# Appendix B

## *Configuration files*

### *GloMoSim Configuration File "config.in "string topology*

```
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# 3532 Boelter Hall
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```

```
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# affiliate of the UC system shall be liable for any damages suffered by
# Licensee from the use of this software.
# $Id: config.in,v 1.32 2001/04/12 18:35:00 jmartin Exp $
# Anything following a "#" is treated as a comment.
        ###########################################################
# The folowing parameter represents the maximum simulation time. The numberd
# portion can be followed by optional letters to modify the simulation time.
# For example:
#       100NS   - 100 nano-seconds
#       100MS   - 100 milli-seconds
#       100S    - 100 seconds
#       100     - 100 seconds (default case)
#       100M    - 100 minutes
#       100H    - 100 hours
#       100D    - 100 days
SIMULATION-TIME     15M
# The following is a random number seed used to initialize  part of the seed of
# various randomly generated numbers in the simulation. This can be used to vary
# the seed of the simulation to see the consistency of the results of the
# simulation.

SEED                1
# The following two parameters stand for the physical terrain in which the nodes
# are being simulated. For example, the following represents an area of size 100
```

```
# meters by 100 meters. All range parameters are in terms of meters.
# Terrain Area we are simulating.

TERRAIN-DIMENSIONS  (2000, 2000)

# The following parameter represents the number of nodes being simulated.

NUMBER-OF-NODES     12
#The following parameter represents the node placement strategy.
#- RANDOM: Nodes are placed randomly within the physical terrain.
#- UNIFORM: Based on the number of nodes in the simulation, the physical
#  terrain is divided into a number of cells. Within each cell, a node is
#  placed randomly.
#- GRID: Node placement starts at (0, 0) and are placed in grid format with
#  each node GRID-UNIT away from its neighbors. The number of nodes has to be
#  square of an integer.
#- FILE: Position of nodes is read from NODE-PLACEMENT-FILE. On each line
of
#  the file, the x and y position of a single node is separated by a space.
# NODE-PLACEMENT      FILE
 NODE-PLACEMENT-FILE ./nodesstring.input
# NODE-PLACEMENT      GRID
# GRID-UNIT           30
# NODE-PLACEMENT      RANDOM
NODE-PLACEMENT      UNIFORM
# The following represent parameters for mobility. If MOBILITY is set to NO,
# than there is no movement of nodes in the model. For the RANDOM-
DRUNKEN model,
# if a node is currently at position (x, y), it can possibly move to (x-1, y),
```

# (x+1, y), (x, y-1), and (x, y+1); as long as the new position is within the
# physical terrain. For random waypoint, a node randomly selects a destination
# from the physical terrain. It moves in the direction of the destination in
# a speed uniformly chosen between MOBILITY-WP-MIN-SPEED and
# MOBILITY-WP-MAX-SPEED (meter/sec). After it reaches its
# destination, the node stays there for MOBILITY-WP-PAUSE time period.
# The MOBILITY-INTERVAL is used in some models that a node updates its position
# every MOBILITY-INTERVAL time period. The MOBILITY-D-UPDATE is used that a node
# updates its position based on the distance (in meters).

MOBILITY  NO

# Random Waypoint and its required parameters.

#MOBILITY RANDOM-WAYPOINT
#MOBILITY-WP-PAUSE      30S
#MOBILITY-WP-MIN-SPEED   0
#MOBILITY-WP-MAX-SPEED   10

#MOBILITY TRACE
#MOBILITY-TRACE-FILE ./mobility.in

#MOBILITY PATHLOSS-MATRIX

# The following parameters are necessary for all the mobility models

MOBILITY-POSITION-GRANULARITY 0.5

```
    ############################################################
# PROPAGATION-LIMIT:
#   Signals with powers below PROPAGATION-LIMIT (in dBm)
#   are not delivered. This value must be smaller than
#   RADIO-RX-SENSITIVITY + RADIO-ANTENNA-GAIN of any node
#   in the model. Otherwise, simulation results may be
#   incorrect. Lower value should make the simulation more
#   precise, but it also make the execution time longer.
#
PROPAGATION-LIMIT      -111.0
# PROPAGATION-PATHLOSS: pathloss model
#   FREE-SPACE:
#     Friss free space model.
#     (path loss exponent, sigma) = (2.0, 0.0)
#   TWO-RAY:
#     Two ray model. It uses free space path loss
#     (2.0, 0.0) for near sight and plane earth
#     path loss (4.0, 0.0) for far sight. The antenna
#     height is hard-coded in the model (1.5m).
#   PATHLOSS-MATRIX:
#PROPAGATION-PATHLOSS   FREE-SPACE
PROPAGATION-PATHLOSS   TWO-RAY
#PROPAGATION-PATHLOSS   PATHLOSS-MATRIX

