ulm university universität ulm

Seminar Computer Networks
Interactive Teaching - an experiment

System design

Bernhard Wiegel, Institute OMI,November 8th, 2011

Content

- Motivation repetition
- Current technologies
- System features and possible applications
- Top - Down System design
  - Requirements
  - Communication models
  - Application design
  - Communication architecture
- Module tasks
- Software design
  - Structure
  - Interfaces

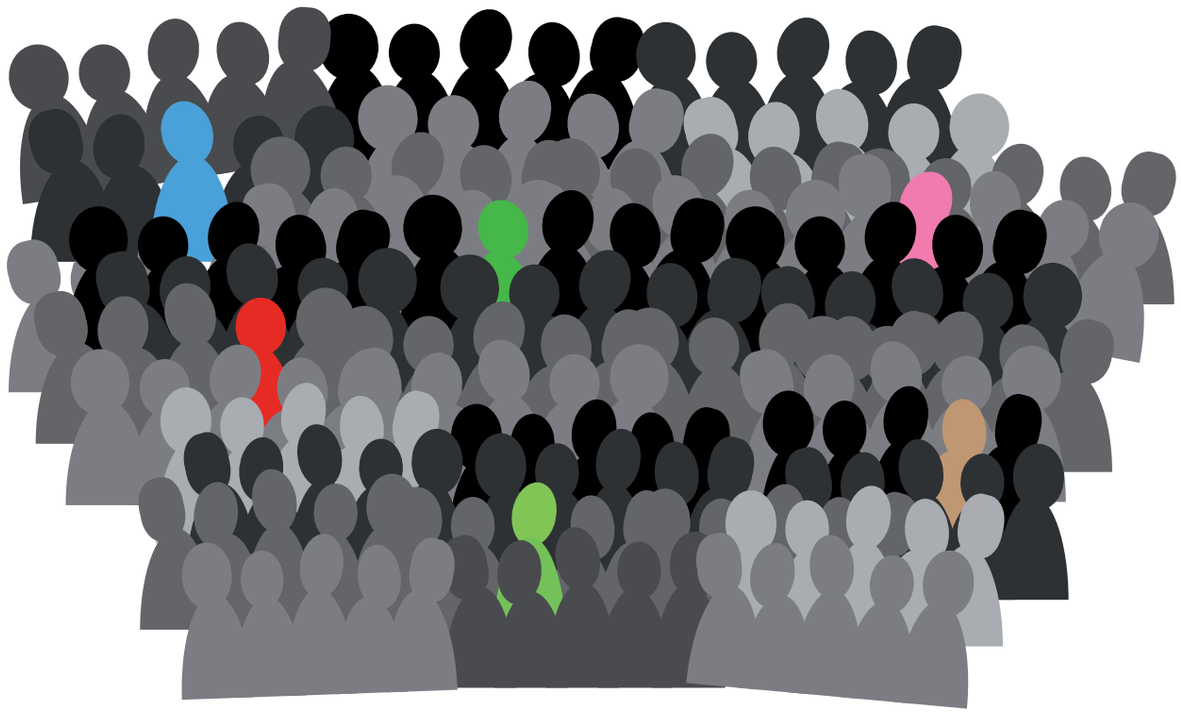
Motivation „System for Interactive Teaching“

- **Idea:** Docents and students communicate during or besides the lectures via a digital network

- Pros
  - Fast and direct feedback
  - Parallel communication
  - Interactive elements will relax the atmosphere

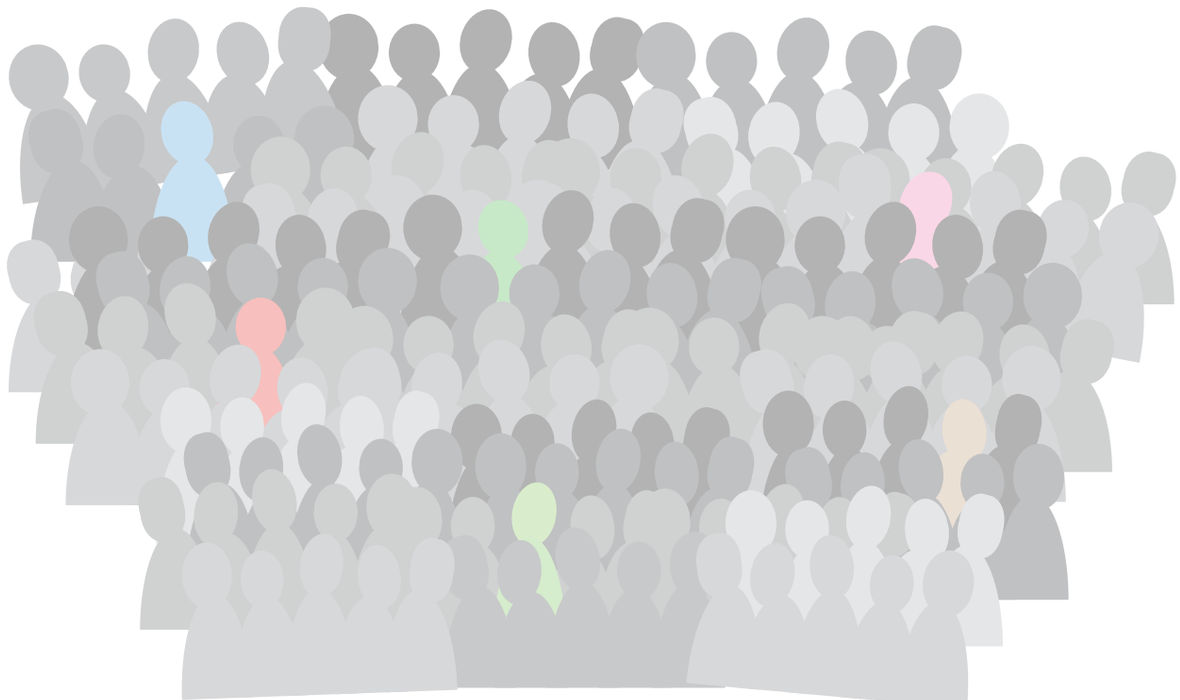
- Advanced teaching possibilities
  - Discovery of comprehension problems
  - Discovery of redundant and for comprehension not necessary content
  - Collecting additional useful information on the lectures‘ topics
  - Collection of frequently asked questions
  - Evaluation of the provided materials
  - More active participation

Why does current technology support such a system ?



Why does current technology support such a system ?

What students bring to a classroom ?



