Green ICN

Architecture and Applications of Green Information Centric Networking

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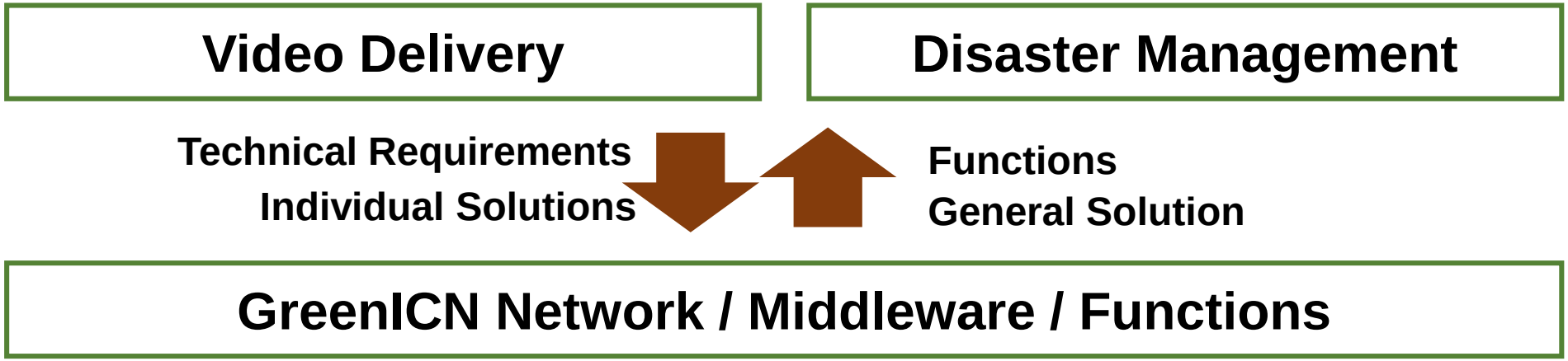
GreenICN Project

Main Objectives (as proposal)

- Research on ICN is at an early stage
  - Many key issues still open, e.g., resource control, migration path, energy efficiency, pub/sub and so on.
- GreenICN project will provide solutions to these issues

Adopting an application driven approach



GreenICN Consortium

KDDI R&D Laboratories, Inc.

