

Towards Internet Science: EINS initiative and work on socio-tech driven content management and decision making

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EU projects EINS and RECOGNITION

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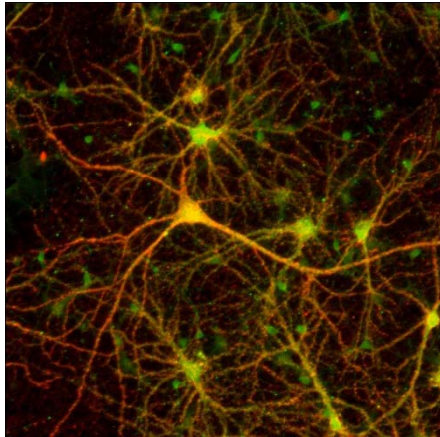
FP7-ICT-2011.1.6-288021 EINS

Network of
Excellence in
Internet Science



Human History: Is all about networks...

Biological Networks



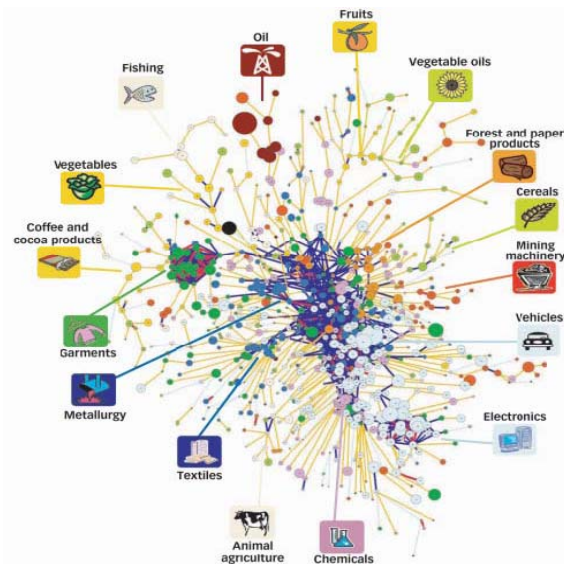
Transportation Networks



Cultural Networks



Economic Networks



Power grid



Social Networks



Internet: just another network?

From a technical artefact



to a central element of our social fabric



Internet-Human Interactions:

- Human Activity shapes the network
- Network impacts on human behavior

Which are *the reciprocal influences* linking the **Internet** and broader **socioeconomic** systems ?

Which are the *prospects and limitations* associated with our attempts to extend current Internet and how can we *influence* its future development?

→ **Network of Excellence in Internet Science**

Network of Excellence in Internet Science

- A. Coordinate the investigation, from **a multi-disciplinary perspective**, of specific internet-related topics **at the intersection between humanistic and technological sciences**, such as privacy and identity, reputation, virtual communities, security and resilience,...

