Toward Ubiquitous Networking: QoS-aware Residential Gateway with Embedded ZigBee-based Network

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Abstract. Society is trending toward ubiquitous networking. This study thus presents a prototype but fully functional system which, in theory, could be expanded worldwide, expediting development of the Internet of Things. Our earlier QoS-aware residential gateway (EmQRG) for real-time class-based queuing bandwidth management is reviewed and experimentally demonstrated in a novel embodiment which includes a FDIXP425-DevPlatform integrating the EmQRG with a wireless M2M ZigBee-based temperature/humidity monitoring network (FT-6250 + FT-6251's), which is treated experimentally as a fire alarm system. When any temperature/humidity module exceeds a preset value, the composite system activates a warning light bulb and sends warning messages to designated recipients. This emergency signal has top EmQRG transmission priority. Tests in the context of streaming video and simulated background internet traffic under light to heavy network congestion and bottlenecking show consistently good QoS for both the alarm and the streaming media. The emergency alerts are received immediately under all conditions. The warning light bulb turns off when temperature falls below the threshold value. Discussion shows that the EmQRG network can contain other embedded EmQRG networks and be embedded within higher EmQRG-based networks. The presented system is cost-effective, easy-to-use, easy-to-implement and completely implementable with available hardware and software.

Keywords: embedded system, QoS, M2M, IoT, home network, wireless sensor network

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