The Cloud for University City Campus

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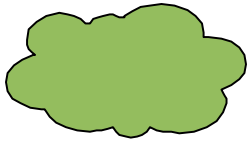
INTRODUCTION

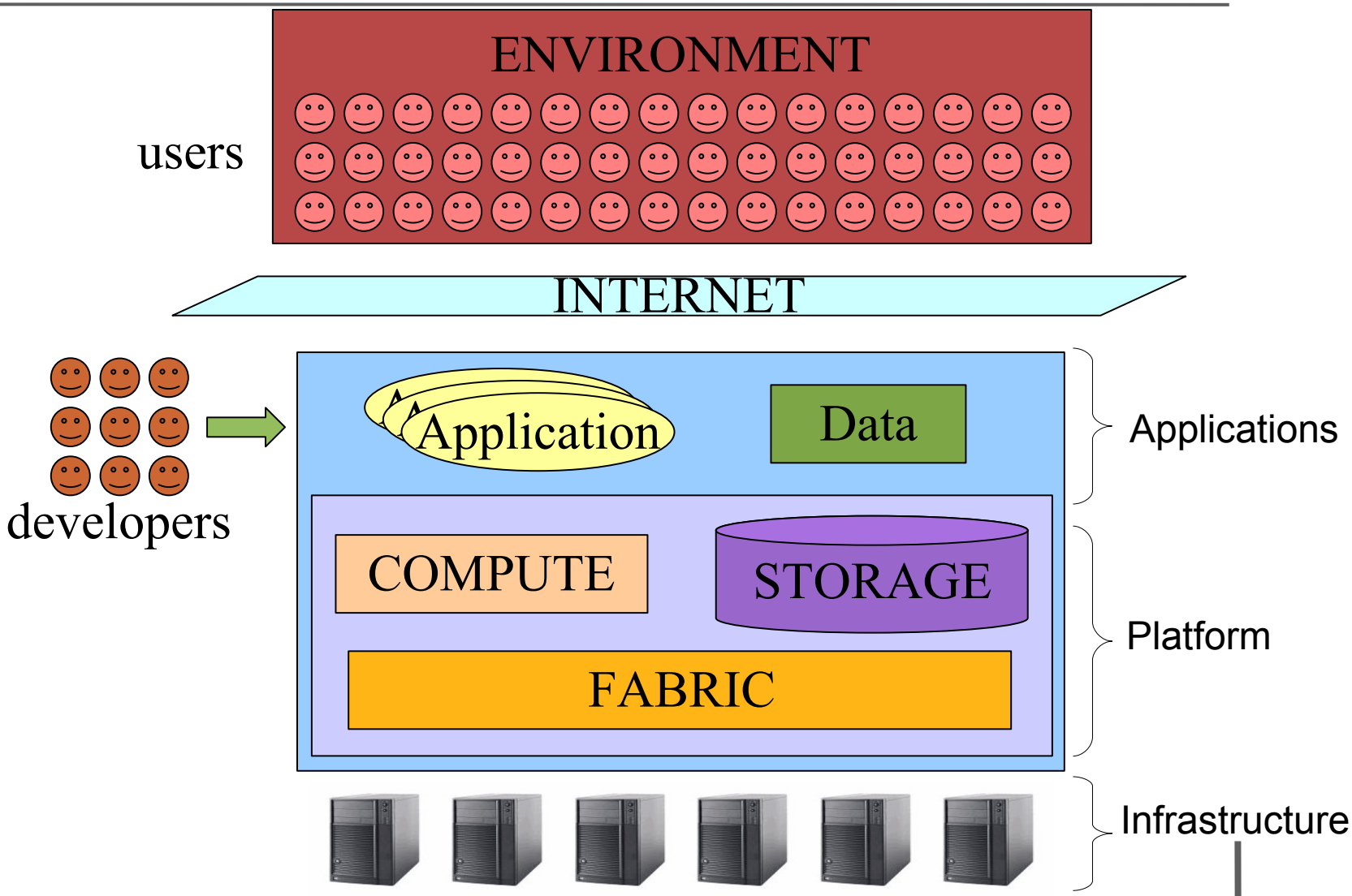
- Cloud technologies are ready to change the way in which we interact with Internet services, and can replace our local computing resources.
- Applications will play a fundamental role to test current ideas and tune/improve/develop the state of the art in cloud computing.
- In this talk we propose to use the cloud to create a virtual **University city campus** in Bologna, hometown of the **most ancient University** in the Western world.
- We can thus say that in our proposal the Past melts into the Future.