**JRA4: Governance,
Regulation &
Standards**



**JRA5: Internet Privacy,
Identity, Trust & Reputation
Mechanisms**



JRA6: Virtual Communities



**JRA7: Internet as Critical
Infrastructure; Security, Resilience
and Dependability Aspects**

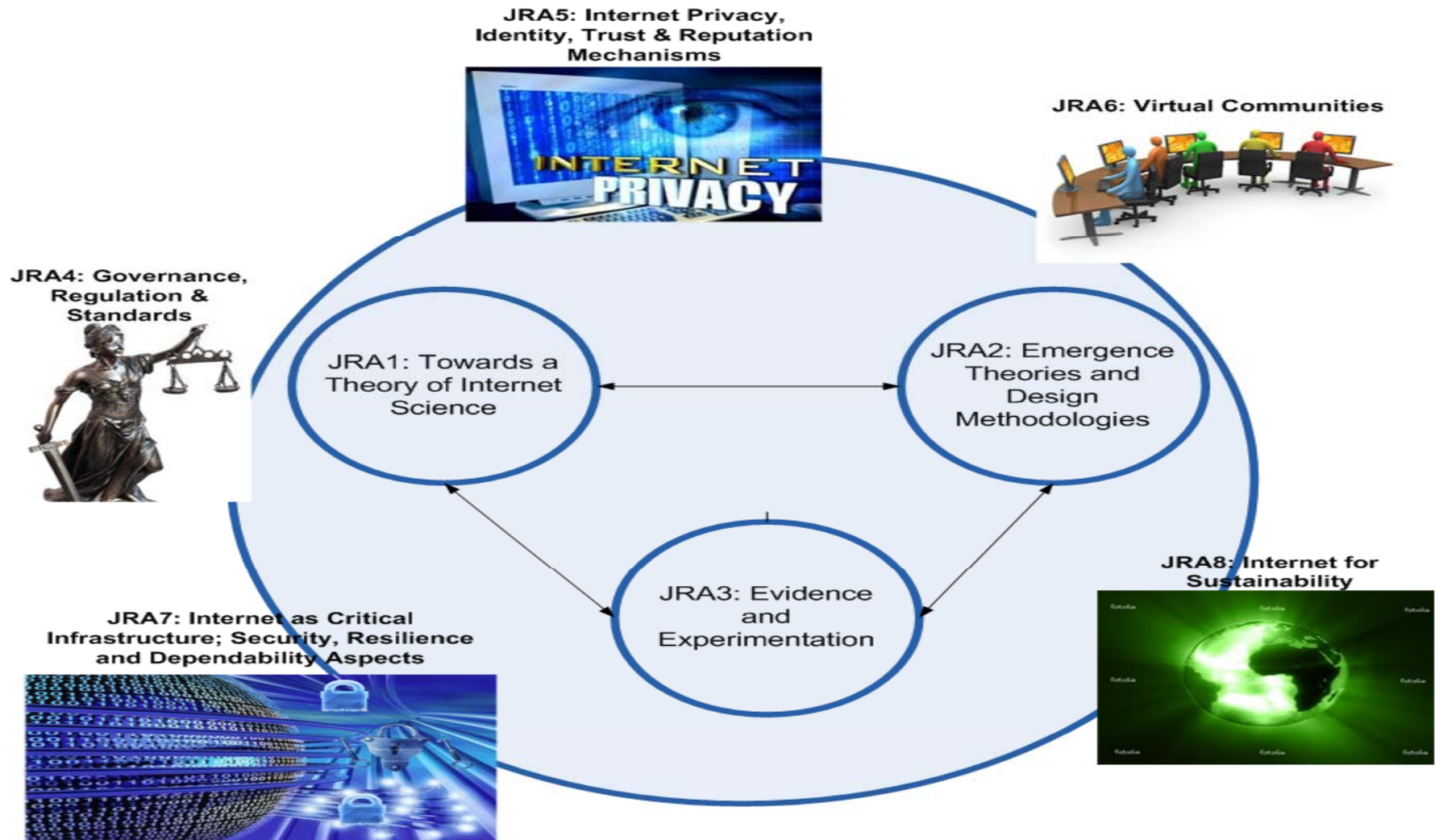


**JRA8: Internet for
Sustainability**



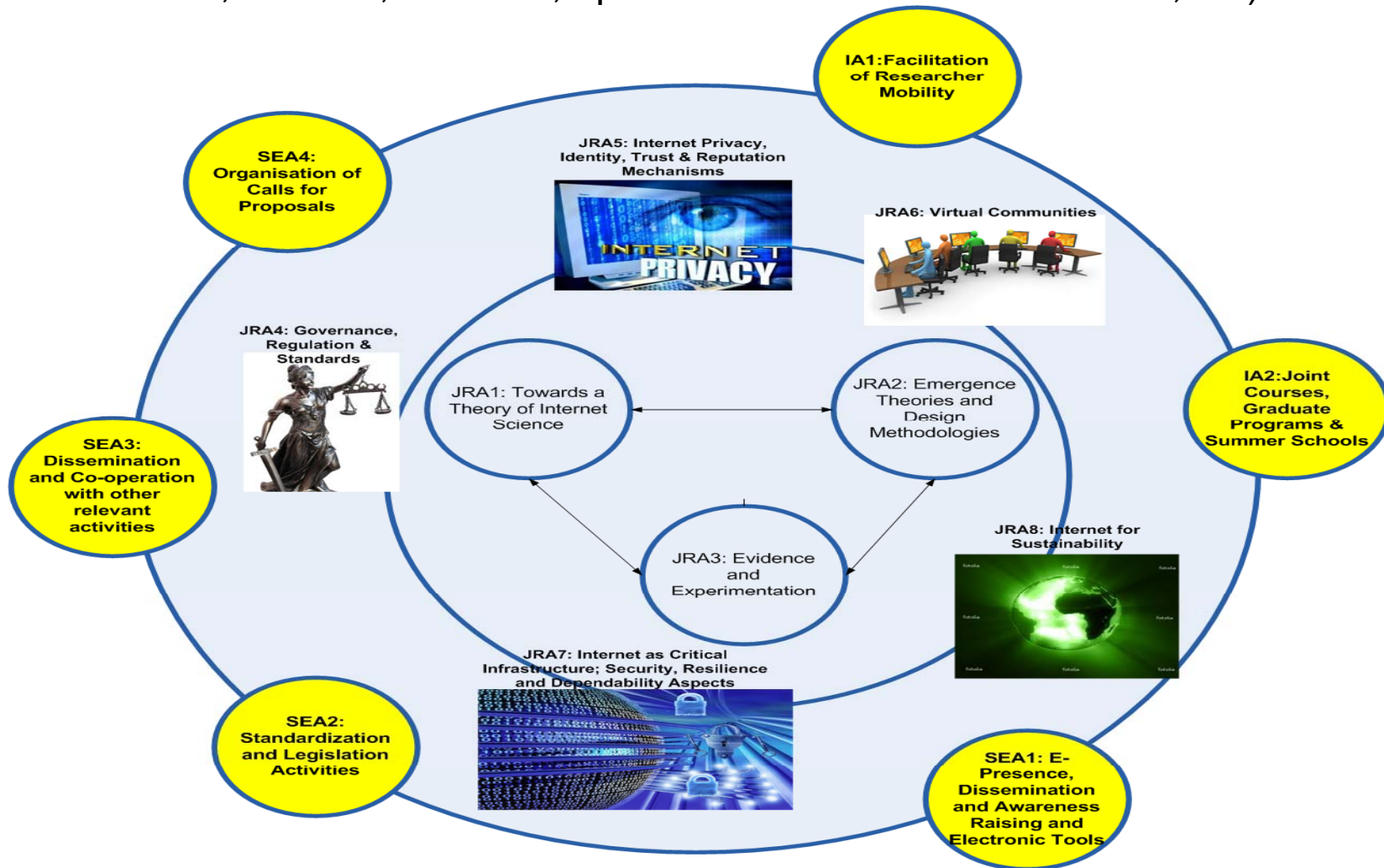
Network of Excellence in Internet Science

- B. Lay the foundations for an Internet Science, for codification and integration of applicable bodies of theory and evidence, applying to aspects of the Internet



Network of Excellence in Internet Science

- C. Provide concrete incentives for academic institutions and individual researchers to conduct studies across multiple disciplines (online journals, conferences, workshops, PhD courses, schools, contests, open calls for innovative activities, etc)



EINS Consortium

EINS unites a **wide team of renowned researchers** from:

