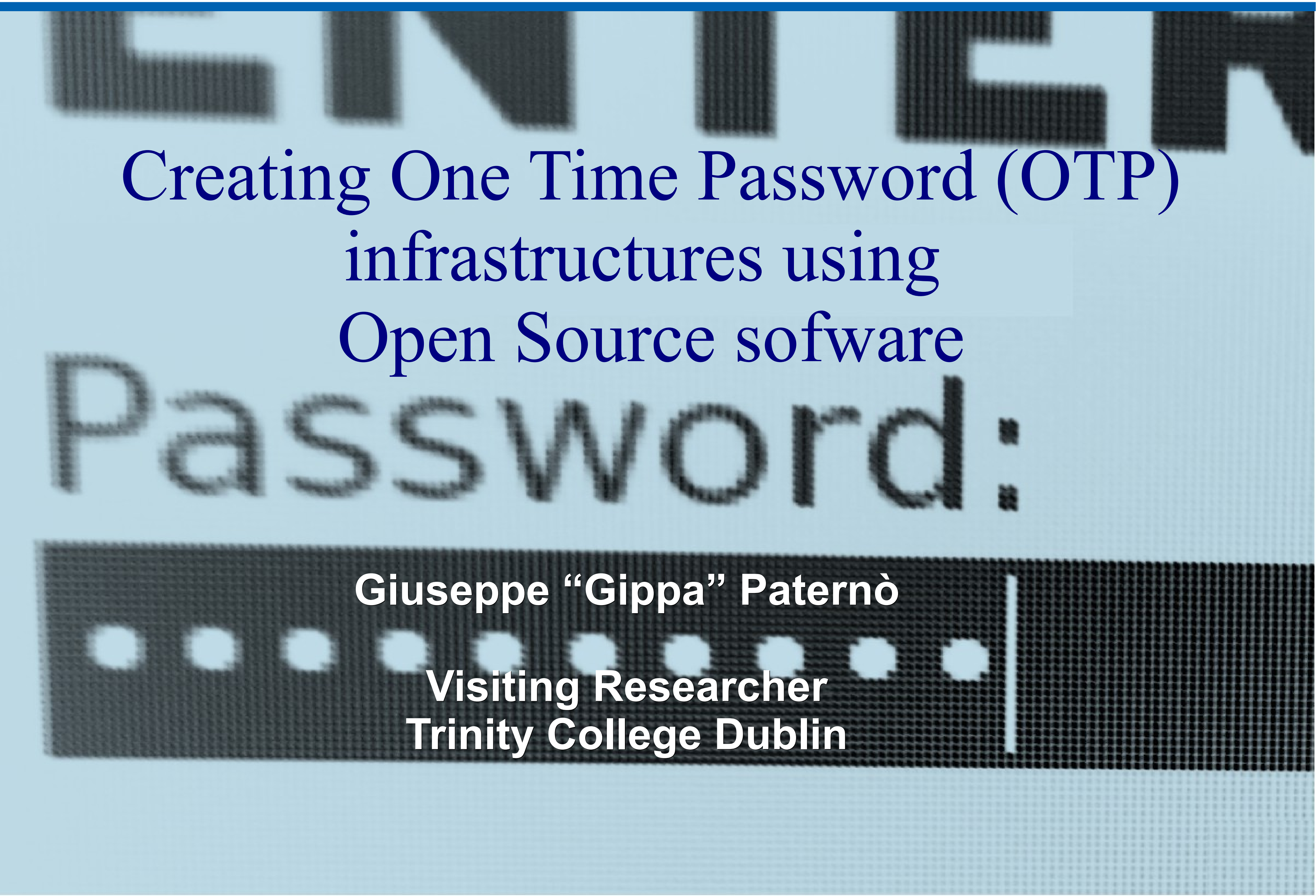

Creating One Time Password (OTP) infrastructures using Open Source sofware

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Who am I

- Visiting Researcher at Trinity College Dublin (Ireland)
- Solution Architect and EMEA Security Expert in Red Hat
- Previously Security Solution Architect in Sun and also in IBM
- Red Hat Certified Security Specialist (RHCSS), Red Hat Certified Architect (RHCA) and Cisco Certified Network Professinal (CCNP)
- Part of the italian security community *sikurezza.org*
- Published books and whitepapers
- Forensic analisys for local govs
- More on:
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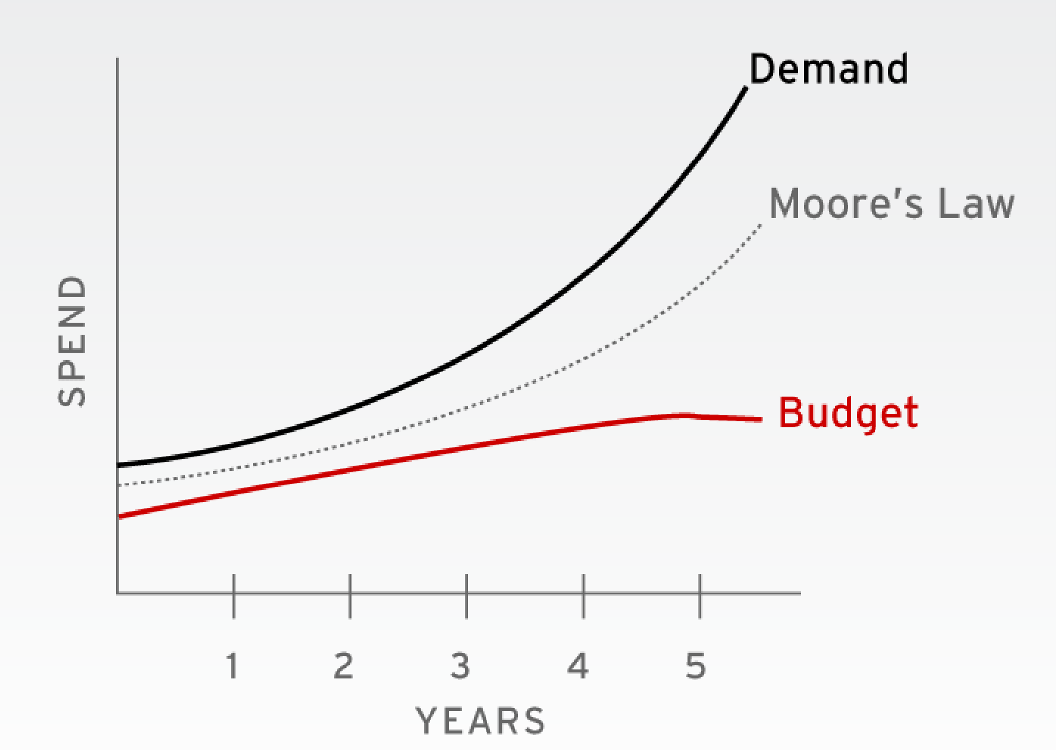
Disclaimer

I do not speak on behalf of my employer, nor I am authorized to represent it publicly.

All and any opinion and results expressed in this presentation are solely mine and do not represent my employer point-of-view.

All the tests and any project contribution are done as a TCD researcher out of business hours.

Global IT scenario



- Even more in this recession phase, the IT budget is getting lower and lower
- The projects (demand) are increasing with significantly less money available

Lowering TCO

"The economic crisis is going to be a catalyst for open source, much like the technology crash of 2001 catapulted Linux front and center"

Laurie Wurster, a Gartner analyst.

The adoption of Open Source software can lower the TCO

… and increase your security!

How Open Source can increase Security?