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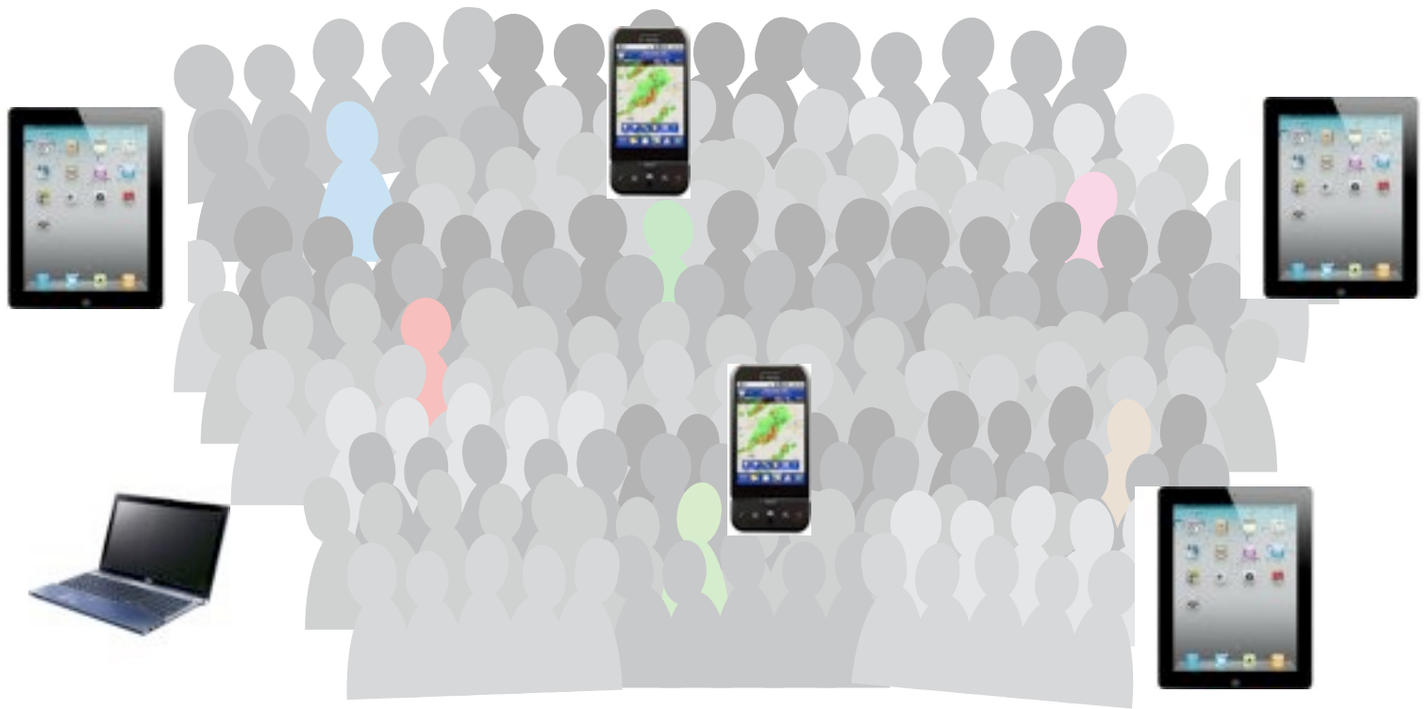

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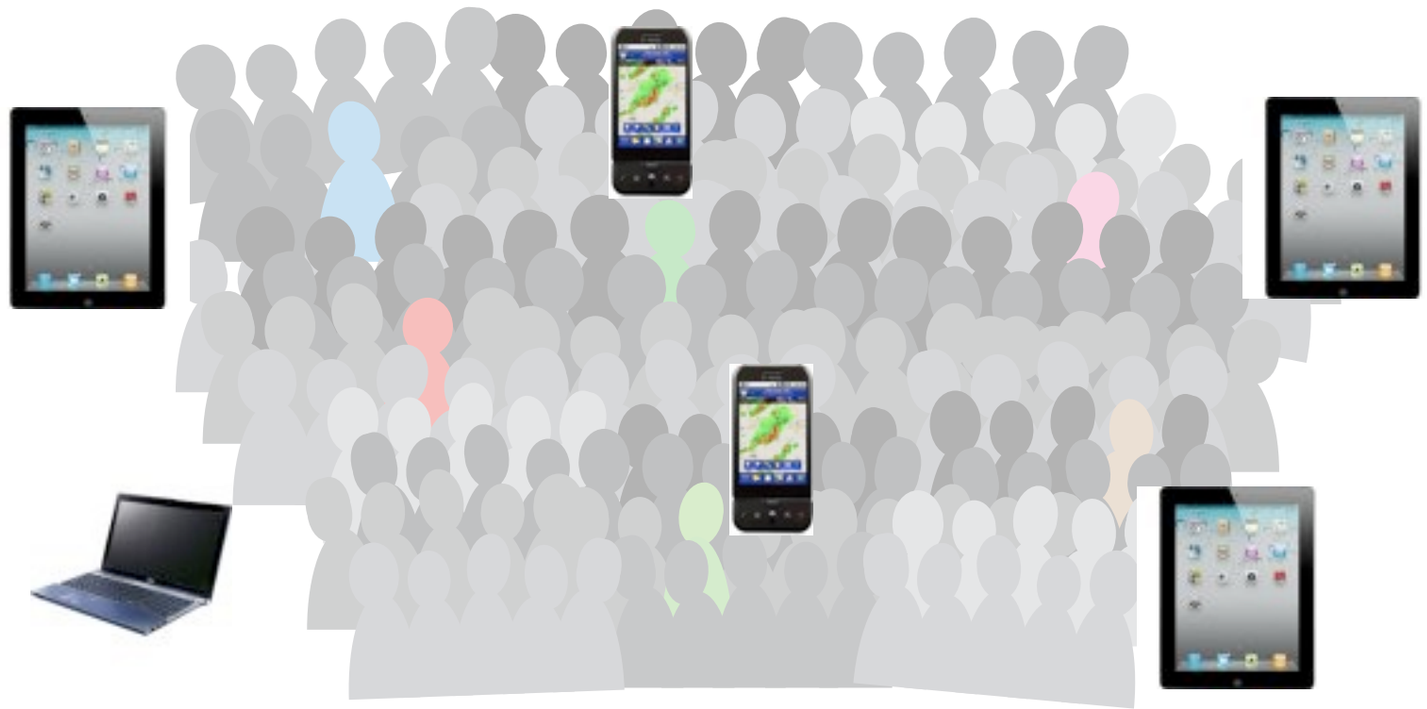