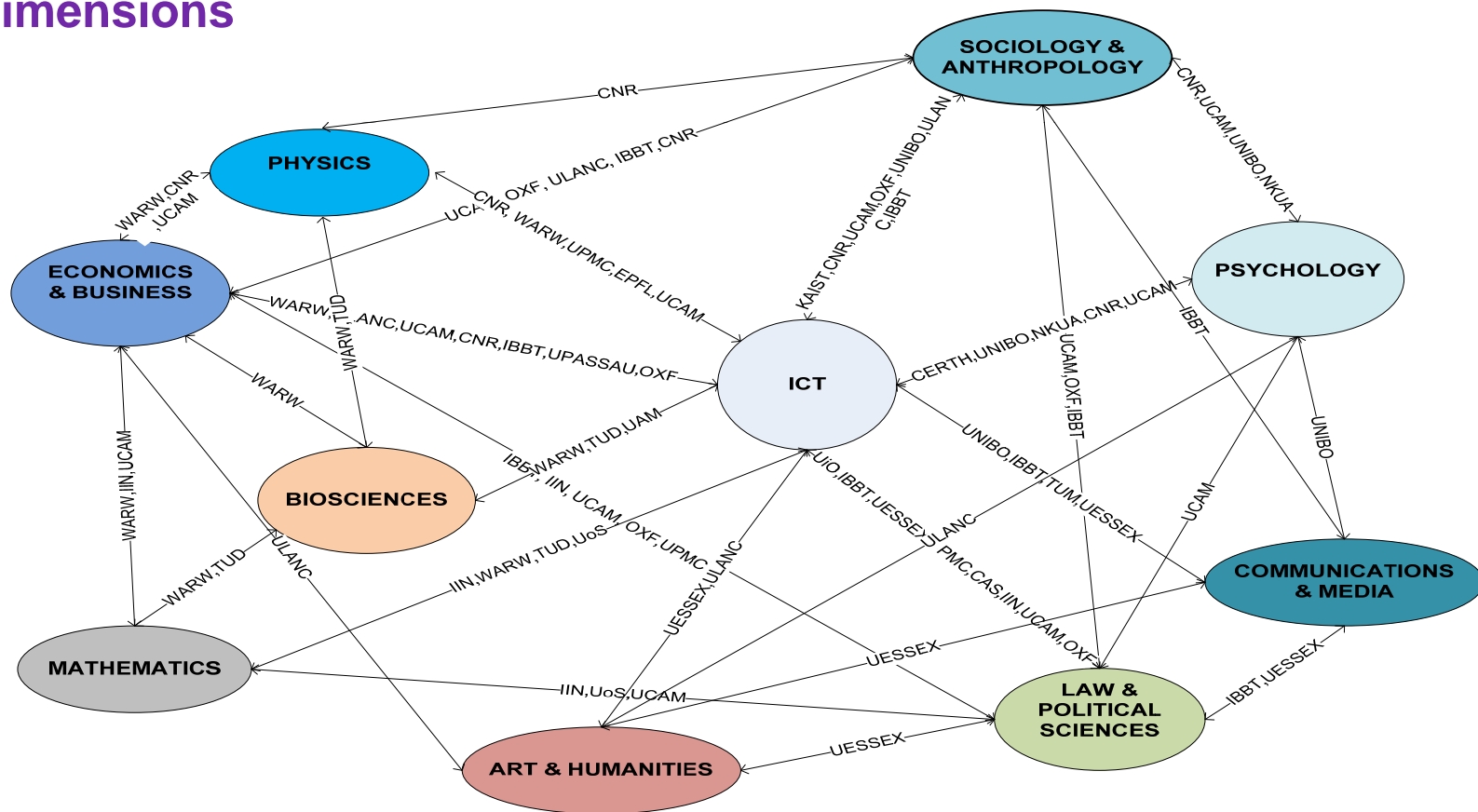
- ICT, with track record on interdisciplinary research & cooperation with non-ICT
- non-ICT, with track record on Internet research
 - The right mix of skills and adequate experience is key to the endeavour success



