

BPM and Cloud Integration

A New Driver for Research in Security in Business Processes

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Guest Lecture: Konzepte und Anwendung von Workflowsystemen
Karlsruhe Institute of Technology (KIT)

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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 talk, we briefly discuss challenges of implementing large-scale systems based on workflow-management in general and, in particular, the in the context of cloud based systems. We will put a particular focus on security requirements and 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 SAP and SAP P&I ACES
- 2 Process-aware Information Systems
- 3 Security, Trust, and Compliance of Business Processes
- 4 Research Directions and Challenges
- 5 Conclusion

Agenda

- 1 SAP and SAP P&I ACES
- 2 Process-aware Information Systems
 - The Ideal World
 - The Real World
 - Cloud Integration
 - System Complexity and Adoption Rate
- 3 Security, Trust, and Compliance of Business Processes
- 4 Research Directions and Challenges
- 5 Conclusion

Die SAP AG

- Leader in Business Software
- Vendor process-aware systems
- More than 25 industries
- 63% of the world's transaction revenue touches an SAP system
- 64 422 employees worldwide
- Headquarters:
Walldorf (and St. Leon-Rot)
- Location in Karlsruhe:
ca. 500m from here



SAP P&I ACES: Mission

Mission

- Orchestrating the architecture definition and communicating the results consistently
- Building the best educated development organization in- and outside the company
- Making Security a key differentiator for choosing SAP

Goals

Architecture

Lead the way we jointly create and manage the architecture of our products

Communication

Roll-out this architecture consistently to our field colleagues, customers and partners.

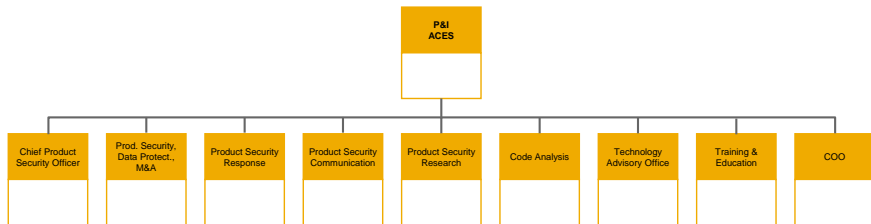
Education

Drive education for developers internally & externally - ensure that it is fun to learn SAP, renew education concepts and technology.

Security

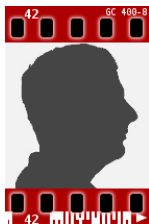
Drive Product Security, transform it to become a differentiator for SAP.

SAP P&I ACES: Organizational Structure



My Background

- Senior Researcher at SAP AG
 - Product Security Research
 - Code Analysis
- Background:
Security, Formal Methods, Software Engineering
- Current work areas:
 - Security in business processes
 - Static code analysis (u.a. für JavaScript)
 - Security Testing



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Ideal World: Modeling

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

- Start Node:** A circle leading to a 'Request Travel' task.
- 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:** A 'sod' (Separation of Duties) task is positioned between the two paths.
- Join Node:** A diamond with a plus sign (+) that receives input from both 'Approve Absence' and 'Approve Budget'.
- Exit Decision Node:** A diamond with an 'X' that branches into two paths: 'approved' leading to 'Contact Service C' and 'lapproved' leading to a task labeled 'Request Travel'.

The left sidebar shows the project structure for 'Aniketos - Case Study C' > 'Travel Approval' > 'src/main/resources' > 'diagrams'. The 'TravelApprovalactiviti...' diagram is selected.

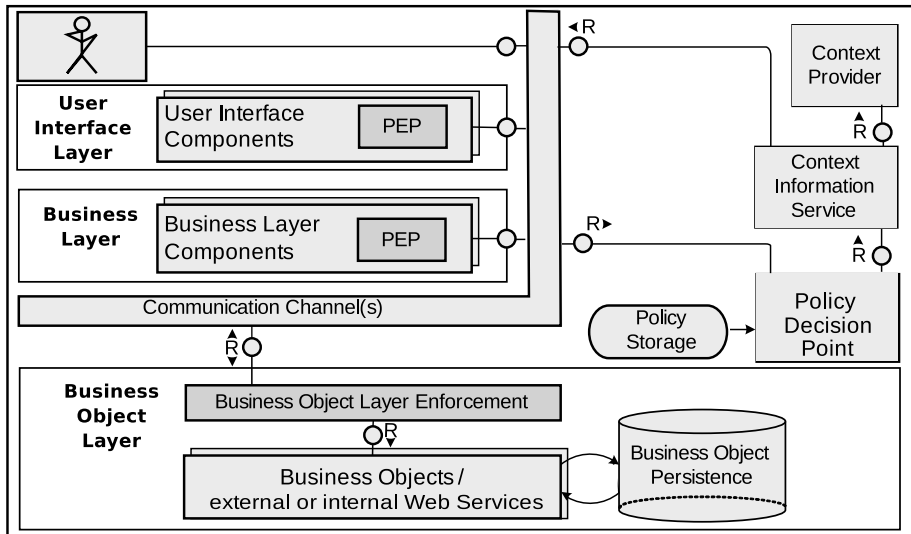
The bottom pane shows the 'Properties' view for the selected element, with the following configuration:

