Future Internet

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Last five decades :

Moving intelligence from organic to anorganic materia (from carbon to silicon)

↓

Last two decades:

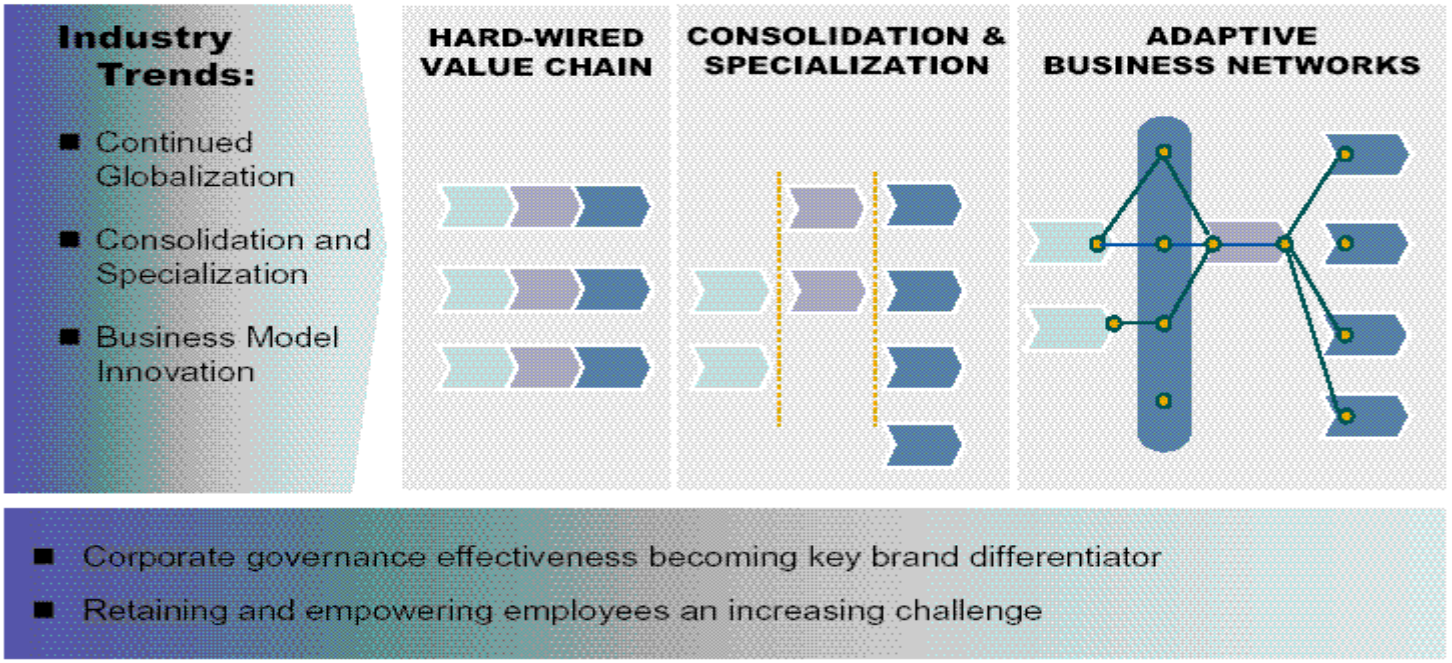
Moving Business intelligence in Cyberspace