NEC Corporation

Panasonic Advanced Technology Development co., Ltd

University of Tokyo

Osaka University

Waseda University

Georg-August-Universität Göttingen
Germany

NEC Europe Ltd.
UK

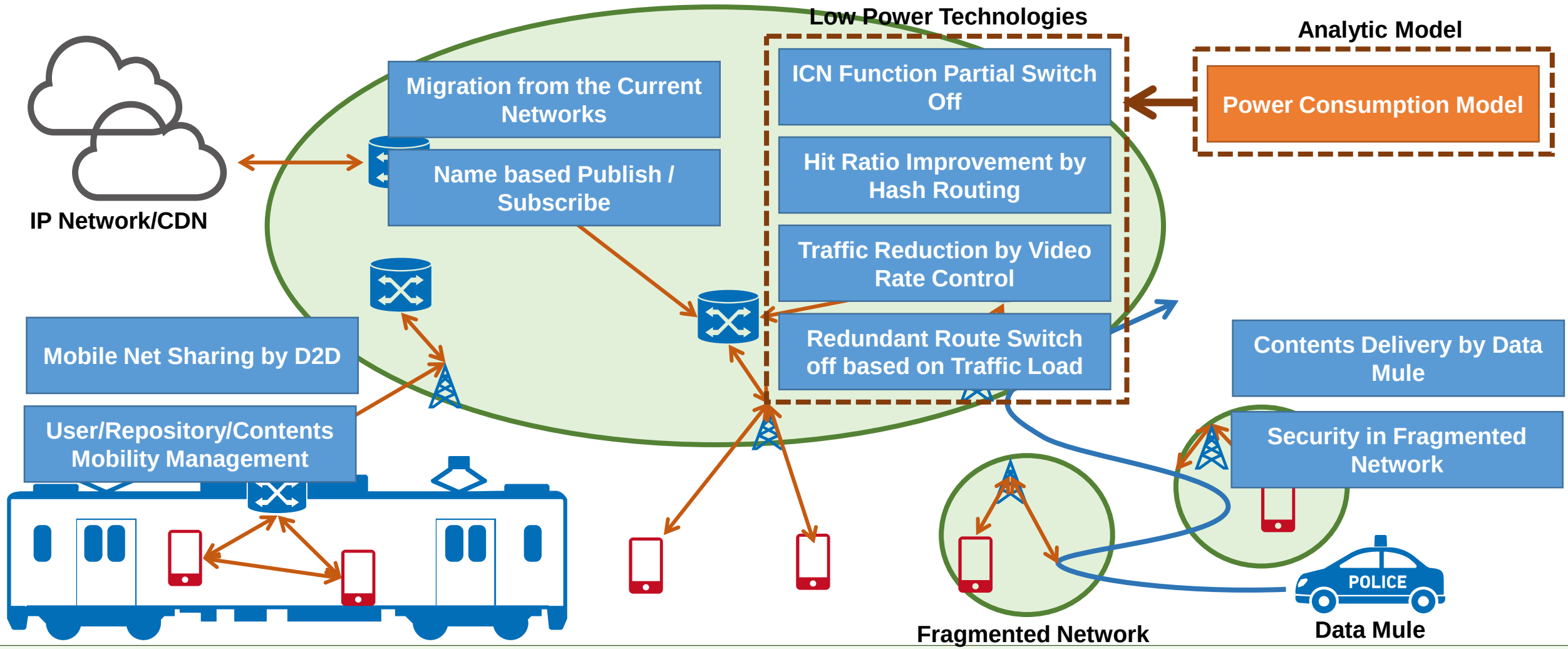
CEDEO
Italy

Telekomunikacja Polska
Poland

University College London
UK

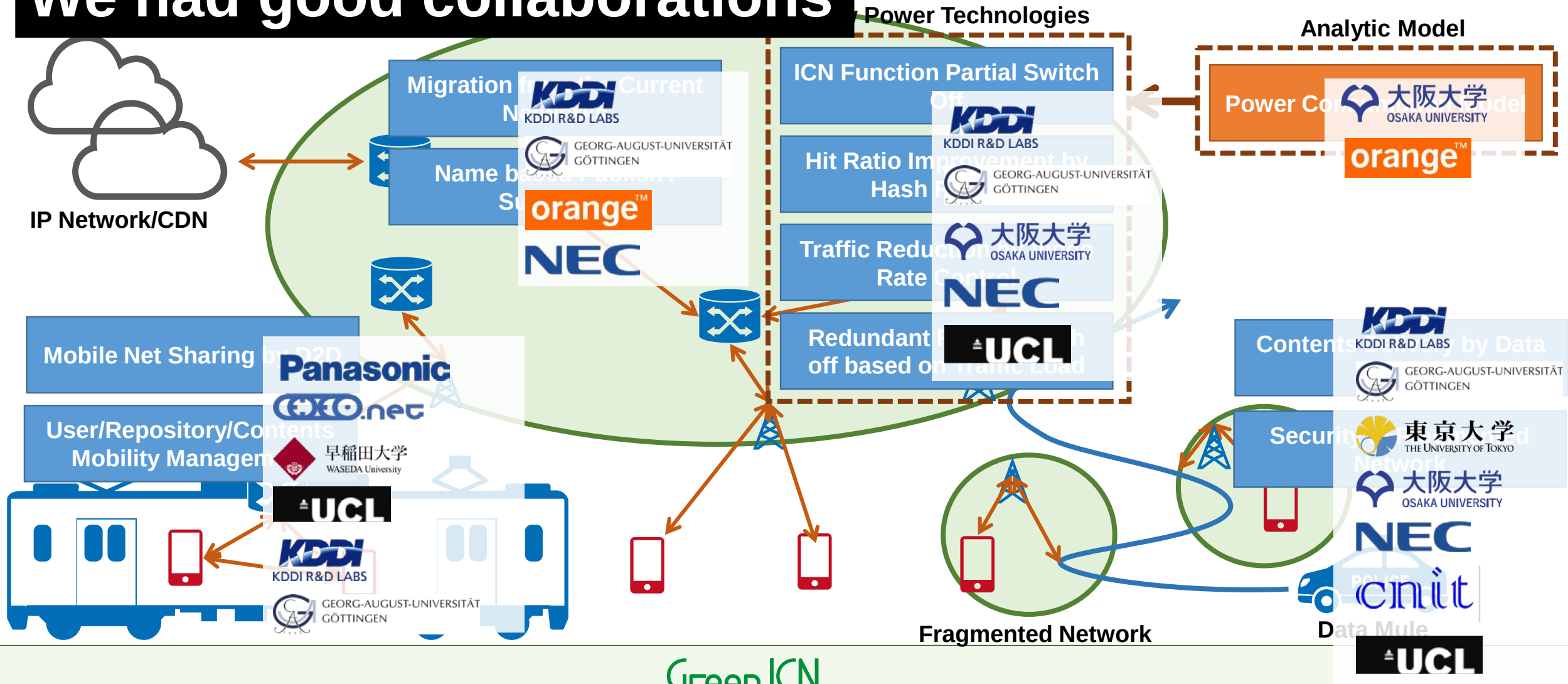
Consorzio Nazionale Interuniversitario per le Telecomunicazioni
Italy

