Chicago 1 GIG training

When/ Where / How

- Launch date for Chicago GIG Resi service is set for late Oct / Early Nov 2016.
- Launch will include ALL areas of Chicago.
- SMTs and Headend techs have been working day and night in order to upgrade our entire plant in record time.

New Channel Line-up

- New Channel line –up located on TDM server.
- As of Oct 20th this line-up is needed to properly troubleshoot our D3.1 plant.
- Important channels to check at every job
  - 3 (63 MHz) Low
  - 88 (609 MHz)Mid
  - 134 (855 MHz)High

DOCCIS channels

- DOCCIS 3.0
  - 16 channels
    - 73-88 (519-609MHz)
- DL Speeds
  - 25-330 MBPS
- Up Speeds
  - 5-25 MBPS

- DOCCIS 3.1 OFDM
  - 1 channel (?)
    - 91-119 (627-765 MHz)
    - PLC 653.8 MHz
    - OFDM block size 144 MHz
    - Subcarrier spacing 50Khz
    - Subcarrier Count 2752
- DL Speeds
  - 1 GIG
- UP Speeds …TBA

Old

Construction

New

Why 1 GIG?

What can you do with 1 GIG?

You could have everyone in your house streaming Netflix, YouTube, Hulu, Pandora, iHeart Radio, Spotify, and gaming all at the same time! Every person in your home can be doing something on every device – all at once simultaneously in seconds. Or you could watch some future super HD video service that doesn't exist yet. And you can brag to your neighbors that yours is bigger, stronger, faster.

Speed	HD Movie	Video Game	MP3 Album	TV Episode
25 Mbps	27 min	1 hr. 21 min	48 secs	3 min
50 Mbps	13 min	40 min	24 secs	1.3 min
100 Mbps	6 min	19 min	11 secs	46 secs
1 GIG	40 secs	2 min	<2 secs	4 secs

Maximizing your speed

What should I have for 1 GIG?

These specifications/configurations are known to work. If you do not have these, you may not get the most from your 1 GIG plan:

OS	Vista	Mac OS X
Processor	Intel i5+	2.5GHZ Intel 15+
RAM	8GB+	8GB+
Hard Drive	SSD	SSD
NIC	1000 Base T	1000 Base T

Hardware

- UBEE 1302 Stand Alone D3.1 Modem

  Cable F-connector, female

  LAN: 4 10/100/1000 Mbps RJ-45 ports

  DOCSIS 3.1 certified

  DOCSIS 1.0/2.0/3.0 certified

  UL/FCC Class B, Energy Star Certified

The UBC1302 is one of a few devices which will support RCN Gigabit Internet. DOCSIS 3.1 modems are unique in that each and every one of them have more than 1 gigabit ethernet port. This is so the customer will be able to enjoy the full breadth of thier bandwidth. Each port, after overhead, can only handle about 930 meg meaning no single wired device will be able to get a full gigabit.

KNOWN FEATURES

GIGABIT AND HIGHER SPEEDS ARE SUPPORTED BY THIS DEVICE
THIS DEVICE IS REVERSE COMPATIBLE WITH ALL VERSIONS OF DOCSIS
4 GIGABIT ETHERNET PORTS ARE PRESENT

REMEMBER, ONLY 2 DYNAMIC IP ADDRESSES ARE PERMITTED PER CUSTOMER.
ONLY 2 PORTS ARE USABLE AT THE SAME TIME!

THIS IS NOT A 3-IN-1, THERE IS NO BUILT IN ROUTER OR WIRELESS ACCESS
MODEM MUST BE INSTALLED UPRIGHT, WITHOUT OBSTRUCTION, FOR COOLING PURPOSES

Asus RT-AC66U

- 5th generation 802.11ac chipset gives you concurrent dual-band 2.4GHz/5GHz for up to super-fast 1.75Gbps
- Gigabit Ethernet ports for fast and reliable internet performance
- AiRadar optimizes wireless coverage with detachable high-powered antennas
- Enjoy the ASUSWRT dashboard UI for 3 steps easy setup, signal monitoring, and network application control

