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UMOBILE

UMOBILE:
Universal, mobile-centric and opportunistic communications architecture

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Feb 19th , 2015
SITI meeting
COPELABS, Lisbon

European Commission | Horizon 2020 European Union funding for Research & Innovation

UCL · University of Cambridge · copelabs · tecnalia Inspiring Business · tekever Autonomous Systems · Senception · fon · AFA Systems

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General View

Definition

- Type of funding scheme: Small project
- Topics: ICT 5 - 2014: Smart Networks and Novel Internet Architectures

Consortium

- Democritus University of Thrace, Greece
- University College London, UK
- University of Cambridge, UK
- COPELABS, Portugal
- Tecnalia, Spain
- Tekever, Portugal
- Senception, Portugal
- Gowex, Spain
- AFA Systems, Italy

Initial Thoughts

- Network availability and affordability for an extended set of communication devices (cars, sensors, home appliances) – Internet of Everything
- Cost of adding new infrastructure and capacity has a drastic effect on rural and remote communities as well as nomadic users.

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Goals

Moto

Make the Future Internet universally pervasive supporting a diverse set of services

Enabling universal Internet access is one of the key issues addressed in the Digital Agenda for Europe (DAE)

Goal

- Develop a new service abstraction that brings together:
  - Principles of Delay Tolerant Networking (DTN)
  - Principles of Information Centric Networking (ICN)
  - Social trust computation
  - Cooperative incentive modeling
- The proposed architecture targets:
  - Mobile networks
  - Extension of Internet connectivity to regions that are not typically covered
  - Enhancement of network resilience

Strategy

Use the benefits of a joint DTN – ICN infrastructure to…

- Allow opportunistic access to information
- Assist information disseminate based on the notion of smart trust circles
- Enable pervasive services, with focus on:
  - Digital inclusion
  - Personal and community safety

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Concept

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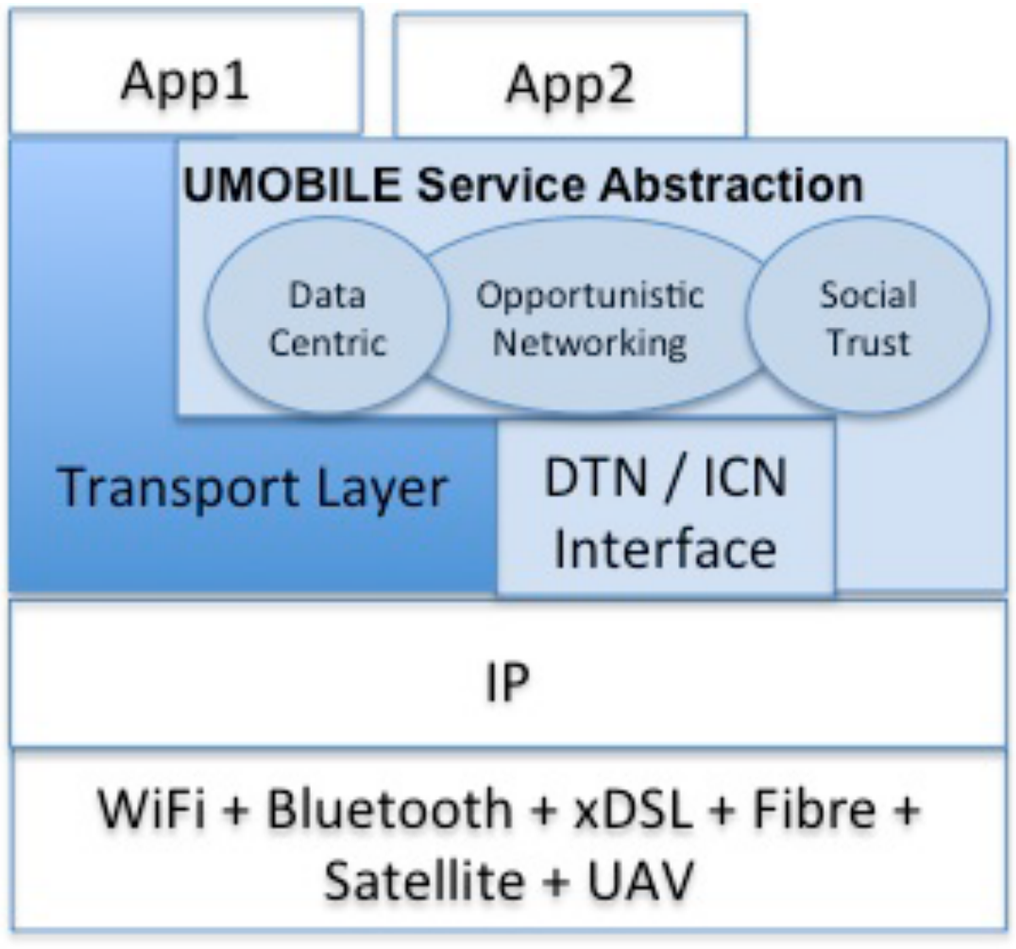
UMOBILE addresses Future Internet architecture in three dimensions

