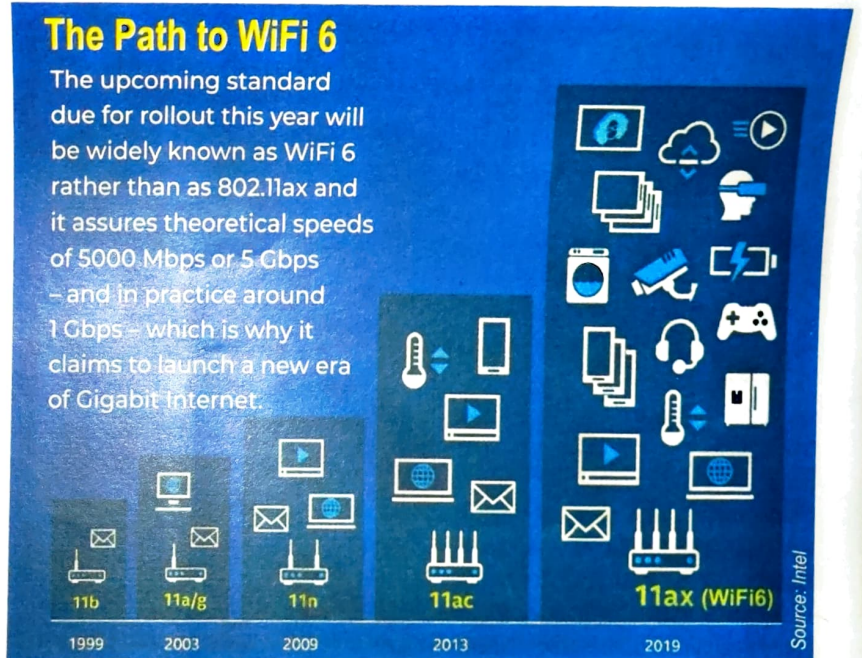


Preparing for the New WiFi!

Anand Parthasarathy

TWO decades have passed since six technology companies joined hands to form what they called the Wireless Ethernet Compatibility Alliance. They ratified a technology that came to be known as WiFi: wirelessly distributing data on an Internet backbone, across homes, offices and public places, at what was then the dizzying speed of 20 Mbps.

Today many of us are able to experience speeds of 100 Mbps or more from our broadband service providers – and this is enough and more to ‘fuel’ what is slowly turning out to be our smart home. Television sets are increasingly Smart TVs – if you connect them to the home WiFi network, they latch on to the Internet allowing us to seamlessly switch between TV channels provided by the Cable or dish connection – and Internet-based content both free and ‘fee’, like YouTube, Hotstar, Netflix and dozens of such services which are collectively



called OTT or Over the Top (over the Internet backbone of the TV, that is).

The new generation of LED light bulbs, refrigerators, washing machines,

microwave ovens, air conditioners and security systems (video doorbells), will increasingly be ‘smart’ appliances – that is, we can control them remotely and

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centrally using the home WiFi network, from our smartphones. In offices, a different family of appliances tend to be smart – copiers, printers, card or finger print based entry systems...

These developments have combined to make WiFi a central and 'must-have' technology for home and office and created new and heavy demand on what is known as wireless bandwidth.

Ever since WiFi was launched, the Institution of Electrical and Electronics Engineers (IEEE), the global custodian of data and electronics standards, gave a number to the standard – 802.11 – with letters attached, that marked the gradual evolution of WiFi. Thus the earliest version of the standard issued in 1999 was 802.11b. Then came 'a', 'g', 'n' and the current standard 'ac'. Each iteration is faster than the earlier one but is backward compatible.

Now the WiFi Alliance – the abbreviated name of the nodal agency – has decided to replace the letter suffixes with numbers. Today's 'ac' version will henceforth be known as WiFi 5, being the fifth upgrade of the standard. In these 20 years, WiFi data speeds have increased nearly 50 fold. The 'ac' or WiFi 5 standard in use now, is capable of transferring data at a speed of around 800 Mbps, though practically attainable speeds may be less than half that in most networks.

