

Multihop Network Simulation with Street Layout

Document Number:

IEEE C802.16j-06/012

Date Submitted:

2006-05-01

Source:

Dean Kitchener, Mark Naden
Nortel
London Road
Harlow, Essex, CM17 9NA

Voice: +44 1279 403118
Fax: +44 1279 402100
E-mail: deank@nortel.com

Wen Tong, Peiyong Zhu,
Gamini Senarnath, Hang Zhang, David Steer, Derek Yu
Nortel, 3500 Carling Avenue

Voice: 613 7631315 613 7658089
Email: wentong@nortel.com pyzhu@nortel.com

Venue:

IEEE 802.16 Session #43, TelAviv, Israel

Base Document: N/A

Purpose:

To further clarify the modeling procedure for network simulation with street layout

Notice:

This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.

Release:

The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.

IEEE 802.16 Patent Policy:

The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures <<http://ieee802.org/16/ipr/patents/policy.html>>, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair <<mailto:chair@wirelessman.org>> as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site <<http://ieee802.org/16/ipr/patents/notices>>.

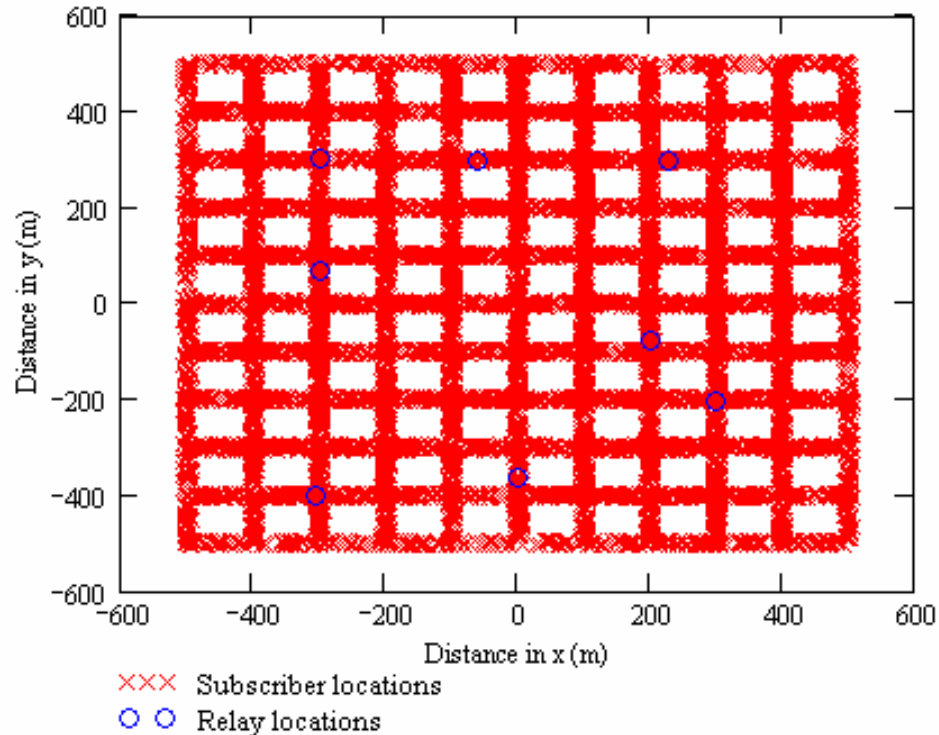
Introduction

- Some path loss and shadowing models have been proposed for multihop networks (see C802.16j-06/009, C802.16j-06/010, and C802.16j-06/011)
- The below rooftop NLOS path loss model (C802.16j-06_010) requires a street layout to be defined. These slides show how a Manhattan street layout can be applied for a Multihop network simulation, after which the path loss models can be easily applied.

