

## Fundamental Principles of Software Engineering.

*Pierre Bourque, Robert Dupuis, Université du Québec à Montréal*

This workshop aims to bring together people interested in participating in an active debate on the fundamental principles that underlie software engineering standards. What exactly are the basis on which those standards are or should be built? What should be such principles? What lessons can we draw from experience? How can we demonstrate empirically the value of industry practices or concepts related to these fundamental principles?

In the 50 year history of software development, various methodologies, methods and techniques have been proposed to facilitate the development of software responsive to needs. Many have proved to be specific to their current state of the technology or problems. As a result, most principles taken for universal then have

proved to be less than that. It even appears to be a challenge to formulate a set of fundamental principles; it is not at all obvious what their nature should be. However, at this point in history, enough such examples of methodologies, methods and techniques have accumulated that we can begin to perceive underlying principles that may, in fact, be fundamental, hence enduring in applicability. This workshop has the objective of identifying some of these fundamental principles.

This workshop will build upon the results of a first workshop on this topic held in Montreal last October during the Forum on Software Engineering Standards Issues (SES'96). Position papers and workshop report for this first workshop can be found at :

[http://saturne.info.nque.m/Labo\\_Recherche/Lrgl/ses96/](http://saturne.info.nque.m/Labo_Recherche/Lrgl/ses96/)

The Montreal workshop agreed to the following metaphor:

Conventional \_Wisdom = Folklore + Fundamental\_Principles

Which means that fundamental principles (FP) are discovered by stripping away the folklore component of conventional wisdom. The Montreal workshop established an initial list of criteria for identifying fundamental principles which need to be discussed further.

These criteria are:

- \* FPs are less specific than methodologies and techniques;
- \* FPs are more enduring than methodologies and techniques;
- \* FPs should be selected or abstracted from practice;
- \* Software engineering FPs should not contradict more general FPs, but there may be tradeoffs in their application;
- \* An FP should not conceal a tradeoff;
- \* An FP should be precise enough to be capable of support or contradiction;
- \* An FP should relate to one or more underlying concepts.

Following a recommendation of the Montreal workshop, a Delphi study among internationally recognized software engineering experts is currently being conducted on what should be the set of fundamental

principles of software engineering. A presentation by the workshop co-chairs on the results of this Delphi study will open the Walnut Creek workshop.

### AN EXAMPLE FUNDAMENTAL PRINCIPLE OF SOFTWARE ENGINEERING:

During the 1960's stepwise refinement was proposed by Wirth and others as an approach to developing algorithms in a manner which assured correctness. Harlan Mills and others scaled the technique to

the system development level with a method called top-down development. Guidelines regarding cohesion and coupling were formulated to

# Software Engineering Standards Symposium S E S S 95

**Saad Motahhir, Badre Bossoufi**



## **Software Engineering Standards Symposium S E S S 95:**

*Software Engineering Standards Symposium (SESS '95 ,1995*      **Second IEEE International Software Engineering Standards Symposium (ISESS'95) ,1995**      **Software Engineering Standards Symposium (SESS '95) ,1995-08**

Proceedings of the August 1995 symposium reflecting current research in high integrity and reliable software applications integration and harmonization of standards assessing conformance to standards and software process and product assessment Topics include requirements for abnormal conditions and events analysis automated integration for the Joint Maritime Command Information System the Rome laboratory framework as the basis for an international quality metric standard and coding regulations for safety critical software No index Annotation copyright by Book News Inc Portland OR

Index to IEEE Publications Institute of Electrical and Electronics Engineers,1995      **Industrial-Strength Formal Methods in Practice** Michael G. Hinchey,Jonathan P. Bowen,2012-12-06 Industrial Strength Formal Methods in Practice provides hands on experience and guidance for anyone who needs to apply formal methods successfully in an industrial context Each chapter is written by an expert in software engineering or formal methods and contains background information introductions to the techniques being used actual fragments of formalised components details of results and an analysis of the overall approach It provides specific details on how to produce high quality software that comes in on time and within budget Aimed mainly at practitioners in software engineering and formal methods this book will also be of interest to the following groups academic researchers working in formal methods who are interested in evidence of their success and in how they can be applied on an industrial scale and students on advanced software engineering courses who need real life specifications and examples on which to base their work      Cryptographic Security Architecture Peter Gutmann,2007-05-08 A cryptographic security architecture is the collection of hardware and software that protects and controls the use of encryption keys and similar cryptovariables It is the foundation for enforcing computer security policies and controls and preempting system misuse This book provides a comprehensive design for a portable flexible high security cryptographic architecture with particular emphasis on incorporating rigorous security models and practices Cryptographic Security Architecture unveils an alternative means of building a trustworthy system based on concepts from established software engineering principles and cognitive psychology Its novel security kernel design implements a reference monitor that controls access to security relevant objects and attributes based on a configurable security policy Topics and features Builds a concise architectural design that can be easily extended in the future Develops an application specific security kernel that enforces a fully customizable rule based security policy Presents a new verification technique that allows verification from the high level specification down to the running code Describes effective security assurance in random number generation and the pitfalls associated therewith Examines the generation and protection of cryptovariables as well as application of the architectural design to cryptographic hardware The work provides an in depth presentation of a flexible platform