UBEE UBC1301 Voice Gateway

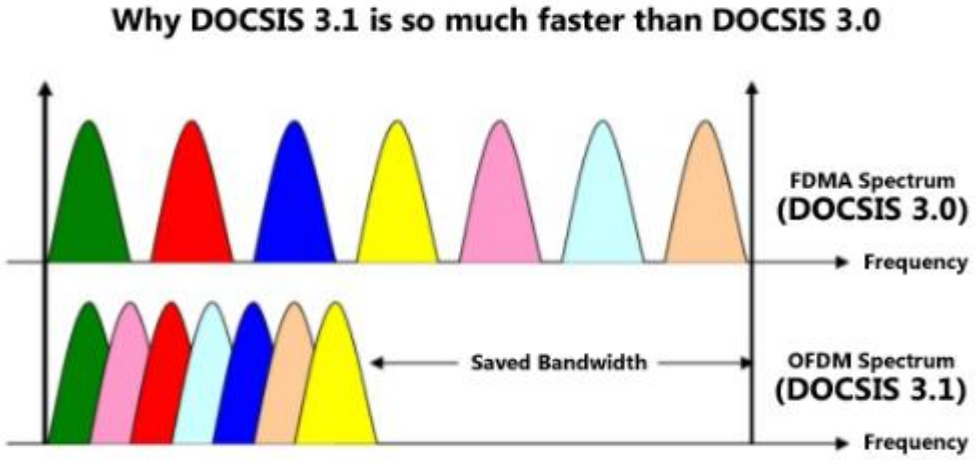
- Cable F-connector, female
- DOCSIS 3.1 2 OFDM x 2 OFDMA / DOCSIS 3.0 32/8 channel bonding
- LAN: 4 10/100/1000 Mbps RJ-45 ports
- Telephony: 2 RJ-11 ports ‣
- DOCSIS 3.1 certification (submitted to CableLabs) ‣
- MoCA 2.0 Bonded ‣
- Supports 8 SSIDS per radio, 802.11b/g/n/ac compliant with link speeds up to AC2400 Wi-Fi (600 Mbps @2.4GHz + 1733 Mbps @ 5GHz) ‣ Beam forming technology and high powered amplifiers to extend range
- 4 Tx and 4 Rx antennas with dual-band concurrent, high power radios

OFDM

Orthoganal Frequency Division Multiplier is a way of encoding digital data across multiple frequencies. **OFDM** is the technology behind **MOCA** and our latest speed upgrade to **Gigabit Internet.**

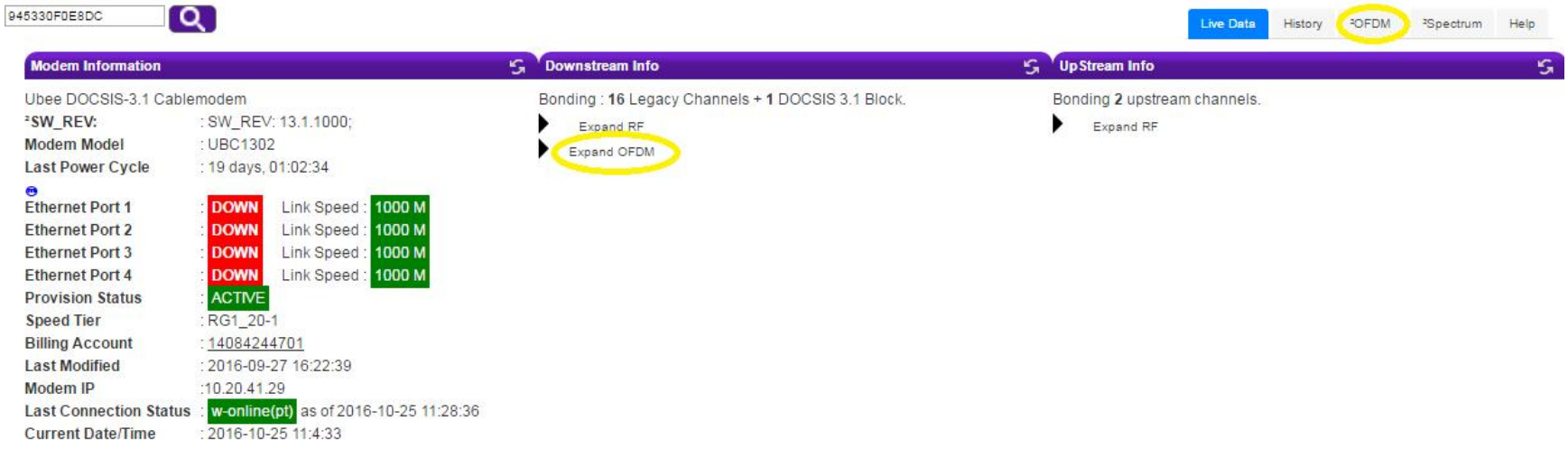
You will observe this as a drop down in **Merlin.**

