Verizon 4G LTE Network Extender for Enterprise Deployment Guide

Network Systems

Samsung Telecommunications America

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Introduction

This manual describes best practices for the deployment of one to three Verizon 4G LTE Network Extenders for Enterprise (henceforth referred to as a Network Extender).

This guide will assist in the following three activities:

- Determining whether the Network Extender is the right solution for you
- Estimating how many Network Extenders you will require
- Determining the appropriate placements for your Network Extenders

Related Documentation

Additional information regarding the Network Extenders can be found in the following product documents.

- Network Extender Quick Start Guide
- Network Extender Product, Safety and Warranty
- Network Extender User Guide
- Network Extender Installation Guide

Network Extender Range

The coverage of the Network Extender will vary based on a number of factors including:

- The type of building it is being deployed within (e.g., building materials number of walls)
- The strength of the existing Verizon 4G LTE signal

The Network Extender coverage radius will vary based the RF absorption or obstruction characteristics of environment it is used in.

It is therefore important to know both your building type and the strength of the existing Verizon 4G LTE coverage before estimating the number of Network Extenders you will need and where you will place them.

You can estimate the range of a Network Extender by finding the row in the table below that applies to your building type and 2 bars (or less) of existing 4G LTE coverage.

Table 1. Network Extender Range for Single Network Extender

Building Type (RF Obstruction)	Approximate Range of Network Extender
Open	200 feet
Medium	100 feet
Dense	70 feet

The Network Extender is designed for use where there is weak 4G LTE signal. If you regularly observe more than 2 bars of 4G LTE macro coverage throughout your building, the solution may not be suitable.

The recommended capacity of the Network Extender can be found in the Auxiliary Network Extender Placement Considerations at the end of this document.

For further information regarding *Building type* see the appropriate headings below.

Building Type

Building type refers to the type of building in which the Network Extenders are being installed. There are three classifications

- Open: An open, generally commercial building with limited amounts of clutter and no or very few internal walls. Examples are warehouses or supermarkets with high ceilings and low racks.
- Medium: A building with typical levels of clutter such as open or mixed plan offices. Some internal walls but not regular internal walls. Examples include mixed use office space with low to mid height cubical walls.

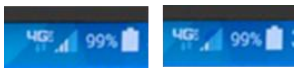
- Dense: Regular internal walls and high levels of clutter. Examples include hospitals and schools or buildings with complex floor plans and narrow hallways and passages.

If your building has many internal concrete or metal walls then a Network Extender may not be suitable for you or you may require professional assistance for installation.

Existing Verizon 4G LTE signal

Existing Verizon 4G LTE Signal refers to the level of the Verizon 4G LTE signal seen prior to the installation of any Network Extenders. It should be determined based on the highest number of bars that you regularly see when in close proximity to the windows of your building.

To check the existing Verizon 4G LTE signal strength you will need to use a 4G LTE capable Verizon phone, with a Verizon SIM card.



Single Network Extender Placement

In the process of determining the placement of your Network Extenders, you also must determine how many Network Extenders you require.

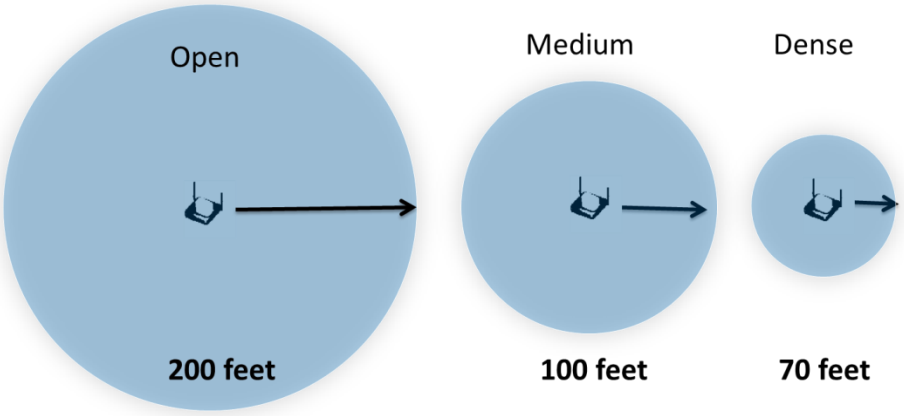
For health and safety reasons, the Network Extender should be placed in a location where people will not pass within 20cm (7.9 inches) of the antennas.

