



Network Architectures and Services
Department of Computer Science
TU München

Peer-to-Peer Systems and Security

IN2194

Dr. Heiko Niedermayer
Christian Grothoff, PhD
Prof. Dr.-Ing Georg Carle



Course organization IN2194

- ❑ Lecture
 - Monday, 10:15-11.45, MI 00.13.009A weekly
 - Thursday, 14:15-15.45, MI 00.13.009A first weekly
- ❑ Exercises
 - 4 exercises on either Monday or Thursday
- ❑ Website
 - www.net.in.tum.de ⇒ lehre ⇒ vorlesungen ⇒ Informationen des Lehrstuhls
<http://www.net.in.tum.de/de/lehre/ss12/vorlesungen/vorlesung-peer-to-peer-systeme-und-sicherheit/>
- ❑ SVN access
 - Subribe on website
- ❑ Questions and Answers / Office hours
 - Prof. Dr. Georg Carle, carle@net.in.tum.de
 - Upon appointment
 - Dr. Heiko Niedermayer, niedermayer@net.in.tum.de
 - Christian Grothoff, Ph.D., grothoff@net.in.tum.de
- ❑ Course Material
 - Slides are available online. Slides may be updated during the course.



Grading

- ❑ Course is 5 ECTS
 - 3 SWS lectures
 - 1 SWS exercises
 - including practical assignment (programming project)
- ❑ Grading
 - Final examinations will be oral and give an individual grade.
 - You must pass the oral exam and practical assignment for being successful in the course.
 - Oral Exam and Practical Assignment contribute to 50 % to grading.
 - 0.3 bonus for passing the exercises
- ❑ Exercises (4 exercise sheets)
 - Success = 70 % of the tasks submitted, present at ≥ 3 exercises and 1x presentation of a solution
 - Goal: Prepares for the oral examination
- ❑ Practical assignment
 - Introduced in the 2nd half of the first lectures
 - Goal: Practically apply the concepts and learn to use them.



Questions

- ❑ Who studies what?
 - Diploma degree?
 - Master in Informatics?
 - Master in Information Systems [Wirtschaftsinformatik]?
 - Other Master courses?
 - Bachelor in Informatics?

- ❑ Which previous relevant courses?



Courses offered by I8

❑ Lectures

SS:

- Introduction to Computer Networking and Distributed Systems (IN0010)
- Discrete Event Simulation (IN2045)

WS:

- Master Course Computer Networks (IN2097)
- Network Security (IN2101)

❑ Seminars

- Seminar – Network Architectures and Services: Network Hacking (IN0013)
- Advanced Seminar - Innovative Internet Technologies and Mobile Communications (IN8901)
- Advanced Seminar – Future Internet (IN8901)
- Advanced Seminar – Sensor Networks(IN0014), with Prof. Baumgarten

❑ Lab Courses

- Bachelor Practical Course - Internet Lab (IN0012)
- Master Practical Course – Computer Networks (IN2106)



Further selected research at I8– Network Architectures and Services



Projektschwerpunkte

	Autonomic / Self-Org. Man.	Mobile comm.	Measure- ments	P2P and Overlays	Network Security
EU ResumeNet	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EU AutHoNe	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DFG LUPUS			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
BMBF ScaleNet	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
NSN SelfMan	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		
NSN TC-NAC		<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
France-Telecom SASCO	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
BWFIT SpoVNet			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
BWFIT AmbiSense		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		



AuthoNe - Autonomic Home Networking

- ❑ EUREKA-Celtic/BMBF-Project
- ❑ Partner in Germany
 - TU München
 - Fraunhofer FOKUS
 - Siemens Corporate Technology
 - Hirschmann Automation and Control
- ❑ EU/Celtic Partner
 - France Telecom, Frankreich
 - Sony-Ericsson, Schweden
 - Ginkgo Networks, Frankreich
 - Univ. Pierre et Marie Curie, Paris (UPMC-LIP6), Frankreich
 - Universität Lund, Schweden