EINS Multidisciplinary

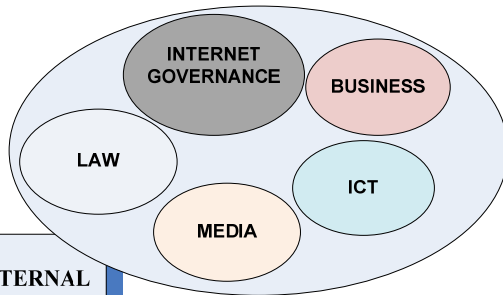
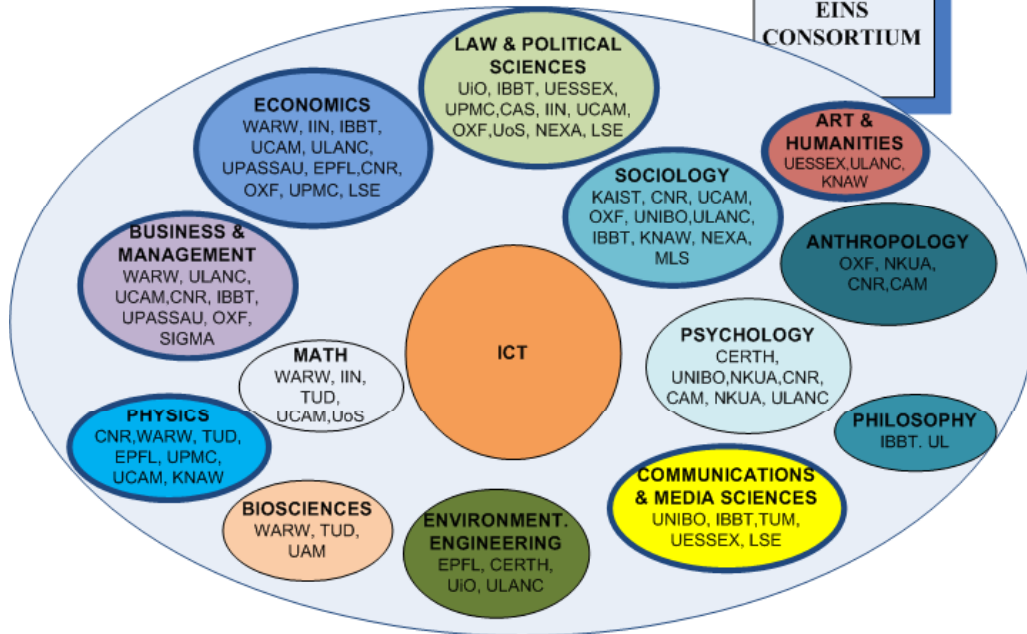
Internet Science will be studied under the perspectives of

- **Applied Sciences** (Math, Biology, Physics, Game Theory...), *along with* (traditional approach on complex systems)
- **Social Sciences** (Economy, Sociology, Law, Politics...): *new key dimensions*

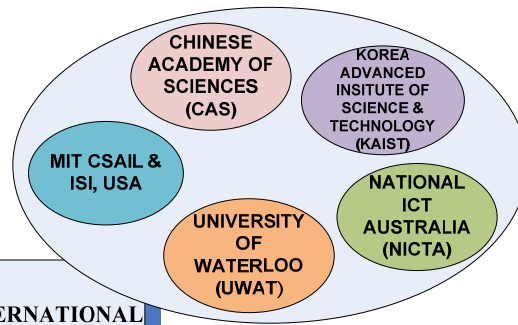


EINS Multi-disciplinarity (Cont.)

