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COOPERATIVE AND SELF-GROWING ENERGY-AWARE NETWORKS

SUSTAINABILITY OF BUSINESS ECOSYSTEMS FOR NEXT GENERATION COGNITIVE NETWORKS

SDR'11-WINNCOMM-EUROPE, 22-24 JUNE 2011 BRUSSELS

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OUTLINE

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- CONSERN Research Directions and Concepts
- CONSERN Business Ecosystem Design
- Multi-Actor analysis (MACTOR) for CONSERN
- Results and Future Work

SELF-GROWING CONCEPTS

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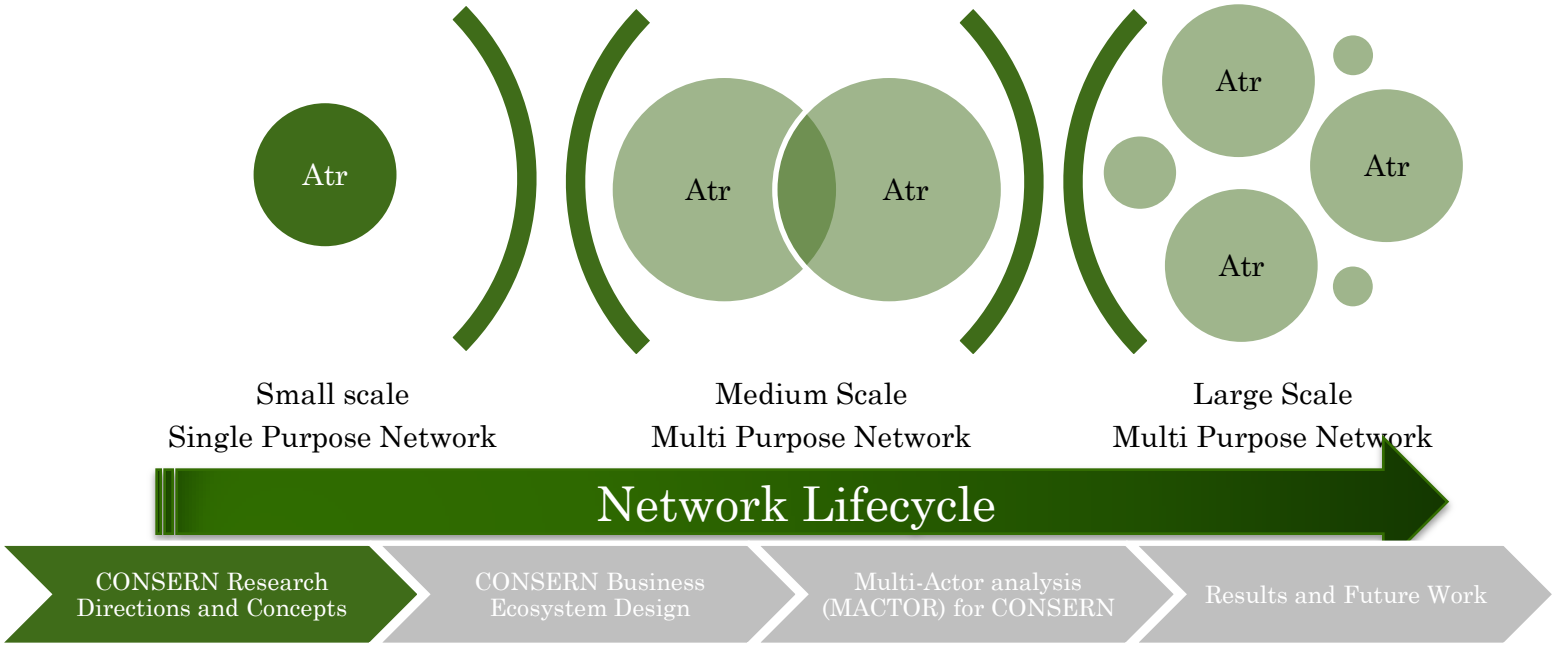
- The Self-growing network refers to the capacity of a SON and self-configurable network to **dynamically evolve**
  - in terms of the number of interconnected heterogeneous network nodes,
  - in terms of the supported operation (multi-objective), i.e. to optimize on-demand for a dedicated (temporary) purpose(s).



CONSERN Research Directions and Concepts

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- Key **Value Proposition** Aspects of CONSERN for
  - **Easy and cost-saving** deployment of complex networks
  - **Reducing dependency** on Network Operators for the **Roll-out and management** of these networks by **smaller parties** than traditional operators: homes, firms, building owners, campus managers
  - Contributing to overall **energy efficiency** by lowering the footprint of wireless networking systems.