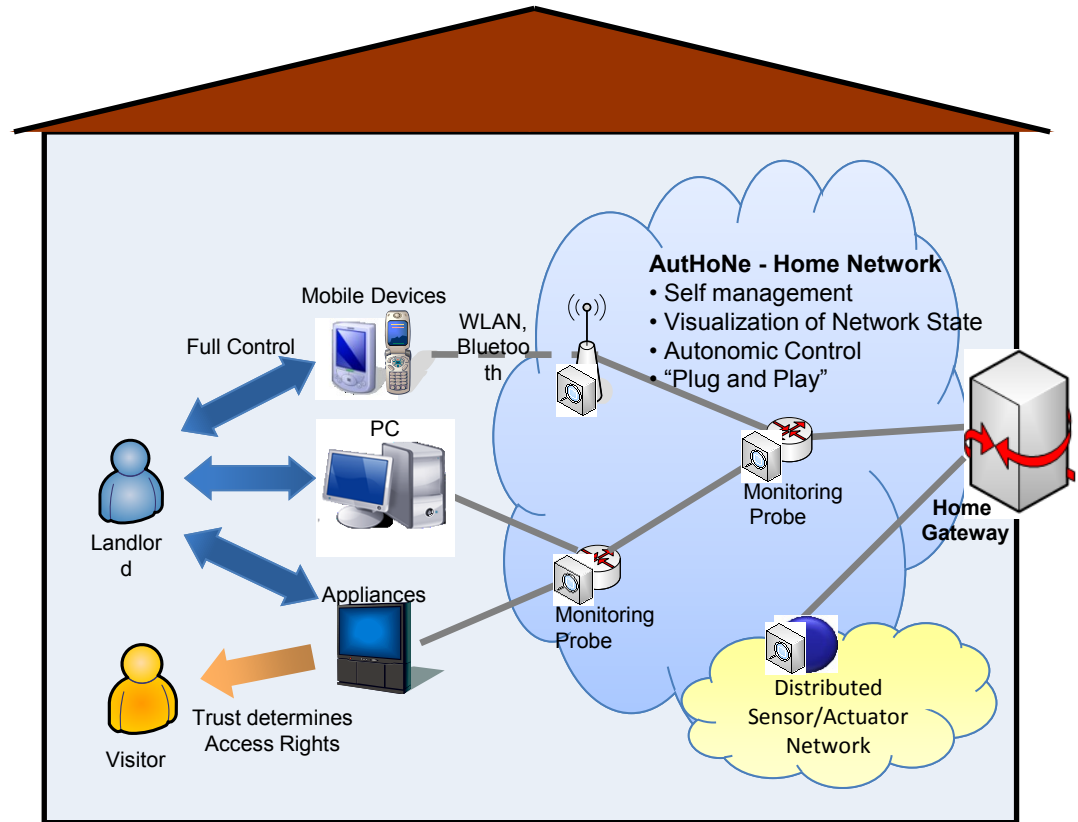
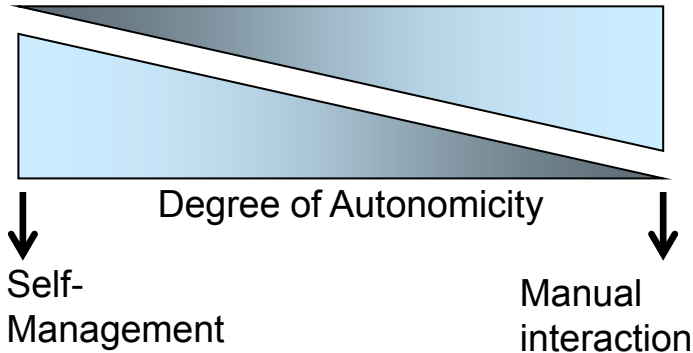
**Bundesministerium
für Bildung
und Forschung**



