

# Securing PostgreSQL From External Attack

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January, 2012

Database systems are rich with attack vectors to exploit. This presentation explores the many potential PostgreSQL external vulnerabilities and shows how they can be secured. *Includes concepts from Magnus Hagander*

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# Attack Vectors



# External Attack Vectors

- ▶ 'Trust' security
- ▶ Passwords / authentication theft
- ▶ Network snooping
- ▶ Network pass-through spoofing
- ▶ Server / backup theft
- ▶ Administrator access

# Internal Attack Vectors (Not Covered)

- ▶ Database object permissions
- ▶ SQL injection attacks
- ▶ Application vulnerability
- ▶ Operating system compromise

# Authentication Security



*[http://www.my-time-machines.net/mosler\\_34.htm](http://www.my-time-machines.net/mosler_34.htm)*

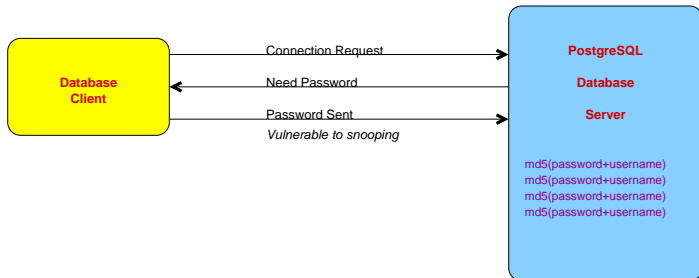
# Avoid 'Trust' Security

```
# TYPE DATABASE USER CIDR-ADDRESS METHOD
# "local" is for Unix domain socket connections only
local all all trust
# IPv4 local connections:
host all all 127.0.0.1/32 trust
# IPv6 local connections:
host all all ::1/128 trust
```

**Solution:** Use the `initdb -A` flag, i.e., you don't want to see this:

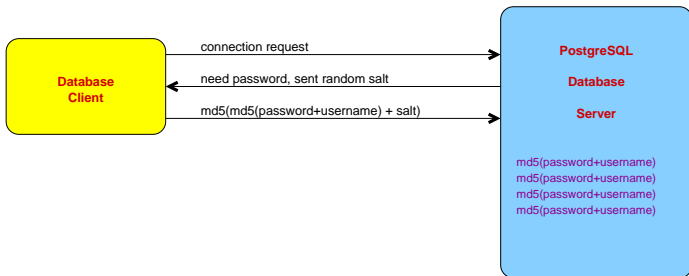
*WARNING: enabling "trust" authentication for local connections  
You can change this by editing pg\_hba.conf or using the -A option the  
next time you run initdb.*

# Password Snooping



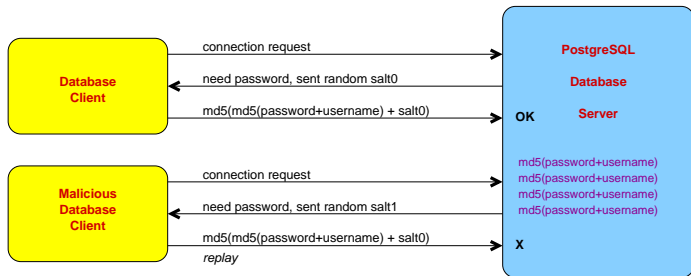
Using 'username' in the MD5 string prevents the same password used by different users from appearing the same. It also adds some randomness to the md5 checksums.

# MD5 Authentication Prevents Password Snooping





# MD5 Authentication Prevents Password Replay



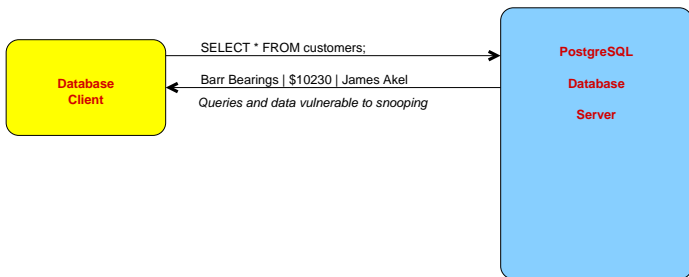
*salt* is a random four-byte integer so millions of connection attempts might allow the reuse of an old authentication reply.

