Van Cam **PHAM**

Doctorant Étudiant en Model-Driven Software Engineering

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Formation

Doctorant Étudiant au LISE (Laboratoire d'Ingénieurie Dirigée par les modèles pour les Systèmes Embarqués)

Saclay, France

Thèse: Methothodologies for model-code synchronization for reactive system development — *Nov. 2014 - Présent*

- **Place de travail**: Laboratoire d'Ingénieurie Dirigée par les modèles pour les Systèmes Embarqués (LISE), CEA-List, Saclay, France.
- **Bref Résumé de la Recherche**: L'utilisation de Model-Driven Engineering (MDE) dans l'industrie augmente. Cependant, d'une part, son adoption est encore faible en comparaison avec l'usage des langages de programmation dans l'ingénierie de logiciels. D'autre part, le code entièrement opérationnel est à peine généré à partir des modèles écrits dans des langages de modélisation graphiques, en utilisant les approches de l'MDE actuelles. Cette thèse proposes une approche for synchroniser le code et les modèles spécifiés en utilisant la modélisation basée sur des composants et les UML state machines (machines à états) pour le développement de systèmes embarqués réagis. L'objective est triple: (1) améliorer la flexibilité de l'MDE en permettant de modifier un modèle et son code généré; (2) harmoniser l'MDE avec des pratiques de programmation traditionnelles; et (3) favoriser la collaboration entre des utilisateurs de l'MDE et développeurs traditionnels de logiciels.
- **L'intérêt de la recherche**: Ma recherche actuel focalise autour de l'MDE et ses applications, la transformation et la synchronisation de modèles, et l'ingénierie de langages de logiciels

U-PSUD (Université de Paris-Sud)

Orsay, France

Master 2 en Systèmes Embarqués et Traitement du Signal (SETI) — *Sept. 2013 - Sept. 2014*

- Programme: Systèmes Embarqués et Traitement du Signal coopéré par l'Université de Paris Sud, ENS Cachan, INSTN CEA et ENSTA ParisTech, France
- Étudiant en bourse de les Relations Internationales de l'Université de Paris-Sud
- Modules inclus: Systèmes Numériques de Commandes en temps réel, Conception de Systèmes Embarqués Complexes, Adéquation de Algorithme-Architecture, Réseaux et Qualité de Services, Compression de Données Multimédia, Fusion de Données, Apprentissage et Réseaux de neurones, et Initiation à la Recherche.

IPH (Institut Polytechnique de Hanoi)

Hanoi, Vietnam

Ingénieur en Systèmes de l'Information et de la Communication — *Sept. 2007 - Jul. 2012*

- Programme: Programme de Formation d'Ingenieur d'Excellence au Vietnam (PFIEV)
- Projet final: Comprendre les avantages et les inconvénients du modèle client-serveur et du modèle peer-to-peer, et combiner les deux modèles pour développer les applications distribuées.

Emploiement

Laboratoire d'Ingénieurie Dirigée par les modèles pour les Systèmes Embarqués (LISE), CEA-LIST

CEA, Saclay, France

Doctorant Étudiant au Laboratoire d'Ingénieurie Dirigée par les modèles pour les Systèmes Embarqués (LISE) — *Nov. 2014 - Présent*

- Je travaille comme doctorant étudiant sous l'encadrement de Dr. Ansgar RADERMACHER, Dr. Sébastien GÉRARD, et Dr. Shuai LI, au LISE, qui developpe l'outil de modélisation industriel, dans le domaine de l'MDE, notamment l'usage du langage de modélisation de UML et la synchronisation entre modèle-modèle et entre modèle-code généré. Mon travail implique l'utilisation de langages différents pour la transformation de modèles et la génération de code tels que QVT, ATL et Xtend, l'utilisation de l'UML pour modéliser des architectures basées sur des composants et des comportements dirigés par des événement pour les systèmes réagis dans le contexte de Papyrus - une extension de l'Eclipse Modeling Framework (EMF), et de techniques différents pour la synchronisation de modèle et code. En plus, Je travaille avec plusieurs langages de programmation dominants tels que Java, C++, et C et j'ai la compréhension profonde de ces langages afin de générer code à partir des modèles. J'ai également étendu le langage C++ pour supporter le desveloppement de systèmes réagis basés sur des composants.

