An Open Federated Laboratory Supporting Network Research for the Future Internet

OneLab
FUTURE INTERNET TEST BEDS

FOKUS
Fraunhofer Institute for Open Communication Systems

OneLab2 - Experimental Facilities for Future Internet Research

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SEVENTH FRAMEWORK PROGRAMME

Experimenter Demands

- **What experimenters want**
  - Proof a theory
  - Investigate a phenomenon
  - Compare own approach to others
- **Experiments should be**
  - Controllable
  - Repeatable
  - Comparable

Picture: http://www.seed.slb.com/en/scictr/watch/skydiving/galileo_pisa.htm

Experimenter Wish List

- **Possibility to control experiment and conditions**
  - Bring environment in a specific state
  - Allow range of changeable parameters
  - Observe parameters of interest
  - Fix variables which are not part of the investigation
  - Supervise boundary conditions and side effects (**which sometimes are the real discovery!**)

Experimenter Wish List

- **Possibilities for experiment observation**
  - Capture and store results and conditions
  - Provide standardized measurements
  - Provide flexible tools for different viewpoints
  - Ensure reliable observations
  - Provide accuracy statements
  - Provide reference data

Challenges

- **General Challenges**
  - Uncontrollable parameters (weather, physical effects,…)
  - Resource limitations for data capturing
  - Access to Data/Data Sharing
- **Specific Challenges with multiple experimenters using the same infrastructure**
  - Interference between experiments
  - Resource distribution
  - Access control

Future Internet Research

- **Broad range of approaches**
  - Evolutionary vs. Revolutionary
  - Different layers (optical, network, services)
  - Different key objectives (manageability, security, mobility)
  - Lacking assessment metrics
- **Different networks**
  - Different basis technology
  - Different structures (dynamic/static, operator-driven/free)
  - New disruptive concepts (e.g. AC, DTN, CDN,..)

➔ **Additional Challenges**

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- **Operation and expansion of PlanetLab Europe**
  - Integration of variety networks (e.g. wireless, DTN, SAC)
  - Provisioning of tools for experimenters
- **Experiment Control**
  - Benchmarking to support reproducibility and comparability
  - Observation of variety of metrics
- **Support for classical and disruptive approaches**
  - Autonomic Communication
  - Delay Tolerant Networks
  - Large-scale data-centric networking (CDN, pub/sub,..)

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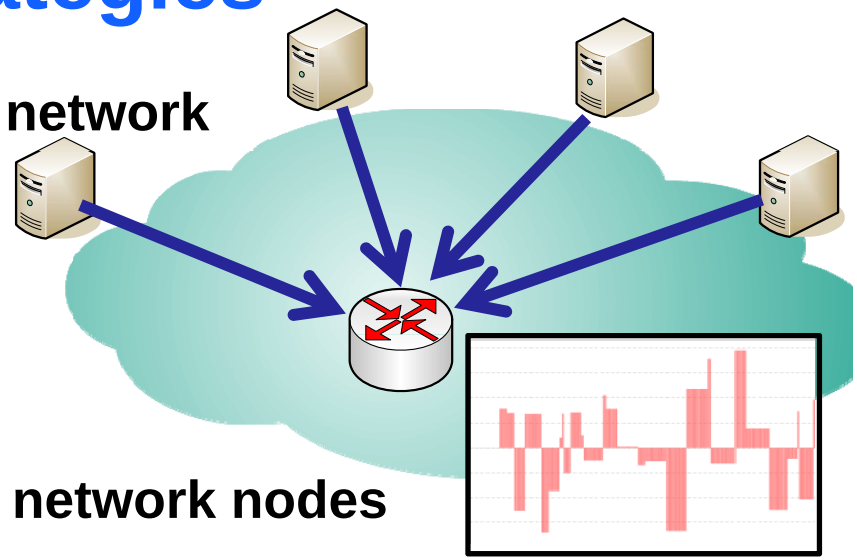
- **Provisioning of extensive and standardized measurements**
  - Measurements in wired and wireless environments
  - Active and passive Measurements
  - Resource management for measurement tasks
  - Controlled access to results
  - Topology discovery
  - Multipoint Packet Tracking
  - Data selection techniques
  - High accuracy timestamping
  - Standardization

Example: Collaboration Strategies



- Goal: Protection against overload within network
  - Legitimate users (flash crowds)
  - Unwanted traffic (attacks, etc.)
- Challenge: Which traffic to filter?
- Approach: Collaboration of services and network nodes
  - Server and network nodes provide valuation reports
  - Router analyzes valuation, decides about filter-rules
  - ➔ least valuable traffic filtered
  - Based on FOKUS Node Collaboration System (NCS)
  - Demo at FIA Prag