↓

INTERNET becomes a mission critical infrastructure for all types of economies

The Business Vision

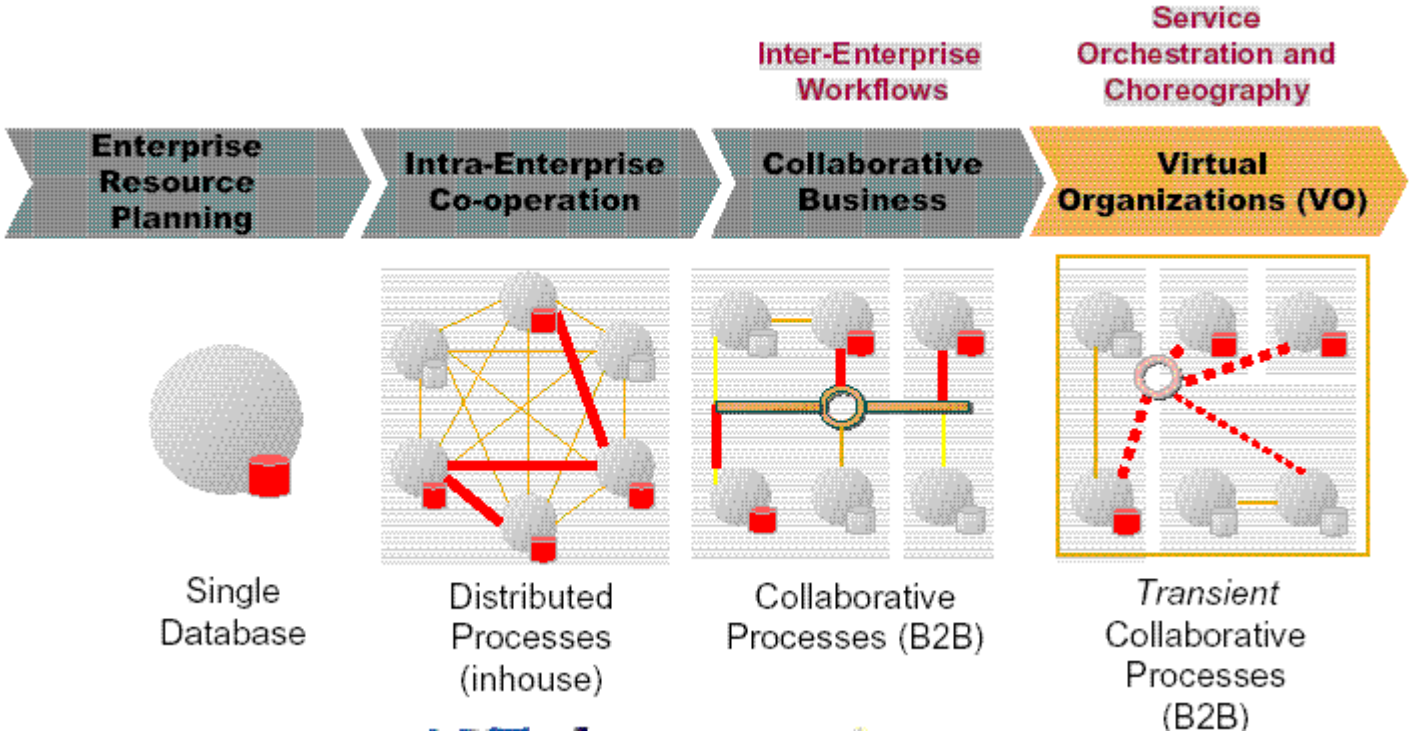
- "By 2015, widespread industry trends will transform many of today's hard-wired value chains into flexible, adaptive business networks"



Source: Volkmar Lotz, *Enterprise Systems Security Research Directions,* In Proceedings of the ESFORS Workshop on Software and Service Development, Security and Dependability, September 6th and 7th, 2006, at ENST in Paris

The Business Vision

- Globalisation of Business Processes
  - Transition from monolithic ERPs to **transient collaborative B2B processes**



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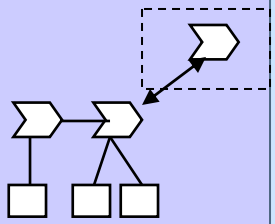
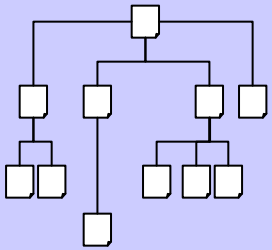
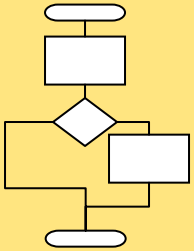
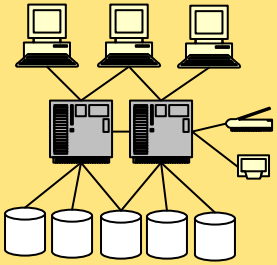
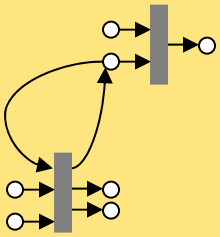
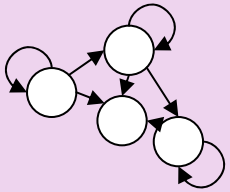
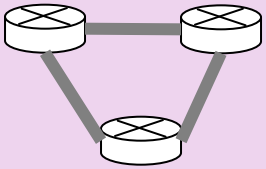
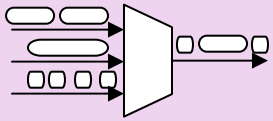
Approach: Mapping Business Requirements in Internet

