# Marco Panunzio

## Curriculum Vitae

last update: December 5, 2011

## Personal

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| Family name: | Panunzio |
| First name: | Marco |
| Citizenship: | Italian |
| Marital status: | Single |
| Date of Birth: | September 28, 1982 |
| Place of Birth: | Padova, Italy |
| Current Address: | Langebrug 2A, 2311TK Leiden, The Netherlands |
| Current Employer: | University of Padova, |
| | Department of Pure and Applied Mathematics |
| | via Trieste 63, 35121 Padova, Italy |
| Homepage: | http://www.math.unipd.it/~panunzio |
| E-mail: | panunzio@math.unipd.it |

## Education

- PhD in Computer Science at the University of Bologna – University of Padova, Italy. The PhD thesis was successfully defended on May 6, 2011, and received the highest mark in the rank scale. Awarded with the "*Doctor Europaeus*" honour label, amongst the other motivations, for the research activities carried out across European research institutions.
- *Laurea Specialistica* (master's degree) in Computer Science at the University of Padova, Italy (full marks cum laude, December 2006)
- *Laurea* (bachelor's degree) in Computer Science at the University of Padova, Italy (104/110, July 2004)
- Certificate of education at the Liceo "Eugenio Curiel" (specializing in scientific studies), Padova, Italy, July 2001

## Current employment

(May 2011 – present) Post-doc research fellow in Computer Science at the University of Padova.

During my post-doc I am continuing my collaboration with the European Space Agency (ESA) toward the definition realization and evaluation of a software reference architecture for use in on-board software.
I am currently working at ESTEC, the research center of ESA in the Netherlands, where I collaborate with the "Software Systems Engineering" section of the "Software Systems" division.

In particular, since three years I am ensuring that the theoretic and methodological foundations that underpin a number of research projects with similar contexts evolve harmoniously without fundamental divergences: 1) *the outcome of my PhD/NPI investigation*; 2) *the outcome of the ESA SAVOIR-FAIRE initiative and the on-going work in the CorDeT-2 study*; 3) *the ARTEMIS JU CHESS project*

Furthermore the outcome of my PhD in terms of methodology, process and toolset support to the definition of the ESA on-board software reference architecture has been spun-in in the CoRDeT-2 study, which is the lead R&D study where those concept are to be finalized and challenged with a representative case study for the development of platform on-board software.

## Research and technology interests

- High-integrity real-time systems
  - Schedulability analysis
  - Hierarchical real-time systems
  - Ada Ravenscar Profile
- Software engineering
  - Model-Driven Engineering
  - Domain-specific modeling
  - Component-Based Software Engineering
  - Correctness by Construction
  - Software reference architectures
- Design and development of enterprise applications based on the Java EE platform

## Linguistic skills

The level of proficiency is expressed with the following values: basic, fair, good, fluent, mother tongue

- Italian                                            mother tongue
- English                                          fluent (full professional proficiency)

## Professional Experience

**On-going research projects**
- COrDeT-2 [2010-2012] – ESA contract

- CHESS [2009-2012] *"Composition with Guarantees for High-Integrity Embedded Software Components Assembly"*, funded in the scope of the "Call 1" of the ARTEMIS Joint Undertaking, grant nr. 216682

- NPI [2008-2012] Enrolled in the Networking/Partnering Initiative of the Directorate of "Technical and Quality Management" at ESA/ESTEC.

**Past research projects**
- COrDeT [2006-2009] - (*Component-oriented development technologies for on-board software*) - ESA contract 20463/06/NL/JD

- ASSERT [2004-2007] - ("*Automated System and Software Engineering for Real-Time applications*") – co-funded by the European Commission with 8.3M Euro in the scope of the Sixth Framework programme and coordinated by the European Space Agency – FP6-IST-2004-004033. *http://www.assert-project.net*

- SPADE-2 [2006-2008] - ("*Supporting Platform for Airport Decision-Making and Efficiency Analysis – Phase 2*"), funded by the European Commission in the scope of the "Sixth Framework Programme".

**Detailed summary**

*[October 2008 – present]* **NPI researcher at ESA/ESTEC**

I spent approximately 10 months of my PhD and 7 months of my post-doc as a visiting researcher at ESTEC, the research center of the European Space Agency (The Netherlands), where I am collaborating with the "Software Systems Engineering" section.

