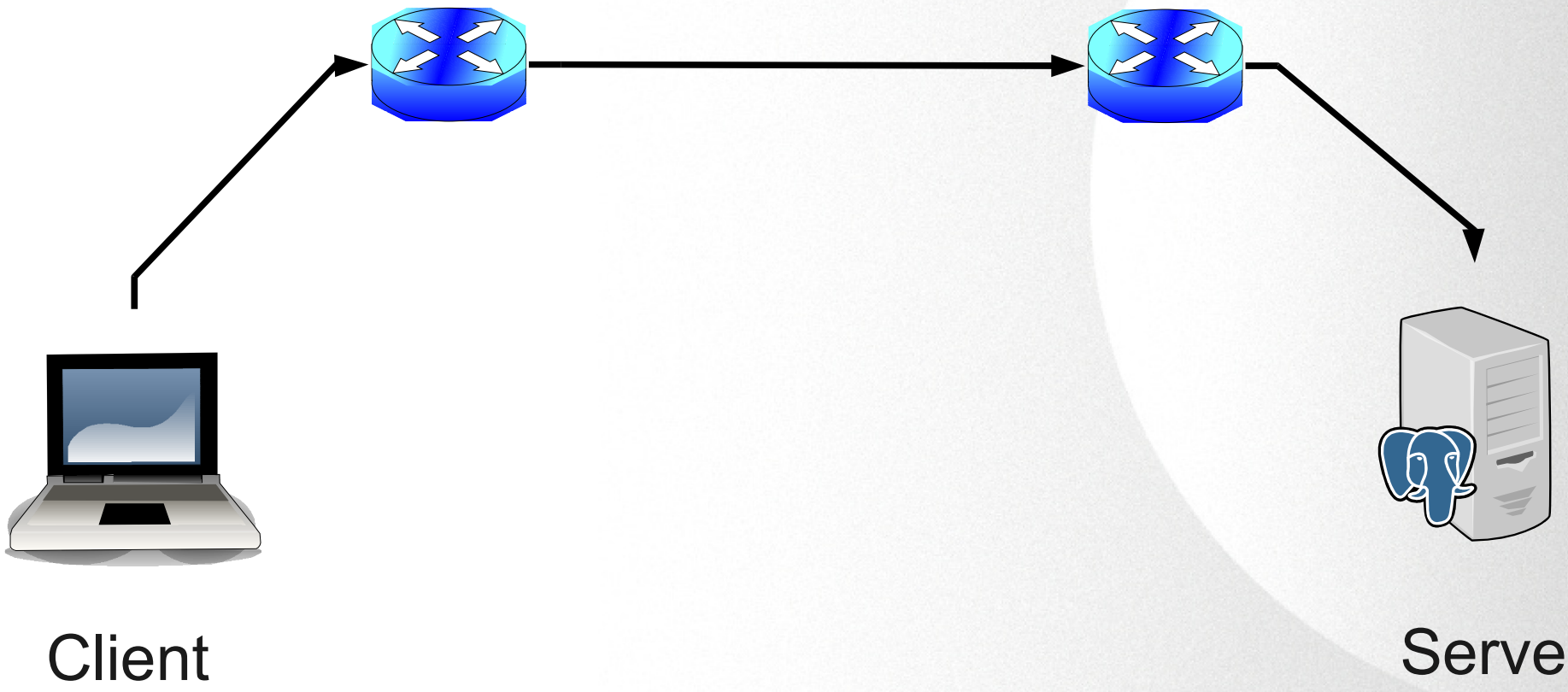
SSL secured connections



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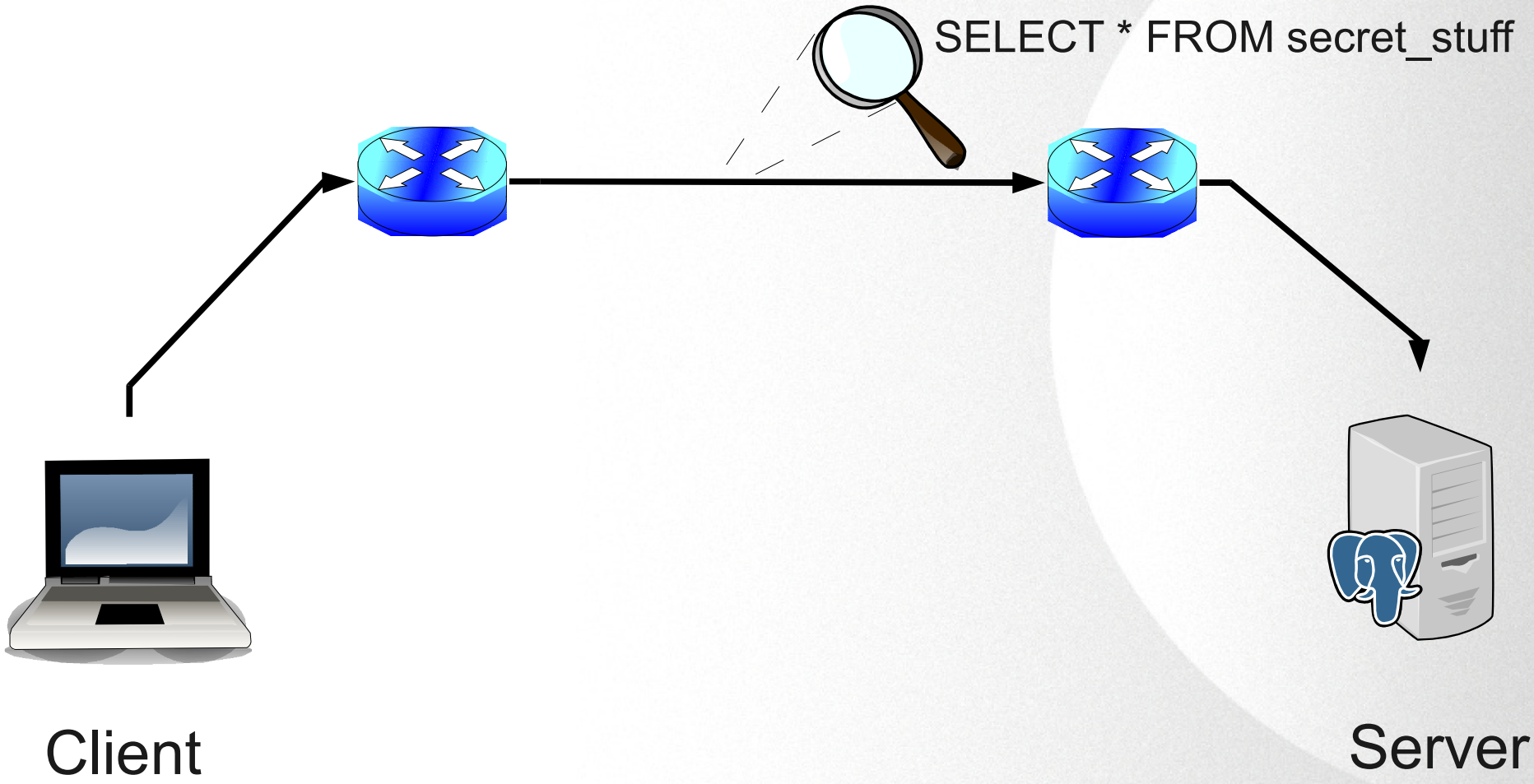
Threats handled by SSL: Eavesdropping



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Eavesdropping

- Prevented by encrypting all data
- Key negotiation is automatic
  - On initial connection
  - After 512Mb traffic
- Server certificate used but not verified

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Key renegotiation

- *Broken in the SSL protocol – OOPS!*
- Fixed SSL libraries *are* available
- Broken fixes were pushed by vendors
- ssl_renegotiation_limit = 512MB

