PERFORMANCE ANALYSIS OF WIMAX FOR VOICE AND VIDEO CONTENT

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Outline

- **Introduction**
- Related Work
- Objectives
- Simulation Scenarios
- Results and Discussion
- Conclusion
- References

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Introduction

- Worldwide interoperability for microwave access is an IEEE 802.16 standard.

- Wireless Internet Service

- Formed in April 2001

- Based of Wireless MAN technology.

- Provide fixed and portable usage.

- Maximum data speed: 70 Mbps

- Range: Line-of-sight ~ 50 km

  Non-line-of-sight ~ 10 km

WiMAX features

- Provides a high speed over greater distances for a large number of users at reasonable cost

- Seamless interoperation between various network types

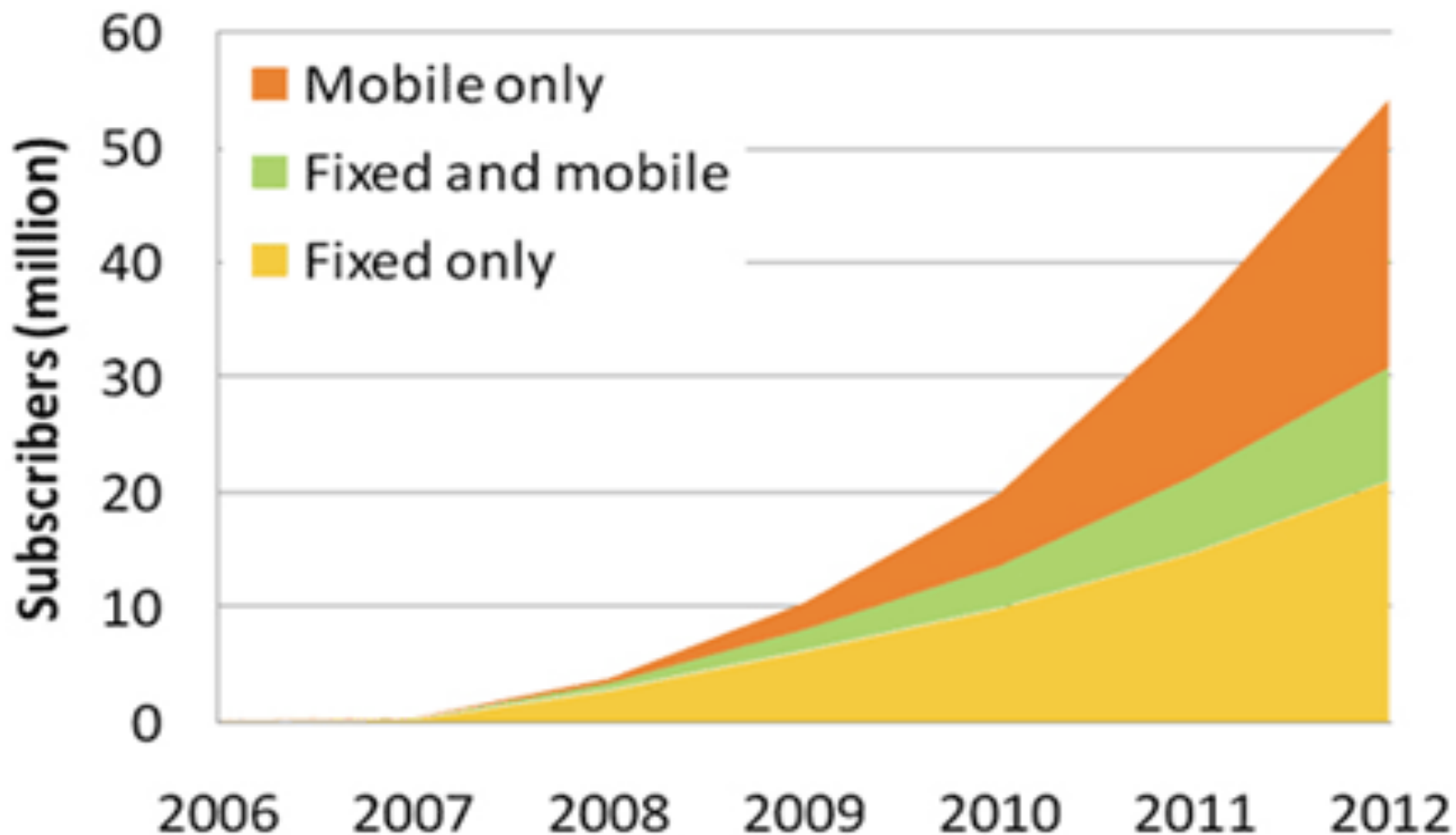- Provides wide area coverage and Quality of Service for wide variety of applications

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Figure 1: Wimax Subscribers (Source: Senza Fili Consulting, 2007)

WiMAX Broadband Access

Figure 2:

