Requirenautics Quarterly

The Newsletter of the The Requirements Engineering Specialist Group of the British Computer Society

Issue 1 (October 1994)

RE-Locations

RE-Soundings

Editorial

Welcome to the first newsletter of the newly formed Requirements Engineering Specialist Group of the British Computer Society. The aims of the group are set out in the chairman's message below, and the group's mission statement, which is included later in this newsletter.

As editor, I hope to produce a newsletter that serves both researchers and practitioners in the requirements engineering community. It will contain news (of course), reviews of conferences, books, workshops, tools, methods, laboratories, etc., and informal articles of interest to the RE community. Please drop me a line if you have suggestions or contributions.

By the time your receive this newsletter, you'll either be at, or have missed the inaugural meeting, which is taking place at Imperial College on 19th October. The theme for the meeting is "Requirements Traceability" and we have included the abstracts from the four distinguished speakers, along with an article on requirements traceability in this issue of the newsletter.

Finally, we have set up a world wide web page for the group, which will contain information about the group, news, and links to interesting resources on the internet, including the archives of the electronic news compiled by Anthony Finkelstein. The web page can be found at:

    http://www.cogs.susx.ac.uk/users/steveea/re/

Steve Easterbrook,
Sussex University

Chairman's Message

As computer systems are used by an increasing number of individuals and organisations, software engineers are faced with an increasing number of customers who have a wide range of requirements for the systems they wish to deploy. Understanding customer requirements, assessing their feasibility, handling their inconsistencies, and specifying them in a form that may used by system designers, are all challenges that requirements engineering seeks to address. For many years, the importance of requirements engineering has been recognised as a critical step in software development. This has been supported by numerous studies that demonstrate the added expense of fixing errors in the later phases of development.

The last few years in particular have seen increased activity and interest in the field of requirements engineering, and regular international conferences and symposia have been set up. The newly established IFIP working group (2.9) on requirements engineering will meet for the first time in the UK in March 1995, and the 2nd International Symposium on Requirements Engineering will be held in York later that month. The UK requirements engineering community has led the way in furthering research and practice in the field.

The Requirements Engineering Specialist Group of the British Computer Society (BCS) has been set up to support this thriving community, by providing an organised forum for education, debate and technology transfer. The vehicles for achieving this are meetings and tutorials around specialist themes (held in a variety of locations in the UK), sponsorship of publications and meetings, and a regular newsletter. Thus, the aim is to establish a valuable resource for requirements engineering activity in the UK.

As with all BCS specialist groups, the success of a group depends on the participation and involvement of its membership. The executive committee welcomes suggestions for meetings, speakers from both industry and academia, articles for the newsletter and, where possible, attendance at meetings.

Thank you for your interest in the group. I hope you will join me and the hard-working committee in making it a success.

Bashar Nuseibeh,
Imperial College

RE-News

REFSQ Proceedings Available!

The proceedings of the First International Workshop on Requirements Engineering: Foundation of Software Quality (REFSQ) were published by Augustinus Verlag and can be ordered by sending an email to: {peter,pohl}@informatik.rwth-aachen.de (cost: DM40 / £17 / US$27) A workshop summary, including an evaluation of the talks, can be gained via anonymous ftp from:
ftp.informatik.rwth-achen.de, in the directory: /pub/NATURE/REFSQ/WS-summary.ps.Z

Calendar

January 1995

International Workshop on Modelling, Analysis and Simulation of Computer and Telecommunication Systems (MASCOTS'95), Durham, North Carolina, USA, January 18 - 20, 1995

February 1995

The 9th Knowledge Acquisition for Knowledge-Based Systems Workshop (KAW'95), Banff, Canada, February 26 - March 3, 1995. Includes a track on Knowledge Acquisition and Requirements Engineering.

March 1995

Second IEEE International Symposium on Requirements Engineering (RE95), York, England, 27-29 March 1995

April 1995

17th International Conference on Software Engineering (ICSE-95), Seattle, Washington USA, April 24-28, 1995

RE-Treats

Forthcoming events organised by the group:

Wednesday, 19th October 1994, 2:00-5:00pm

Inaugural Meeting of the BCS Requirements Engineering Specialist Group

Theme: Requirements Traceability

Place: Room 418, Department of Computing, Imperial College, 180 Queen's Gate, London SW7 2BZ (nearest tubes: Sth. Kensington and Gloucester Rd.