Autonomic Home Networks



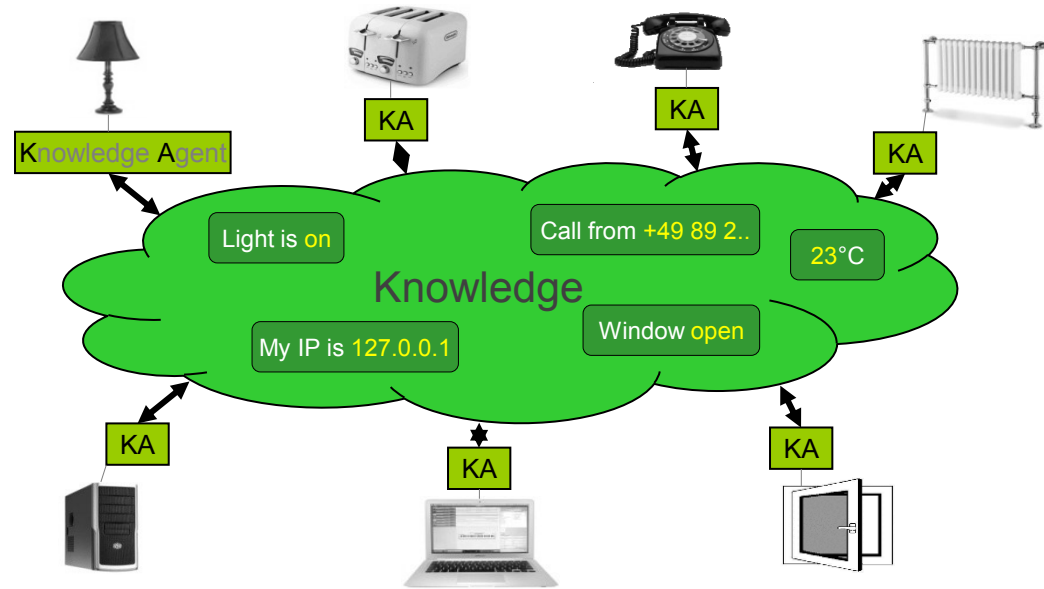
adaption to users and environment



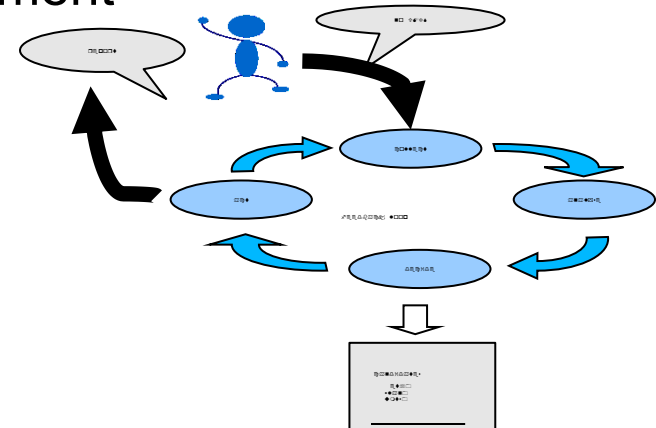


Basic concepts

□ Knowledge Platform



□ Autonomous Configuration and Management





Basic concepts

□ User Control

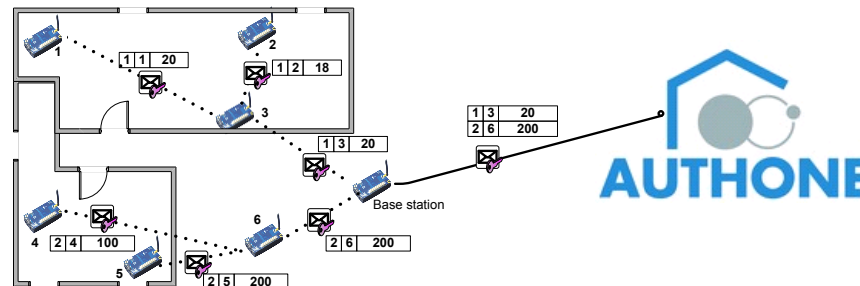
- User-friendly
- Modes for normal users and experts



No remote access
Only remote access by owner
(no administrative control)
...
Remote access by friends
...

□ Interaction with Environment

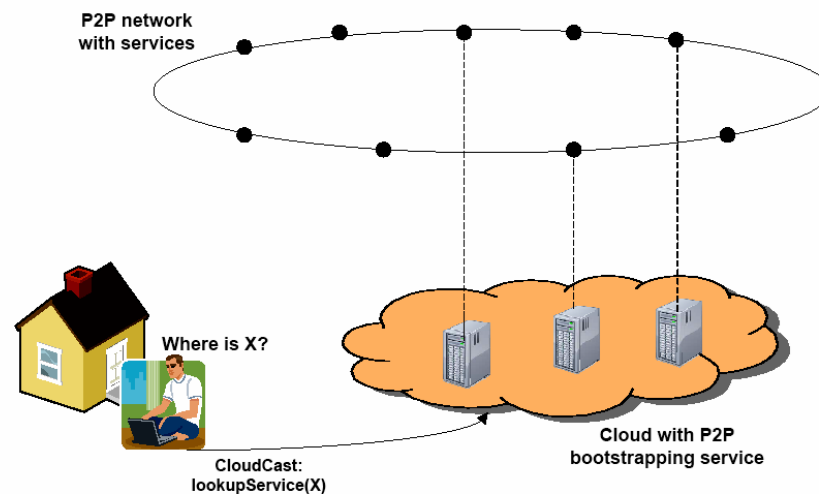
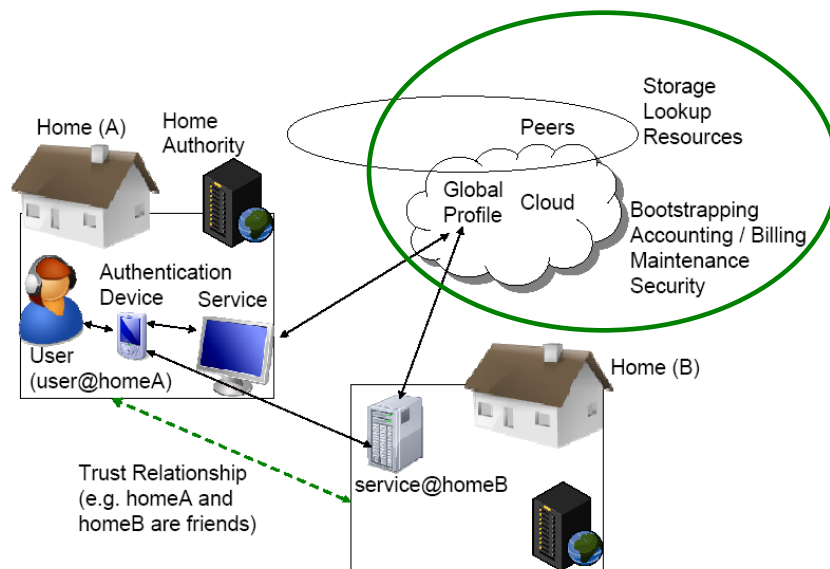
- Sensors
- Actuators