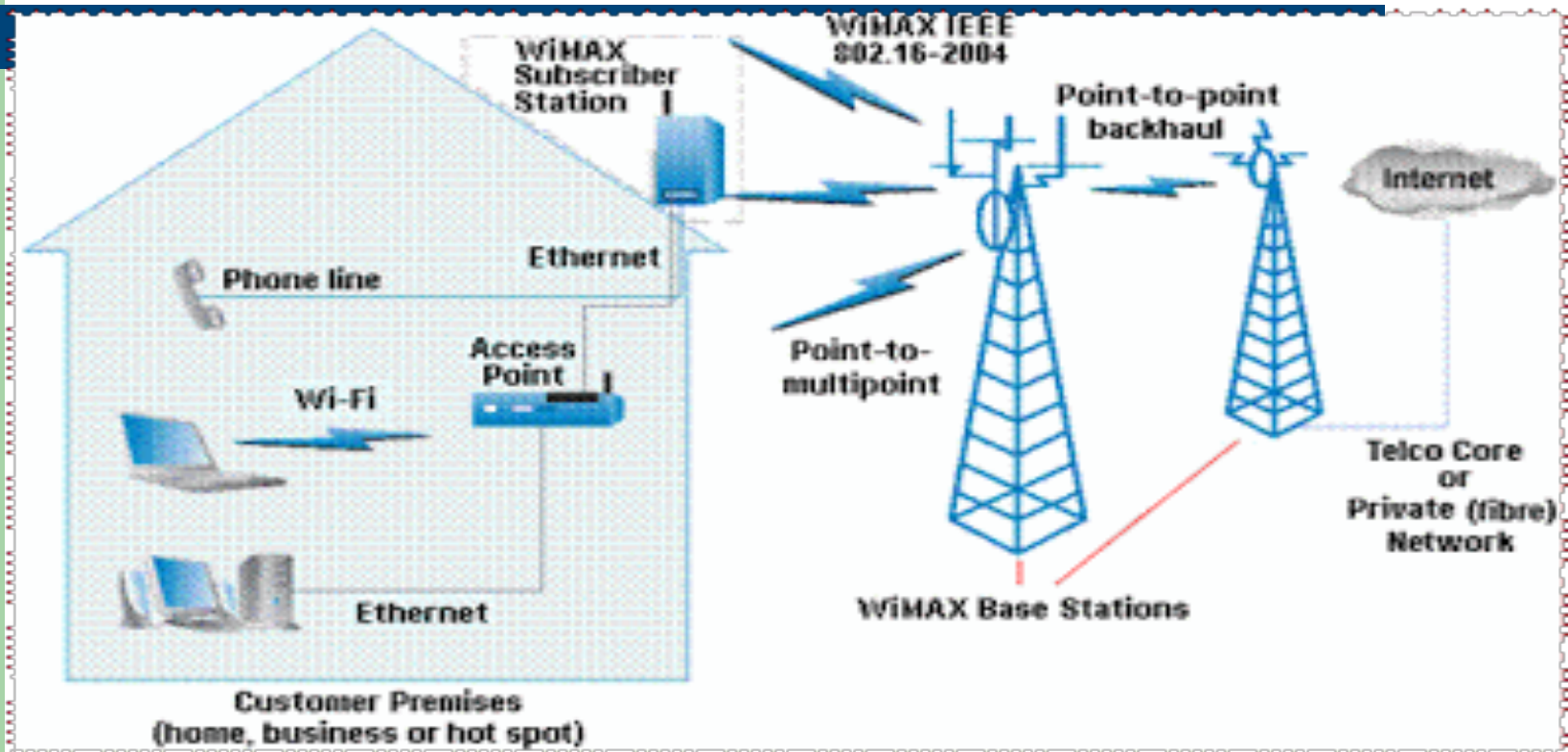Intel, Understanding Wi-Fi and WiMAX as metro-access solutions [Online]. Available: http://www.rclient.com/PDFs/IntelPaper.pdf (February 2008)

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Video Services

- Video is organized as sequence of frames.
- Video frame packets are transmitted at constant rate
- Video content characterized by several parameters: Video format, Pixel color depth, Frame inter-arrival rate
- Video frame inter-arrival rates range from 10 fps to 30 fps.
- Video source is delivered to video clients over an IP network.
- Video trace file (Tokyo Olympics) taken from Arizona State University [1][8].
- 30 frames per second and frame resolution 352*288 used
- Video is loss tolerant but delay sensitive.

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VoIP

- VoIP (Voice over Internet Protocol) enables voice communication to be delivered over Internet Protocol networks.

- Voice traffic is loss and delay sensitive.

- VoIP provides services at low costs as compared to the traditional phone services.

- VoIP is available on many smartphones, personal computers, and on Internet access devices.

- Voice quality may suffer when compression is done but compression reduces bandwidth requirements.