Laboratoire d'Ingénieurie Dirigée par les modèles pour les Systèmes Embarqués (LISE), CEA-LIST

CEA, Saclay, France

Stage au Laboratoire d'Ingénieurie Dirigée par les modèles pour les Systèmes Embarqués (LISE) — *Avr. 2014 - Sept. 2014*

- J'ai travaillé comme un stagiaire sous l'encadrement de Dr. Ansgar RADERMACHER dans le contexte of l'application de l'MDE and le modèle basé sur des composants FCM (component-based model) au développement de systèmes distribués, notamment la modélisation des composants d'intéraction entre des composants distribués basés sur le middleware ZeroMQ.

Toshiba Software Development Vietnam (TSDV) — *Hanoi, Vietnam*

Ingénieur de logiciels pours des ordinateurs et des Systèmes Embarqués — *Jul. 2012 - Aou. 2013*

- J'ai travaillé comme un ingénieur de logiciels dans trois projets: (1) traiter l'analyse des exigences, le design detaillé, l'implémentation, les teste unitaires, les tests d'intégration, et optimisation au niveau de programmation pour le logiciels du système embarqué: Toshiba G2R protection relay. Le développement ustilisant C comme le langage de développement et Visual Studio comme l'environnement de développement intégré inclut l'utilisation du standard IEC 60870-5-103 pour contrôller et communiquer entre des appareils électriques intelligents, et le test sur un matériel réel et le test utilisant un outil de débogage; (2) développer une application pour contrôller les appareils électrique en utilisant un protocole privé de Toshiba et le langage de C#. L'application sonde les appareils afin de recever des données des erreurs enregistrés, et créer un diagramme pour l'analyse des orgins des erreurs; et (3) utiliser le Qt framework et la bibliotheque C++ de ffmpeg pour l'implémentaion d'une application de lecture multimédia, qui joue les audios and les vidéo.

Tamtay.vn Company — *Hanoi, Vietnam*

Internship for developing games and applications for Android — *Feb. 2012 - Apr. 2012*

- I worked as an intern at the tamtay.vn company, that develops applications and games for the tamtay.vn social network. My responsibility is to investigate the development framework Android SDK for Android applications. I then collaborated with another intern to develop a simple multimedia play application, that downloads and plays music files and associated information transfered in JSON files. I was then responsible for investigating the AndEngine game engine to learn skills in game development.

School of Communication and Information Technology - Hanoi University of Science and Technology — *Hanoi, Vietnam*

Internship for investigating Google Cloud Platform — *Jul. 2011 - Aug. 2011*

- I worked as an intern at the School of Communication and Information Technology. I investigated the *Google App Engine* Google Cloud Platform for building scalable webs and mobile backends using Java, Eclipse IDE, TomCat, plugin of Google App Engine for Java.

Skills and Experiences

Programming	JAVA, C/C++ (especially for embedded systems), C#, Androind, JavaScript, ASM, Matlab, Python
Modeling	UML (class, state machine, composite structure, deployment, ALF, profile, PSCS, PSSM), MARTE, Papyrus, Model-Driven Engineering (model transformation such as QVT and ATL, code generation such as Xtend and Acceleo, IncQuery-based model query), Component-based software modeling, event-driven behavior modeling for reactive systems, round-trip engineering and syncrhonization for model-model and model-code
Framework and Tools	LaTeX, Papyrus, Visual Studio, NetBeans, Eclipse, CodeBlocks, QT, TomCat, Android Studio, Oracle, VirtualBox, IBM Rhapsody
Operating Systems	Ubuntu, Windows 7, 10, XP
Teaching	Supervise practicals for undergraduate students in Android Programming, SQL for database query, C++ and JAVA Programming
Languages	English, French, Vietnamese
Network experiences	Peer-to-peer vs client-server architecture, TCP/IP, application layer protocols, routing protocols, wireless network
Other skills	Neural network for statistic learning, VHDL for simulation, real-time tasks scheduling, multimedia compression, background VHDL and signal processing