Home Networks with Cloud and P2P services

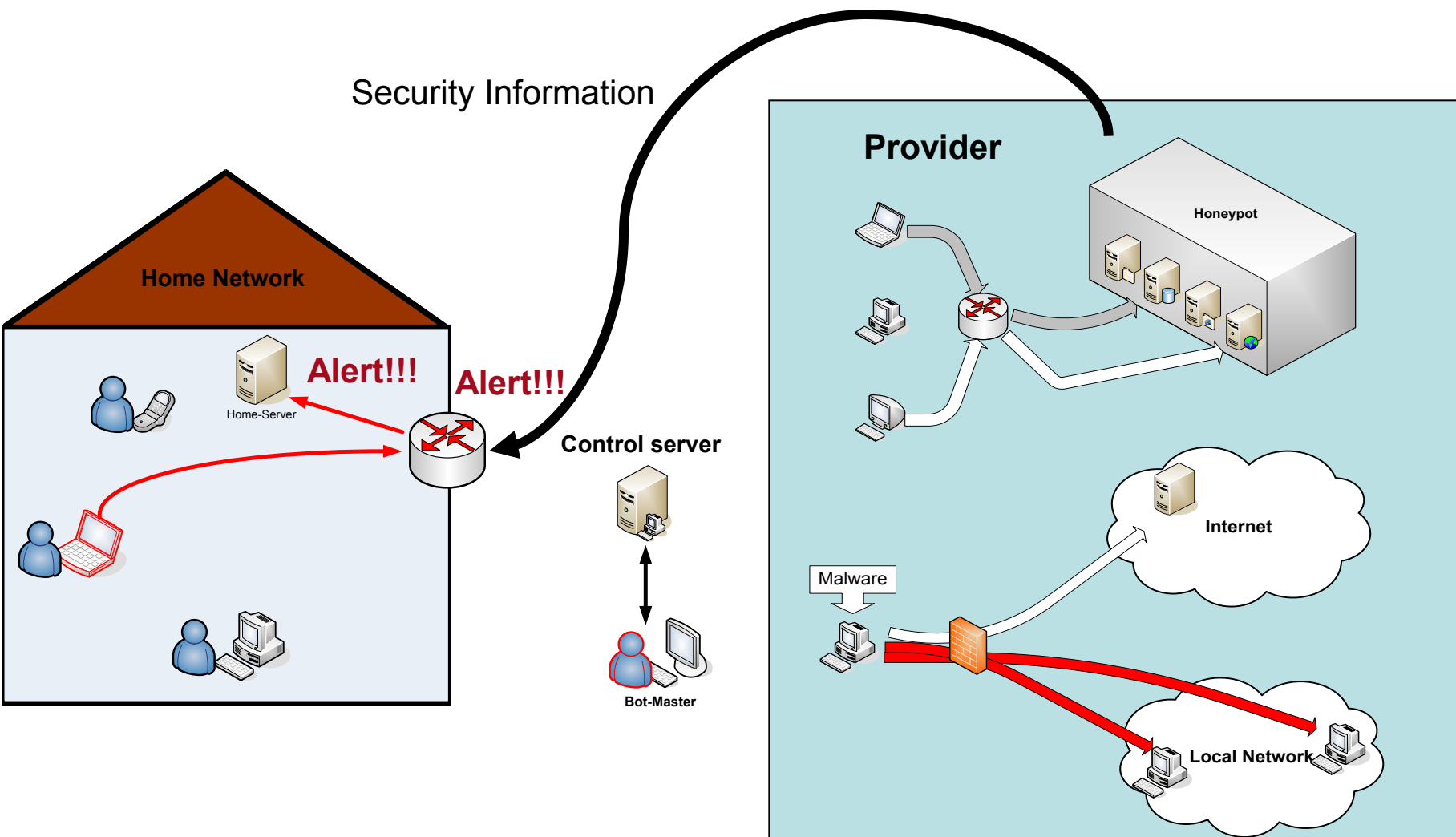
- ❑ AutHoNe provides Self-Management
 - Knowledge plane
 - Zero Configuration
- ❑ Cloud Computing
 - Computation and Storage in the network
 - Reliable resources
 - Pay and get more resources
 - Security Anchor → Provider and its accounting
- ❑ In combination with Peer-to-Peer
 - Use existing resources at edge
 - Scalability
 - Non-critical tasks and replication
- ❑ Bootstrapping and lookup of services
 - CloudCast to a near-by service cloud for lookup or processing