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Related work

- Hrudey, Will and Ljiljana Trajkovic. "Streaming video content over IEEE 802.16/WiMAX broadband access." *OPNETWORK 2008* (2008) [3]
    - Performance of WiMAX was studied using fixed nodes placed at different distances from the base station for video traffic
- Gill, Rajvir, Tanjila Farah, and Ljiljana Trajkovic. "Comparison of WiMAX and ADSL performance when streaming audio and video content." [2] (2011).
    - Audio and video content and fixed nodes used to analyze WiMAX performance
- Rufai, Syed Hamza Mehmood, Qingye Ding, and Ljiljana Trajkovic. "Comparison of VoIP and Video Content Performance Over WiMAX and LTE." [10]
    - WiMAX with mobile stations is analyzed for VoIP and video traffic using only two cells.

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Objectives

- We implemented WiMAX network on Riverbed Modeler 18.0.

- Analysis of WiMAX with fixed nodes as well as during handover.

- Impact of distance of workstations from base station on performance.

- Study the effectiveness of WiMAX while streaming video and during voice calls

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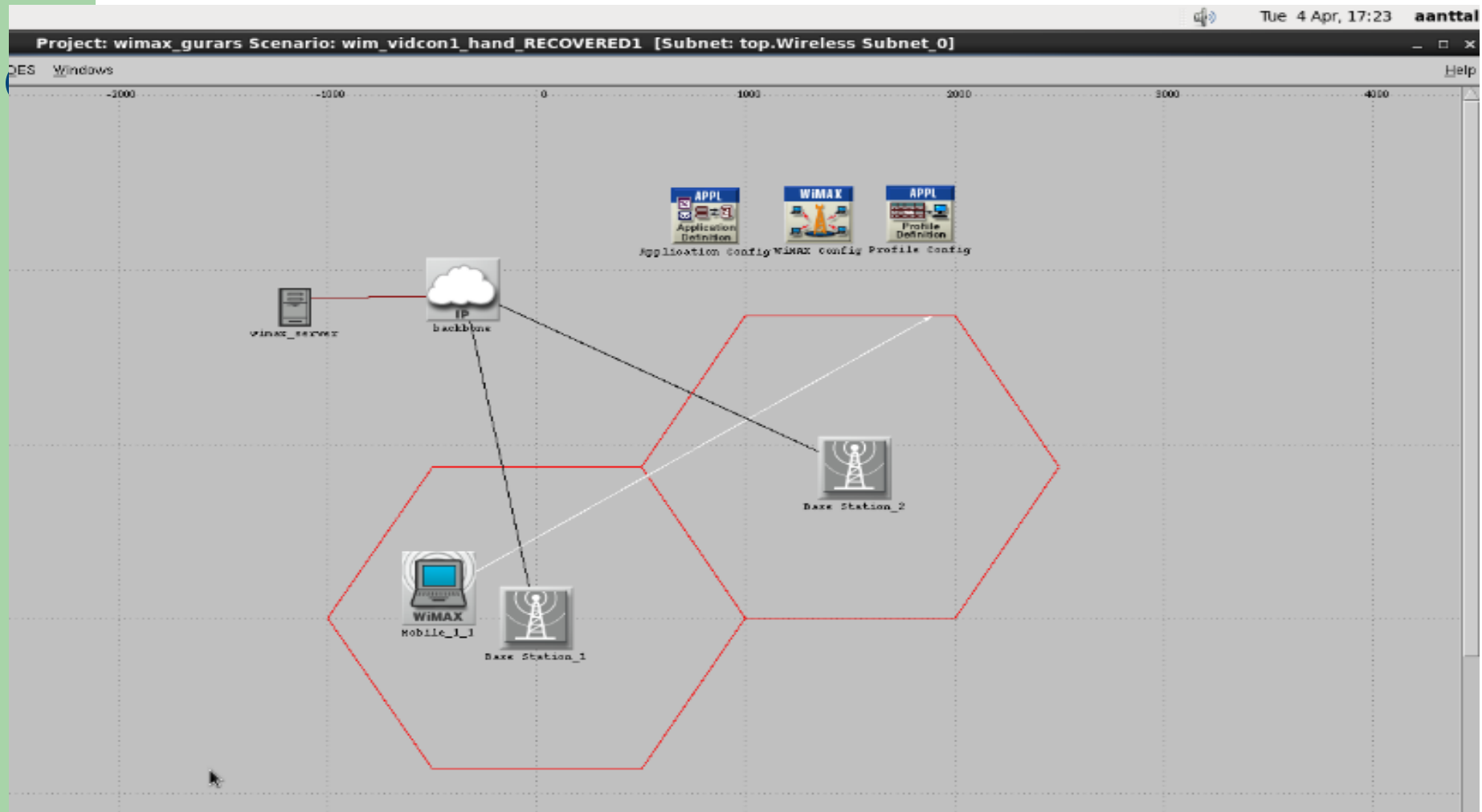- Results and Discussion
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Simulation Scenario 1