- Different scenarios (e.g.) home/office vs campus deployment) and different business models (e.g.) operator-centric vs operator independent) lead to different **incentives** for and **objections** by major stakeholders

CONSERN Research Directions and Concepts

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- Different **incentives** for and **objections** by major stakeholders create a gap, economists term it as "**energy efficiency gap**"
  - Difference in the **actual** and **optimal** use of energy efficient solutions like CONSERN.
  - Existence of inefficient use of energy efficiency from a **societal** point of view, but also from a **business** point of view.
- Issues like the energy efficiency gap, further inhibits the sustainability and success of CONSERN Business models, hence require further attention especially during the business ecosystem design phase.
- We tested MACTOR (multi-actor) method for CONSERN business ecosystem in order to develop:
  - the understanding of inter-actor synergies,
  - the conflicts and strategic preferences regarding specific issues
  - Identify potential incentives and objections

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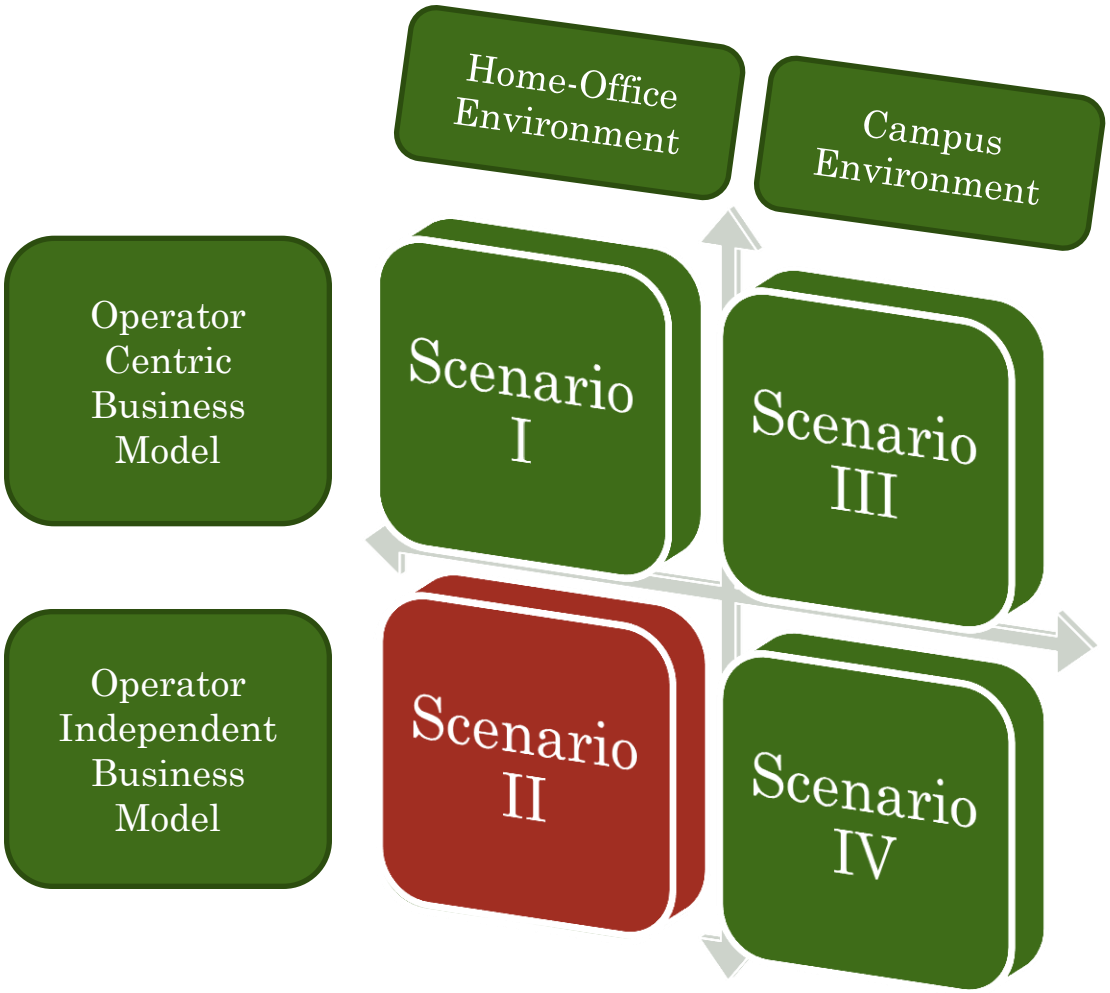
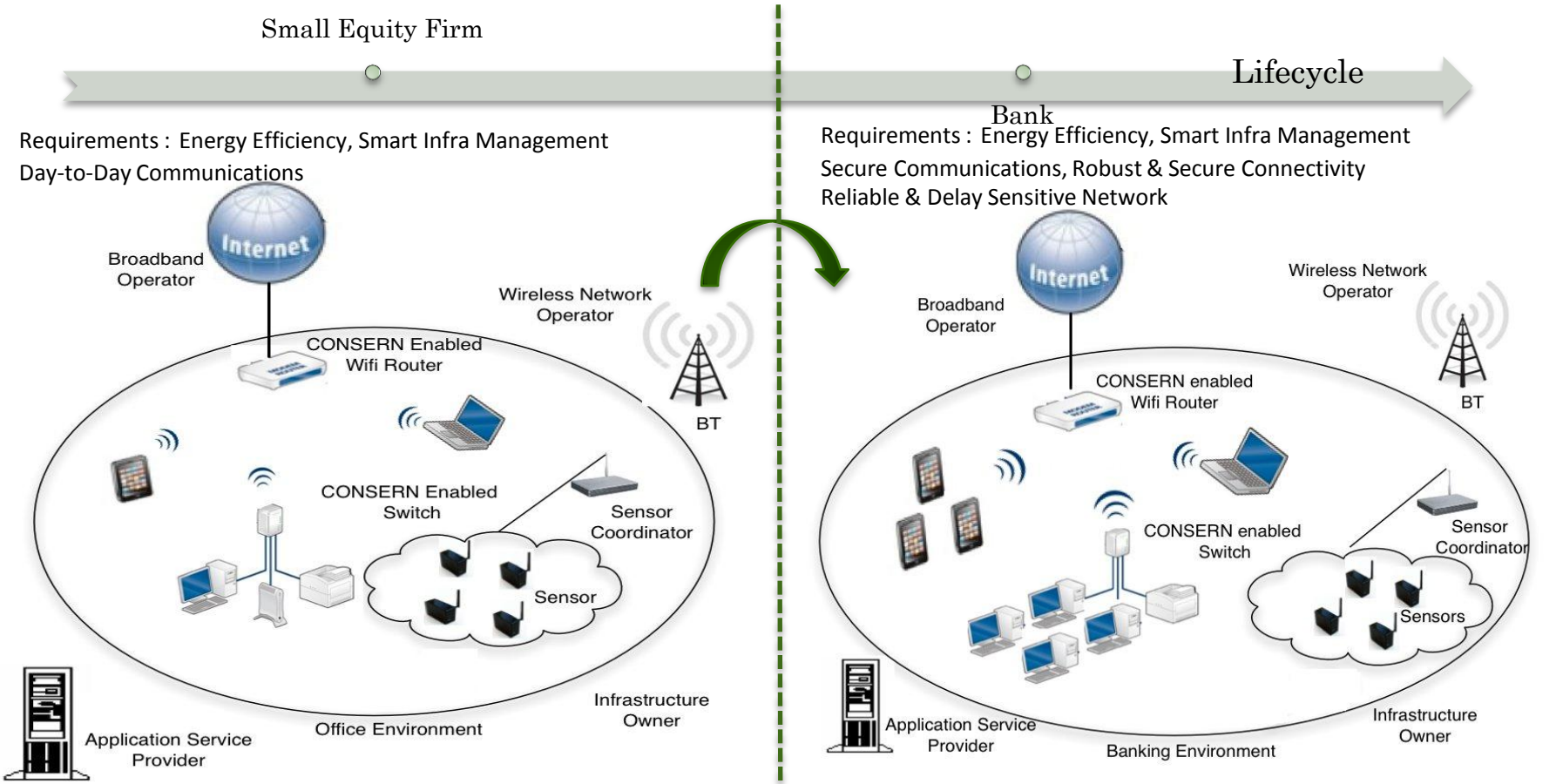


