RESEARCH ARTICLE OPEN ACCESS

REDUCED ENERGY CONSUMPTION OF DATA TRANSMISSION FOR TCP DOWNLOAD/UPLOADS

Mr.S.Sambasivam,M.C.A..,M.Phil..,[1], S.Suriya Sugan[2],

[1]Associate Professor, Department of Computer Applications, Nandha Engineering College(Autonomous),Erode,Tamilnadu,India.

[2]Final MCA,Department of Computer Applications,Nandha Engineering College (Autonomous),Erode,Tamilnadu,India.

Email: [1]sammy2173@gmail.com,[2]s.suryasugan@gmail.com

Abstract. Energy consumption caused by wireless data transmission on smart phones is increasing rapidly with the growing popularity of applications that require network connectivity. This results in shrinking battery life, as the development of battery technology is unable to keep up with the energy demand of applications. While waiting for breakthroughs in battery technology, we can try and make the networked applications more energy-efficient. Wireless data transmission consumes a significant part of the overall energy consumption of smart phones, due to the popularity of Internet applications. This project investigates the energy consumption characteristics of data transmission over Wi-Fi, focusing on the effect of Internet flow characteristics and network environment. The author presents deterministic models that describe the energy consumption of Wi-Fi data transmission with traffic burstiness, network performance metrics like throughput and retransmission rate, and parameters of the power saving mechanisms in use. These models are practical because their inputs are easily available on mobile platforms without modifying low-level software or hardware components. This project demonstrates the practice of model-based energy profiling on Maemo, Symbian, and Android phones, and evaluate the accuracy with physical power measurement of applications including file transfer, web browsing, video streaming, and instant messaging. Their experimental results show that our models are of adequate accuracy for energy profiling and are easy to apply.

I. INTRODUCTION

This manual is intended for embedded systems engineers and support professionals who are not familiar with wireless networking from a theoretical or implementation point of view. The components, organization, and operation of Wi-Fi networks will be presented. There is an emphasis on security issues and the available security protocols. Wi-Fi is the transmission of radio signals. Wireless Rabbits offer the embedded systems engineer many benefits in a wide range of applications. Figure 1 illustrates the Rabbit's hole in a sensor monitoring application.

The dramatic recent developments in IoT are mainly driven by the tremendous need and benefits that can be gained from connecting our physical world to the Internet. It is expected that there will be 50 billion (and by some estimates, more) IoT interconnected devices in the coming years [1]. This growth in the number of connected devices opens the doors to new applications, for example in agriculture, transportation, manufacturing, smart homes, smart healthcare, and M2M communications. Many challenges such as energy efficiency, reliability, security, interoperability and scalability have to be overcome before the planned growth in the number and functionalities of IoT can be realized. Given the expected number of devices, one of the most important challenges is energy efficiency and hence greening the associated networks, which grabbed attention in both the academic and industrial domains. Cloud computing is investigated as one of the solutions to the energy efficiency challenge in networks and data centers. However, with the large data generated by the connected IoT objects (expected to generate 2.3 trillion gigabytes of data every day by year 2020), new cloud computing with IoT poses trending challenges which need to be addressed. Among these challenges is the hunger for more processing capabilities, high communication bandwidth, security, and latency requirements. A number of solutions were suggested to address these issues. The work started with distributed content placement, thus bringing content closer to users, distributed data centers, thus bringing the processing capabilities closer to users and IoT devices and distributed processing of big data, where processing the huge data generated by IoT Z. T. Al-Azez et al.: Energy Efficient IoT Virtualization Framework With P2P Networking and Processing devices near the source can extract knowledge from the data and hence transmit the small volume ‘extracted knowledge’

messages, thus saving network and processing resources and hence energy [12]. However, a different and potentially more efficient solution, advocated here, is to process the IoT data by the IoT objects themselves or by the devices in the nearest layer to these objects. According to Allied Business Intelligence (ABI), it is expected that 90% of the data created by the endpoints will be processed and stored locally rather than being handled by the conventional clouds. Since some complicated data processing tasks cannot be done by most of the IoT devices and sensors because of their limited capabilities, edge computing is proposed to provide more resources to serve such tasks in efficient and fast ways. One of the suggested ways to do this is the dynamic installation of virtual machines (VMs) in the edge cloud to process the raw data generated by the tasks requested by the IoT objects. The processed results are then sent back to the objects. A single IoT network is considered consisting of IoT network elements (relays, coordinators and gateways). Data processing and traffic aggregation were done by VMs hosted in cloudlets, where these mini clouds are distributed over the IoT network elements. The work was extended in which two separated IoT networks were considered with the deployment of a Passive Optical Access Network (PON). The main goal of our previous work is to investigate the potential energy efficiency gains that can be made if a use is made of distributed cloudlets at the edge of the network compared to centralized cloudlets at highest layer of the implemented model.

