

# Energy Aware Management for Internet of things

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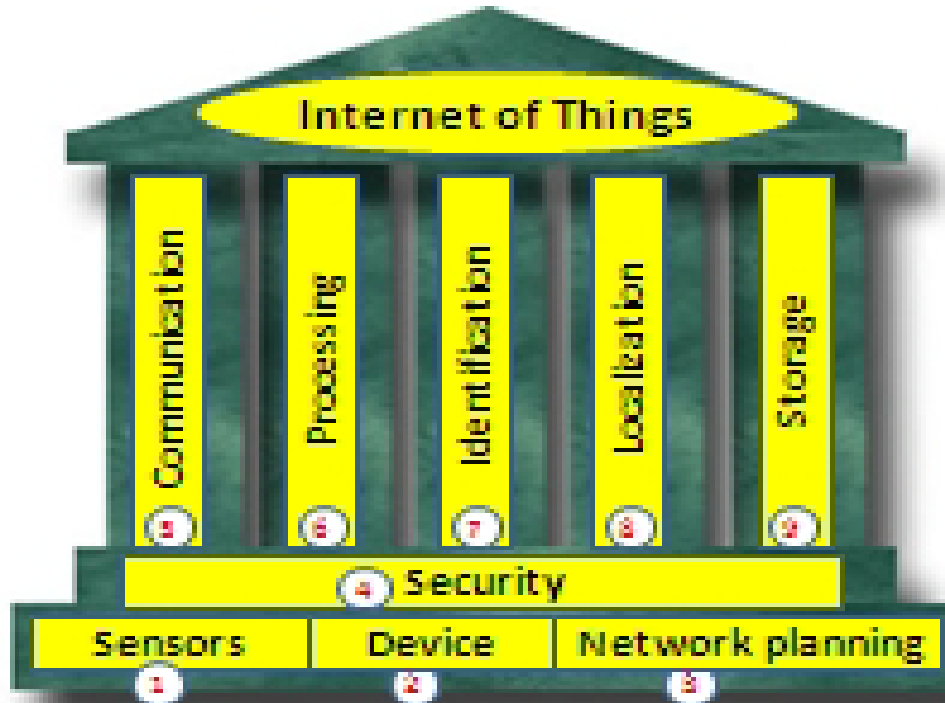
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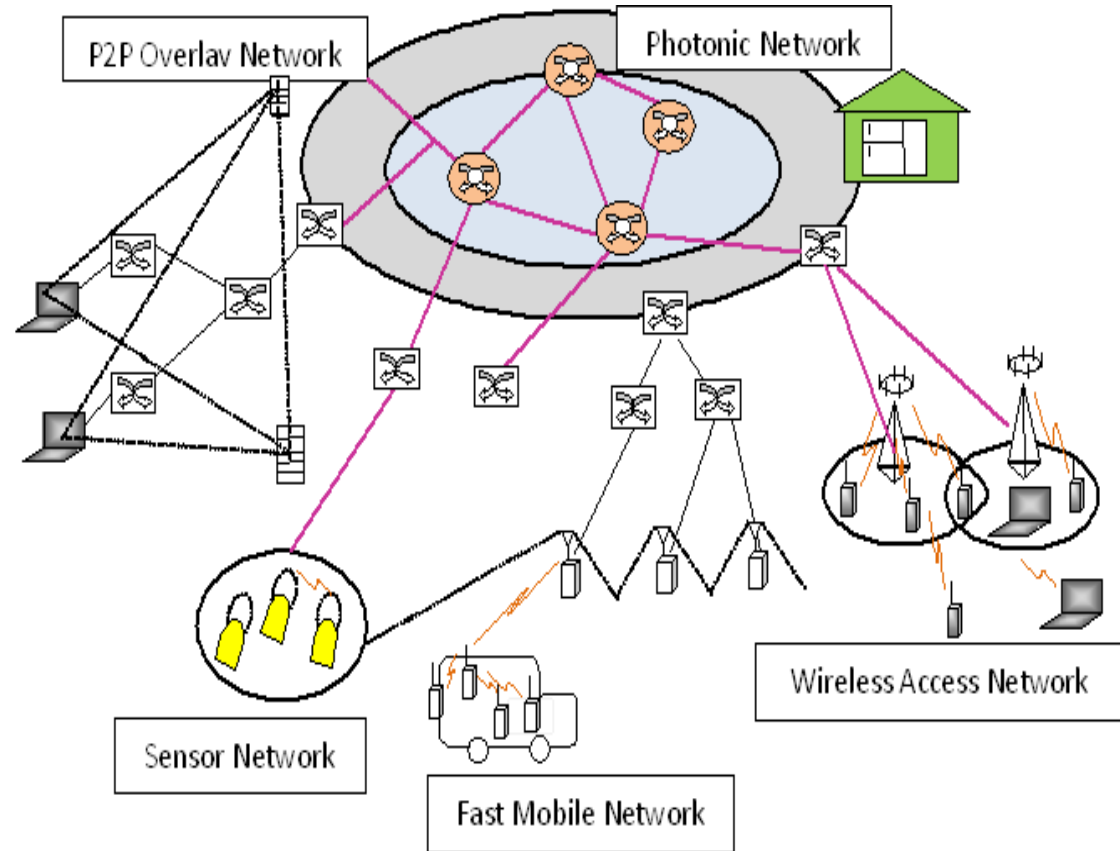
# Objective

