OWASP Hackademic Challenges

A practical environment for teaching application security

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.about

Kostas

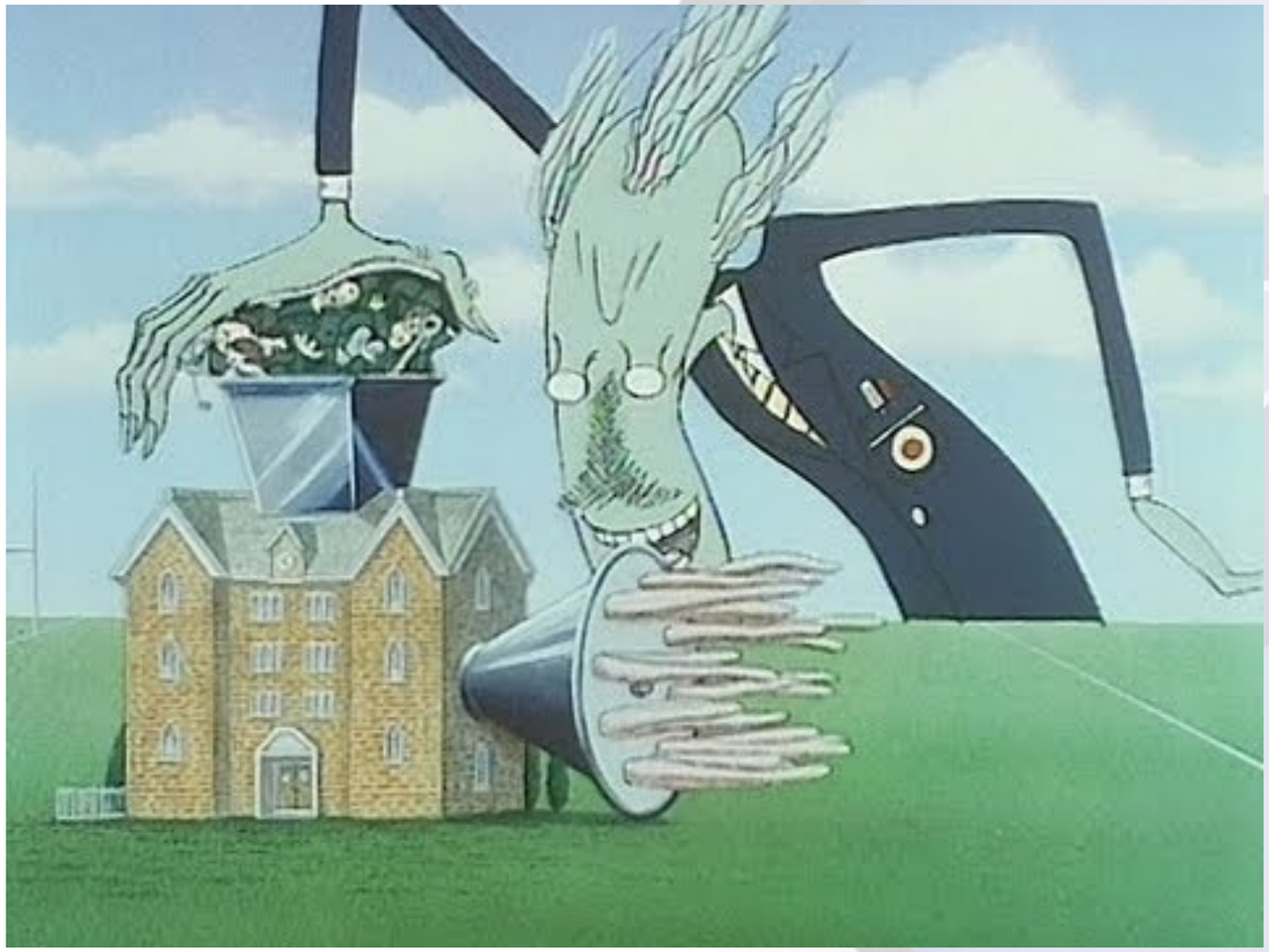
- 10+ years of experience in InfoSec as a consultant and researcher
- Currently: InfoSec Services Team Lead at OTE S.A.
- Involved with OWASP since 2005 as the Greek Chapter Leader
  - Co-Started the Hackademic Challenges Project in 2011.
  - Organized the OWASP AppSec Research 2012 conference.
- Research
  - PhD in Trust in MANETs – Univ. of Athens, GR
  - 10+ publications and 50+ citations
  - Teaching InfoSec and AppSec at Greek universities

Spyros

- Freelance web developer, uni student.
- Currently: Web Developer at Telesto Technologies Ltd.
- Involved with OWASP since 2010
  - Co-Organized OWASP AppSec Research 2012
  - Joined the Hackademic development team in 2011.
- Participated as a student at GSOC in 2012 and as a mentor in 2013
- Coming soon: Internship at CERN Security Team

.disclaimer

No students were harmed in the making of this project



What is hackademic?