The process for placing your Network Extender is as follows:

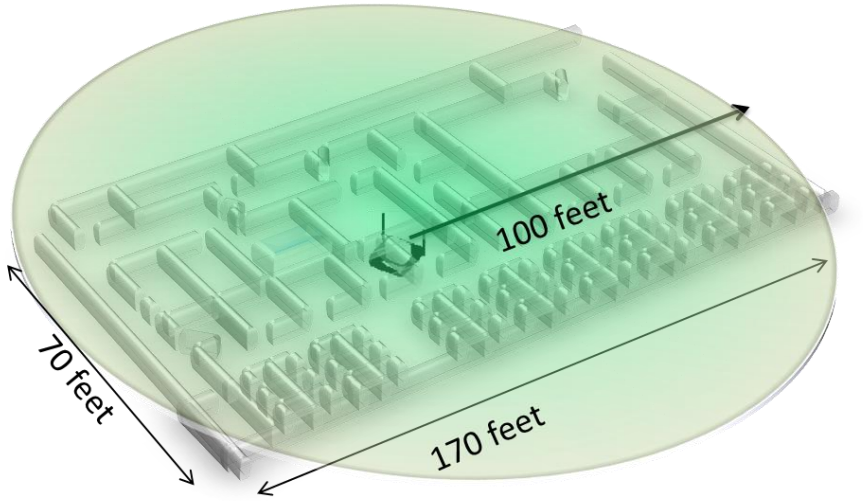
Step 1: Determine the range of your Network Extenders from Table 1. above

To visualize the coverage provided by your Network Extender, consider that the Network Extender will provide 4G LTE service to Verizon 4G LTE devices that fall within a circle that has a radius equal to the Network Extender's range.

Network Extender Typical Range



Step 2: Determine the placement of your Network Extender along the center axis of the building.



If one Network Extender is sufficient for your entire building size, then it is a good idea to place it in a central location. Use the radius calculation as a guide to find the proper positioning from the building's edges. Determine the best location with maximum visibility to the building exterior. Remember that dense structures such as stairwells and elevators will limit the range of the Network Extender.

To visualize the coverage provided by your Network Extender, consider that the Network Extender will provide 4G LTE service to Verizon 4G LTE devices that fall within a circle that has a radius equal to the Network Extender's range.

Dual Network Extender Placement

If the building's dimensions are larger than the radius of a single Network Extender; the following process will help determine how many Network Extenders you require.

For health and safety reasons, the Network Extender should be placed in a location where people will not pass within 20cm (7.9 inches) of the antennas.

The process for placing your Network Extenders is as follows:

1. Determine if the Verizon 4G LTE coverage is 2 bars or less
2. Review the approximated range
3. Check recommended spacing

Step 1: Determine the range of your Network Extenders from Table 2. below.

In the event that a single Network Extender range is not able to cover the entire building, the recommended spacing must be taken into consideration. User experience will differ depending on number of users and services in use and existing coverage from the Verizon 4G LTE network. The table below assumes that the Network Extender is operating at full power.

Table 2. Network Extender Spacing for additional Placements

Building Type	Approximate Range of Network Extender	Recommended Spacing
Open	200 feet	320 feet
Medium	100 feet	170 feet
Dense	70 feet	120 feet

If you regularly observe more than 2 bars of 4G LTE coverage throughout your building, then you may require professional assistance for installation. The recommended capacity of the Network Extender can be found in the Auxiliary Network Extender Placement Considerations at the end of this document.

Step 2: Determine the placement of your first Network Extender.

Your first Network Extender should be placed in a location towards one end of the building. Both corners of the building should be near the maximum range of the Network Extender but not beyond it.

