NETWORK TRAFFIC PREDICTION IN WIRELESS NETWORKS FOR IMPROVING QoS USING DEEP LEARNING TECHNIQUES


Abstract— Many mechanisms lying on bandwidth reservation, handoff mechanism is proposed in the literature to reduce the connection dropping probability for handoffs in wireless communications networks. The handoff actions occur at higher rate in a packet-switched wireless communication(5G) networks than in a traditional communication systems. Hence, an well-organized bandwidth reservation mechanism for a neighboring cells is critical in the process of handoff through the connection of multimedia calls. This mechanism avoids the undesired force termination and waste of limited bandwidth in fourth and fifth generation mobile communication networks, particularly when the mobility of the mobility device is high. In this paper, a phased solution of priority detection, mobility scheduling using deep learning techniques have been proposed. The motivation of the phases is to provide the Quality of Service (QoS) at regular communication and high mobility condition by considering the physical parameters. Meanwhile, a deep learning based service model is integrated to accommodate novel metrics used in handing out handoffs and task scheduling in wireless communication networks. This mechanism provides the more advantages in terms of choosing the tasks in a priority based scenario and providing un-interrupted service at the point of handoffs as well as an efficient way of utilizing the bandwidth.

Index Terms— Neural Network, Iterative Process, Bandwidth Estimation, Deep learning.

I. INTRODUCTION

Interest in providing the availability of routing through the internet and QoS, content distribution and file sharing services, enabling multicasting or protecting from Denial of Service (DoS) attacks have been addressed by different application layer overlay design proposals [1]. Recently, it has seen that the rise of the Internet as a means of content delivery [1] is due to the growing popularity of smart handheld devices as a means of content consumers. Available content includes software and smart-phone applications, music and video files available, and media streaming applications. Each type of contents is associated with a particular desired quality of service but low delays between request and reception is good for all types of content [2]. 4G networking frameworks have recently received a lot of attention on the research community, as they provide an efficient infrastructure to use available networking resources in a transparent, scalable and cost-effective way. 4G networks are initially designed and considered for huge content distribution across networks [3]. One of the trends in internet is that it is being applied to the transfer of massive content [4]. Increasing number of communication software such as Skype and Peer-Cast, the area of audio or video conferencing and streaming are built on distributed architectures based on the 4G/5G model. 1.1 Architecture :

Universal Mobile Telecommunication System (UMTS) is developed in terms of various applications, services and bandwidth. The development of UMTS network is mainly based on the GSM or GPRS network that can support different types of applications such as data, voice and video. UMTS network is able to efficiently interact with other networks [6]. This service ranges from legacy applications such as data transfer to voice and multimedia calls [7]. In order to satisfy the user requirements, proper end-to-end QoS must be provided to the application flows [8]. A 4G QoS architecture is required to provide resource guarantees that allow prioritization or prioritization of services, and to deploy the performance improvement. techniques that boost the performance by properly reallocating resources to users [9]. 4G (or) Next Generation Networks (NGN) allows connectivity anytime, anywhere with QoS and mobility functions [10]. The 4G network consists of internet protocols to facilitate the subscribers by enabling the selection of every application in any environment. In 4G cellular networks, a high bandwidth along with high data rate is required and also a quicker and optimized strategy of handover is required to make the clear and reliable communication. The 4G network system runs with the cooperation of 2G and 3G and imparts the IP based wireless communication. The main target in 4G is video streaming on IP based protocol, such as IP TV. If [11] 4G is deployed efficiently, it can solve many problems related to the speedy connections, performance, connectivity, and end user performance. These networks are helpful in reducing the Signal to Noise Ratio (SNR) at the receiver side along with the achievement of scalability and higher data rates.

