SYSTEM-OF-SYSTEMS THAT ACT LOCALLY FOR OPTIMIZING GLOBALLY

EU FP7 - SMALL/MEDIUM-SCALE FOCUSED RESEARCH PROJECT (STREP)
FP7-ICT-2013.3.4: ADVANCED COMPUTING, EMBEDDED AND CONTROL SYSTEMS
D) FROM ANALYZING TO CONTROLLING BEHAVIOUR OF SYSTEM OF SYSTEMS (SOS)

Local4Global Review Meeting

WP6 Evaluation

Thomas Schild, RWTH Aachen University

29.05.2015
Florence, Italy

LOCAL4GLOBAL

Local^{4}Global
Contact Information

For information regarding this Project: Check the Project Web-Site: http://local4global-fp7.eu

	Participants
1	CERTH - Centre for Research and Technology
2	ETHZ – Eidgenössische Technische Hochschule Zürich
3	RWTH – RWTH Aachen University
4	IK4 – IK4 TEKNIKER
5	TRV – TRANSVER GmbH
6	TUC – Technical University of Crete
7	TUM – Technische Universtität Muenchen

Project Acronym: Local4Global

Project Number: 611538

Project Start Date: October 2013

Duration: 3 Years

Funded by: EU FP7

Program Name:
EU FP7 - SMALL/MEDIUM-SCALE FOCUSED RESEARCH PROJECT (STREP)
FP7-ICT-2013.3.4: ADVANCED COMPUTING, EMBEDDED AND CONTROL SYSTEMS
D) FROM ANALYZING TO CONTROLLING BEHAVIOUR OF SYSTEM OF SYSTEMS (SOS)

Evaluation Task

Task: Evaluation of Local4GLobal`s impact on:

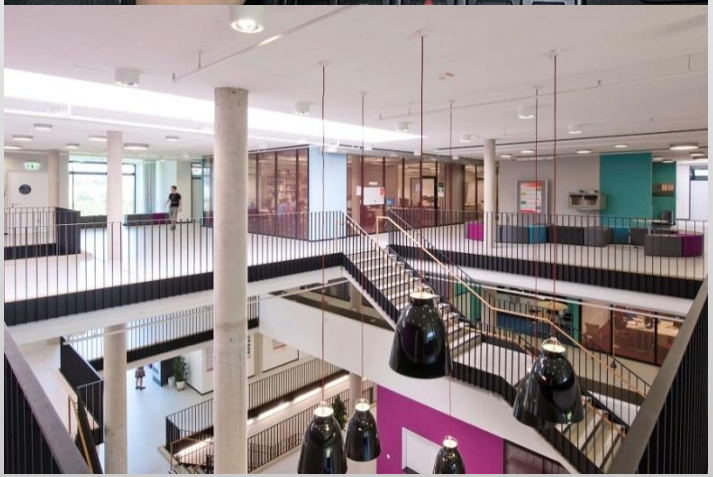
- Generic TSoS
- Traffic Use Case
- Building Use Case

Challenges:

I. Transferability

II. Comparability

→ Final Evaluation Plan D6.1.2



Main assessment objectives (GKPI)

