

ITS 413 – ASSIGNMENT 1

1 Background

You run your own ICT consulting business. One part of your business is to provide network design advice to organisations that are considering new infrastructure and/or opportunities. You have a new Client seeking your advice.

2 Scenario

The Client is a 2-year old company that has had considerable success in computer graphics, especially for popular movies. Initially operating their business out of university labs and home offices, after receiving significant Venture Capital funding to aggressively grow their business, they have decided to move into two new facilities. The first facility is the main corporate office, housing the majority of management, finance and some technical staff. This building is a traditional office building. The second facility houses the development and testing centres, with the majority of the technical staff (engineers, scientists, artists). This building is an old warehouse, to be converted to suit the Client.

The Client is considering networking options for the second facility (the warehouse). One option, for which they have contracted you to investigate, is that of providing an “all-wireless” network. (This is attractive, because many of the employees are moving between offices, the layout of offices is often re-arranged, and it is difficult to install wires in most of the building). The services that will be provided by the network include: normal office Internet access (web, email, database, instant messaging); video-over-IP for videoconferencing and others.

3 Task 1

After a preliminary study, the Client is concerned about the performance limitations of wireless LANs, especially for video conferencing applications. Your task is to provide the Client with data about the performance of a wireless LAN with these applications. In addition, they are concerned about the link to use between the two offices.

You may make the following assumptions:

- Consider only a single access point (AP). Although the real network will have multiple APs, they will be separated by distance or frequency such that their performance is independent of each other.
- The applications are between a wireless LAN client and a server at the main office. For video conferencing the main purpose will allow scientists and artists in the development building to talk with the management in the central office.
- IEEE 802.11b (at 11Mb/s) is the lowest data rate wireless LAN available in all areas of the development building. Although 802.11g and 802.11n are available, because of the distances and obstructions, many of the users will need to revert to IEEE 802.11b.

The specific tasks are:

- a) Use OPNET IT Guru to analyse the performance of a single AP wireless LAN when the video conferencing application is used. You will be provided with an initial model and scenario called “ITS413_WLAN_000”. You should analyse at least the following cases:
 - i. Number of clients varies between 1 and 10. Use the default values provided in ITS413_WLAN_000 (e.g. RTS/CTS is not used, 10 frames per second video).

- b) Choose the optimal number of clients per AP to adequately support video conferencing applications. Explain (justify) the choice. For the remaining tasks, assume the wireless LAN has this many clients per AP.
- c) Compare the performance of the network when:
 - i. Default conditions (as in (a)).
 - ii. RTS/CTS is used for all packets.
 - iii. The video frame rate is 15 frames per second (however the total video data rate is the same as part i).
- d) Consider the default conditions from part (a), but with the optimal number of clients as in part (b). Compare the performance of the network when:
 - i. Default conditions (as in (a)). (ATM/SONET/OC1 link, background utilisation 0%)
 - ii. Link between router A and B is: PPP/E1; background utilisation: 0%.
 - iii. Link between router A and B is: PPP/E3; background utilisation: 0%.
 - iv. ATM/SONET/OC1 link, background utilisation 50%
 - v. Link between router A and B is: PPP/E1; background utilisation: 50%.
 - vi. Link between router A and B is: PPP/E3; background utilisation: 50%.

You should record at least the following statistics:

- i. Global Wireless LAN load, data dropped, throughput and delay.
- ii. Global video conferencing packet end-to-end delay and packet delay variation.
- iii. Point-to-point utilisation for the link between Router A and Router B (both directions)

You may (and should) use the provided IT Guru file. Simply duplicate the scenarios, add extra clients and change parameters (attributes) where necessary. For the random seed you must use your group number. You should save your file as "ITS413_WLAN_xxx" where xxx is your group number.

In your final report you should include the following:

1. A list of scenarios analysed, including a description for each scenario. The description should clearly state the difference between this scenario and the others.
2. Plots of statistics from parts (c) and (d). Explain what you see in each plot.
3. A table showing a summary of results for all scenarios.
4. An explanation of how and why the performance changes for each case. For example, what changes when the number of clients increases? Why?

You must submit your OPNET IT Guru files (all files in your directory starting with ITS413_WLAN_xxx, where xxx is your group number). Submit them as a ZIP or RAR or TAR archive named "ITS413_WLAN_xxx". You must save the plots of statistics for each scenario.

4 Task 2

From the analysis you now know the performance limitations for the video applications for the Client. Additional information that the Client wants to know includes:

- a) How secure are wireless LANs? Explain the main security issues of wireless LANs when compared to wired LANs. What are the techniques available to make wireless LANs secure? What are the advantages/disadvantages of different techniques? What is the status of the techniques in currently available products?
- b) What techniques are available to give priority to some applications? (For example, all packets from video conferencing applications should be given priority with respect to file downloads or web browsing). What are the advantages/disadvantages of different techniques? What is the status of the techniques in currently available products?

In your final report you should the above questions in at least half page of text (recommended: 1-2 pages). You may include additional supporting tables, figures and lists.

5 Payment

You have entered an agreement with the Client such that an independent third party will evaluate your final report (and OPNET IT Guru models) to determine how much of the full project cost you will be paid. If you complete all tasks with very good answers then you will receive 100%. You will be evaluated in the following areas:

- Completeness and correctness. You have addressed all tasks/issues; you analysed the correct scenarios; the conclusions you make are correct; the explanations in Task 2 are correct. 50%
- Coverage. You have provided sufficient depth in your answers (e.g. detail explanations). 10%
- Quality. The analysis, conclusions and explanations are of high quality. 25%
- Presentation. The report is professionally presented; the explanations are clear; you use diagrams where appropriate. 15%.