# NOISE-FIGURE: noise figure
NOISE-FIGURE    10.0

# TEMPARATURE: temparature of the environment (in K)
```

```
#
TEMPARATURE     290.0
##########################################
# RADIO-TYPE: radio model to transmit and receive packets
#   RADIO-ACCNOISE: standard radio model
#   RADIO-NONOISE: abstract radio model
#   (RADIO-NONOISE is compatible with the current version (2.1b5)
#    of ns-2 radio model)
#
RADIO-TYPE              RADIO-ACCNOISE
#RADIO-TYPE             RADIO-NONOISE
# RADIO-FREQUENCY: frequency (in heltz)  (Identifying variable for multiple
   radios)
RADIO-FREQUENCY     2.4e9

# RADIO-BANDWIDTH: bandwidth (in bits per second)
RADIO-BANDWIDTH     2000000

# RADIO-RX-TYPE: packet reception model
#   SNR-BOUNDED:
#     If the Signal to Noise Ratio (SNR) is more than
#     RADIO-RX-SNR-THRESHOLD (in dB), it receives the signal
#     without error. Otherwise the packet is dropped.
#     RADIO-RX-SNR-THRESHOLD needs to be specified.
#   BER-BASED:
#     It looks up Bit Error Rate (BER) in the SNR - BER table
#     specified by BER-TABLE-FILE.
        RADIO-RX-TYPE           SNR-BOUNDED
RADIO-RX-SNR-THRESHOLD  10.0
```

```
#RADIO-RX-SNR-THRESHOLD  8.49583

#RADIO-RX-TYPE          BER-BASED
#BER-TABLE-FILE         ./ber_bpsk.in

# RADIO-TX-POWER: radio transmition power (in dBm)
RADIO-TX-POWER        15.0
# RADIO-ANTENNA-GAIN: antenna gain (in dB)
RADIO-ANTENNA-GAIN  0.0

# RADIO-RX-SENSITIVITY: sensitivity of the radio (in dBm)
RADIO-RX-SENSITIVITY -91.0
# RADIO-RX-THRESHOLD: Minimum power for received packet (in dBm)
RADIO-RX-THRESHOLD -81.0

###############################
MAC-PROTOCOL       802.11
#MAC-PROTOCOL       CSMA
#MAC-PROTOCOL       MACA
#MAC-PROTOCOL       TSMA
#TSMA-MAX-NODE-DEGREE     8
#MAC-PROPAGATION-DELAY 1000NS
# PROMISCUOUS-MODE defaults to YES and is necessary if nodes want
# to overhear packets destined to the neighboring node.
# Currently this option needs to be set to YES only for DSR is selected
# as routing protocol.  Setting it to "NO" may save a trivial amount
# of time for other protocols.
#PROMISCUOUS-MODE     NO
###############################
```

```
# Currently the only choice.

NETWORK-PROTOCOL    IP
NETWORK-OUTPUT-QUEUE-SIZE-PER-PRIORITY 100

#RED-MIN-QUEUE-THRESHOLD 150
#RED-MAX-QUEUE-THRESHOLD 200
#RED-MAX-MARKING-PROBABILITY 0.1
#RED-QUEUE-WEIGHT .0001
#RED-TYPICAL-PACKET-TRANSMISSION-TIME 64000NS
##############################
#ROUTING-PROTOCOL    BELLMANFORD
#ROUTING-PROTOCOL    AODV
  ROUTING-PROTOCOL    DSR
#ROUTING-PROTOCOL    LAR1
#ROUTING-PROTOCOL    WRP
#ROUTING-PROTOCOL    FISHEYE
#ROUTING-PROTOCOL    ZRP
#ZONE-RADIUS         2
#ROUTING-PROTOCOL    STATIC
#STATIC-ROUTE-FILE   ROUTES.IN

# The following is used to setup applications such as FTP and Telnet.
# The file will need to contain parameters that will be use to
# determine connections and other characteristics of the particular
# application.
APP-CONFIG-FILE    ./appstring.conf
# The following parameters determine if you are interested in the statistics of
# a a single or multiple layer. By specifying the following parameters as YES,
```