Open Source = Open Standards = Choice

The OATH Alliance

- The Initiative for Open Authentication (OATH)
- Open alliance of vendors
  - ActiveIdentity, Vasco, Gemalto, Aladdin, ...
- http://www.openauthentication.org/
- Created a common algorithm for one time password tokens (HOTP)
  - A common "protocol" for the interoperability of the several impementations available

What is HOTP

- An HMAC-Based One-Time Password Algorithm (HOTP)
- A common shared algorithm that is meant to facilitate the adoption of two-factor authentication
- Alogorithm published as RFC 4226
- The complete standard on:
  - http://www.rfc-editor.org/

HOTP: Internals

The algorithm is:

HOTP(K,C) = Truncate(HMAC-SHA-1(K,C))

K	Shared key between client and server
C	8-byte counter value syncronized between client and server
Truncate()	Perform a dynamic truncation and reduction of the string to extract a 4-byte dynamic binary code. The result must extract minimum a 6-digit code, but also 7 and 8-digit code

Anathomy of HOTP

- The shared key between the OTP peers (token and authenticator) is an hexadecimal string
  - The lenght is a SHA-1 digest
- Example of generating a new HMAC 6-digit shared key:

```
dd if=/dev/random bs=4096 count=1 2>/dev/null |
   sha1sum | awk '{print $1}'
```

HOTP implementations

- Both commercial and open source implementations available
- Most of the hardware tokens adhere to the HOTP algorithm
- Few software implementations, most of which proprietary/closed source
- Some software client available:
  - J2ME, iPhone and Windows Mobile
  - Publically available algorithm makes it simple to implement a client

How does it fit all together?

The software

- An open source OTP server:
  - Only one server implementation available (OTPD), formelly from TRI-D Systems
  - Now I made it available on **http://otpd.googlecode.com**
- FreeRADIUS, the popular radius server for Linux
- Two tested freely available client:
  - oathdsss.jar (DSSS) for Java MIDP (Nokia)
  - iToken (Quest Software) for iPhone
- Also tried some hardware tokens

OTPD server

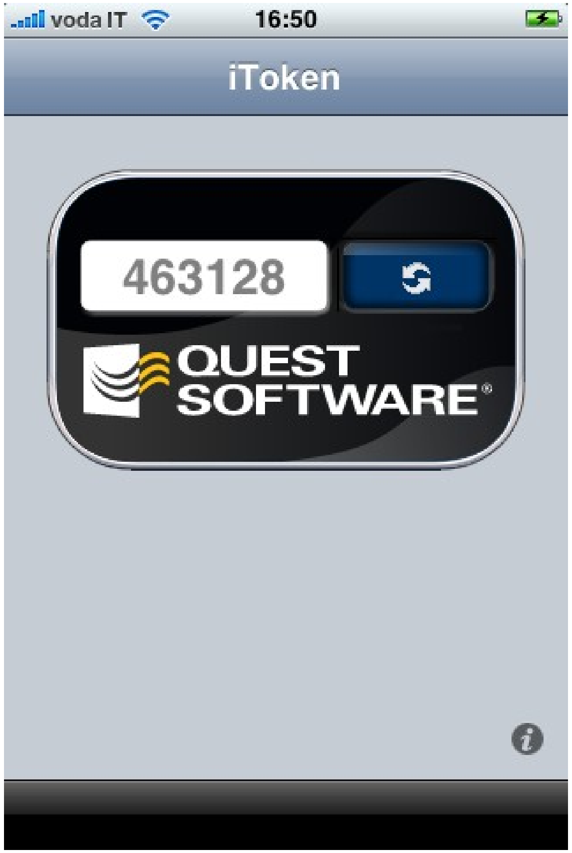
- It handle the validation of the One Time Passwords
    - Uses files and LDAP as repository
- Keeps the state of the OTP token (counter)
- Supported tokens:
    - HOTP
    - CRYPTOCard
    - Plain old x9.9 (based on DES, unsecure!)
- It listen to autentication requests

FreeRADIUS

- Well known high-performance open source RADIUS server
  - Handle authentication and accounting
  - Plug-in based
- One of the plug-in is **rlm_otpd**
  - Developed by TRI-D Systems
  - Communicate via Unix sockets with the OTPD server to verify an OTP token

