How Fast and Reliable Dedicated Internet Access can Improve Employees' WFH (*Working From Home*) Experience

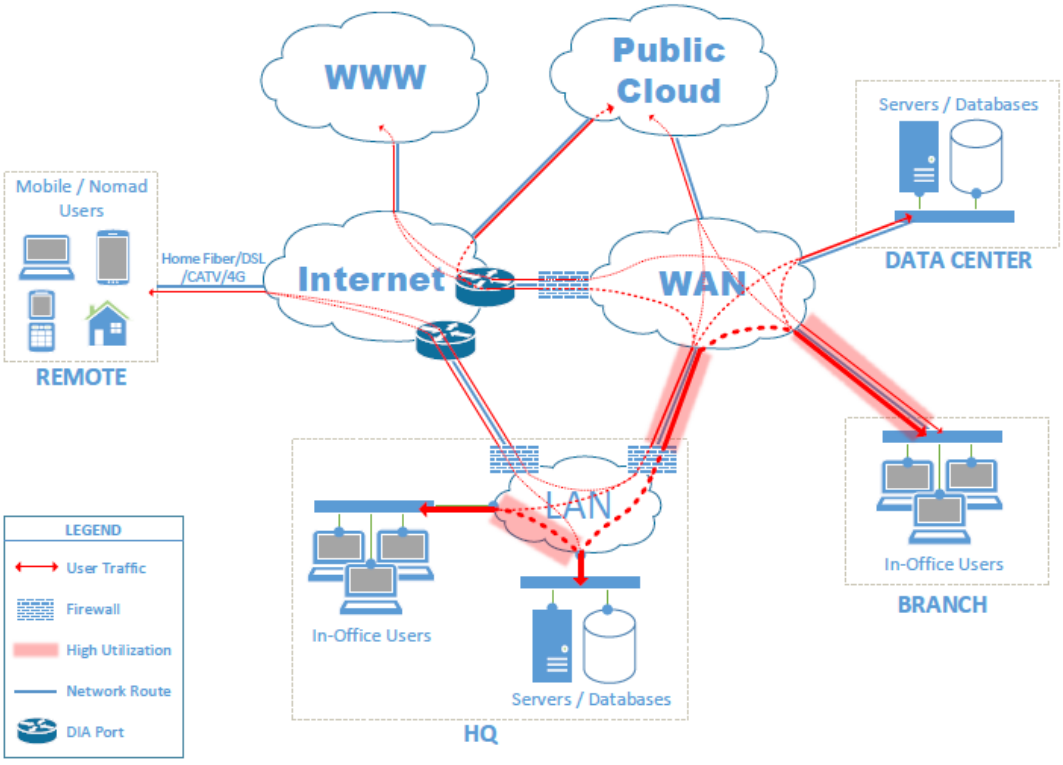
A study of WFH impact on Corporate Networks' Traffic Flow during COVID-19 Quarantine

Typical Corporate Network Architecture & Traffic

Under normal conditions, most employees of small & medium businesses (SMB) or larger Enterprise corporations work from within the Company's premises and use their internal IT environment to access tools and applications necessary for their daily work. These encompass company-wide systems such as CRM (Customer Resource Management), ERP (Enterprise Resource Planning), and other documentation, inventory or billing systems, as well as the company's business communications infrastructure (phone, email, instant messaging – now often combined under a UC – Unified Communications platform).

On-premise employees access these systems either locally via the company's LAN (Local Area Network), if the systems are physically located within the same building, or across a WAN (Wide Area Network) when those systems are remote, either as physical servers located in other offices (such as Headquarters), data centers (either company's own, or large, shared, CNDCs - Carrier Neutral Data Centers) or in the Cloud. From the company's network, in-office users access the Public Cloud, as well as the entire Internet, via dedicated gateways, i.e. breakout points equipped with security features (firewalls, VPN – Virtual Private Network – concentrators, etc.)

Some employees always require remote access to the company's IT infrastructure, notably mobile or nomad users, through the Internet (from their home fiber/DSL/CATV or wireless 4G connection) and the company's secure gateways – however only a very small fraction of the work force usually requires such remote VPN access, and then not on a regular and sustained basis.