I contributed to the activities carried out by the SAVOIR-FAIRE working group, comprised of staff of ESA, CNES, DLR, SSI, Thales Alenia Space (Cannes), Astrium Satellites (Toulouse), SSF, Terma, GMV, Scisys, which was investigating the definition of a software reference architecture for on-board software.

In this period I acquired a good knowledge of the ESA R&D funding mechanism and policy, contributed to the review of technical documents from ESA-funded R&D studies and from operational projects.

I currently continue to work at ESTEC for my post-doctoral research activities.

See the post-doc and PhD description for more details.

*[January 2009 – present]* **News Editor for the Ada User Journal**

Ada User Journal aims to inform readers about recent news concerning the Ada programming language and its use, general Ada-related software engineering issues and Ada-related activities in Europe and other parts of the world.
The Ada User Journal is a quarterly journal produced by the Ada-Europe association.
The language of the journal is English.

*[January 2008 – May 2011]* **PhD student at the University of Bologna – University of Padova**

During my research activities I mainly investigated the definition of a software reference architecture for on-board software. In particular I focused on the definition of a suitable component model. As part of my PhD thesis, I created an incarnation of the component model, based on a domain-specific metamodel. The software reference architecture and the component model are the technical solutions to a set of strategical needs and high-level requirements set by the the main players of the European space domain: ESA, system and software prime contractors and the major software suppliers. In order to gather and have detailed discussions on those needs and derive a set of technical requirements for the reference architecture, I was also invited for short visits to the premises of Thales Alenia Space (Cannes) and Astrium Satellites (Toulouse).

*[October 10-17, 2007]* **Invited researcher at Thales-Alenia Space (Cannes) and Astrium Satellites (Toulouse)**

I helped the designers of the ASSERT pilot projects in using the tools (graphical editor, model-transformations, model-based schedulability analysis) that were being developed by the University of Padova and Intecs. Those tools were used to design and develop the final demonstrators of the ASSERT project, which implemented a set of use cases for satellite on-board software, targeting real hardware.

*[August 2006-December 2007]* **Software Engineer / Researcher**

ASSERT project: "Automated proof-based System and Software Engineering for Real-Time applications" (IST-FP6-2004 004033).

The main activities I carried out in the project follow:

- I devised a set of schedulability analysis equations to analyze hierarchical real-time systems abiding by the "Priority-band Architecture" and the Ravenscar Computational Model, through extension and adaptation of pre-existent theories.

- I investigated the application of state-of-the-art sensitivity analysis theories to hierarchical real-time systems.

- Extension of the well-known schedulability analysis tool MAST by the University of Cantabria (http://mast.unican.es) with the implementation of the devised schedulability analysis equations.

- Design and development of the process of "Model-based schedulability analysis", to perform the schedulability analysis of a real-time system directly on a MDE architectural description of it (its *model*) and make the results available directly in the user model.

*[October 2006 - February 2007]* **Software Engineer / Consultant**

Employer: University of Padova (formally "Consorzio Ferrara Ricerche")

I worked in the SPADE-2 project: "Supporting Platform for Airport Decision-Making and Efficiency Analysis – Phase 2", funded by the European Commission in the scope of the objective "Integrating and Strengthening the European Research Area (2002-2006), Aeronautics and Space" of the "Sixth Framework Programme".

The main activities carried out in the project were:

- selection and test of technologies, development environments and tools to be used by the team of "Consorzio Ferrara Ricerche";

- contribution to the architectural re-design of one of the pre-existent SPADE prototypes: conversion from stand-alone Java application to client-server application on J2EE platform.

- design and effective migration of a module of one of the prototypes of the SPADE project. The activity was carried out as a feasibility assessment for the migration of the whole SPADE platform.

*[April 2004 - June 2004]* **(Intern) Software designer and developer**

Employer : I.K.S. srl, corso Stati Uniti 14/bis, 35127 Padova.

I contributed to the design and development of a presentation layer tailored for web clients for "I'M", an Identity Management software solution based on the J2EE platform (visit http://www.iks.it for further information). My bachelor's thesis is based on this experience.

## Resume of technical skills
The level of proficiency is expressed with the following values: basic, fair, good, very good.

