International Journal of Emerging Trends & Technology in Computer Science (IJETTCS)
Web Site: www.ijettcs.org Email: editor@ijettcs.org
Volume 4, Issue 1, January-February 2015 ISSN 2278-6856

A Survey On Parallel Synchronized Data Transmission In Wireless Network

[1] Ms. Shilpa Kawadkar , [2]Prof. Sapna Khapre

[1]Department of computer science engineering, Nagpur University, Maharashtra, India

[2]Department of computer science engineering, Nagpur University, Maharashtra, India

Abstract

In parallel communication number of line between transmitter and receiver depends on number of bits to be transmitted, to transmit one byte 8 lines are required between transmitter and receiver. Mobile devices equipped with multiple network interfaces can increase their throughput by making use of parallel transmissions over multiple paths and bandwidth aggregation, enabled by the stream control transport protocol (SCTP). However, the different bandwidth and delay of the multiple paths will determine data to be received out of order and in the absence of related mechanisms to correct this, serious application-level performance degradations will occur. Here the proposed system will use multiple wireless devices and transfer data over multiple line depending upon the user configuration and synchronize the data over the receiving end. It will let the user control the wireless data transmission speed as per the requirement.

Keywords: SCTP, concurrent multipath transfer, transport protocols, energy efficiency, reliability.

1. INTRODUCTION

In wireless communication technologies have experienced an extremely rapid development. Supported by the latest technological advances, mobile devices have also become smarter and many are already equipped with multiple network interfaces. Large number of increaseingly complex services and applications in various areas of interest, including business and entertainment, are widely offered to users of these mobile devices over the wireless networks, making use of their ubiquitous access support. However, the heterogeneity of the wireless network environment requires additional solutions to enable smooth high-quality service provisioning.

The stream control transmission protocol (SCTP) with its multihoming feature and SCTP's dynamic reconfiguration extension (mSCTP) are very promising protocols to support efficient data transmission, including seamless handover in heterogeneous wireless networks. Concurrent multipath transfer (CMT) uses SCTP's multi- homing feature to concurrently distribute data across multiple independent end-to-end paths in a multihomed SCTP association. Mobile devices equipped with multiple network interfaces can achieve bandwidth aggregation by using CMT to improve data throughput, bandwidth resource utilization, and system robustness[1].

There are many important applications of multicast in energy-constrained wireless networks, such as wireless sensor networks for disseminating information (e.g. Environmental changes) and wireless adhoc networks consisting of laptops or PDAs for conducting collaborative tasks (e.g. Video conference). However, such networks hardly sustain a large amount of multicast data because of limited battery capacity and unreliable wireless transmission medium. While the problem of multicast capacity has been comprehensively studied in traditional energy-unconstrained wireless networks, these results, in essence on the maximum network throughput in terms of instant dissemination rate, are far from enough to answer the more fundamental question that how many packets can be disseminated from source to destinations for a multicast session in an energy-constrained environment.

To achieve the maximum multicast capacity, each node involved in a multicast session should deliver packets as many as possible in an energy-efficient manner. Traditionally, power control has been adopted as a simple and effective power saving strategy in many tree-based protocols, for example, in which each node is assigned a fixed transmission power level to reach its farthest child node in the tree. The capacity of a multicast tree is obviously determined by the bottleneck node that exhausts its battery first[2]. One way to improve the transmission reliability is to improve the diversity gain. Thus, to address the second problem, we consider how to obtain full diversity after the interference cancellation.

To deal with the first problem, various interference cancellation schemes were first proposed for multiple access channels (MACs. Without knowledge of interference, interference suppression was realized by an array processing scheme based on minimum mean square error (MMSE) receiver in [3]. The achievements made in wireless technology have provided pervasive network connectivity not only to the home and workplace, but also to remote areas where no wired infrastructure can reach. More recently, we have regarded this new means of communication as a primary resource and subscribe to it daily—if not constantly—in the form of mobile on-demand information services. Several wireless access technologies currently exist, such as: CDMA2000 and

Wideband Code Division Multiple Access (W-CDMA) for 3G and 4G cellular communication WiMAX (IEEE 802.16) for broadband access in metropolian area networks (MANs); and Wi-Fi (IEEE 802.11) for wired equivalent local area networks (LANs).

