

# Examinable material for INF5360/ INF9360 spring 2013

## A. Seminar topics with emphasis on Adaptability

### A.0: Introductory material

- Overview slides on self-adaptive software and slides on the MAPE-K control loop model.
- Distributed Systems: Principles and Paradigms, A. S. Tanenbaum, M. Van Steen, Prentice Hall, 2nd edition, 2007. chapter 2, section 2.3 (pages 54-58)  
Introduces general approaches to adaptive software.

- Composing Adaptive Software, P. K. McKinley et al, IEEE Computer, 2004 (9p): Overview of techniques for compositional adaptation.

- M. Salehie, L. Tahvildari, "Self-Adaptive Software: Landscape and Research Challenges", ACM TAAS, 2009.

Provides good survey on self-adaptive software. Focus on section 2 and 3. The paper introduces an adaptation control loop framework (sect 2) and taxonomy of self-adaptation (sect 3).

### A.1: Architecture-based self-adaptation

- An Architecture Based Approach to Self-Adaptive Software, P. Oreizy et al, IEEE Intelligent Systems, 1999 (9p). Visionary paper. Introduce the fundamental role of software architecture in self-adaptive systems.

- Rainbow: Architecture-Based Self-Adaptation with Reusable Infrastructure, David Garlan et al, IEEE Computer 37, 10, 2004 (9p)

### A.2: Context-aware and model-driven self-adaptation:

A Development Framework and Methodology for Self-Adapting Applications in Ubiquitous Computing Environments, Hallsteinsen et al, Journal of Systems and Software (JSS) 85, Elsevier, 2012, pp 2840-2859

A recent and fairly complete description of the MUSIC middleware and development tools.

### A.3: Reflective middleware

- Coulson G., Blair G., Grace P., Joolia A., Lee K., Ueyama J. OpenCOM v2: A component model for building systems software. Proceedings of IASTED Software Engineering and Applications (SEA). ESA, Cambridge, MA, November 2004 (6p)

The paper provides an introduction to OpenCOM v2 which is a generic component model for building middleware systems.

- Grace, P., Blair, G.S., Samual, S., "ReMMoC: A Reflective Middleware to Support Mobile Client Interoperability", Proceedings of the International Symposium on Distributed Objects and Applications (DOA'03), Catania, Sicily, November 2003.

ReMMoC is an OpenCom based middleware providing pluggable and reflective service discovery and binding frameworks supporting mobile client interoperability.

- Extra paper for PhD students: Coulson, G., Grace, P., Blair, G., Cai, W., Cooper, C., Duce, D., Mathy, L., Yeung, W.-K., Porter, B., Sagar, M., and Li, J. A Component-based Middleware Framework for Configurable and Reconfigurable Grid Computing. *Concurrency and Computation: Practice and Experience* 18, 8 (July 2006), 865-874.

GridKit introduces a configurable overlay framework supporting resource sensitive heterogeneous grid computing.

#### **A.4: Dynamic aspect weaving for dynamic adaptation**

- P. Grace, B. Lagaisse, E. Truyen, and W. Joosen. A Reflective Framework for Fine- Grained Adaptation of Aspect-Oriented Compositions. In 7th Int. Symposium on Software Composition (SC), volume 4954 of LNCS. Springer, Mar. 2008.

The paper illustrates how aspects and reflection can be used to provide fine-grained software adaptation of cross cutting concerns.

A basic knowledge of aspect-oriented programming is assumed (see e.g. Wikipedia).

#### **A5: Adaptable Service Composition for Dynamic Service Oriented Environment**

- N. Ben Mabrouk and V. Issarny et al. QoS-aware service composition in dynamic service oriented environments. In Proceedings of the 10th ACM/IFIP/USENIX International Conference on Middleware (Middleware '09). Springer-Verlag New York, Inc., New York, NY, USA, , Article 7 , 20 pages. 2009.

This paper presents an efficient service selection algorithm that provides the appropriate ground for QoS-aware service composition in dynamic service environments.

- L. Cavallaro, E. Di Nitto, C. A. Furia, and M. Pradella. A Tile-Based Approach for Self Assembling Service Compositions. In Proceedings of the 2010 15th IEEE International Conference on Engineering of Complex Computer Systems (ICECCS '10). IEEE Computer Society, Washington, DC, USA, 43-52. 2010.

This paper presents an approach to the design of self-adaptive service-oriented applications based on a new model called service tiles.

A basic knowledge of service-oriented computing is assumed (see e.g. Papazoglou and Georgakopolous, "Service-Oriented Computing", CACM 46(10), 2003, pp 25-28.).

## **D. Seminar topics with emphasis on dependability**

### **D1: Introductory material**

- The overview slides.
- Chapter 8 in the Tanenbaum and van Steen textbook.

### **D3: Scalable membership management and failure detection**

- Correctness of a Gossip Based Membership Protocol by Andre Allavena, Alan Demers and John Hopcroft

Skip the appendix. You can also avoid some math in Sections 4.2 and 4.3.

The focus should be on the techniques of mixing and reinforcement, desirable overlay properties, and how the former contribute to the latter.

### **D4: Failure Detection and its QoS**

- "On the Quality of Service of Failure Detectors" by Chen, Toueg, and Aguilera. Consider the 2002 version published in the IEEE Transactions on Computers. Skip the appendix. Furthermore, avoid some of the heavier math in Sections 2.4, 3.3, 4, 5, and 6.

"The Accrual Failure Detector" by Naohiro Hayashibara, Xavier Defago, Rami Yared, Takuya Katayama published at SRDS 2004. You can skip Sections 6.2 and 6.3 altogether.

### **D6: Optimistic Replication**

- "Optimistic Replication" by Saito and Shapiro.

Beware the very broad scope and the high number of citations. Skip most citations. Skip Section 4 as most of it was taught in INF5040. Focus on the overview and be selective when it comes to the technical details in Sections 5 to 7.

### **D7: Paxos and distributed coordination**

- An overview of Paxos and its different types: [http://en.wikipedia.org/wiki/Paxos\\_algorithm](http://en.wikipedia.org/wiki/Paxos_algorithm)

The focus is on the goals, roles of the nodes, message types and information sent in each message, different Paxos flavors, and comparison between them.

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