EINS
CONSORTIUM



EXTERNAL
ADVISORY
COMITTEE



INTERNATIONAL
DIMENSION

Interdisciplinary Initiatives:

FIRM-MediacityUK (Creative Media Policies), **ESSEX EXCCEL** (European Law Center), **Next Generation Infrastructure** (Governance, Policies), **Swiss Experiment** (sharing sensor data), **P2PNext** (P2P CDN), **Opensense** (air pollution sensing), **WARW "Mimetic Factors in Individual Behaviour: Health and Well-being"** (ESCR, BBSRC-funded), **"Complexity in healthcare systems"** (Medical-Business joint with BU), **EIFFEL Think Tank** on Future INET, **OpenLabs**, **CIP projects**, **EC Presidency Council** on telecoms (**network neutrality**), **WARW "Complex Networks & their dynamics"** (including opinions and markets), **Global INET Values** (online trust, privacy), **Privacy Values Networks** (EPSRC-funded), **SOCIALNETS** (Physics, Anthropology), **RECOGNITION** (Physics, Psychology, Biology)

Eventually remove some of the confusion networking technologies have created....

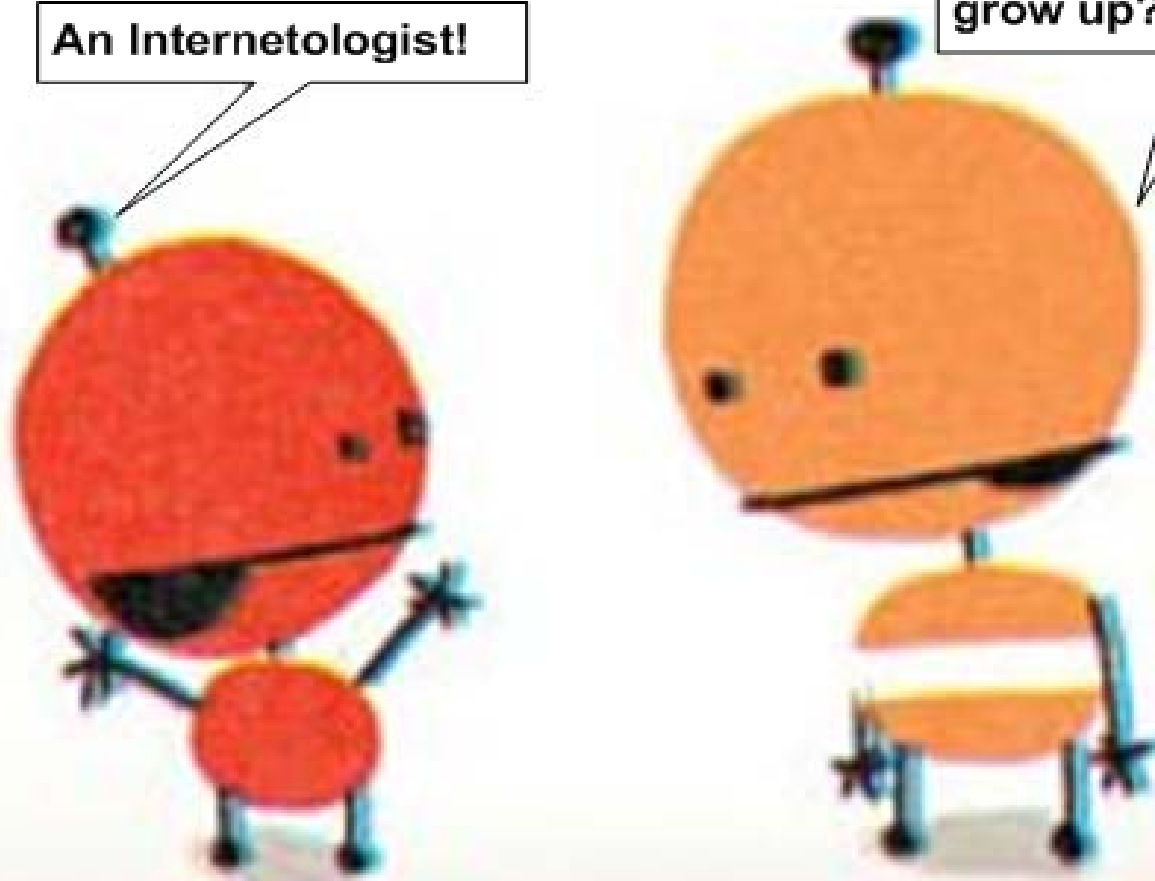


*"No, you weren't downloaded.
You were born."*

Move towards a new, highly-regarded science

An Internetologist!