Nevertheless, the demand for higher data rates continues to grow, and researchers must find new ways to satisfy this need. One solution, known as multihoming, incorporates multiple network interfaces into a single device. Applied to wireless networking, multihoping can improve performance by exploiting unused resources from the radio spectrum. Already many popular consumer electronics, like Apple's iPhone and Research in Motion's Blackberry Bold, come standard with Wi-Fi and cellular technologies (e.g. GSM and UMTS). Although products like these have more than one network interface, some advantages to multihoming are not being realized. Connection migration from one access technology to another, called vertical handover, is a perfect example of multihoming at its finest.

Assuming a voice over IP (VoIP) telephone call is initiated within a Wi-Fi network, without a continuous series of overlapping Wi-Fi networks, the call will be dropped as soon as the phone travels even a short distance (e.g. 10s of metres). Although Wi-Fi offers high data rates at low cost, while mobile, cellular technologies can keep calls active albeit at a higher cost with lower data rates. This is not to say these devices are not currently capable of such function, but at this time they do so only through proprietary means [4].

The increasing computing power and storage capacity of mobile devices is creating opportunities for multimedia application support and development. The capacity of IP access networks in comparison to traditional mobile networks is attractive for the distribution of multimedia components such as voice and video, or triple play. The real-time nature of multimedia content distribution however, has stringent bandwidth, delay, and loss requirements. These requirements have significant performance implications for underlying networks and network protocol [5]. Scalable video broadcasting, in contrast, enables network operators to support many mobile devices without exhausting network bandwidth.

This is achieved by using scalable video coders to encode each TV channel into a single stream with multiple layers, and broadcast each layer only once. Such a coded stream is scalable because several substreams, with one or a few layers, can be extracted from the complete stream and are still decodable. Each mobile device can then choose and render the substream that is most appropriate to its capability and condition. Scalable video broadcasting, however, is quite challenging for the base station broad- casting multiple TV channels. This is because the base station broadcasts every TV channel in bursts with a bit rate much higher than the encoding rate of that TV channel, which enables mobile devices to receive a burst of data and turn off their radio components until the next burst in order to save energy.

This is called time slicing, which is dictated in leading broadcast standards such as Digital Video Broadcast-Handheld (DVB-H) and Forward Link Only (MediaFLO). Time slicing is important because energy saving is critical to battery-powered mobile devices, and recent commercial mobile TV chips consume more than 400 mw in continuous mode, which is nontrivial compared to the total power consumption of many mobile devices [6].

2. RELATED WORK

This paper proposes a novel quality-aware adaptive concurrent multipath transfer solution (CMT-QA) that utilizes SCTP for FTP-like data transmission and real-time video delivery in wireless heterogeneous networks. CMT-QA monitors and analyses regularly each path's data handling capability and makes data delivery adaptation decisions to select the qualified paths for concurrent data transfer. CMT-QA includes a series of mechanisms to distribute data chunks over multiple paths intelligently and obviously determined by the bottleneck node that exhausts its battery first. One way to improve the transmission reliability is to improve control the data traffic rate of each path independently.

CMT-QA's goal is to mitigate the out-of-order data reception by reducing the reordering delay and unnecessary fast retransmissions. CMT-QA can effectively differentiate between different types of packet loss to avoid unreasonable congestion window adjustments for retransmissions [1]. In this paper, to explore the expected multicast capacity, we propose a framework for the joint optimization of both dynamic power control and error control. In our framework, the lossy wireless transmission links are characterized by the Rayleigh fading model, which reveals the realistic relationship among link quality, transmission power, and path attenuation.

Under this model, we exploit the reliability gain of random linear network coding, also referred to as intrabatch coding in this paper, by disseminating data in batches. To maximize multicast capacity, another type of network coding opportunities across batches, referred to as interbatch coding, is also explored. Our analytical framework based on intrabatch and interbatch network coding eventually leads to a linear programming formulation that is proved to obtain the optimal multicast capacity. To approach the theoretical results in practice, we propose an algorithm called DMCC that exploits the intrabatch and interbatch coding via dynamically constructing bottleneck trees.