	Structure	Resources	Multiplexing	Laws	Dependability
Business				Market rules WTO Rules Organisation rules ...	Workflow Availability Reliability Safety Security
Software				SOA	Transaction
Networking [TCP/IP]				?	Best-effort Fairness (~TCP) Self-✶

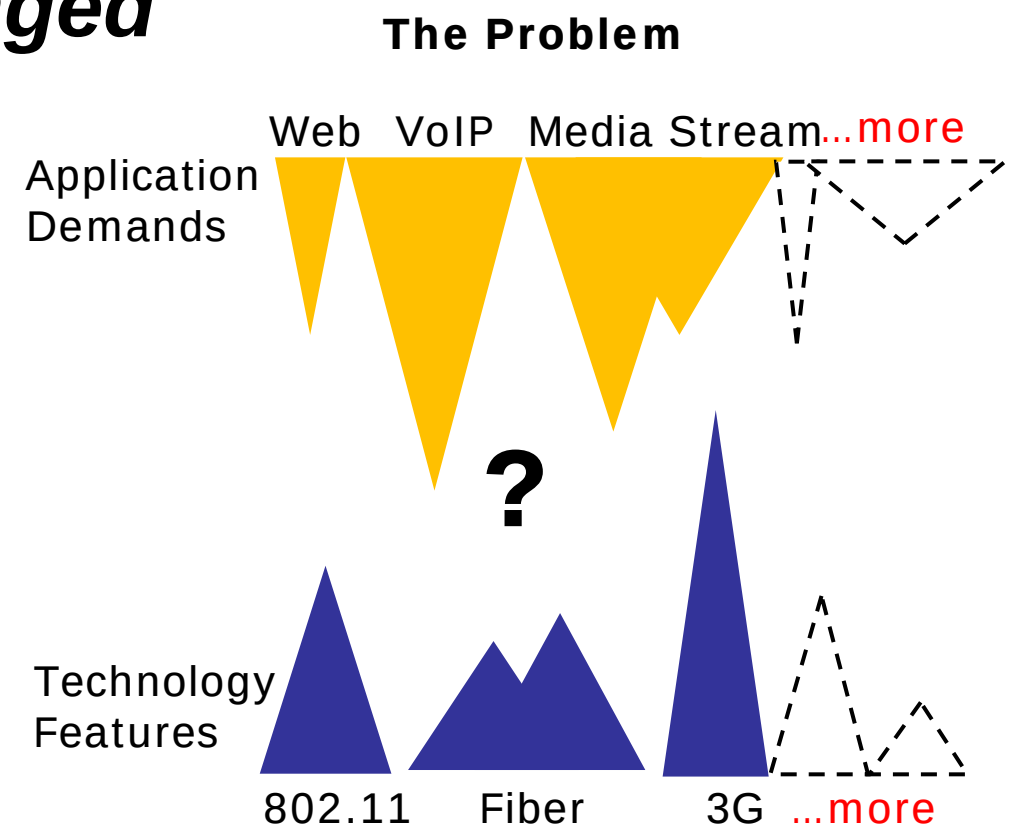
ServiceInteractionPatterns.com

- “For service-oriented architectures to move forward, we need to shift from thinking in terms of request-response and buyer-seller-shipper interaction scenarios into addressing complex, large-scale, multi-party interactions in a systematic manner”

[Marlon Dumas]
http://sky.fit.qut.edu.au/~dumas/ServiceInteractionPatterns/

The world has ***changed***

- Mobility/wireless
- Node Explosion
- Quality Demands
- Heterogeneity
- Unwanted traffic
- Security threats
- Privacy concerns
- Green IT
- **No GOVERNANCE**