GreenICN Project Overview

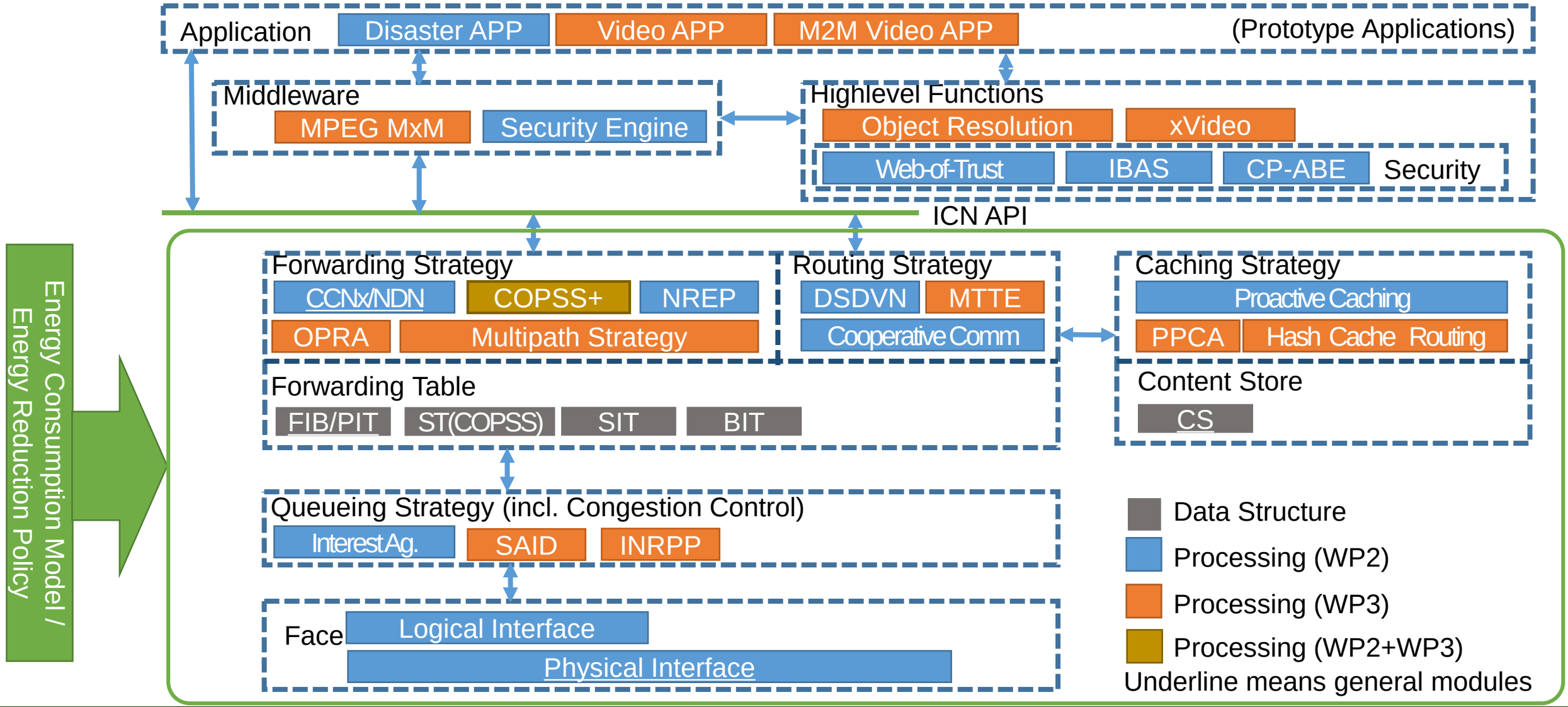


GreenICN Project Overview

We had good collaborations

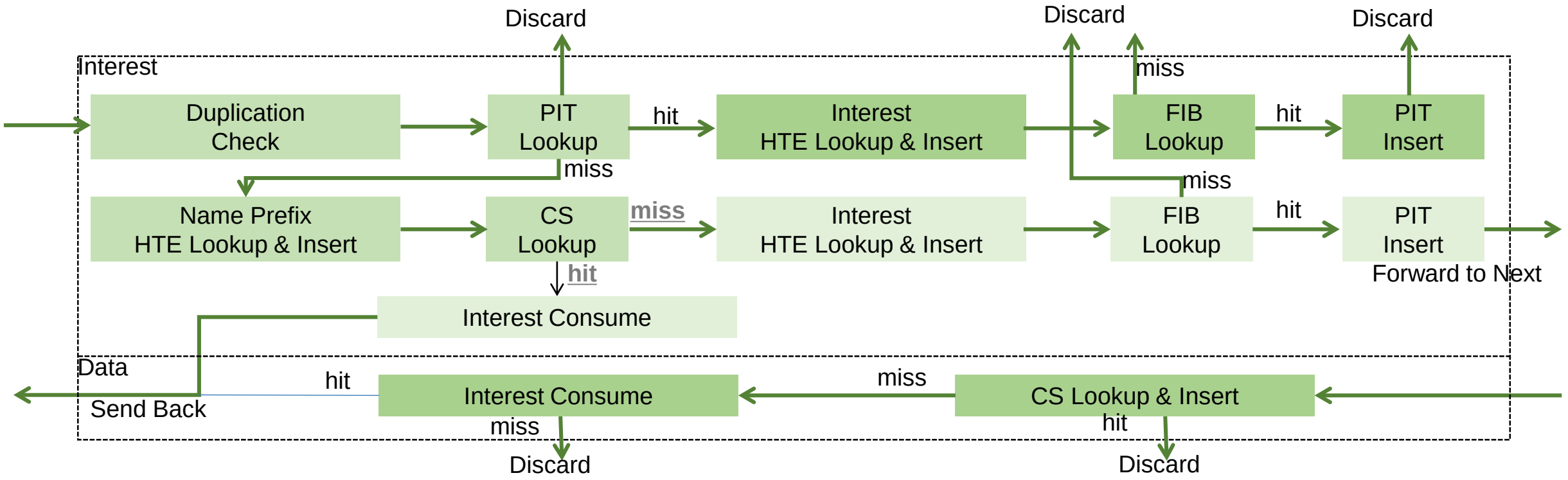


Relationship between Modules



Power Consumption Model