The soft-token

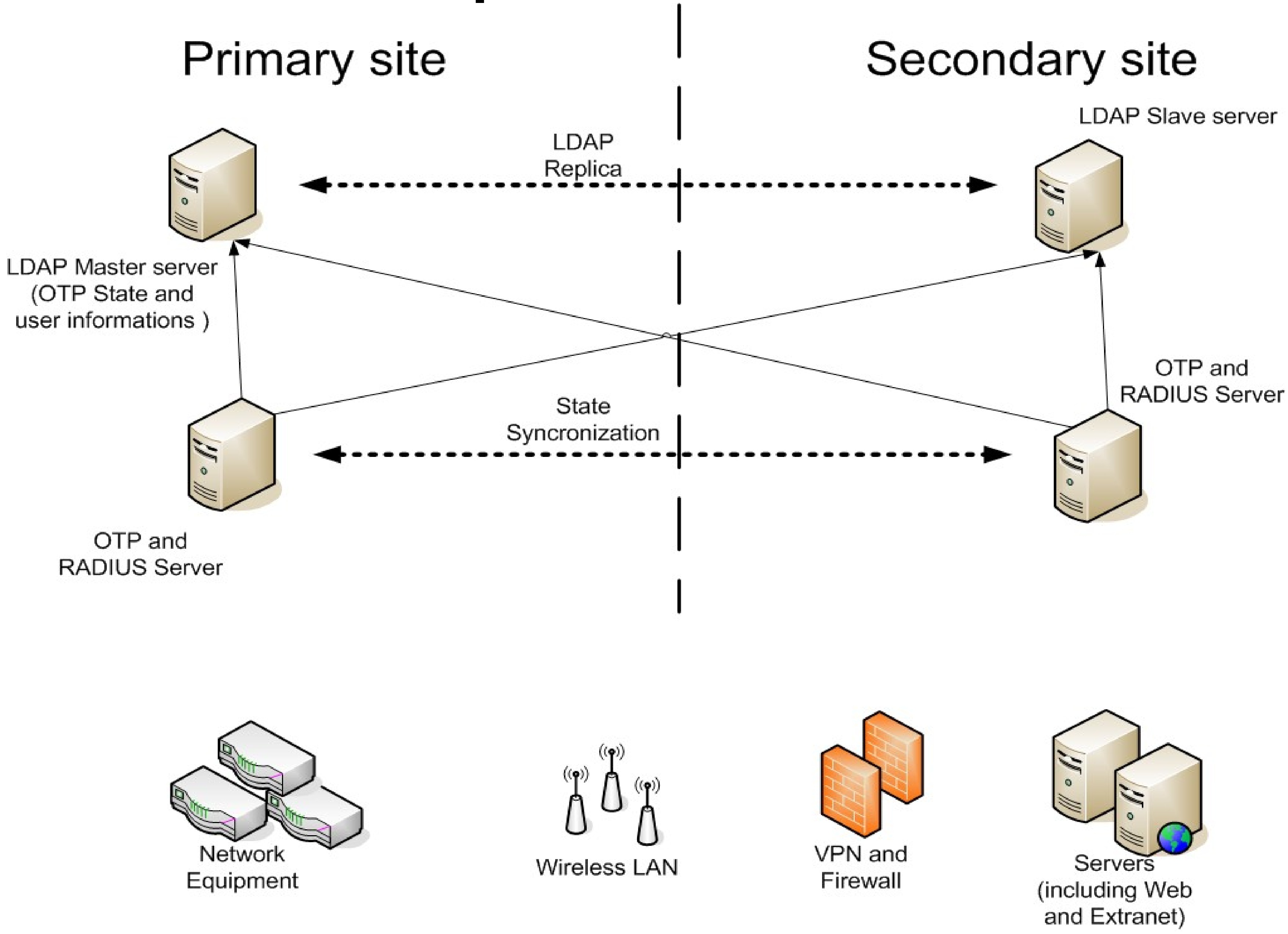
- An OTP token in software
- Less "secure" than an hardware
  - What if my laptop is stolen?
- A compromise is using a soft-token on a mobile platform
  - Easy to manage
  - Lower costs
  - Better security over a "fat" client on laptops/desktops
  - Available for most mobile phones



What can I authenticate?