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

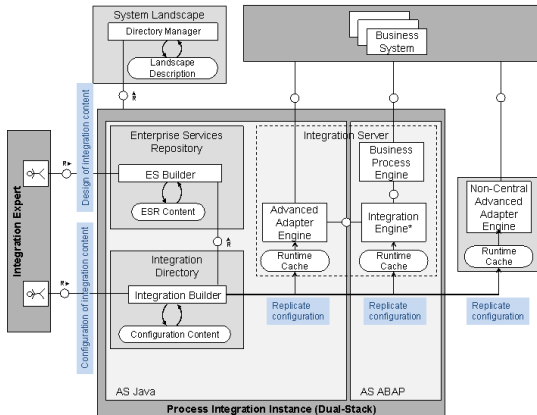
The 'Permissions' table is also visible:

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

Ideal World: Deployment and Execution



Real World: Deployment and Execution



Backend:

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

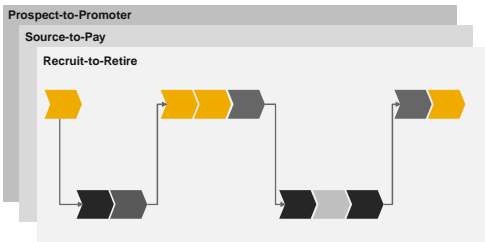
Frontend:

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

End-to-End Business Process Integration

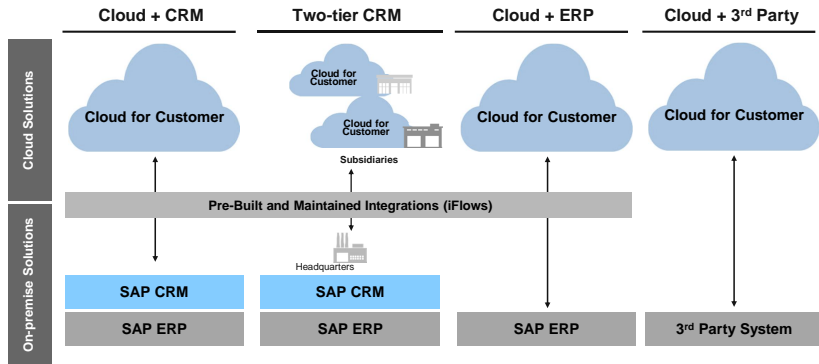
- Customers have complex on-premise landscapes
- As customers adopt cloud solutions, hybrid landscapes will become a norm
- Integration across the boundaries of cloud and on-premise is a must to prevent application silos

End-to-End Business Processes

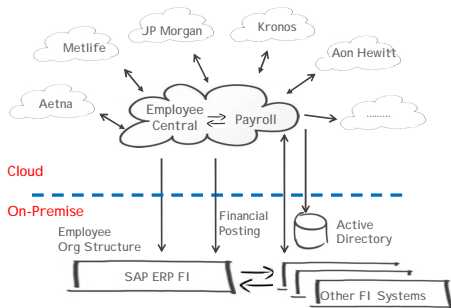


As companies adopt cloud, real-time end-to-end business process integration is critical

How the Future Might Look Like

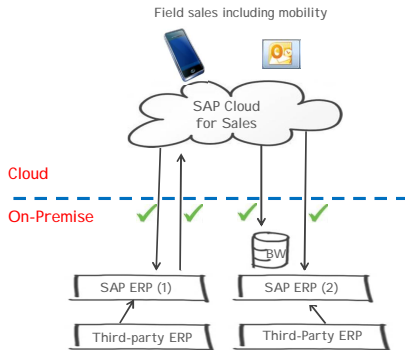


Customer Example (1/2)