*Design and software engineering skills*
Concurrent systems (*very good*), Real-Time Systems (*very good*), Embedded systems (*good*), Component-based Software Engineering (*very good*), Model-Driven Engineering (*very good*), Metamodeling and domain-specific modeling (*good*), Code generation (*good*), Multi-core systems (*fair*)

*Programming languages*
C++ (*good*), C (*fair*), Ada (*good*), Ada *[Ravenscar profile]* (*very good*), Java (*very good*)

*Modeling and design languages*
UML (*very good*), SysML (*good*), UML/MARTE (*good*), HRT-HOOD (*fair*), AADL (*good*)

*Model transformation languages (M2M and M2T)*
ATL (*good*), QVT-o (*good*), Acceleo (*good*), MOFScript (*good*)

*Development platforms*
Eclipse (*good*), Netbeans (*fair*)

*Versioning systems*
CVS (*good*), SVN (*good*)

*Operating Systems*
Windows XP / 7 (*good*), Linux (*good*)

*Others*
EMF (*good*), EMF Validation framework (*fair*), Eclipse plugin development (good), Obeo Designer [framework for the creation of Eclipse-based graphical editors] (*good*),


**Services for the community**

Reviewer of manuscripts for the "Automated Software Engineering Journal".

Author of a mini-series of 5 Ada Gems (published by AdaCore) describing a set of code patterns for the development of Ravenscar-compliant real-time systems.
(see Gem #89, #92,  #94, #96 and #103 at *http://www.adacore.com/category/developers-center/gems/*)

**Publications**

**Journals**

D. Cancila, R. Passerone, T. Vardanega, M. Panunzio: "Toward Correctness in the Specification and Handling of Non-functional Attributes of High-Integrity Real-Time Embedded Systems".
*IEEE Transactions on Industrial Informatics*, Volume 6, No. 2, pp. 181-194, May 2010.


**International Conferences**

M. Panunzio, T. Vardanega: "A Component Model for On-board Software Applications", *36th EUROMICRO Conference on Software Engineering and Advanced Applications (SEAA 2010)*, IEEE Computer Society, pp. 57-64, September 2010.

E. Mezzetti, M. Panunzio, T. Vardanega: "Preservation of Timing Properties with the Ada Ravenscar Profile", *15th International Conference on Reliable Software Technologies - Ada-Europe 2010*, Springer – LNCS, pp. 153-166, June 2010.

M. Panunzio, T. Vardanega: "On Component-Based Development and High-Integrity Real-Time Systems.". *15th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA 2009)*, IEEE Computer Society, pp. 79-84, August 2009.

M. Bordin, M. Panunzio, S. Puri: "Rapid Model-Driven Prototyping and Verification for High-Integrity Real-Time Systems", *23rd IEEE/ACM International Conference on Automated Software Engineering*, IEEE, pp. 491-492, September 2008.

M.Bordin, M. Panunzio, T. Vardanega: "Fitting Schedulability Analysis Theory into Model-Driven Engineering", *20th EUROMICRO Conference on Real-Time Systems (ECRTS 2008)*, IEEE Computer Society, pp. 135-144, July 2008.

M. Panunzio, T. Vardanega: "An Approach to the Timing Analysis of Hierarchical Systems", *13th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA 2007)*, IEEE Computer Society, pp. 157-164, August 2007.

M. Panunzio, T. Vardanega: "A Metamodel-driven Process Featuring Advanced Model-based Timing Analysis", *12th International Conference on Reliable Software Technologies - Ada-Europe 2007*, Springer – LNCS, pp. 128-141, June 2007.

**Workshops and work-in-progress papers**

A. Zovi, M. Panunzio, T. Vardanega: "A component-based tool environment for the model-driven development of critical real-time systems: marrying software engineering to real-time systems", *RTSS@Work demo session*, held in conjunction with the *32nd IEEE Real-Time Systems Symposium*, Vienna, Austria, November 2010.

M. Panunzio, T. Vardanega: "Charting the evolution of the Ada Ravenscar code archetypes", *15th International Real-Time Ada Workshop*, to appear on *ACM SIGAda Ada Letters*, 2011.

M. Panunzio, T. Vardanega: "Common pitfalls and misconceptions of component-oriented approaches for real-time embedded systems: lesson learned and solutions". *3rd Workshop on Compositional Theory and Technology for Real-Time Embedded Systems*, in conjunction with *The 31st IEEE Real-Time Systems Symposium*, San Diego, California - USA, November 2010.