Figure 3: Fixed nodes

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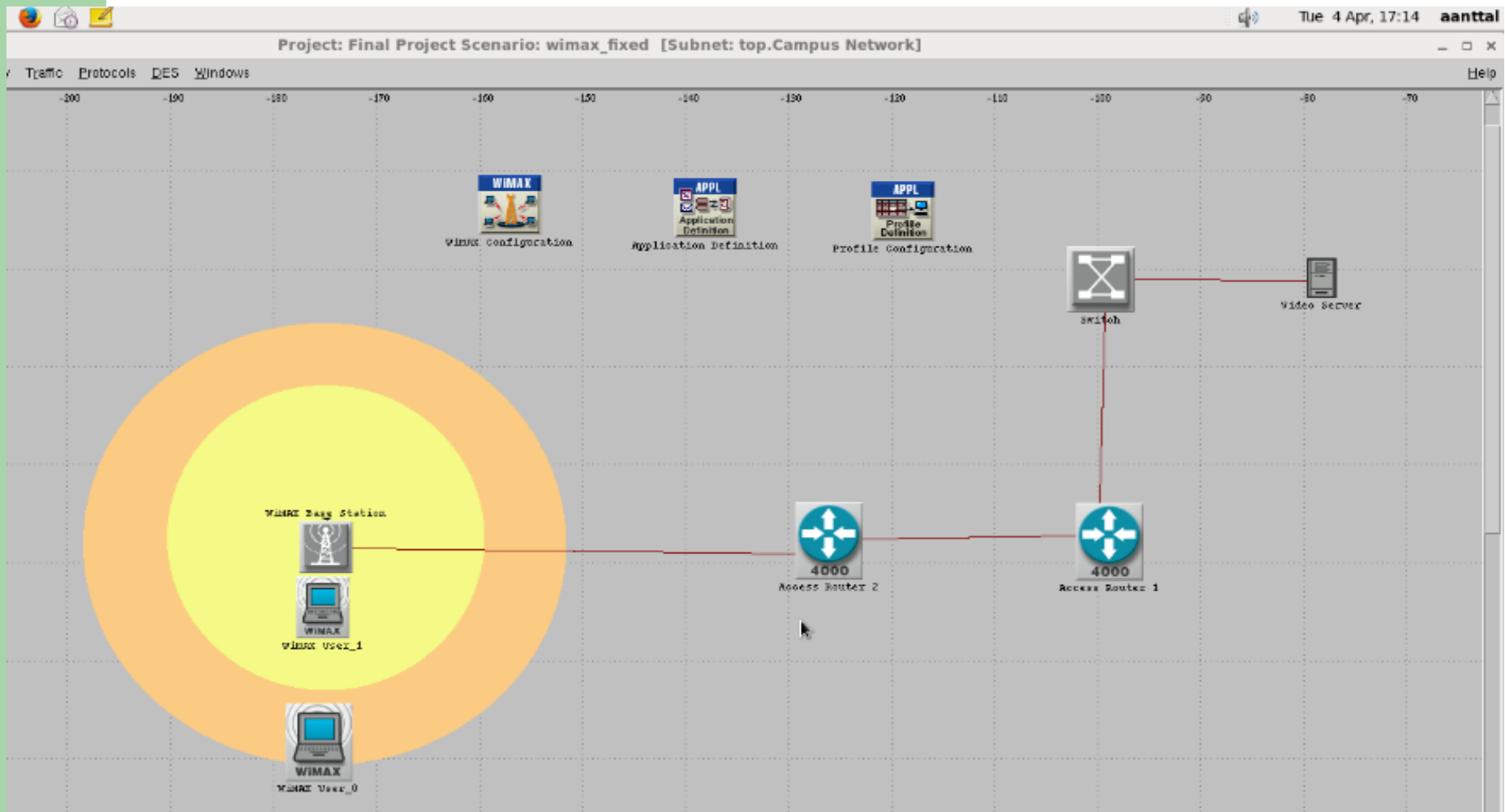
Simulation Scenario 2

- Mobile workstation moving from one cell to other.

- When mobile station is moving across the region of base station, it should be served by that base station.

