New algorithm resolves Wi-Fi interference problems

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Credit: Alain Herzog

To overcome the problem of interference between wireless networks, a doctoral student at EPFL has developed an algorithm that automatically selects the best frequency band according to the usage of neighboring networks. This system increases the initial capacity of the data path by up to seven times.

By organizing the passage of digital data through a router almost in real time, one can improve the quality of a wireless network. This is accomplished by an algorithm developed by an EPFL PhD student: it tells the data which route to follow. Currently neighboring wireless networks often borrow the same frequency bands and create caps, while other routes remain free. This new system allows better distribution of

these packets and thus improves traffic flow. Disadvantages such as slow downloading, untimely cuts in service and slow communication are thereby greatly reduced.

In an urban environment where each home has its own wireless access point, delays caused by interference between networks are frequent. The frequency band, or the route through which the data passes, is divided into 13 channels. Routers are programmed so that data travels along some of them. Numerous devices – about one in four – use the same slot. However, when more access points using the same channels are nearby, this creates interference. It follows the same principle as traffic jams that occur when all cars are forced to use the same lane on a highway.

Routers can use up to eight of these frequency bands simultaneously. To send an email or perform a simple search in a search engine, for example, one or two bands will suffice. This is the genius of the system developed by Julien Herzen, a PhD student at EPFL's Computer Communications and Applications Laboratory. It automatically shares the channels between different users based on needs at a specific moment.

At regular intervals, the system redistributes pathways according to users' needs. The width of the frequency band is not determined in advance. "It's about compromise," emphasizes the doctoral student. "This works best if everyone is using it, but the impact is also positive for a single user. The system optimizes the free frequency band without interfering with the networks of neighbors." According to its designer, this automation of bandwidth sharing increases the amount of data that passes at a specific time by up to seven times.

Current routers can change preset channels, or can even find them automatically, but they do not offer real-time adaptation. The new Wi-Fi

norms, 802.11ac and 802-22n, enable data to flow faster, but they are also hungrier for bandwidth. They can mobilize up to eight channels at once, when the old standard was four. Still, that doesn't solve the problem. "This increases speed for a single user, but when several devices operate in a limited area, the data packets are still slow," said Patrick Thiran, head of the laboratory.

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