Wednesday, 25th January 1995, 2pm

Theme: Enterprise Modelling

Place: University of Manchester (exact details later).

Speakers will include Prof. Peri Loucopoulos and Prof. John Dobson

Look out for email announcements for details.

RE-Mission

Requirements engineering is the elicitation, definition, modelling, analysis, specification and validation of the needs of a computer system. It is multi- disciplinary and draws on techniques from software engineering, knowledge acquisition, cognitive science and the social sciences to improve software engineering practice. The Requirements Engineering Specialist Group (RESG) welcomes members from, and undertakes events for, both practitioners and academics in requirements engineering.

RESG offers the opportunity to requirements engineering practitioners and researchers to exchange experiences and new technologies through workshops, seminars and tutorials on all aspects of requirements engineering. These include, but are not restricted to:
- case studies and experiences;
- standards;
- methods and environments;
- formal representation schemes and specification languages;
- descriptions of the requirements engineering process;
- validation, elicitation, traceability, metrics, reuse, prototyping, animation, and execution of requirements;
- multiple viewpoints;
- non-functional requirements
- acquisition of requirements through reverse engineering and re-engineering;
- domain modelling and analysis;
- artificial intelligence techniques;
- cognitive science and human-computer interaction;
- requirements for the human-computer interface of computer systems;
- group and co-operative work, including ways to overcome barriers to communication;
- organisation modelling, including identification of stakeholders;
- political and cultural issues;
- philosophical and social underpinnings.

A regular newsletter is distributed to all members of RESG. Books on various aspects of requirements engineering are also planned. Proceedings of seminars, workshops and conferences organised by RESG will be published. Members of RESG can expect to get substantial discounts on conferences, workshops and tutorials.

To join the group please contact: Sara Jones, School of Information Sciences, University of Hertfordshire, Hatfield AL10 9AB, UK, S.Jones@Herts.ac.uk

RE-Issues

Requirements Traceability

The theme for the inaugural meeting on 19th October is Requirements Traceability. Here we present the abstracts from the invited talks on 19th, followed by a short article on requirements traceability by Mack Alford.

PROGRAMME:

Introduction: Bashar Nuseibeh (Imperial College), "The Requirements Engineering Specialist Group of the BCS".

Requirements Traceability: research problems and research directions

Prof. Anthony Finkelstein, City University

My talk will concentrate on outstanding problems in requirements traceability and will attempt to define a research agenda in this area. I will consider requirements traceability in the context of software engineering research. I will briefly review the state-of-the-art. I will point to areas in which further work is needed. I will suggest some promising research directions in these areas.

Information linkages within projects

Richard Stevens, QSS Oxford

Traceability is one form of the links that represent the relationships between different elements within a project. Links can be used, for example, as a path to replicate information (hypertext), or to represent the relationship back to a customer requirement (contractual traceability). But many other types of links are needed including:

- Applicability links - where a non-functional requirement is applied to a functional requirement;
- Grouping links - representing connections between grouped items;
- Interface links - representing the flow of information or physical material between two components inside a system;
- Control links - representing the control paths between system components;
- Test links - between requirements, test system and product;

The types of links needed cannot be defined in advance. In any individual project, users will need to make arbitrary types of links to express the re-use of components, or the different types of users involved, or the safety criticality of different functions.

Building a system requires a variety of models, and links are the means by which different models interact. The systems process, expressed by the systems standard involved, defines the models, the types of links that are necessary, when they need to be made, and when they can be broken. Linkages are expensive both to make and to change. A fundamental objective of a system standard is actually to minimise the need to make and to change linkages (to avoid circular links for example). Traceability is therefore defined as a by-product of the systems definition process.

The 4 Levels Of Requirements Traceability

Dr. Laurence James, Marconi Systems Technology

In this talk I describe the different levels of traceability in typical use both in projects and in real life The Requirements & Traceability Management (RTM), is used to illustrate these different levels.