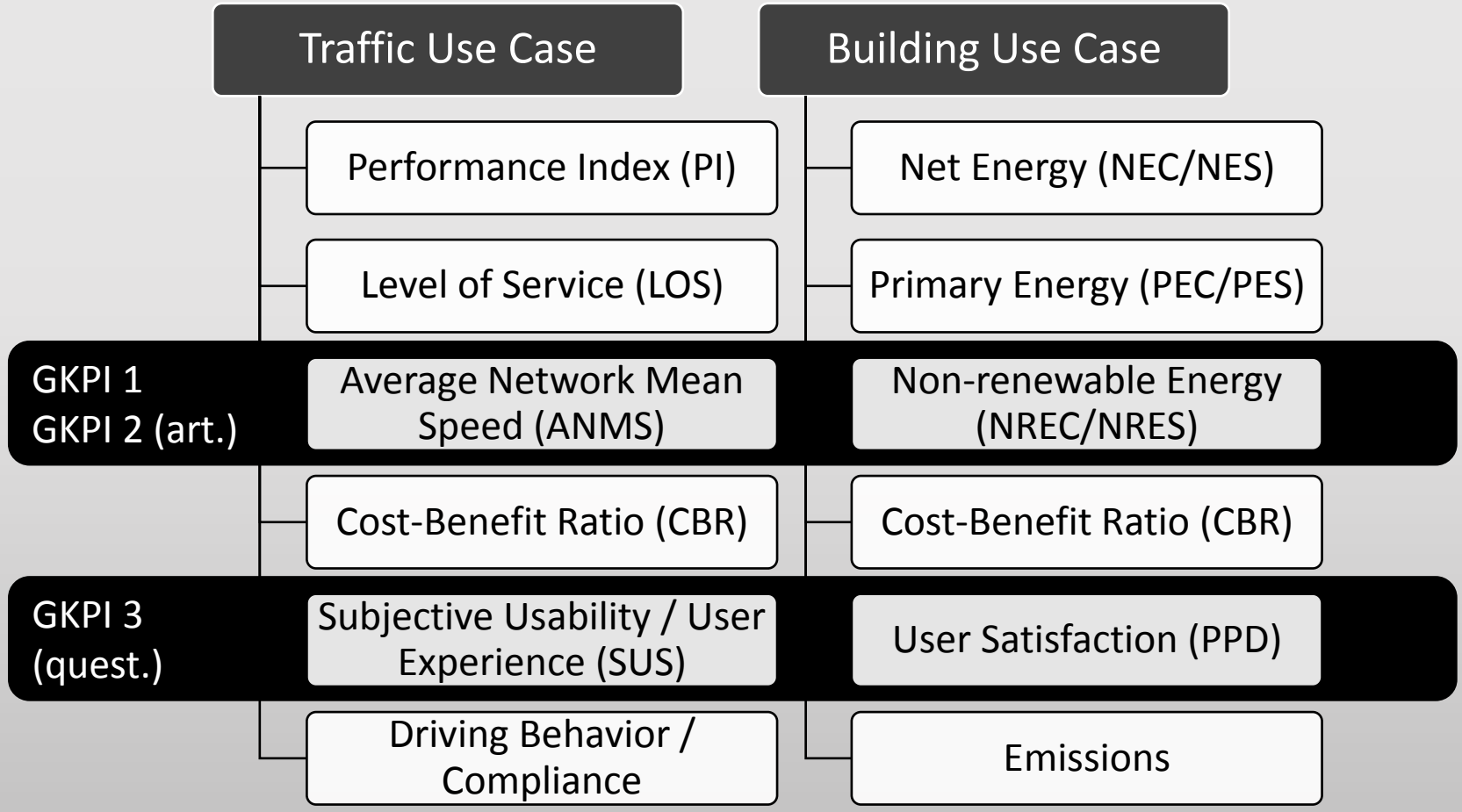
Index	Description	Target Improvement	Main Objective
GKPI 1	Traffic Use Case: Difference in terms of daily average network speed	30 %	O1, O2, O3
	Building Use Case: Difference in terms of daily average energy consumption from non-renewable sources while maintaining users' comfort (Fanger Factor) at an acceptable level		
GKPI 2	Equal to GKPI 1, but when major (artificial) incidents are present	30 %	O1, O2, O3
GKPI 3	Users' satisfaction metric to be calculated through questionnaires	***no decline***	O1, O2, O3

Assessment methodology

1. Determination of (G)KPI
   - Measurable criteria
   - Determination of use case specific KPI
   - Selection of transferable KPI per use case allows
     - Comparison in percentage of improvement
     - Transfer to generic TSoS

2. Human factors
   - Questionnaires (e.g. user acceptance)
   - Model-based estimation (e.g. thermal comfort)

KPI – GKPI relations

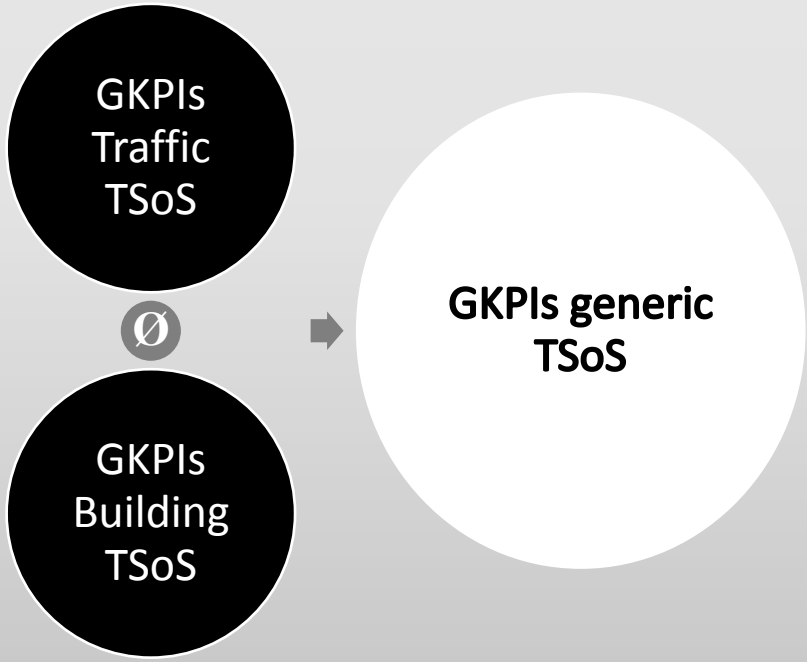


Transfer to generic TSoS

- Identification of topical related KPI
- Relative expression
- Statistical evaluation

