

Wireless Networks as an Infrastructure for Mission-Critical Business Applications

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Abstract. Despite the dynamic growth of wireless network systems, their presence in business-support infrastructure has been limited. In the article we provide an overview of generic corporate network architecture and examine usefulness of available wireless network solutions in such systems. Following this overview we analyze new wireless network architecture which currently undergoes standardization process – wireless mesh. It can result in significant increase in both bandwidth and reliability of complex wireless systems, even to a level suitable for mission-critical business applications. In conclusion we point out research directions and topics which are critical for integration of wireless solutions into business-support network infrastructure as they differ from currently followed main line of standardization works on the subject.

Keywords: e-business, corporate networks, wireless networks, WiFi, WiMAX, wireless mesh.

1 Introduction

Wireless network systems are amongst the most dynamically expanding computer technologies today. This growth is most observable in case of Wireless Local Area (WLAN) and Metropolitan Area Networks (WMAN). They are widely used in many scenarios, starting from simple two-computer ad-hoc setups through private home and SOHO networks to large, public Internet access systems.

With such economically viable and widely supported wireless network technologies as WiFi (IEEE 802.11) [1] and WiMAX (IEEE 802.16) [2], it would seem that we should be eager to integrate wireless solutions into corporate networks, to support various classical business and e-business activities. Their low deployments costs and obvious benefits of unwired access should make them a solution of choice. In reality it is not the case, and apart from last-mile Internet access networks, wireless solutions trend to stay out of business support infrastructure.

In the article we offer our analysis of this state of affairs and point out its possible causes, based on both our theoretic research concerning 802.11/802.16 standards [3-6] verified by extensive practical experience in designing and deploying such installations [7-10]. We would also like to present a new emerging type of wireless network architecture, which in our opinion, is able to remove the limitations which currently

makes them unfit to provide ample support for business applications – especially high-availability mission-critical tasks.

2 Network System Architecture

To decide if currently available wireless technologies are adequate for building production-grade enterprise networks suitable to support mission-critical business applications (services requiring highest possible availability including precise level of QoS), we are going to analyze overall architecture of such networks. Then we will present sets of qualities for each network type, which are necessary for efficient support of business environment.

We can partition most currently operating enterprise grade computer networks into two basic building blocks: backbone and access networks.

Backbone network system is responsible connecting all separate elements of corporate network, which requires transporting large amounts of assorted network traffic, needed to support all kinds of applications present in enterprise. There are relatively few endpoints in such a network, each responsible for handling whole network system instead of a single workstation, and the amount of network traffic is very high. There is also a limited set of different traffic types present, each requiring different QoS parameters. The setup of backbone network is relatively static and resource requirements possible to predicate, so such networks are often statically managed, with limited need for dynamic management and configuration protocols.

Access networks, in contrast, consist of a considerable number of networked workstations and a single (or in some cases redundant) point of contact with backbone network. A considerable number of traffic flows exists between workstations and backbone network, but there also exist numerous direct flows between workstations in such network. They carry substantial amounts information and are most often short-lived and highly unpredictable. QoS parameters required for such diverse traffic are hard to predicate and often impossible to fulfill due to limited network resources.

In such environment there is a dire need for efficient monitoring, dynamic management and configuration mechanisms, especially if we aim to provide QoS guarantees for our users and applications. Moreover, users often retain significant control over their workstation's configuration, which leads to even more unpredictable network setup and highly possible misconfiguration. That makes such mechanisms even more crucial, but unfortunately they tend to drastically raise hardware costs, so frequently administrators of access networks depend on drastically extended bandwidth as means to offset potential problems.

Many requirements needed to support business applications are the same in both backbone and access networks. The main difference between these network type is dynamically changing nature of access networks, number of devices and the fact that most of these devices are under control of end-users.

From our research and experience with *corporate backbone network systems* [3,4,8] we believe that the list below covers most important characteristics of such networks. We present them here in order of importance: *Reliability, Resources and efficiency, Quality of Service, Security, Range*.