- Mobile workstation is moving at a speed of 10 m/sec

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Simulation Scenario 2

Figure 4: Mobile Nodes

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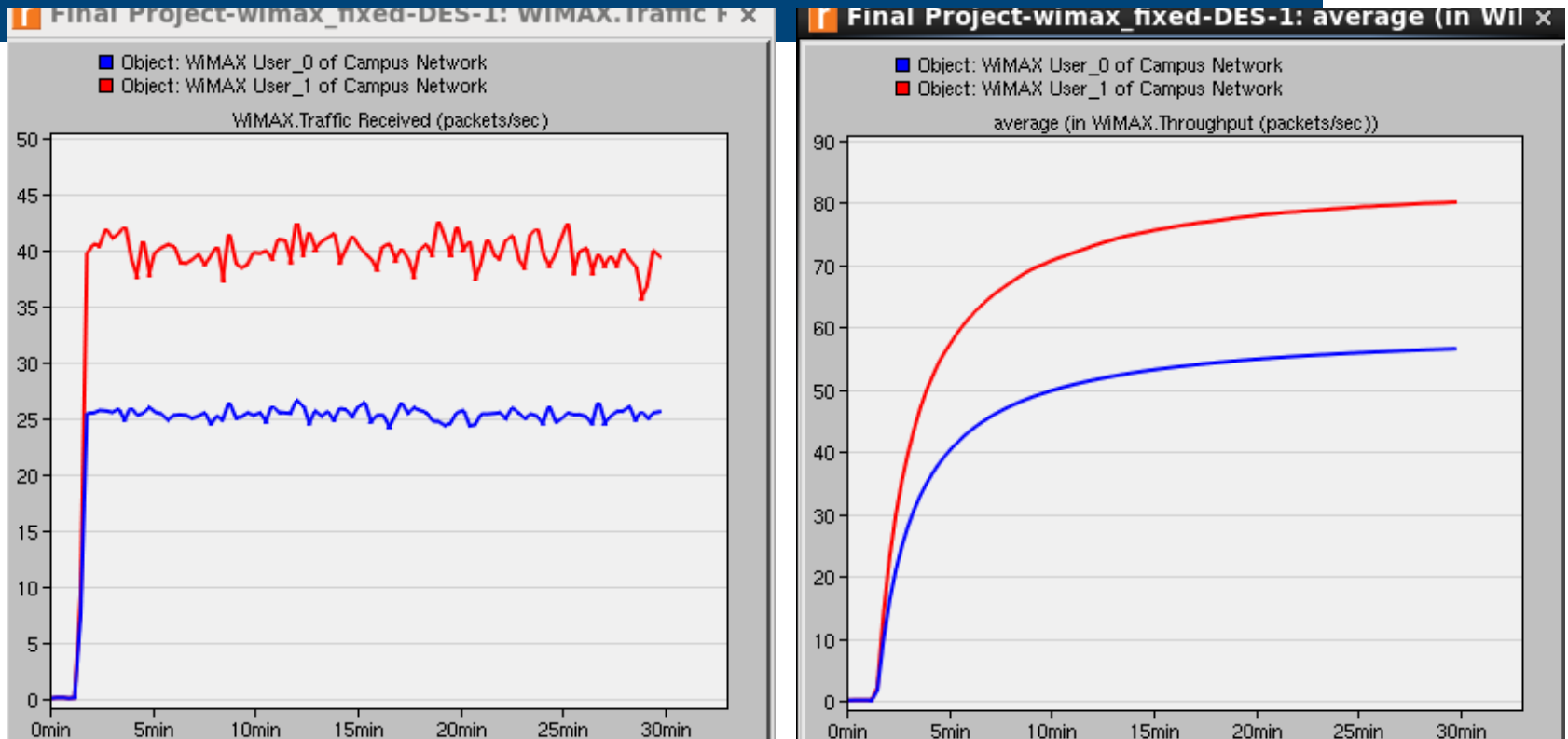- Conclusion
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Scenario 1: Fixed Nodes

Figure 5: Traffic Received(packets/sec) and Throughput(packets/sec)
Fixed node nearer to the base station receives more data and has greater throughput