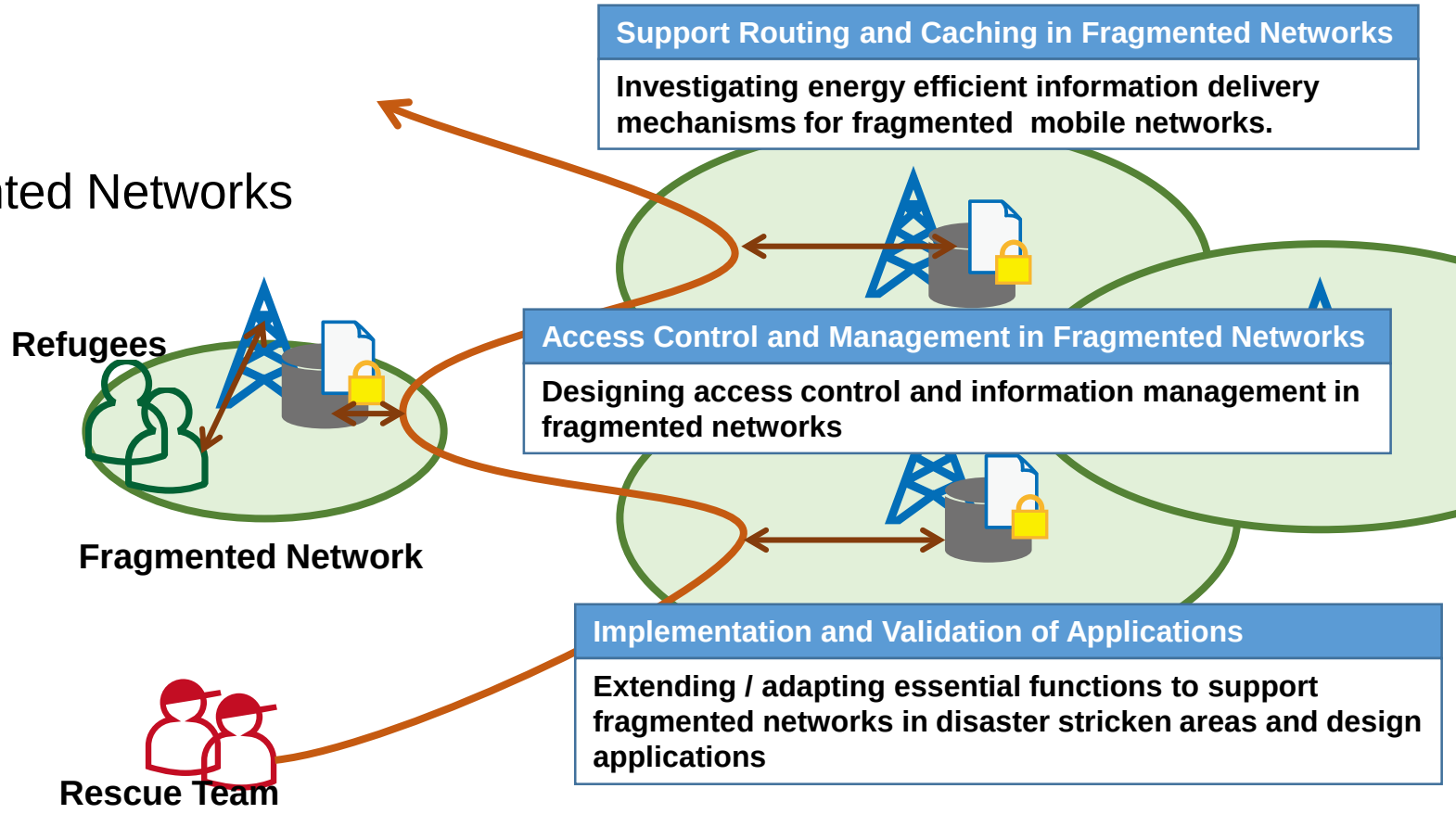
- **Analyzing the power consumption for each function**
  - For clarifying the relationship with the power consumption
- **Developing the policy to reduce the power consumption**