OUTLINE

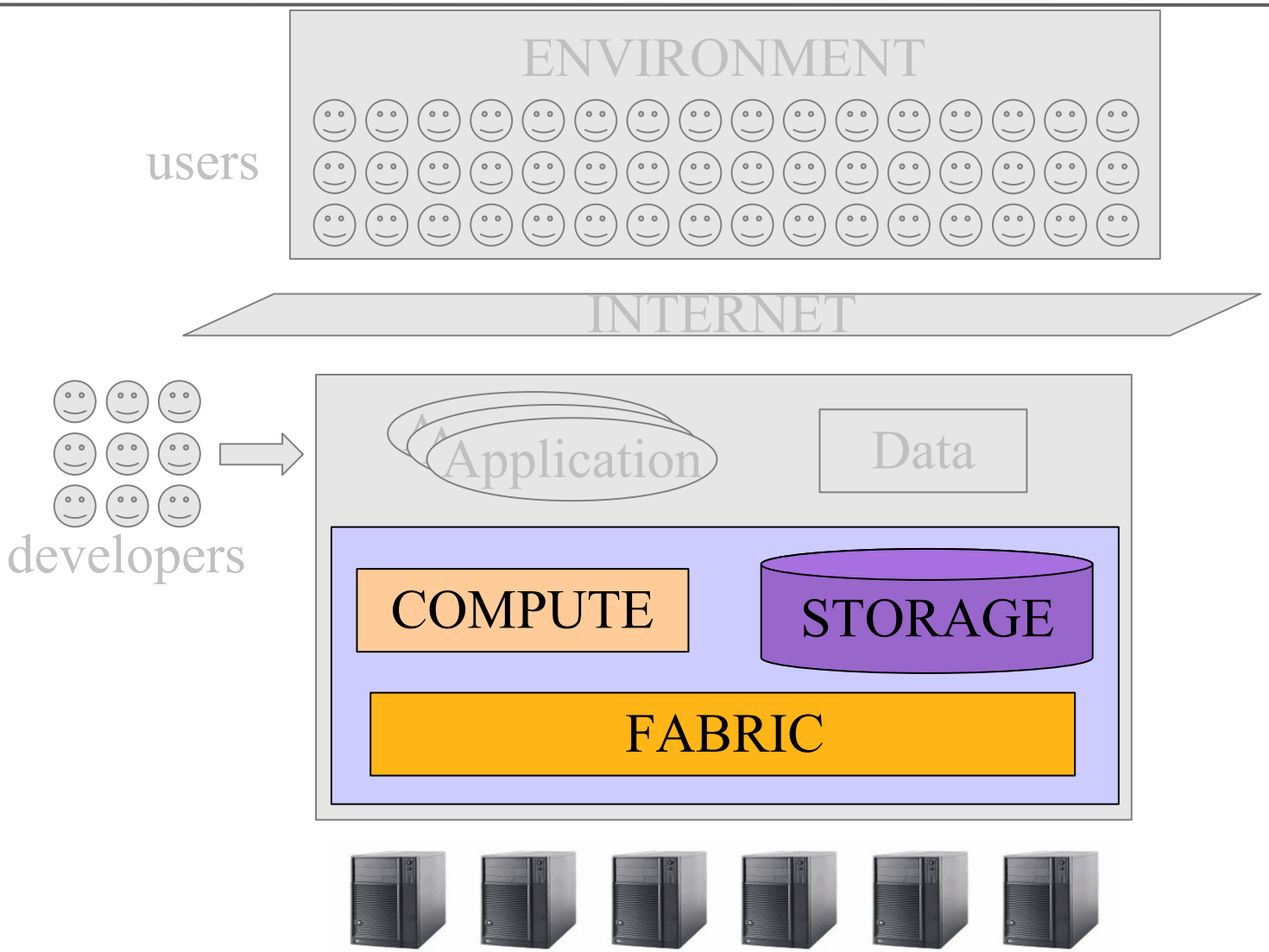
- Making the Cloud: main actors.
- Social, technical and geographical features of the Bologna University city campus.
- Main phases of the project:
  - Pilot: turning on the basic infrastructure.
  - Internal development: application building and usage restricted to a limited number of users.
  - Integration: adding “global” services.
  - Extension: widening the user base.
- Opportunities and summary of the proposal.