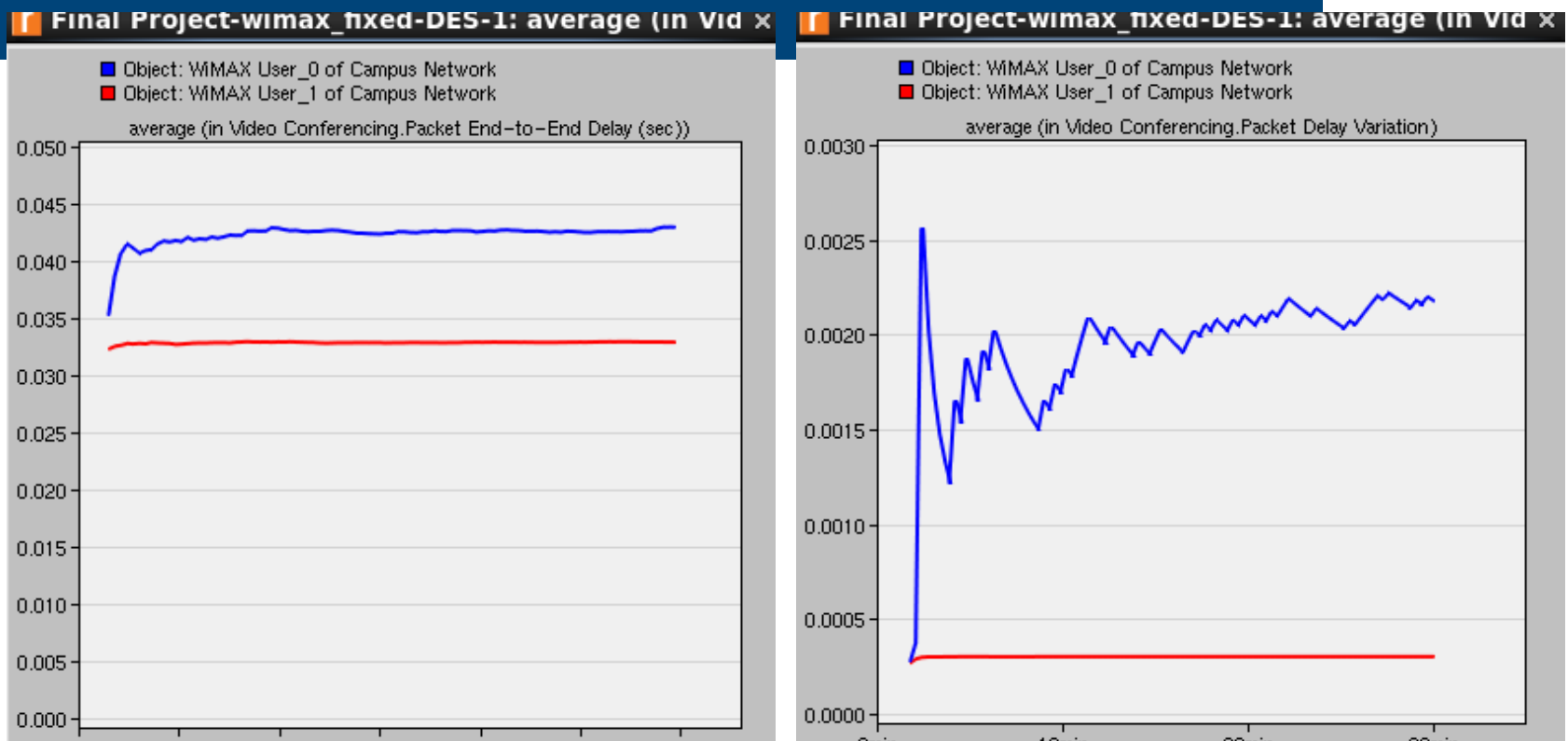05/04/2017

Scenario 1: Fixed Nodes

Figure 6: Delay(sec) and Jitter(sec)

Fixed node nearer to the base station has less delay and jitter
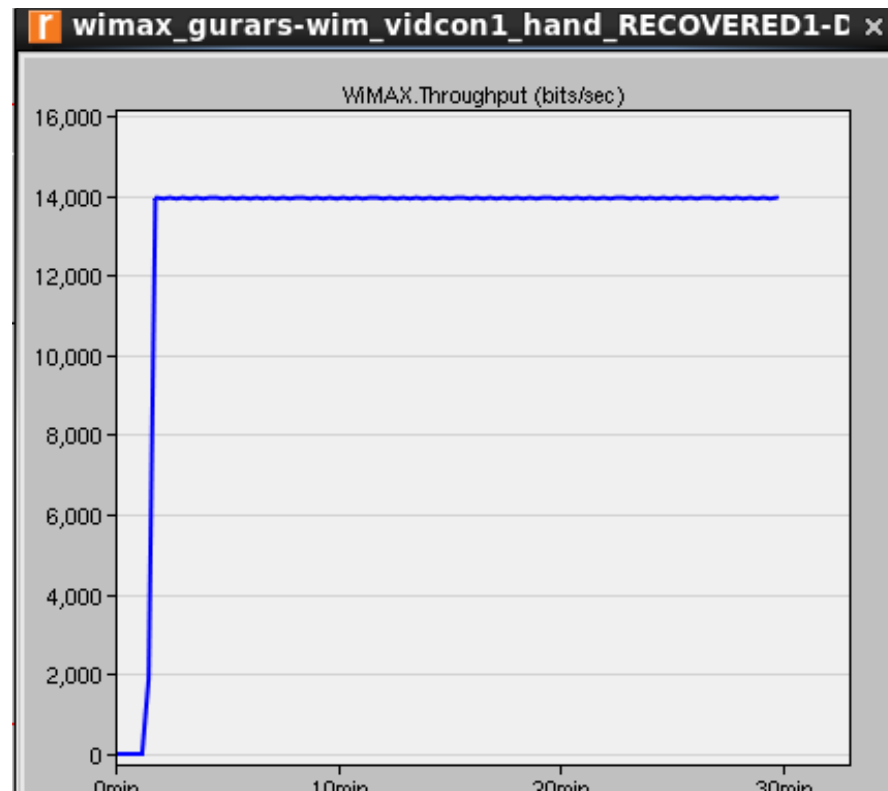
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Scenario 2: With Video