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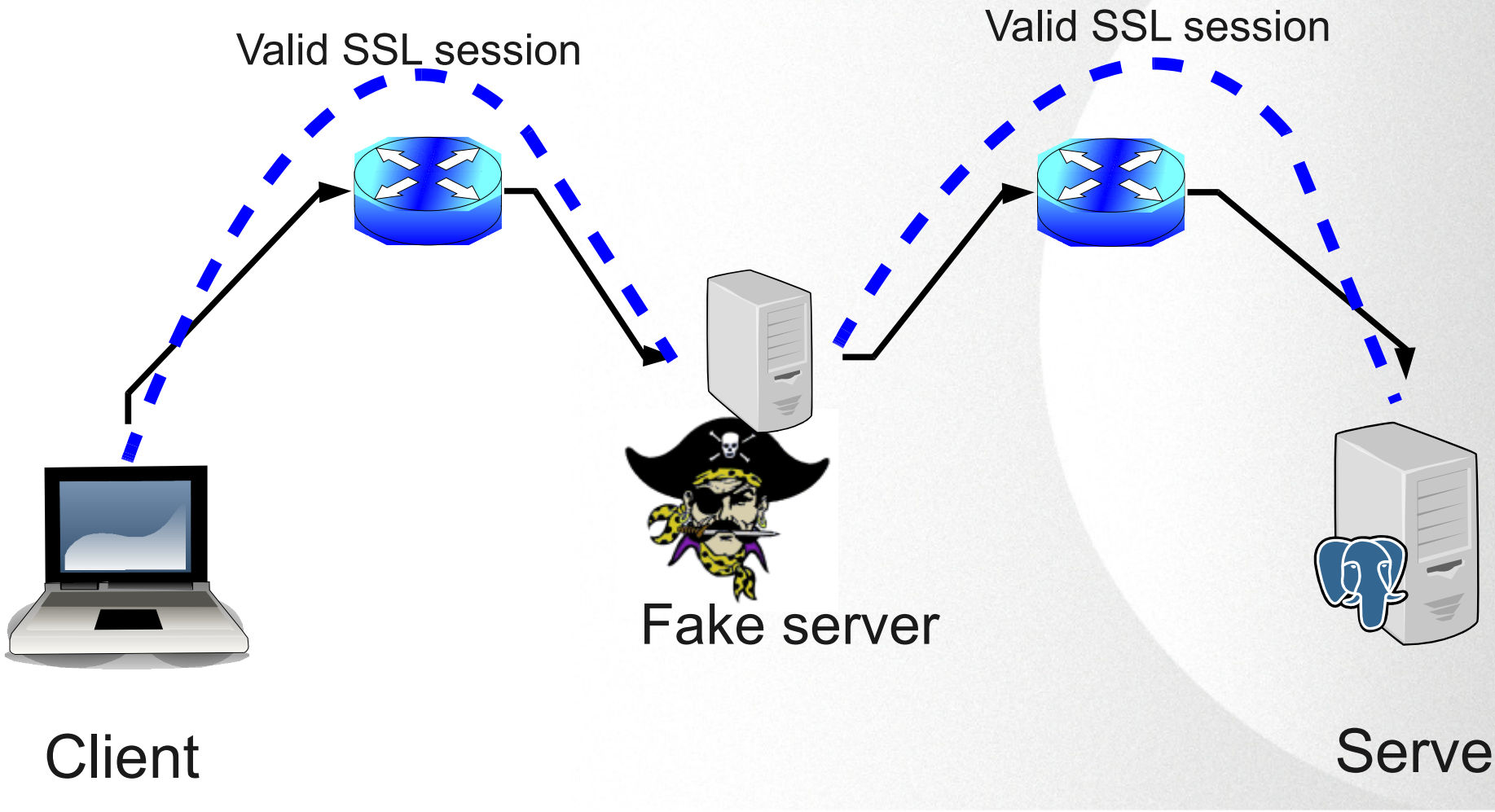
Threats handled by SSL: Man in the middle



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SSL server verification

- On top of encryption
- Validate that the server is who it claims to be
- CA issues certificate, can be self-signed
- CA certificate known by client