Extensive simulations are conducted to show that its performance is very close to the optimal solution[2]. This paper proposes a design criterion and then propose a systematic design to satisfy the criterion so that it achieves full diversity. The code rate approaches one when encoding length gets large. We prove that full diversity can be achieved by the proposed STBC without the channel information at the transmitters [3]. In this paper, we investigate state of the art multihoming techniques using SCTP. A comprehensive survey of developments has brought forth three main research areas, namely: handover management, concurrent multipath transfer (CMT), and cross-layer activities. While the presented algorithms may offer sufficient results, many open problems still remain [4].

This paper analyzes the performance of multimedia distribution when making use of two multi-homing SCTP-based approaches: Single Path Transfer and Concurrent Multi-path Transfer, in which a single or all paths within an association are used simultaneously for data transmission. In this investigation various retransmission policies and different parameter sets are used in turn and recommendations are made for achieving best results during video delivery. In order to perform this study a novel realistic evaluation tool-set was pro- posed and is described, which can simulate video delivery over SCTP [5]. In this paper, We analyze the performance of the proposed broadcast schemes.

In addition, we have implemented the proposed schemes in a real mobile TV testbed to show their practicality and efficiency. Our extensive experiments confirm that the proposed schemes enable energy saving differentiation: between 75 and 95 percent were observed. Moreover, one of the schemes achieves low channel switching delays: 200 msec is possible with typical system parameters [6]. In this paper, WiSE tries to infer whether losses are due to congestion or to radio channel errors.

At the same time, the available bandwidth of the current path used for transmission is matched to that of an alternate path, also probed for available bandwidth. If the current path is severely congested and the alternate path is lightly loaded, WiSE switches the transmission onto the alternate path using SCTP's flexible path management capabilities. Extensive simulations under different scenarios highlight the superiority of the proposed solution with respect to TCP and the standard SCTP implementation [7]. This paper proposes three algorithms which augment and/or modify current SCTP to counter these side-effects.

Presented with several choices as to where a sender should direct retransmissions of lost data, we propose five retransmission policies for CMT. We demonstrate spurious retransmissions in CMT with all five policies and propose changes to CMT to allow the different policies. CMT is evaluated against AppStripe, which is an idealized application that stripes data over multiple paths using multiple SCTP associations. The different CMT retransmission policies are then evaluated with varied constrained receive buffer sizes. In this foundation work, we evaluated with varied constrained receive buffer sizes. In this foundation work, we operate under the strong assumption that the bottleneck queues on the end-to-end paths used in CMT are independent [8].

3. PROPOSED METHOD

3.1 Architecture

In physical implementation of wireless network , it is difficult to dynamically control transfer data because of asynchronization, packet delay and loss etc. In order overcome the problem, to designing a dynamically controllable wireless network in which multiple radio frequency device.

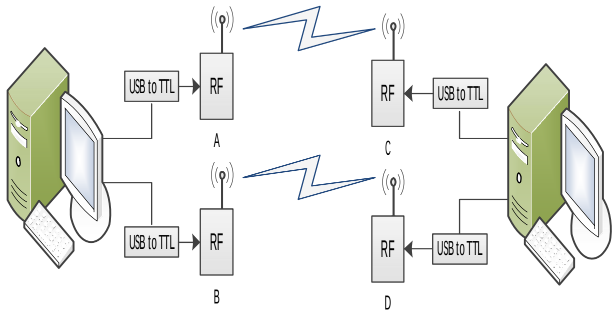


Figure 1 : System Architecture

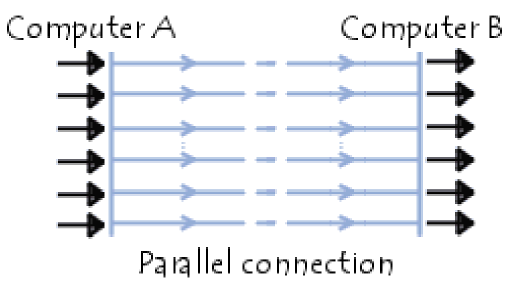
In this architecture, building a wireless node with capability to broadcast a computer passed messages and receives the incoming messages. Develop a windows based application to read and write data over the wireless devices. Develop a windows based application to split the data or files in to multiple chunks or part and merge those parts back in to single file.