Figure 7: Throughput(packets/sec) during handover

Scenario 2:
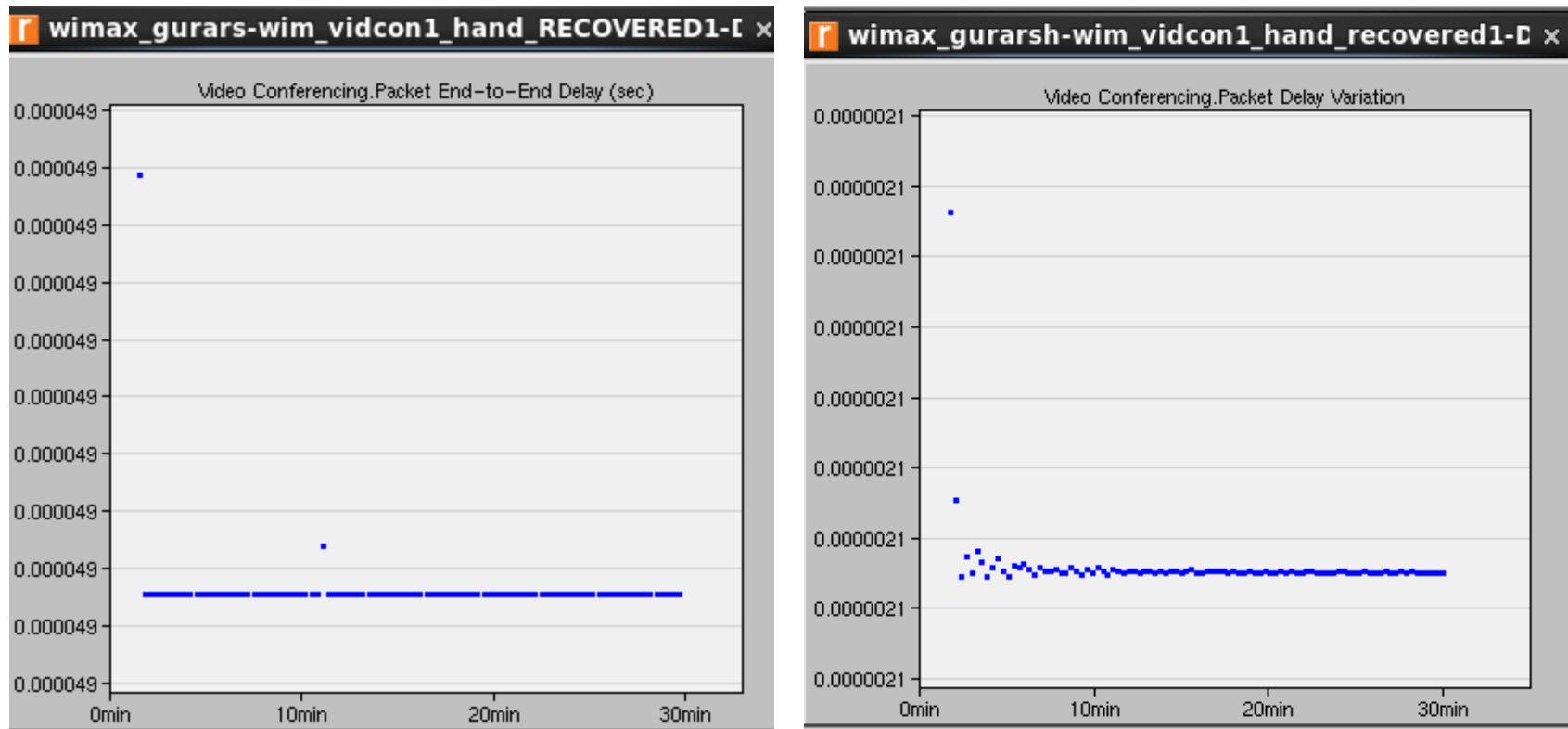

Figure 8: Delay(sec) and Jitter(sec) during handover

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Scenario 3: With VoIP

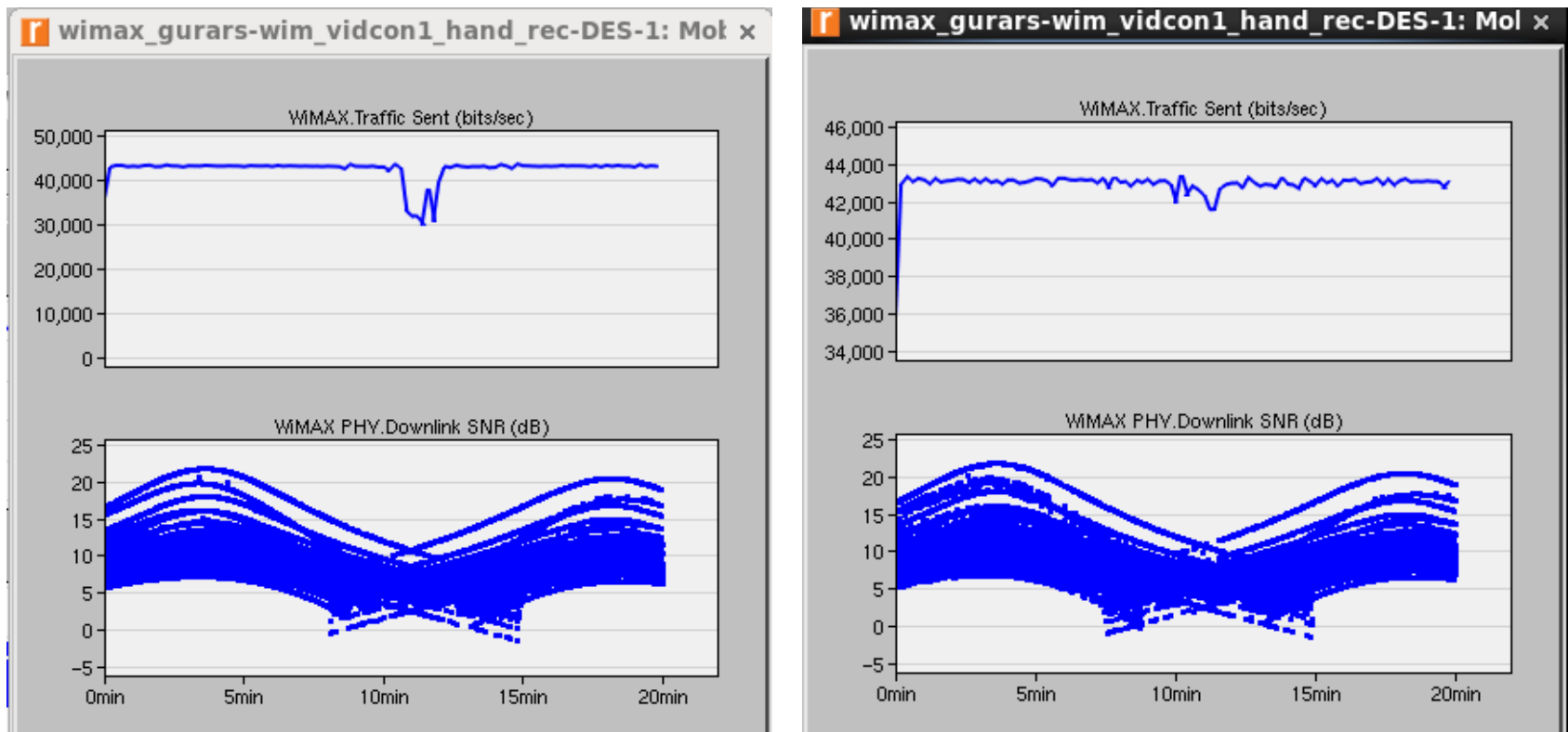Figure 9: Delay(sec) of a mobile node

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Scenario 3:

Figure 10: Handover Threshold value as 0.4dB and 6dB respectively

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Conclusion

- Extensive simulation of WiMAX wireless networks under different scenarios have been conducted.

- Distance plays an important parameter in performance output.

- Handover threshold affects the performance of WiMAX.

- WiMAX is an efficient system to transfer video and voice over IP networks

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Future Work

- Simulate the WiMAX network when a large number of users are trying to access the network and analyze the performance.

- Analyzing how background traffic impacts the performance of video streaming in WiMAX.

- Other application like remote login and network printer can also be incorporated.

- Performance can be improved by changing different parameters.

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References

[1]G. Auwera, P. David, and M. Reisslein. Traffic characteristics of H.264/ AVC variable bit rate video. [Online]. Available: http://trace. eas.asu.edu/ h264/index.html (Mar. 2008)