Design, evaluate and implement a management architecture that allows the interworking and integration of the multi-domain networks and nodes comprising the IoT environment while enabling autonomic resource management.

The purpose is to allow for sufficient resource availability for various scenarios, which in an IoT environment is critical due to the complicated scenario in relation to decision making, management and reliability.

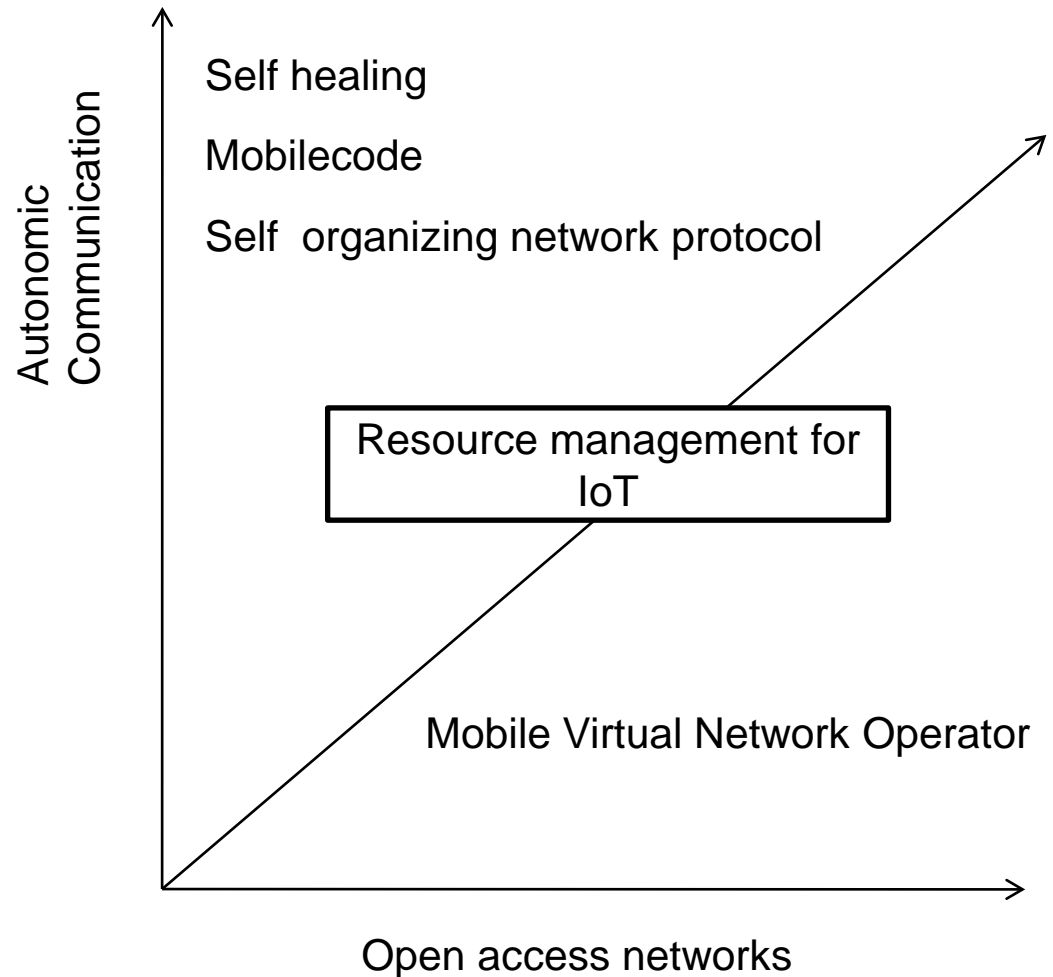
The main aspects that are addressed are scalability, energy efficiency, autonomic behavior patterns, and clustering in an IoT scenario.