You may receive a bonus (of up to 25%) if you deliver an outstanding report (for example, analyse additional relevant scenarios than those required).

You may receive a penalty for not completing the work on your own. For example, copying from or heavy re-use of Wikipedia and other websites will be penalised. There is no need to work with other groups.

You must indicate the contributions of each group member towards the project (for example, person 1 – 20%; person 2 – 30%; person 3 – 50%). All group members must participate in the project.

6 Deliverables

You must deliver the final report as a printed hardcopy by 5pm 19 December 2008. By the same time, you must deliver an archived copy of your OPNET IT Guru files (via email).

A suggested structure of your final report is (and possible lengths of each section):

Title Page

Contributions

1. Introduction (1/2 page)
2. IT Guru Analysis
 - 2.1 Scenarios Analysed (several pages, including plots)
 - 2.3 Summary Statistics (tables)
 - 2.4 Discussion and Conclusions (2-3 pages)
- 3 Issues in Wireless LANs
 - 3.1 Security in Wireless LANs (1-2 pages, plus diagrams)
 - 3.2 Priority in Wireless LANs (1-2 pages, plus diagrams)

7 Groups

The assigned groups are:

ID	Name	Group
4822781524	Krikamol Muandet	1
4822792489	Teerawat Pinit	1
5122800790	Anongporn Sapkrasaesin	1
4822771376	Wittawat Jitkrittum	2
4822802536	Korakot Phianpattanawit	2
5122800840	Boontarika Sukpomb	2
4822773331	Jenkit Kuntonsurakan	3
4822796176	Shivnetra Singhsumransukh	3
5122800857	Akkarush Sungka	3
4822781516	Pich Tantichukaitikul	4
4822795822	Methawee Natedee	4
5122800899	Hemchart Chauchot	4
4822775097	Panyapat Sangvachirapibal	5
4822775139	Peera Chotimanus	5
4922770898	Pitipat Yoskai	5
4822771392	Surawut Nilanuch	6
4822791135	Benjawan Arukaroon	6
4922783586	Pongsakorn Chamapinan	6
4822772796	Thanaphat Limgitnuwat	7
4822774511	Panithan Ballungpattama	7
4922783040	Sethawich Uthayopas	7
4822792158	Korntep Na Songkhla	8
4822801439	Piraphol Kengsakul	8
4922791977	Raiwin Klinpituk	8
4822774917	Kitanan Sirilapphoonphon	9
4822780302	Jirach Suthammanas	9
4922790177	Nutdanai Trakarnsirinont	9
4822791101	Chayanit Komook	10
4822796093	Pathompat Nantarakchaikul	10
4922770641	Kittipong Siracha	10
4822773364	Jitsopa Phuthananukij	11
4822780054	Yanisa Akkarawichai	11
4922770856	Sararat Klinkhajorn	11

4822774339	Totsawin Jangprasert	12
4822774834	Davidai Haiyakijgosol	12
4922791555	Picha Ungsucarn	12
4822780351	Nattawadee Panyapanich	13
4822795889	Trakoon Hiranprateep	13
4922791910	Pitchaporn Satasuk	13
4822791754	Nont Posriprasert	14
4822791762	Worapan Bumrungsri	14
4922781804	Pasakorn Akkachotikul	14
4822791051	Kanchana Viriyachot	15
4822791283	Pornsawan Piyaprapakorn	15
4822798475	Malisa Chanvenukool	15
4922782950	Pattaraporn Bodhisuwan	15
4822772879	Kamol Vangnayunut	16
4822774784	Chalatih Charuchaimontri	16
4922781796	Vichao Saenghiranwathana	16
4822773281	Chutimas Prompruk	17
4822790988	Kitipan Rovichanrung	17
4922781507	Chayanit Limsakul	17
4822775394	Thanasarn Jarutangtrong	18
4822780161	Trissawan Tangtatsawasdi	18
5122800204	Piriya Piriyaikulchai	18
4822773265	Chotika Angsurit	19
4822791671	Suradej Cholnapakul	19
4922781531	Tithipat Sriburanasorn	19
4822772721	Mathus Tuachob	20
4822796242	Warut Thamsatitwong	20
4922800232	Supapan Tanrattanavong	20
4822770717	Kultawat Toyavanit	21
4822791176	Napha Daosodsai	21
4922791647	Nikhil Chaudhry	21
4822776343	Chalika Sangkhavanish	22
4822780047	Natida Chevarunotai	22
4922770773	Natt Kitsawatpaisan	22
4822792000	Nuttapong Chaiyawatana	23
4822792646	Peng Zhou	23
4922770286	Maythavute Poonpanitch	23
4822772788	Apiwat Henpraserttae	24
4822773646	Nuttakorn Mungkalakiri	24
4922770245	Pornthep Chutinantvarodom	24
4822774875	Karnchanit Choengwiwatkit	25
4822774982	Nawapon Chaowanapunja	25
4922781812	Thitiya Phanchaipetch	25
4822770485	Kajornpong Poolsawad	26
4822780096	Srisudarat Srisadee	26
4922791928	Kasama Yongsiriwit	26
4822770493	Jirapath Jariyawatthananon	27
4822791150	Thitima Nuchpithak	27
4922792389	Rattapat Taburan	27
4822791960	Nipat Jongcharoensiri	28
4822807949	Krit Inthajak	28
4922780418	Tanin Sittitanadol	28
4722797167	Nattadit Sukcharoen	29
4822773158	Athiwat Kshemasanta Na Ayudhya	29
4922800174	Xinming Zhao	29