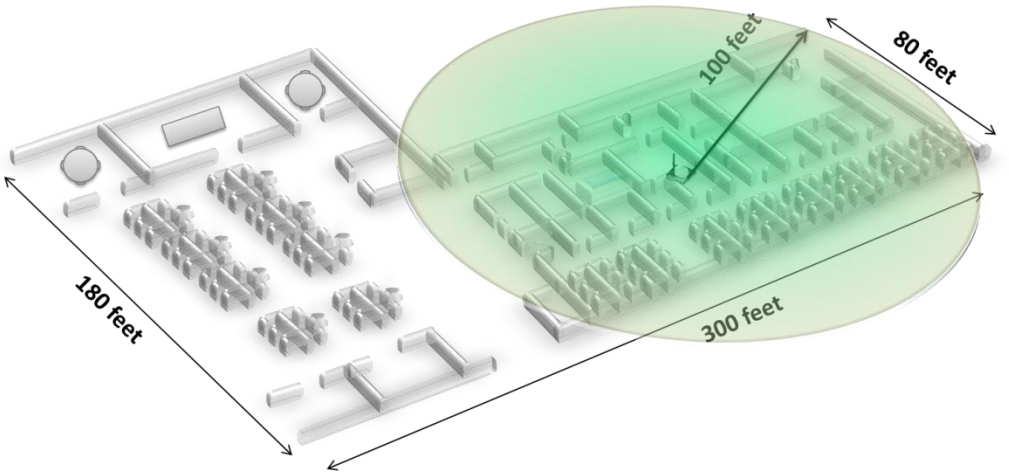


Figure 1. Network Extender Placement in Medium Building Type

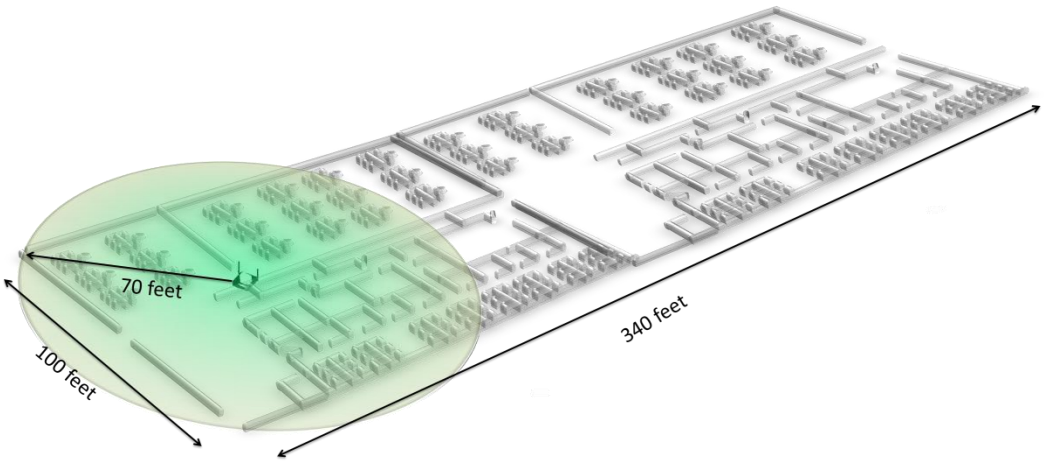


Figure 2. Network Extender Placement in Dense Building Type

Step 3: Determine the placement of your second Network Extender

For the second Network Extender, place it at the recommended range or closer to the first Network Extender, taking into consideration where the range completes the coverage for the other side.