# Password Attacks

- ▶ Weak passwords
- ▶ Reuse of old passwords
- ▶ Brute-Force password attacks

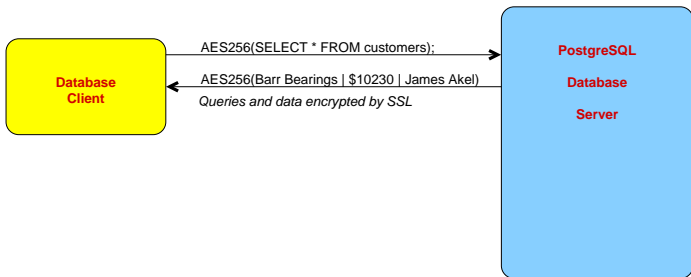
None of these vulnerabilities is prevented by Postgres directly, but external authentication methods, like LDAP, PAM, and SSPI, can prevent them.

# Queries and Data Still Vulnerable to Network Snooping



Password changes are also vulnerable to snooping.

# SSL Prevents Snooping By Encrypting Queries and Data

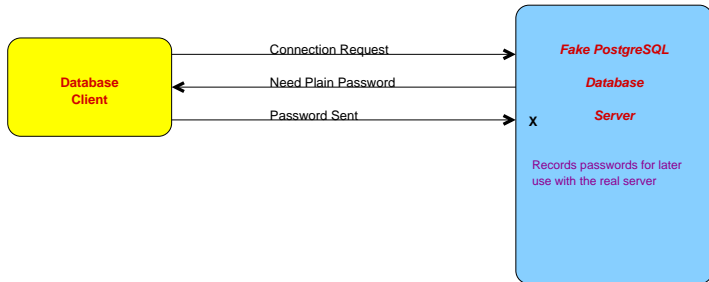


# Preventing Spoofing



<http://redwing.hutman.net/~mreed/warriorshtm/impostor.htm>

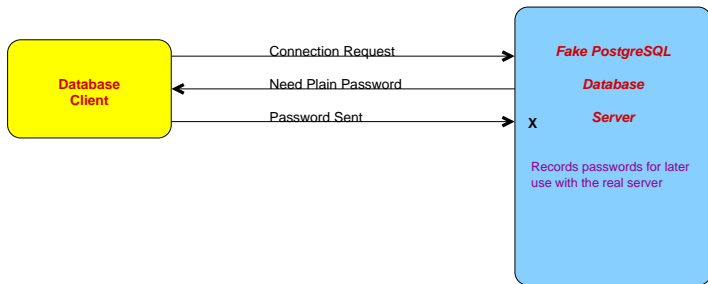
# Localhost Spoofing While the Database Server Is Down



Uses a fake socket or binds to port 5432 while the real server is down. (/tmp is world-writable and 5432 is not a root-only port.)

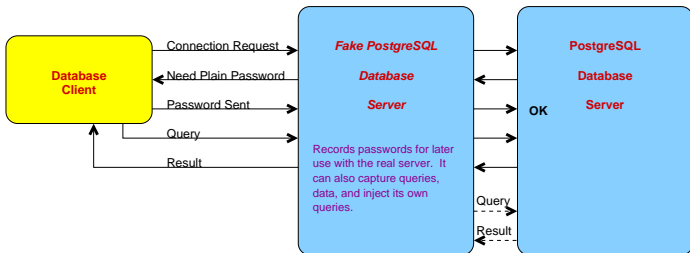
The server controls the choice of 'password' instead of 'md5'.

# Network Spoofing



Without SSL 'root' certificates there is no way to know if the server you are connecting to is a legitimate server.

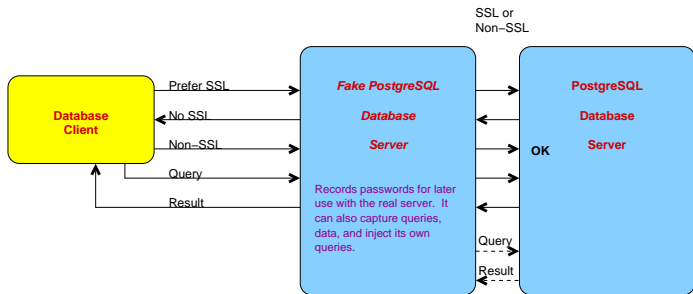
# Network Spoofing Pass-Through



Without SSL 'root' certificates there is no way to know if the server you are connecting to is a legitimate server.