This is different from **DOCSIS 3.0** specifications of using wideband channel spacing and behave differently. The efficiency and redundancy of OFDM vs. FDMA (The Technology behind DOCSIS 3.0) is phenomenal. **OFDM** allows for a much more efficient use of bandwidth available over any



- Essentially, by **eliminating the space** between **separate channels,** we are able to more efficiently use our equipment to provide superior speeds. If we look at the chart below we can see the same amount of channels in a comparison of subcarriers.

Merlin


945330F0E8DC
Live Data
History
OFDM
Spectrum
Help
Modem Information
Downstream Info
UpStream Info
Ubee DOCSIS-3.1 Cablemodem
SW_REV: : SW_REV: 13.1.1000;
Modem Model : UBC1302
Last Power Cycle : 19 days, 01:02:34
Ethernet Port 1 : DOWN Link Speed : 1000 M
Ethernet Port 2 : DOWN Link Speed : 1000 M
Ethernet Port 3 : DOWN Link Speed : 1000 M
Ethernet Port 4 : DOWN Link Speed : 1000 M
Provision Status : ACTIVE
Speed Tier : RG1_20-1
Billing Account : 14084244701
Last Modified : 2016-09-27 16:22:39
Modem IP :10.20.41.29
Last Connection Status : w-online(pt) as of 2016-10-25 11:28:36
Current Date/Time : 2016-10-25 11:4:33
Bonding : 16 Legacy Channels + 1 DOCSIS 3.1 Block.
Expand RF
Expand OFDM
Bonding 2 upstream channels.
Expand RF

Modem Information

Jbee DOCSIS-3.1 Cablemodem

SW_REV:	: SW_REV: 13.1.1000;
Modem Model	: UBC1302
Last Power Cycle	: 19 days, 01:02:34
Ethernet Port 1	: DOWN Link Speed : 1000 M
Ethernet Port 2	: DOWN Link Speed : 1000 M
Ethernet Port 3	: DOWN Link Speed : 1000 M
Ethernet Port 4	: DOWN Link Speed : 1000 M
Provision Status	: ACTIVE
Speed Tier	: RG1_20-1
Billing Account	: 14084244701
Last Modified	: 2016-09-27 16:22:39
Modem IP	:10.20.41.29
Last Connection Status	: w-online(pt) as of 2016-10-25 11:28:36
Current Date/Time	: 2016-10-25 11:6:33

Reboot Modem | Display Filters | Clear Cable Host

Delete Modem

Downstream Info

Bonding : **16** Legacy Channels + **1** DOCSIS 3.1 Block.

Expand RF
Expand OFDM

PLC Carrier: 651 Mhz
Pilot Count: 44
Subcarrier Spacing: 50 Khz

ConfigChangeCt	Cw Corrected	Cw Total	Cw Uncorrectable	InOctets	profileID
4	0	2	0	254867603545	1
4	26015627	6535990863	330271	232246696931	0

Channel Frequency	Downstream Pwr
651 Mhz	6.3
627 Mhz	2
633 Mhz	4.2
639 Mhz	4.6
645 Mhz	5.1
651 Mhz	5.8
657 Mhz	6.1
663 Mhz	5.3
669 Mhz	5
675 Mhz	4.5
681 Mhz	4.6
687 Mhz	4.7
693 Mhz	5.6
699 Mhz	6.3
705 Mhz	7
711 Mhz	7.7
717 Mhz	6.9
723 Mhz	6.4
729 Mhz	5.9
735 Mhz	5.6
741 Mhz	5.4
747 Mhz	5.6
753 Mhz	6.2
759 Mhz	6.9
765 Mhz	5.2

UpStream Info

Bonding **2** upstream channels.