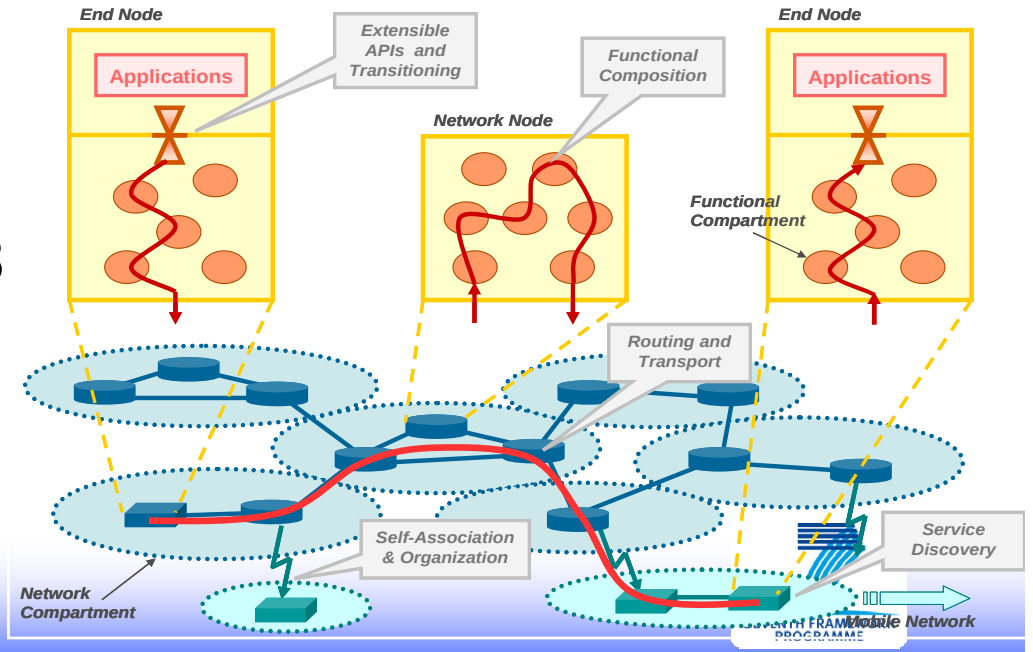
Zseby, Kleis, Hirsch, *Self-Protecting Networks: How Cooperation Strategies Can Strengthen Network Security*, it+ti Themenheft „Next Generation Internet“, 2008.

Experiments in OneLab

- **What we expect from testbed**
  - Scale (large number of servers, network nodes, reports)
  - Diversity (heterogeneous technologies, different services)
  - Realistic environment (delay, loss, failures)
  - Tools to set parameters and to observe results
- **What we want to investigate**
  - Performance of solution (rule setting and removal)
  - Overhead for collaboration ➔ flow measurements
  - Influence of timing for valuation reports
  - Weighting strategies for valuation reports

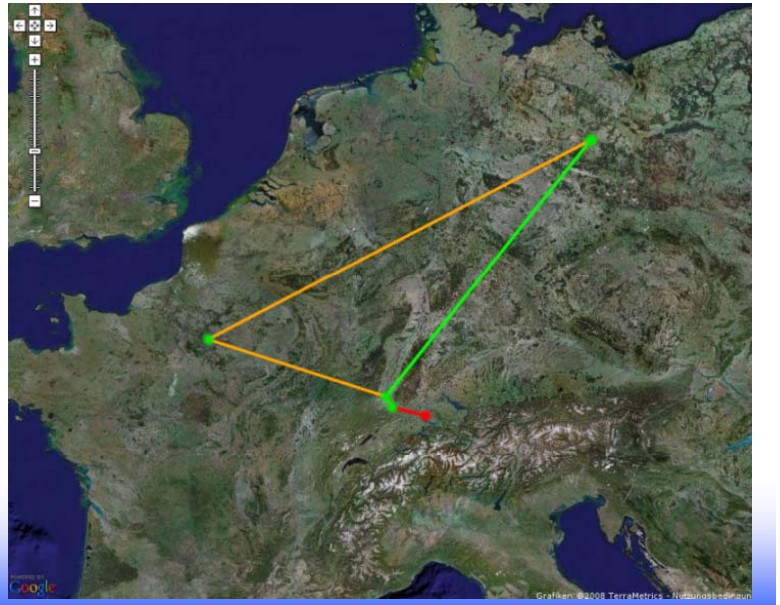
Example: Autonomic Communication

- **Idea: Functional Composition**
  - On-Demand network stack
  - Composition of functions based on situation
  - Utilize all degrees of freedom to optimize
- **ANACore**
  - AC prototype for FC
  - Public release August 2008
  - Runs parallel to traditional stack



SAC Support in onelab2

- **Establishment of playground for SAC research**
  - Experiments on SAC connectivity
  - Collaboration among SAC projects (ANA, HAGGLE)
- **Challenges**
  - Connection of SAC world with traditional IP
  - Monitoring in Non-IP Environment
- **OneLab provides**
  - Integration of SAC Testbed
  - Development of SAC gateway
  - Integration of Monitoring Bricks



Onelab2 is for You!

- **Onelab2 is support for Experimenters**
  - *Join PlanetLab Europe:* ***http://www.planet-lab.eu/join_us***
- **Already addresses wide range of demands**
  - Benchmarking
  - Wireless
  - Data-centric networking
  - Autonomic Communication
  - …
- **But there may be more**

➔ ***Tell us your experiment demands***

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Thank You!

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