

Facilitating the Evolutionary Modifications in Distributed Apps via Automated Refactoring

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Evolutionary Modifications





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Client Insourcing Refactoring







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Research Approach

- New approach that facilitates a large class of evolutionary modifications in distributed applications
- Novel, domain-specific automated refactoring—*Client Insourcing*—that moves remotely executed functionalities to be executed locally, thereby creating a semantically equivalent centralized version of the distributed application.
- A centralized equivalent of a distributed application can serve as a faithful surrogate for various maintenance and evolutionary tasks









VIRGINIA TECI



VIRGINIA TECH.







Progress so far

- Client Insourcing & Debugging for Full-stack JS Apps
 - ICWE'19, K.An and E.Tilevich (to be presented tomorrow)
 - Distributed Apps written by same Language, JavaScript!





Progress so far

- Trust Execution for Real-time Apps
 - GPCE'18, Y. Liu, <u>K. An</u> and E. Tilevich





Progress so far

- Source-to-Source Translation with Rule Inference
 - MobileSoft'18, <u>K. An</u>, N. Meng, and E. Tilevich





Remaining work

- Extend to Multilingual Distributed Apps
 - Take advantage of Full-Stack JS apps:
 - Lower maintenance costs (JS everywhere); same tools for the backend and frontend parts





Remaining Work: Conceptual Challenges

- Bridging semantic differences between client and server languages (i.e., Java vs. JS)
- Emulating standard server language libraries and frameworks in the insourced code
- Ensuring requisite performance characteristics in redistributed code
- Multi-tier architecture. (i.e. Database)



Evaluation Plan

- <u>RQ1.</u> Client Insourcing Value, Correctness, and Applicability: How much programmer effort does Client Insourcing save?
- <u>RQ2.</u> Applicability to Facilitating Evolutionary Modifications: What kind of evolutionary tasks can be facilitated by Client Insourcing?
- RQ3. Maintaining Semantic Equivalence in the Presence of Client Insourcing Enhanced with Language Translation: How feasible is it to maintain the business logic of a distributed multilingual application by transforming it into a centralized monolingual application?



Conclusions, Future Work, and Q&A

- I have described my dissertation research, concerned with the challenges of evolving distributed apps to meet the continuously changing requirements
- My research puts forward a radical notion that a centralized equivalent can serve as a faithful proxy of a distributed apps for software evolution tasks
- As a future work direction, we plan to generalize our approach to multilingual and multi-tier (database) applications