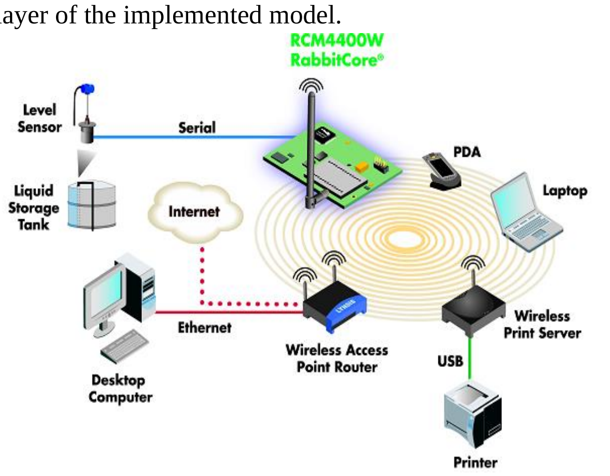

FIG 1.1 ILLUSTRATES THE RABBIT’S HOLE IN A SENSOR MONITORING APPLICATION.

II. LITERATURE REVIEW

In this work [1], the authors addressed the forenamed challenge by developing a tool called ARO (mobile Operation Resource Optimizer). To the stylish of their knowledge, ARO is the first tool that exposes thecross-layer commerce for layers ranging from advanced layers similar as stoner input and operation geste down to the lower protocol layers similar as HTTP, transport, and veritably importantly radio coffers. In particular, so far little focus has been placed on the commerce between operations and the radio access network (RAN) in the exploration community. Similarcross-layer information encompassing device-specific and network-specific information helps capture the dickers across important confines similar as energy effectiveness, performance, and functionality, making similar dickers unequivocal rather than arbitrary as it's frequently the case moment. It thus helps reveal hamstrung resource operation (e.g., high resource outflow of periodic followership measures for Pandora) due to a lack of translucency in the lower-subcaste protocol geste, leading to suggestions for enhancement.

ARO consists of an online featherlight data collector and an offline analysis module. To outline an operation, an ARO stoner simply starts the data collector, which incurs lower than 15 of runtime outflow, and also runs the operation for a asked duration as a normal operation stoner. The collector captures packet traces, system and stoner input events, which are latterly reused by the analysis module on a commodity PC. The proposed ARO frame also applies to other types of cellular networks similar as GPRS/ EDGE, EvDO, and 4G LTE that involve analogous dickers to those in UMTS. They punctuate their benefactions as follows.

1. An accurate RRC state conclusion fashion

They present a methodology that directly infers RRC countries from packet traces collected on a handset. The conclusion fashion is necessary due to lacking of an interface for penetrating RRC countries directly from the handset tackle. Using a simulation- grounded approach to infer RRC countries, the new conclusion algorithm differs from former work (3, 4) in two aspects. First, the former algorithm assumes traces are collected at the cellular core network while their new approach targets at a more common script where traces are captured directly on a handset. Second, their algorithm significantly improves the conclusion delicacy by performing further fine-granulated simulation of transmission ranges to more precisely prisoner state transitions. Considering similar new factors increases the delicacy of state transition identification from

85 to 98. They concoct a new power- grounded conclusion algorithm to validate their packet- grounded conclusion approach

2. Root cause analysis for short business bursts

Low effectiveness of radio resource and energy operation are unnaturally attributed to short business bursts carrying small quantum of stoner data while having long idle ages, during which a device keeps the radio channel enthralled, fitted ahead and after the bursts (5, 3). They develop a new algorithm to identify them and to distinguish which factor triggers each similar burst,e.g., stoner input, TCP loss, or operation detention, by synthesizing analysis results of the TCP, HTTP, and stoner input subcaste. ARO also employs a robust algorithm to identify periodic data transfers that in numerous cases dodge high resource outflow. Discovering similar driving factors is pivotal for understanding the root cause of hamstrung resource application. Former work (6, 3) also probe the impact of business patterns on radio power operation policy and propose suggestions. In discrepancy, ARO is essential in furnishing more specific opinion by breaking down resource consumption into each burst with its driving factor directly inferred. For illustration, for the Fox News operation, by relating operation- subcaste actions (e.g., transferring image thumbnails), stoner input (e.g., scrolling the screen), and RRC countries, ARO reveals it's stoner's scrolling geste that triggers scattered business (i.e., short bursts) for downloading image thumbnails in news captions (i.e., images are transferred only when they're displayed as a stoner scrolls down the screen), and quantifies its resource impact. Assaying data collected at one single subcaste doesn't give similar sapience due to deficient information.

