AI: Internet Computing

Lecture 1 — Introduction

Acknowledgement and Disclaimer

The present lecture *AI: Internet Computing*[1] is based on the lecture *Angewandte Informatik 2 (AI 2)*.

AI 2, including its slides, was designed by **Prof. Dr. Ingo Scholtes**[2] from the Institute of Applied Informatics and Formal Description Methods (AIFB) at Karlsruhe Institute of Technology and held until 2016. **Prof. Dr. Agnes Koschmider**[3] continued the lecture in 2017.

It is with great thanks that my team and I, Prof. Dr. Ali Sunyaev, took over and continued this lecture in 2018.

[1] AI stands for “Angewandte Informatik” which is German and can be translated to Applied Informatics or Applied Computer Science.

[2] Prof. Dr. Ingo Scholtes, Machine Learning for Complex Networks, Julius-Maximilian-Universität Würzburg

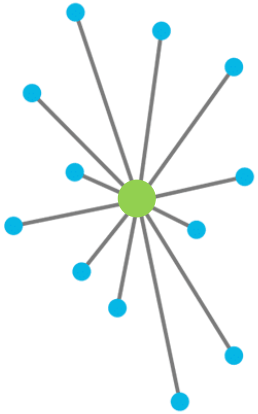
[3] Prof. Dr. Agnes Koschmider, Process Analytics, Christian-Albrechts-Universität zu Kiel

Prof. Dr. Ali Sunyaev

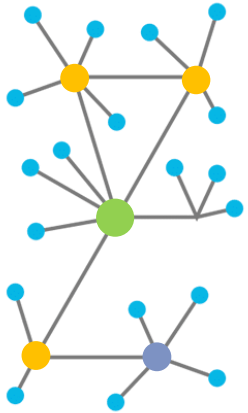
- Professor for Computer Science at the Karlsruhe Institute of Technology (KIT).
- PhD in 2010, Master's degree (diploma) in Computer Science, Technical University of Munich (TUM).
- Visiting faculty member at Harvard University.
- Spokesperson of the BISE division in the German Informatics Society (GI).
- Research work has been appreciated numerous times and is featured in a variety of media outlets.
- Several editorial responsibilities | research and executive education for a number of organizations | mentor of several start-ups.

Research funded by:
DFG Deutsche Forschungsgemeinschaft
EnBW B|BRAUN SAP
HELMHOLTZ RESEARCH FOR GRAND CHALLENGES
RSF Russian Science Foundation
Federal Ministry of Education and Research
Federal Ministry for Economic Affairs and Energy
Federal Ministry of Justice and Consumer Protection

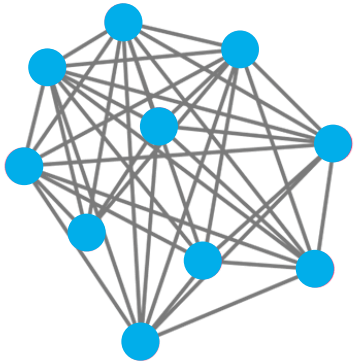
Internet Computing
Distributed Systems vs. Decentralized Systems



Centralized Network
(e.g., Web-Services)



Partially
(De-)Centralized Network
(e.g., Domain Name Systems)



Decentralized Networks
(e.g., Peer-to-Peer Networks)

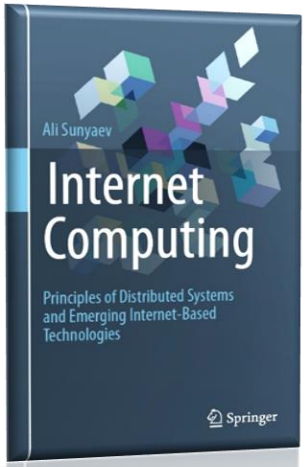
Degree of Decentralization

● Client ● Server (3rd Level) ● Server (2nd Level) ● Server (1st Level)

Figures align with Baran P. (1964) On Distributed Communications Networks. IEEE Transactions on Communications Systems 12(1):1–9.

Learning Goals of the Lecture

In this course you will learn key architectures and technologies for the design and implementation of **Internet Computing** applications.



Textbook: Internet Computing

- Principles of Distributed Systems and Emerging Internet-Based Technologies
- Introduces students and young professionals to the fundamentals of contemporary, emerging and future technologies and services in Internet computing