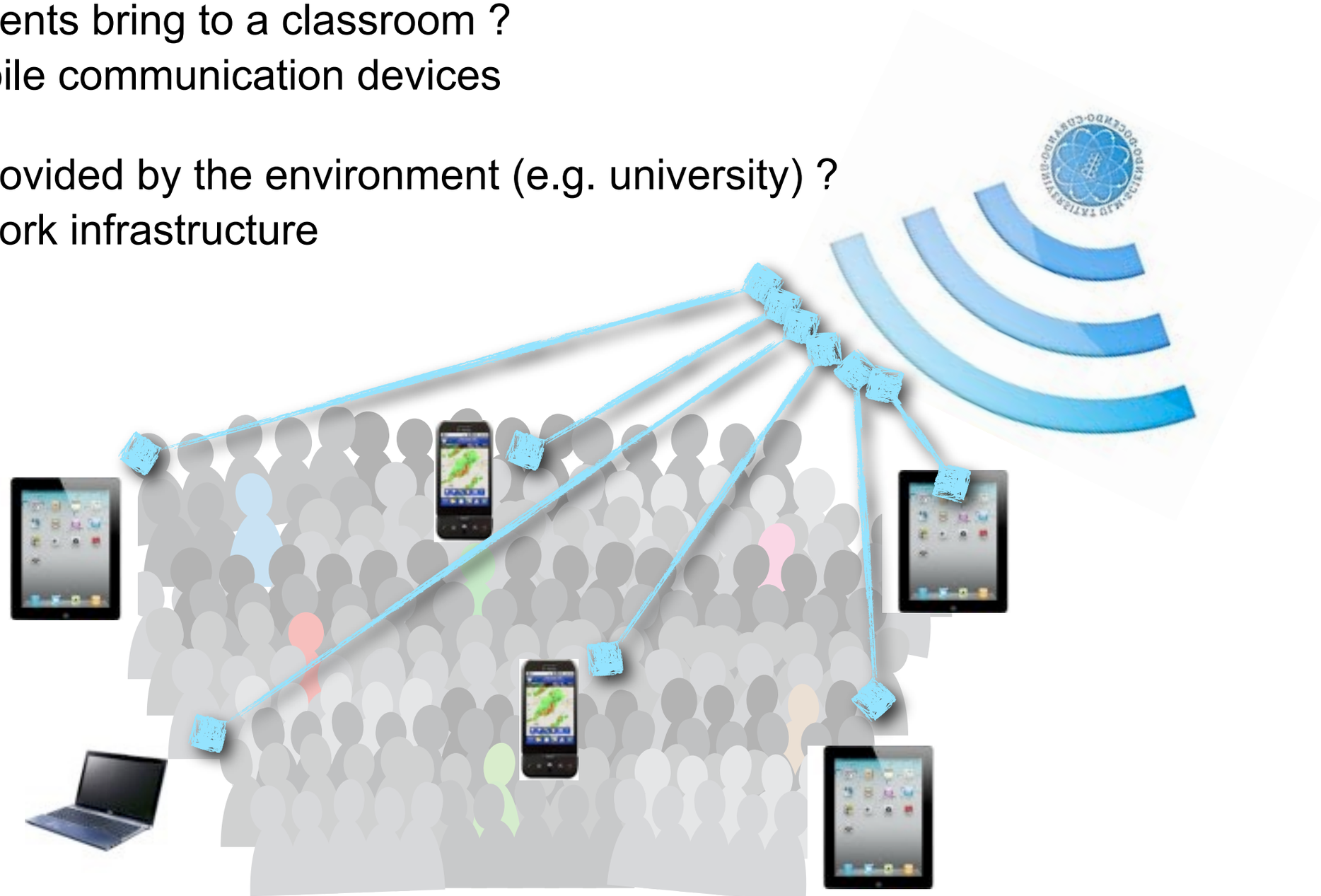
Why does current technology support such a system ?

What students bring to a classroom ?

– mobile communication devices

What is provided by the environment (e.g. university) ?

– network infrastructure



System features - Possible application

- Interactive feedback
  - in form of questions prepared by the docent or the students
  - spontaneous
  - quick data acquisition

- Evaluation or rating of lecture contents
  - by both students and docents

- Creating a collection of proceeding information on lecture material

What could be a practical application / service ?

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– ???

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– Feedback of lecture speed

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– Feedback of lecture speed

– Automated vote or poll system

System Design - Top/Down

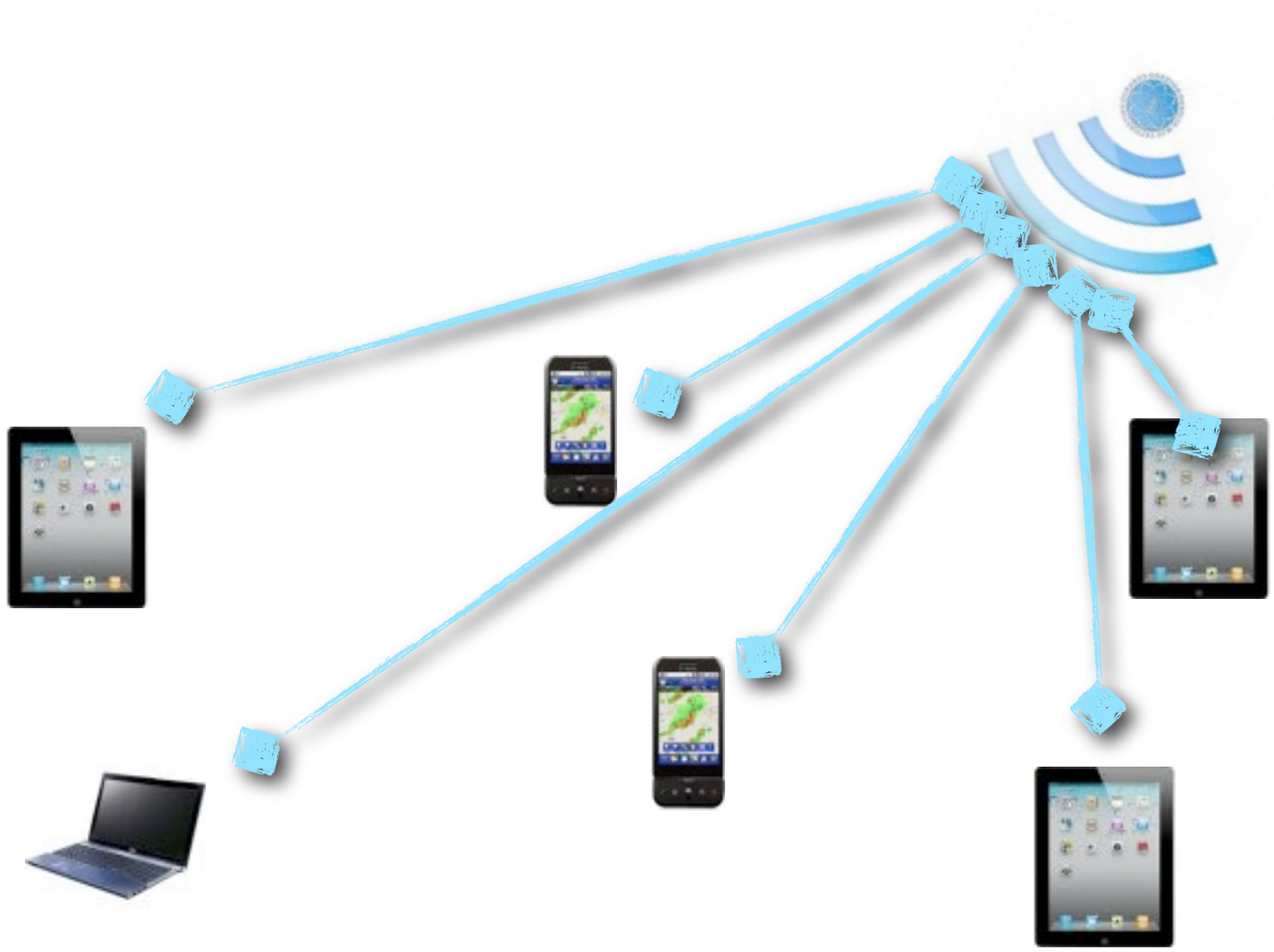
- Identification of the application
- Specification of the application‘s functionality and its requirements
- Top level communication model
- Specification of the communication architecture
- Specification of tasks for each of the architectures modules
- Design of software structure
- Specification of module interfaces