independent cryptographic security architecture suited to software hardware and hybrid implementations Security design practitioners professionals researchers and advanced students will find the work an essential resource      *Proceedings of the International Conference on Computing in High Energy Physics '95*, 1996 CHEP Computing in High Energy Physics is the largest international meeting of the communities of High Energy Physics Computing Science and the Computing Industry The sixth conference in this series was held in Rio de Janeiro Brazil in September 1995 The focus of the conference was Computing for the next Millennium High Energy Physics is at a point where major changes in the way data acquisition and computing problems are addressed will be called for in the high energy physics programs of the year 2000 and beyond The conference covered a wide spectrum of topics including Data Access Storage and Analysis Data Acquisition and Triggering Worldwide Collaboration and Networking Tools Languages and Software Development Environments and special purpose processing systems The papers presented both recent progress and radical approaches to computing problems as candidates for the basis of future computing in the field of high energy physics Provided by publisher                 □□□□□□□□□□□□□□□□□□ ,1997          [Monthly Catalogue, United States Public Documents](#),1995          [Monthly Catalog of United States Government Publications](#),1994          **Index of Specifications and Standards**,2005          **Safe Comp 95** Gerhard Rabe,2013-04-18 Safety related computer systems are those which may lead to loss of life injury or plant and environmental damage Such systems therefore have to be developed and implemented so that they meet strict require and security because their applications cover ments on safety reliability nearly all areas of daily life and range from controlling and monitoring industrial processes through robotics and power generation to transport systems Highly reliable electronic systems for safety related applications represent an area in which industry has been involved for many years and which is now gaining increasing importance in academia Their relevance also results from an increased perception of safety by society Therefore not only are technicians involved in this area but psycho logical and sociological aspects also play a major role Dealing with safety related systems we have to consider the whole lifecycle of these systems starting from specification up to implementation assessment and operation All those issues mentioned above are covered in this book which represents the proceedings of the 14th International Conference on Computer Safety Reliability and Security SAFECOMP 95 held in Belgirate Italy 11 13 October 1995 The conference continues the series of SAFECOMP conferences which was originated by the European Workshop on Industrial Computer Systems Technical Committee 7 on Safety Security and Reliability EWICS TC7 and reflects the state of the art experience and new trends in the area of safety related computer systems          **Department Of Defense Index of Specifications and Standards Numerical Listing Part II November 2005** ,          *Digital Technologies and Applications* Saad Motahhir,Badre Bossoufi,2024-08-16 This book presents volume 1 of selected research papers presented at the fourth International Conference on Digital Technologies and Applications ICDTA 24 Highlighting the latest innovations in digital technologies as artificial intelligence Internet of Things embedded systems chatbot network technology digital

transformation and their applications in several areas as Industry 4.0 sustainability energy transition and healthcare the book encourages and inspires researchers industry professionals and policymakers to put these methods into practice

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,1995 **Hagenberg Research** Bruno Buchberger,Michael Affenzeller,Alois Ferscha,Michael Haller,Tudor Jebelean,Erich Peter Klement,Peter Paule,Gustav Pomberger,Wolfgang Schreiner,Robert Stubenrauch,Roland Wagner,Gerhard Weiß,Wolfgang Windsteiger,2009-05-29 BrunoBuchberger This book is a synopsis of basic and applied research done at the various research institutions of the Softwarepark Hagenberg in Austria Starting with 15 coworkers in my Research Institute for Symbolic Computation RISC I initiated the Softwarepark Hagenberg in 1987 on request of the Upper Austrian Government with the objective of creating a scientific technological and economic impulse for the region and the international community In the meantime in a joint effort the Softwarepark Hagenberg has grown to the current 2009 size of over 1000 R D employees and 1300 students in six research institutions 40 companies and 20 academic study programs on the bachelor master s and PhD level The goal of the Softwarepark Hagenberg is innovation of economy in one of the most important current technologies software It is the message of this book that this can only be achieved and guaranteed long term by watering the root namely emphasis on research both basic and applied In this book we summarize what has been achieved in terms of research in the various research institutions in the Softwarepark Hagenberg and what research vision we have for the imminent future When I founded the Softwarepark Hagenberg in addition to the watering the root principle I had the vision that such a technology park can only prosper if we realize the magic triangle i.e the close interaction of research academic education and business applications at one site see Figure 1 **Index of Conference Proceedings** British Library. Document Supply Centre,2001 **Component-Based Software Development for Embedded Systems** Colin

Atkinson,2005-12-12 This book provides a good opportunity for software engineering practitioners and researchers to get in sync with the current state of the art and future trends in component based embedded software research The book is based on a selective compilation of papers that cover the complete component based embedded software spectrum ranging from methodology to tools Methodology aspects covered by the book include functional and non functional specification validation verification and component architecture As tools are a critical success factor in the transfer from academia generated

knowledge to industry ready technology an important part of the book is devoted to tools This state of the art survey contains 16 carefully selected papers organised in topical sections on specification and verification component compatibility component architectures implementation and tool support as well as non functional properties

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