- IoT scenario is characterized by heterogeneity.
- Proposed research focuses on design and evaluation of management framework.
- Needs to support algorithms and mechanism for autonomous self-x mechanism.
- Autonomous solution concern management of nodes, autonomic decision making loop, protocol reconfiguration and autonomously self organizing network element.
- Research will propose design and evaluation in terms of energy efficiency algorithms, protocols for enabling dynamic ad-hoc and optimized resource allocation and control in IoT Scenario



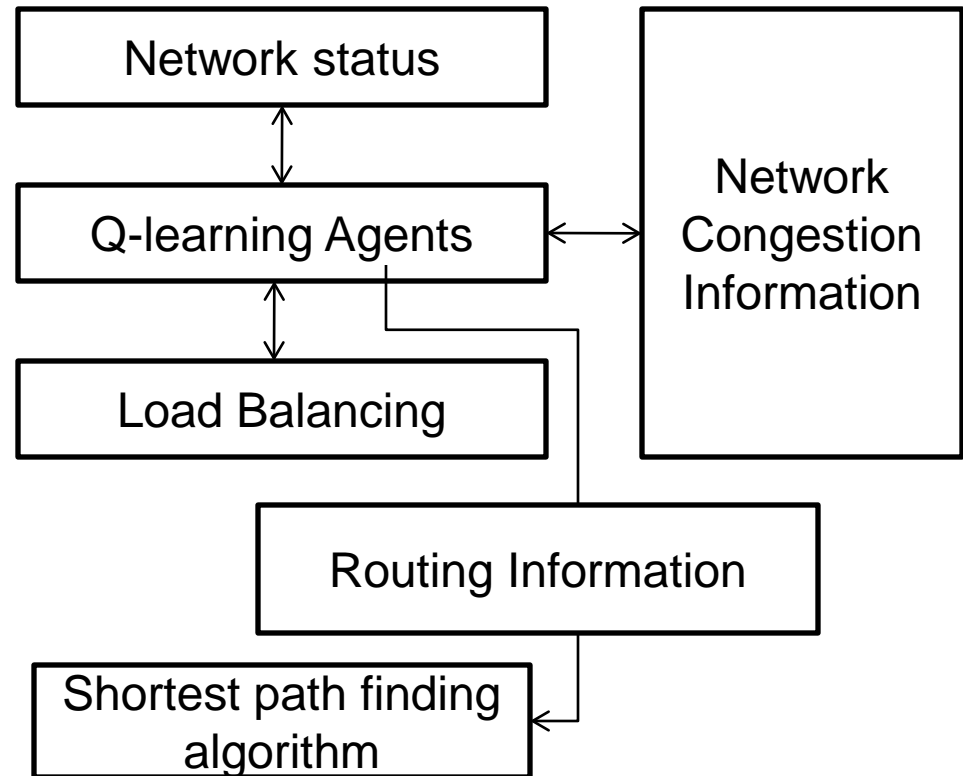
# Self-X

- Interworking
- Self management
- Service aware resource allocation
- Configuration of network resources
- Energy efficiency