CONSERN Business ecosystem Design

- The Operator Independent Business Model is adopted the Infrastructure Owner deploys and builds CONSERN ecosystem using off-the-shelf devices
  - Phase I : represents a small equity firm whose requirements are limited to day-to-day communications, efficient resource utilization and spectrum usage
  - Phase II : the equity firm is acquired by a bank with security, reliability and robustness as a priority



Small Scale – Purpose driven network

Large Scale – Multipurpose Networks

CONSERN Business ecosystem Design

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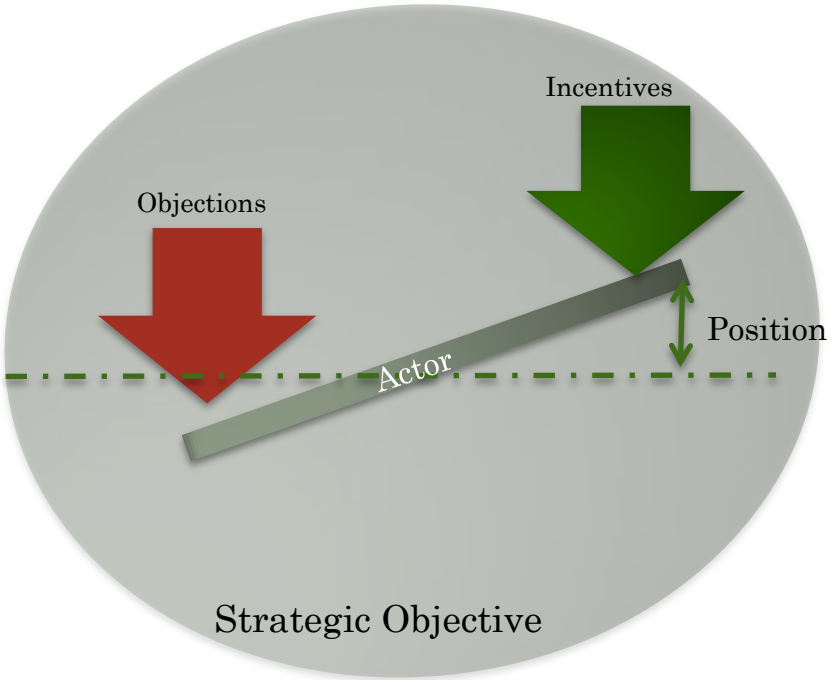
Business Actors	Roles
Broadband Operator (BO)	Fixed Connectivity Provisioning
Infrastructure Owner (IO)	Network Infrastructure Ownership
End User (EU)	Service Consumption
Device Manufacturers (DM)	Device Manufacturing and Retailing
3rd Party Application Service Provider (ASP)	Application Service Provisioning
Wireless Network Operator (WNO)	Wireless Connectivity Provisioning