System / Application requirements

- Setup of network connectivity between a set of mobile devices
- User management
- Security / Privacy
- Anonymity
- Discovery service
- Application specific data exchange
- Realtime feedback
- Extended lecture recording

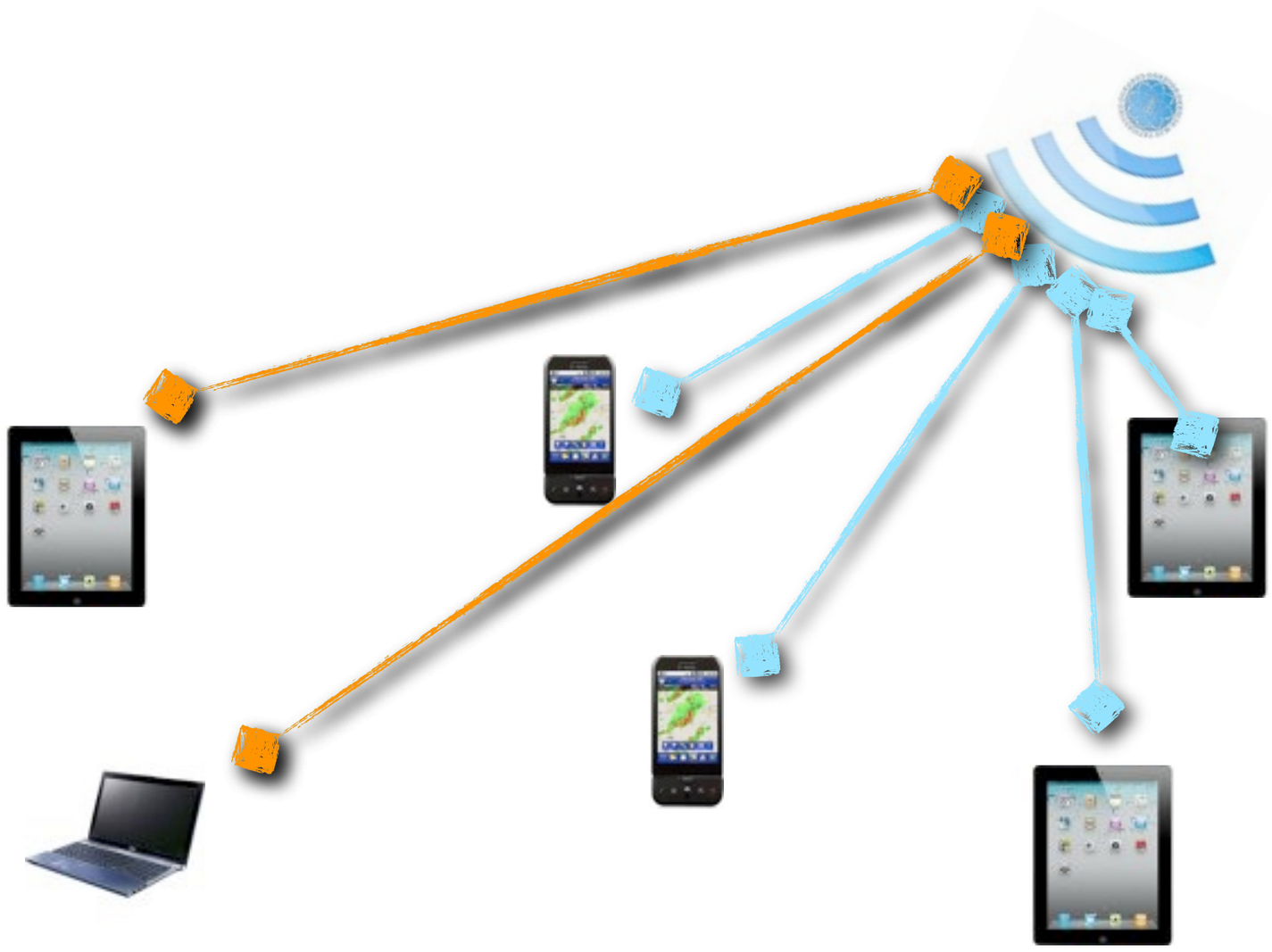
Top Level Communication Model

Top Level Communication Model