- **Geographical dimension**: extends Internet in a low-cost and self-organizing way, by providing reachability based on opportunistic transmission including satellite and UAV-assisted communications.
- **Scalability dimension**: accommodates any type of moving object
- **Functional dimension**: exploits social aspects such as behavioral patterns of groups and objects

UMOBILE Approach

- Architectural aspects
  - Naming Architecture
  - Service Abstraction Layer
  - Node Design
- Lifetime of Content
  - Content publication, resolution
  - In-network caching caching and content delivery



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Applicability Scenarios

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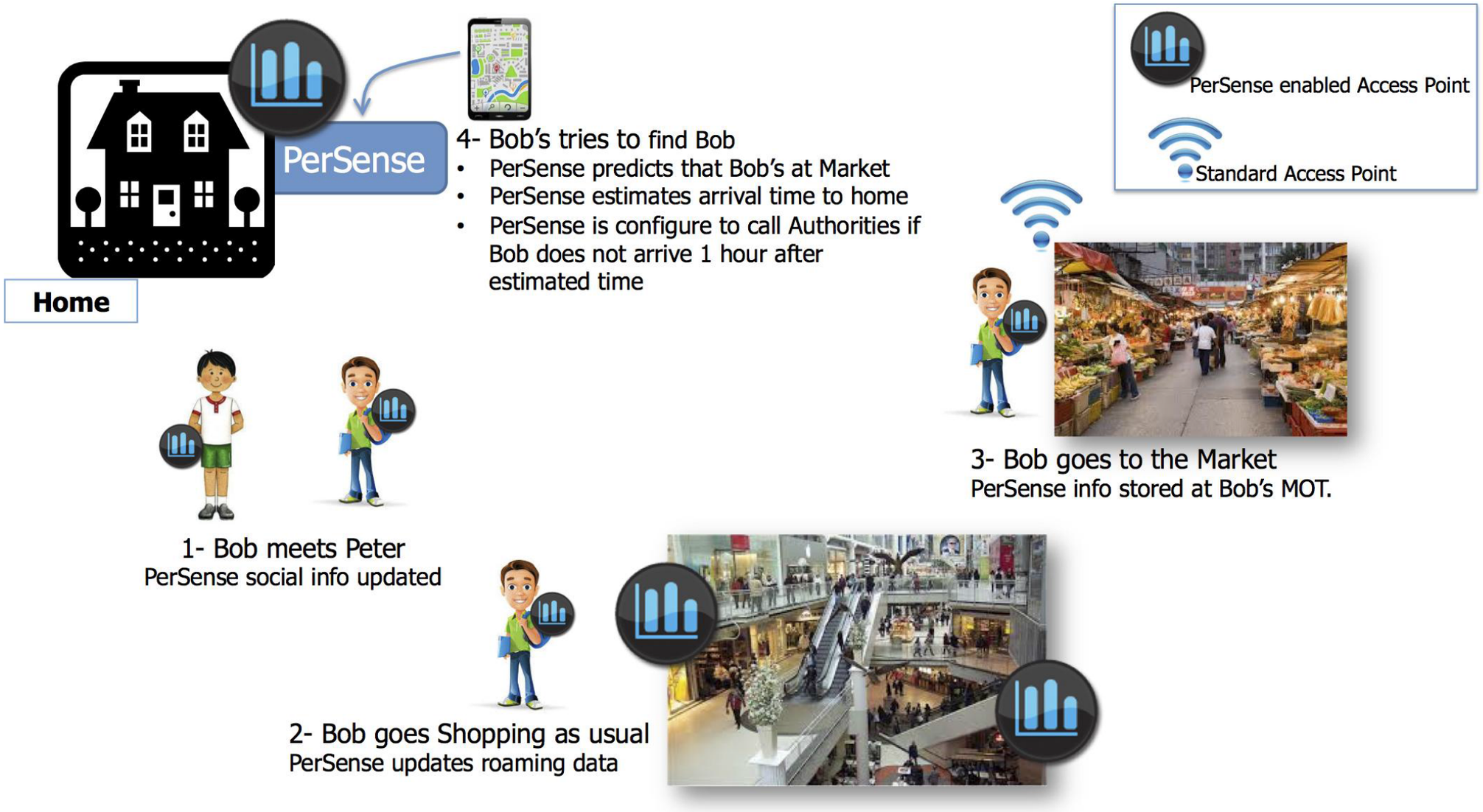
Applicability Scenario 1: Children Safety Prevention

What matter is the definition, over time, of a regular social behaviour pattern to allow the identification of abnormal situations and, as a consequence, emit alerts within the context of specific trusted circles.