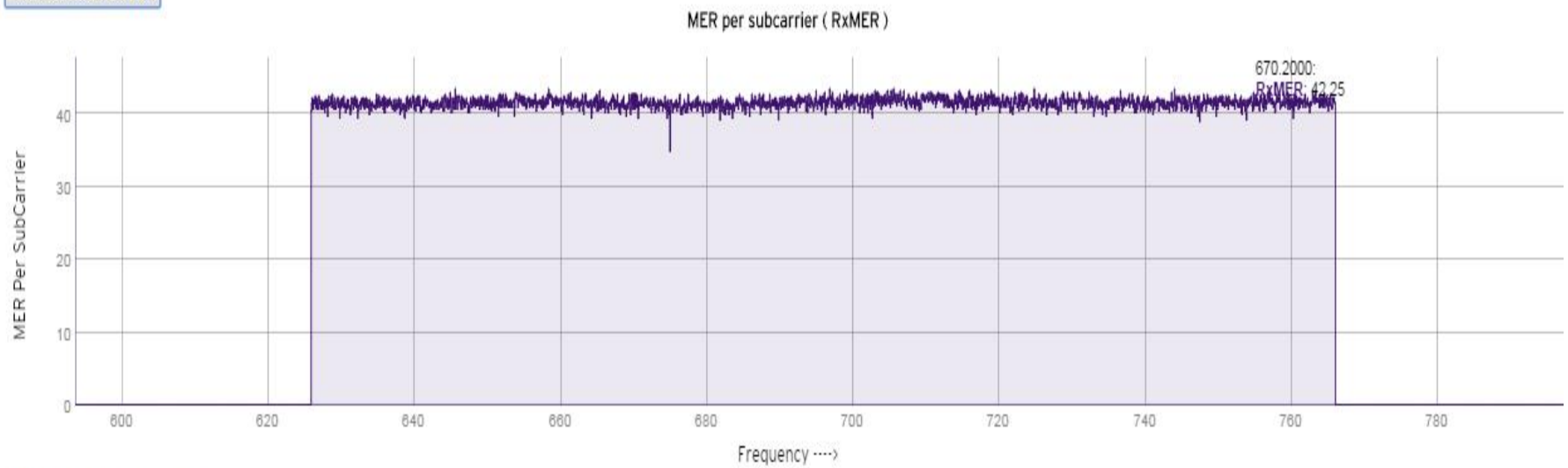
Expand RF

945330F0E8DC

Live Data | History | OFDM | Spectrum | Help

OFDM RxMER

RX MER Per Subcarrier



Subcarrier Spacing:	50 Khz
Subcarriers:	4096
Average MER:	41.57 dB

Notes

- **LED BEHAVIOR**

LED LABEL		POWER	DS	US	ONLINE	ETHERNET 1-4 (Rear Panel)
COLOR		GREEN	GREEN	GREEN	GREEN	GREEN / ORANGE
Cable Modem Initialization	(1) Power On	On	Flashes when DS (downstream) scan is in progress.	Flashes when US (upstream) scan is in progress.	Flashes when obtaining IP address and configuration.	On
	(2) Load Image	Off				On if Ethernet device is connected.
	(3) H/W Check	On (flashes just after power on).				
	(4) DS Locked and Sync OK					
	(5) US Ranging					
	(6) US Ranging OK					
	(7) Registration OK		On	On		
	(8) NACO Enable					
	(9) NACO Disable					
Cable Modem Operation	(1) Attached CPE	On	On	On	On if network connected. Off if network connect failed.	On Green = connected at 1000Mbps (GigE) On Orange = connected at 10/100 Mbps
	(2) CPE Data Tx/Rx					Flashes (Green or Orange) if connected.
	Firmware Upgrade	On	Flash	Flash	On	