Multi-Stakeholder CONSERN Business Ecosystem

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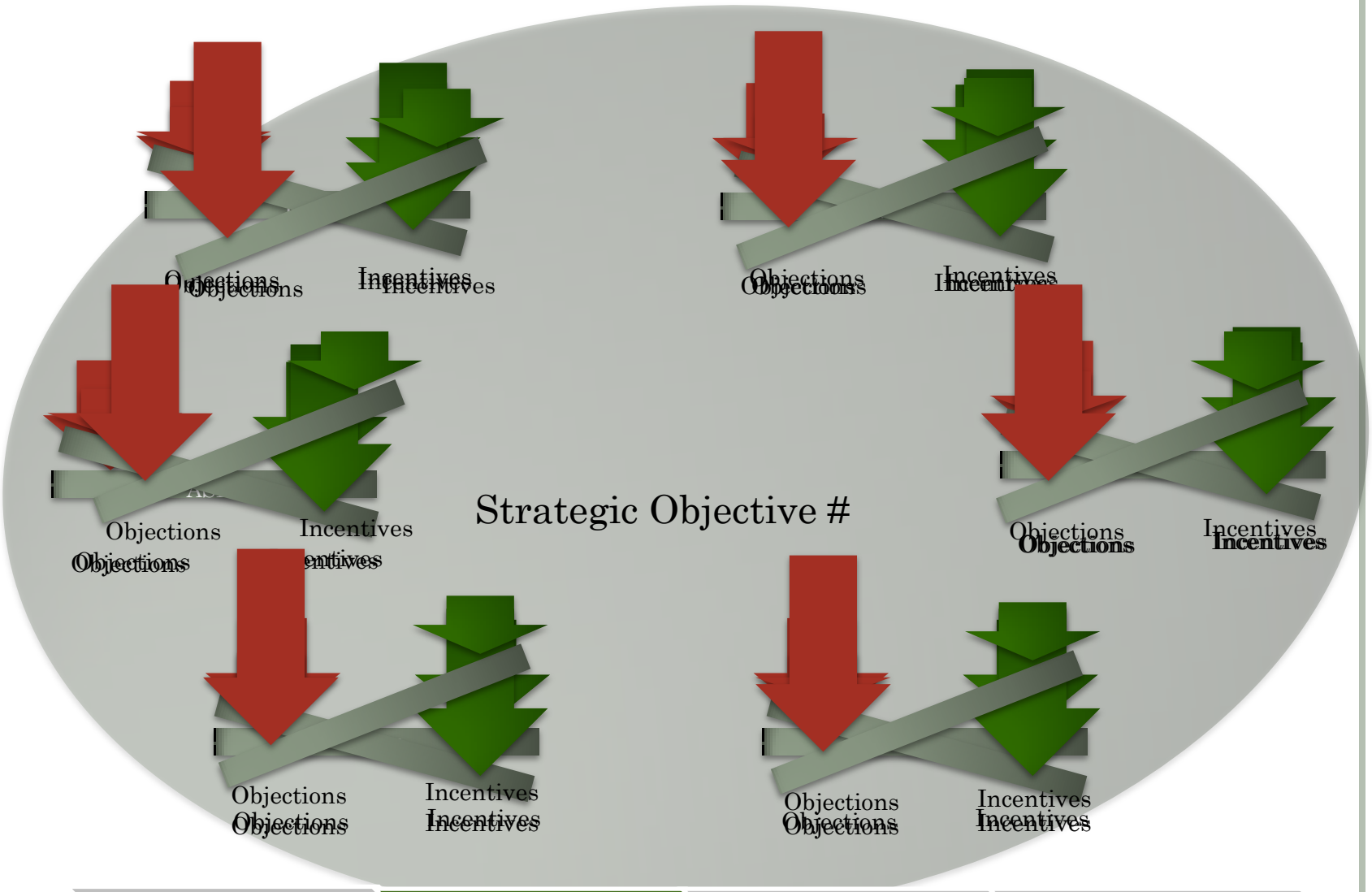

Multi-Actor analysis (MACTOR) for CONSERN

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MACTOR Matrix of Alliances and Conflicts: Tactics, Objectives and Recommendations

Developed by Godet[#], as an answer to the increasing critics made to traditional extrapolation-based forecasting methods.