1.2 Advantages and Disadvantages:

This new breed of systems creates an application level virtual network with their own overlay topology and routing protocols [12]. Overlay networks are used increasingly for network sensitive applications such as distributed web caching, content dissemination and stream processing [13]. A 4G network is a distributed network architecture in which participants
make a portion of their resources, such as processing power, disk storage or network bandwidth, directly available to other network participants without the need for central coordination instances such as servers or stable hosts. Peers are both suppliers and consumers of resources, in contrast to the traditional client-server model [14]. A 4G network is distributed, scalable, cost-effective, cooperative resource sharing and self-organizing network. It encourages Service Providers (SPs) to deploy many real-time applications over large scale heterogeneous networks.

Floodling-based systems do not scale due to the bandwidth and processing requirements that are imposed on the network. It does not provide guarantees to lookup time or content accessibility [1]. The simple pileup of hardware on servers is not sufficient to meet the rapidly increasing user demands. The dynamic boosting of network connections occurs commonly during a popular live streaming program. Freeloading is identified as a problem for peer-to-peer systems because many earlier peer-to-peer protocols allowed nonexcludable access to overlay resources [13]. In systems, mobile device requests were served indistinguishably, regardless of the amount and quality of the contributions that the requesting peer had made to the overlay [16]. Without authentication, adversary nodes can spoof the identity and falsify the messages in the overlay. As a result, a malicious node launches man-in-the-middle or denial-of service attacks.

1.3 Factors Affecting QoS in 4G network:

**Latency:** It is also known as time to delivery. Latency is defined as the time from which a publisher publishes an event and a subscriber to that event receives notification that is available. The overlay network must effectively reduce the overall latency of event notifications. The latency can also be defined as delay.

**Bandwidth:** Bandwidth represents the resources available across a path during event transfer. It is denoted by the number of events transferred between the publisher and subscriber per unit time. If a subscriber doesn’t specify the requirement, then the broker network assumes the default values, which provide the maximum possible bandwidth available along a path.

**Reliability:** Reliability plays an important role in peer to peer networks. It can be defined as the frequency of error occurred on the network [18].

**Packet-loss:** Packet transmission is done by the sender but it is not received by the destination. This is called packet loss [24].

At the time of data transmission, we should be aware of the following: Buffer cache ratio- [13] Buffer cache ratio plays a vital role in transmission when a data packet is transmitted through another node.

**Available capacity-** [12] Availability capacity is directly related to the bandwidth. As bandwidth determines the availability of the number of channels at the time of data transmission so it plays a vital role in the content awareness.

**CPU speed-** CPU processing speed is a major issue in the data transmission since it controls the traffic factors at different time.

**Memory size-** Buffer cache ratio is a factor of memory that is present at different nodes. It plays a significant role in the time delay and heavy traffic.

1.4 Basics of Neural Network

The term neural network was traditionally referred to a network or circuit of biological neurons. The modern usage of the term often refers to the artificial neural networks, which are composed of artificial neurons or nodes. Thus the term may either refer to biological neural networks,
and tables.

B. Figures

As said, to insert images in Word, position the cursor at the insertion point and either use Insert | Picture | From File or copy the image to the Windows clipboard and then Edit | Paste Special | Picture (with “Float over text” unchecked).

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II. MATH

If you are using Word, use either the Microsoft Equation Editor or the MathType add-on (http://www.mathtype.com) for equations in your paper (Insert | Object | Create New | Microsoft Equation or MathType Equation). “Float over text” should not be selected.

III. UNITS

Use either SI (MKS) or CGS as primary units. (SI units are strongly encouraged.) English units may be used as secondary units (in parentheses). This applies to papers in data storage. For example, write “15 Gb/cm$^2$ (100 Gb/in$^2$).” An exception is when English units are used as identifiers in trade, such as “3½ in disk drive.” Avoid combining SI and CGS units, such as current in amperes and magnetic field in oversteps. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity in an equation.

The SI unit for magnetic field strength $H$ is A/m. However, if you wish to use units of T, either refer to magnetic flux density $B$ or magnetic field strength symbolized as $\mu_0 H$. Use the center dot to separate compound units, e.g., “A·m$^{-1}$.”

