

Security in the Context of Business Processes

Thoughts from a System Vendor's Perspective

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Dagstuhl Seminar 13211: "Verifiably Secure Process-Aware Information Systems"
<http://www.dagstuhl.de/13341>

18.08.2013 – 23.08.2013

Abstract

Enterprise systems in general and process aware systems in particular are storing and processing the most critical assets of a company. To protect these assets, such systems need to implement a multitude of security properties. Moreover, such systems need often to comply to various compliance regulations.

In this keynote, we present process-level security requirements as well as discuss the gap between the ideal world of process-aware information systems and the real world. We conclude our presentation by discussing several research challenges in the area of verifiable secure process aware information systems.

Agenda

- 1 Security, Trust, and Compliance of Business Processes
- 2 Process-aware Information Systems
- 3 Research Directions and Challenges
- 4 Conclusion

Point of View



Overall:

- Vendor process-aware systems
- More than 25 industries
- 63% of the world's transaction revenue touches an SAP system
- 64 422 employees worldwide

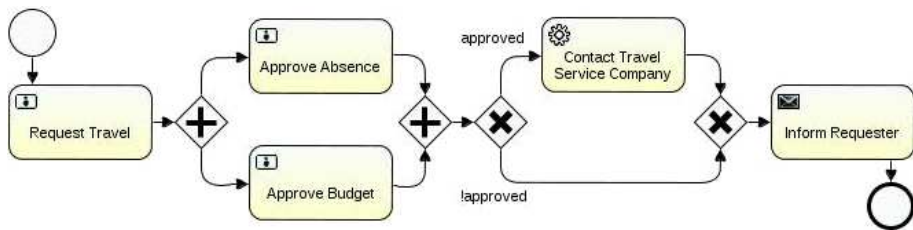
Personal Background:

- Researcher (SE, FM, Security)
- Security Expert:
supporting all phases of a SDLC

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Security in Business Processes: An Example



Access Control



Goal:

- Control access to
Tasks, Resources (Data), ...

The core:

- Usually:
Users, Roles, Access Rights, ...
- In special cases:
Data labeling

On top:

- Separation of Duty
- Binding of Duty
- Delegation

Protecting Data (and Goods)



Goal:

- Ensure
 - confidentiality
 - integrity (safety)of data (and goods)

The core:

- Need-to-Know
- Fingerprints
- Encryption
- Sensors

Compliance and Additional Requirements



Many regulated markets

- Basel II/III, SoX, PCI
- HIPAA

Many customer-specific regulations

- Own governance to mitigate risks
- Own business code of conduct
- Fraud detection/prevention
- Non-observability

Customers are individually audited

- No “one certificate fits all” solution

Security should not hinder business

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Ideal World: Modeling

The screenshot displays the SAP Business Modeler interface for modeling an activity. The main canvas shows an activity diagram for 'TravelApproval' with the following elements:

- Start Node:** A circle leading to a task node 'Request Travel'.
- Decision Node:** A diamond with a plus sign (+) that branches into two paths: 'sf1' leading to 'Approve Absence' and 'sf2' leading to 'Approve Budget'.
- Task Nodes:** 'Approve Absence' and 'Approve Budget' are task nodes. 'Approve Budget' has a 'sod' (Start of Day) icon.
- Flow:** Both 'Approve Absence' and 'Approve Budget' lead to a second decision node with a plus sign (+).
- Exit Decision:** A diamond with an 'X' that branches based on 'approved' (to 'Contact Service C') and 'lapproved' (to a task node).
- Flow:** The 'lapproved' path leads back to the 'Request Travel' task node, forming a loop.

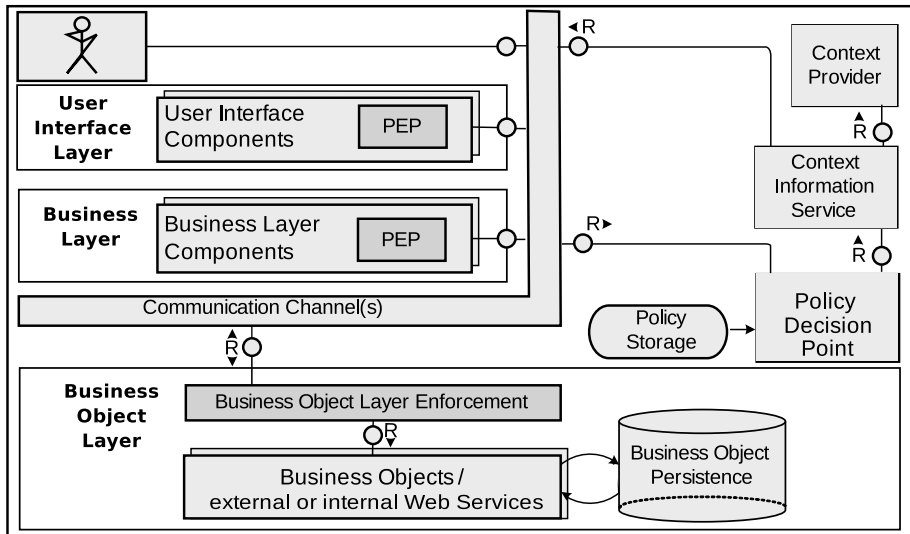
The interface includes a menu bar (File, Edit, View, Navigate, Search, Project, Run, Window, Help), a Package/Project browser on the left, a Palette on the right, and a Properties panel at the bottom.