```
# the simulation will provide you with statistics for that particular layer. All
# the statistics are compiled together into a file called "GLOMO.STAT" that is
# produced at the end of the simulation. If you need the statistics for a
# particular node or particular protocol, it is easy to do the filtering. Every
# single line in the file is of the following format:
# Node:      9, Layer:  RadioNoCapture, Total number of collisions is 0
APPLICATION-STATISTICS          YES
TCP-STATISTICS                  NO
UDP-STATISTICS                  NO
ROUTING-STATISTICS              NO
NETWORK-LAYER-STATISTICS    NO
MAC-LAYER-STATISTICS            NO
RADIO-LAYER-STATISTICS          NO
CHANNEL-LAYER-STATISTICS    NO
MOBILITY-STATISTICS             NO

   # GUI-OPTION: YES allows GloMoSim to communicate with the Java Gui Vis
                  Tool , NO does not. Note : YES increases simulation time.

GUI-OPTION      YES
GUI-RADIO       YES
GUI-ROUTING     YES
```

# *Configuration files*

# *GloMoSim Configuration File "config.in "ring topology*

```
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# Professor Rajive Bagrodia
# University of California, Los Angeles
# Department of Computer Science
# Box 951596
# 3532 Boelter Hall
# Los Angeles, CA 90095-1596
# rajive@cs.ucla.edu
```

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# Licensee from the use of this software.
# $Id: config.in,v 1.32 2001/04/12 18:35:00 jmartin Exp $
# Anything following a "#" is treated as a comment.
        ###########################################################
# The folowing parameter represents the maximum simulation time. The numberd
# portion can be followed by optional letters to modify the simulation time.
# For example:
#       100NS   - 100 nano-seconds
#       100MS   - 100 milli-seconds
#       100S    - 100 seconds
#       100     - 100 seconds (default case)
#       100M    - 100 minutes
#       100H    - 100 hours
#       100D    - 100 days
SIMULATION-TIME     15M
# The following is a random number seed used to initialize  part of the seed of
# various randomly generated numbers in the simulation. This can be used to vary
# the seed of the simulation to see the consistency of the results of the
# simulation.

SEED                1
# The following two parameters stand for the physical terrain in which the nodes
# are being simulated. For example, the following represents an area of size 100
```

```
# meters by 100 meters. All range parameters are in terms of meters.
# Terrain Area we are simulating.

TERRAIN-DIMENSIONS  (2000, 2000)

# The following parameter represents the number of nodes being simulated.

NUMBER-OF-NODES     12
#The following parameter represents the node placement strategy.
#- RANDOM: Nodes are placed randomly within the physical terrain.
#- UNIFORM: Based on the number of nodes in the simulation, the physical
#  terrain is divided into a number of cells. Within each cell, a node is
#  placed randomly.
#- GRID: Node placement starts at (0, 0) and are placed in grid format with
#  each node GRID-UNIT away from its neighbors. The number of nodes has to be
#  square of an integer.
#- FILE: Position of nodes is read from NODE-PLACEMENT-FILE. On each line
of
#  the file, the x and y position of a single node is separated by a space.
# NODE-PLACEMENT      FILE
 NODE-PLACEMENT-FILE ./nodesring.input
# NODE-PLACEMENT      GRID
# GRID-UNIT           30
# NODE-PLACEMENT      RANDOM
NODE-PLACEMENT      UNIFORM
# The following represent parameters for mobility. If MOBILITY is set to NO,
# than there is no movement of nodes in the model. For the RANDOM-
DRUNKEN model,
# if a node is currently at position (x, y), it can possibly move to (x-1, y),
```

```
# (x+1, y), (x, y-1), and (x, y+1); as long as the new position is within the
# physical terrain. For random waypoint, a node randomly selects a destination
# from the physical terrain. It moves in the direction of the destination in
# a speed uniformly chosen between MOBILITY-WP-MIN-SPEED and
# MOBILITY-WP-MAX-SPEED (meter/sec). After it reaches its
# destination, the node stays there for MOBILITY-WP-PAUSE time period.
# The MOBILITY-INTERVAL is used in some models that a node updates its
position
# every MOBILITY-INTERVAL time period. The MOBILITY-D-UPDATE is
used that a node
# updates its position based on the distance (in meters).

MOBILITY  NO

# Random Waypoint and its required parameters.

#MOBILITY RANDOM-WAYPOINT
#MOBILITY-WP-PAUSE       30S
#MOBILITY-WP-MIN-SPEED   0
#MOBILITY-WP-MAX-SPEED   10

#MOBILITY TRACE
#MOBILITY-TRACE-FILE ./mobility.in

#MOBILITY PATHLOSS-MATRIX

# The following parameters are necessary for all the mobility models

MOBILITY-POSITION-GRANULARITY 0.5
```

```
    ############################################################