Detecting Command and Control Traffic

- ❑ Provider-guided attack detection in home networks

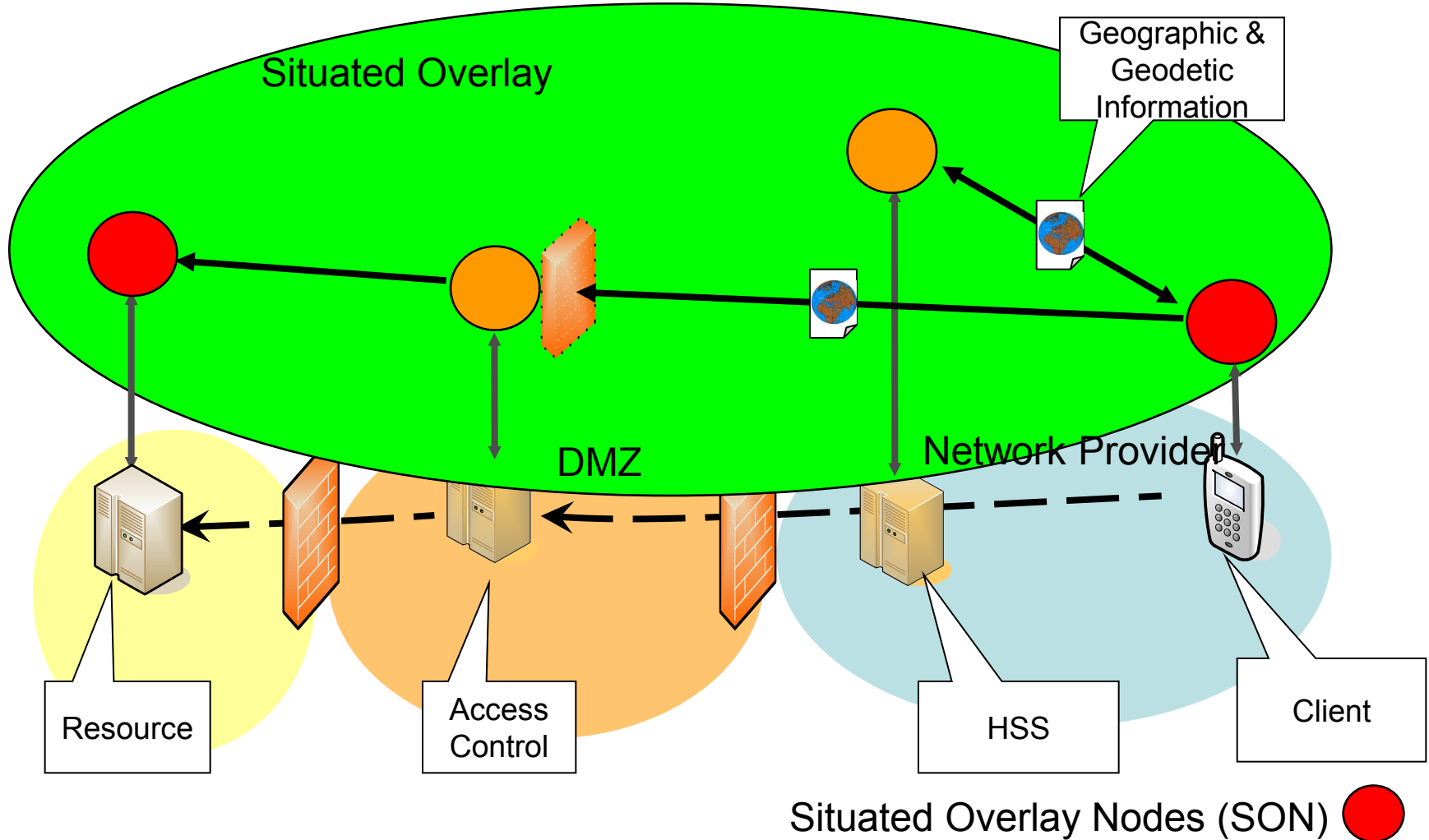




France-Telecom-Project SASCO: Overlay Security

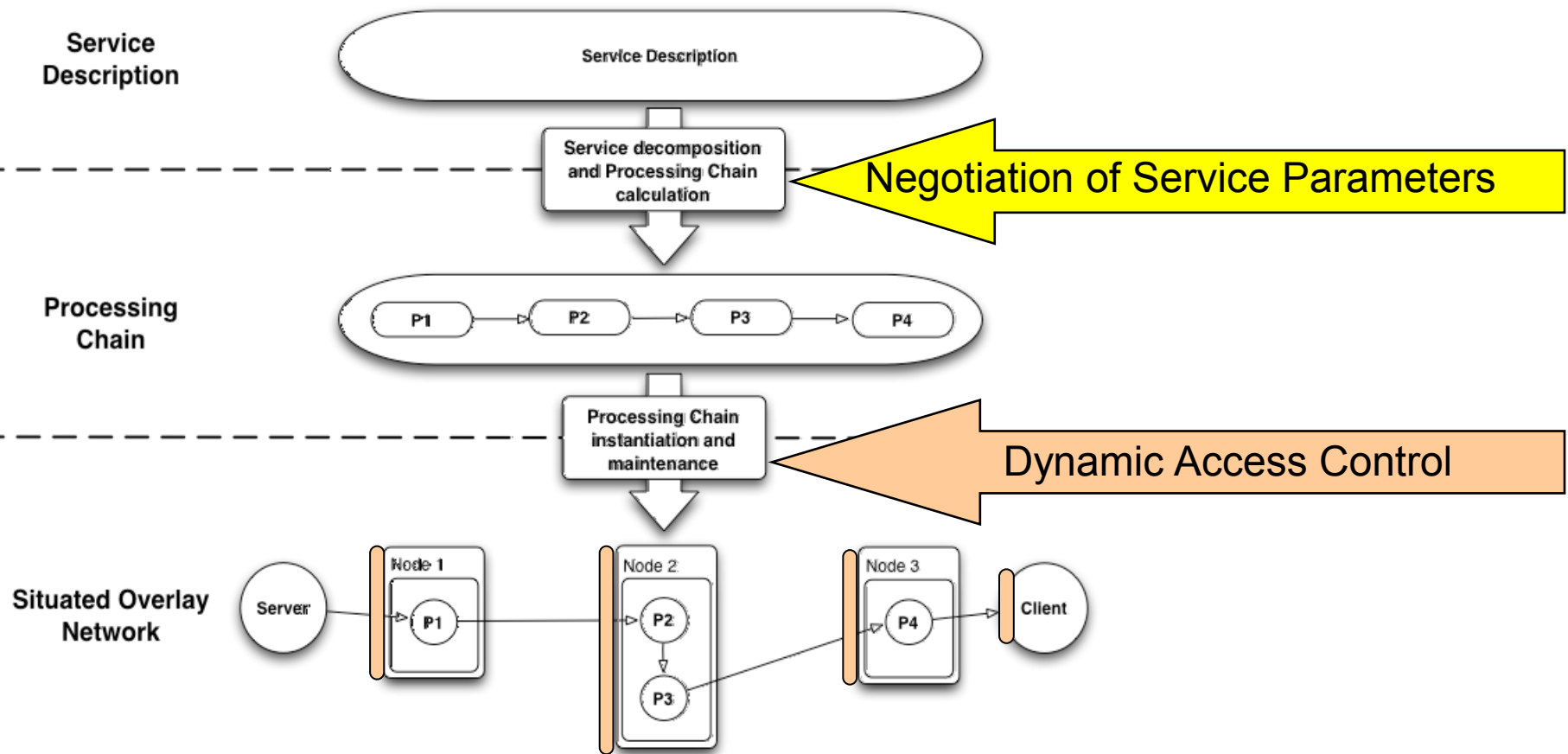
□ Project SASCO

- Cooperation with France Télécom and Fraunhofer FOKUS





SASCO: Situated Autonomic Service Control





BWFIT SpoVNet: Cross-Layer-Information for Overlays