Properties Panel:

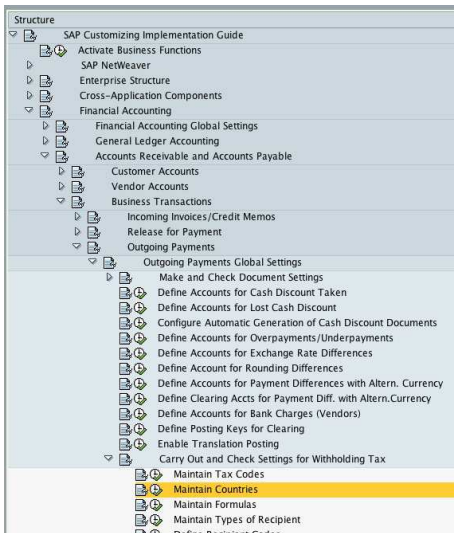
- Listeners:** Action: Full Access
- Multi instance:** Role: Administrator
- Security:**
- Need-to-know:** Permissions:
- Delegation:**

Permission Name	Action	Roles	Add
<input type="checkbox"/> Perm-usertask2-Claim	Claim	Manager, Pr	Add Remove
<input type="checkbox"/> Perm-usertask2-Complete	Complete	Manager, Pr	

Ideal World: Deployment and Execution



Real World: Modeling



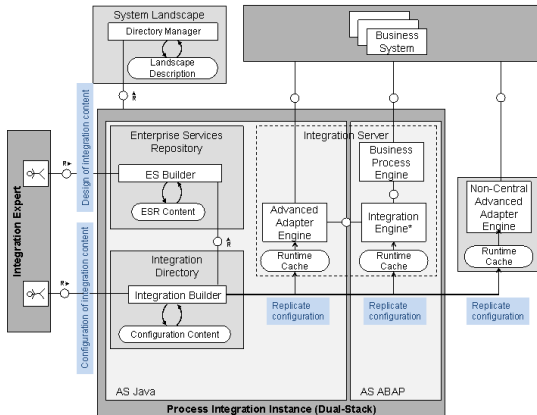
Process Models:

- BPMN/BPEL
- Configurable transactions
- Custom Coding
- Legacy Systems
- External services

Security:

- Each system (OS, DB, IS)
 - own security infrastructure
 - own logging infrastructure
- Management solutions try to bridge this gap

Real World: Deployment and Execution



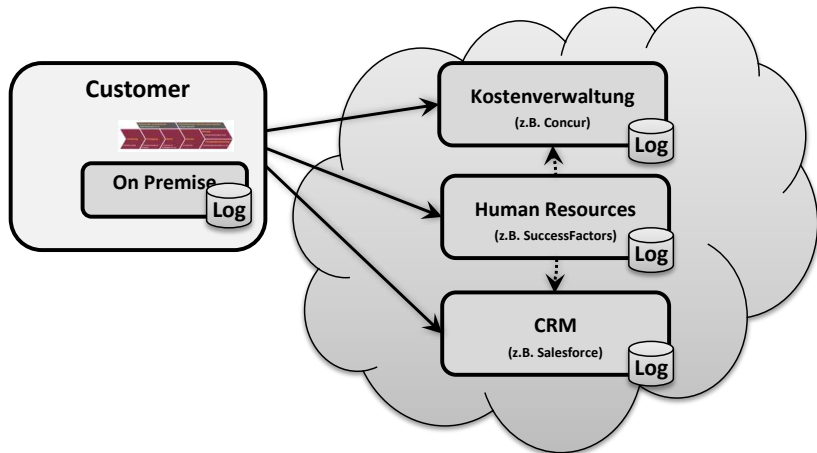
Backend:

- AS Java, AS ABAP
- Business Process Engine
- Legacy Systems
- External services
- Sensors and product lines

