

# Towards Composed Communication Services in Future Networks

Hans Wippel, Martin Röhrich, Martina Zitterbart  
Institute of Telematics, Universität Karlsruhe



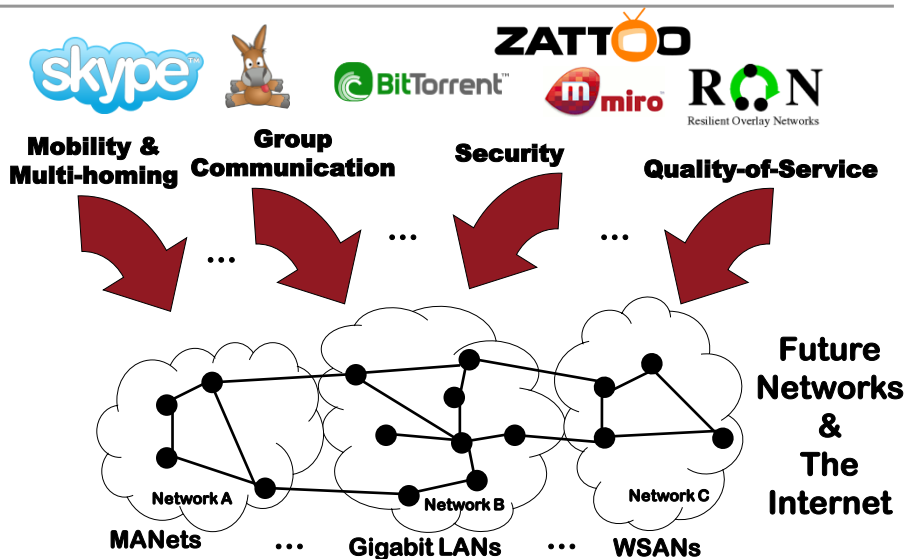
Current research in working groups 1 & 6

Hans Wippel

0



## Requirements in Future Networks



Current research in working groups 1 & 6

Hans Wippel

1



## Our Approach – Application-tailored Communication Services

- ▶ Extension/Evolution of the existing Internet architecture
  - Patchwork architecture
  - Hard to predict
    - Requirements of future applications
    - Properties of future networks
  
- ▶ Our approach
  - Application-tailored networks (Virtualization)
  - Application-tailored protocols (Service Composition)



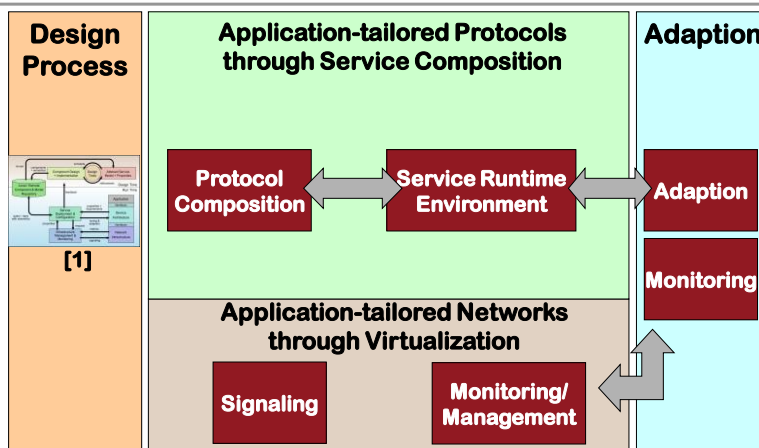
Current research in working groups 1 & 6

Hans Wippel

2



## Realization of Application-tailored Communication Services



[1] L. Völker, D. Martin, T. Rohrberg, H. Backhaus, P. Baumung, H. Wippel, M. Zitterbart: **Design Process and Development Tools for Concurrent Future Networks**, 3rd GI/ITG KuVS Workshop on The Future Internet, Munich, Germany, May 2009.



