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DebtFlag: Technical Debt Management with a Development Environment Integrated Tool

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Motivation and Problem

- **Availability and clarity of technical debt information is a key factor in successful technical debt management**
- **Software products are highly complex, self-emergent and experience constant updates**
  - Two approaches to TD information production
    - Automatic: accommodates update rates; incapable of capturing entire requirements space
    - Manual: capable of capturing the entire requirements space; incapable of accommodating update rates

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Solution

- **Combine the two approaches**
  - Manual assessment to identify source points
  - Partially automate the documentation process
  - Fully automate the processes of propagation and technical debt information maintenance

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DebtFlag

- **DebtFlag links structured observations about technical debt to related parts of the software implementation and**
- **uses implementation technique specific information to maintain them.**
- **DebtFlag produced technical information pursues technical debt management at**
  - the implementation level (micromanagement)
  - the project level (adherence to TDMF)

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DebtFlag

- **DebtFlag mechanism**
  - software implementation process and technique independent, system abstraction
    - structure of documented technical debt
    - automation of technical debt propagation
    - technical debt management
- **DebtFlag tool**
  - implementation of the DebtFlag mechanism
  - Java (Eclipse plug-in + Vaadin web-app)

DebtFlag Mechanism

Structure of Documented Technical Debt

- **Uses the documentation structure from Technical Debt Management Framework***
- **Extends this with an additional layer**
  - TDIs composed from DebtFlag elements
    - user may define a TDI as an unlimited collection of implementation technique specified elements
    - each element may introduce a unique rule set for the propagation of its technical debt

*Seaman, C., & Guo, Y. (2011). Measuring and monitoring technical debt. *Advances in Computers*, *82*, 25-46.

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DebtFlag Mechanism

Automation of Technical Debt Propagation

- **DebtFlag's dynamic functionality requires that two processes are automated**
  - identifying source points for TD propagation
  - propagation of technical debt according to rule sets and dependencies

DebtFlag Mechanism

Technical Debt Management

- **Project level management**
  - Support for the TDMF
    - DebtFlag mechanism is designed to be able to efficiently construct and maintain the TDL for the software implementation artifact
- **Implementation level micromanagement**
  - DebtFlag maintains an implementation level representation of technical debt

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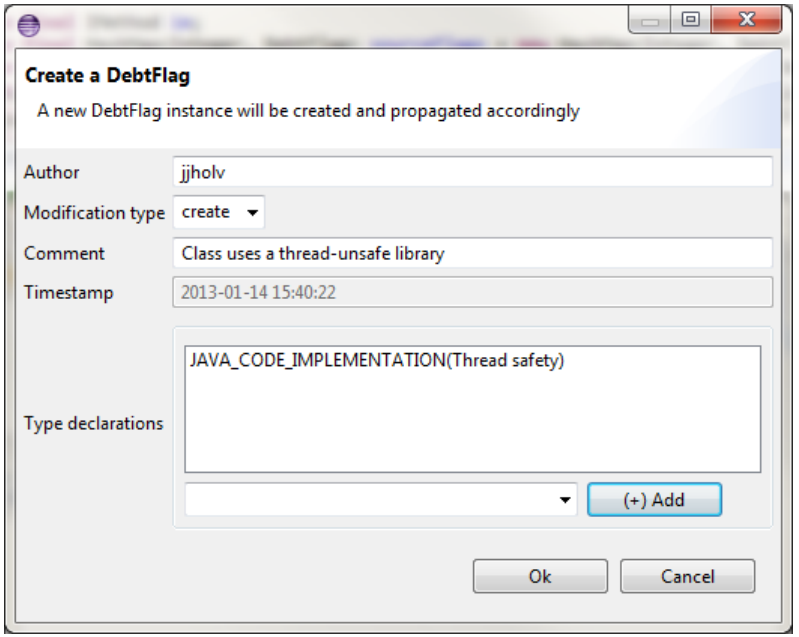
DebtFlag Tool

- **Implementation of the DebtFlag mechanism**
- **DebtFlag plug-in**
  - for the Eclipse IDE
  - supports developing in Java
  - TD micromanagement
- **DebtFlag web-application**
  - dynamic representation of the TDL
  - project level management