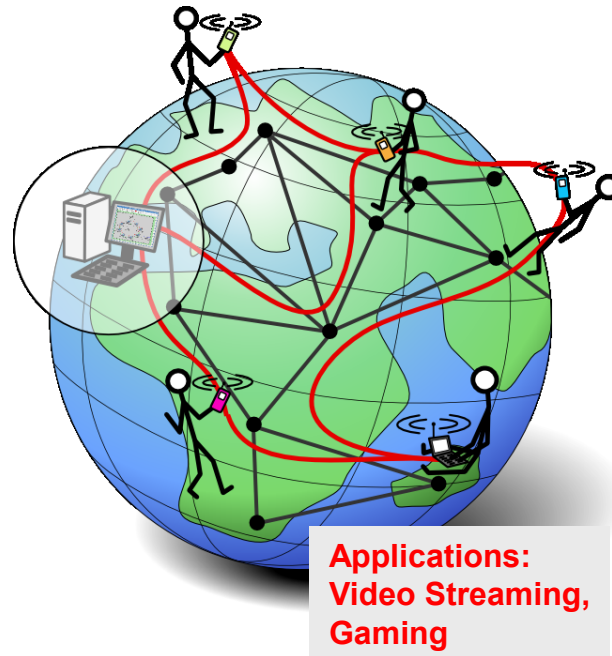
Prof. Dr. Paul Kühn
Universität Stuttgart

Prof. Dr. Martina
Zitterbart
Universität Karlsruhe

Prof. Dr. Georg Carle
TU München

Prof. Dr. Kurt
Rothermel
Universität Stuttgart

Prof. Dr. Wolfgang
Effelsberg
Universität Mannheim

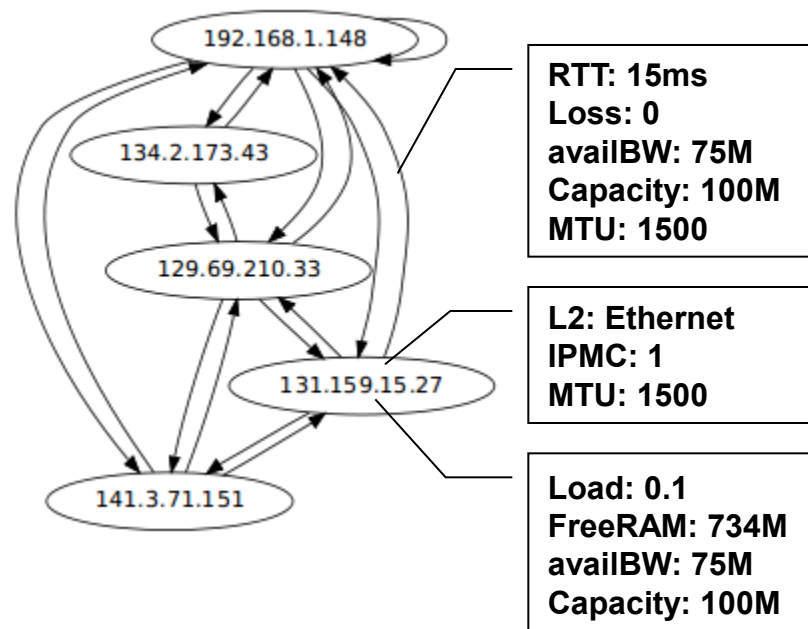
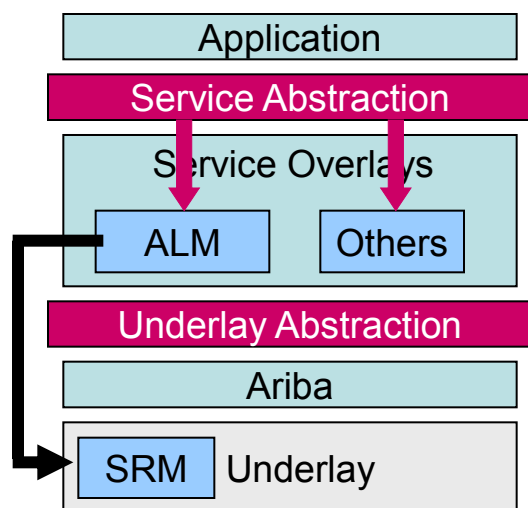
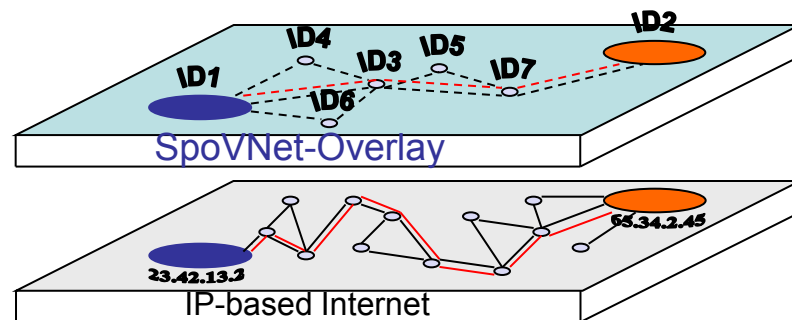