- Relatively simple challenges, mainly web-based that involve JavaScript, PHP, web server mis-configuration, etc.
- The goal is to present the general idea behind certain security issues, rather than having complex, sophisticated challenges.
- Variety of topics covered, rather than going too deep into one of them.
- Some may seem simple and 'old-fashioned' (e.g. XSS) but websites vulnerable to them still exist!

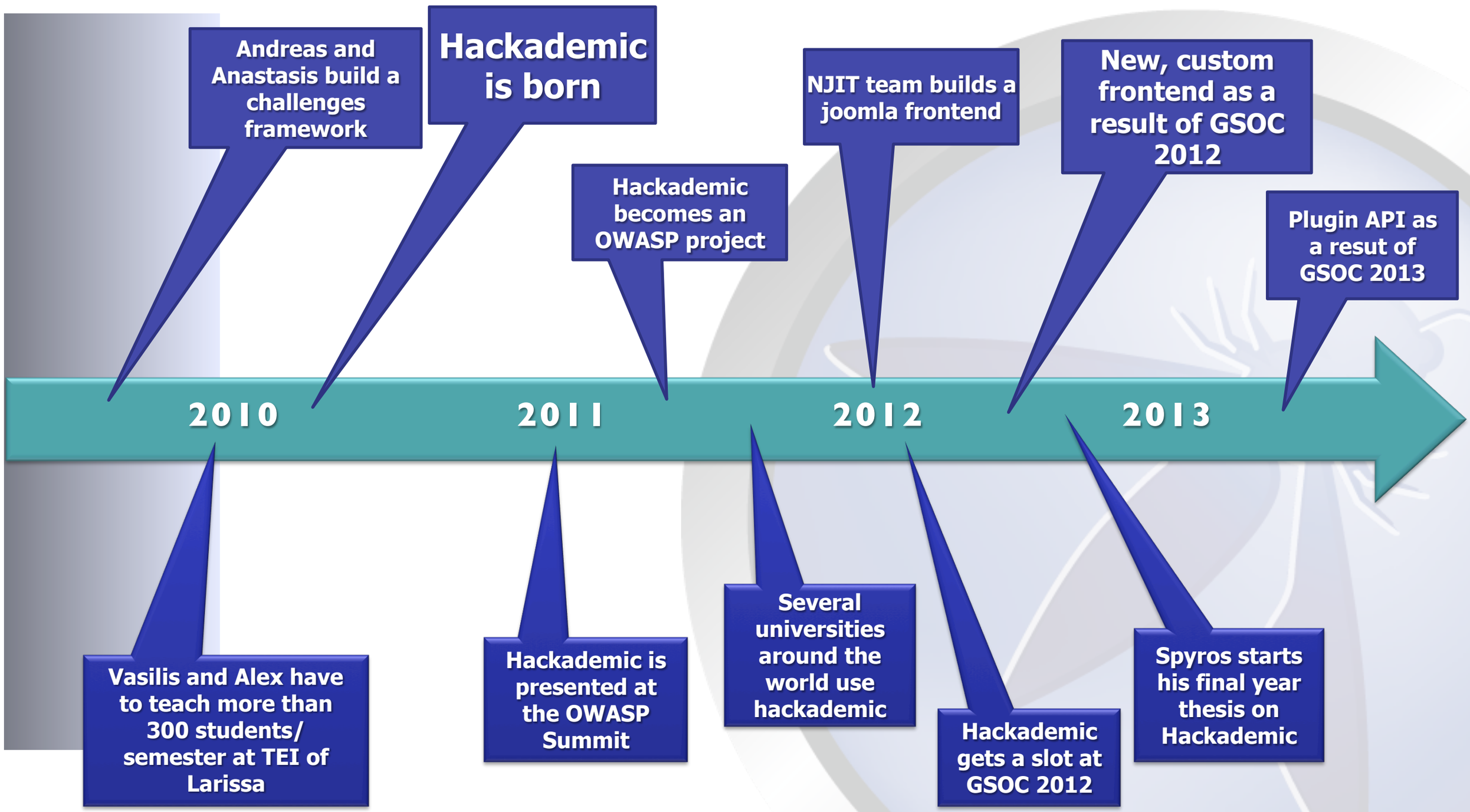
Challenges - Motivation

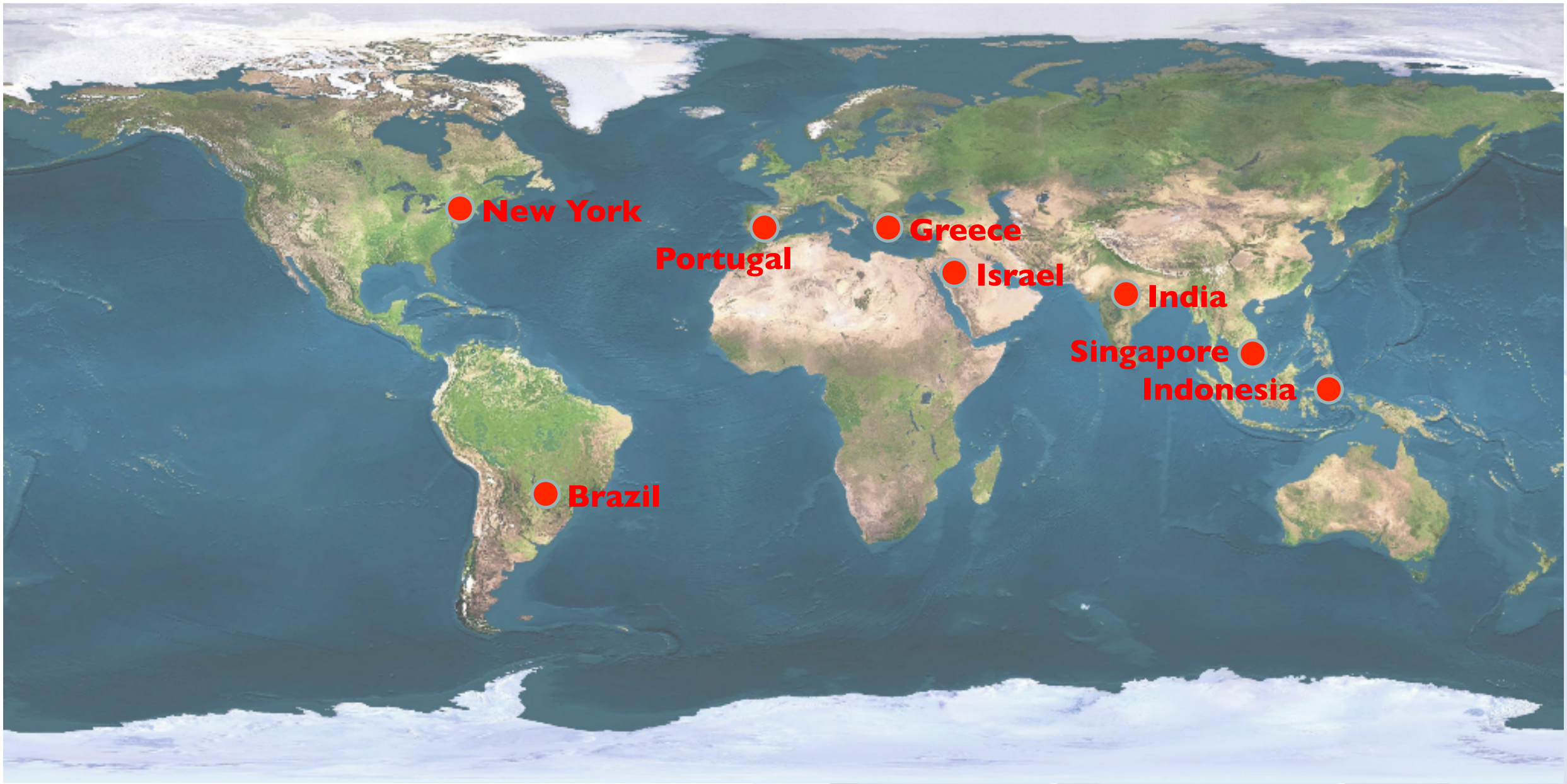
- Teach security at 300+ students each semester.
- Students have varying background, skills and knowledge.
- University courses are too theoretical.
- Every student (and every teacher) wants to have a “pen-test lab”

labs are cool but…

- Hard to build/maintain (especially if students practice hacking on them!)
- Most existing vulnerable apps (e.g. WebGoat) are nice for demos or self-teaching but not designed for use in a class-lab environment.
- Need to promote discussion and interaction
- Need to introduce the "attacker's perspective"

hackademic


Andreas and Anastasis build a challenges framework
Hackademic is born
Hackademic becomes an OWASP project
NJIT team builds a joomla frontend
New, custom frontend as a result of GSOC 2012
Plugin API as a resut of GSOC 2013
2010
2011
2012
2013
Vasilis and Alex have to teach more than 300 students/ semester at TEI of Larissa
Hackademic is presented at the OWASP Summit
Several universities around the world use hackademic
Hackademic gets a slot at GSOC 2012
Spyros starts his final year thesis on Hackademic