Application 1 : Disaster Scenario

- **Energy and communication resources are at a premium**
- **Presence of fragmented networks with only intermittent connectivity**

- **Challenges**
  - Communication in Fragmented Networks
  - Security
  - Traffic Prioritization
  - Handling Congestion
  - Delay/Disruption Tolerant
  - Energy Efficiency



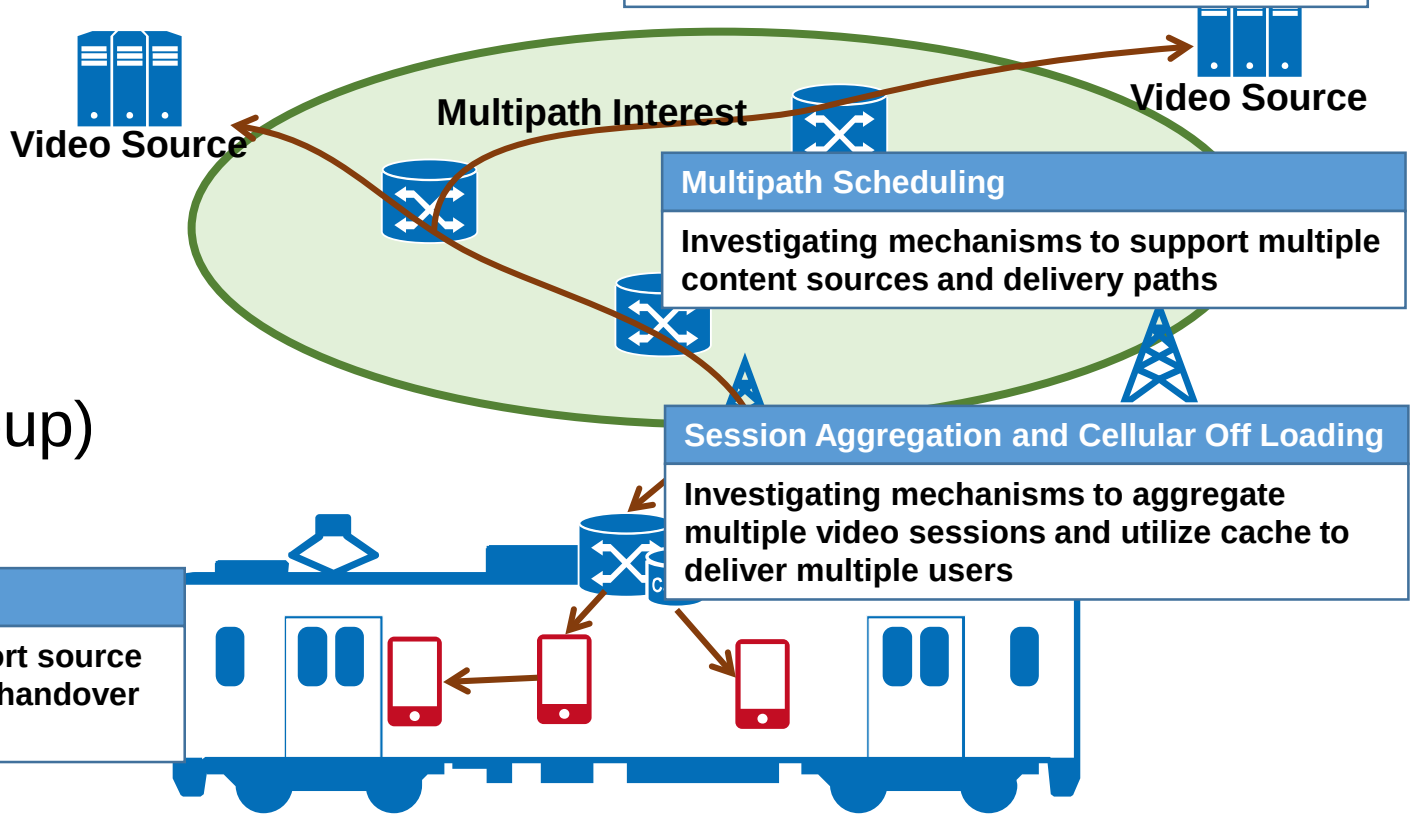
Application 2 : Video Distribution

- **Video accounted for around 50% of mobile data traffic in 2015**
- **Energy-efficient video delivery is required**

- **Challenges**
  - Large scale dissemination
  - Cache management
  - Congestion control
  - Mobility (include source, group)
  - CDNs/caches and migration

Caching

Investigating caching strategies for video and energy saving



Multipath Scheduling

Investigating mechanisms to support multiple content sources and delivery paths

Session Aggregation and Cellular Off Loading

Investigating mechanisms to aggregate multiple video sessions and utilize cache to deliver multiple users

Routing and Mobility Management

Investigating mechanisms to support source mobility as well as seamless video handover with client mobility

Disseminations

- **A large part of our work has been published in standardization forums and peer reviewed conferences / journals / workshops / poster-demo and etc.**

- **Standardizations**
  - IRTF ICNRG, ITU-T, MPEG
- **Publications**
  - Conference, Journals, Workshops, Demo
- **Activities**
  - Open Workshop

Standardizations

- **ITU-T DR&NRR**
  - Adding Information-Centric Networking as a component technology in Part II of the framework document “Disaster Relief Systems, Network Resilience and Recovery (DR&NRR): Promising technologies and use cases.”
