

SpeedFactor in WiFi Evaluation

What is Speed Factor?

Speed Factor is a crucial component in evaluating your WiFi network's performance within CONTROL. It measures how well your actual connection speed matches the theoretical maximum speed of your WiFi standard and configuration. A higher Speed Factor indicates that you're getting closer to the full potential of your WiFi setup.

Note on Terminology: In this document, we use the terms "speed", "data rate", and "throughput" interchangeably. These all refer to the rate at which data is transmitted over your WiFi connection, which directly impacts the user's experience. While technically "speed" can be misleading as it's often used colloquially, here it's used synonymously with the more accurate terms "data rate" and "throughput".

Technical Foundation

Speed Factor is based on several technical aspects:

1. **WiFi Standards:** Each standard (802.11n, 802.11ac, etc.) has different theoretical maximum speeds.
2. **Channel Bandwidth:** Wider channels (e.g., 40 MHz vs 20 MHz) allow for higher speeds.
3. **Actual Data Rates:** The real-world upload and download speeds your devices are achieving.

How is Speed Factor Measured?

CONTROL compares the actual data rates (both uplink and downlink) with the theoretical maximum for your WiFi standard and channel bandwidth using the following process:

Step 1: Identify Maximum Theoretical Data Rate

The system uses the TR-181 parameter:

- `Device.WiFi.Radio.MaxBitRate`: The maximum PHY bit rate supported by this interface (expressed in *Mbps*)

Step 2: Measure Actual Data Rates

The system measures actual uplink and downlink data rates using the TR-181 parameters:

- `Device.WiFi.AccessPoint.{i}.AssociatedDevice.{i}.LastDataDownLinkRate`: The data transmit rate in *kbps* that was most recently used for transmission from the access point to the associated device
- `Device.WiFi.AccessPoint.{i}.AssociatedDevice.{i}.LastDataUplinkRate`: The data transmit rate in *kbps* that was most recently used for transmission from the associated device to the access point

Step 3: Calculate Speed Factor Percentage

$$\text{Speed Factor Percentage} = (\text{Actual Data Rate} / \text{MaxBitRate}) \times 100$$

Where **Actual Data Rate** is the average of `LastDataDownlinkRate` and `LastDataUplinkRate`.

Step 4: Assign Speed Factor Score

Based on the calculated percentage, CONTROL assigns a Speed Factor score:

- **10 (Excellent)**: 80% or more
- **8 (Very Good)**: 60-79%
- **6 (Good)**: 40-59%
- **4 (Fair)**: Less than 40%

This comparison between the actual data rates (throughput) and the maximum supported bit rate gives a clear indication of how well your WiFi connection is performing relative to its theoretical capabilities, which translates directly to the speed and quality of the user's experience.

Calculation Example

Consider the following scenario:

- MaxBitRate is 1300 Mbps (typical for 802.11ac with 80 MHz channel)
- LastDataDownlinkRate is 780 Mbps
- LastDataUplinkRate is 650 Mbps

Calculation:

1. Average Actual Speed = $(780 + 650) / 2 = 715$ Mbps
2. Speed Factor Percentage = $(715 / 1300) \times 100 \approx 55\%$
3. **Result:** Speed Factor score of **6 (Good)**

This comparison between the actual speeds and the maximum supported bit rate gives a clear indication of how well your WiFi connection is performing relative to its theoretical capabilities.

What Does Your Speed Factor Mean?

- **10-9:** You're getting the most out of your WiFi setup. Ideal for all applications, including high-bandwidth activities.
- **8-7:** Very good performance. Suitable for most high-bandwidth applications.
- **6-5:** Good performance for general use, but might struggle with very demanding applications.
- **4:** Your speed is significantly below potential. You may experience issues with high-bandwidth applications.

Why is Speed Factor Important?

1. **Performance Indicator:** It shows how well your actual speeds match up to what's theoretically possible.
2. **Troubleshooting Tool:** A low Speed Factor can indicate issues that need addressing.
3. **Value Assessment:** It helps you understand if you're getting the full value from your WiFi setup and internet plan.

Reference Speeds for WiFi Standards

The following table provides typical maximum theoretical speeds for common WiFi standards and configurations:

- **802.11n (20 MHz channel):** Up to 72 Mbps
- **802.11n (40 MHz channel):** Up to 150 Mbps
- **802.11ac (80 MHz channel):** Up to 1300 Mbps
- **802.11ax (160 MHz channel):** Up to 2400 Mbps

Note: These are simplified figures. Actual maximums can vary based on specific configurations and number of spatial streams.

References

- [1] [IEEE Std 802.11n-2009](#)
- [2] [IEEE Std 802.11ac-2013](#)
- [3] [IEEE Std 802.11ax-2021](#)

How Can You Improve Your Speed Factor?

To optimize your Speed Factor score, consider the following recommendations:

- Ensure you're using the latest WiFi standards supported by your router
- Use wider channel bandwidths when possible (e.g., 40 MHz instead of 20 MHz)
- Reduce interference from other devices and networks
- Position your router for optimal coverage
- Consider upgrading your router or internet plan if you consistently get low scores

Speed Factor in Context

While Speed Factor is important, it works in conjunction with other metrics like Signal Factor and Interference Factor within CONTROL. A high Speed Factor indicates that you're efficiently using your WiFi technology, but factors like signal strength and interference also play crucial roles in overall performance.

Remember, Speed Factor helps you understand if you're getting the speeds you should be getting based on your WiFi setup. It's a key indicator of your WiFi efficiency and performance.

Revision #2

Created 2026-02-13 22:43:22 UTC by ipena@zequenze.com

Updated 2026-04-09 03:18:56 UTC by mauro@zequenze.com