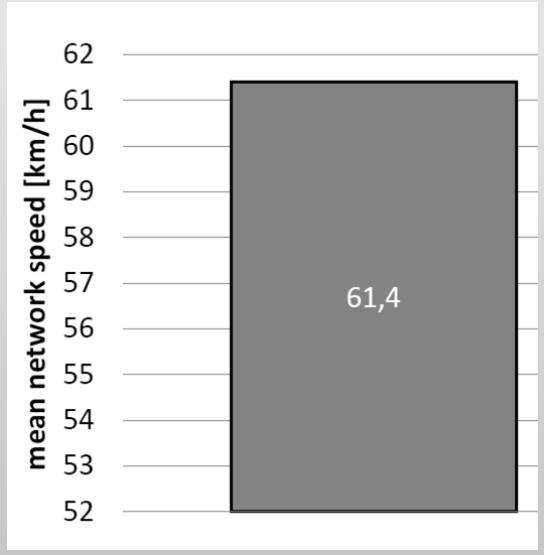
In Local4Global:

- Population: 2 use cases
- Arithmetic average [%]
- Spread (± deviation) [%]

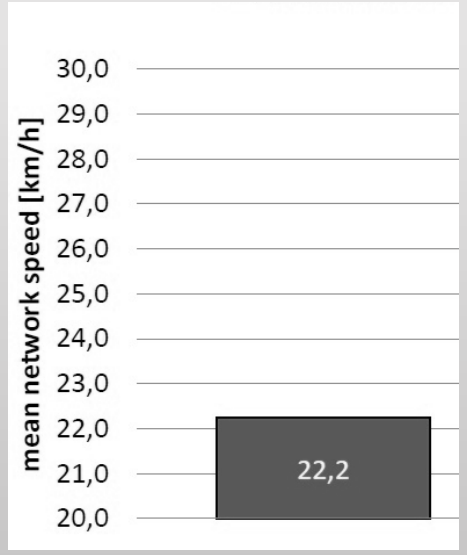


Traffic Use Case - Baseline

- Main baseline value:
  - **ANMS (Demand I) = 61,4 km/h**
  - **ANMS (Demand II) = 22,2 km/h**
- Simulative determination of ANMS (first estimation)



Demand I (off-peak)



Demand II (on-peak)

Building Use Case - Baseline

- Exemplary baseline calculation for 3 conference rooms
- Main baseline value: **NREC = 4,53 kWh/d**

KPI Co-Simulation	Temperature (°C)	CO_2 (ppm)	PPD (%)	PMV	NEC (kWh/d)	REC (kWh/d)	NREC (kWh/d)	PEC (kWh/d)
Room 19	22,75	487	9,11	0,11				
Room 20	23,01	513	9,75	0,21				
Room 21	22,26	493	9,4	0,09				
Total					9,23	4,70	**4,53**	16,70

where:

PPD = Percentage of People Unsatifsfied
PMV = Predicted Mean Vote
NEC = Net Energy Consumed
REC = Renewable Energy Consumed
NREC = Non-Renewable Energy Consumed
PEC = Primary Energy Consumed

Thank you for your attention!

Questions, suggestions and comments are welcome!

References

Diakaki, Christina, et al. *Technical System of Systems Modelling and Analysis Requirements.* Deliverable 2.1, EU Local4Global FP7-ICT project #611538, 2014.

Ettinger, Roland, Michael Krause, Thomas Schild, and Roozbeh Sangi. *Use Case Requirements.* Deliverable 2.3, EU Local4Global FP7-ICT project #611538, 2014.

Roland Ettinger, and Michael Krause. *1st Implementation Plan: Traffic Use Case.* Deliverable 5.1.1, EU Local4GLobal FP7-ICT project #611538, 2014.

Walid Fourati, and Michael Krause. *Final Implementation Plan: Traffic Use Case.* Deliverable 5.1.2, EU Local4GLobal FP7-ICT project #611538, 2015.

Schild, Thomas, and Roozbeh Sangi. *1st Implementation Plan: Building Use Case.* Deliverable 5.2.1, EU Local4GLobal FP7-ICT project #611538, 2014.

Schild, Thomas, and Roozbeh Sangi. *Final Implementation Plan: Building Use Case.* Deliverable 5.2.2, EU Local4GLobal FP7-ICT project #611538, 2015.

Schild, Thomas, Roozbeh Sangi, Tudor Ungureanu, Roland Ettinger, and Michael Krause. *Evaluation Plan (1st version)*. Deliverable 6.1.1, EU Local4Global FP7-ICT project #611538, 2014.

Schild, Thomas, Roozbeh Sangi, Walid Fourati, and Michael Krause. *Final Evaluation Plan*. Deliverable 6.1.2, EU Local4Global FP7-ICT project #611538, 2015.

RWTH Aachen University

- Univ.-Prof. Dr.-Ing. Dirk Müller , Head of the Institute

- Dr.-Ing. Rita Streblow, Chief Engineer

- Dipl.-Ing. (FH) Thomas Schild M.B.A., Research Associate

- Dipl.-Wirt.-Ing. Johannes Fütterer , Research Associate

- Roozbeh Sangi, M.Sc., Research Associate