Topics of Interests

Model-Driven Software Engineering

- The main research interest of my PhD thesis are methodologies for synchronization of code and model specified in UML-based component-based modeling and UML state machines, and studying different techniques for model transformation such as QVT, ATL, Triple-Graph Grammar (TGG), and Change-driven transformation, for model synchronization such as QVT-Relation and TGG. I'm also involved in researching approaches for a mapping of a UML model containing the ALF code, and programming language code. This mapping will enable a synchronization of UML model with ALF and programming code, and eventually provide synchronization of a platform-independent model with code. Furthermore, I'm also interested in approaches for simulating a system from its models and generating fully operational code from models, especially UML models, which might contain ALF code, approaches for optimizing software system at the model level (e.g. optimization ALF code or UML state machines), and if possibly approaches for model interpretation and compilation. The final goal is harmonization of software programming and MDE practices.

Software programming

- As a PhD student and a practitioner in software engineering, I am passionate in programming, especially the use of mainstream programming languages such as C/C++ and Java for development of software applications (e.g. embedded system applications) for solving everyday life problems. I'm also interested in knowing practices how to be productive and qualitative in programming.

Model-Driven Engineering with Large Models

- I have been working with Papyrus UML models during my thesis for generating real case-study embedded systems, e.g. 12000 lines of code generated for the Lego Car factory case study. When models become large, the processing of the models, e.g. querying and loading for model transformations, becomes very slow, which might harms the adoption of modeling techniques to industrial development. For this, I'm very interested in studying techniques for speeding model manipulations up such as incremental model query with IncQuery or the PrefetchML prefetching and caching language for caching models.

Application to Modeling and Development of Embedded and Distributed Systems

- In my thesis, I work in the context of the Papyrus Designer - an extension of the Papyrus modeling tool. Papyrus Designer provides component-based modeling and code generation for distributed embedded systems, using the concepts of interaction components to model remote interactions between distributed components. I'm interested in studying methodologies for applying Papyrus Designer with its UML profile to distributed systems, especially component-based distributed reactive systems.

State Machine-Based Language Engineering and Transformation

- A major part of my thesis work is about extending, engineering, and transforming software programming language. Especially, I'm interested in extending current programming languages to support a state machine-based event-driven model for developing reactive systems.

References

Dr. Ansgar RADERMACHER
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Dr. Shuai LI
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Dr. Sebastien GERARD
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Laboratory: LISE- Papyrus development
CEA-LIST, CEA, Saclay, France

Publications

Conference Proceedings and Journal Articles

V. C. Pham, S. Li, A. Radermacher, S. Gerard, and C. Mraidha. Fostering Software Architect and Programmer Collaboration. In *21st International Conference on Engineering of Complex Computer Systems, ICECCS 2016, Dubai, United Arab Emirates, November 6-8, 2016*, pages 3–12, a.

V. C. Pham, A. Radermacher, and S. Gérard. From UML State Machine to Code and Back Again! In *Position Papers of the 2016 Federated Conference on Computer Science and Information Systems, FedCSIS 2016, Gdańsk, Poland, September 11-14, 2016.*, pages 283–290, b.

V. C. Pham, A. Radermacher, S. Gérard, and S. Li. Bidirectional Mapping Between Architecture and Code for Synchronization. In *ICSA 2017 - Proceedings of the 14th International Conference on Software Architecture, Gothenburg, Sweeden, 3-7 April, 2017.*, c.

V. C. Pham, A. Radermacher, S. Gérard, and S. Li. Complete Code Generation from UML State Machine. In *MODELSWARD 2017 - Proceedings of the 5th International Conference on Model-Driven Engineering and Software Development, Porto, Portugal, 19-21 February, 2017.*, d.

V. C. Pham, A. Radermacher, S. Gérard, and F. Noyrit. Change Rule Execution Scheduling in Incremental Roundtrip Engineering Chain: From Model-to-Code and Back. In *MODELSWARD 2016 - Proceedings of the 4rd International Conference on Model-Driven Engineering and Software Development, Rome, Italy, 19-21 February, 2016.*, pages 225–232, e.

V. C. Pham, Ö. Gürcan, and A. Radermacher. Interaction Components Between Components based on a Middleware. In *1st International Workshop on Model-Driven Engineering for Component-based Software Systems (ModComp'14)*, 2014.

