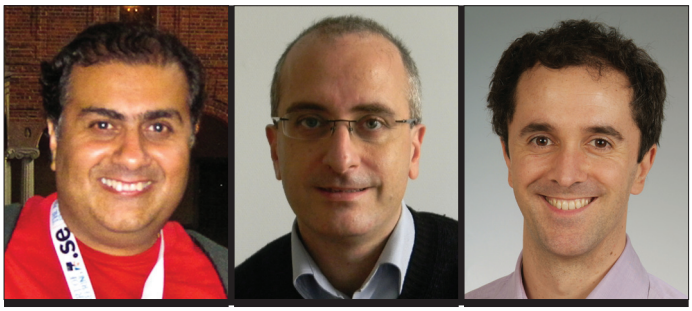
DESIGN AND IMPLEMENTATIONS SERIES XI



Vijay K. Gurbani *Salvatore Loreto* *Saverio Niccolini*

Welcome to the 11th installment of the Design and Implementation (D&I) Series. The D&I Series was created with a specific goal: to facilitate knowledge transfer between scientists and industry-oriented engineers. In contrast to the classic academically oriented articles on communication technologies, D&I articles focus primarily on the practical "lessons learned" that are gained while designing, implementing, and deploying new communications products, services, and solutions.

"Lessons learned" include not only the final design of the solution, but also mistakes, trade-offs, redesigns, re-engineering, bugs, protocol and standard inadequacies, inefficiencies, interoperability issues, and other "negative" results. Traditionally, such results are considered non-publishable by academia and trade secrets or competitive intelligence by industry — but in fact these results are the most valuable information for the IEEE Communications Society's industry members because it potentially reduces time and cost for their similar projects while improving quality. IEEE academic members can use them as guidance for further research or standardization work.

Before summarizing the articles in this installment, please welcome Vijay Gurbani as the new D&I Series Co-Editor. Vijay is a Distinguished Member of Technical Staff at Bell Laboratories, Alcatel-Lucent, and a multiple contributor to IETF standardization. His professional biography appears at the end of this editorial.

This installment's topic areas include design and implementation of location services in wireless sensor environments and in operator-owned content delivery networks.

LOCATION SERVICES IN WIRELESS SENSOR ENVIRONMENTS

In an increasingly mobile-centered world, sensing context is becoming of paramount importance to provide successful (mobile) services. Location is a key element of space context information, and location information needs to be exchanged across multiple devices and services. In this scenario, the Open Mobile Alliance (OMA) standardized the RESTful location (web) services for terminal location. The article describes the motivating scenario for the adoption of such web services in a wireless sensor environment (i.e., the tracking of people/assetd in large buildings), along with the identified key requirements to be addressed by this design and implementation work. The article written by Asadul Islam, Fatna Belqasmi, Roch Glitho, and Ferhat Khendek brings the reader through the design of an architecture using OMA RESTful location services in a wireless environment along with the definition of interfaces and procedures, and reports the details on the implementation together with performance measurements. In the lessons learned section, the authors discuss how to efficiently use location information at the necessary level of granularity needed in a large building scenario as well as providing useful suggestions for extending OMA specifications and on how to make the best use of the technology and tools available.

DESIGN PRINCIPLES OF AN OPERATOR-OWNED CONTENT DELIVERY NETWORK

Network operators are facing a strong challenge in dealing with the tremendous increase of bandwidth-hungry video services. With average revenue per user (ARPU) stable, network operators are not willing to increase their investments to continuously boost the capacity of the network infrastructure without a proper foreseeable return on investment (RoI). For this reason, operators are looking at ways to reduce the pressure of video services on their backhaul and core networks. This article presents the design of an operator-owned highly distributed content delivery network architecture that allows an operator to keep traffic local by extending the coverage of traditional CDNs with caching locations much closer to users. The authors of this article focus, inside this huge design and implementation space, on providing guidance for practitioners to four specific areas: how to select location of cache servers in order to satisfy the design goal of network-tailored cache placement; how to implement request routing mechanisms in order to satisfy the requirement of being network-aware; how to perform content replica placement in a balanced manner; and how to achieve flexible content outsourcing/retrieval.

BIOGRAPHIES

VIJAY K. GURBANI [M'98] (vkg@bell-labs.com) is a Distinguished Member of Technical Staff in the Multimedia Domain at Bell Laboratories, Alcatel-Lucent. He holds a B.Sc. in computer science with a minor in mathematics and an M.Sc. in computer science, both from Bradley University, and a Ph.D. in computer science from Illinois Institute of Technology. His current work focuses on Internet multimedia session protocols and peer-to-peer (P2P) networks. He is the author of over 50 journal papers and conference proceedings, five books, and 13 IETF RFCs. He is currently Co-Chair of the Application Layer Traffic Optimization (ALTO) Working Group in the IETF, which is designing a protocol to enable efficient communications between peers in a P2P system. His research interests are multimedia services, multimedia signaling protocols, security of Internet multimedia protocols and services, and P2P networks and their application to various domains. He holds four patents and has nine applications pending with the U.S. Patent Office. He is a senior member of the ACM, and a member of the IEEE Computer Society and Usenix.

SALVATORE LORETO [M'01, SM'09] (salvatore.loreto@ieee.org) has 15 years of experience in a variety of information and communication industries, and has been working in networking and telecommunications since 1999. Currently, he works as a research scientist in the MultiMedia Technology section branch, which is part of the NomadicLab, at Ericsson Research Finland. He has made contributions in Internet transport protocols (e.g., TCP, SCTP), signal protocols (e.g., SIP, XMPP), VoIP, IP-telephony convergence, conferencing over IP, 3GPP IP Multimedia Subsystem (IMS), HTTP, and web technologies. He is also an active contributor to the IETF, where he has coauthored several RFCs and Internet drafts. Currently he is serving within the IETF as Co-Chair of the SIP Overload Control (soc), Application Area (appsawg), and BiDirectional or Server-Initiated HTTP (HyBi) Working Groups. For the IEEE Communications Society, he serves as a Design and Implementation Series Co-Editor and an Associate Technical Editor for *IEEE Communications Magazine*. He received an M.S. degree in engineer computer science and a Ph.D. degree in computer networking from Napoli University in 1999 and 2006, respectively.

SAVERIO NICCOLINI (saverio.niccolini@neclab.eu) has more than 10 years of experience in information and communication technologies, and has been in the networking and telecommunications industries since 2001. Currently, he leads a research group focusing on the areas of network traffic monitoring, real-time communications and service analytics, and software-defined networking inside the network research division of NEC Laboratories Europe in Heidelberg, Germany. He has made several contributions to improve technologies for Internet-based service operations and management including, but not limited to, real-time communications monitoring and overload control, streaming analytics of service records, and distributed systems for content delivery. He has also been an active contributor to the IETF, where he has coauthored several RFCs and Internet drafts in the operations and management area (e.g., on packet sampling, traceroute measurements, and SIP peering). For the IEEE Communications Society, he serves as a Design and Implementation Series Co-Editor. He received an M.S. degree in telecommunications engineering and a Ph.D. degree in information engineering from the University of Pisa in 1999 and 2006, respectively. from Napoli University in 1999 and 2006, respectively