What do you want to become when you will grow up?



Internetologist

An expert on a body of fundamental knowledge that addresses major challenges that have emerged in various disciplines – as well as across disciplines – as a consequence of the penetration of the Internet

Keep in touch / Participate

- Opportunities for highly inter-disciplinary work
- EINS events – funding for external participation
- NSF anticipated involvement (NeXtworking 2013/14 event, similar to Nextworking 2003 and 2007 , see e.g. <http://cgi.di.uoa.gr/~nextwork/nextworking2003>)

<http://www.internet-science.eu>

Work on Distributed Selfish Replication (DSR)

- DSR strategy with Nash EQ / Mistreatment-free
- DSR Factoring in node misbehaviour / churn
- Framework for social group tightness / community detection based on interest similarities.
- Tightness-driven DSR – shaping cooperation attitude

- N. Laoutaris, O. Telelis, V. Zissimopoulos, I. Stavrakakis, "Distributed Selfish Replication," IEEE Transactions on Parallel and Distributed Systems, Dec., 2006
- E. Jaho, I. Koukoutsidis, I. Stavrakakis, I. Jaho "Cooperative Content Replication in Networks with Autonomous Nodes", Computer Communications Journal, Elsevier, Vol. 35, No. 5, pp: 637-647, vol. 35, Iss. 5, 2012, pp. 637 – 647, March 2012
- E. Jaho, M. Karaliopoulos, I. Stavrakakis. ISCoDe: a framework for interest similarity-based community detection in social networks. INFOCOM-NetSciCom'11, Apr. 10-15, 2011, Shanghai.
- E. Jaho, M. Karaliopoulos, I. Stavrakakis, "Social similarity favors cooperation: the distributed content replication case", IEEE Transactions on Parallel and Distributed Systems, to appear.

Work on Distributed Content Migration

Distributed and scalable approaches to facility location problem

- Neighbor-hopping service migration
- The R-ball heuristic
- Centrality-driven distributed service migration

- K. Oikonomou, I. Stavrakakis, “Scalable Service Migration in Autonomic Network Environments,” IEEE JSAC, Vol. 28, No. 1, January 2010
- N. Laoutaris, G. Smaragdakis, K. Oikonomou, I. Stavrakakis, A. Bestavros, “Distributed Placement of Service Facilities in Large-Scale Networks”, IEEE INFOCOM’07, May 6-12, 2007, Anchorage, Alaska.(Extended version under review in IEEE ToN)
- P. Pandazopoulos, M. Karaliopoulos, I. Stavrakakis, “Centrality-driven scalable service migration”, 23rd International Teletraffic Congress (ITC), Sept. 6-9, 2011, San Francisco, USA. (extended version under review in IEEE TPDS)

Work on Resource Selection Decision-making

autonomous/selfish users / resource –limited (competition)
and distributed environments with choices

- Case Study: Parking space search in urban environments
(free vs for-a-fee access spectrum selection - tragedy of commons setups)
- Unbounded / bounded rationality
 - Perfect vs. imperfect information/knowledge
 - Full or limited computational capacity to assess impact of choices
 - (Cumulative) Prospect Theory
 - Alternative equilibrium concepts (Quantal Response Equilibrium, Rosenthal equilibrium)
 - Heuristics (emphasis on the cognitive processes underlying decisions)
- E. Kokolaki, M. Karaliopoulos, I. Stavrakakis, “Leveraging information in parking assistance systems”, under review, IEEE Trans Veh. Tec.