Road Transport Telematic Applications

Authors:

Gideon Mbiydzenyuy

Jan Persson

Paul Davidsson

School of Computing, BTH, Sweden

{gideon.mbiydzenyuy, jan.persson, paul.davidsson}@bth.se

www.bth.se
BLEKINGE INSTITUTE OF TECHNOLOGY

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Outline

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2. Methodology
3. Problem Formulation
4. Results
5. Conclusions
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Background

There are opportunities…

Intelligent resource utilization: from stand alone to real time systems, with multiple services, can it be much better?

Society has interest on benefits, but often only costs is noticeable

How can synergies be used to increase benefits (MSAs)

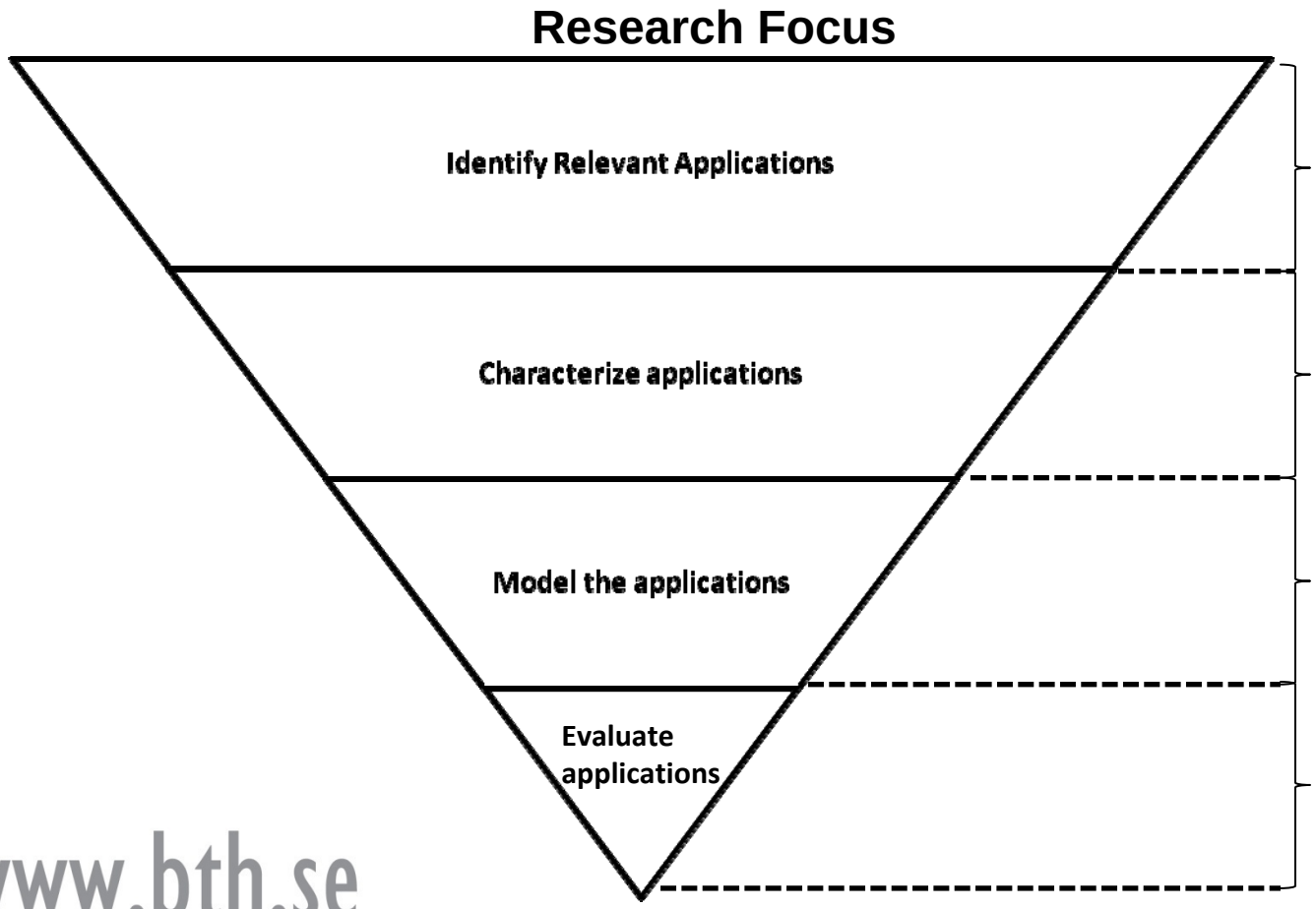
Is CBA suitable enough for ITS? Any alternatives, or modifications?

Societal acceptance of ITS systems?

"let's deploy the system, it will improve traffic safety" **Vs** **"let's deploy the system it will reduce two deaths per year"**