3. Quantifying resource impact of traffic bursts:

In order to quantitatively analyze resource bottlenecks, ARO addresses a new problem of quantifying resource consumption of traffic bursts due to a certain triggering factor. It is achieved by computing the difference between the resource consumption in two scenarios where bursts of interest are kept and removed, respectively. The latter scenario requires changing the traffic pattern. To address such a challenge of modifying a cellular packet trace while having its RRC states updated accordingly, ARO strategically decouples the RRC state machine impact from application traffic patterns, modifies the trace, and then faithfully reconstructs the RRC states.

4. Identification of resource inefficiencies of real Android applications:

They apply ARO to six real Android applications each with at least 250,000 downloads from the Android market as of Dec 2010. ARO reveals that many of these very popular applications (Fox News, Pandora, Mobclix ad platform, BBC News etc.) have significant resource utilization inefficiencies that are previously unknown. They provide suggestions on improving them. In particular, they are starting to contact developers of popular applications such as Pandora. The feedback has been encouragingly positive as the provided technique greatly helps developers identify resource usage inefficiencies and improve their applications [7].

[2]In this paper, When examining the anticipated usage patterns of WiFi on smartphones, it appears that in addition to fast and possibly free Internet access (including VoIP and video), direct communication between nearby devices is of growing interest. Obvious examples include media streaming either between smartphones or between a phone and another nearby wireless device (TV or computer) in a home or office setting. This is exemplified in the plethora of new WiFi based streaming solutions, as well as being one of the main motivations behind the WiGig initiative. Another scenario includes ad-hoc social networking and communication, such as iPhone's iGroups, Nokia's Instant Community, Mobiluck, and WiPeer, to name a few.

In this work, they present a power and throughput study of WiFi and Bluetooth on modern smartphones, in which they investigate the relationship between obtained throughput and power, and the power consumption in the various states of the wireless interfaces. In the process, they discover several interesting phenomena (some counter previous conventions) and draw some practical recommendations for future academic research and practical development. Some of the highlights of their findings include:

For WiFi, the power consumption is generally linear with the obtained throughput. However, whenever the sender's network card (NIC) is more capable than that of the receiver, there is a threshold point at which the power consumption doubles, while the throughput continues to grow linearly. Beyond this point, when running over UDP and trying to further increase the offered load, the obtained throughput eventually starts to drop as well, while power consumption continues to rise. When running over TCP, which inherently self regulates its offered load, the obtained throughput is slightly beyond the threshold point. This means that TCP stops too late; if it would have constrained the sender's rate to be slightly lower, it could have saved half the energy! They discuss this phenomenon, explain why it happens, and suggest ways of eliminating it in TCP

For WiFi, they discovered that when the phones are connected to an access point but not communicating, their WiFi related power consumption is marginal. This means that the Power-Saving Mode (PSM) of WiFi is highly effective. Consequently, unless a phone is communicating, as long as it is connected to an access point, WiFi will hardly drain its battery

(3) In this paper, When examining the anticipated operation patterns of WiFi on smartphones, it appears that in addition to fast and conceivably free Internet access (including VoIP and videotape), direct communication between near bias is of growing interest. Egregious exemplifications include media streaming either between smartphones or between a phone and another near wireless device (Television or computer) in a home or office setting. This is instanced in the plethora of new WiFi grounded streaming results, as well as being one of the main provocations behind the WiGig action. Another script includes ad-hoc social networking and communication, similar as iPhone’s iGroups, Nokia’s Instant Community, Mobiluck, and WiPeer, to name a many.

(4) In this paper, the authors discussed about a putatively straightforward way to conserve battery life of a mobile device is to resettle operation prosecution incompletely to pall. This fashion is nominated as offloading and/ or cyber rustling occasionally. Several fabrics, including MAUI (30), Ditz (31), CloneCloud (32) and ThinkAir (33), have been developed to discharge CPU ferocious tasks. Still, most popular apps involve also network communication, similar as updates of social networks or remote data access, which consume a major part of the overall energy.

Nearly all former work focuses on easing the cargo by migrating heavy computational tasks to the pall. To address this failing, they probe the feasibility of unpacking network ferocious communication, taking open source operations as exemplifications. To this end, they use a specific frame, ThinkAir (33), for operation partitioning and migration. It should be noted that their thing isn't to develop their own offloading frame, but rather to study the feasibility of using being results with typical apps.