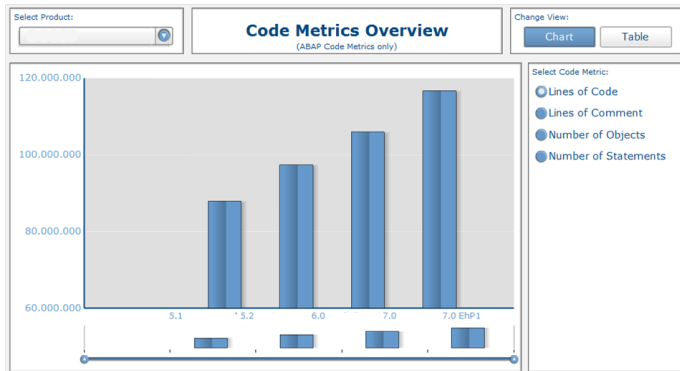
- Large manufacturing company with SAP ERP, multiple legacy HR and other financial applications worldwide
- Migration from legacy HR system
- >120 third-party interfaces – Integration of third-party cloud solutions to Employee Central (EC) and EC Payroll
- 100% of SAP-to-SAP integrations and 30% of all integrations covered by prepackaged integration flows (iFlows)

Customer Example (2/2)



- Industrial manufacturer with multiple subsidiaries on different SAP ERP clients as well as third-party ERP systems
- Rapid implementation with small IT team
- Delivered improved usability for field sales and collaboration between field sales and back office
- Integration of accounts, materials, sales quotes and sales orders

Evolution of Source Code

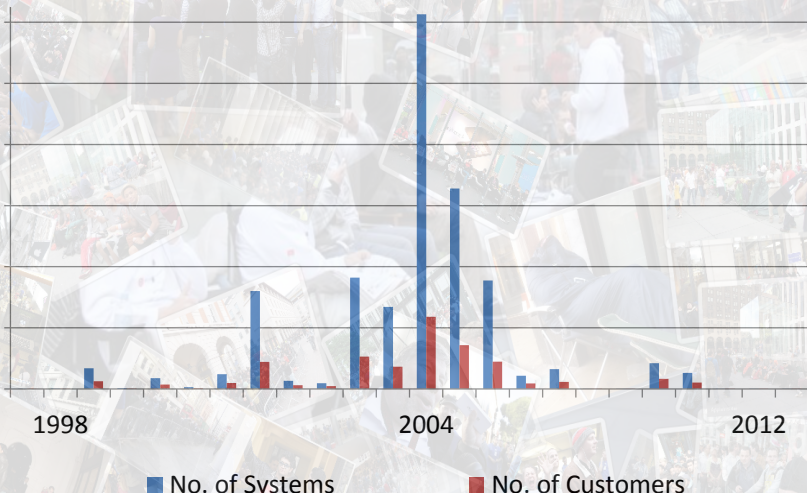


- Increase in
 - code size
 - code complexity
 - number of products
 - product versions

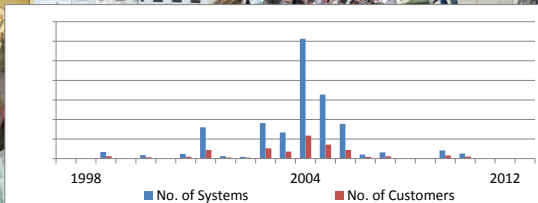
Support Lifecycle (Maintenance)



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

Customer Requirements

LOB*



Single source of truth and master data synchronization



Real-time business process integration



Integrated user experience



Rapid deployment

*Line of business

IT



Data security and compliance



Support for complex landscapes



Choice of integration technology

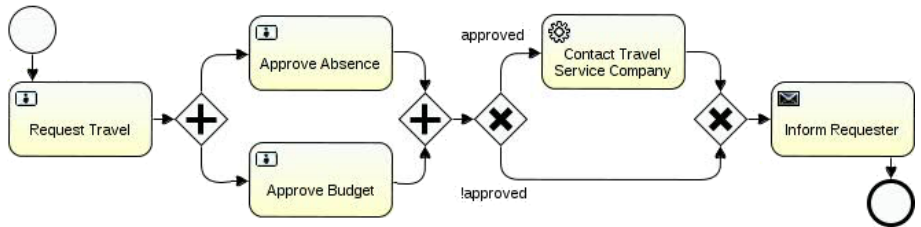


End-to-end monitoring and support

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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

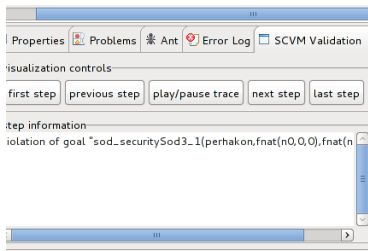
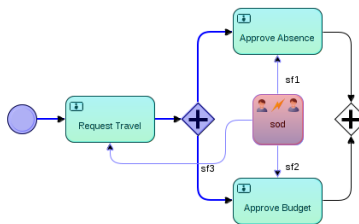
- No “one certificate fits all” solution

Security should not hinder business

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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!

Interested in an Internship/Thesis at SAP:

- achim.brucker@sap.com
- www.sap.com/jobs/ and search for location "Karlsruhe" or "student"



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