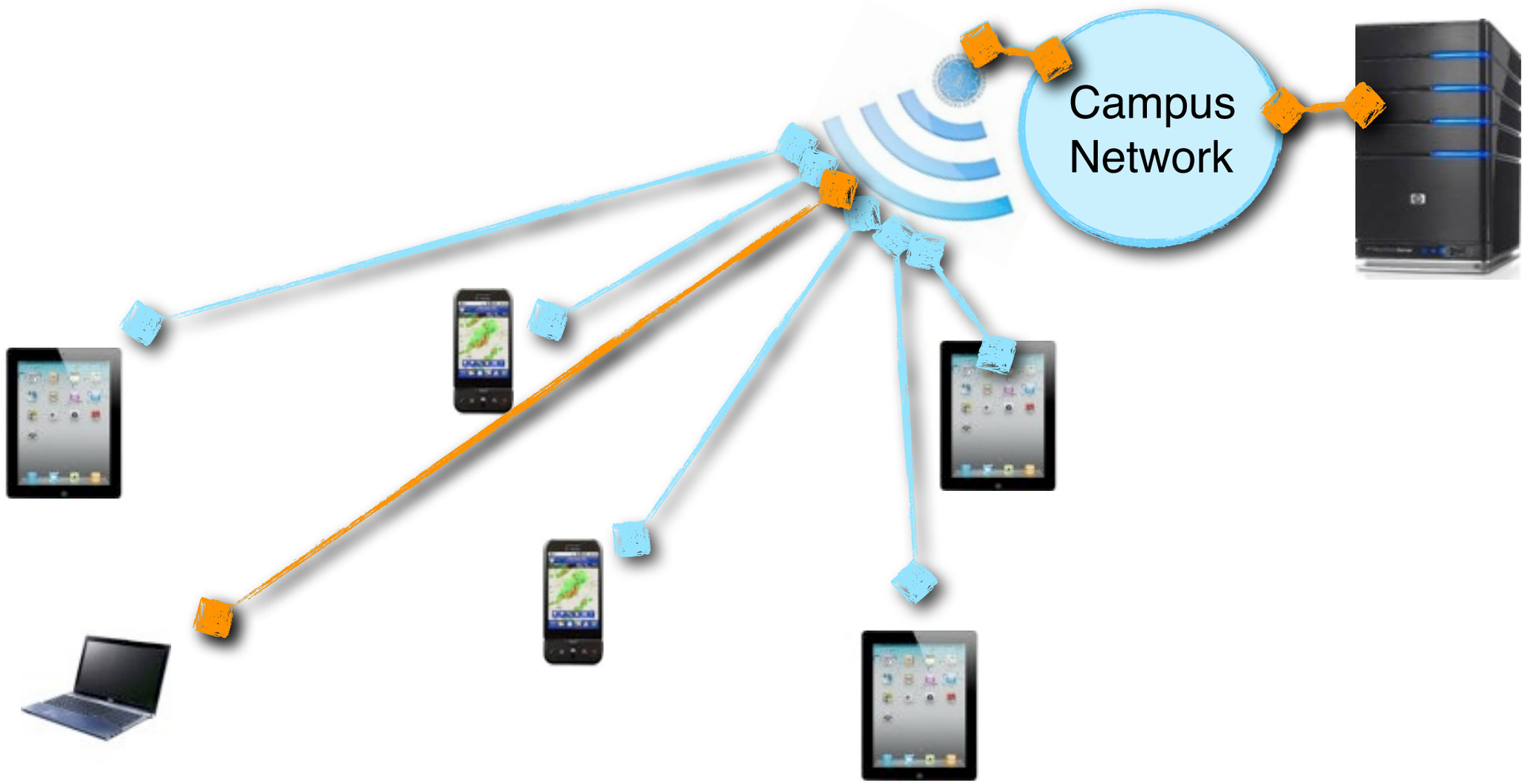
Top Level Communication Model

– Client / Client



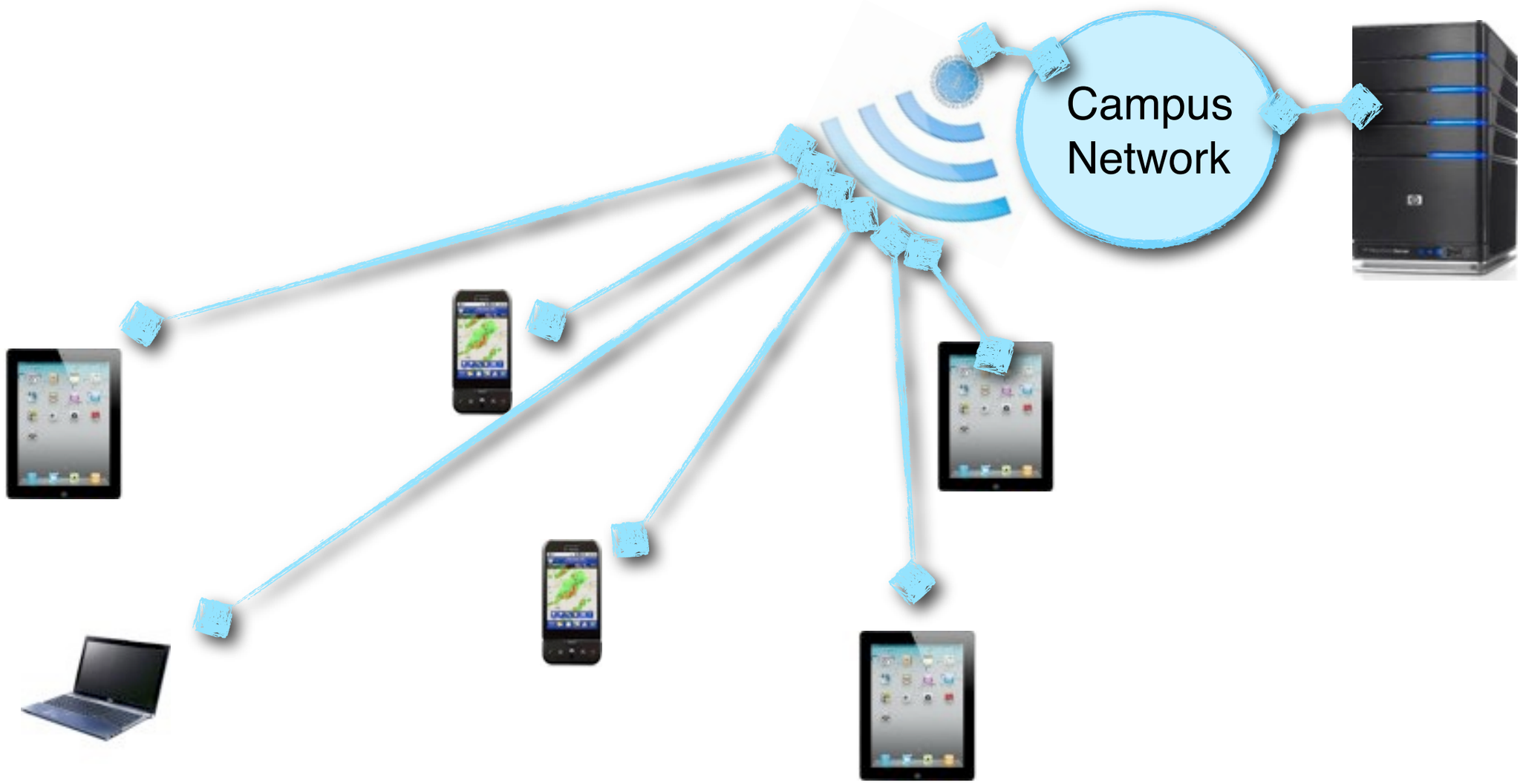
Top Level Communication Model

- Client / Client
- Client / Server



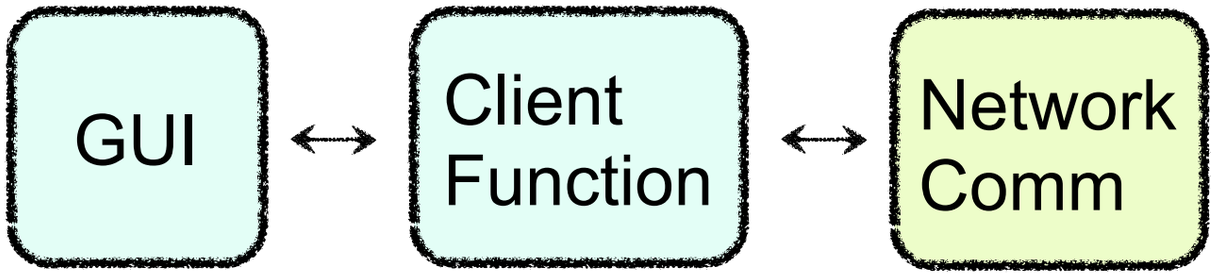
Top Level Communication Model

- Client / Client
- Client / Server
- Service Advertisement / Discovery

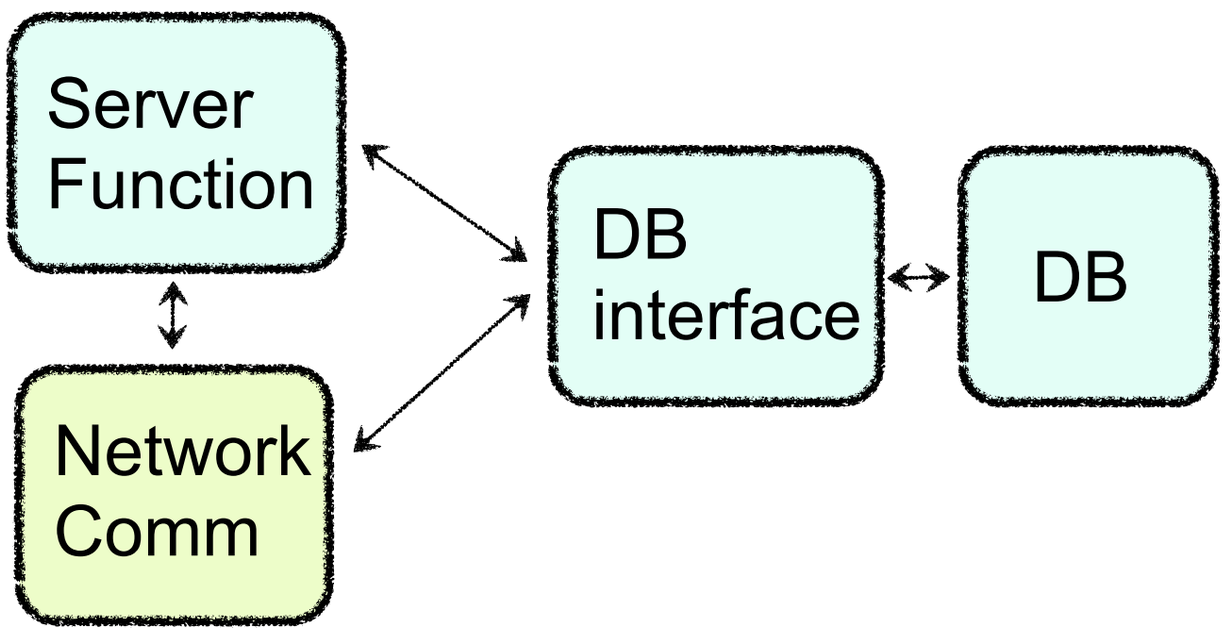