- Any RADIUS compliant system, ex:
  - VPN systems
  - Wireless LANs
  - Routers/network equipments
  - Core UNIX systems (through pam_radius)
  - Captive portals
- Any application can use the RADIUS protocol:
  - common APIs available in C, PHP, Python, Ruby, Java (J2EE)

Enteprise scenario



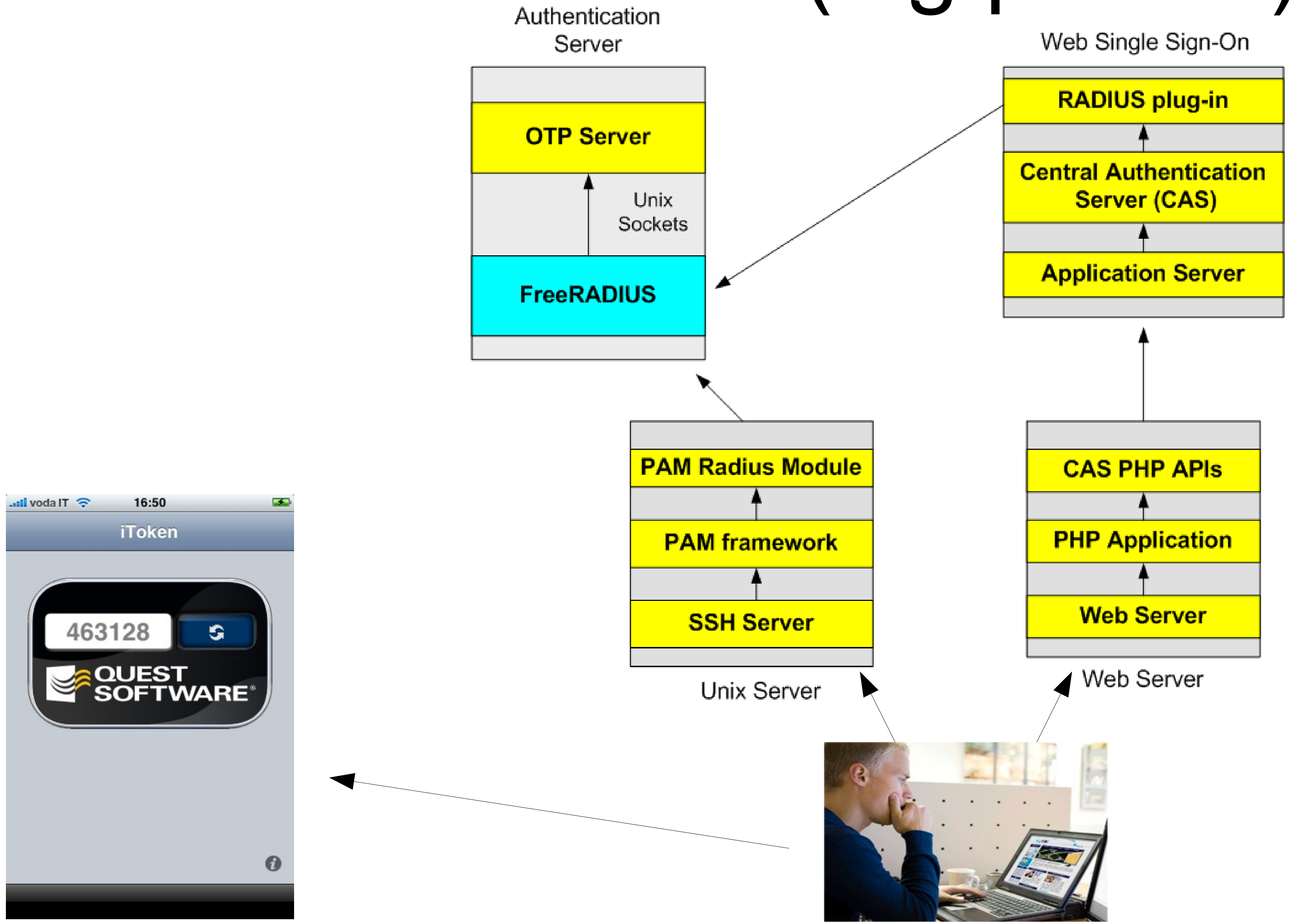
Demo scenario

- Authentication server:
  - OTP Server
  - FreeRADIUS Server
- Client UNIX
- Web application (PHP)
- Centralized Web Single Sign-On (CAS)