# Virtualization

- Collaborative and distributed decision making related algorithm for efficient operation
- Self organization by enabling resources *Virtualization of network*
- Knowledge sharing entity: collect, maintain, evaluate and distribute knowledge
- Decision model : Overall optimality level in resource management



Autonomic Control Logic

# Energy Efficiency

## Energy efficiency

- Load Balancing : less signaling and less overheads
- Autonomous Network: flexibility and scalability
- Context aware: Avoids duplication

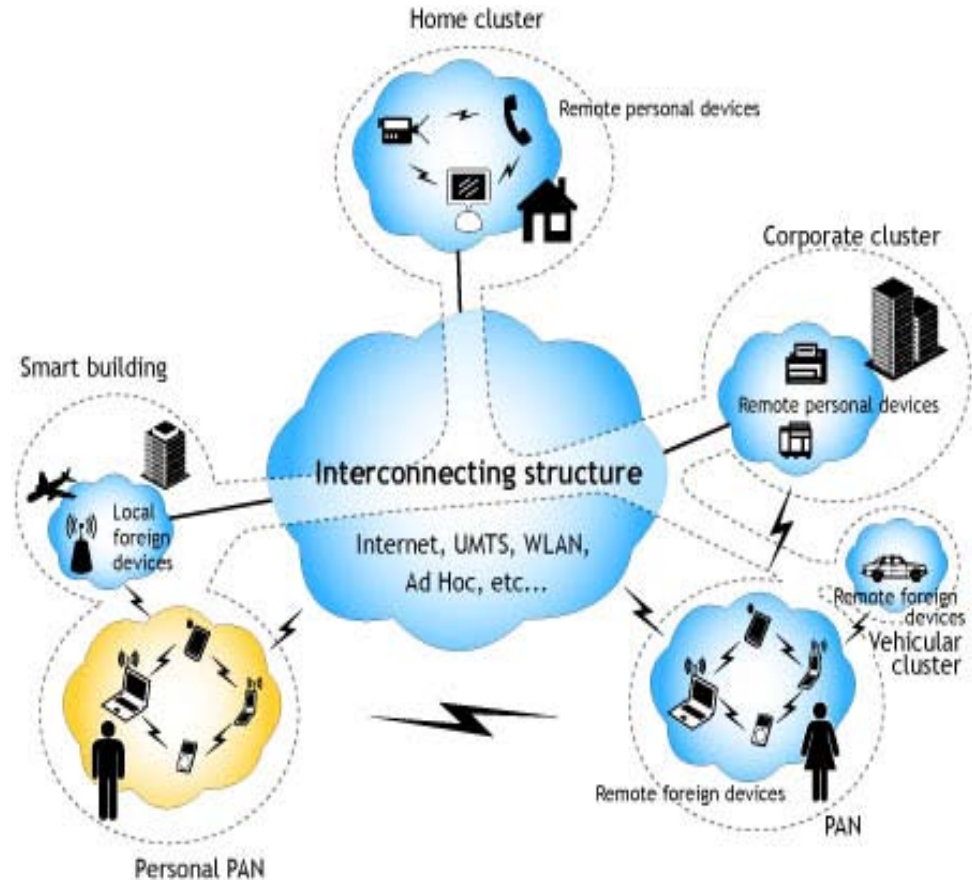


# Key Challenges

Application/ System Core domain	Interaction with strangers	Lack of centralized goals, control	Information reflection collection	Meaningful adaptation	Engineering Cooperative behaviour	Hererogeneous services and semantics
Analysis & design of autonomic algorithms		Self monitoring Self stabilization	Self optimisation	Computational steering	Self stabilisation game theory Econometrics	
Context awareness and semantics in communication	Metadata acquisition		Self description	Self analysis		Interface description
Novel coordination & communications programming models	Uncoupled interactions	Novel abstraction Negotiation	Localized interactions	stigmergy	Field based programming	Interface matching and brokering
Trust and security	Trust formation	Policy matching	Information visibility and leakage		Algorithm and information disclosure	End to end trust maintenance
Evaluation and testing		Scalability testing Stability testing		Stability under perturbation	Process-versus point correctness	