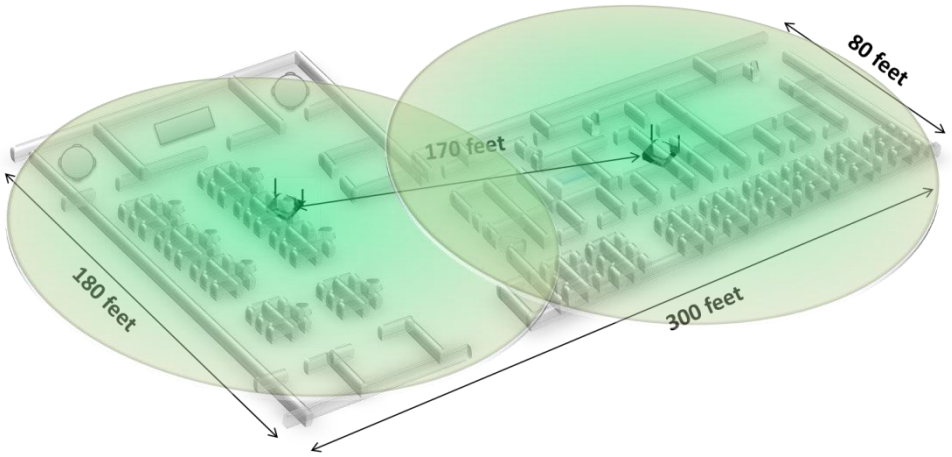


Figure 3. Second Placement in Medium Building Type (Range 100 feet, Recommended spacing up to 170 feet.)

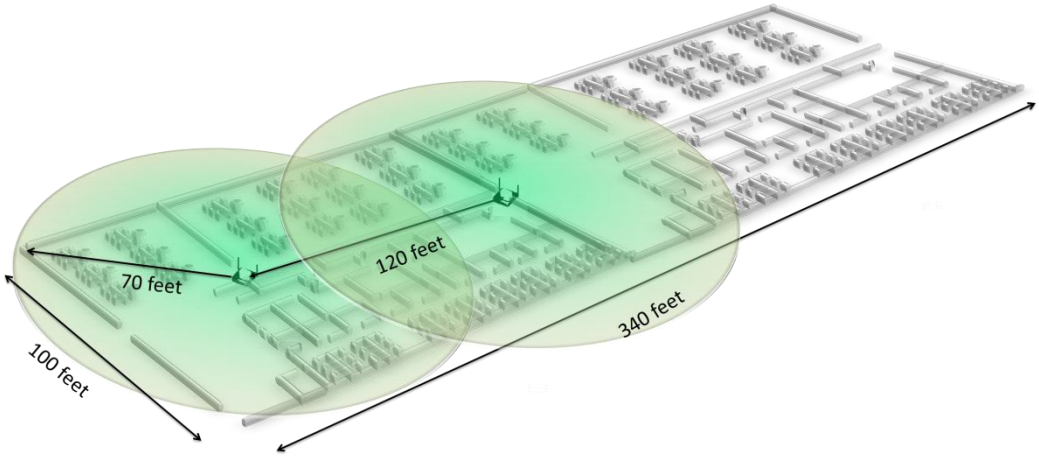


Figure 4. Second placement in Dense Building Type (Range 70 feet, Recommended spacing up to 120 feet).

Step 4: Determine the placement of your third Network Extender

If the first two Network Extenders do not entirely cover your building, place a third Network Extender in line and continue while taking care not to exceed the recommended spacing requirement.

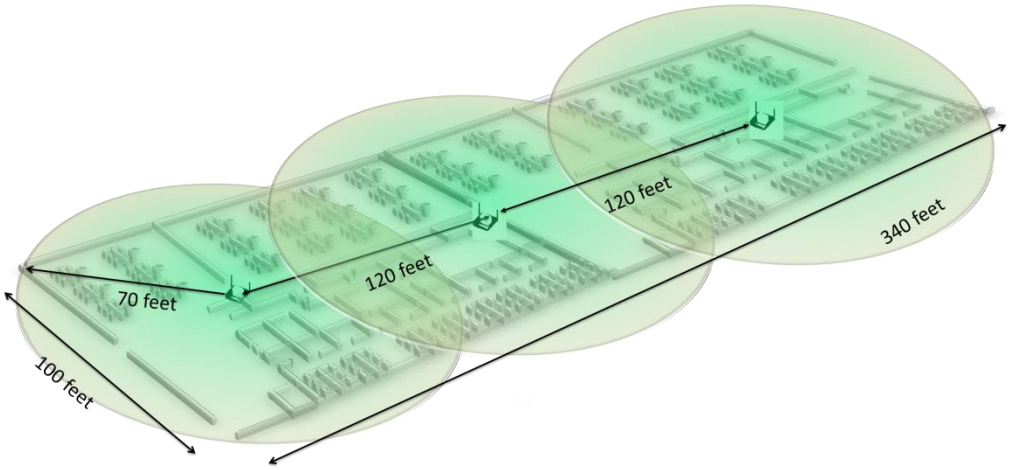


Figure 5. Third placement in Dense Building Type (Range 70 feet, Recommended spacing up to 120 feet).