Demo (the clients)

- Client Unix
  - Interactive log-in
  - Leverage the pam_radius module
- Web Single Sign-On
  - Based on Yale CAS
  - Customized to login through RADIUS
- PHP web application
  - Dummy application to demonstrate CAS' capabilities with OTP integration
  - Virtually every application can leverage CAS architecture

Demo scenario (big picture)



Authentication Server

OTP Server

Unix Sockets

FreeRADIUS

Web Single Sign-On

RADIUS plug-in

Central Authentication Server (CAS)

Application Server

PAM Radius Module

PAM framework

SSH Server

Unix Server

CAS PHP APIs

PHP Application

Web Server

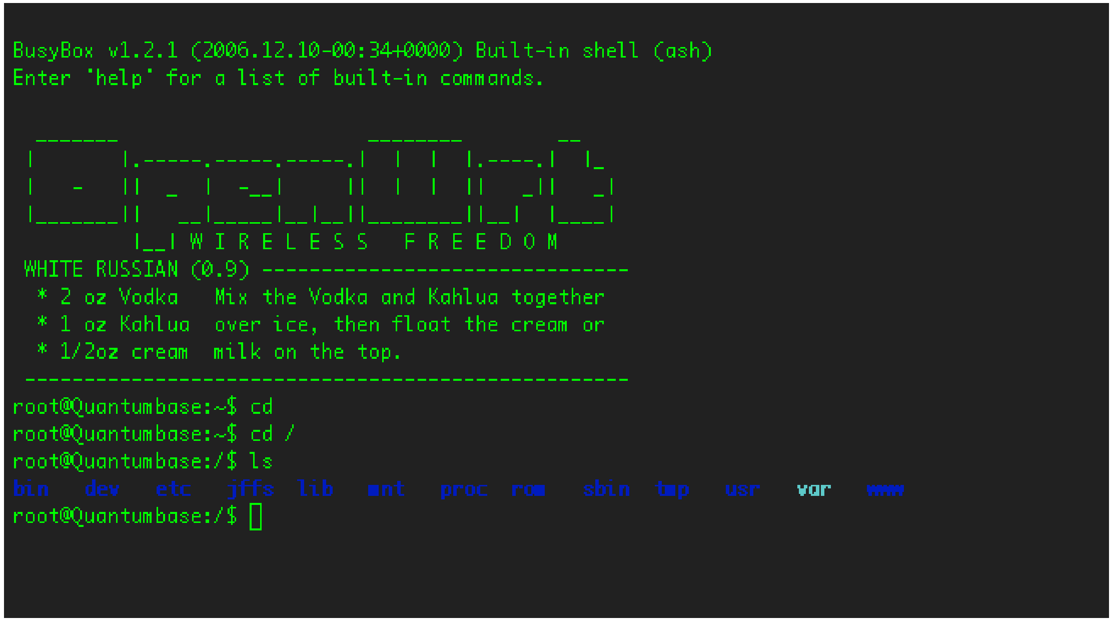
Web Server

Interactive log-in

OTP/Radius Server

Authentication Request (RADIUS)