[2]Gill, Rajvir, Tanjila Farah, and Ljiljana Trajkovic. "Comparison of WiMAX and ADSL performance when streaming audio and video content." (2011).

[3]Hrudey, Will and Ljiljana Trajkovic. "Streaming video content over IEEE 802.16/WiMAX broadband access." *OPNETWORK 2008* (2008).

[4]IEEE standard for local, metropolitan area networks part 16: air interface for fixed, and mobile broadband wireless access systems, IEEE Standard 802.16, 2005.

[5]WiMAX Tutorials. [Online]. Available: https://www.tutorialspoint.com/wimax/index.htm

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[6]J. Yang and Z. Li ENSC 833 Final project report. "Investigation on Handover in WiMAX and Performance Comparison of VoIP over WiMAX and LTE", Spring 2016.

[7]Al-Rousan, Nabil, Omar Altrad, and Ljiljana Trajkovic. "Dual-trigger handover algorithm for WiMAX technology." (2011).

[8] G. Auwera, P. David, and M. Reisslein, Traffic and quality characterization of single-layer video streams encoded with the H.264/MPEG-4 advanced video coding standard and scalable video coding extension [Online]. Available: http://trace.eas.asu.edu/h264/index.html (Mar. 2008).

[9] Intel, Understanding Wi-Fi and WiMAX as metro-access solutions [Online]. Available: http://www.rclient.com/PDFs/IntelPaper.pdf (February 2008).

[10] Rufai, Syed Hamza Mehmood, Qingye Ding, and Ljiljana Trajkovic. "Comparison of VoIP and Video Content Performance Over WiMAX and LTE."

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Questions?