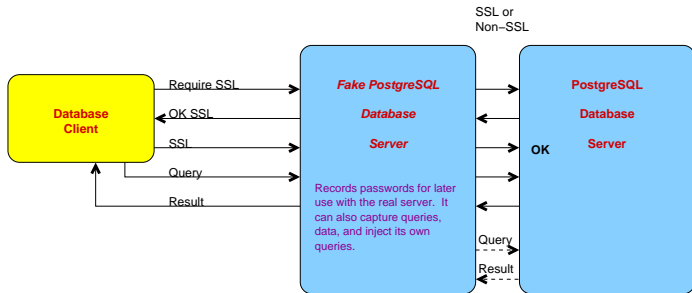


# SSL 'Prefer' Is Not Secure



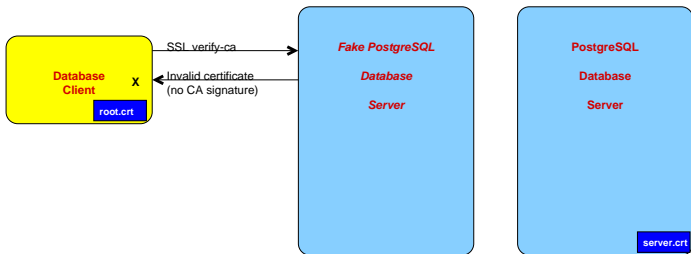
Without SSL 'root' certificates there is no way to know if the server you are connecting to is a legitimate server.

# SSL 'Require' Is Not Secure From Spoofing

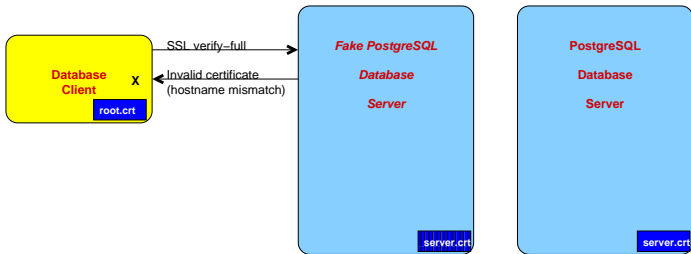


Without SSL 'root' certificates there is no way to know if the server you are connecting to is a legitimate server.

# SSL 'Verify-CA' Is Secure From Spoofing

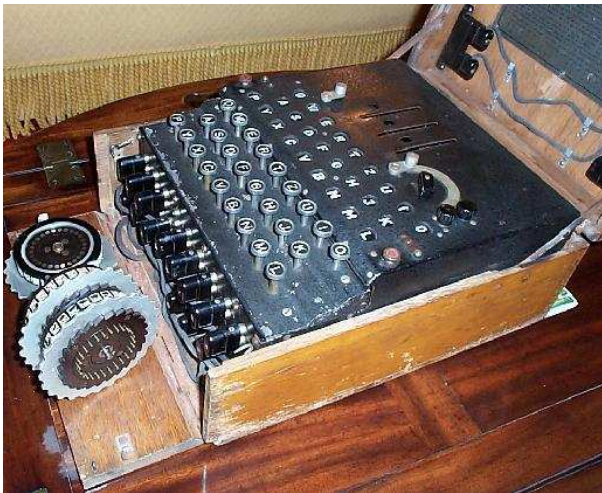


# SSL 'Verify-full' Is Secure Even From Some Certificate Thefts



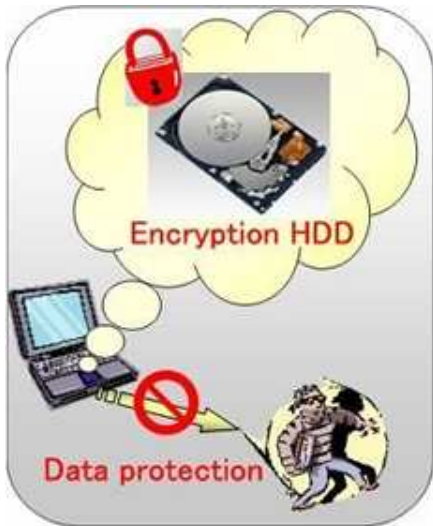
Certificate stolen from  
a CA-trusted computer,  
but not the database  
server.