IV. HELPFUL HINTS

A. Figures and Tables

Because the final formatting of your paper is limited in scale, you need to position figures and tables at the top and bottom of each column. Large figures and tables may span both columns. Place figure captions below the figures; place table titles above the tables. If your figure has two parts, include the labels “(a)” and “(b)” as part of the artwork. Please verify that the figures and tables you mention in the text actually exist. Do not put borders around the outside of your figures. Use the abbreviation “Fig.” even at the beginning of a sentence. Do not abbreviate “Table.” Tables are numbered with Roman numerals.

Include a note with your final paper indicating that you request color printing. Do not use color unless it is necessary for the proper interpretation of your figures. There is an additional charge for color printing.

Figure axis labels are often a source of confusion. Use words rather than symbols. As an example, write the quantity “Magnetization,” or “Magnetization $M$, not just “$M$.” Put units in parentheses. Do not label axes only with units. As in Fig. 1, for example, write “Magnetization (A/m)” or “Magnetization (A m$^{-1}$),” not just “A/m.” Do not label axes with a ratio of quantities and units. For example, write “Temperature (K),” not “Temperature/K.”

Multipliers can be especially confusing. Write “Magnetization (kA/m)” or “Magnetization (10$^3$ A/m).” Do not write “Magnetization (A/m) × 1000” because the reader would not know whether the top axis label in Fig. 1 meant 16000 A/m or 0.016 A/m. Figure labels should be legible, approximately 8 to 12 point type.

B. References

Number citations consecutively in square brackets [1]. The sentence punctuation follows the brackets [2]. Multiple references [2], [3] are each numbered with separate brackets [1]–[3]. When citing a section in a book, please give the relevant page numbers [2]. In sentences, refer simply to the reference number, as in [3]. Do not use “Ref. [3]” or “reference [3]” except at the beginning of a sentence: “Reference [3] shows ... .” Number footnotes separately in superscripts (Insert | Footnote). Place the actual footnote at the bottom of the column in which it is cited; do not put footnotes in the reference list (endnotes). Use letters for table footnotes (see Table I).

Please note that the references at the end of this document are in the preferred referencing style. Give all authors’ names; do
not use “et al.” unless there are six authors or more. Use a space after authors' initials. Papers that have not been published should be cited as “unpublished” [4]. Papers that have been submitted for publication should be cited as “submitted for publication” [5]. Papers that have been accepted for publication, but not yet specified for an issue should be cited as “to be published” [6]. Please give affiliations and addresses for private communications [7].

C. Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have already been defined in the abstract. Abbreviations such as SI, ac, and dc do not have to be defined. Abbreviations that incorporate periods should not have spaces: write “C.N.R.S.” not “C. N. R. S.” Do not use abbreviations in the title unless they are unavoidable (for example, “INTERNATIONAL JOURNAL OF ENGINEERING AND INNOVATIVE TECHNOLOGY” in the title of this article).

D. Equations

Number equations consecutively with equation numbers in parentheses flush with the right margin, as in (1). First use the equation editor to create the equation. Then select the “Equation” markup style. Press the tab key and write the equation number in parentheses. To make your equations more compact, you may use the solidus (/), the exp function, or appropriate exponents. Use parentheses to avoid ambiguities in denominators. Punctuate equations when they are part of a sentence, as in

\[
\int_0^\infty F(r, \varphi) \, dr \, d\varphi = \frac{\sigma r_z}{(2\mu_0)} \cdot \int_0^\infty \exp(-\lambda |z_j - z_i|) \lambda^{-1} J_1(\lambda r_j) J_0(\lambda r_d) \, d\lambda.
\]  

(1)

Be sure that the symbols in your equation have been defined before the equation appears or immediately following. Italicize symbols (T might refer to temperature, but T is the unit tesla). Refer to “(1),” not “Eq. (1)” or “equation (1),” except at the beginning of a sentence: “Equation (1) is ....”

E. Other Recommendations

Use one space after periods and colons. Hyphenate complex modifiers: “zero-field-cooled magnetization.” Avoid dangling participles, such as, “Using (1), the potential was calculated.” It is not clear who or what used (1).] Write instead, “The potential was calculated by using (1),” or “Using (1), we calculated the potential.”