Typical Corporate Network and "Normal" Traffic Flow (with In-Office Users)

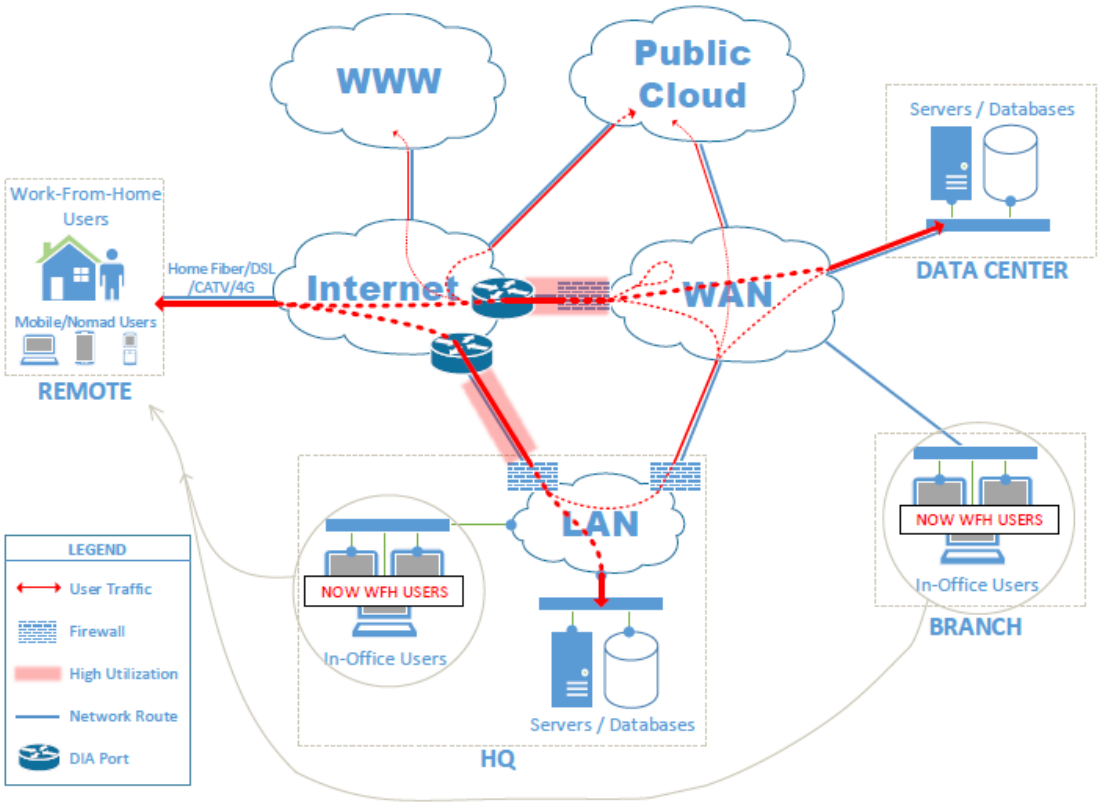
Impact of Users Working From Home

During crisis times, such as the current COVID-19 shelter-in-place or stay-at-home orders, the situation entirely reverses: now all employees able to perform their duties remotely are required to Work From Home (WFH), leading to a surge in remote VPN access.

This creates a challenge for most businesses, at different levels:

- employees need to be equipped with laptops;
- new firewall and VPN devices and licenses need to be implemented;
- and most importantly, fast and reliable Internet access to the company's network infrastructure is required.

Indeed, in those situations, **the Internet becomes the central networking fabric for a company's IT infrastructure**, as such it needs to have adequate quality, in terms of speed and reliability. Dedicated Internet Access (DIA) becomes a requirement, where standard "business class" broadband Internet solutions may have sufficed in the past.



Typical Corporate Network and "Work From Home" Traffic Flow (In-Office Users are now WFH Users)

Benefits of Cogent DIA

Cogent provides Dedicated Internet Access (DIA) exclusively over optical fiber, at speeds ranging from 100 Megabit/s to several 100 Gigabit/s. **DIA is dedicated bandwidth, i.e., non-oversubscribed and symmetrical,** which means that the entire optical fiber "pipe", in both upload and download directions, is dedicated to a single customer connection, all the time. Shared services, such as GPON, provided over mass-market fiber infrastructure laid by Incumbent Local Exchange Carriers (ILECs), or DOCSIS/HFC technologies used by CableTV providers, can easily become congested when all customers are using their bandwidth simultaneously, such as during this crisis.

Wherever remote network access VPN traffic physically enter the company's network, fast and reliable DIA is required, to handle the traffic increase. This can be either at one of the company's office building, where Gigabit speed becomes a must, or at a data center hosting servers and databases, where DIA speeds can be taken affordably to 10 Gigabit levels and above.