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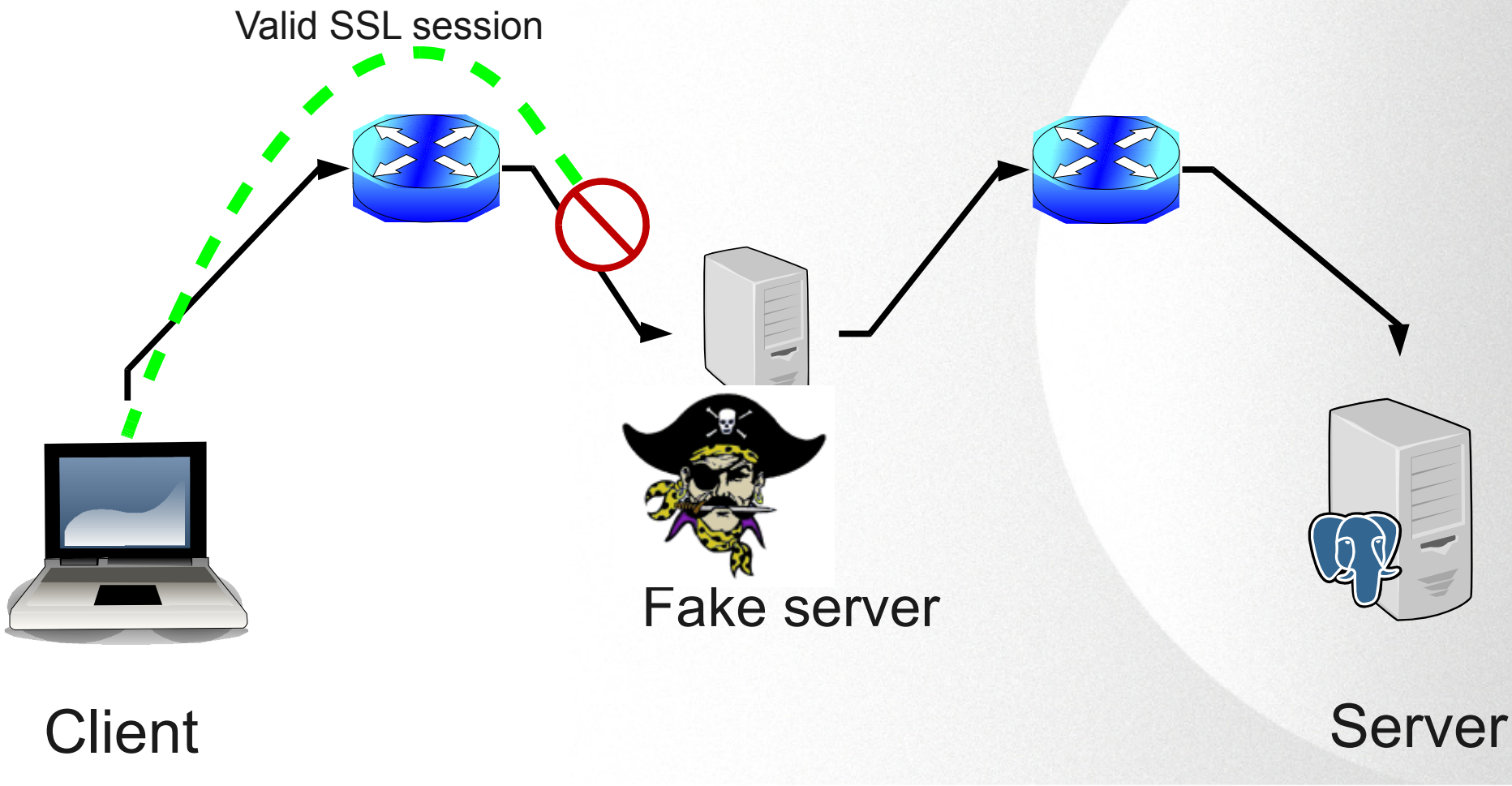
Threats handled by SSL: Man in the middle



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SSL client authentication

- On top of encryption
- Normally on top of server verificateion, but not necessary
- CA issued certificate on *client*
- Match *CN* on certificate to user id
- Protect client certificate!

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SSL client authentication

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SSL client certificates

- Can also be used *together* with other authentication
- Require client certificate
- *Also* require e.g. username/password

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SSL in libpq

- Controlled by *sslmode* parameter
- Or environment *PGSSLMODE*
- For security, must be set on client
  - Remember, *unknown = unsecure*

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Summary of libpq SSL modes

Client Mode	Protect against		Compatible with server set to		Performance overhead
	Eavesdrop	MITM	SSL required	SSL disabled	
disable	no	no	FAIL	works	no
allow	no	no	works	works	If necessary
prefer	no	no	works	works	If possible
require	yes	no	works	FAIL	yes
verify-ca	yes	yes	works	FAIL	yes
verify-full	yes	yes	works	FAIL	yes

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Not a bad idea: ipsec

- If already deployed
- Application transparent
- Global policies
- Integrated management
- Somebody Elses Problem?

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Secure PostgreSQL Deployments

Questions?

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