Architecture

– Client on mobile devices (tablets, smartphones)



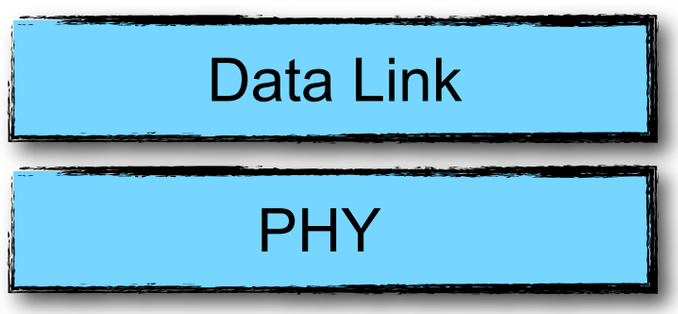
– Server



Communication Architecture

Communication Architecture

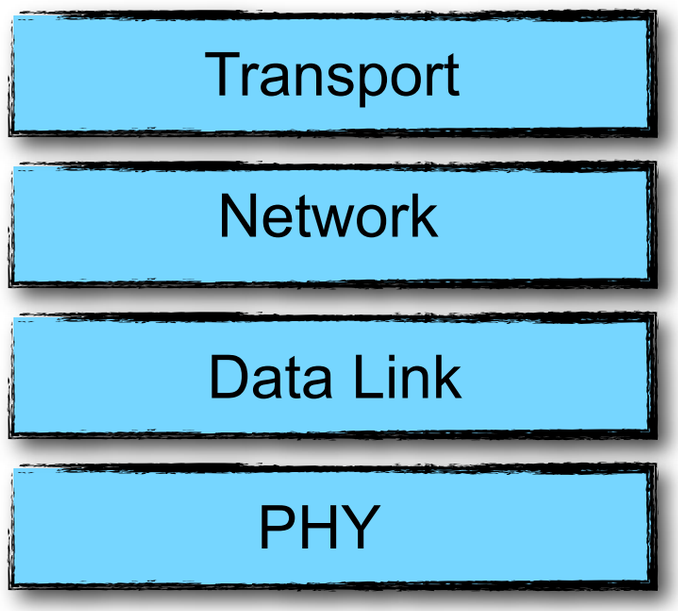
– Layer 1 & 2 - e.g. Wireless LAN 802.11 protocol



Communication Architecture

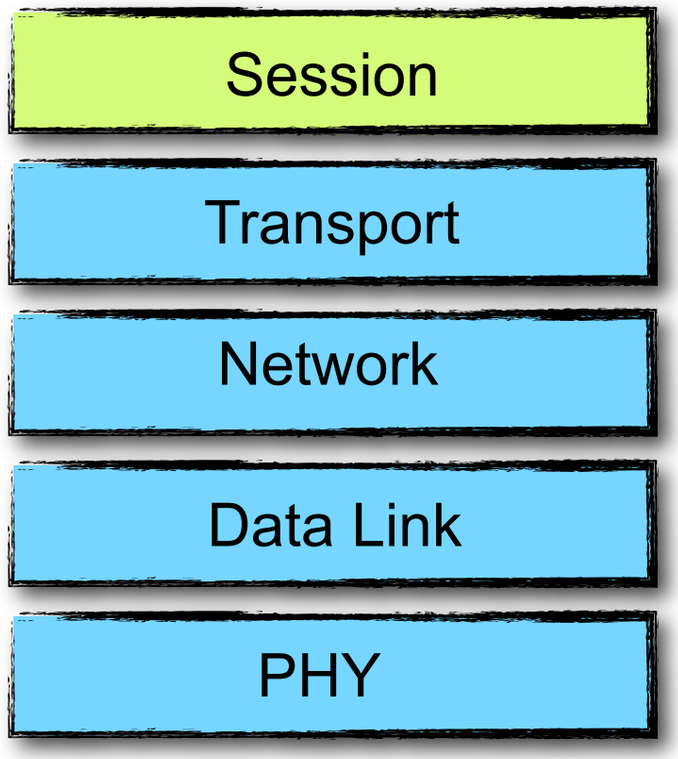
– Layer 3 & 4 - TCP / IP protocol family