Successfully tested and implemented to map the stakeholder strategies, relationship of power and potential alliances and conflicts in various business cases.

#c.f Godet

Business Model Configuration

CONTROL PARAMETERS				VALUE PARAMETERS			
Value Network Parameters		**Functional Arch. Parameters**		**Financial Model Parameters**		**Value Configuration Parameters**	
Combination of Assets		Modularity		Cost (Sharing) Model		Positioning	
Concentrated	*Distributed*	*Modular*	*Integrated*	*Concentrated*	*Distributed*	*Complement*	*Substitute*
Vertical Integration		Distrib. of Intelligence		Revenue Model		User Involvement	
Integrated	*Disintegrated*	*Centralised*	*Distributed*	*Direct*	*Indirect*	*High*	*Low*
Customer Ownership		Interoperability		Revenue Sharing Model		Intended Value	
Direct	*Intermediated*	*Yes*	*No*	*Yes*	*No*	*Price/ Quality*	*Lock-in*

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Strategic Issues and Objectives

- **O1: Increase in Energy Efficiency**
- **O2: Partly Substituting Solution**
- **O3: Reduced Complexity**
- **O4: Independence from Operator**
- **O5: Reliance on Non-Proprietary Devices**
- **O6: Revenue Model**

MULTI-ACTOR ANALYSIS (MACTOR) FOR CONSERN

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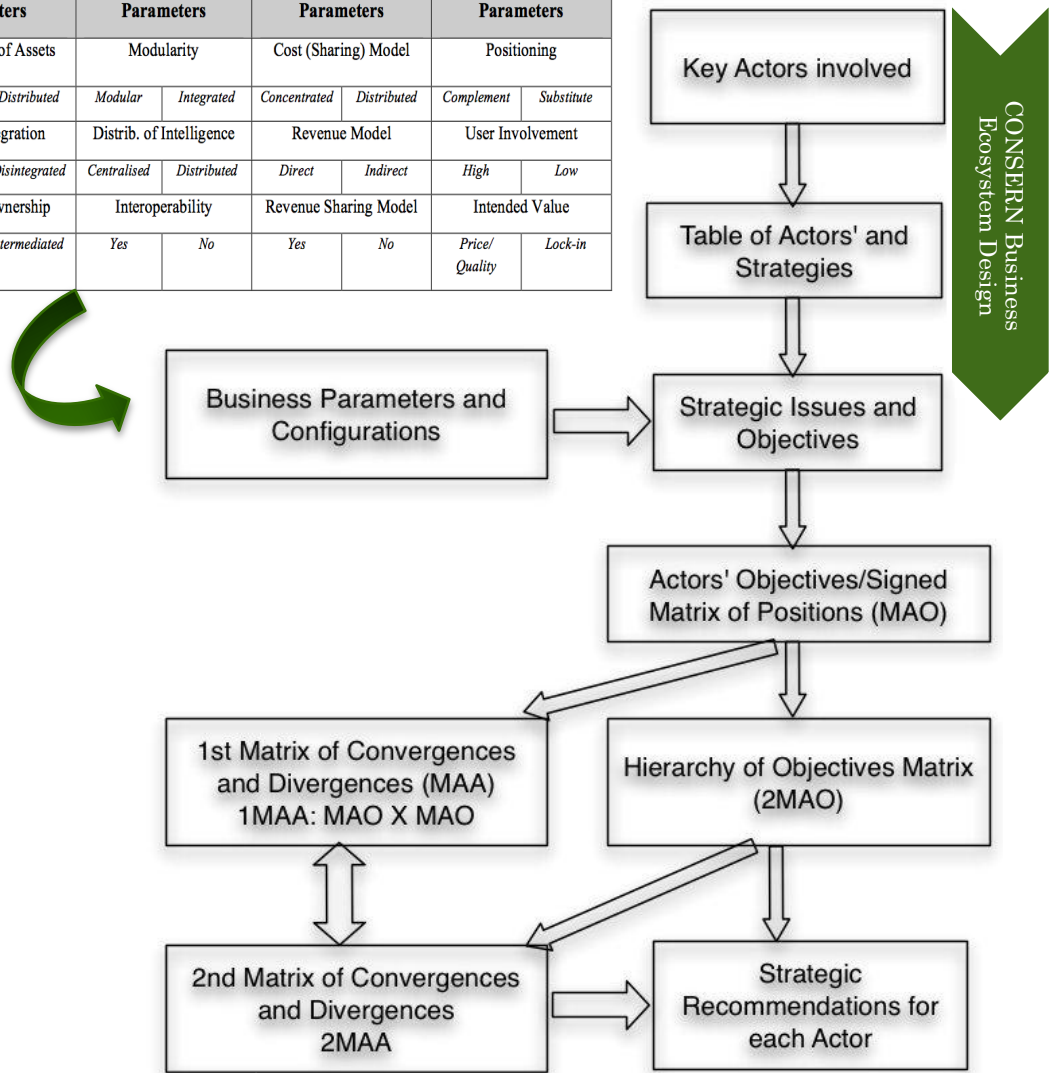