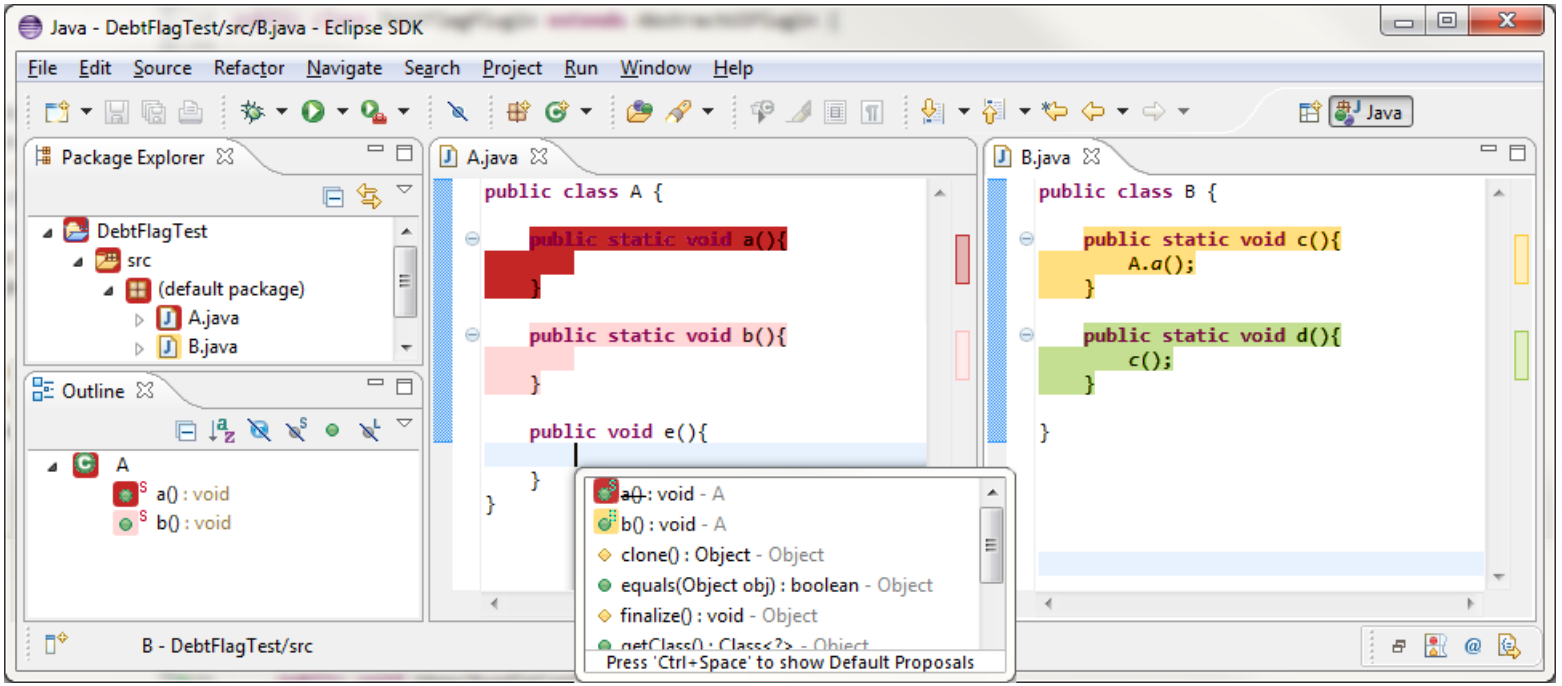
DebtFlag Plug-In – Capturing Technical Debt

- **Triggered through interaction with Java elements in the Eclipse**
- **Partially automated documentation of technical debt (creation of DebtFlag elements)**