Hub	CBR	Mac Address	Modem Type	Connection Location	Browser	Test Site	DSpeeds 1	Upload 1	DSpeeds 2	Upload 2	DSpeeds 3	Upload3	Average	
									9/22/2016				Average dn	AVG up
WSD	CBR 1	945330F0edd3	Ubee 1302	Direct to CBR8	IE	Speedtest.rcn.net	667	59	743	58	687	57	699	58
WSD	CBR 1	945330F0edd3	Ubee 1302	Direct to CBR8	Chrome	Speedtest.rcn.net	568	64	420	59	389	60	459	61
WSD	CBR 1	945330F0edd3	Ubee 1302	Direct to CBR8	Firefox	Speedtest.rcn.net	308	48	254	48	246	48	269	48
WSD	CBR 1	945330F0edd3	Ubee 1302	Direct to CBR8	IE	speakeasy	479	51	480	51	400	51	453	51
WSD	CBR 1	945330F0edd3	Ubee 1302	Direct to CBR8	Chrome	speakeasy	425	51	698	51	676	52	600	51
WSD	CBR 1	945330F0edd3	Ubee 1302	Direct to CBR8	Firefox	speakeasy	566	51	587	51	491	51	548	51
WSD	CBR 1	945330F0edd3	Ubee 1302	Direct to CBR8	Firefox /Debian	Speedtest.rcn.net	874	55	876	55	833	55	861	55
WSD	CBR 1	203D66AE3855	Arris 8200	Direct to CBR8	IE	Speedtest.rcn.net	661	50	819	58	796	49	759	52
WSD	CBR 1	203D66AE3855	Arris 8200	Direct to CBR8	chrome	Speedtest.rcn.net	729	65	740	50	750	50	740	55
WSD	CBR 1	203D66AE3855	Arris 8200	Direct to CBR8	Firefox	Speedtest.rcn.net	417	44	407	45	407	46	410	45
WSD	CBR 1	203D66AE3855	Arris 8200	Direct to CBR8	IE	speakeasy	718	46	710	47	662	47	697	47
WSD	CBR 1	203D66AE3855	Arris 8200	Direct to CBR8	Chrome	speakeasy	653	46	712	47	712	47	692	47
WSD	CBR 1	203D66AE3855	Arris 8200	Direct to CBR8	Firefox /Debian	Speedtest.rcn.net	742	55	888	55	872	55	834	55

									9/22/2016				Average dn	AVG up
43rd	CBR1	945330F0EEC0	Ubee 1302	Direct to CBR8	IE	Speedtest.rcn.net	695	56	687	52	612	56	665	55
43rd	CBR1	945330F0EEC0	Ubee 1302	Direct to CBR8	Chrome	Speedtest.rcn.net	209	52	225	31	226	41	220	41
43rd	CBR1	945330F0EEC0	Ubee 1302	Direct to CBR8	Firefox	Speedtest.rcn.net	295	46	348	48	429	47	357	47
43rd	CBR1	945330F0EEC0	Ubee 1302	Direct to CBR8	IE	speakeasy	699	49	705	49	717	44	707	47
43rd	CBR1	945330F0EEC0	Ubee 1302	Direct to CBR8	Chrome	speakeasy	636	47	636	47	635	49	636	48
43rd	CBR1	945330F0EEC0	Ubee 1302	Direct to CBR8	Firefox	speakeasy	505	49	434	49	453	49	464	49
43rd	CBR1	945330F0EEC0	Ubee 1302	Direct to CBR8	Firefox /Debian	Speedtest.rcn.net	870	52	880	66	906	51	885	56
43rd	CBR1	203D66AD7B15	Arris 8200	Direct to CBR8	Firefox/Debian	Speedtest.rcn.net	886	49	865	50	879	50	877	50
43rd	CBR1	203D66AD7B15	Arris 8200	Direct to CBR8	IE	Speakeasy	765	48	729	47	711	50	735	48
43rd	CBR1	203D66AD7B15	Arris 8200	Direct to CBR8	Chrome	Speakeasy	451	48	475	49	510	49	479	49
43rd	CBR2	203D66AD7B16	Arris 8200	Direct to CBR9	Firefox	Speakeasy	501	48	417	48	428	49	449	48

									9/22/2016				Average dn	AVG up
ELM	CBR1	9453.30f0.ee02	Ubee 1302	Direct to CBR8	IE	Speedtest.rcn.net	798	58	592	47	571	53	654	53
ELM	CBR1	9453.30f0.ee02	Ubee 1302	Direct to CBR8	Chrome	Speedtest.rcn.net	431	43	351	43	366	44	383	43
ELM	CBR1	9453.30f0.ee02	Ubee 1302	Direct to CBR8	Firefox	Speedtest.rcn.net	186	33	289	42	205	41	227	39
ELM	CBR1	9453.30f0.ee02	Ubee 1302	Direct to CBR8	IE	speakeasy	671	44	704	46	737	45	704	45
ELM	CBR1	9453.30f0.ee02	Ubee 1302	Direct to CBR8	Chrome	speakeasy	403	48	394	47	401	45	399	47
ELM	CBR1	9453.30f0.ee02	Ubee 1302	Direct to CBR8	Firefox	speakeasy	261	45	301	45	427	44	330	45
ELM	CBR1	9453.30f0.ee02	Ubee 1302	Direct to CBR8	Firefox /Debian	Speedtest.rcn.net	816	49	640	49	895	41	784	46
ELM	CBR1	203D66AD7B45	Arris 8200	Direct to CBR8	Firefox /Debian	Speedtest.rcn.net	871	49	851	51	891	48	871	49
ELM	CBR1	203D66AD7B45	Arris 8200	Direct to CBR8	IE	Speedtest.rcn.net	653	48	602	51	779	49	678	49
ELM	CBR1	203D66AD7B45	Arris 8200	Direct to CBR8	Chrome	Speedtest.rcn.net	375	28	381	39	392	49	383	39
ELM	CBR1	203D66AD7B45	Arris 8200	Direct to CBR8	Firefox	Speedtest.rcn.net	212	35	344	35	377	44	311	38
ELM	CBR1	203D66AD7B45	Arris 8200	Direct to CBR8	IE	speakeasy	490	45	490	45	492	46	491	45
ELM	CBR1	203D66AD7B45	Arris 8200	Direct to CBR8	Chrome	speakeasy	388	44	399	45	404	45	397	45
ELM	CBR1	203D66AD7B45	Arris 8200	Direct to CBR8	Firefox	speakeasy	280	46	299	45	270	46	283	46