Log-on request



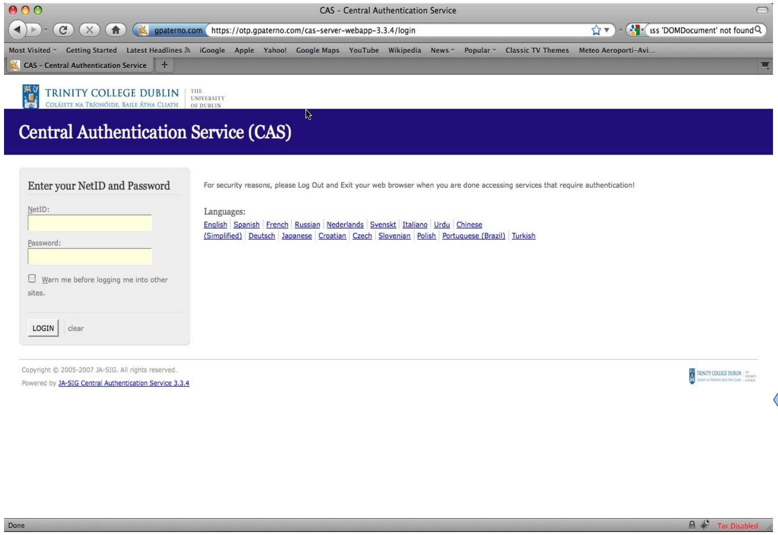
```
BusyBox v1.2.1 (2006.12.10-00:34+0000) Built-in shell (ash)
Enter 'help' for a list of built-in commands.

  _______                     ________        __
 |       |.-----.-----.-----.|  |  |  |.----.|  |_
 |   -   ||  _  |  -__|     ||  |  |  ||   _||   _|
 |_______||   __|_____|__|__||________||__|  |____|
          |__| W I R E L E S S   F R E E D O M
 WHITE RUSSIAN (0.9) -------------------------------
  * 2 oz Vodka   Mix the Vodka and Kahlua together
  * 1 oz Kahlua  over ice, then float the cream or
  * 1/2oz cream  milk on the top.
 ---------------------------------------------------
root@Quantumbase:~$ cd
root@Quantumbase:~$ cd /
root@Quantumbase:/$ ls
bin   dev   etc   jffs  lib   mnt   proc  rom   sbin  tmp   usr   var   www
root@Quantumbase:/$ 
```

Web Application

OTP/Radius Server

Authentication Request (RADIUS)



Central Authentication Service (CAS)

Enter your NetID and Password

NetID:

Password:

□ Warn me before logging me into other sites.

For security reasons, please Log Out and Exit your web browser when you are done accessing services that require authentication!

Languages:
English | Spanish | French | Russian | Nederlands | Svenskt | Italiano | Urdu | Chinese (Simplified) | Deutsch | Japanese | Croatian | Czech | Slovenian | Polish | Portuguese (Brazil) | Turkish

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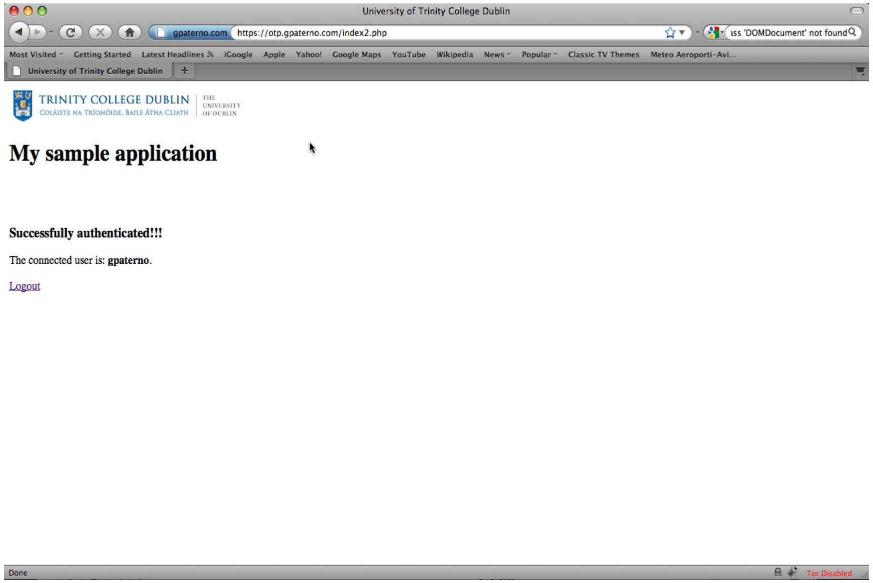
Powered by JA-SIG Central Authentication Service 3.3.4

Redirect to CAS' Single Sign-on Portal

Web Access



My sample application

Successfully authenticated!!!

The connected user is: **gpaterno**.

Logout

Demo now!

Thank you!!

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