- ❑ SpoVNet: Spontaneous Virtual Networks
- ❑ Flexible, adaptive and spontaneous service provisioning
- ❑ Approach: overlays
 - Let-1000-networks-bloom instead of One-size-fits-all
 - Tailored architecture for applications and networks
 - Cross-Layer-Information supports QoS decisions and optimisation
 - No dedicated infrastructure needed



SpoVNet - Spontaneous Virtual Networks

- Partners: KIT (Zitterbart), Uni Stuttgart (Kühn, Rothermel), Uni Mannheim (Effelsberg)
- Future Internet Approach
 - Locator/Identifier-Split
 - On demand overlay creation
 - Service overlays
 - UNISONO (@TUM) Cross-layer Information Service

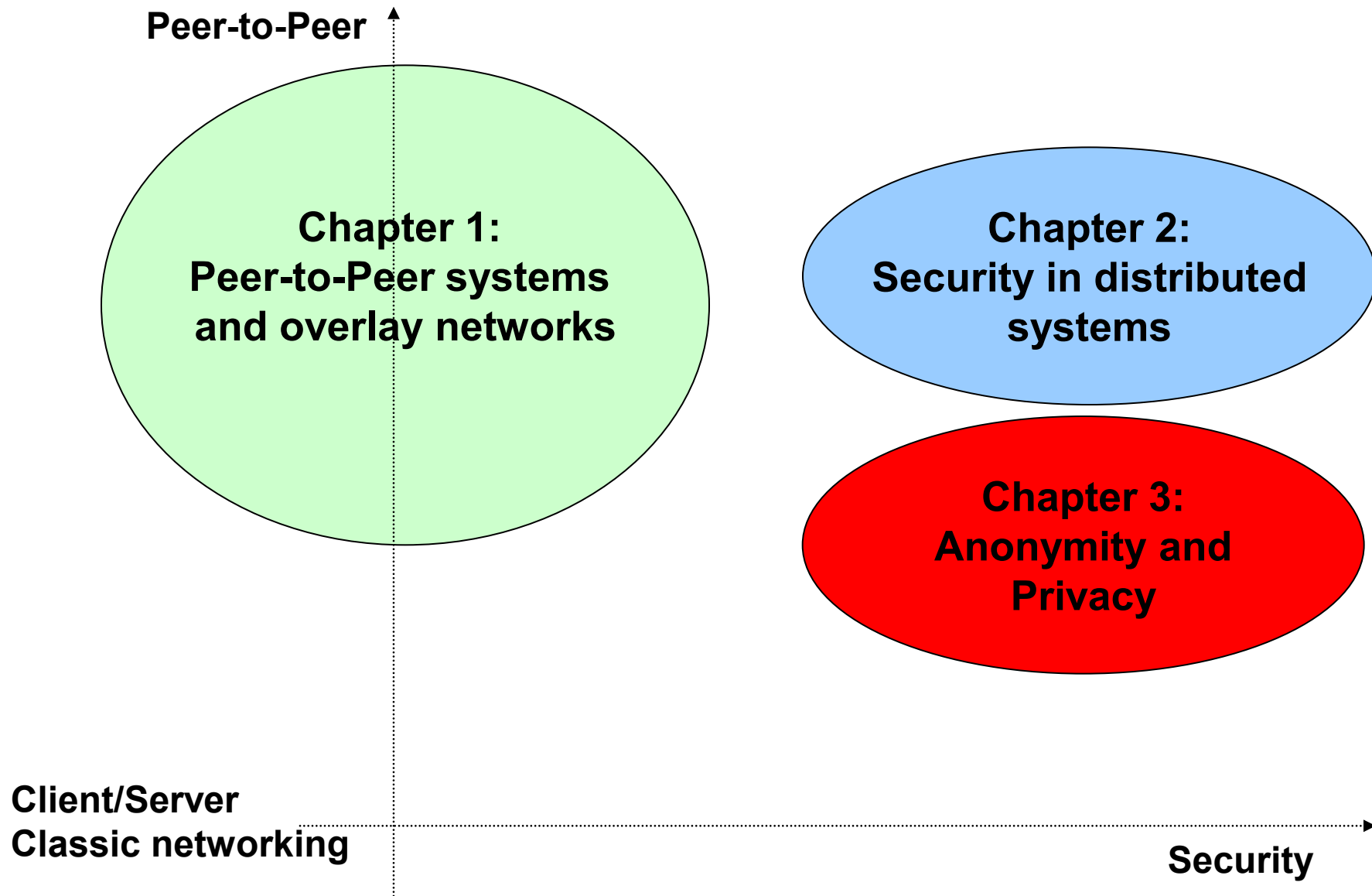




The lecture...