MULTI-ACTOR ANALYSIS (MACTOR) FOR CONSERN

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Actor – Objective Interaction (2MAO)

	O1	O2	O3	O4	O5	O6
BO	1	-3	1	-3	-3	-3
IO	3	3	3	1	2	3
EU	1	0	1	-1	0	0
DM	2	3	2	0	0	3
ASP	0	3	1	3	1	0
WNO	1	-3	1	-3	-3	-3

-3: Strong Objection; +3: Strong Incentive

Actor – Actor Interaction (2MAA)

	BO	IO	EU	DM	ASP	WNO
BO		-21	0	-14	-20	0
IO	0		0	0	0	-21
EU	5	5		0	-2	0
DM	0	30	4		0	-14
ASP	0	17	0	11		-20
WNO	38	0	5	0	0	

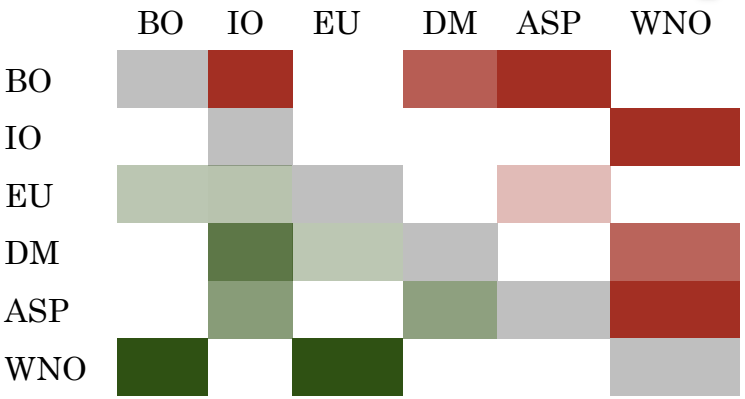
MAO X MOA : MAA (Matrix Transpose)

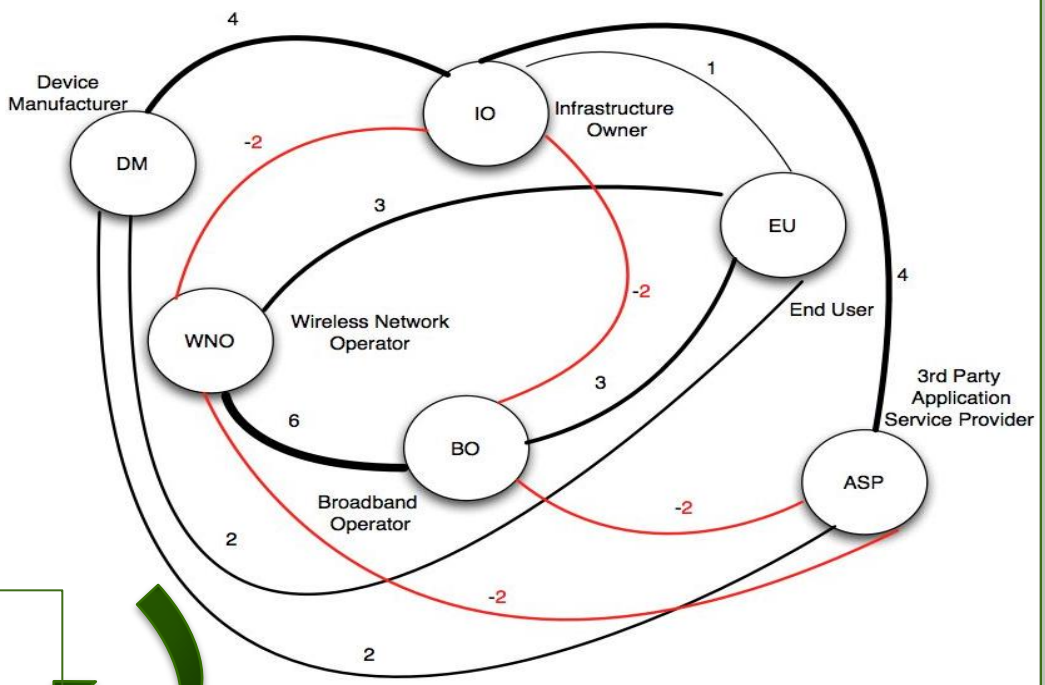
nCij : matrix product which retains only positive scalar products.

nDij :matrix product which retains only negative scalar products.

Results – Incentives and Objections

Actor – Actor Interaction (MAA)





Ecosystem Convergence & Divergence

WNO + BO: converge and diverge equally on all issues

IO – (**WNO+BO**): diverge because of Operator Independent Business Model involved.