RTM is a suite of multi-user configurable tools designed to facilitate the capture, management, traceability and documentation of systems engineering data in the many forms that it exists within the systems development lifecycle. This includes support for both textual and graphical requirements data, data held in Computer Aided Systems Engineering (CASE) tools such as "RDD100", "Teamwork" or "Software Through Pictures" as well as engineer specifiable (generic) information sets.

Tracing Requirements Through Design

Professor David Budgen (Keele University)

The activities of requirements elicitation and design development may both make use of `scenarios' to explore the attributes and properties of a problem (requirements) and the proposed solution (design). The criteria used for choosing scenarios seem to be largely if not completely `ad hoc' in nature, and my presentation will discuss some ideas about how these might be derived in a more systematic manner.

RE-Readings

Types Of Traceability

Mack Alford

Alford Enterprises

Traceability has re-emerged as an interesting topic in Requirements Engineering conferences. While this interest is worthwhile, it is still useful to put this interest into perspective by reviewing how the topic originated and how it has been changing over the past 40 years.

With the emergence of systems engineering in the late 1950s, it was realised that a system had to be designed to satisfy the customer's requirements. In the context of contracts between the military as customer, it became necessary for a contractor to show that the delivered system satisfied the customers requirements and all applicable standards (e.g., environment, safety, etc.). Contract law grew up to differentiate the statements which the contractor must satisfy, designated with words like "the system shall...", from statements which were provided as guidance, designated with words like "the

system will...". In practice, each of the "shall"s were identified, and paper documents were produced to demonstrate that each such customer requirement was satisfied by tracing it to a series of specifications of the system and its components; and each such statement was then the subject of an inspection, analysis, demonstration, or test to demonstrate compliance (see for example, Chestnut's 1975 book on Systems Engineering). I call this " R to R to T" traceability, because it traces a high level Requirement to lower level Requirements and Tests.

This approach became a legally required state of the practice of Systems Engineering on all DoD Contracts. Thus traceability was originally developed as a mechanism to ensure that what was delivered satisfied the requirements as originally written. It was accomplished with typewriter and paper. Because of the difficulty of changing typewritten documents, traceability was not usually kept up to date as the system changed, and sometimes systems failed because of it. For example, Apollo 13 failed in part because the original requirement for Apollo spacecraft to only use 12V battery power was changed 18 months after the program started to use 60V AC power as well, and one of the subcontractors who delivered a thermocouple did not get the message. Similarly, the Shuttle environment requirement was to be able to launch from 31F to 31F degrees, while the Booster requirement only specified launch temperature at 55 degrees, a clear loss of traceability that led to loss of life.

When software engineering came along, since software was a component, the traceability from requirements to design became a necessary activity there as well. When computers became cost effective for keeping requirements information in the 1970s, this kind of traceability was implemented with database technology. This allowed "R to R to T" traceability to be implemented and kept up to date much more efficiently. But the difficulty of performing upgrades on systems, especially software systems, showed that simple "R to R to T" traceability was necessary for developing systems, but insufficient to be able to maintain them. Whole systems were thrown away because no one could determine how to modify them because the decisions that led to the system were not recorded.

In the mid 1970s, following a recent paper in the literature, the SREM project incorporated the decisions into the traceability. We might call this "R to D to R" traceability, where D stands for a decision. While published, it had no effect on the state of the practice until the cost of interactive processing came down in the late 1980s when it was implemented in Ascent Logic's RDD-100. Several thousand engineers are now using this tool and others (e.g., Vitec's CORE, DOORS) to implement these concepts. The intent is to enable tracing requirements to decisions to where they influence a design, and the reverse, so that when changes occur, the changes can be traced through the entire system, and modifications can be reliably performed.

Recently, this "R to D to R" style traceability has been adapted as a mechanism to demonstrate compliance of a proposed system to the thousands of environmental rules and regulations promulgated by city, county, state, and federal agencies in the U.S. for waste disposal systems. This allows the documentation of HOW the laws were interpreted and HOW they claim to be satisfied.