ARCHITECTURE OF A CLOUD





NEXT: MAPPING TO THE BOLOGNA UCC



Components of the University City

Campus Cloud Application

or: Why we think Bologna is a good choice

FEASIBILITY STUDY

- Users.
- Environment.
- Internet connection.
- Developers.
- Applications/Data.

POTENTIAL USERS

- Cloud applications are especially useful when they serve a large (and varying) number of users.
- The University of Bologna has **about 85 thousands** students enrolled, making it one of the most attended universities in Italy.

- In addition,
  - **3,193** permanent faculty members.
  - **3,103** admin/technical units.
  - About **1,800** external faculty members.
  - Over **2,000** contract collaborators involved to a varied extent in research and teaching activities.

ENVIRONMENT (1)

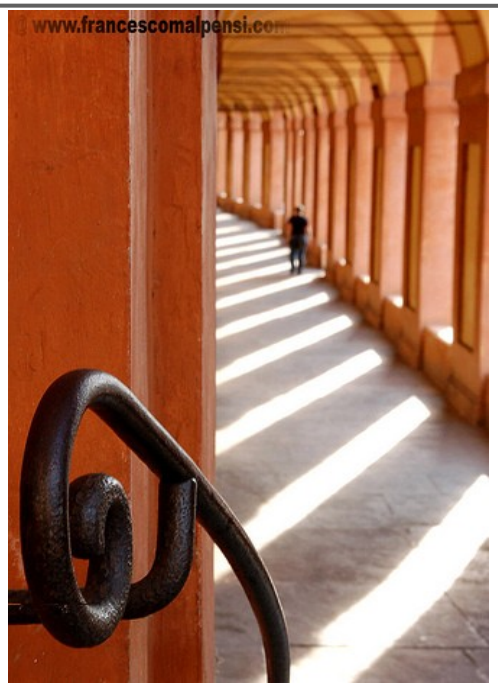
5 Campuses based in Bologna, Forlì, Cesena, Ravenna, Rimini and in a decentralized site in Buenos Aires.

23 Faculties, 70 Departments, 21 Research Centres, 224 degree programmes activated.

In Bologna, the campus is already **spread over the city**: University buildings alternate with private buildings and surround public squares.

ENVIRONMENT (2)

- Nice weather and *portici* – yes, this is a very important feature of our cloud application...



- In Bologna, streets and squares are the perfect physical environment over which a virtual campus can be built.

ENVIRONMENT (3)

- Students already spend a lot of their time in squares and coffee bars.

- It is not unusual to see them studying or even attending outdoor classes.

NETWORK CONNECTION

- A significant part of the city center is covered by wireless networks freely available to University students and staff and citizens.
- Users of Bologna City Council (residents and employees).
- Users of the Bologna University (students, teachers, technical-administrative staff).