ThinkAir, like many other existing frameworks supporting application partitioning on a method granularity, provides APIs for specifying which methods are allowed to be offloaded. This requires programmers with expert knowledge to manually select and annotate these methods. Using a case study, they observe that in practice there are several constraints, such as Java serialization issues, usage of callbacks, and access to native APIs that are tied to the device, which limit the ability of remotely executing a method. They find these constraints to be non-trivial and laborous to identify manually. They develop a tool to automate the identification of such constraints and provide analysis results from a set of apps. The results reveal that such constraints exist very frequently in typical apps.

[5]In this paper, Mobile and portable devices are usually driven by battery power. Due to the limited battery capacity, it is essential to reduce power consumption on mobile devices without degrading the performance of applications, particularly for those applications that are QoS sensitive. The basic power saving method is to put the wireless network interface (WNI) into the sleep mode when it is idle, e.g., IEEE 802.11 power saving mechanism [35]. However, 802.11 power saving mode (PSM) may increase the connection round trip time due to the lagged data reception, and thus may significantly degrade the throughput of TCP-based applications. In order to achieve a high TCP throughput, the WNI has to be active to generate timely acknowledgments for received data. As a result, a significant amount of energy is wasted on channel listening [36], [37]. For applications like TCP-based streaming media, which has strict requirements on packet delay and can quickly drain out the battery of mobile devices, it is difficult to explore the trade-offs between the power saving and the caused delay to applications.

The power saving mode can be most effectively managed if the streaming traffic flowing to a client is in a predictable pattern, such as periodic bursts. Accordingly, the client can accurately adapt to streaming traffic pattern to sleep and to work periodically. Therefore, the power consumption on the client device is minimized while the demanded high throughput is also maintained. Efforts have been made towards this goal. However, existing solutions are either expensive or inefficient. For example, a proxy-based solution [38] is proposed to buffer and shape streaming media traffic into blocks, so that the data packets arrive at the client side with predictable intervals. Although clients can transit to lower power states during the block intervals without degrading application level performance, this solution needs a dedicated infrastructure support and is protocol dependent. Furthermore, RTSP-based Windows, RealNetworks, and QuickTime streaming services have their own extensions on the standard RTSP protocols [39], which have to be implemented individually for a general purpose RTSP proxy.

A customer-centric scheme (40) is proposed to reshape the TCP business into bursts, and put the WNI into sleep between two bursts by modifying the customer TCP mound. Besides lacking specific consideration for the streaming business, this scheme increases the data transmission time as a trade-off, which can be a high cost for some bulk data transmissions and inferior for streaming media operations with strict QoS demands. Streaming, mock streaming, and train downloading are the most generally used media delivery approaches on the Internet moment (39). These ways generally use TCP as the transmission protocol. With the decreasingly abundant Internet bandwidth, the transmission rate of media business is frequently not constrained by the TCP traffic control medium on the network, but by the control on the side, which they relate to as bandwidth throttling, due to an decreasingly high demand.

III. PROPOSED METHODOLOGY

The existing system identified the following properties of multimedia sharing and corresponding design consideration through the analysis of existing contents. Presents simple and practical power models of network data transmission based on Internet flow characteristics and network environment context. Evaluates the proposed power a model is through thorough empirical experiments on three different network environments.

In this project three approaches are used in the existing system. The first approach TCP Download/Upload with a Single Flow is evaluates the data transmission efficiency with one requested node to other single node scenario. The second approach TCP Download/Upload with Multiple Flows is evaluates the data transmission efficiency from many nodes to one requested node scenario. The third approach TCP Download/Upload in Congested Network is evaluates the data transmission efficiency from many nodes (busy environment) to one requested node scenario.

- The daily increasing size of linked multi-media contents.
- Significantly increases the server bandwidth consumption.
- If large number of users accesses the data, then concurrency problem will occur.

In proposed system, all the existing system approach is being carried out. In addition, based on the past transactions, for a given node which nodes serves the data in fast and reliable manner is found out and suggested for successive communication is also implemented. Also, Details about stable nodes which serve the data to other requested nodes are maintained. In proposed system, P2P based approach is used in which when a node is downloading and viewing media content, it can upload the content simultaneously. In order to efficiently share media content, the project uses segmented media content to avoid the possibility of downloading failure.

It enables users to share existing media segments while downloading others. The stable nodes function as brokers to match content requesters and providers. Nodes are considered as stable (running for minimum given time threshold since power on) peers by giving a time threshold and nodes switched on up to that time is treated as stable node.

In addition, the peers online and offline can be maintained. The total number of up time and down time of each peer is also maintained.