In the late 1980s papers started to appear proposing keeping traceability of goals to subgoals to arguments to requirements. We might call this "G to R" traceability, going from the Goals to the Requirements, coming much earlier in the system development cycle.. Note that the intent here is to demonstrate that all goals have been considered in coming up with the requirements, and showing HOW and WHY a goal is satisfied, not just where. This could also be used to show the trade-off of requirements against cost, schedule, risk, etc., thus treating requirements as "soft" rather than "hard".

In summary, the concept of traceability has evolved over the past 40 years to meet many new needs of application and to take advantage of the availability of low cost computing. Perhaps we need to start using phrases to identify the specific kind of traceability we are interested in -- requirements traceability, decision traceability, and goals traceability -- and make clear the intent of the traceability, not just the mechanisms.

RE-Calls

A summary of recent conference announcements and calls for papers. These are provided merely as reminders: please refer to the full calls for details about topics covered, types of submission, and how to submit.

The Fourth European Conference on Computer Supported Co-operative Work (ECSCW95) Stockholm, Sweden, Sept 11-15 1995.

Submission Deadline: February 1, 1995

Web page: http://www.nada.kth.se/ecscw95/

Email: ecscw95@kth.se

Symposium on Designing Interactive Systems: Processes, Practices, Methods, and Techniques (DIS'95) University of Michigan, Ann Arbor USA, August 23-25, 1995

Submission Deadline: February 10, 1995

Enquiries: Sue Schuon, Collaboratory for Research on Electronic Work, University of Michigan, sues@umich.edu

The 7th Conference on Advanced Information Systems Engineering (CAiSE*95), Jyvaskyla, Finland, 12-16 June 1995.

Theme: Information Systems Engineering: Current Practice and Future Prospects.

Deadline for papers, panel proposals, tutorial proposals: 30 November 1994

Email: caise95@jyu.fi

Fifth International Symposium of The National Council on Systems Engineering (NCOSE), Saint Louis, Missouri, July 24-26, 1995

Theme: "Systems Engineering in the Global Market Place."

Draft Paper Submission: Sept 29, 1994

Enquiries: Bill Schoening, email: schoening@mdafltsim.mdc.com

International Working Conference on Information System Concepts: Towards A Consolidation Of Views (ISCO3), Marburg/Germany, 28-30 March 1995

Papers due: 28 October 1994

http://WWW.mathematik.uni-marburg.de/~isco3

Email: isco3@mathematik.uni-marburg.de

IFIP WG8.1 Working Conference On Information System Development For Decentralised Organisations, Trondheim, Norway, 21-23 August, 1995

Deadline for Papers: 10 February, 1995

Enquiries: johnkrog@idt.unit.no

http://www.idt.unit.no/~johnkrog/ifip.html

Second International Conference on Concurrent Engineering: Research and Applications (CE95), Washington DC, August 28-30, 1995

Deadline for papers: 1 January 1995

Conference Chair: Anand J. Paul, Concurrent Technologies Corporation, paul@ctc.com

3rd International Conference on Conceptual Structures (ICCS'95), University of California, Santa Cruz, August 14-18, 1995

Deadline for papers: December 12, 1994

Program Chair: Gerard Ellis, Computer Science Dept, RMIT, Melbourne, Australia, ged@cs.rmit.edu.au

http://www.cs.rmit.edu.au/ICCS95/

Special Issue of the IEE/BCS Software Engineering Journal on "Viewpoints for Software Engineering".

Submission Deadline: 30th December 1994.

Edited by: Ian Sommerville and Anthony Finkelstein.

E-mail: is@comp.lancs.ac.uk

RE-Actors

The committee of RESG are:

Chair: Dr Bashar Nuseibeh, Imperial College London (ban@doc.ic.ac.uk);

Treasurer: Dr Neil Maiden, City University, London (N.A.M.Maiden@city.ac.uk)

Secretary: Paul Gough, Philips Labs (gough@prl.phil.co.uk)

Membership Secretary: Sara Jones, University of Hertfordshire (S.Jones@herts.ac.uk)

Newsletter Editor: Dr Steve Easterbrook, University of Sussex (steveea@cogs.susx.ac.uk)

Industrial Liaison Officer: Orlena Gotel, Imperial College London (oczg@doc.ic.ac.uk)