3.2 Transmission Modes

The transmission mode refers to the number of elementary units of information (bits) that can be simultaneously translated by the communications channel. In fact, processors (and therefore computers in general) never process (in the case of recent processors) a single bit at a time generally they are able to process several (most of the time it is 8: one byte), and for this reason the basic connections on a computer are parallel connections.

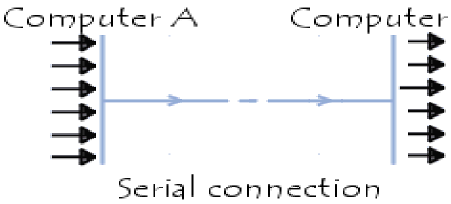
3.2.1 Parallel connection

Parallel connection means simultaneous transmission of N bits. These bits are sent simultaneously over N different channels (a channel being, for example, a wire, a cable or any other physical medium). The parallel connection on PC-type computers generally requires 10 wires.



3.2.2 Serial connection

In a serial connection, the data are sent one bit at a time over the transmission channel. However, since most processors process data in parallel, the transmitter needs to transform incoming parallel data into serial data and the receiver needs to do the opposite. These operations are performed by a communications controller (normally a UART (Universal Asynchronous Receiver Transmitter) chip).



3.3 File Processing

The System.IO namespaces contain types that support input and output, including the ability to read and write data to streams either synchronously or asynchronously, to compress data in streams, to create and use isolated stores, to map files to an application's logical address space, to store multiple data objects in a single container, to communicate using anonymous or named pipes, to implement custom logging, and to handle the flow of data to and from serial ports.

3.4 Transceiver

When time and RF engineering experience is of abundance, a designer may opt to use RF integrated circuits (chips or chipsets) to save on RF component costs. Using chips/chipsets, the designer actually develops the hardware and software workings of the product. While the individual chips/chipsets offer functionality the designer must dictate how those chips will work in concert with the software the designer will develop. This task is not for the faint of heart, as completed designs must also pass rigid regulatory testing for deployment in the various regions of the world. The regulatory approval process alone can become months or years of a cycle of rejection, followed by a reworking of the product and continued by rejection and reworking until the product is approved. Wireless transceiver (transmitter / receiver) modules offer a faster time-to-market alternative to chips/chipsets that allow designers at all levels of RF experience to integrate a completed wireless system into their products. Many modules are manufactured as a drop-in solution where designers create a compatible pin-out on their processor board and supply serial data to the appropriate pins.

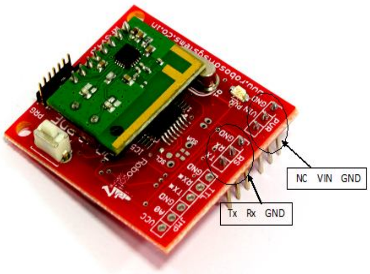


Figure 2: RF Transceiver

Modules offering the easiest integration allow the designer to send raw UART data into the module and expect that same data out on the receiving end of the wireless link. Wireless transceiver modules allowing the quickest time-to-market are also FCC and other regulatory agency approved. That means jurisdictions accepting FCC approval allow designers using FCC approved modules to bypass further testing for their wireless products. In Europe and other countries, pre-approved modules by ETSI and other regulatory bodies allow the designer to deploy products in various regions of the world with minimal additional approvals. The completed RF design and agency approval of many wireless transceiver modules make them a popular choice in the fast-paced world of wireless data communication product design.

4. CONCLUSION

In this paper, investigated in details the performanance of real-time multimedia transmission employing the transport layer multi-homing protocol SCTP when utilizing various flovors of Single Path Transfer and Concurrent Multipath Transfer, respectively. To deal with issues of scalability and intensive data processing in large scale wireless sensor networks, distributed storage and parallel processing mechanisms are proposed in the literature. These mechanisms implement the concepts of in-network data storage, querying and parallel processing. The distributed collective intelligence of a large numbers of sensors is exploited, and network energy is saved by reducing the communication complexity.

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