- **IRTF ICNRG**
  - Using ICN in disaster scenario
- **ITU-T SG13**
  - Adding use cases of disaster scenarios and recommendations to Y.supFNDAN
- **MPEG**
  - Proposal for MXM Green Metadata Technology Engine API
  - A testbed for research, development and experimentation of ICN Peer technologies

Publications

- **Publications and etc.**
  - **66** peer reviewed publications
  - **63** invited papers / technical reports available to the public and a book chapter
  - **49** non paper related presentations at conferences (keynotes, invited talks, panels, universities, standardization and ICT events)

- **Three Best Paper Awards :**
  - IFIP Networking, May 2015.
  - IEEE Global Internet Symposium, IEEE InfocomWorkshops, April 2015.
  - ACM ICN, September 2014


18TH IEEE GLOBAL INTERNET SYMPOSIUM
APRIL 27, 2015, HONG KONG

BEST PAPER AWARD

PRESENTED TO

DINH NGUYEN, KOHEI SUGIYAMA AND ATSUSHI TAGAMI

"CONGESTION PRICE FOR CACHE MANAGEMENT IN INFORMATION-CENTRIC NETWORKING"

PROGRAM CHAIRS:
TORU HASEGAWA
JIANGCHUAN LIU

Activities

- **Research Activities and Future of EU/US/JP ICN Projects Workshop**
  - 30th Oct. 2015
  - Waseda Univ. ONO Auditorium
  - 70- attendants
- **Program**
  - GreenICN Project
  - Standardization
    - ITU-T
    - IETF/IRTF
  - NDN Project
  - CCNx Project
  - POINT Project

Conclusion

- **ICN has the potential to solve many issues prevalent in current IP**
  - However the research on ICN at an early stage
  - GreenICN peroject provides many solutions
- **GreenICN Project**
  - Application driven approach
  - Energy cosumption model / energy reduction policy

- **Improve the research activities related with the future network technologies in EU and JP**