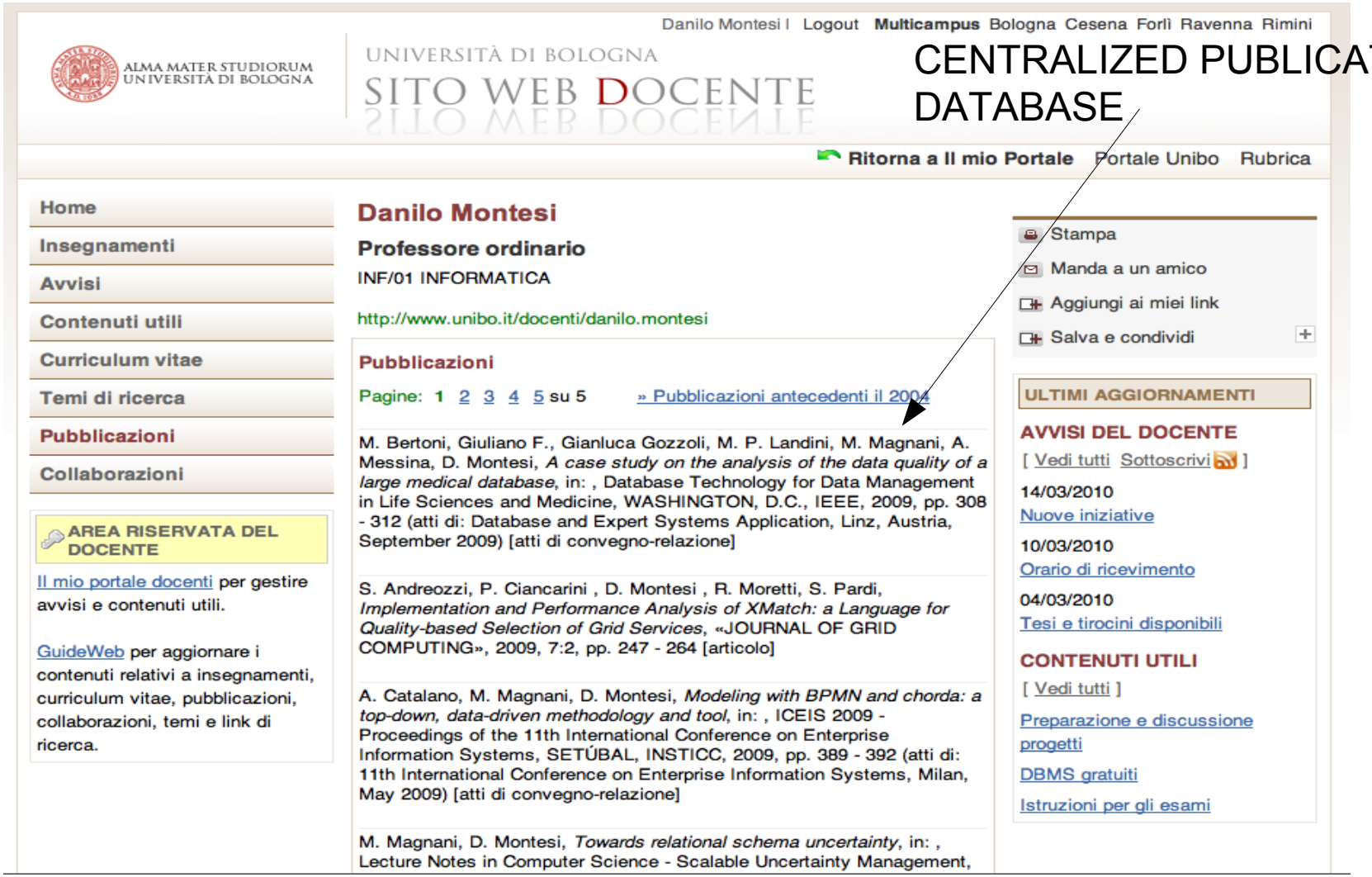
DEVELOPERS

- The University provides several undergraduate and post graduate degrees in computing.
- These students can be both users and developers, coding applications as project works and experimental theses.
- The integration of cloud technologies into computing curricula with the possibility of developing real applications used by other students can help in building a competence center.

APPLICATIONS/DATA (1)

- **231** institutional websites, **126** web services and about **90,000** online contents are an integral part of the University Web Portal.
- → Many services are ready to be put in the cloud.
- → Lots of data are already available to application developers.
- Main areas:
  - Research.
  - Didactics.
  - Virtual Labs.
  - Mobility.
  - ...

