JCOMSS: PAPER PREPARATION GUIDELINES

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Format: two-column format

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Spaces between columns: 0.4 cm

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IMPORTANT:

1. Please fit font size, style, and other things **according the enclosed sample pages (particularly please take into account the IEEE Trans. style and formating**!

A Historical Perspective on the Evolution of Software Architecture (font size 24)

First A. Author, Fellow, IEEE, and Second B. Author (font size 11)

***Abstract*—The evolution of software architecture, including operating systems and applications, spans from batch systems on big iron to today's hand-held devices, and is now reaching into ubiquitous computing objects as evident in efforts such as JINI and Bluetooth. In digital telecommunication, the origins came from PCM and Ethernet, via OSI's X.25 to fast packet-switching realized in Frame Relay and ATM and now culminate in the exploding Internet environment. (font size 9, bold)**

***Index terms*—software architecture, operating systems, distributed systems. (font size 9, bold)**

I. Introduction (font size 10, Small Caps)

This paper is an essay that tries to identify and explain the overarching concepts, principles, and approaches in the field of software architecture as it evolved during the first half century of its lifetime. It is inspired by the approach taken by eighteen's century historians and philosophers (Dilthey, Hegel) called "history of ideas" (Ideengeschichte).

We start out by giving our definition of architecture which leads to the first basic concept of the operating system as a metaphor of an interface transformation between hardware and software.

The paper is organized as follows. Section I. describes…

II. Architecture

What do we mean by software architecture? We actually give two complementary meanings. In analogy to the approach of the architect involved in construction of buildings, we separate the architecture into exo-architecture which looks at the system from the "outer" side, i.e. the appearance of the system to their users, and into endo-architecture which looks at the "inner" side, i.e. the internal structure as seen by the builders [1].

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Digital Object Identifier (DOI): 10.24138/jcomss.v1XiY.ZZZ (font size 8)

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*A. Distributed Systems **(font size 10, Italic)***

A.1 Overview (font size 10)

We consider a "distributed system" to be a set of programs running on separate physical systems (not necessarily in a geographically spread network) which communicate and/or cooperate with one another. In our view, the deciding characteristic is that communications can fail in an unpredictable manner, and the distributed system has to be prepared for such failures [2]. Such systems show therefore non-deterministic behavior.

III. Networking

How does a network differ from a distributed system? In Fig. 1 we view the boundaries between them as floating.

The most important distinction in our view is the network's necessity to deal with change, with change being a mandatory phenomenon in networks, but not necessarily in distributed systems.

TABLE I
Impact of Number of Nodes (font size 8, Small Caps)

It follows from (1)

$$L(\hat{x}_i) = L_{c,i}(y_i) + L(x_i) + L_e(\hat{x}_i) \qquad (2)$$

The most important distinction in our view is the network's necessity to deal with change, with change being a mandatory

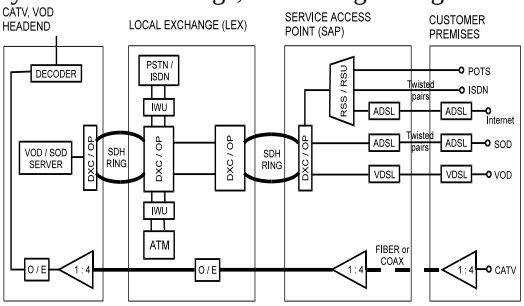

Fig. 1. Network architecture [3] (font size 8)

From the point of view of system optimization, media coding/decoding scheme should be considered in the similar way as channel coding/decoding scheme in telecommunications. However, there is a very significant difference between the restrictions imposed on the two systems. Indeed, in telecommunication systems an important design issue which restricts channel coding efficiency is a trade-off between embedded redundancy needed for error control and the required channel capacity (bandwidth and/or power) due to the increased signaling rate. In public communications, the amount of the embedded redundancy is not commonly a restricting factor which makes the media MAP decoding even more powerful. It could be said that in human communications the embedded redundancy is "gratis" since people use to repeat sentences, data, photos etc. Generally, in public communications embedded redundancy is "gratis" since different printed and electronic media are practically competing in publishing information interesting for people (users).

In addition, since media decoder works with symbols from the same alphabet as used by the source, media decoder may entirely exploit the source redundancy to minimize error probability.

IV. Concluding Remarks

Finally, if over the first fifty years of its life the computing/communication environment merely reflected the culture in which it grew, the next fifty years may very well see a development where the converging electronic technologies will dominate the culture; in that sense the new millennium we are about to begin could become the era of electronic culture or in current parlance of "e-culture".

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First A. Author was with AT&T Bell Labs (now Lucent Technologies) from 1965 to 1989, working on applied research projects in operating systems, packet switching and telecommunication software. From 1990 to 1995, he was ISS Professor of Telecommunication at Arizona State University with research in telecommuni-cations software architecture as applied to mobile communication and network management.Since 1992 he has also been giving short courses on related subjects in many countries. State University in the Fall of 1990. His current research program in networking includes work in the areas of control of ISDN/Broadband ISDN networks, mobile communication networks, and multimedia communication, which ranges from call processing for intelligent network services to network management. Research emphasis is on advanced software technologies for development of telecommunication networks, as used in switches, for signalling and in network management, with a focus on object and component technology and formal definition techniques. He is member of ACM, IEEE, IEEE Computer and Communication Societies. (font size 8)

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