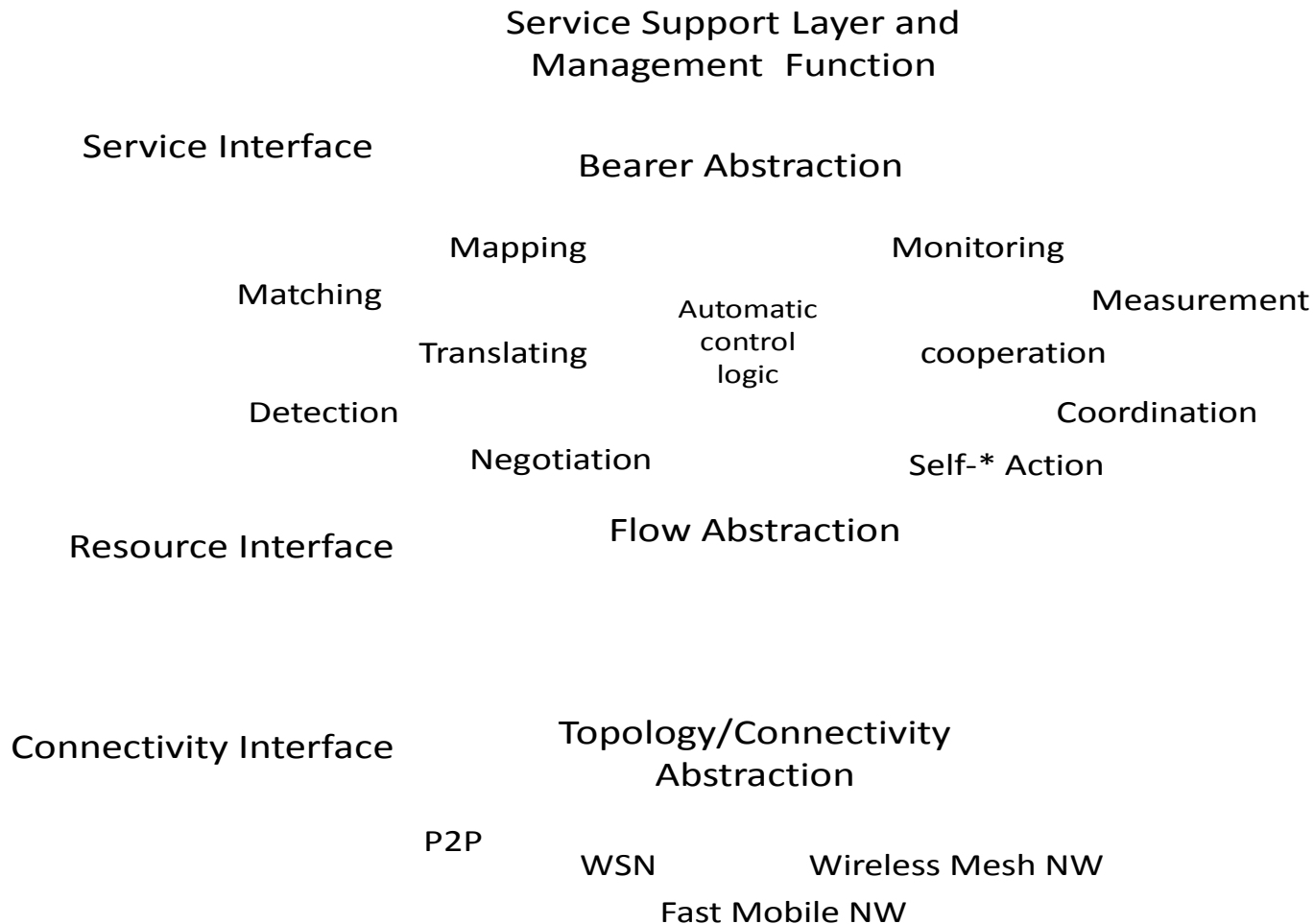
# Why Horizontal Architecture

- Traditional network
- Proposed Network architecture
- Concept of capillary network