E. Mezzetti, M. Panunzio, T. Vardanega: "Bounding the Effects of Resource Access Protocols on Cache Behavior", *10th International Workshop on Worst-Case Execution-Time Analysis*, July 2010.

M. Panunzio, C. Santamaria, A. Zovi, T. Vardanega: "Correctness by Construction and Separation of Concerns in a MDE Design Infrastructure", *1st Workshop on Hands-on Platforms and tools for model-based engineering of Embedded Systems*, held in conjunction with the *6th European Conference on Modelling Foundations and Applications*, June 2010.

E. Mezzetti, M. Panunzio, T. Vardanega: "Temporal Isolation with the Ravenscar Profile and Ada 2005", *14th International Real-Time Ada Workshop*, published on *ACM SIGAda Ada Letters*, Volume XXX(1), April 2010.

M. Bordin, M. Panunzio, C. Santamaria, T. Vardanega: "A Reinterpretation of Patterns to Increase the Expressive Power of Model-Driven Engineering". *1st International Workshop on Model Based Architecting and Construction of Embedded Systems*, held in conjunction with "*The ACM/IEEE 11th International Conference on Model Driven Engineering Languages and Systems*", September 2008.

M. Bordin, M. Panunzio, T. Vardanega: "A Metamodel-driven Development for Statically Verifiable Real-Time Systems". *19th EUROMICRO Conference on Real-Time Systems (Work-in-Progress track)*, July 2007.

M. Bordin, M. Panunzio, O. Rohlik: "An Integrated Metamodel-Driven Process focusing on Reuse and Correctness". *1st Workshop on Model and Analysis for Automotive Systems*, held in conjunction with "*The 27th IEEE Real-Time Systems Symposium*", December 2006.

**Doctoral thesis**

M. Panunzio: "Definition, realization and evaluation of a software reference architecture for use in space applications". [In English]. Supervisor: Prof. Tullio Vardanega. University of Bologna, Italy. *http:// www.informatica.unibo.it/ricerca/ublcs/2011/UBLCS-2011-07*

**Master's thesis**

M. Panunzio: "Teorie e strumenti per l'analisi temporale di sistemi real-time a struttura gerarchica" (Theories and Tools for the Schedulability Analysis of Hierarchical Real-Time Systems). [In Italian]. Supervisor: Prof. Tullio Vardanega. University of Padova, Italy.

**Bachelor's thesis**

R. Cardin, M. Panunzio: "Infrastruttura di Presentazione per un sistema di Identity Management in ambiente J2EE con l'utilizzo del Framework Struts". (Presentation layer for and Identity Management system based on J2EE platform using the Struts Framework). [In Italian]. Supervisor: Prof. Tullio Vardanega. University of Padova, Italy

**Others**

SAVOIR-FAIRE working group (Jean-Loup Terraillon (ESA), Andreas Jung (ESA), Paul Arberet (CNES), Sergio Montenegro (DLR), Alain Rossignol (Astrium), Gérald Garcia (TAS), Jianning Li (SSC), Ana Isabel Rodriguez (GMV), Silvia Mazzini (Intecs), Poul Hougaard (Terma), Stuart Fowell (SciSys), Massimo Ferraguto (SSF)) and Marco Panunzio (University of Padua): Space On-Board Software Reference Architecture. *14th Eurospace Conference on Data Systems in Aerospace*, Budapest, Hungary, June 1-4, 2010.

M. Bordin, M. Panunzio, T. Vardanega: "Beyond ASSERT: Increasing the Effectiveness of Model-Driven Engineering". *13th Eurospace Conference on Data Systems in Aerospace*, May 2009.

M. Panunzio, T. Vardanega: "Application of Model-Driven Engineering to the Development of On-board Software: Benefits and Challenges", *ESA Workshop on Avionics Data, Control and Software Systems*, ESA/ESTEC, October 2008.

D. Thomas, J-P. Blanquart, M. Panunzio: "Advanced Real-Time Analysis in ASSERT – Application on Satellite Central Flight Software", *15th International Conference on Reliable Software Technologies - Ada-Europe 2008 (Industrial presentations session)*, June 2008.

M. Panunzio, J.A. Pulido, T. Vardanega: "The Priority-band Architecture: a Partitioning Approach to the Definition of Avionics Reference Architectures", *ESA Workshop on Avionics Data, Control and Software Systems*, ESA/ESTEC, October 2007.

Leiden, December 5 , 2011

Marco Panunzio