

Alexander Clemm
Ralf Wolter *Editors*

Advances in Network-Embedded Management and Applications

Proceedings of the First International
Workshop on Network-Embedded
Management and Applications
October 28, 2010, Niagara Falls, Canada

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Preface

It is a great pleasure to present the proceedings of the 1st International Workshop on Network-Embedded Management and Applications, NEMA. NEMA was held on October 28, 2010, in Niagara Falls, Canada, in conjunction with the 6th International Conference on Network and Service Management (CNSM), the former Manweek. It was technically co-sponsored by the IEEE Communications Society and by IFIP. The goal of NEMA was to bring together researchers and scientists from industry and academia to share views and ideas and present their results regarding management (and other) applications that are embedded inside the network, as opposed to merely attached to a network. It is the first workshop dedicated to this particular topic. The workshop's Web site can be accessed at <http://nema.networkembedded.org/>, where also future editions will be announced.

The motivation behind NEMA is the general trend of modern network devices to become increasingly “intelligent” and programmable. Examples range from router scripting environments to fully programmable server blades. As a result, networked applications are no longer constrained just to servers that are interconnected via a network, but can migrate into and become embedded within the network itself. This promises to accelerate the current trend towards systems that are increasingly autonomous and to a certain degree self-managing. There are several drivers behind this trend: Equipment vendors continue to add value to the network to counter commoditization pressures. Network and service providers desire to adapt and optimize networks ever more closely to their specific environment. The emergence of cloud in the data center context has provided powerful evidence how programmable networking infrastructure which facilitates automation of management tasks can lead to entire new business models. In addition, there is growing recognition of the importance to make network operation and administration as easy as possible to contain operational expenses, pushing functions into the network that used to be performed outside, and to be able cope with control cycles that need to keep getting shorter from the time that observations are made to the time action occurs.

As network devices are being increasingly opened up to in a way that allows them to be programmed, the network itself is becoming a platform for a whole new ecosystem of network-embedded applications serving management and other purposes. The next frontier lies in applications that go beyond traditional management and control functions and that are becoming increasingly decentralized, not constrained in scope to individual systems. Examples include decentralized monitoring, gossip-based configuration, network event correlation inside the network across multiple systems, overlay control protocols, and network-aware multi-media applications. At the same time, another trend looks at leveraging increased programmability of networks, specifically programmability of data and control plane, to add more networking intelligence also outside, not inside the network. This is an exciting time for both researchers and practitioners, as these trends pave the way for another wave of exciting new opportunities for innovation in networking.

The six papers that were selected from the submissions to NEMA represent a wide cross section of varying interpretations of this theme and are divided into two parts. Part One covers enablers for network-embedded management applications – the platforms, frameworks, development environments which facilitate the development of network-embedded management and applications. Starting with the general topic of how to instrument systems for management purposes and transition from legacy command-driven to model-driven architectures, it proceeds with a set of papers that introduce specific examples of hardware- and software based programmable platforms, namely a programmable low-power hardware platforms, as well as an application framework for programmable network control that allows application developers to create complex and application-specific network services. Part Two covers network-embedded applications that might leverage and benefit from such enabling platforms, ranging from the determination of where to optimally place management control functions inside a network, then discussing how multi-core hardware processors can be leveraged for traffic filtering applications, finally concluding with an application of delay-tolerant networks in the context of the One Laptop Per Child Program.

We hope that you will enjoy these proceedings and find the presented ideas stimulating and thought-provoking. We would like to thank the authors of the papers without whom the program would not have been possible, the members of the NEMA Technical Program Committees who provided high-quality reviews that enabled us to make the final paper selection from the submissions that were received, and the organizers of CNSM who were hosting NEMA and allowed us to use their conference facilities. In particular, we would like to thank the team at Springer, first and foremost Brett Kurzman, without whom these proceedings would not have been possible and who in many ways got the ball rolling in the first place.

August 2010

Alexander Clemm and Ralf Wolter

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