Current research in working groups 1 & 6

Hans Wippel

3



## Network Virtualization - Benefits

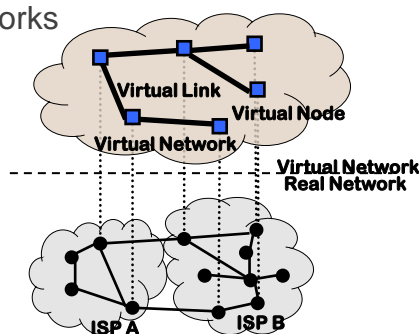
### Application-tailored Networks through Virtualization

Signaling

Monitoring/  
Management

#### ► Abstraction from physical networks

- Parallel operation of networks
- Protected from each-other
- On existing infrastructure
- With arbitrary structure/topology
- With specific properties
- Influence on protocol design



## Network Virtualization – Current Research

#### ► Signaling protocols

- Set up and modification of virtual networks
  - Virtual Nodes
  - Virtual Links
- Resource Reservations

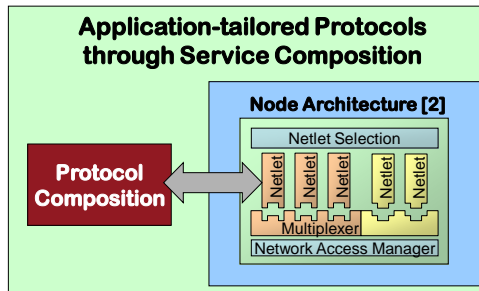
#### ► Management

- Control Quality-of-Service parameters
- Detect network changes/errors

#### ► Interfaces

- Provide virtual nodes with information about the network

## Service Composition



- ▶ Protocol Composition
  - Application-tailored protocols
    - Optimized for networks
    - Adaptable

[2] L. Völker, D. Martin, I. El Khayat, C. Werle, M. Zitterbart: **A Node Architecture for 1000 Future Networks**, Proc. Of the International Workshop on the Network of the Future 2009, Dresden, Germany, Jun. 2009.



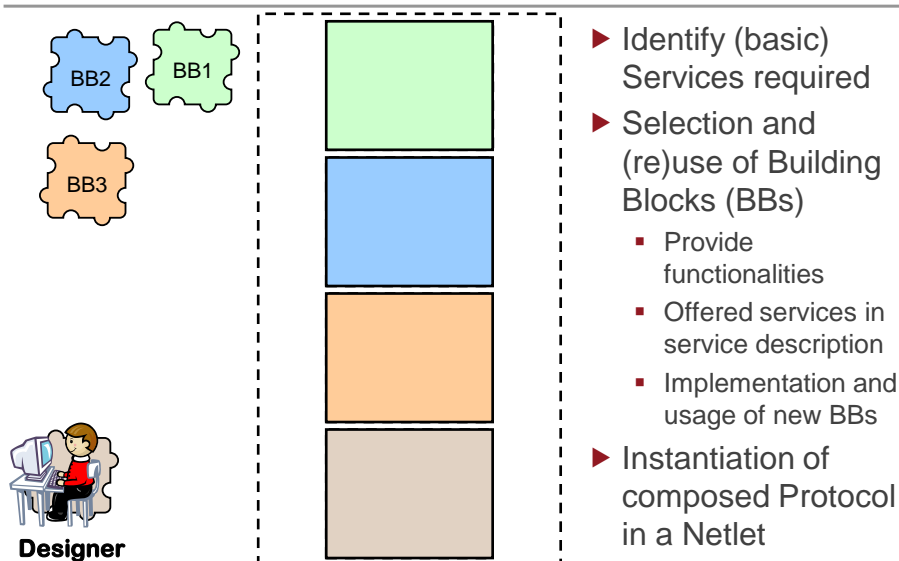
Current research in working groups 1 & 6