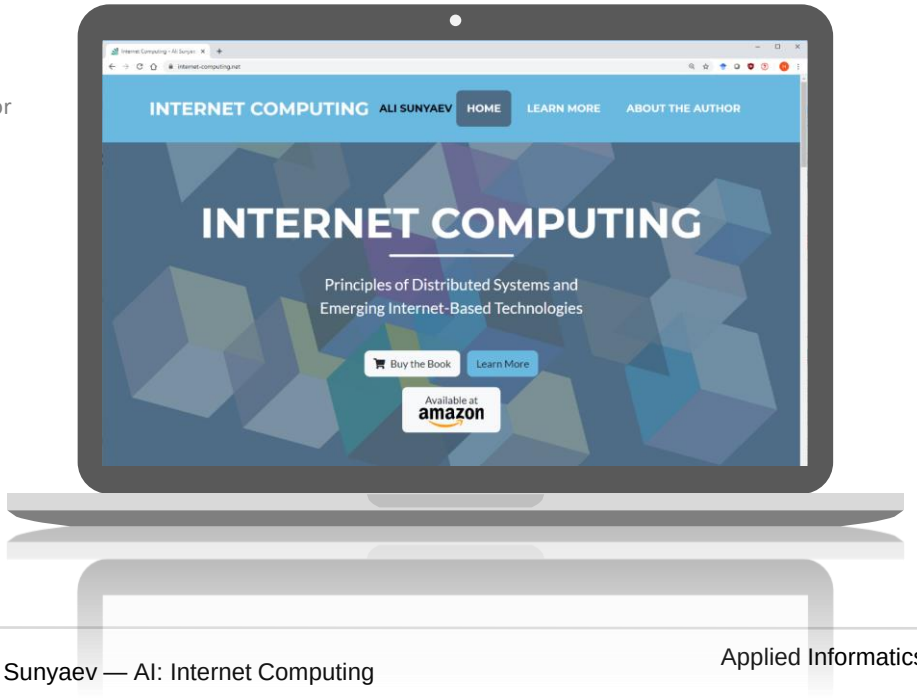
Textbook: Internet Computing

Learning goals and summary for each chapter

Website: www.internet-computing.net

Available online

A wealth of examples for every chapter



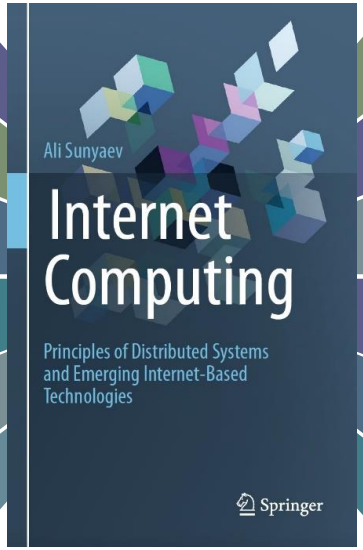
12 Chapters

Recommendations for further readings at the end of each chapter

Questions for checking students' comprehension at the end of each chapter

Textbook: Internet Computing—Chapters

1. Introduction to Internet Computing
2. Information Systems Architecture
3. Design of Good Information Systems Architectures
4. Internet Architectures
5. Middleware
6. Web Services



7. Cloud Computing
8. Fog and Edge Computing
9. Distributed Ledger Technology
10. The Internet of Things
11. Critical Information Infrastructures
12. Emerging Technologies

Textbook: Internet Computing—Chapters

01

Introduction to Internet Computing

- A Brief History of the Internet
- Defining Internet Computing
- Distributed Information Systems for Internet Computing
- Application Examples of Internet Computing

02

Information Systems Architecture

- Defining Information Systems Architecture
- The Principles of Information Systems Architecture
- Architectural Views
- Architectural Patterns

03

Design of Good Information Systems Architectures

- Architecture Design
- IS Architectures' Quality
- The Information Systems Architecture Design Process

04

Internet Architectures

- History of the Internet
- Today's Internet Network Infrastructure
- The Internet Protocol
- Content Delivery Networks
- Emerging Internet Network Architecture

Textbook: Internet Computing—Chapters

05

Middleware

- Introduction to Middleware
- Remote Procedure Call
- Middleware Categories

06

Web Services

- Introduction to Web Services
- Basic Web Technologies
- Web Service Architectures

07

Cloud Computing

- An Introduction to Cloud Computing
- Essentials to the Provision of Cloud Services
- Chances and Challenges of Cloud Computing
- Security and Data Protection in Cloud Environments

08

Fog and Edge Computing

- Fog and Edge Computing Fundamentals
- Challenges and Opportunities of Fog and Edge Computing
- Fog and Edge Computing in Practice

Textbook: Internet Computing—Chapters

09

Distributed Ledger Technology

- Background of Distributed Ledger Technology
- Technical Foundation
- The Bitcoin Blockchain
- Smart Contracts
- Applications of Distributed Ledger Technology

10

The Internet of Things

- Introduction of the Internet of Things
- The Internet of Things: Technologies and Architectures
- Internet of Things Applications
- Challenges and the Future of the Internet of Things

11

Critical Information Infrastructures

- Foundations of Critical Information Infrastructures
- Properties of Critical Information Infrastructures
- Functions of Critical Information Infrastructures
- Operation of Critical Information Infrastructures

12

Emerging Technologies

- Emergence and Emerging Technology
- Immersive Technologies
- Virtual Assistant
- Artificial Intelligence