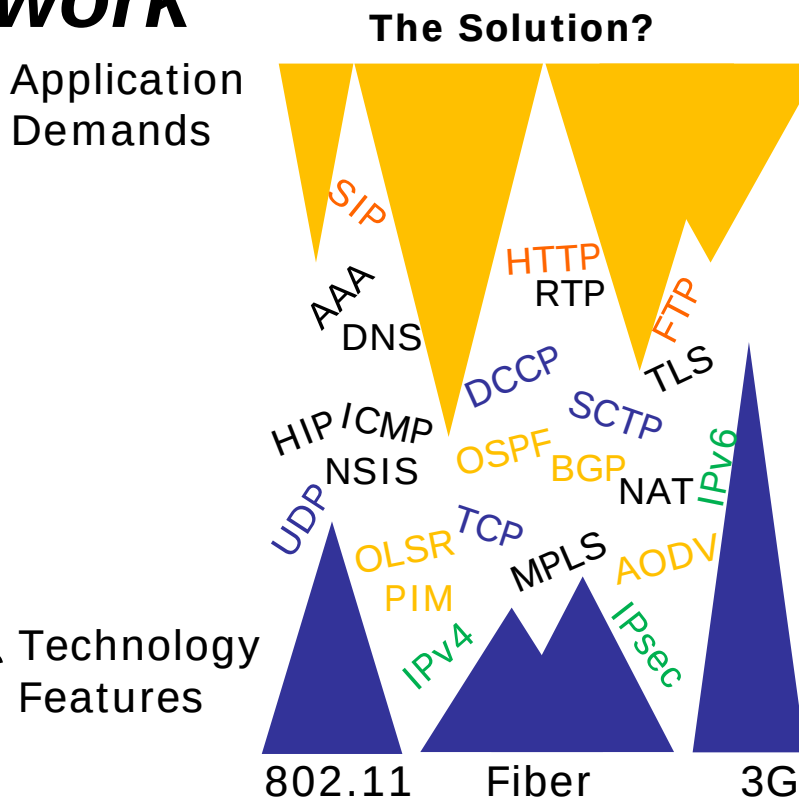
…and will continue ***changing***

Growing demands by ***businesses*** and ***communities***

Internet today: A huge ***Patchwork***

- Data plane diversification
- Control plane explosion
- High management costs
- Poor security