If three Network Extenders do not fulfil the requirement, professional assistance for proper planning and installation may be required.

Auxiliary Network Extender Placement Considerations

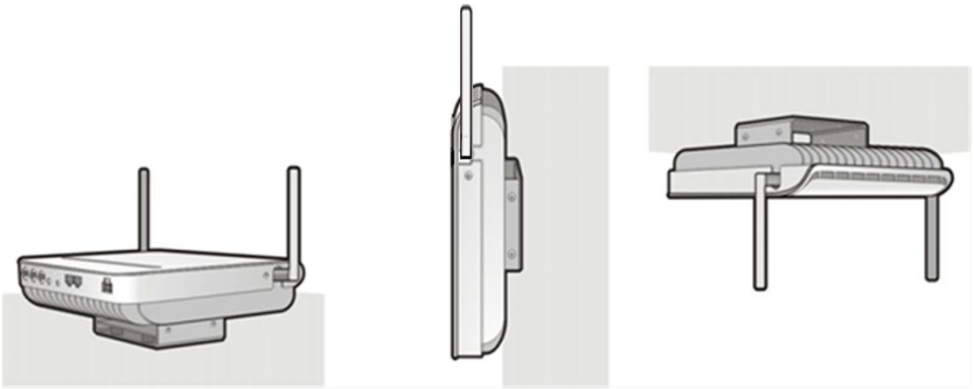
Mounting Height

It is generally recommended, where practical, that the Network Extender is mounted to the ceiling or high up on a wall to provide the best coverage.

However, it is not recommended to mount the Network Extenders beyond the following maximum recommended heights:

Table 3. Maximum recommended mounting heights

Building Type	Maximum recommended mounting height for a Network Extender
Open	32 feet
Medium	14 feet
Dense	10.5 feet



[Floor] [Wall] [Ceiling]

Recommended antenna placement is perpendicular to the floor.

Number of Users

When choosing Network Extender locations it is important to plan the placements such that there are no more than 200 Verizon 4G LTE devices within the coverage area of their nearest Network Extender.

Number of 4G LTE Network Extender for Enterprise units	Active Users supported (total)	Estimated 4G device Population Supported (Idle Capacity)
1	42	120-200*
2	84	200-400*

* Note: The number of supported Verizon Wireless devices will vary based on usage patterns of a location. The usage pattern of a location may itself vary depending on the time of day or during special events held at the location. It is advisable that the deployed units be capable of handling the peak traffic to avoid reaching active user capacity.

GPS signal

The Network Extender requires a sufficient GPS signal (that allows for acquiring a location fix) in order to operate.

The GPS antenna cable that comes with the Network Extender is 23 feet long. Therefore, the Network Extender should be placed within 23 feet of a location, so that a strong GPS signal can be acquired. If this is not practical, then an optional GPS antenna extension kit can be utilized.

To determine whether a location has a sufficiently strong GPS signal, check the GPS location can be obtained use a standalone GPS, or mobile device with 3rd party GPS test app that shows satellite signal quality. The Network Extender's Admin Webpage can also display the number of GPS satellites seen and their signal quality.

Power

The Network Extender comes equipped with a power supply unit that can be plugged into a standard US power outlet. The power supply unit has a 1.5m (5 feet) long cable. Therefore, the Network Extender needs to be within range of a power outlet. If this is not practical then an optional Power Over Ethernet device may be required, such that the unit can be powered via the Ethernet cable instead of via the dedicated power port.

Proximity to external walls and windows

When a Network Extender is placed too close to an external wall or window, the Network Extender can provide large areas of coverage outside of the deployment area. This may result in reduced capacity, and thus a poorer experience, for users who are inside the building.

To minimize this impact, it is recommended that the Network Extender not be placed closer than is necessary to external walls or windows, particularly where the walls and windows are close to busy thoroughfares.

Proximity to Users

The closer a user is to a Network Extender, the better the performance of the Network Extender and the better the user experience will be.

Where practical, it is a good idea to position the Network Extenders as close to the end users as possible.