Manhattan Street Grid

- Assume all subscribers are located outdoors in streets, where the street layout is a Manhattan type street grid
- Determine the block size in x- and y-directions
 - For example, 100m in both x and y
- Assume a street width (e.g.. 12m)
- Randomly generate subscriber locations on the street grid, taking into account the street width
- Randomly generate some relay locations on the street grid

Example: 1km x 1km area

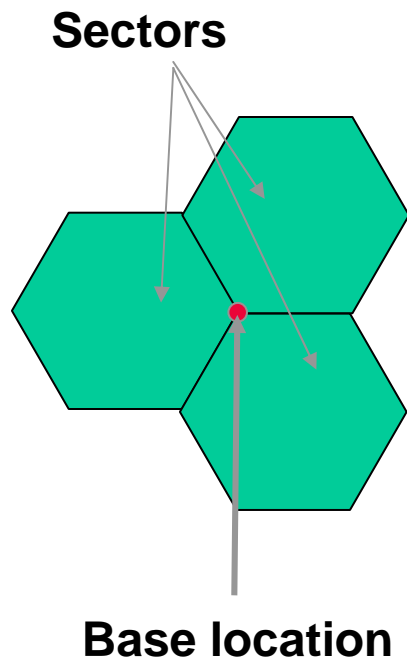


The NLOS Berg model (see C802.16j-06/010) needs to know the number of street sections between two points.

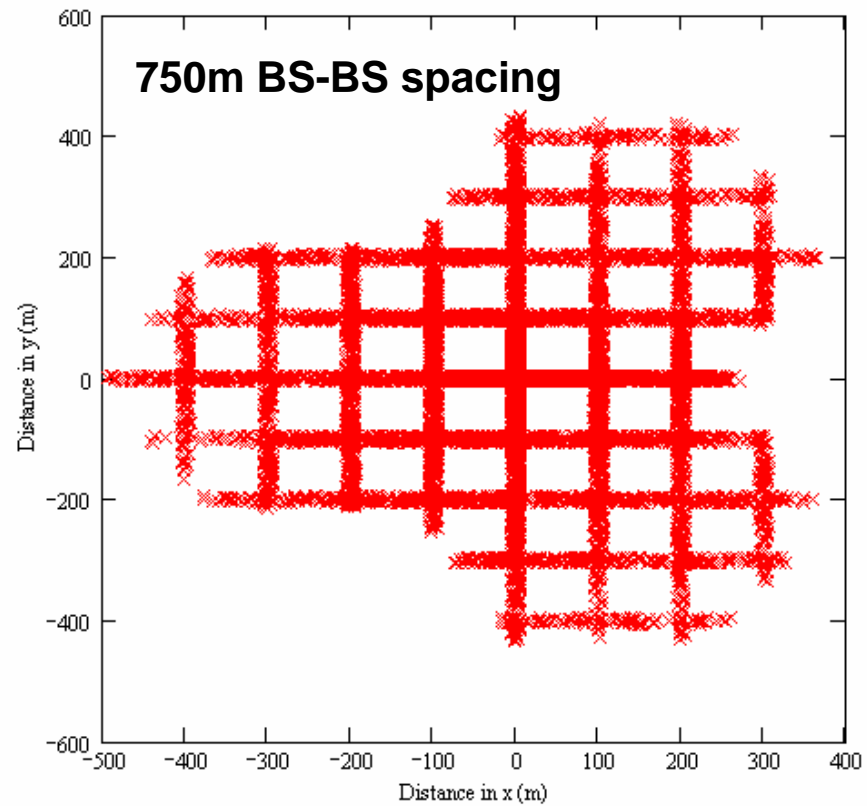
A simple algorithm can be used to determine this for the given street layout – there will never be more than three.

Berg path loss can then be compared with the over-the-rooftop path loss and the minimum taken.

Tricellular Network



Outdoor subscriber locations on a Manhattan street grid in a tricellular network



Summary of modelling procedure

- BS-RS and BS-MS path loss and shadowing can be applied using the models given in C802.16j-06/010
- Outdoor subscriber locations can be determined using a street layout
 - Manhattan street layout is given as an example in this slide set
 - Other, irregular, street grids can also be considered
 - The approach gives the option for including indoor subscribers, where these could be distributed not just in x and y, but according to a height (z) distribution as well. An appropriate path loss/shadowing model is needed for this
- From the street layout, path loss for below rooftop relays and subscribers can be calculated using the proposed below rooftop path loss model.