# Data Encryption To Avoid Data Theft



<http://jproc.ca/crypto/enigma.html>

# Disk Volume Encryption



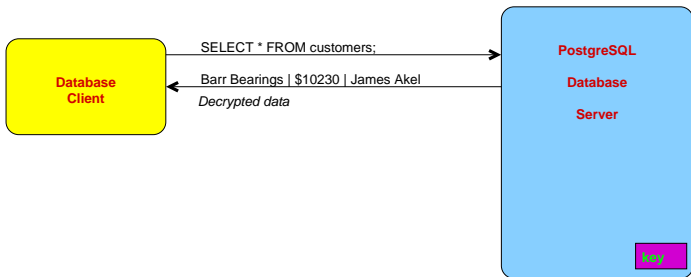
<http://www.pclaunches.com/>

# Column Encryption

id	name	credit_card_number
428914	Piller Plaster Co.	\xc30d04070302254dc045353f28 ; 456cd241013e2d421e198f3320e8 ; 41a7e4f751ebd9e2938cb6932390 ; 5c339c02b5a8580663d6249eb24f ; 192e226c1647dc02536eb6a79a65 ; 3f3ed455ffc5726ca2b67430d5

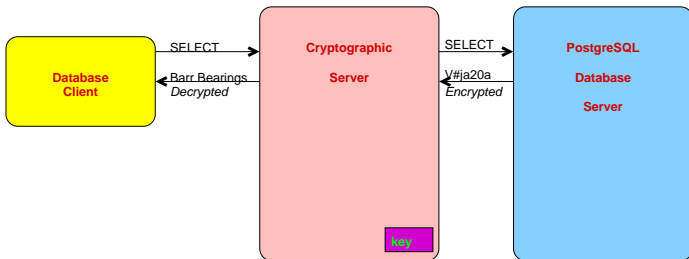
Encryption methods are decryptable (e.g. AES), while hashes are one-way (e.g. MD5). A one-way hash is best for data like passwords that only need to be checked for a match, rather than decrypted.

# Where to Store the Key? On the Server

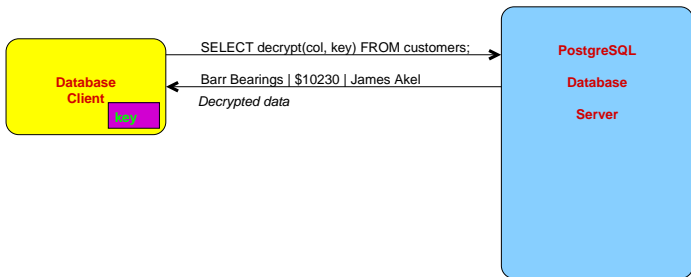




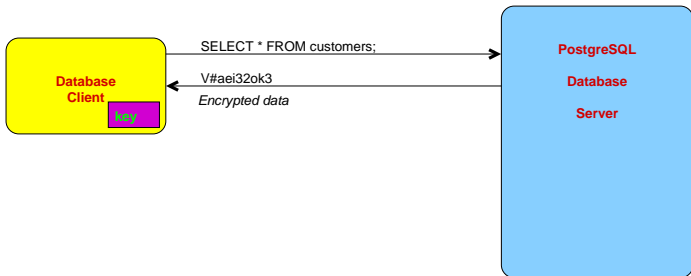
# Store the Key on an Intermediate Server



# Store the Key on the Client and Encrypt/Decrypt on the Server

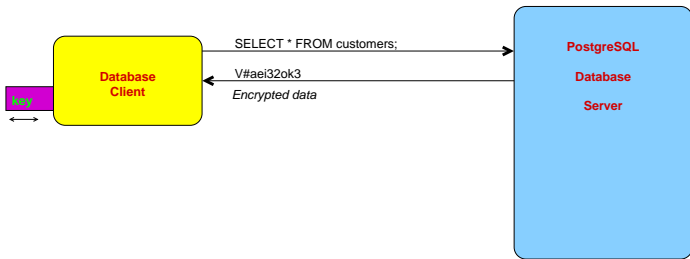


# Encrypt/Decrypt on the Client



This prevents server administrators from viewing sensitive data.

# Store the Key on a Client Hardware Token



This prevents problems caused by client hardware theft.

# Conclusion



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*Todd Ehlers, Flickr*