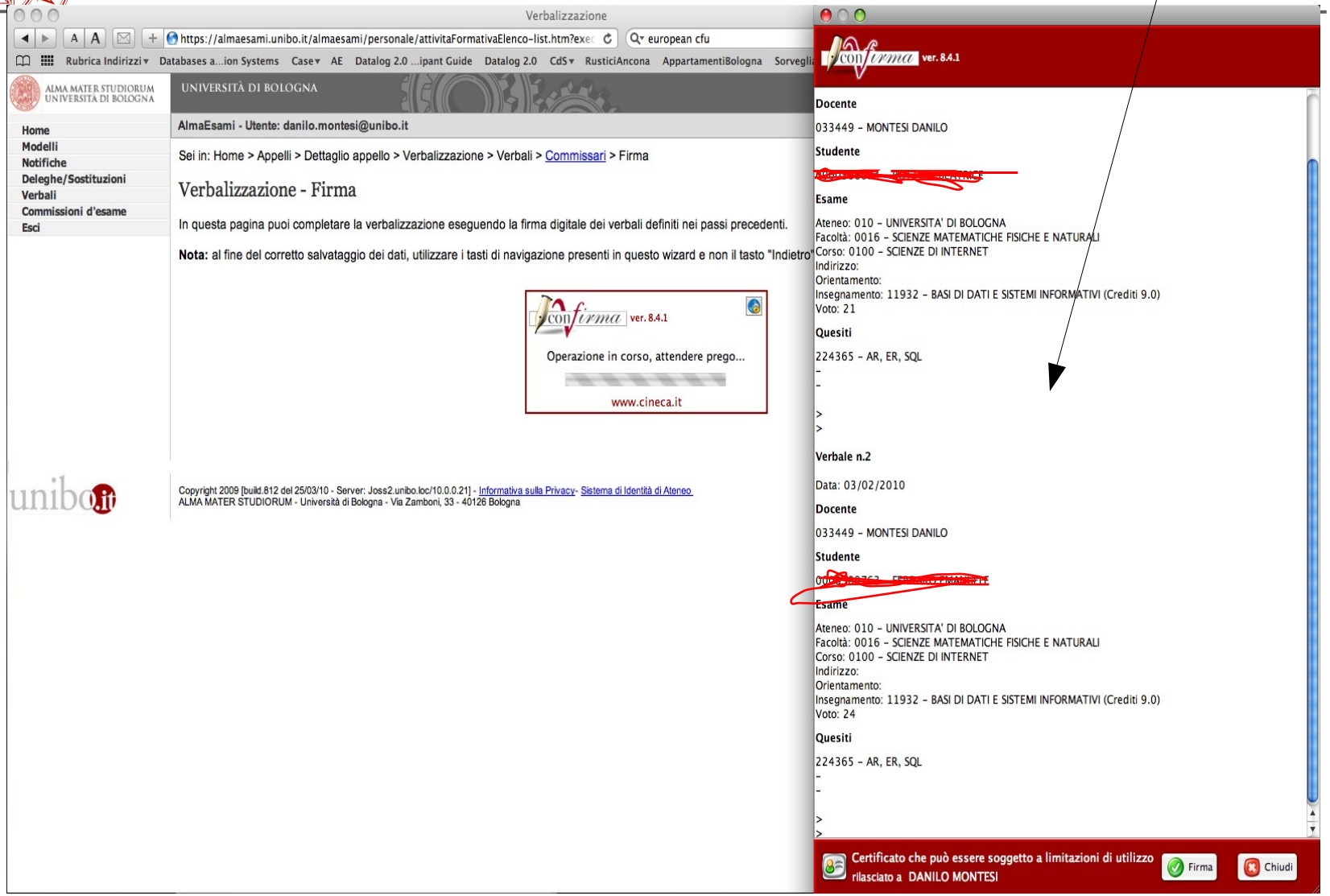
APPLICATIONS/DATA: faculty



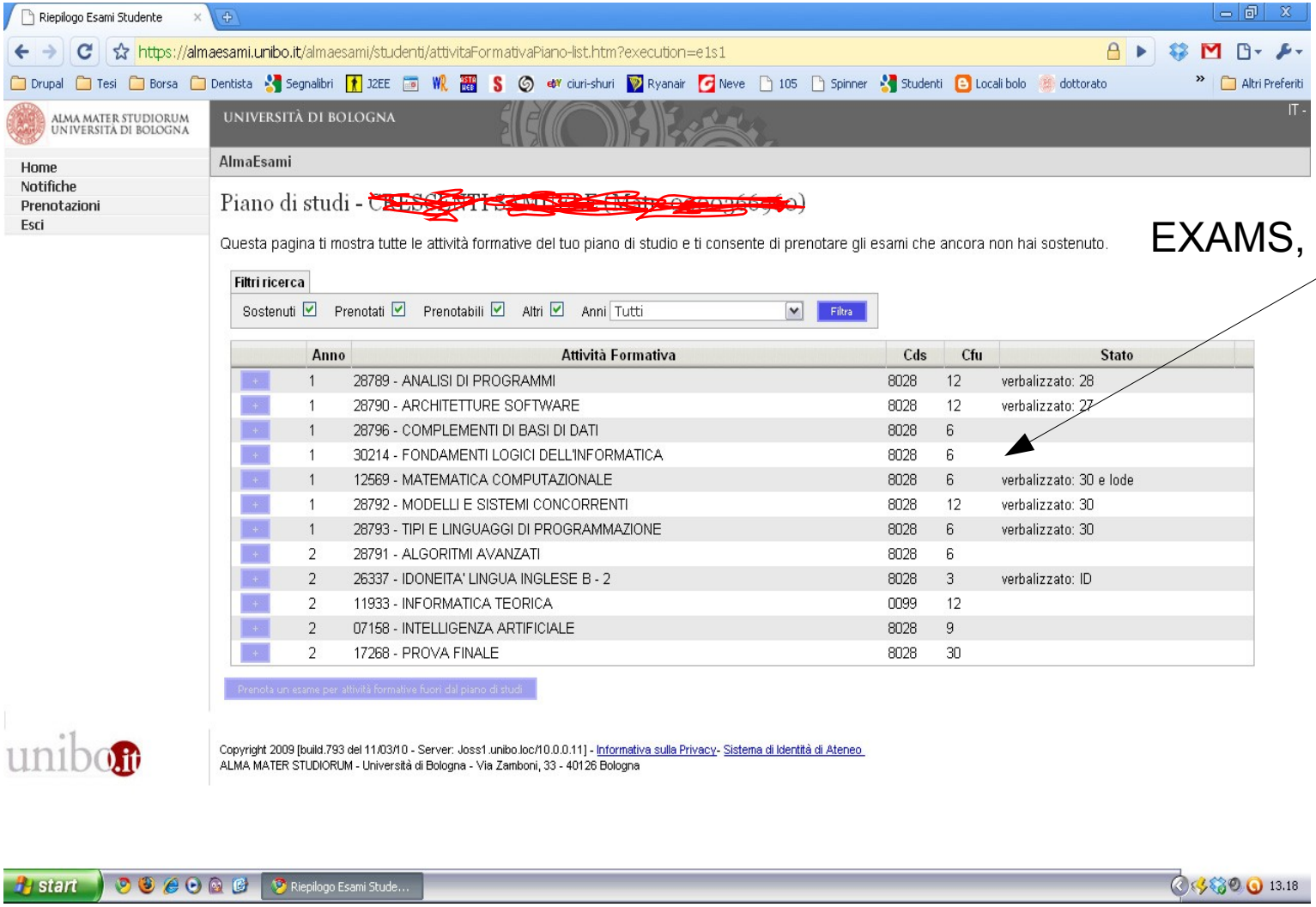
CENTRALIZED PUBLICATION DATABASE

APPLICATIONS/DATA: digital signature

CENTRALIZED PRIVATE DATABASE



APPLICATIONS/DATA: student



EXAMS, CURRICULA

APPLICATIONS/DATA: library system

The University of Bologna incorporates a huge and complex bibliographic heritage, which is integrated to the SBA - the University Library System.