Woodside

Ubee

Download 556

Upload 54

Arris

Download 689

Upload 50

43rd Ave

Ubee

Download 562

Upload 49

Arris

Download 635

Upload 49

Elmhurst

Ubee

Download 497

Upload 45

Arris

Download 488

Upload 44

Talking points

- **What does “speeds up to 1 GIG” mean?**
- The benefits offered by Gigabit speeds are real and very exciting, especially as technology advances – 1 GIG is the next generation internet for today’s home (faster downloads, quicker response times, smooth streaming, etc.). While we provide 1 gigabit speed, many factors can impact your speeds that are beyond our control. For example, the age and processor capability of your equipment, wireless interference, browsers and other factors all impact Internet speed.
-
- **If I can’t get 1 GIG on my device, why do I need 1 GIG?**
- 1 Gigabit internet is crazy fast and offers huge benefits for your home. If you have multiple devices connected to the internet or individuals accessing the Internet at the same time, 1 Gigabit service will provide more total bandwidth to go around, which will result in a better overall experience for every device and user in your house. 1 Gigabit speed enables you to run all your devices at the same time and have faster downloads, quicker response times, smooth streaming, crisp video viewing and more.

** Testing two Laptops simultaneously off of the same modem*

Hub	CBR	Mac Address	Modem Type	Connection Location	Browser	Test Site		DSpeeds 1	DSpeeds 2	DSpeeds 3	DSpeeds 4	DSpeeds 5	DSpeeds 6	Average
WSD	CBR 1	945330F0edd3	Ubee 1302	Direct to CBR8	Firefox /Debian	Speedtest.rcn.net	HP Probook 6550p	189	426	356	396	333	367	**345**
WSD	CBR 1	945330F0edd3	Ubee 1302	Direct to CBR8	IE	Speedtest.rcn.net	HP2540p	738	481	625	568	660	685	**626**
								927	907	981	964	993	1052	**971**
WSD	CBR 1	945330F0edd3	Ubee 1302	Direct to CBR8	Firefox /Debian	Speedtest.rcn.net	HP Probook 6550p	620	598	585	587	552	578	**587**
WSD	CBR 1	945330F0edd3	Ubee 1302	Direct to CBR8	IE	Speedtest.rcn.net	HP2540p	721	686	663	671	620	819	**697**
								1341	1284	1248	1258	1172	1397	**1283**
WSD	CBR 1	203D66AE3855	Arris 8200	Direct to CBR8	Firefox /Debian	Speedtest.rcn.net	HP Probook 6550p	184	378	188	278	449	218	**283**
WSD	CBR 1	203D66AE3855	Arris 8200	Direct to CBR8	IE	Speedtest.rcn.net	HP2540p	678	583	573	641	608	673	**626**
								862	961	761	919	1057	891	**909**
WSD	CBR 1	203D66AE3855	Arris 8200	Direct to CBR8	Firefox /Debian	Speedtest.net	HP Probook 6550p	811	746	777	750	628	625	**723**
WSD	CBR 1	203D66AE3855	Arris 8200	Direct to CBR8	IE	Speedtest.net	HP2540p	781	755	751	790	752	746	**763**
								1592	1501	1528	1540	1380	1371	**1485**