The upcoming standard due for rollout this year will be widely known as WiFi 6 rather than as 802.11ax and it assures theoretical speeds of 5000 Mbps or 5 Gbps – and in practice around 1 Gbps – which is why it claims to launch a new era of Gigabit Internet. Remember when civilian planes like the famous Concorde first broke the speed of sound barrier and attained speeds of Mach 1 and more? The breakthrough across the gigabit barrier in data speeds is just as momentous – and it will happen in 2019.

Hand in hand with the upward bump in wireless Internet speeds to the region of 1 Gbps, that we can shortly expect, another key development is



WiFi 6 Tools-of-the-trade are Here

Even before any Indian service provider has announced the new Gigabit Internet speeds of WiFi 6, the first devices that will help leverage these higher data speeds have come to India – sorry your existing home/office router or the access point dome of the Wifi in your neighbourhood Cafe Coffee Day can't tackle the enhanced data rates of Gigabit Internet aka WiFi6!

Netgear was the first to bring WiFi 6-ready home routers to India. In May 2019, they launched two Gigabit models: Nighthawk AX4 and AX8. Both offer data speeds that are four times faster than the fastest routers available today – rated up to 3 Gbps, that is 3000 Mbps. In practice one can expect top data speeds of around 2000-2400 Mbps.

These routers will work in both the standard WiFi bands – 2.4 GHz and 5 GHz, switching at will to select the best route between router and device. The difference between the two models is in the number of parallel data streams they handle – 4 and 8 respectively. WiFi 6 routers promise not just zippier speeds but better penetration: many Indian homes have concrete walls which are not wireless conductors. WiFi6 brings technology that improves performance in such environments by harnessing multiple beams and bands.

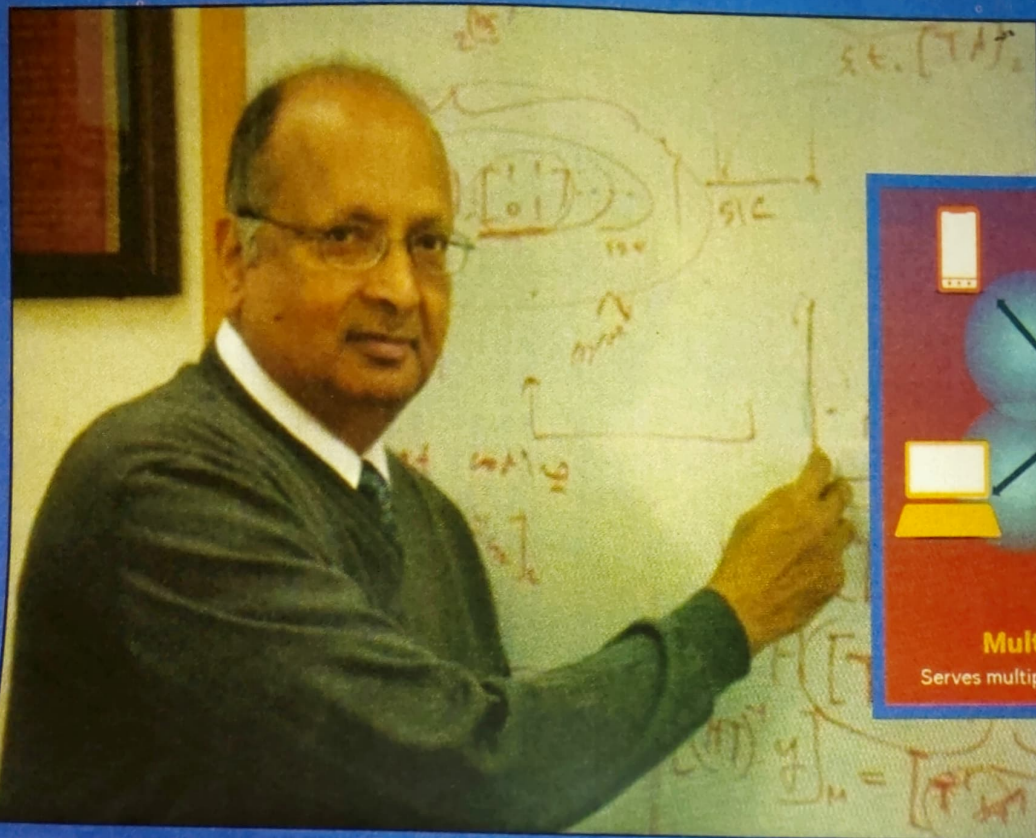
The Netgear WiFi6 routers cost between Rs 30,000 and Rs 40,000 today. They are significantly costlier than WiFi 5 or 802.11ac routers, but anyone buying a new router this year may see the advantage in ensuring that it can serve for 4-5 years without becoming obsolete, there is a price to pay for this future proofing.