# PROPAGATION-LIMIT:
#   Signals with powers below PROPAGATION-LIMIT (in dBm)
#   are not delivered. This value must be smaller than
#   RADIO-RX-SENSITIVITY + RADIO-ANTENNA-GAIN of any node
#   in the model. Otherwise, simulation results may be
#   incorrect. Lower value should make the simulation more
#   precise, but it also make the execution time longer.
#
PROPAGATION-LIMIT      -111.0
# PROPAGATION-PATHLOSS: pathloss model
#   FREE-SPACE:
#     Friss free space model.
#     (path loss exponent, sigma) = (2.0, 0.0)
#   TWO-RAY:
#     Two ray model. It uses free space path loss
#     (2.0, 0.0) for near sight and plane earth
#     path loss (4.0, 0.0) for far sight. The antenna
#     height is hard-coded in the model (1.5m).
#   PATHLOSS-MATRIX:
#PROPAGATION-PATHLOSS   FREE-SPACE
PROPAGATION-PATHLOSS   TWO-RAY
#PROPAGATION-PATHLOSS   PATHLOSS-MATRIX

# NOISE-FIGURE: noise figure
NOISE-FIGURE    10.0

# TEMPARATURE: temparature of the environment (in K)
```

```
#
TEMPARATURE     290.0
##########################################
# RADIO-TYPE: radio model to transmit and receive packets
#   RADIO-ACCNOISE: standard radio model
#   RADIO-NONOISE: abstract radio model
#   (RADIO-NONOISE is compatible with the current version (2.1b5)
#    of ns-2 radio model)
#
RADIO-TYPE              RADIO-ACCNOISE
#RADIO-TYPE             RADIO-NONOISE
# RADIO-FREQUENCY: frequency (in heltz)  (Identifying variable for multiple
   radios)
RADIO-FREQUENCY     2.4e9

# RADIO-BANDWIDTH: bandwidth (in bits per second)
RADIO-BANDWIDTH     2000000

# RADIO-RX-TYPE: packet reception model
#   SNR-BOUNDED:
#     If the Signal to Noise Ratio (SNR) is more than
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#     without error. Otherwise the packet is dropped.
#     RADIO-RX-SNR-THRESHOLD needs to be specified.
#   BER-BASED:
#     It looks up Bit Error Rate (BER) in the SNR - BER table
#     specified by BER-TABLE-FILE.
        RADIO-RX-TYPE           SNR-BOUNDED
RADIO-RX-SNR-THRESHOLD  10.0
```

```
#RADIO-RX-SNR-THRESHOLD  8.49583

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#BER-TABLE-FILE         ./ber_bpsk.in

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# RADIO-ANTENNA-GAIN: antenna gain (in dB)
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# RADIO-RX-SENSITIVITY: sensitivity of the radio (in dBm)
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RADIO-RX-THRESHOLD -81.0

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#MAC-PROTOCOL       CSMA
#MAC-PROTOCOL       MACA
#MAC-PROTOCOL       TSMA
#TSMA-MAX-NODE-DEGREE     8
#MAC-PROPAGATION-DELAY 1000NS
# PROMISCUOUS-MODE defaults to YES and is necessary if nodes want
# to overhear packets destined to the neighboring node.
# Currently this option needs to be set to YES only for DSR is selected
# as routing protocol.  Setting it to "NO" may save a trivial amount
# of time for other protocols.
#PROMISCUOUS-MODE     NO
###############################
```

```
# Currently the only choice.

NETWORK-PROTOCOL    IP
NETWORK-OUTPUT-QUEUE-SIZE-PER-PRIORITY 100

#RED-MIN-QUEUE-THRESHOLD 150
#RED-MAX-QUEUE-THRESHOLD 200
#RED-MAX-MARKING-PROBABILITY 0.1
#RED-QUEUE-WEIGHT .0001
#RED-TYPICAL-PACKET-TRANSMISSION-TIME 64000NS
##############################
#ROUTING-PROTOCOL    BELLMANFORD
#ROUTING-PROTOCOL    AODV
  ROUTING-PROTOCOL    DSR
#ROUTING-PROTOCOL    LAR1
#ROUTING-PROTOCOL    WRP
#ROUTING-PROTOCOL    FISHEYE
#ROUTING-PROTOCOL    ZRP
#ZONE-RADIUS         2
#ROUTING-PROTOCOL    STATIC
#STATIC-ROUTE-FILE   ROUTES.IN

# The following is used to setup applications such as FTP and Telnet.
# The file will need to contain parameters that will be use to
# determine connections and other characteristics of the particular
# application.
APP-CONFIG-FILE    ./appring.conf
# The following parameters determine if you are interested in the statistics of
# a a single or multiple layer. By specifying the following parameters as YES,
```

```
# the simulation will provide you with statistics for that particular layer. All
# the statistics are compiled together into a file called "GLOMO.STAT" that is
# produced at the end of the simulation. If you need the statistics for a
# particular node or particular protocol, it is easy to do the filtering. Every
# single line in the file is of the following format:
# Node:      9, Layer:  RadioNoCapture, Total number of collisions is 0
APPLICATION-STATISTICS          YES
TCP-STATISTICS                  NO
UDP-STATISTICS                  NO
ROUTING-STATISTICS              NO
NETWORK-LAYER-STATISTICS    NO
MAC-LAYER-STATISTICS            NO
RADIO-LAYER-STATISTICS          NO
CHANNEL-LAYER-STATISTICS    NO
MOBILITY-STATISTICS             NO

   # GUI-OPTION: YES allows GloMoSim to communicate with the Java Gui Vis
                  Tool , NO does not. Note : YES increases simulation time.

GUI-OPTION      YES
GUI-RADIO       YES
GUI-ROUTING     YES
```