IV. FINDINGS

- Peers are classified as high-capability super-peers that handle search or routing, and ordinary peers that act as their clients.
- Stable nodes can be identified.
- Time threshold is given to treat the node as stable node.
- Rating the super peer nodes is possible. This helps to add more capability to that node.
- Multimedia content retrieval is efficient and data availability is more.
- Most offline peers can be tracked easily.
- Stable node which serves data for long time is considered.
- Best serving node is suggested from previous transmissions.

IV. CONCLUSION

The difficulty in distributing the content in the server is eliminated by using this application. It reduces the server bandwidth to consistent amount. The end users need not wait for server in downloading the content since the P2P application gets the content from available clients. The application works well for given tasks in network environment. Any node with .Net framework installed can execute the application and identifies the best site. The underlying mechanism can be extended to any / all kind of web servers and even in multi-platform like Linux, Solaris and more. The system eliminates the difficulties in the existing system. It is developed in a user-friendly manner. The system is very fast and any transaction can be viewed or retaken at any level. This software is very particular in reducing the work and achieving the accuracy.

REFERENCES

[1] F. Qian et al., “Profiling resource usage for mobile applications: A cross-layer approach,” in Proc. MobiSys, Bethesda, MD, USA, Jun. 2011, pp. 321–334

[2] 300 Million UMTS Subscribers. http://www.3gpp.org/300-million-UMTS-subscribers

[3] F. Qian, Z. Wang, A. Gerber, Z. M. Mao, S. Sen, and O. Spatscheck. Characterizing Radio Resource Allocation for 3G Networks. In IMC, 2010

[4] F. Qian, Z. Wang, A. Gerber, Z. M. Mao, S. Sen, and O. Spatscheck. TOP: Tail Optimization Protocol for Cellular Radio Resource Allocation. In ICNP, 2010

[5] N. Balasubramanian, A. Balasubramanian, and A. Venkataramani. Energy Consumption in Mobile Phones: A Measurement Study and Implications for Network Applications. In IMC, 2009

[6] H. Falaki, D. Lymberopoulos, R. Mahajan, S. Kandula, and D. Estrin. A First Look at Traffic on Smartphones. In IMC, 2010

[7] A Call for More Energy Efficient Apps. http://www.research.att.com/articles/featured_stories/2011_03/201102_Energy_efficient

[8] R. Friedman, A. Kogan, and K. Yevgeny, "On power and throughput tradeoffs of WiFi and bluetooth in smartphones," in Proc.INFOCOM, Shanghai, China, Apr. 2011

[9] T. Pering, Y. Agarwal, R. Gupta, and C. Power, "Coolspots : Reducing the power consumption of wireless mobile devices with multiple radio interfaces," in Proc. ACM MobiSys, 2006, pp. 220–232

[10] P. Bonnet, A. Beaufour, M. B. Dydensborg, and M. Leopold, "Bluetooth based sensor networks," SIGMOD Rec., vol. 32, no. 4, pp. 35–40, 2003

[11] P. Mohan, V. N. Padmanabhan, and R. Ramjee, "Trafficsense: Rich monitoring of road and traffic conditions using mobile smartphones," Microsoft, Technical Report MSR-TR-2008-59, 2008

[12] J.-C. Cano, J.-M. Cano, E. Gonzalez, C. Calafate, and P. Manzoni, "Power characterization of a bluetooth-based wireless node for ubiquitous computing," Proc. IEEE ICWMC, p. 13, 2006

[13] R. Friedman and A. Kogan, "Efficient power utilization in multi-radio wireless ad hoc networks," in Proc. OPODIS, 2009, pp. 159–173

[14] ——, "Power aware management middleware for multiple radio interfaces," in Proc. 10th Int. Middleware Conference, 2009, pp. 288–307

[15] G. Ananthanarayanan and I. Stoica, "Blue-Fi: enhancing Wi-Fi performance using bluetooth signals," in Proc. MobiSys, 2009, pp. 249–262

[16] E. Shih, P. Bahl, and M. J. Sinclair, "Wake on wireless: an event driven energy saving strategy for battery operated devices," in Proc. ACM MOBICOM, 2002, pp.160-171

[17] L. M. Feeney and M. Nilsson, "Investigating the energy consumption of a wireless network interface in an ad hoc networking environment," in Proc. IEEE INFOCOM, 2001, pp. 1548–1557

[18] P. Bahl, A. Adya, J. Padhye, and A. Walman, "Reconsidering wireless systems with multiple radios," ACM SIGCOMM Comput. Communication. Rev., vol. 34, no. , pp. 39–46, 20045;