source of the figure: MAGNET project

# Proposed Reference Model



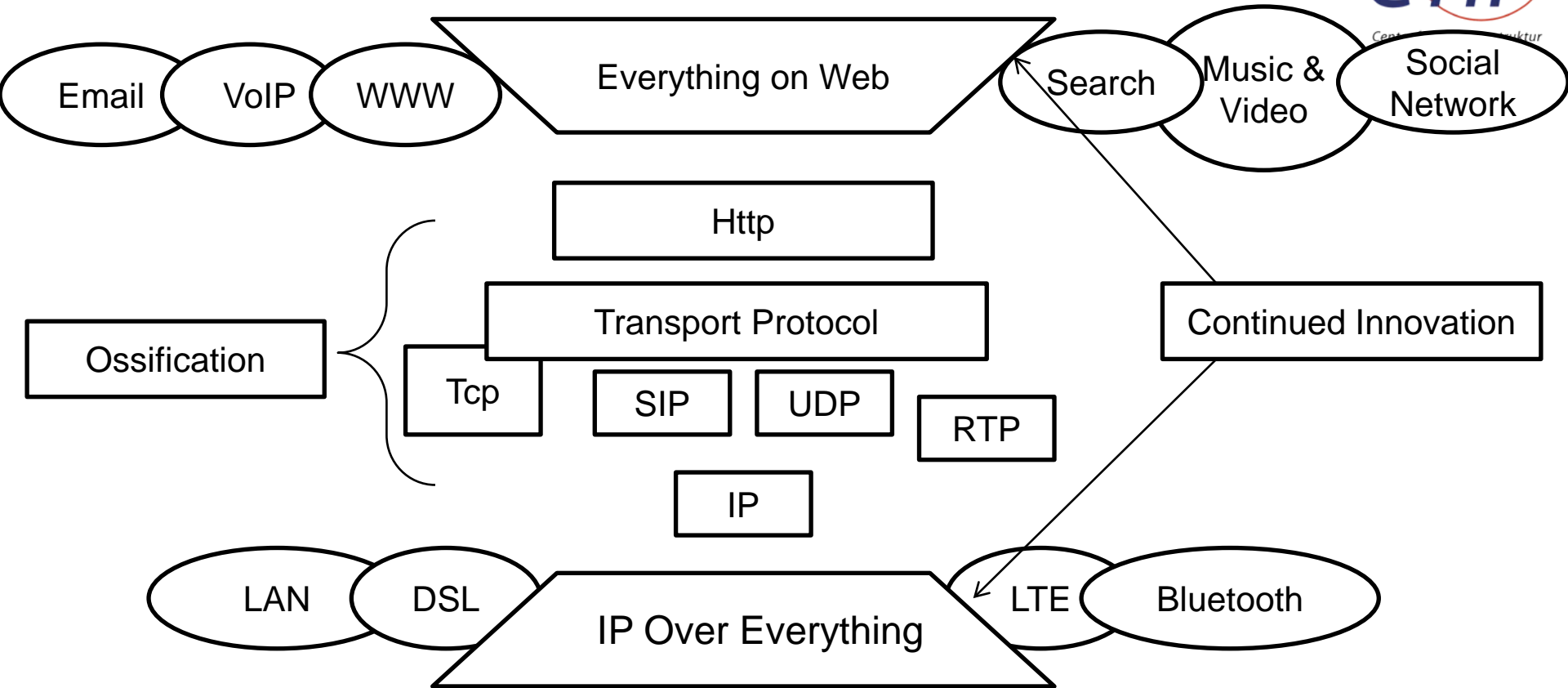
# Conclusions and Future Works

- Enabling of self—\* functionalities for interworking of disparate multi-domain nodes and networks;
- Autonomous resource management framework for various IoT scenarios
- Protocols and algorithms for dynamic, ad hoc resource allocation and control.

**Thank you!!**

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# Virtualization



Lighter protocols and lighter implementations that compress the explicit protocol layers into a single communications module are required