The **University Library System (SBA)** is composed of:

- **85** service points
- **6 thousand** posts for reading and investigations
- **3.5 million** monographs
- **21 thousand** online periodicals
- **250** databases
- **20 thousand** electronic books

The **Inter-Library Centre (CIB)** is engaged in the supply of automation services and in the development of new library services.

An interesting starting point to develop rich services.

Main phases of the project

PHASE 1: PILOT

- Objectives:
  - Setup a cloud infrastructure.
  - Make some existing applications available in the cloud.
- Students will be able to access these services without coming in our labs.
- We will only have users, restricted to computer science students.

Move labs into public places in the city center, with students accessing resources directly from their laptops and the available Internet connection.

This phase will create the basic infrastructure to be used to develop custom applications.

- It will be based on existing systems.
- Initial user feedback collected, to drive the following phases.

PHASE 2: INTERNAL DEVELOPMENT

- In phase 2 will still involve only computing students, who will now become developers.
- The objective of this phase is to spread the competences that will be then needed to develop more complex applications for all other users.

The developed cloud applications (of this phase) will belong to two classes:

- General applications, decided by students and instructors (collective intelligence).
- Moving into the cloud other applications previously available inside our labs, to complete (or extend) phase 1.

PHASE 3: INTEGRATION

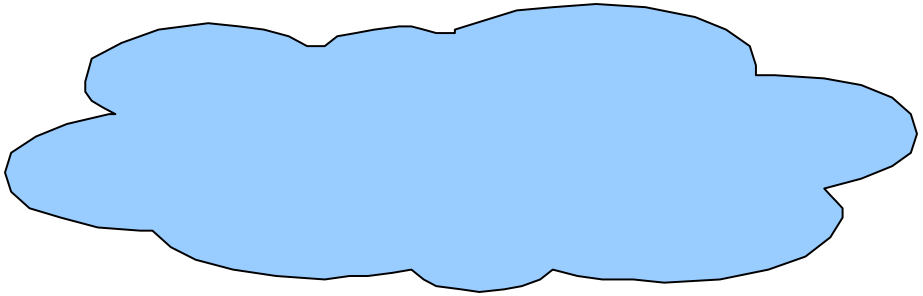
- At the beginning of this phase we will already have:
  - User feedback on pros and cons of using cloud applications to build the city campus.
  - Developers with competences in application development.
- At this point, we will start building applications of interest for the wider space of users: students and staff from other departments.
- This phase is the bridge toward the final step, where the first applications will be made available to people outside the department of computer science.

PHASE 4: EXTENSION

- With this phase, the first services will be available to everyone, tested and monitored.

AS IS

TO BE



OPPORTUNITIES

- Develop an enviroment and a set of applications which can be applied to several other contexts, e.g., other universities or environments with similar features.
- Deal with a real application of cloud technologies to identify potential areas of new development and test existing infrastructures, as well as experiment innovative services.
- Form students with strong competences on the cloud, giving them the keys to be the next developers or related ideas and advances.

CRITICAL ASPECTS

- Privacy and data location.
  - Italian law requires complete knowledge on the location of the data.
- Acceptance.
  - Although the cloud should simplify many technical details, change is always a risk.
- Mobile@BUCC.
  - Many existing applications should be rethought to be used with mobile devices.
  - A path that we should anyway traverse.

SUMMARY OF THE PROPOSAL

- Building a University City Campus based on cloud technologies.
- Objectives: testing, development and experimental analysis of new techniques on a real and computationally demanding scenario, providing competences to students.
- Bologna seems to be an ideal place where to start, because of the aforementioned reasons.
- System building and deployment divided into small phases, to gradually reach all the objectives of the overall proposal.

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

Thank you.