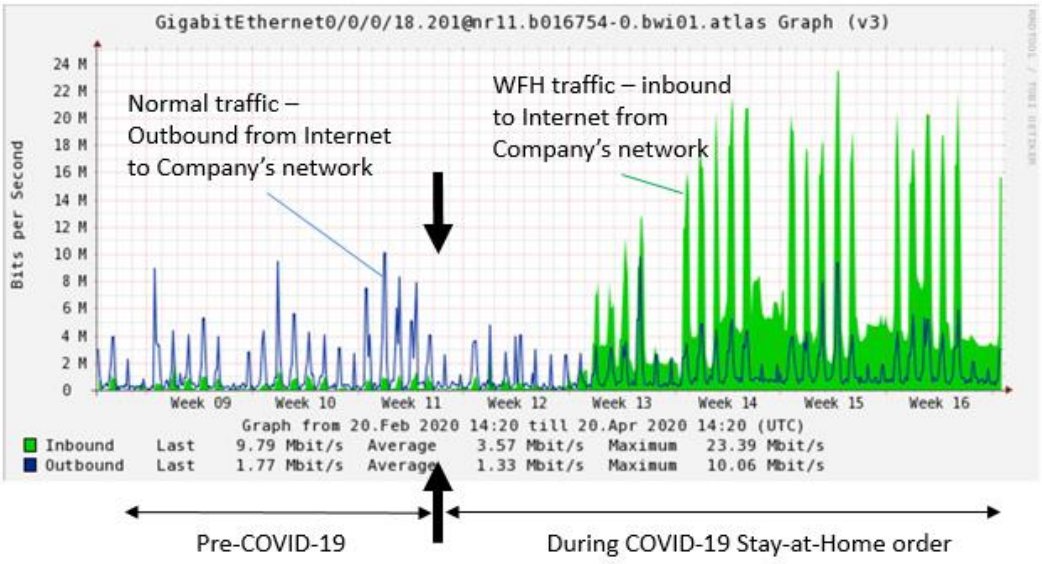
Traffic increases are not the only consequence of WFH, but also **reversal of traffic flow, which makes the symmetrical component of DIA particularly important**: the upload direction (from the company's network inbound to the Internet) becomes equally as important as the download direction, traditionally more utilized as users download content from the Internet.

In a nutshell, this new Working From Home environment diverts corporate network traffic off premises, and onto the Internet – traffic that would otherwise stay on a company's LAN, or WAN, now flows across the Internet, in an unexpected direction, in and out of the company's network.

Observed Changes in Network Traffic

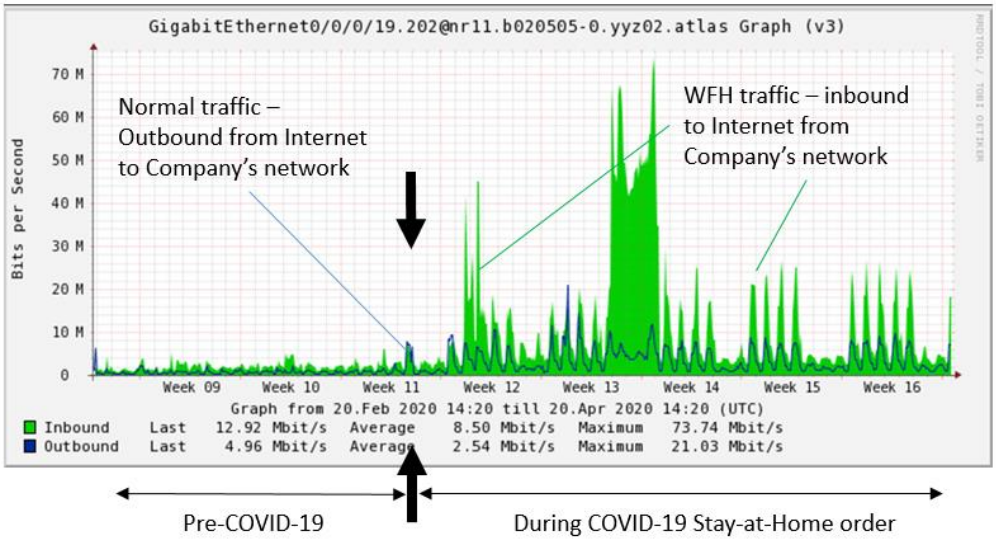
These traffic patterns can be observed in the traffic graphs below, showing two of Cogent's corporate DIA customers' traffic profiles at their Office Building pre- and post-COVID-19 stay-at-home orders, among its Small & Medium Business customers. **Traffic profiles shifts from mostly outbound** (from Cogent's network into the Customer's network, as users pull content from the Internet) **to overwhelmingly inbound** to Cogent's network, from the Customer's network, **and increases sharply** at the same time.