- *INSECURE*
- *HIGHLY COMPLEX*
- ***NO GOVERNANCE RULES UNCONTROLLABLE***



INTERNET A MISSION CRITICAL INFRASTRUCTURE

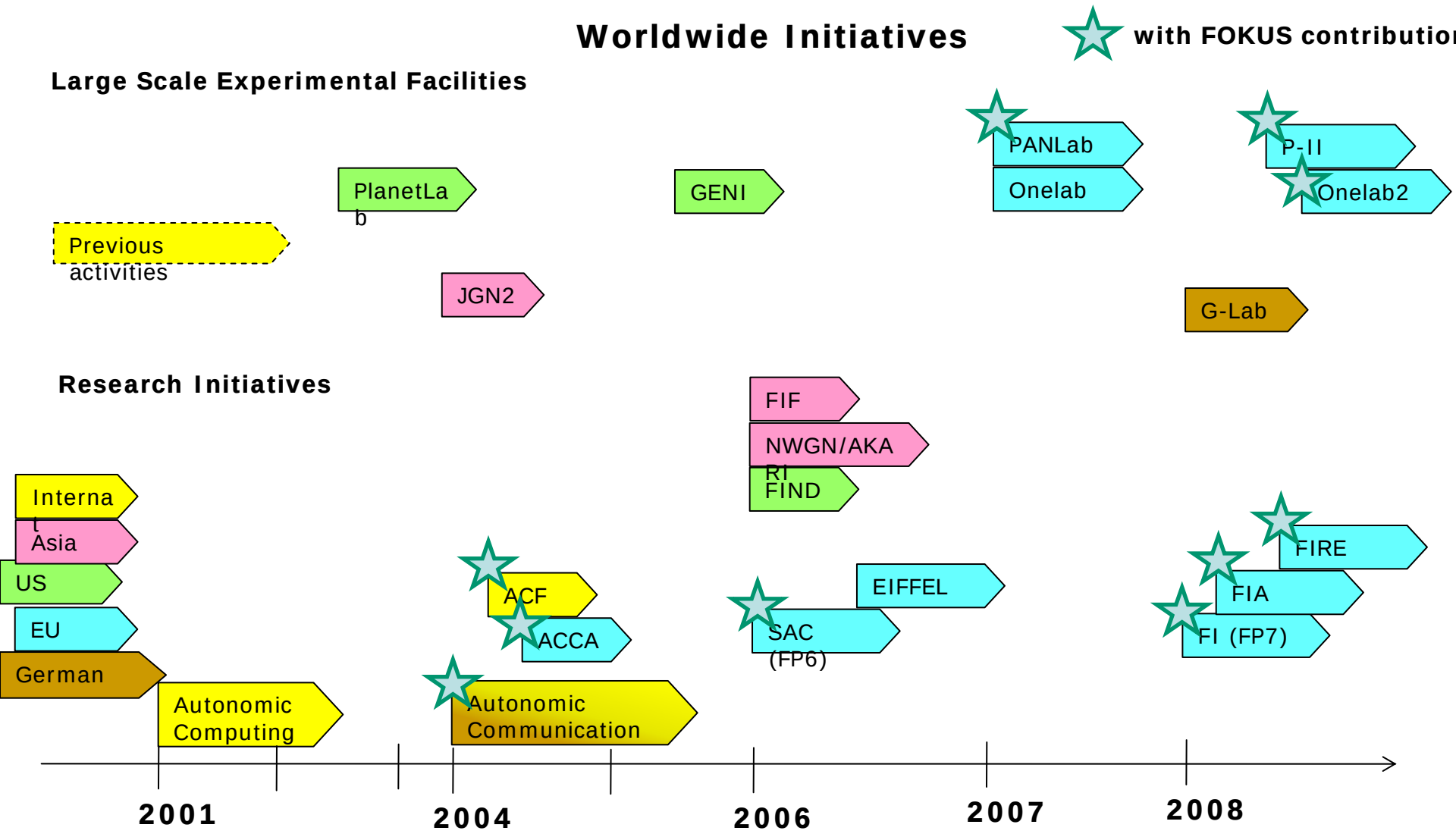
Internet everywhere

- Simple access *everywhere*
- High reliability
- High scalability (Internet of Things)

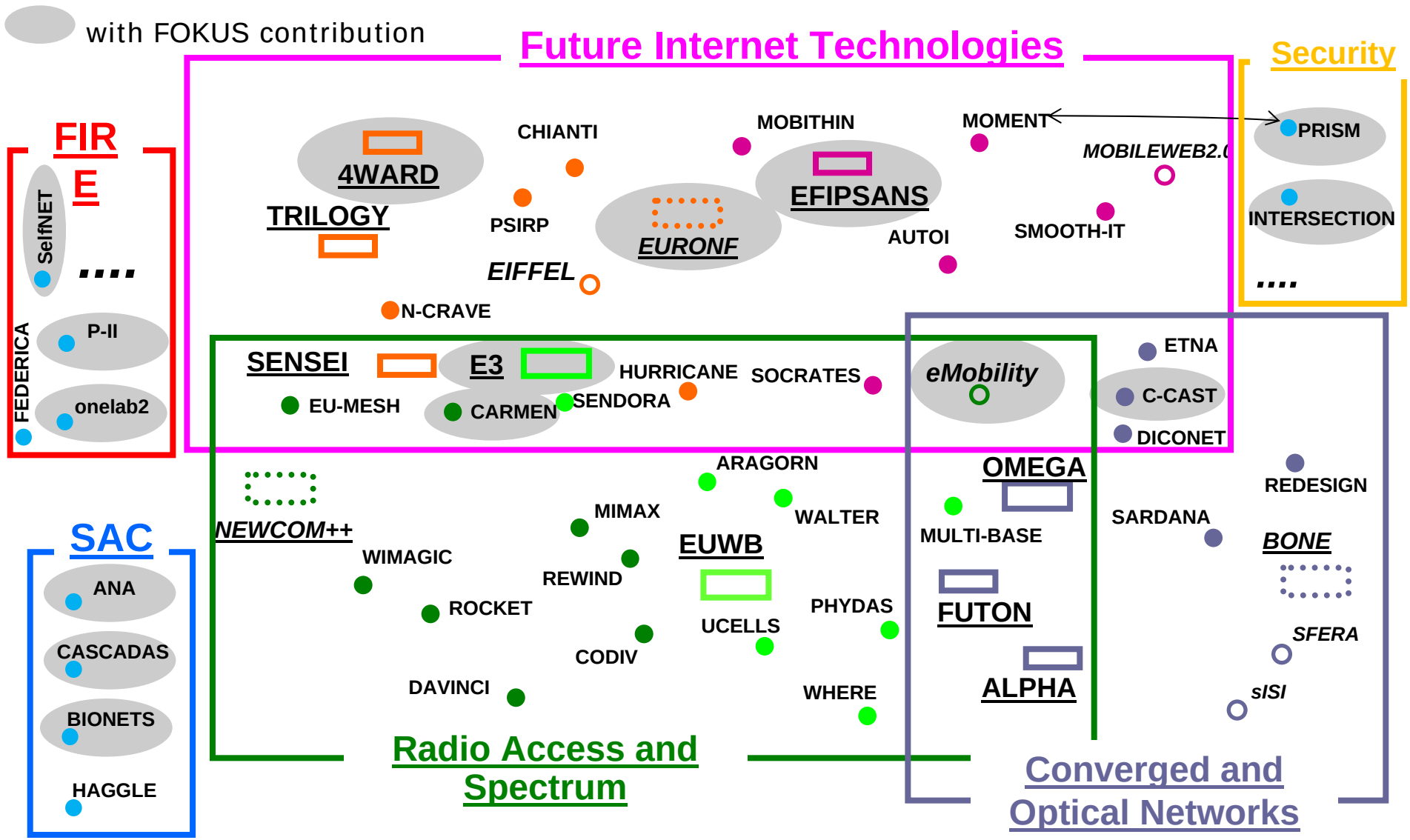
Enabler for new/critical applications (eGov, eHealth, Emergency,..)

