Palantír: Increasing Awareness among Distributed CM Workspaces

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A Typical Development Scenario

Pete’s workspace

Ellen’s workspace

CM repository
Direct Conflicts

Overlapping changes to the same artifact
Indirect Conflicts

Changes to one artifact modifying the behavior of another artifact
Traditional CM Approaches

■ Pessimistic
  - An artifact can be changed by only one person at any one time
  - Limited in not allowing any parallel work

■ Optimistic
  - An artifact can be changed by many persons at the same time
  - Limited in leading to merge problems that need to be resolved manually
Traditional CM Approaches

- **Pessimistic**
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Neither solution addresses direct and indirect conflicts very well, especially in a distributed and decentralized setting.
Key Observation

- A CM workspace in reality provides two kinds of isolation:
  - **Good isolation**
    - Hides actual changes to artifacts
  - **Bad isolation**
    - Hides knowledge of what artifacts other developers are changing
Approach

- **Continuous workspace awareness**
  - Which artifacts are being changed by whom?
  - What is the *severity* of the changes? (amount/size of change being made)
  - What is the *impact* of the changes? (effect of changes on one’s current work)

- Such awareness has the potential to significantly reduce the number of direct and indirect conflicts
Palantír Architecture

Pete’s Visualization

Pete’s View of the World

Event wrapper

CM client

Severity/impact analysis

CM server

Event wrapper

CM client

Ellen’s Visualization

Ellen’s View of the World

Event wrapper

CM client

Petie’s workspace

CM repository

Ellen’s workspace
Populating a Workspace
Making Changes in the Workspace
Committing Changes
More Changes (by Other Developers)
Visualization Features

- **Different views with different trade-offs**
  - Amount of information versus level of intrusiveness
  - Scroll-bar, tabular, fully graphical

- **Configurable**
  - Selection of relevant developers, events, timeframes

- **Scalable**
  - Internal data structure versus actual visualization
  - Pair-wise workspaces
  - Sorting per severity or change impact

- **Extensive metadata**
Severity Analysis

- **Amount (size) of change being made**
- **Proposed algorithms**
  - Number of files
    - Simple, but inaccurate
  - Lines of code
    - Simple, but inaccurate
  - Token based difference
    - Measures structural changes, but language dependent
  - Abstract syntax tree
    - Very detailed analyses, but likely too expensive (and language dependent)

- **Current work in progress**
Impact Analysis

Effect of changes on one’s current work

Proposed algorithms
- Overlapping number of files
  - Simple, but inaccurate
- Overlapping lines of code
  - Simple, but inaccurate
- Changed interfaces
  - Potentially accurate and effective, but language dependent
- Dependency analysis
  - Very precise, semantic results, but complex (and language dependent)

Current work in progress
Conclusions

- Palantír is a prototype that...
  - ...brings awareness to distributed CM workspaces
  - ...shows pair-wise conflict
  - ...provides severity and impact analyses
- Palantír is independent of the type of CM system used
- Use of Palantír results in fewer direct and indirect conflicts
  - Case study to be planned in near future
- Future work
  - Integrate with different CM systems
  - Implement severity and impact analysis algorithms for both atomic and compound artifacts
  - Develop additional visualizations
Research Projects

Ménage
ArchView

Design

Palantír
Wren
NUCM

Implementation

System Testing

TWICS
SRM

Deployment

Émigré
ArchDiff

Run–Time

xADL 2.0

Versioned Components (Architecture)

Components

Source Files

Features

Systems

Executables