The following graphs show traffic profiles (bandwidth usage in bit per second) charted over time, from about three weeks before the COVID-19 stay-at-home order to about five weeks after that date. Each peak in the graph is a day in the week, with weekdays showing higher than weekends, as expected in a business environment. The blue line shows traffic outbound from Cogent to the customer, i.e. users downloading content from the Internet, while the green area shows inbound traffic to Cogent, coming from the customer, i.e. users uploading content to the Internet.



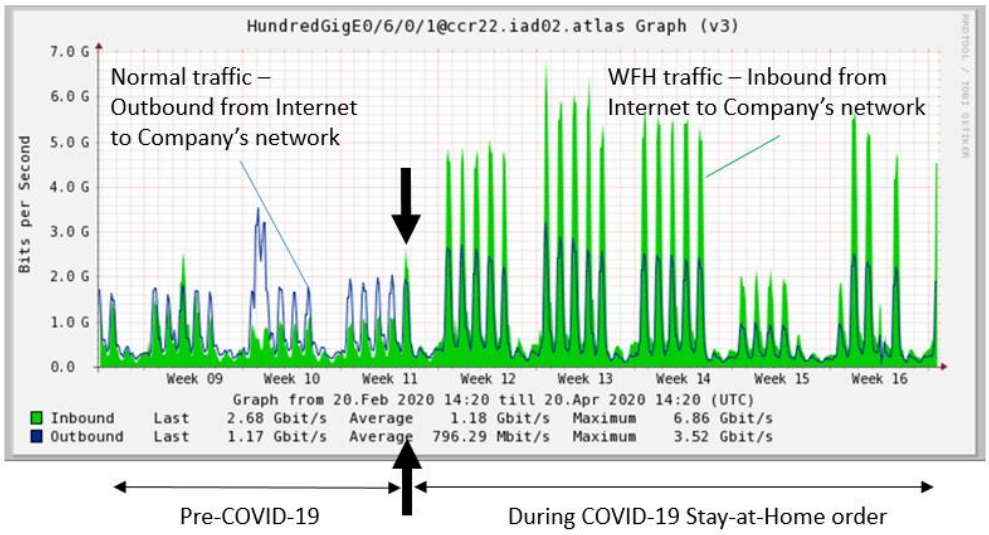
Traffic graph of a Cogent Small Business Customer at their Corporate Offices around COVID-19 Shelter Date

The graph above shows the bandwidth usage of a smaller-sized customer, while the graph below shows similar trends for a medium-sized customer. Individual systems setup, configuration and individual events (such as system backups or database synchronizations) may influence the shape of these traffic curves.



Traffic graph of a Cogent <u>Medium Business</u> Customer at their Corporate Offices around COVID-19 Shelter Date

Below, another example of a similar behavior, this time at a data center location of one of Cogent's larger Enterprise customers, shows DIA traffic profile at their Data Center pre- and post-COVID-19 stay-at home orders. Here again, traffic surges post-COVID-19 shelter date and shifts from mostly download (as users pull content from the Internet) to overwhelmingly upload, i.e. inbound to Cogent's network, originating from Customer's network.



Traffic graph of a Cogent <u>Large Enterprise</u> Customer at a Data Center around COVID-19 Shelter Date

Whether at their corporate offices or at their data center, **these Cogent Customers benefited in both situations from well-dimensioned, fully symmetrical DIA services**, which enabled them to cope with both the traffic increase and the reversal of traffic direction originating from the surge in remote access VPN traffic originating from WFH employees.

If you want to hear more about Cogent's Dedicated Internet Access (DIA) services for Small & Medium Businesses, as well as for large Enterprises, and about the full scope of Cogent's connectivity solutions (IP Transit, Ethernet Services, SD-WAN, Colocation), please visit www.cogentco.com, or contact Cogent at 1-877-875-4432 or sales@cogentco.com. Your Cogent Account Manager will respond right away to discuss alternatives.