- Provide governance for the business logic
- Model the business patterns in the ICT infrastructure
- Security without constraints to applications and users

Future Internet Research

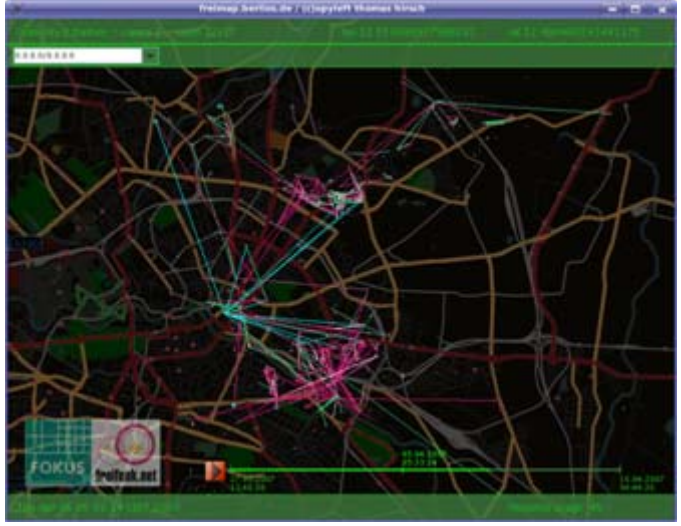


EU View: Future Internet Projects and Clusters



based on: Zimmermann: European Research towards a Future Internet, ICT Mobile Summit 2008

Future Internet Vision



Future Internet Structures

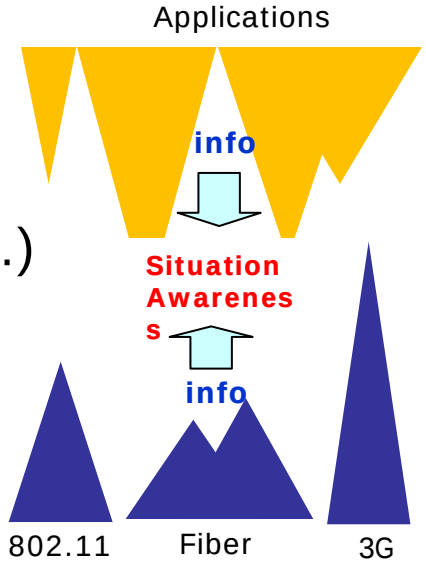
- Towards infinite number of nodes
- Heterogeneous technologies
- Dynamic ***ad hoc/operator-free*** structures

Future Internet Operation

- "Business Logic is King" ➔ network serves
- Network self-protection (failures, attacks, congestion, …)
- Network self-management to support governance