IO-ASP-DM : Strongly converge and support OI BM

ASP-(**WNO+BM**) : ASP diverge and would like to operate independently

RESULTS – FOCAL ACTOR

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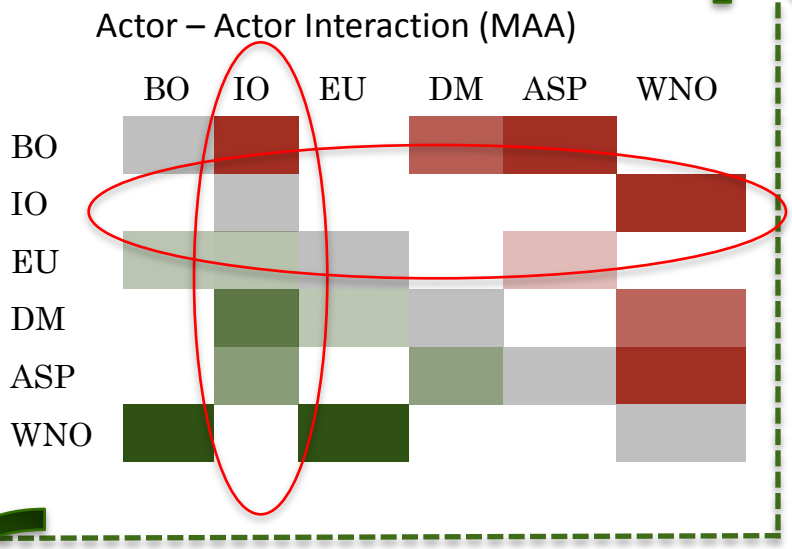

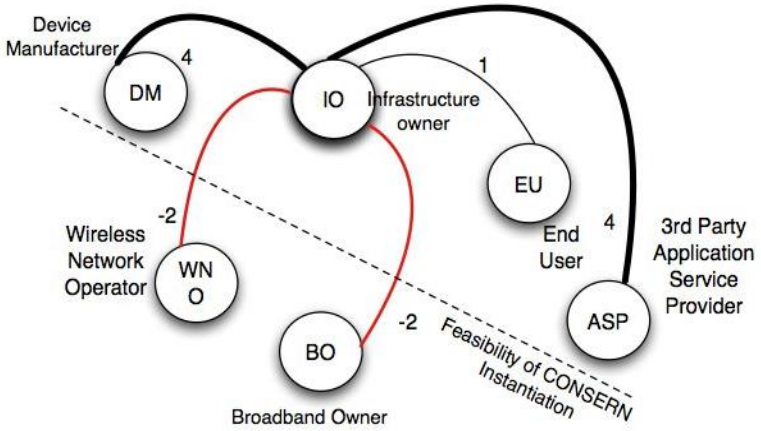

Implications for Infrastructure Owner	
IO-DM	directly interact with DMs to purchase the legacy and CONSERN enabled devices
IO-ASP	3rd Party ASPs will find this opportunity beneficial for improving and re-inventing their present value of service offerings and closely collaborate with IOs
IO-EU-ASP	Will mediate the interaction between EU and ASP both in terms of network and revenue sharing
IO-NO-BO	Will be more independent and selective in choosing the data-plans and mobile connectivity from WNO and BO

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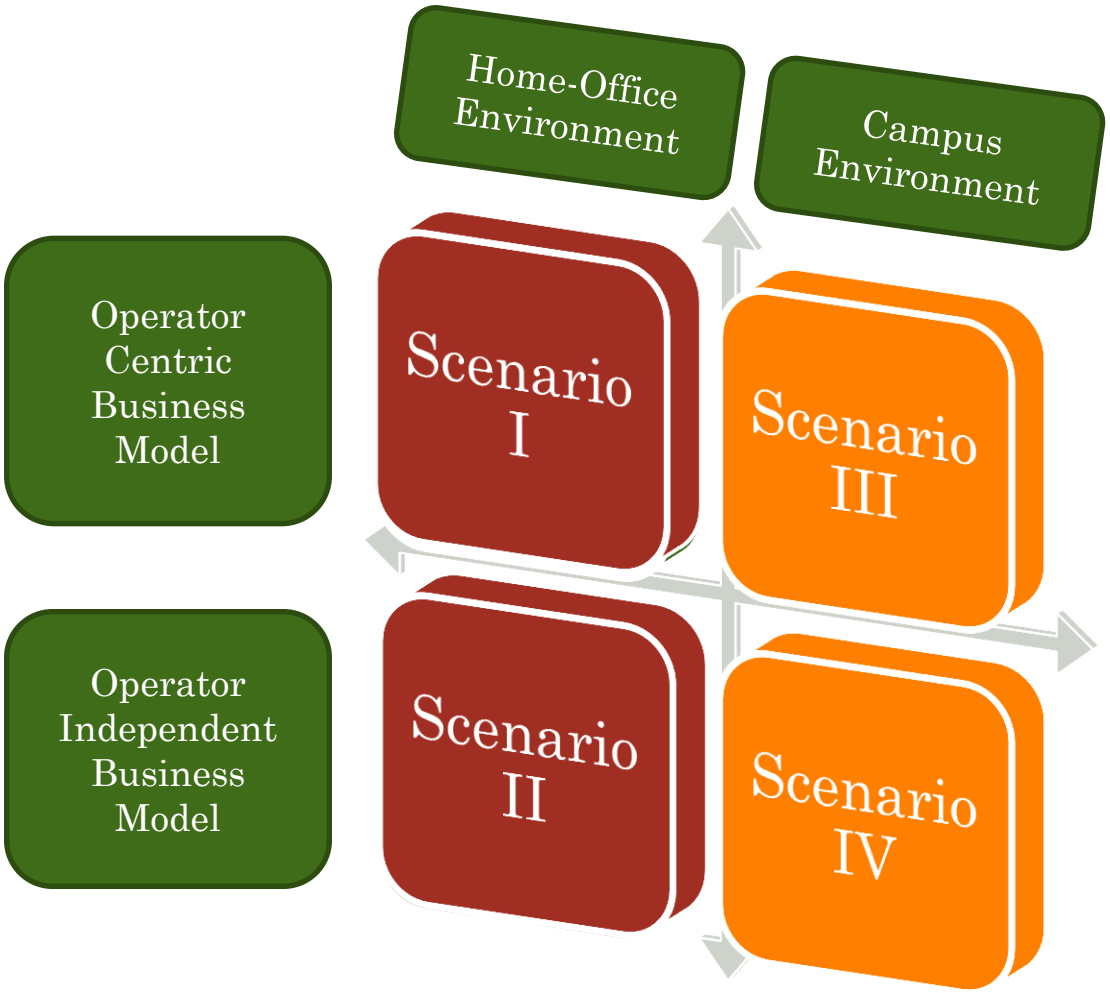