Use a zero before decimal points: “0.25,” not “.25.” Use “cm," not “cc.” Indicate sample dimensions as “0.1 cm x 0.2 cm,” not “0.1 x 0.2 cm².” The abbreviation for “seconds” is “s,” not “sec.” Do not mix complete spellings and abbreviations of units: use “Wb/m²” or “webers per square meter,” not “webers/m².” When expressing a range of values, write “7 to 9” or “7-9,” not “7-9.”

A parenthetical statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.) In American English, periods and commas are within quotation marks, like “this period.” Other punctuation is “outside!” Avoid contractions; for example, write “do not” instead of “don’t.” The serial comma is preferred: “A, B, and C” instead of “A, B and C.”

If you wish, you may write in the first person singular or plural and use the active voice (“I observed that ...” or “We observed that ...” instead of “It was observed that ...”). Remember to check spelling. If your native language is not English, please get a native English-speaking colleague to proofread your paper.

V. SOME COMMON MISTAKES

The word “data” is plural, not singular. The subscript for the permeability of vacuum \( \mu_0 \) is zero, not a lowercase letter “o.” The term for residual magnetization is “remanence”; the adjective is “remanent”; do not write “remnance” or “remnant.” Use the word “micrometer” instead of “micron.” A graph within a graph is an “inset,” not an “insert.” The word “alter” indicates an alloy of s

Be aware of the different meanings of the homophones “affect” (usually a verb) and “effect” (usually a noun), “complement” and “compliment,” “discreet” and “discrete,” “principal” (e.g., “principal investigator”) and “principle” (e.g., “principle of measurement”). Do not confuse “imply” and “infer.”

Prefixes such as “non,” “sub,” “micro,” “multi,” and “ultra” are not independent words; they modify, usually without a hyphen. There is no period after the “et” in the Latin abbreviation “et al.” (it is also italicized). The abbreviation “i.e.” means “that is,” and the abbreviation “e.g.” means “for example” (these abbreviations are not italicized).

An excellent style manual and source of information for science writers is [9].

VI. EDITORIAL POLICY

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Authors of rejected papers may revise and resubmit them to the journal again.
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The contents of the journal are peer-reviewed and archival. The journal INTERNATIONAL JOURNAL OF ENGINEERING AND INNOVATIVE TECHNOLOGY (IJETIR) publishes scholarly articles of archival value as well as tutorial expositions and critical reviews of classical subjects and topics of current interest.

Authors should consider the following points:
1) Technical papers submitted for publication must advance the state of knowledge and must cite relevant prior work.
2) The length of a submitted paper should be commensurate with the importance, or appropriate to the complexity, of the work. For example, an obvious extension of previously published work might not be appropriate for publication or might be adequately treated in just a few pages.
3) Authors must convince both peer reviewers and the editors of the scientific and technical merit of a paper; the standards of proof are higher when extraordinary or unexpected results are reported.
4) Because replication is required for scientific progress, papers submitted for publication must provide sufficient information to allow readers to perform similar experiments or calculations and use the reported results. Although not everything need be disclosed, a paper must contain new, useable, and fully described information. For example, a specimen's chemical composition need not be reported if the main purpose of a paper is to introduce a new measurement technique. Authors should expect to be challenged by reviewers if the results are not supported by adequate data and critical details.

CONCLUSION

This paper described a neural network based solution on 4G network and bandwidth estimation. The mobile device is done in three phases. The first phase was used to attain high mobility of the device and the solution was provided for the fast handoff in 4G network. The second phase included neural network for detecting the job's priority. The third phase had been provided the better bandwidth to the all the present service. An effective bandwidth calculation made more resources available in the network. The iterative neural network method has been scheduled the jobs according to the priority. As the solution is timely based, the paper is more effective in terms of current scenario. The main issue of quality of service is degradation at the time of handoff, whose amount is more in 4G networks as they have high mobility. The future work should focus on the cost-effectiveness in terms of bandwidth and time. There should be some distributed system to be developed so that no dependency on the base station will be presented.

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