Modeling and Evolving Software Product Line Architectures (PLAs) using Change-Sets and Relationships

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Modeling Product Line Variability

How do we model features at the software architecture level?



CD

Reader

Sound

Source

Free Product:

Player

Traditional Variation Points



Guard Variables and Possible Values:

CD = { 'reader' | 'writer' } MP3 = { 'none' | 'encoder' | 'decoder' }

Selecting the Free Product



Guard Variables and Possible Values:

CD = { '*reader*' | 'writer' } MP3 = { '*none*' | 'encoder' | 'decoder' }

Selecting the Trial Product



Guard Variables and Possible Values: CD = { '*reader*' | 'writer' } MP3 = { 'none' | 'encoder' | '*decoder*' }

Selecting the Pro Product



Guard Variables and Possible Values:

CD = { 'reader' | '*writer*' }

MP3 = { 'none' | '*encoder*' | 'decoder' }

Difficulties with Variation Points



- Selection is natural, but...
 - High degree of redundancy, scattering, tangling
 - Concepts implicitly represented, difficult to interpret and manipulate

Key: Model Variability using Change-Sets

Change-Sets

- Encapsulate logically-related variability
- Merged together to compose products

CD

Reader

Original













Relationships

- Explicitly express change-set interdependencies
- Govern valid change-set combinations

Change-Set & Relationship Architecting Environment



Conclusions and Future Work

- Change-sets and Relationships
 - Applied to 5 PLAs (3 illustrative, 2 real)
 - Reduce PLA redundancy, scattering and tangling
 - Directly visualizable and manipulable
- Generalization:
 - Approach is applicable to other artifact types
 - E.g., Class / Activity Diagrams and State Charts
 - Applicable across multiple artifacts
- Future work: collaboration and evolution

Thank you... Questions?

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