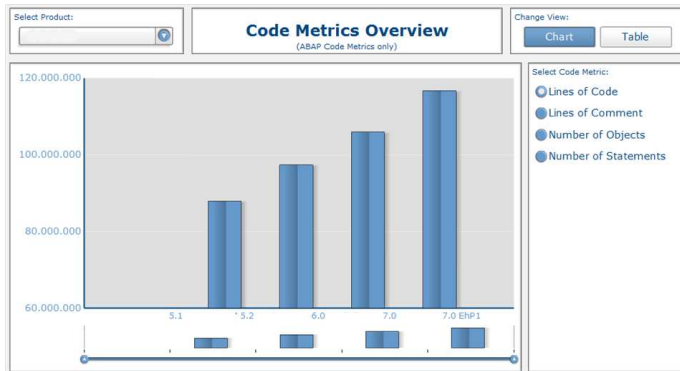
Frontend:

- Desktop clients
- Web-based clients
- Mobile clients
- Client side compositions (e.g., mash-ups)

How the Future Might Look Like



Evolution of Source Code

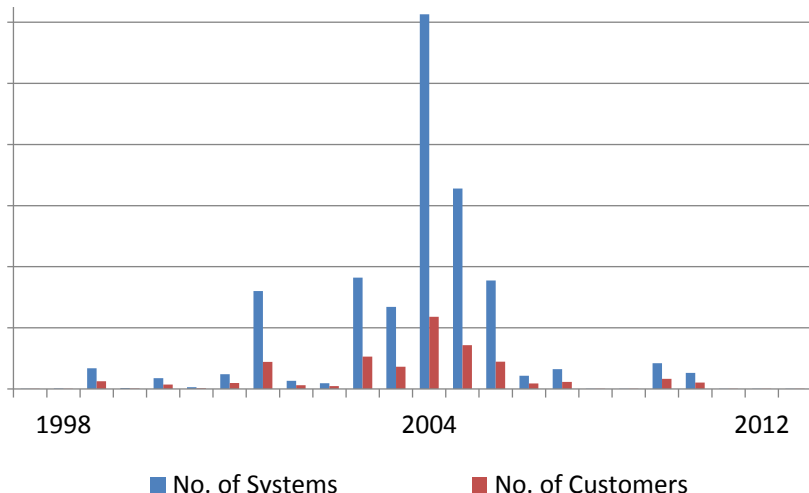


- Increase in
 - code size
 - code complexity
 - number of products
 - product versions

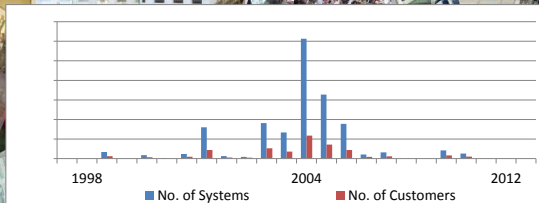
Support Lifecycle (Maintenance)



Support Lifecycle (Maintenance)



Support Lifecycle (Maintenance)



Example (Maintenance Cycles)

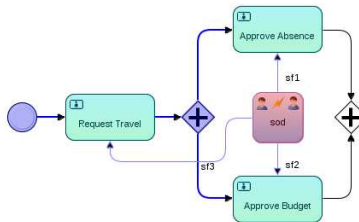
Produkt	Release	EOL	ext. EOL
Windows XP	2001	2009	2014
Windows 8	2012	2018	2023
Red Hat Ent. Linux	2012	2020	2023
SAP ERP	2004	2020	> 2024

Maintenance fees: typical 20% of the original price

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Our Research Over the Last Decade



Access Control for Processes

- RBAC-like models
- Delegation models
- Break-(the)-glass models

Model-driven Security

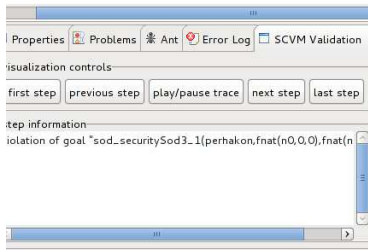
- Modeling of Security
- Generation of implementation, configuration
- Monitoring based on models

Process-level Verification

- Compliance to security spec.
- Consistency of security configurations

Implementation-level Verification

- Compliance of implementation to process level security req.



Research Challenges



Adaptability:

- How to extend systems safely
- Integration of legacy systems

Auditability:

- Coherent audit across providers/systems
- Reduction of audit costs

Cloud (SaaS):

- How to manage decentralized systems
- How to capture behavior of the composition
- Who is the attacker

Process level vs. technical levels:

- Security is more than CIA
- Ensuring secure implementation

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Conclusion



The most interesting challenges are still ahead of us!

- Real systems are large and complex:
 - many programming languages or frameworks
 - many security technologies
 - highly distributed
 - implement business processes in many different ways
- Many research is done on the process level
- We now need to bring the
 - process level
 - implementation levelcloser together to provide **end-to-end security**
- Cloud solutions create new challenges:
 - data protection across different providers
 - new attacker models

Thank you!



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