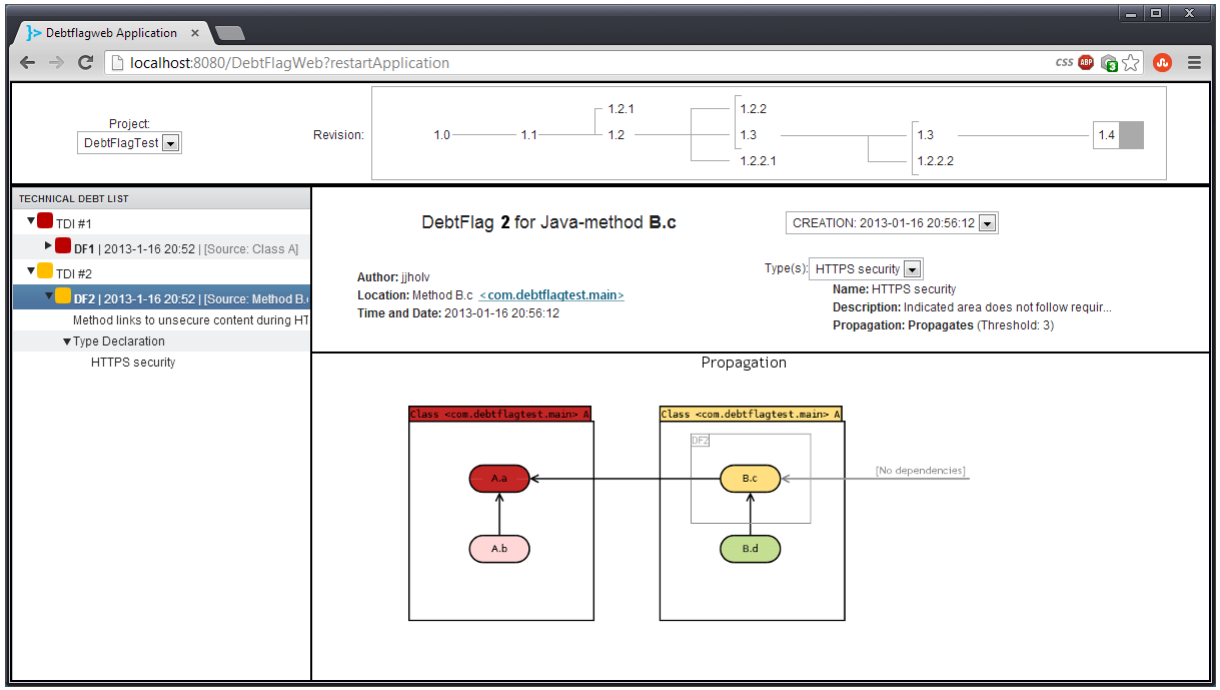
DebtFlag Plug-In – Implementation Level Representation of Technical Debt

- **Micromanagement; visualization and restriction**



DebtFlag Web Application – Dynamic Representation of the TDL

- **Project level TD management**
  - changes propagated back to implementation



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Future work

- **Mechanism Improvement and Validation**
  - Department software projects
  - Experimentation and case studies with industrial partners
    - Nokia ICM (legacy code project in Pro*C)
- **Propagation model improvement**
  - Variety of possible inputs and models to use
- **Extending technique support**

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Discussion

- Benefits
- Drawbacks
- Application in software development
- Propagation modeling
- Propagation analysis

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Discussion

Expected benefits of using the DebtFlag

- **captures human made observations**
- **documents the structure of technical debt**
- **presents technical debt at the implementation level**
- **makes continued use of higher level technical debt management approaches possible**

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Discussion

Foreseen drawbacks to using the DebtFlag

- **may endorse technical debt accumulation**
- **places the burden of technical debt management onto the end user**
- **does not protect the information from propagation rule set bias**
- **is heavily dependent onto outside services**

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Application in Software Development

- **Integrate into parts of the software process where relevant observations are made**
  - Implementation process
  - Developers are the end users
- **Produced documentation serves as the integration point for further technical debt management approaches**
  - TDMF or other SW dev. approaches

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Propagation Modeling

- **How does dependency propagation affect TD principal and interest?**
  - forms of propagation
  - types of implementation elements
- **Modeling the effect of diminishing TD**
- **Supporting TD management**
- **Possibility in link structure algorithms**
  - PageRank

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Propagation Analysis