Troubleshooting

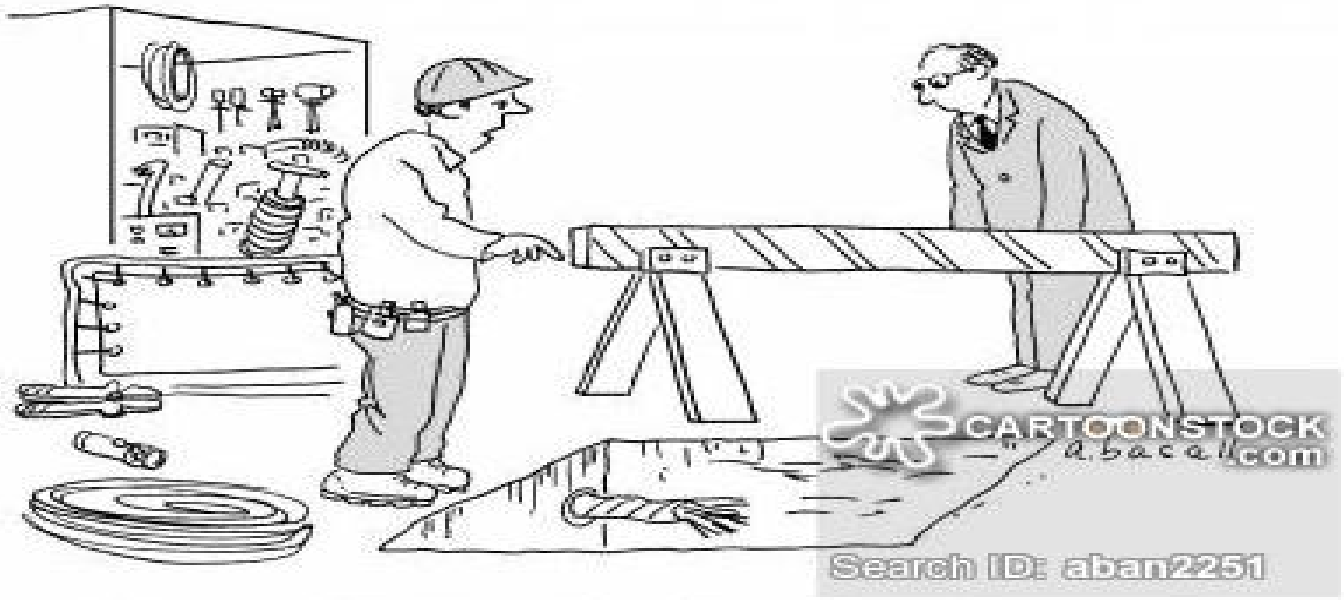
- The technology behind our **DOCSIS 3.1** service is very different previous versions. Fortunately, troubleshooting **DOCSIS 3.1** is almost the same.
- Customer has plugged in more then 2 devices into the UBEE DOCSIS 3.1 modem and now the proper devices cannot get online
  - Unplug all devices from the modem
  - Unplug the power from the modem
  - Wait one minute
  - Plug in the power to the modem
  - Plug in the ethernet to the 2 devices you wish to have IP addresses
  - Power cycle each device
- **Speeds**
  - It is impossible for a single device to get a Gigabit
  - All DOCSIS 3.1 modems have more then one port in an effort to give our customers an opportunity to get all of the speed out of their modem. This is done because each wired connection is limited to 890-920 meg at the very best. This is due to Ethernet overhead and is a universal problem across all providers.
  - As always, trouble calls should be placed when a customer is not satisfied with their speeds after we go over all of the details and troubleshoot.

What factors could affect my speed?

The website you're on, the number of people online, the browser you use, your wireless equipment, the number of devices running at once and many other things could all contribute to slowing down your Internet experience. A wired connection will always give you the fastest speed you will experience in your home. But you should also note that not all devices and electronics are designed to handle Gigabit speeds. An average computer might show a speed test slower than 500 Mbps, even when we are actually feeding you a full GIG (1,000 Mbps). Even if you have the latest equipment, there are still factors beyond our control that could impact speed. However, ***1 Gigabit will provide more total bandwidth for your home, which will, in turn, result in better overall performance and happiness for everyone in your house.***

NOW

- Let’s all install a DOCCIS 3.1 UBEE 1302 using a ASUS RT-AC66U.



"When we finish installing fibre optic cables, we will be able to transmit error messages to your computer thousands of times faster."