Hand in hand with WiFi 6 routers, Access Point hardware ready for the new WiFi standard has also reached India. Aruba, a subsidiary of Hewlett Packard has been quick to offer two series – 530 and 550 – of WiFi 6 access points for campus and public WiFi providers. In fact, the CV Raman Block of the International Institute of Information Technology (IIIT) in Bangalore, has already been upgraded by Aruba to offer WiFi 6 speeds as soon as any telecom provider offers the service. Other networking leaders like Cisco are also ready with their WiFi 6 solutions for enterprise.

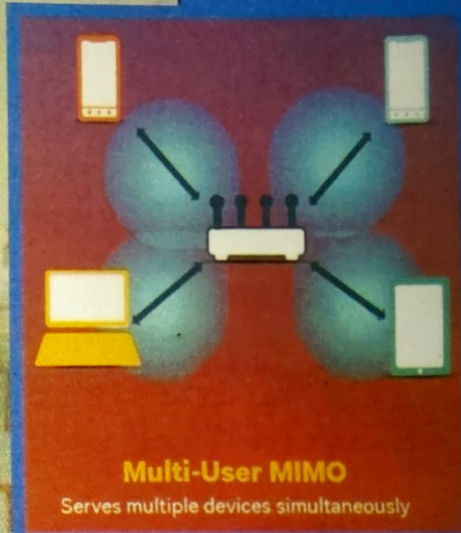


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Man Behind MIMO is an Indian



Dr A. Paulraj



WiFi 6 routers build on a technology that is already available in many of the higher-end home routers today: MIMO. This mouthful acronym stands for Multiple In Multiple Out.

Most budget routers use "SU-MIMO", or "Single User, Multiple-Input, Multiple-Output". With these routers, only one device can receive data at any given time. If someone in your home is watching Netflix and another watching YouTube at the same time, only one will get priority and the other will experience annoying waits – remember that little circle going round and round?

"MU-MIMO" (that is Multi User MIMO) routers, break up the bandwidth into separate streams, all sharing the connection equally. The effect is that no matter how

many devices you tag on to your home WiFi network, they will all get equal and simultaneous attention – instead of waiting in queue to be served.

In WiFi 6 this feature will be enhanced by allowing up to 8 devices to connect simultaneously with one dedicated channel per device. To use supercomputer jargon, this is a case of parallel processing! The result will be quite dramatic when you use one channel to download a heavy movie file in ultra HD or "4k". With MIMO it won't bring all other channels to a crawl.

The inventor of MIMO is India-born emeritus professor of Electrical Engineering at Stanford University, Dr Arogyaswami Paulraj. He patented the technology in

1992 and last year was inducted into the Hall of Fame of the US Patent Office. Awarded the Padma Bhushan in 2010, Dr Paulraj regularly visits India where he steers the Government of India's High Level 5G Forum.