New York
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TEI of Larissa
TEI of Messolonghi
Athens Univ. of
Economics and Business
Univ. of Athens
Univ. of Piraeus
Univ. of Peloponnese

hackademic v0.2

- Based on a Joomla frontend
- 10 web application security challenges
  - From simple to intermediate
  - Topics: information gathering, xss, encoding, etc.
- More challenges came in later
  - Crypto
  - SQLi
  - Entire VMs

Rules for Challenges

- There must be a scenario/story/myth.
- It must target a specific topic.
- The solution should be single and deterministic.
- There should be a “timeline” and a strategy for delivering the knowledge behind the set of all these exercises
- The difficulty in solving the exercises should escalate

Student’s reactions

it works!

- Student expect typical “text-based”, theoretical lectures
- Instead, for a minute they get to ‘think like an attacker’.
- Several students, upon completion of the given challenges, attempted the next ones. Some did so at home ⇒ They liked it!
- Can lead to several discussions and input from students

Questionnaires

- 25 questions in total
- Approx. 500 students have replied up to now
  - Looking to automate this…
- Questions on the level of skills/knowledge
- Feedback on the use of challenges


Usefulness of exercises
Not at all
3%
Little
12%
Significantly
50%
Very much
35%

Why a new version?

- Lots of interest to build new challenges
- Similar interest to use hackademic in various classes/universities.
- Need to work on usability and ease of installation
- Need to facilitate importing new challenges

hackademic v0.3

New features:

- An entirely new interface
- Installer
- Facilitates/automates installation
- Prerequisites: Apache/PHP/MySQL (XAMPP, LAMP, etc.)

Firefox | Hackademic CMS

localhost/xampp/hackademic/admin/

OWASP
The Open Web Application Security Project

HACKADEMIC

Hi admin, Home | Add New Articles | Article Manager | Users/Classes | Add New Challenge | Challenge Manager | Logout

Dashboard

Add New Article

Article Manager

User Manager

Add New Challenge

Challenge Manager

Configuration

Installer

- Facilitates/automates installation
- Prerequisites: Apache/PHP/MySQL (XAMPP, LAMP, etc.)

Role-based access

- Admin
- Student
  - Can view progress, his rank among his class and global rank
- Teacher
  - Can create classes and assign students to them
  - Can monitor students' progress and score
  - Can post articles

Class/Students Management

Added usability for teachers:

- Create/Manage/Archive Class
  - Assign students to classes
  - Assign challenges to classes (students)
  - Monitor student/class progress
- Add announcements/articles

Importing new challenges

Ability to import new challenges

- (Nearly) automated procedure
- Workflow:
  - Teacher uploads challenge as .zip file
  - Challenge is automatically placed in the correct directory
  - Admin checks challenge
  - Admin published challenge
  - Teacher can add challenge to class


Excellent
Good
Average
Poor

Scoring System

- Instead of a simple, binary system we implemented a complex way of marking:
  - Maximum attempts
  - Time for completion
  - Attempts/minute
  - Player keeps trying after being successful
  - Use of known user agents (vulnerability scanners)
  - Cheating detection: too many challenges solved with 1 attempt only.

Security Enhancements

- Use of ESAPI-PHP for:
  - Input validation
  - Escaping
  - Session management
- Access control improvements
  - Quite complex (along with session management) as there are two different levels of access: CMS and challenges.