– Layer 1 & 2 - e.g. Wireless LAN 802.11 protocol



Communication Architecture

- Layer 5 - Sessions overcome changes in underlying layers
- Layer 3 & 4 - TCP / IP protocol family
- Layer 1 & 2 - e.g. Wireless LAN 802.11 protocol



Communication Architecture

- Layer 6 - Encryption, Authentication
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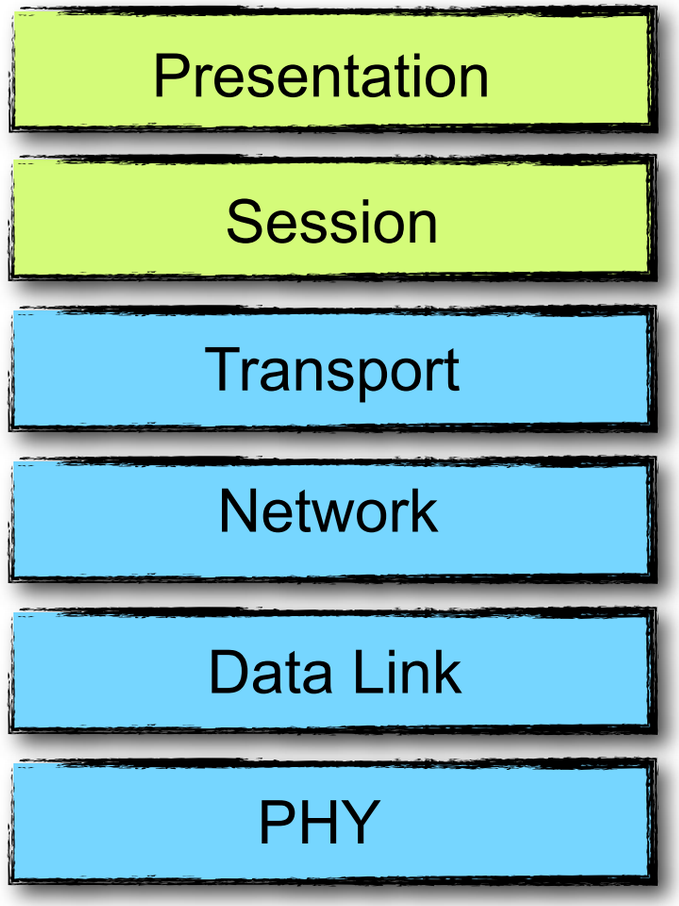

Communication Architecture

- Layer 7 - Application protocol, Service Discovery / Advertisement protocol
- Layer 6 - Encryption, Authentication
- Layer 5 - Sessions overcome changes in underlying layers
- Layer 3 & 4 - TCP / IP protocol family
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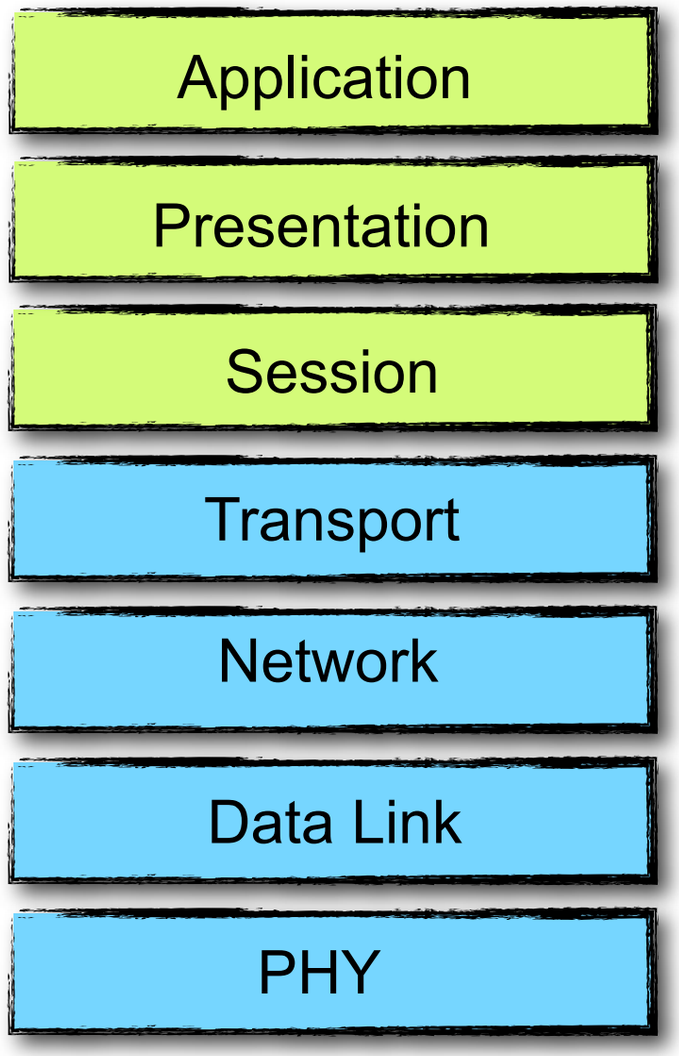
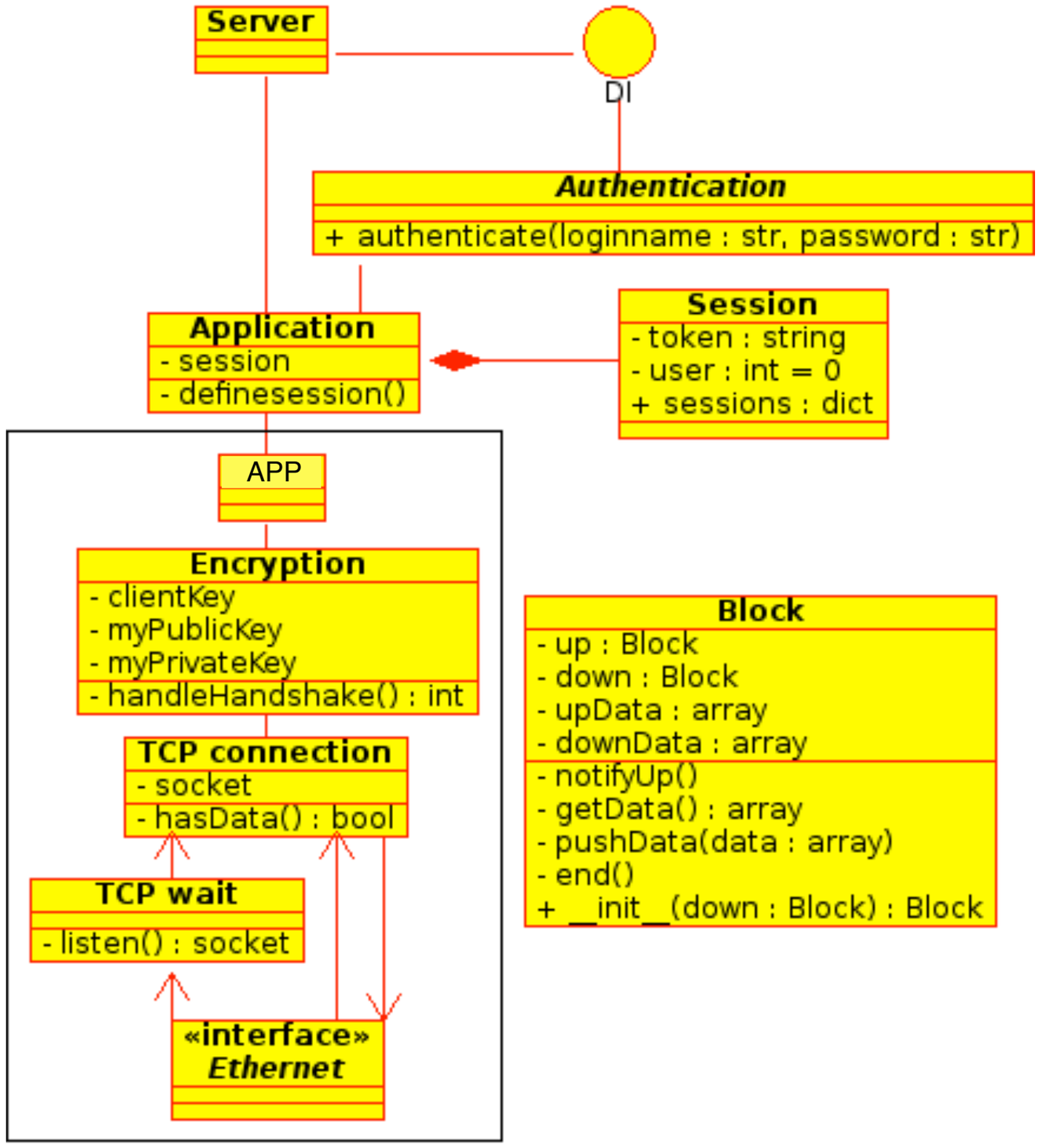