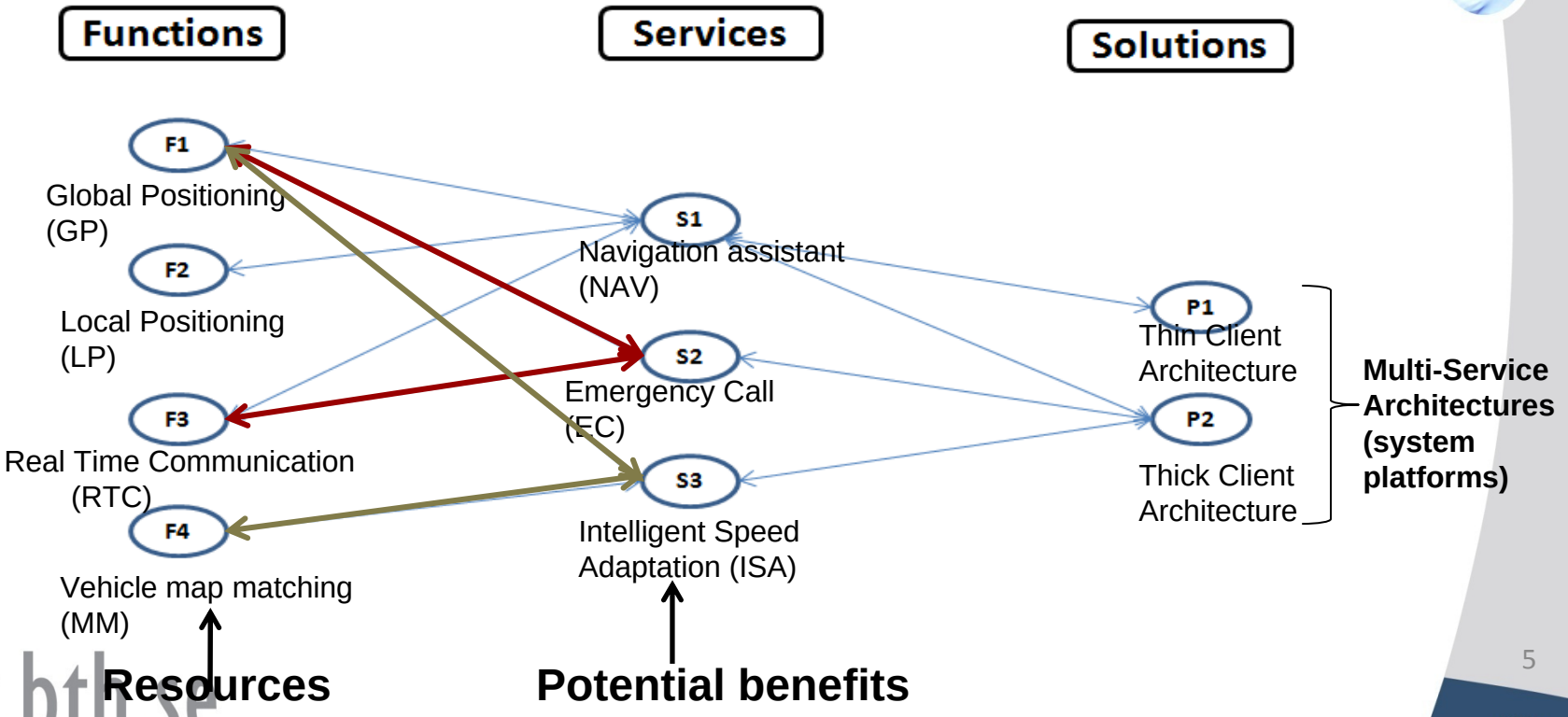
Methodology

Quantitative modeling for mathematical programming



Model Description

Quantitative modeling and mathematical programming



Problem Formulation

Integer Linear Optimization model

$$Ob = \sum_{i \in S} V_i * X_i - \sum_{j \in F} C_j * F_j - \sum_{i \in S, j \in F} C_{i,j} * Y_{i,j} - l_{t.j \in F} - \sum_{\hat{i}\hat{i} \in S, i \neq \hat{i}} D_{i\hat{i}}$$

$$V_i = \frac{1}{(1+\varepsilon)^{T_i}} * \sum_{k \in P} \alpha_{ik} * P_k \quad i \in S$$

$$V^*_{i\hat{i}} = \frac{1}{(1+\varepsilon)^{T_i}} * \sum_{k \in P} P_k * (\alpha_{ik} + \alpha_{\hat{i}.k} - \alpha_{ik} * \alpha_{\hat{i}.k}) = V_i + V_{\hat{i}} \frac{1}{(1+\varepsilon)^{T_i}} * \sum_{k \in P} P_k * \alpha_{ik} * * \alpha_{\hat{i}.k} \quad i, \hat{i} \in S$$

$$X_{i\tilde{D}} = \sum_{i \in D: i \neq \hat{i},\, j \in F} w_{i\hat{i}j}, \hat{i} \in \tilde{D} \subseteq S$$

$$D_{i\hat{i}} = \sum_{k \in P} P_k * \alpha_{ik} * * \alpha_{\hat{i}.k} \quad i, \hat{i} \in S$$

Results

In the context of HGV road transport

- **Framework for holistic analysis of TTSs**
- **Relevant TTSs (32) with potential synergies to EFC systems**
- **Valuation approach and quantitative TTS values for analysis**
- **Dependency modelling between TTSs**
- **Hierarchical cluster agglomeration for studying synergies**
- **Proposed benefits optimization Model for selecting TTSs**

Conclusions

Preliminary work on:

•Identification and attempts to formalize relevant HGV telematic services
•Valuation of HGV transport telematic services

•Improved valuation of services in the context of existing services (dependencies)

•Novel attempts to combine processing and communication resource utilization with societal benefits optimization model

•Novel approach to the analysis of Multi-Service Architectures for ITS systems using optimization as an improvement to traditional CBA

Future Work

- **Further validate proposed models and improve data quality**
- **Model different architecture concepts (resource constraints) and test on the proposed model**
- **Analyze results and compare different architecture concepts**
- **Develop and compare alternative quantitative models**
- **Design a simulation model to generate alternative data output and feed data as input to optimization model**

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Questions, Comments…

Thank You!