FUTURE WORK

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- Paper explicitly demonstrates the relevance of using multi-actor analysis for understanding critical interplay between stakeholders in a business ecosystem. Next steps and future research includes :
  - Exploring and establishing the CONSERN business ecosystem based on inputs from real world actors
  - Validating stakeholder positions through expert interviews and workshops.
  - Repeat similar exercise for Operator Centric business model in Office and Campus environment.

- Results from MACTOR analysis will act as an input for strategic recommendations and performing impact assessment for CONSERN.
- From a methodology point of view, we intend to improve and adapt MACTOR for upcoming and current research tasks.

PROJECT OVERVIEW & CONSORTIUM

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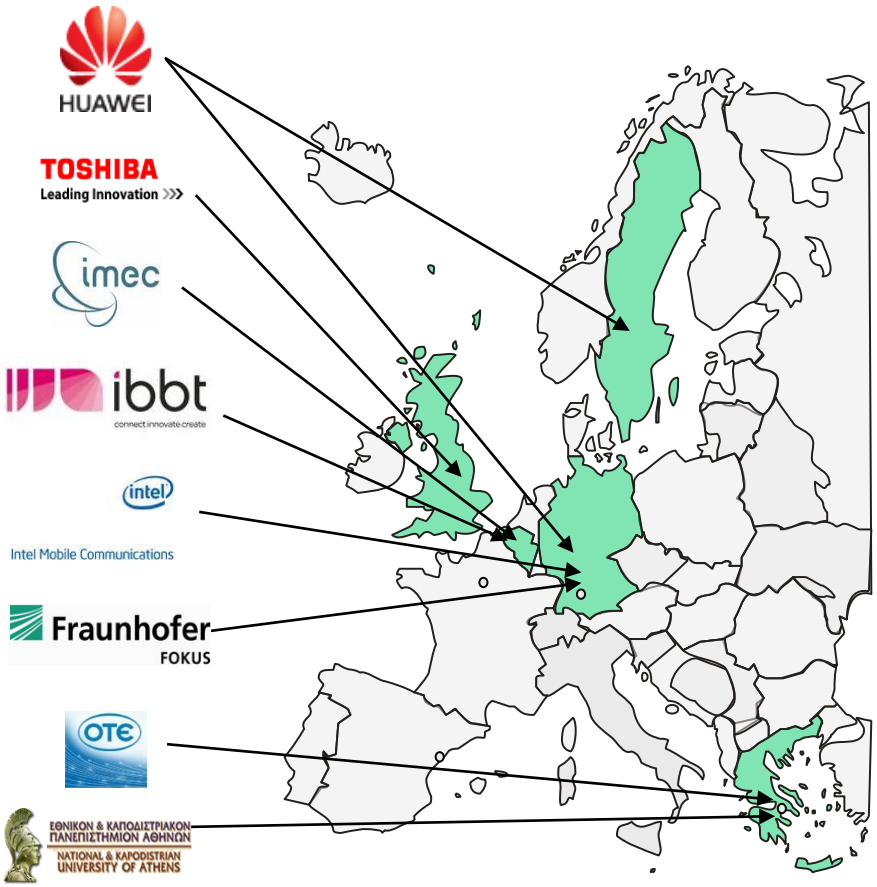

Project Consortium:

- NKUA ■ HWDU ■ HWSE
- Fraunhofer ■ IBBT ■ IMC
- IMEC ■ TREL ■ OTE

Project Data:

- Duration: 24 months
- Start: 01/06/2010

Contacts

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- Dr. Egon Schulz – Technical Manager (egon.schulz@huawei.com)

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Intel Mobile Communications

THANK YOU

Questions?