V. C. Pham, A. Radermacher, S. Gérard, and S. Li. UML State Machine and Composite Structure-Based Modeling and Code Generation for Reactive Systems. *Springer Communications in Computer and Information Science*, 2017. to appear.

- V. C. Pham, A. Radermacher, S. Gérard, and S. Li. UML State Machine and Composite Structure-Based Modeling and Code Generation for Reactive Systems. *Springer Communications in Computer and Information Science*, 2017. to appear
- V. C. Pham, A. Radermacher, S. Gérard, and S. Li. Bidirectional Mapping Between Architecture and Code for Synchronization. In *ICSA 2017 - Proceedings of the 14th International Conference on Software Architecture, Gothenburg, Sweeden, 3-7 April, 2017.*, c
- V. C. Pham, A. Radermacher, S. Gérard, and S. Li. Complete Code Generation from UML State Machine. In *MODELSWARD 2017 - Proceedings of the 5th International Conference on Model-Driven Engineering and Software Development, Porto, Portugal, 19-21 February, 2017.*, d
- V. C. Pham, S. Li, A. Radermacher, S. Gerard, and C. Mraidha. Fostering Software Architect and Programmer Collaboration. In *21st International Conference on Engineering of Complex Computer Systems, ICECCS 2016, Dubai, United Arab Emirates, November 6-8, 2016*, pages 3–12, a
- V. C. Pham, A. Radermacher, and S. Gérard. From UML State Machine to Code and Back Again! In *Position Papers of the 2016 Federated Conference on Computer Science and Information Systems, FedCSIS 2016, Gdańsk, Poland, September 11-14, 2016.*, pages 283–290, b

- V. C. Pham, A. Radermacher, S. Gérard, and F. Noyrit. Change Rule Execution Scheduling in Incremental Roundtrip Engineering Chain: From Model-to-Code and Back. In *MODELSWARD 2016 - Proceedings of the 4rd International Conference on Model-Driven Engineering and Software Development, Rome, Italy, 19-21 February, 2016.*, pages 225–232, e
- V. C. Pham, Ö. Gürcan, and A. Radermacher. Interaction Components Between Components based on a Middleware. In *1st International Workshop on Model-Driven Engineering for Component-based Software Systems (ModComp'14)*, 2014

Presentation/Courses Attended

14th ICSA (International Conference on Software Architecture) — *Gothenburg, Sweeden*

Presenter for Conference Paper: Bidirectional Mapping Between Architecture and Code for Synchronization — *Apr. 2017*

- Presented an approach, which enables a bidirectional mapping between UML-based architecture model and code. This proposed mapping is part of a synchronization approach, which synchronizes code and UML-based model, using UML component-based modeling and UML state machines.

5th MODELSWARD (International Conference on Model-Driven Engineering and Software Development) — *Porto, Portugal*

Presenter for Conference Paper: Complete Code Generation From UML State Machines — *Feb. 2017*

- Presented an approach, which enables generating efficient code from UML state machines with full UML state machine features, including pseudo states and UML events. The generated code is evaluated for its runtime execution semantics conforming to the UML specification, its performance in event processing speed, and its static and dynamic memory consumption.

21th ICECCS (International Conference on Engineering of Complex Computer Systems) — *Dubai, UAE*

Presenter for Conference Paper: Foster Software Architect and Programmer Collaboration — *Nov. 2016*

- Presented a model-code synchronization methodological pattern, which allows model and code to be concurrently modified by software architects and programmers, respectively, and synchronizes the modifications made in the model and the code.

36th SEW (International Software Engineering Workshop) — *Gothenburg, Sweed*

Presenter for Conference Paper: From UML State Machine to Code and Back — *Sept. 2016*

- Presented a mapping between UML state machine elements and object-oriented code. The purpose is to provide a round-trip engineering between UML state machine and code, which means that modifications in code can be reflected back to model.

6th International Summer School on Domain Specific Modelling Theory and Practice (DSM-TP) — *Antwerp, Belgium*

Attendee at Summer School — *Aug. 2015*

- Attended as a doctoral student. I learned different concepts and practices of MDE in this summer school such as model transformation, domain-specific modeling language design, mapping abstract and concrete syntax as well as the theory of temporal logic.