Enabler

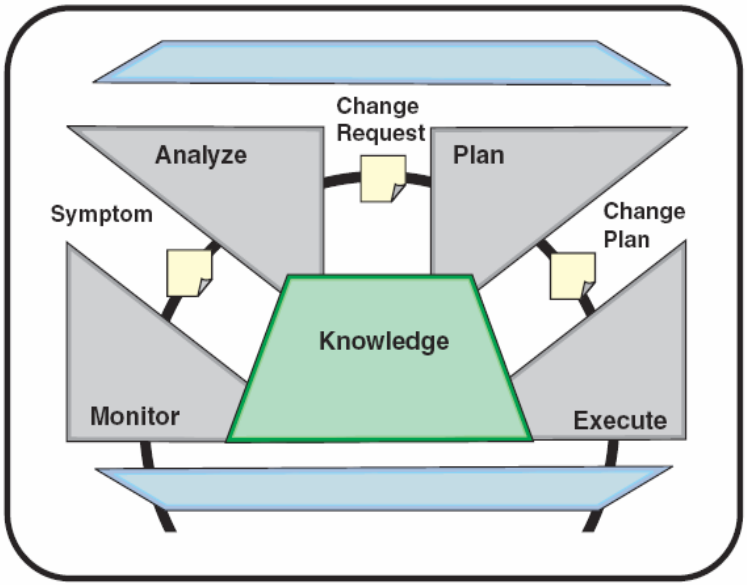
- Strong cooperation between network and business requirements
- **NEW INTELLIGENT ROUTER TECHNOLOGIES**



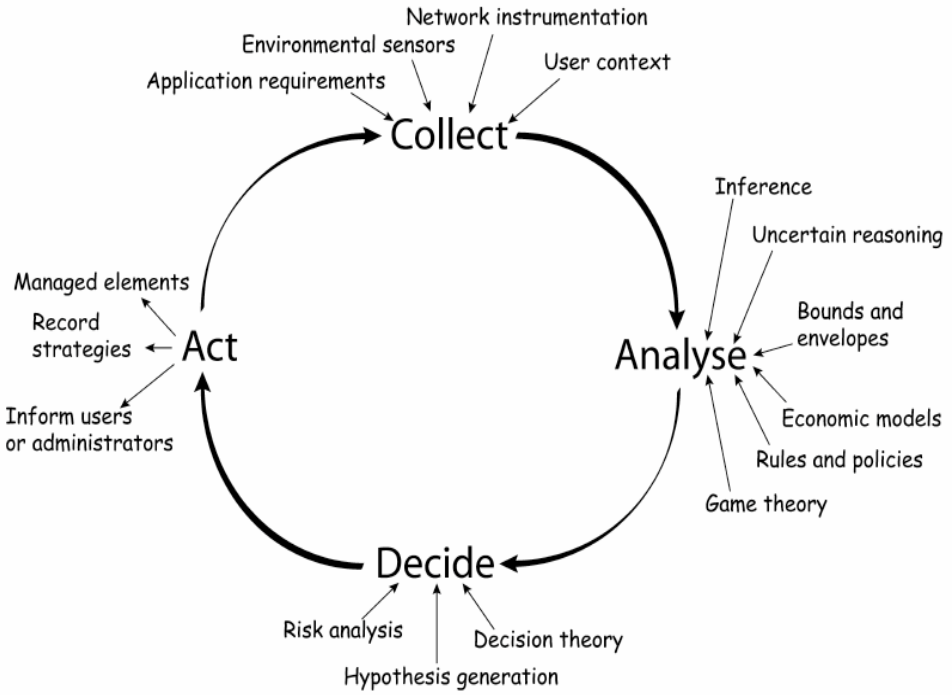
NEW ROUTER TECHNOLOGIES

Basic Idea: Changing End-to-End dogma to decision-making *within* the network

- Support for Business Requirements
- Self-Management
- Self-Protection



Autonomic Computing [IBM]: MAPE
Monitor-Analyze-Plan-Execute



Autonomic Communication [Dobson]:
Collect-Analyze-Decide-Act

Thank you!