Hans Wippel

6



## Development of Application-tailored Protocols



Current research in working groups 1 & 6

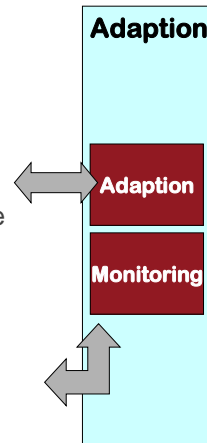
Hans Wippel

7



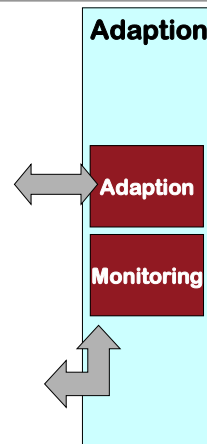
## Runtime Adaption

- ▶ Dynamic networks
  - Varying communication properties
  - Not necessarily compensated by virtualization
    - Mobility, change of data/error rate
  - Composed protocols/Netlets must provide offered services
- Runtime adaption
  - Modification of Building Block parameters
    - Compensation of network changes
    - Optimization of communication

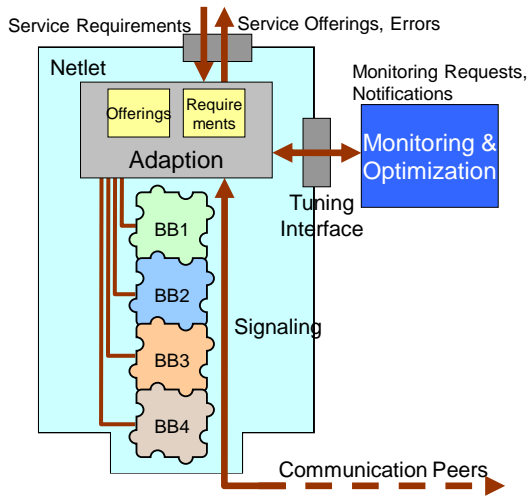


## Runtime Adaption – Current Considerations

- ▶ Runtime adaption includes
  - Gathering of Information (Monitoring)
  - Adaption of Building Blocks
  - Knowledge about
    - Service requirements and offerings
    - Building Block dependencies
  - Signaling between communication peers



## Runtime Adaption – Current Considerations



- ▶ Monitoring & Optimization component
  - Gathers network information
  - Informs Netlet about network changes
- ▶ Adaption Component in the Netlet
  - Interfaces with monitoring & optimization component
  - Knowledge about
    - Service Requirements
    - Service Offerings
    - Dependencies between Building Blocks
  - Controls parameters of Building Blocks
  - Handles signaling between communication peers

## Run Time Adaption – Current Considerations

- ▶ Challenges
  - Dependencies between Building Blocks
    - Identification
    - (Formal) description
    - Handling during adaption
  - Design of Building Blocks
    - Interfaces
    - Granularity
    - Structure
    - Support for adaption?
      - Simplification?
      - Minimization of dependencies?

## Conclusion and Future Work

---

- ▶ Current research in the areas of
  - Network Virtualization
    - Signaling protocols
  - Service Composition
    - Design and interfaces of Building Blocks
    - Run-time adaption of composed Building Blocks
  
- ▶ Future Work
  - Evaluations in the testbed
    - Signaling protocols for virtual networks
    - Run-time adaption mechanisms



Current research in working groups 1 & 6

Hans Wippel

12



## Thank you for your attention!

---

Universität Karlsruhe (TH)  
Research University · founded 1825

Dipl.-Inform.  
**Hans Wippel**

Zirkel 2 · Geb. 20.20 · 76128 Karlsruhe  
Tel.: +49 721 608 - 6395 · Fax: - 67 89  
E-Mail: [wippel@tm.uka.de](mailto:wippel@tm.uka.de)  
<http://www.tm.uka.de/~wippel>



© Peter Baumung



Current research in working groups 1 & 6

Hans Wippel

13