Other features

- Easy to use installer (all you need is Apache/MySQL/PHP)
- Multiple solutions per challenge

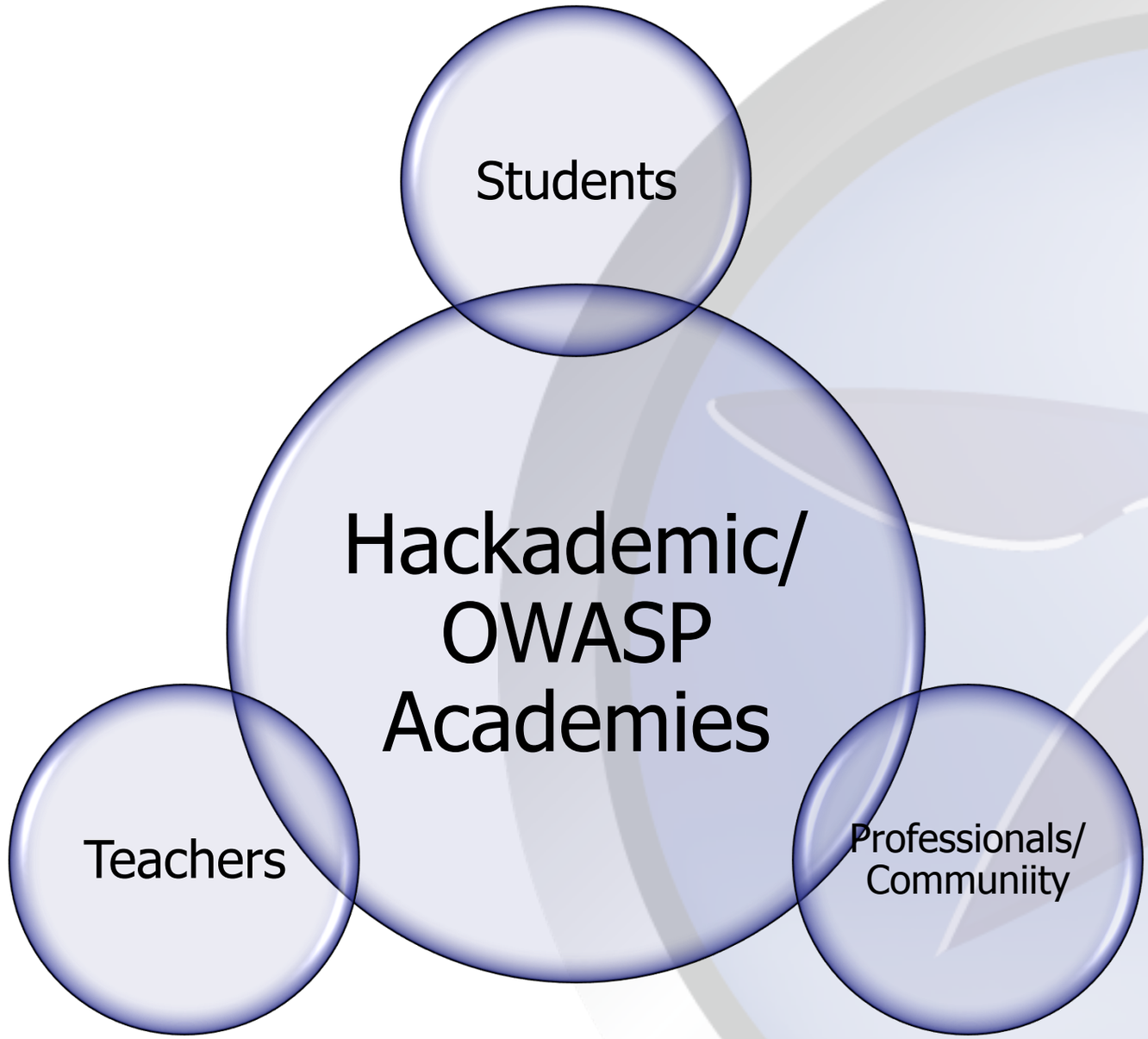
Extending Hackademic

- Plugin API
- Endless possibilities to extend Hackademic
  - Add or change functionality
  - Create themes
- Plugins work by defining actions that hook execution points and callbacks that do the work
- Plugins are manageable through the UI

More info: https://github.com/span/hackademic/wiki/Plugin-API-Overview

Demo

Hackademic Ecosystem



(Near) Future Work

- Documentation – user's guide
- Release a hardened VM version
- Migrate from esapi-php to a more modern, actively developed library
- Add integrated questionnaires for students/teachers (for stats and/or exams)
- Add teaching content
- Add more challenges – engage with the community
- Implement reporting mechanism

Thanks

Dr. Vasilis Vlachos

Andreas Venieris

Anastasis Stasinopoulos

Alex Papanikolaou

Pragya Gupta

Daniel Kvist

Fotis Liatsis

Nikos Danopoulos

Petros Andreou

Thank You!

http://hackademic.eu

Next Stop:

OWASP AppSec USA Project Summit

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