Relations between case studies and Theme 2 results
– Towards D8.6 –

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1 Aim of SENSORIA Deliverable 8.6 (due M36)
   - Editors: Maurice ter Beek, Stefania Gnesi
   - Reviewer: Fabio Gadducci

2 Overview of collected contributions

3 Work to be done...
Aim of SENSORIA Deliverable 8.6 (due M36)

Relations between case studies and Theme 2 results

D8.6 will describe the relations between the four SENSORIA case studies of WP8 and the more technical work as carried out within the WPs of Theme 2: *Mathematical analysis and verification techniques and tools for system behaviour and quality of service properties*

D8.6 will show how the theoretical approaches to qualitative and quantitative aspects of services (WP3 and WP4) are applied to scenarios of the Automotive, Finance, Telecommunications and Course management & e-learning case studies (WP8)

Towards D8.6: Eleven contributions collected on web site

⇒ Ten of them deal exclusively with the Automotive case study!!!

? One formalises a Finance scenario, but no analysis or verification technique or tool from WP3 or WP4 is used (does this fit D8.6?)
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M.H. ter Beek (ISTI-CNR)
Overview of collected contributions

- 11 contributions in total (10 × Automotive, 1 × Finance)
- 8 contributions from WP3 (Qualitative Aspects of Services), 3 contributions from WP4 (Quantitative Aspects of Services)
- 1 contribution from T3.1, 2 from T3.2, 3 from T3.3, 2 from T3.4, 1 from T4.2, 2 from T4.3
- T3.5: Language Extensions and Prototyping
- T4.1: Probabilistic and Stochastic Extensions of the Core Calculus
- T4.4: Resource Usage and Quantitative Security Issues
- Contributions from DSIUF, DTU, FAST, ISTI, LMU, LSS-IMPERIAL, PISA, S&N, UEDIN, ULEICES
- ATX, BUTE, FFCUL, LSS-UCL, MIP, UNIBO, UNITN, UWARSAW (some already announced their contributions during coffee breaks)
Formalising the S&N Credit Request (DTU & S&N)

- T3.1: Security and Trust for Services
- Finance: Credit request scenario
- Formalises scenario’s cryptographic communication protocols
- Uses: Alice-Bob notation

Results: Translate the case study from high-level formalism into low-level specifications in order to allow formal validation

Future: Analyse security properties (confidentiality, authentication) to obtain full protocol analytical validation of system
Specifying and Analysing SOC Applications with COWS (DSIUF)

- T3.2: Resource Usage of Mobile Services
- Automotive: On road assistance scenario (a.k.a. low oil level)
- Flavour of qualitative properties that can be analysed with the tool
- Uses: COWS process calculus with additions (type system), SocL branching-time temporal logic, CMC on-the-fly model checker
- Results: Express and enforce confidentiality properties
- Future: Enable the use of proof techniques and analytical tools developed for COWS to analyse SOC applications programmed in WS-BPEL or modelled in SRML
T3.2: Resource Usage of Mobile Services

Automotive: Accident assistance scenario (a.k.a. airbag)
Static analysis in relational form
Uses: \( p\pi \) pattern-matching \( \pi \)-calculus, flow logic

Results: Ensure the correct delivery of services in the presence of multiplexed communication; used to show that only service subscribers are able to employ a service

Future: Transfer the analysis technology to the richer set of Sensoria core calculi
T3.3: Behavioural Properties

Automotive: Accident assistance scenario (a.k.a. airbag)
Static analysis in relational form of correlations
Uses: CWS fragment of COWS process calculus (orchestration constructs discarded), flow logic

Results: Proof of absence of malign session interference

Future: Add orchestration constructs (discarded from COWS)
T3.3: Behavioural Properties

Automotive: On road assistance scenario (essentially)

Flow-sensitive and context-sensitive analysis of $\pi$-calculus

Uses: Static program analyses techniques, $\pi$-calculus

Results: Ensure that private information sent to services over a wireless network is not leaked

Future: Develop similar analysis technique for hardware programming language VHDL
Logic-based conflict detection for distributed policies (PISA & ULEICIES)

- T3.3: Behavioural Properties

- Automotive: On road assistance scenario (a.k.a. car repair)
- Semantics-based techniques to detect policy conflict and a consideration of conflict resolution
- Uses: Appel policy language, theorem proving, $\Delta$DSTL(x) distributed-state temporal logic

- Results: Detection of conflicts

- Future: Implement conflict detection filter using the proof assistant MaRK (built on top of Isabelle)
T3.4: Verification Techniques

Automotive: On road assistance scenario (a.k.a. low oil level)
Qualitative analysis of the scenario’s requirements model
Uses: UML, communicating UML state machines, CMC on-the-fly model checker, SocL action- and state-based branching-time temporal logic

Results: The requirements model of the scenario is well designed

Future: relax modelling assumptions, perform quantitative analysis
A model checking approach for verifying COWS specifications (DSIUF & ISTI)

- T3.4: Verification Techniques

- Automotive: On road assistance scenario (a.k.a. low oil level)
- Qualitative analysis of properties of services expressed as generic logical patterns describing desirable peculiar features of services
- Uses: COWS process calculus, SocL branching-time temporal logic, CMC on-the-fly model checker

- Results: Express and check functional properties of services

- Future: Define an alternative operational semantics for COWS to support a more compositional verification methodology
T4.2: Stochastic Logics

Automotive: Accident assistance scenario (a.k.a. airbag)  
Towards quantitative analysis (no model checking yet)  
Uses: MoSL action- and state-based real-time probabilistic spatial temporal logic (for StoKlaim)

Results: Express non-functional, performance and dependability oriented properties/requirements of/on services

Future: Develop proper tools to support system modelling and verification based on StoKlaim and MoSL
T4.3: Quantitative Measurements of QoS for SLAs

Automotive: Accident assistance scenario (a.k.a. airbag)

Quantitative analysis of QoS metrics

Uses: Cyclic PEPA process algebra, Stochastic Petri Nets (via ipc Imperial PEPA compiler), Hydra DNAmaca Markov chain analyser (SPN tool), Condor high-throughput computing platform

Results: Sensitivity (response-time) analysis of above scenario

Future: Better use Condor’s support for distributed computing
T4.3: Quantitative Measurements of QoS for SLAs

Automotive: Accident assistance scenario (a.k.a. airbag)
Qualitative and quantitative analysis
Uses: FSP Finite State Process notation, PEPA process algebra, LTSA Labelled Transition System Analyzer, SDE Sensoria Development Environment (e.g. PEPA Eclipse Plug-in project and ipclib tool suite)

Results: Safety and response-time analysis of above scenario

Future: Extend the SDE to perform analyses on high-level (UML or BPEL) models
Applications of Theme 2 results to the other case studies? (Finance?)
i.e. of analysis/verification techniques & tools from WP3/WP4 to WP8

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(if you did not do so already...)

See Laura’s talk for a template structure for your contribution

and

see Nora’s talk for the deadline for sending your contribution
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