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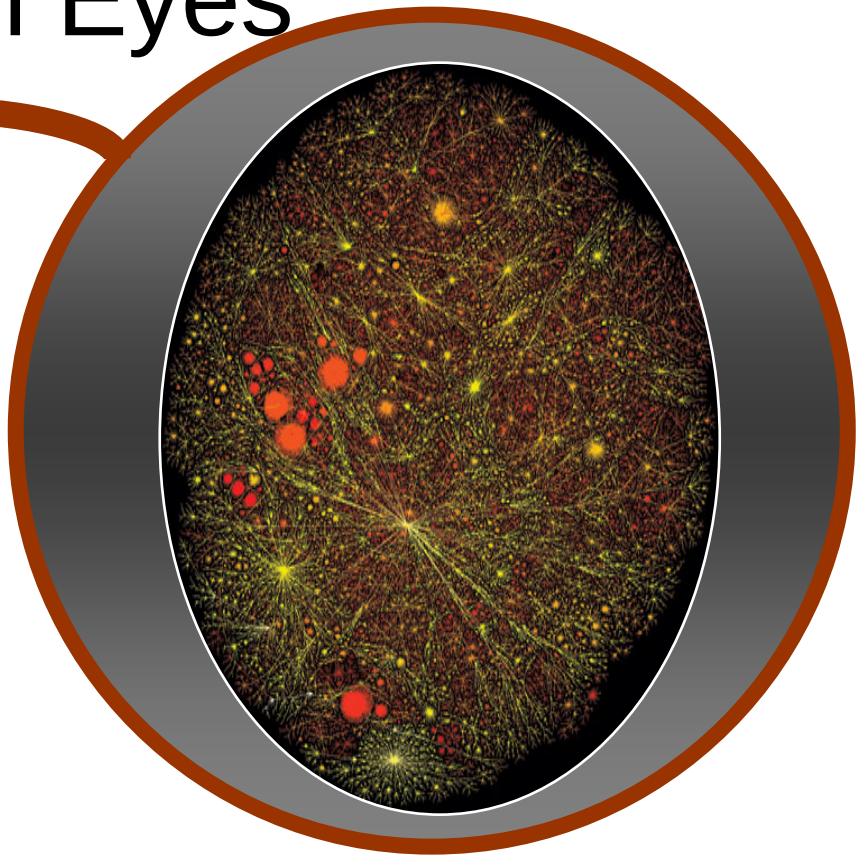
Looking at Networking Landscape with Both Eyes

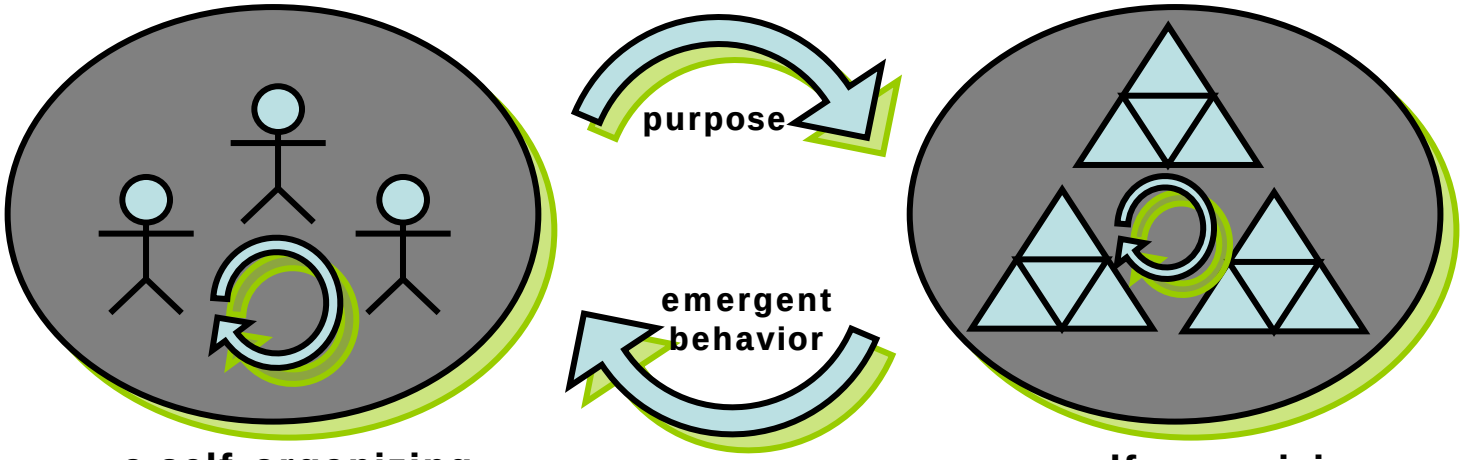


User View: **i-centric**
seamless communication experience

Operator View: **autonomic**
organic growth and self-management

Image credits: http://photo.net/bboard/q-and-a-fetch-msg?msg_id=008gsl & vhttp://www.nature.com/nphys/journal/v1/n2/fig_tab/nphys162_F1.html

Research Agenda



- Society is changing
  - Communities ➔ Ad hoc
  - Services ➔ Ad hoc
  - Operators ➔ Ad hoc
- Research must act
  - Aware networks
  - Aware systems
  - Aware services

Autonomic Communication:
Enabler for a new communication paradigm