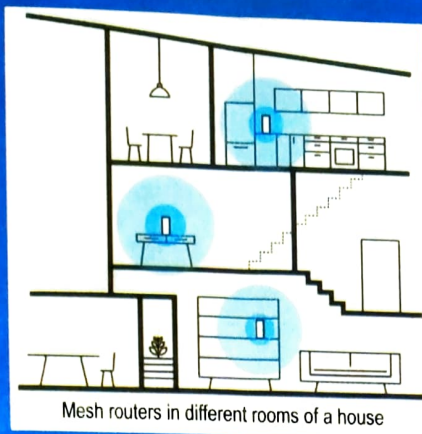
MIMO will be a key technology that fuels all mobile and wireless data networks. Says Dr Paulraj: "Like many big breakthroughs, MIMO faced significant skepticism for a few years, but it eventually took off and is now the foundation of all wireless systems." With regard to WiFi he adds: "The increased data rate offered by MU-MIMO is distributed across multiple users simultaneously – instead of a single user as in ordinary MIMO."

Mix-n-match Mesh Routers for Better Coverage

Many homes these days are experiencing the thrill of having a central smart speaker like Amazon Echo or Google Home and being able to "speak" their commands to Alexa or Google Assistant: 'Hey Alexa, what is the movie in the nearest multiplex?' 'Google turn on the AC'.

But soon they experience glitches. The old WiFi router that was good enough to connect two mobile phones and a PC is no longer up to this heavy demand. They reveal 'black holes' they never knew existed.... odd spots in the home where one could not connect to the Internet. People want to roam in and out of rooms and bathrooms, while continuing to browse on their phones – or talking to Alexa.

This is the main reason a new WiFi technology variant called Mesh Networking is becoming popular.



Think of it this way. The traditional router may be powerful with 2 to 4 antennae, but it is stuck in one corner of the house from where it has to penetrate walls, move up and down floors. What if we were to split the router into a number of mini routers, spread all over the home or apartment, each talking to the other and handing over the data, like relay racers passing on the baton, as you the user move from room to user with your phone?

The idea has translated into Mesh WiFi routers with multiple node units, typically 3. Each one 'talks' to everyone. Together, they form a large wireless mesh, supporting each other. If the signal on one band fades, the network switches to the alternate band to maintain a good connection. Setting up a Mesh router network is very easy. Connect one mesh unit to the incoming broadband and add additional units nodes with a few clicks of a mobile app... the same network name and password is handed on smoothly.

Major router makers all offer Mesh router packages under brand names like D-Link COVR, Netgear Orbi or Linksys Velop. The advantage is, as your need grows you can expand beyond the basic 2-3 unit package and add more units.

happening – an explosion in the spread of public wireless Internet – what are called WiFi hotspots. We are used to being offered free Internet on our mobile phones or laptops for half an hour or so, in railway stations, airports, bus terminals, many public parks, malls and restaurants. In fact many young people have become expert in remaining 'connected' to their social networks like Facebook or Whatsapp almost all day, adeptly jumping from one free hotspot to the next and saving on their cellular data plans.

These networks can be expected to grow and as part of Smart City initiatives, we can hope to see systematic spread in hotspots in over 20 cities in India this year – many funded by civic bodies or by large corporations as part of their corporate social responsibilities. Almost all railway station WiFi is the



contribution of Google in partnership with RailTel. The largest public WiFi in India is the *Aaple Sarkar* network of the Maharashtra government in Mumbai.

Such public wireless spots are not known to be terribly fast but that may change for hard-nosed business reasons. For mobile phone service providers, it is relatively costly to provide high speed internet to individual customers against their data plans and relatively cheaper to provide the same speed via hotspots.

So in the near future, telecom operators and public hotspot operators are likely to do a deal whereby, whenever a subscriber enters a hotspot, his phone will seamlessly switch his data channel from cellular to WiFi – no OTP, no passwords. As a phone user, you won't sense the change but for this to happen, hotspot speeds must match cellular data speeds. So kicking and screaming maybe, but we can expect those notorious public WiFi spots to soon deliver decent connectivity. That's progress!

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