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Applicability Scenarios

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Applicability Scenario 2: Prevention in Disaster/Emergency Situations

The use case comprises the exchange of personal and public utility data, with such data being processed, independently of its source, as to aid disaster prevention measures

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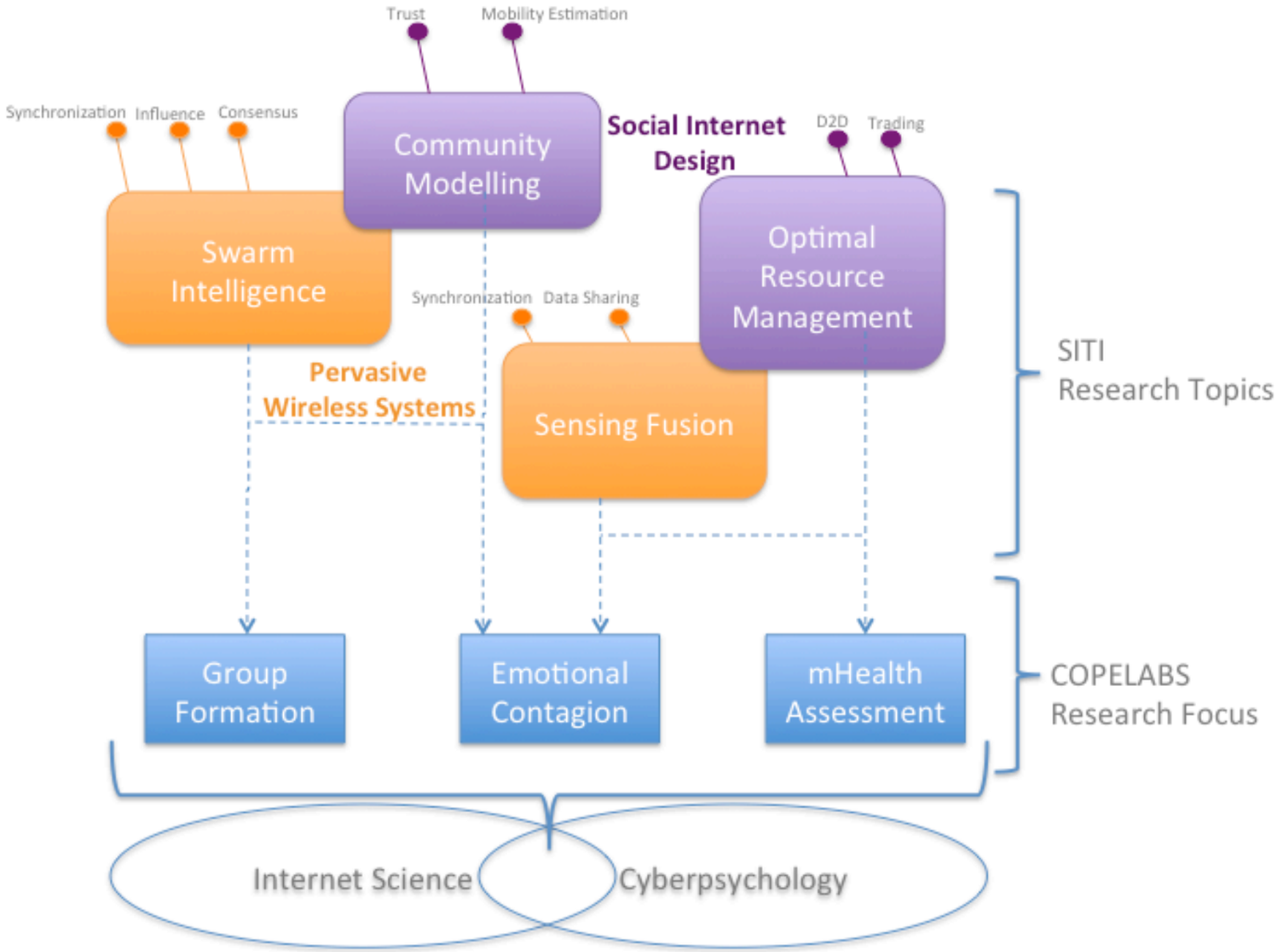
COPELABS – UMOBILE Ecosystem



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- Trust circles and mobility modeling
  - Software: Mtracker (Android)
- Social-aware opportunistic routing
  - Software: dLife (ONE simulator)
- Social-aware content-based opportunistic routing
  - Software: SCORP (ONE simulator
- Expertise in social trust computation and self-organized pervasive systems

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- Development of a social-aware and content based opportunistic communication abstract, based on
  - Awareness about trust circles
  - Collective human behavior
- Deployment on pervasive scenarios based on wearable and embedded devices (and maybe UAV depending on specific needs)
- Evaluation in scenarios related to
  - Personal (children) and community (civil) safety
  - Digital inclusion (if good field experimental sites show up)