Course Overview





- ❑ Network of equals
- ❑ No distinction between client and server
- ❑ Users and their computers at the edges of the Internet share their resources (bandwidth, CPU, storage).
- ❑ Self-organization of the system
- ❑ Autonomy from central entities like central servers
- ❑ Peers come and go → continuously changing environment



Very popular due to file-sharing and content distribution networks that today are responsible for majority of the traffic of the Internet



... but ...

- ❑ Highly decentralized systems are not very secure.
- ❑ What about peers that do not cooperate?
- ❑ What about attacks or misuse?

... still....

- ❑ Peer-to-Peer systems are useful for censor-resistance, DoS resilience, etc.

➡ Security is an important issue especially for serious applications. Decentralized systems have their drawbacks, but also a high potential for improvements!

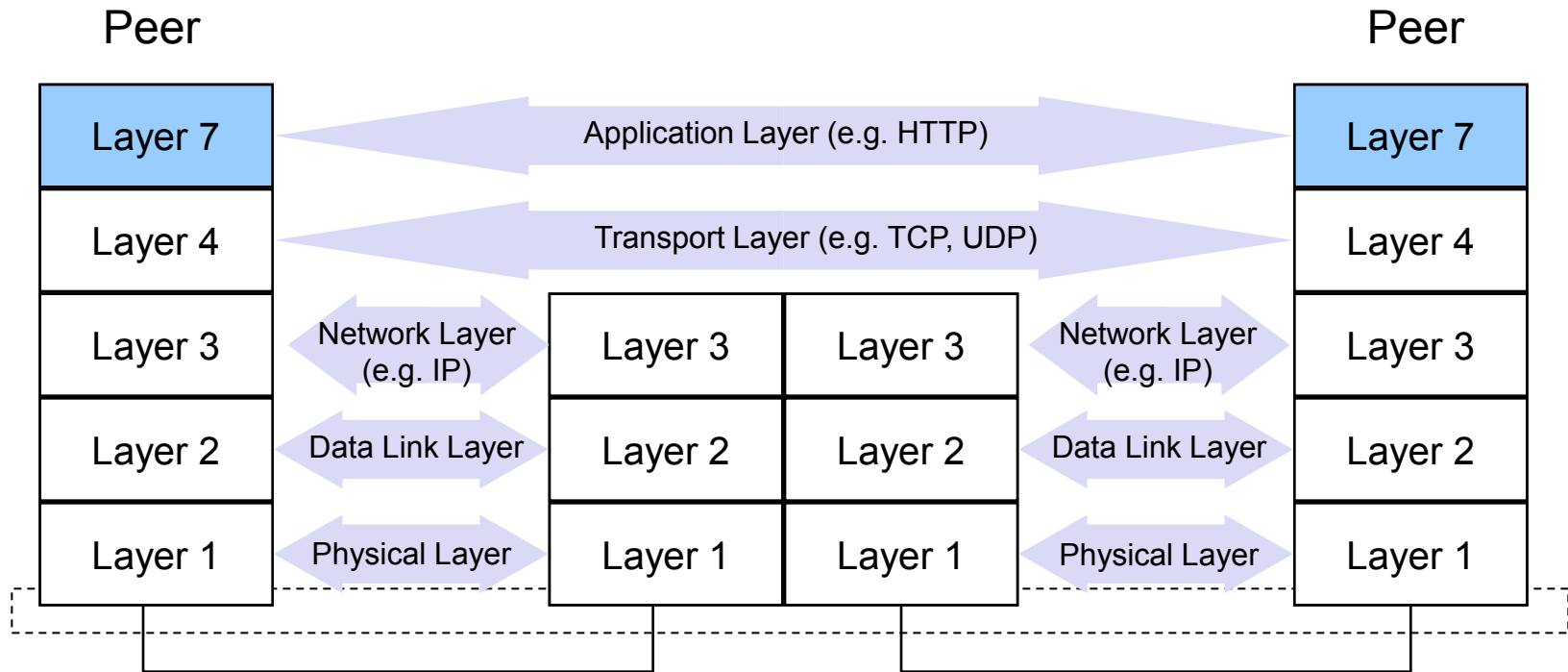


- ❑ In our daily life we are often an anonymous entity among a mass of other entities.
- ❑ Pseudonymity: An entity hides behind a pseudonym, so that anyone (but an authority) only knows the pseudonym, but not the true identity. The pseudonym can be tracked.
- ❑ Anonymity: Hide the identity, the usage/traffic patterns, and relationships from other entities or observers. No tracking.
 - ➔ Traffic Analysis can reveal information that is leaked even if encryption is used. Technologies like Onion Routing can make these attacks harder.



Where are we?

... on the network stack...



... on application layer with some exceptions.



Where are we? II

Who is contributing / doing the work?