Module tasks (presented by groups)

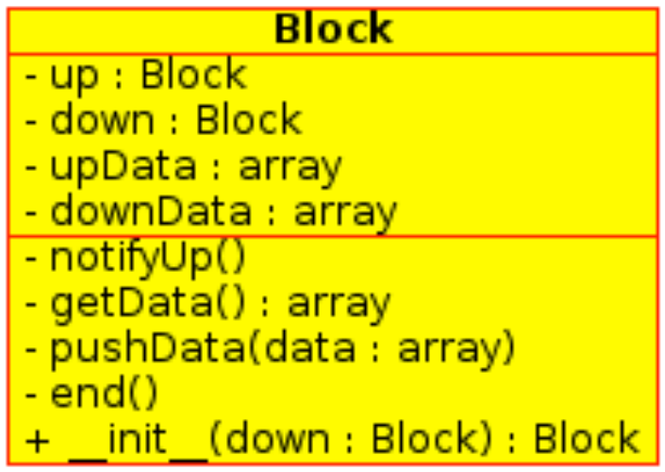
- Session and Identity management
- Encryption
- Authentication
- Application protocol
- Service discovery
- Service advertisement
- Security model

Software structure of communication architecture

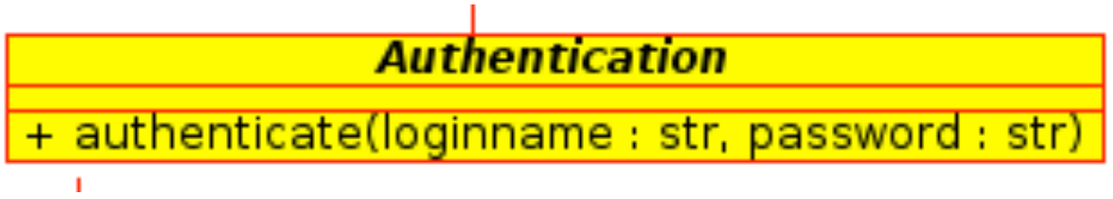


Module interfaces

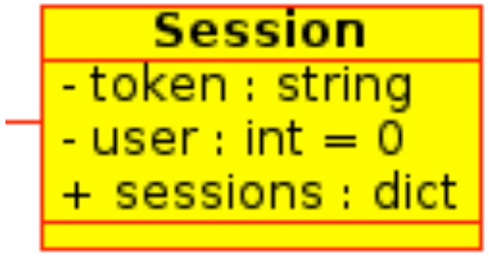
– Protocol classes derived from Block



– AUTH class



– Session class



Summary

– Present methods and describe module task
– Concept for one method that solves module task
– Pseudo-Code of concept implementation

– Implementation within iOS client app and/or server environment
  - within given software framework
  - according to specified module interfaces

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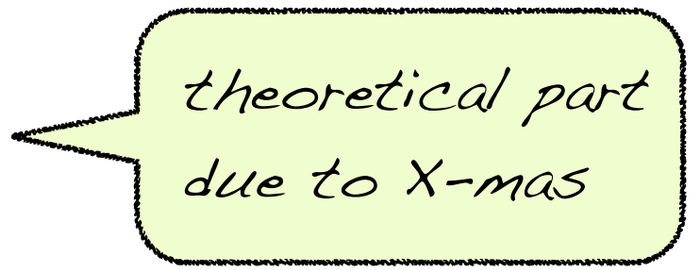

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theoretical part
due to X-mas

– Implementation within iOS client app and/or server environment
  - within given software framework
  - according to specified module interfaces

practical part
due to february

Hardware handout

- Each group gets a brand new MacBookPro and a iPad2 to solve the practical seminar part
- Each group has to sign a lending agreement
- Hardware has to be returned at the end of the semester

- Please use these devices responsibly !

Apple University developer group

- Development of iPad Apps using XCode
  - installed on MacBookPro
  - have to be signed by developer

- Invitation email to join developer group
  - Please join the group and create an AppleID if necessary
  - Create and upload your user certificate
  - We will provide you with the necessary developer certificate

- Next week, we will present the development flow and the code templates for client and server

Contact information

Information on the web

- Group assignments
- Presentation dates
- Presentation templates for Open-Office and PowerPoint
- Templates and tutorial for implementation part
- Lecture material
- Web: www.uni-ulm.de/in/omi

Contact

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