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COPELABS Publications relevant to UMOBILE

Data-centric Opportunistic Networking

- Paulo Mendes, "Combining Data Naming and Context Awareness for Pervasive Networks", Elsevier Journal of Network and Computer Applications, Special Issue on Information-Centric Network Architecture, Protocols, Algorithms and Applications, October 2014

- Waldir Moreira, Paulo Mendes, "Social-aware Forwarding in Opportunistic Wireless Networks: Content Awareness or Obliviousness?", in Proc. of IEEE WoWMoM workshop on autonomic and opportunistic communications, Sidney, Australia, June 2014

- Waldir Moreira, Paulo Mendes, Susana Sargento, "Social-aware Opportunistic Routing Protocol based on User's Interactions and Interests", in Proc. of AdhocNets, Barcelona, Spain, October 2013

- Bruno Batista, Paulo Mendes, "ICON - An Information Centric Architecture for Opportunistic Networks", IEEE INFOCOM workshop on emerging design choices in name-oriented networking, Torino, Italy, April 2013

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COPELABS Publications relevant to UMOBILE

Social-aware Opportunistic Networking

- Waldir Moreira, Paulo Mendes, “Dynamics of Social-aware Pervasive Networks” in Proc. of IEEE PERCOM workshop (PerMoby), St. Louis, USA, March 2015

- Waldir Moreira, Paulo Mendes, "Impact of Human Behavior on Social Opportunistic Forwarding", Elsevier Ad Hoc Networks, Special Issue on New Research Challenges in Mobile, Opportunistic and Delay-Tolerant Networks, July 2014

- Ronedo Ferreira, Waldir Moreira, Paulo Mendes, Mario Gerla, Eduardo Cerqueira, "Improving the Delivery Rate of Digital Inclusion Applications for Amazon Riverside Communities by Using an Integrated Bluetooth DTN Architecture", International Journal of Computer Science and Network Security, Vol.14, no.1, January 2014.

- Waldir Moreira, Paulo Mendes, "Social-aware Opportunistic Routing: The new trend", Springer Book on Routing in Opportunistic Networks, ISBN 978-1-4614-3513-6, August 2013.

- Waldir Moreira, Ronedo Ferreira, Douglas Cirqueira, Paulo Mendes and Eduardo Cerqueira "SocialDTN: A DTN implementation for Digital and Social Inclusion", in Proc. of ACM Mobicom workshop on Lowest cost denominator networking for universal access, Miami, USA, September 2013

- Waldir Moreira, Paulo Mendes, Susana Sargento, "Assessment Model for Opportunistic Routing", IEEE Latin America Transactions, Vol 10 Issue 3 April 2012

- Waldir Moreira, Manuel de Souza, Paulo Mendes, Susana Sargento, "Study on the Effect of Network Dynamics on Opportunistic Routing", in Proc. of AdhocNow, Belgrade, Serbia, July 2012.

- Waldir Moreira, Paulo Mendes, Susana Sargento, "Opportunistic Routing based on daily routines", in Proc. of IEEE WoWMoM workshop on autonomic and opportunistic communications, San Francisco, USA, June, 2012.

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User-centric Networking

- Rute Sofia, Paulo Mendes, Huiling Zhu, Alessandro Bogliolo, Fikret Sivrikaya, Paolo Di Francesco, "User-centric Networking: Cooperation in Wireless Networks", Springer Lecture Notes in Computer Science, Wireless Networking for Moving Objects: Models, Approaches, Techniques, Protocols, Architectures, Tools, Applications and Services, 2014

- Namusale Chama, Antonio Junior, Waldir Moreira, Paulo Mendes, Rute Sofia, “User-centric Networking, Routing Aspects”, Springer Lecture Notes in Social Networks, User-Centric Networking: Future Perspectives, ISBN 978-3-319-05217-5, May 2014

- Paulo Mendes, Waldir Moreira, Tauseef Jamal, Huseyin Haci, Huiling Zhu, “Cooperative Networking In User-Centric Wireless Networks”, Springer Lecture Notes in Social Networks, User-Centric Networking: Future Perspectives, ISBN 978-3-319-05217-5, May 2014.

- Carlos Ballester Lafuentea, Jean-Marc Seigneur, Waldir Moreira, Paulo Mendes, Linas Maknavicius, Alessandro Bogliolo, Paolo Di Francesco, "Trust and Cooperation Incentives for Wireless User-Centric Environments" IADIS e-society, Berlin, Germany, March 2012

- Rute Sofia, Paulo Mendes, “User-provided Networks: Consumer as Provider”, IEEE Communication Magazine, Feature Topic on Consumer Communications and Networking - Gaming and Entertainment, Vol 46, # 12, pp. 86-91, December, 2008


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