# Glomosim Inputs files

## nodessting.input

## String topology

0 (200 200)

1 (200 400)

2 (200 600)

3 (200 800)

4 (200 1000)

5 (200 1200)

6 (200 1400)

7 (200 1600)

8 (200 1800)

10 (200 2000)

11 (200 2200)

## nodering.input

## Ring Topology

0 (200 200)

1 (200 400)

2 (200 600)

3 (200 800)

4 (400 800)

5 (600 800)

6 (800 800)

7 (800 600)

8 (800 400)

9 (800 200)

10 (600 200)

11 (400 200)

Appstring.input

```
FTP/GENERIC 0 1 56 1460  0S  0S
FTP/GENERIC 1 2 56 1460   0S  0S
FTP/GENERIC 2 3 56 1460   0S  0S
FTP/GENERIC 3 4 56 1460   0S  0S
FTP/GENERIC 4 5 56 1460   0S  0S
FTP/GENERIC 5 6 56 1460  0S  0S
FTP/GENERIC 6 7 56 1460   0S  0S
FTP/GENERIC 7 8 56 1460   0S  0S
FTP/GENERIC 8 9 56 1460   0S  0S
FTP/GENERIC 9 10 56 1460   0S  0S
FTP/GENERIC 10 11 56 1460   0S  0S

# 2. FTP/GENERIC
#
# FTP/GENERIC does not use tcplib to simulate file transfer.  Instead,
# the client simply sends the data items to the server without the server
# sending any control information back to the client.  In order to use
# FTP/GENERIC, the following format is needed:
#
#     FTP/GENERIC <src> <dest> <items to send> <item size> <start time> <end
time>
#
# where
#
```

```
#    <src> is the client node.
#    <dest> is the server node.
#    <items to send> is how many application layer items to send.
#    <item size> is size of each application layer item.
#    <start time> is when to start FTP/GENERIC during the simulation.
#    <end time> is when to terminate FTP/GENERIC during the simulation.
#
# If <items to send> is set to 0, FTP/GENERIC will run until the specified
# <end time> or until the end of the simuation, which ever comes first.
# If <end time> is set to 0, FTP/GENERIC will run until all <items to send>
# is transmitted or until the end of simulation, which ever comes first.
# If <items to send> and <end time> are both greater than 0, FTP/GENERIC will
# will run until either <items to send> is done, <end time> is reached, or
# the simulation ends, which ever comes first.
#
.
```