

 Better every day

DNS over HTTPS (DoH): Human Rights, Markets, and Governance

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AMTS

On being inside and outside the Westphalian system

Inside the Westphalian system

- ✓ Telecom operators are required to strictly follow the provisions of local laws
- ✓ In most jurisdictions, telecom operators are required to be licensed.
- ✓ Mobile operators must be authorized to use frequencies in each jurisdiction.
- ✓ To conduct business in another jurisdiction, registration of another legal entity is required.
- ✓ Each legal entity in each jurisdiction deploys telecommunications infrastructure to serve users in the territory of that jurisdiction only.
- ✓ Customer support for each jurisdiction is provided in the native language of that jurisdiction.
- ✓ **Telecom operators are always highly dependent on local laws. Breaking the law - losing your license.**

Outside the Westphalian system

- ✓ In most cases, an OTT provider does not need to create a legal entity in a jurisdiction to provide Internet users in that jurisdiction with access to their services. This is done by telecom operators.
- ✓ OTT uses telecommunication networks located in different jurisdictions, in most cases bypassing a number of local laws.
- ✓ OTT does not need to organize support for users of another jurisdiction in their native language, this is done by telecom operators.
- ✓ Local requirements of Network Neutrality and customers' demands allow to save **the** fragile balance the interests of OTTs and telecoms.

1. The Westphalian system does not provide for the possibility of transition from national regulation to cross-border regulation.
2. **No one in the world is ready to give up the Westphalian system.**
3. The development of the institution of legislation does not keep pace with the development of technologies. There is a conflict between the need to apply local laws in each jurisdiction and the cross-border nature of Internet services.
4. **DOH is a cross-border OTT DNS service that significantly increases the existing tensions between the Westphalian system and the cross-border nature of the services, as well as the stakeholders within and outside the Westphalian system. It is unlikely that DOH will be able to destroy the Westphalian system.**

No OTT service can bury the Westphalian system. In contrast, the reckless deployment of any OTT service may be the main reason why the Core Internet Values can be buried under the pressure of the Westphalian system

On Net Neutrality for DOH Providers

DOH, unlike traditional OTT services, cannot be classified as a disruptive innovation because it does not create a new market segment that has not been previously served by anyone.

In 2013, the number of instant messages per year approached 41 billion, the number of SMS remained at 20 billion. The IM market has been growing for 5 years. SMS market for 20 years. These were different markets.

DOH providers will not be able to enter the market as IT OTT services.

DOH providers will have to compete not only among themselves but also with telecom operators.

Battles for Madison River and Comcast-BitTorrent, Netflix-Comcast, etc. in 2015, ended with the approval of Open Internet Order, which in 2018 was replaced by Restoring Internet Freedom.

If Netflix decides to become a DOH provider, the outcome of the new battle for users can end "reasonable network management".

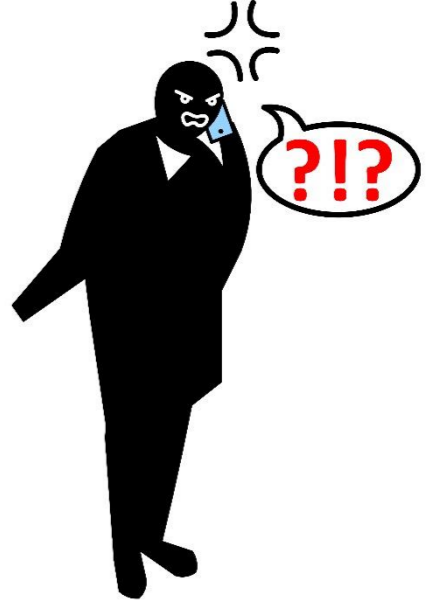
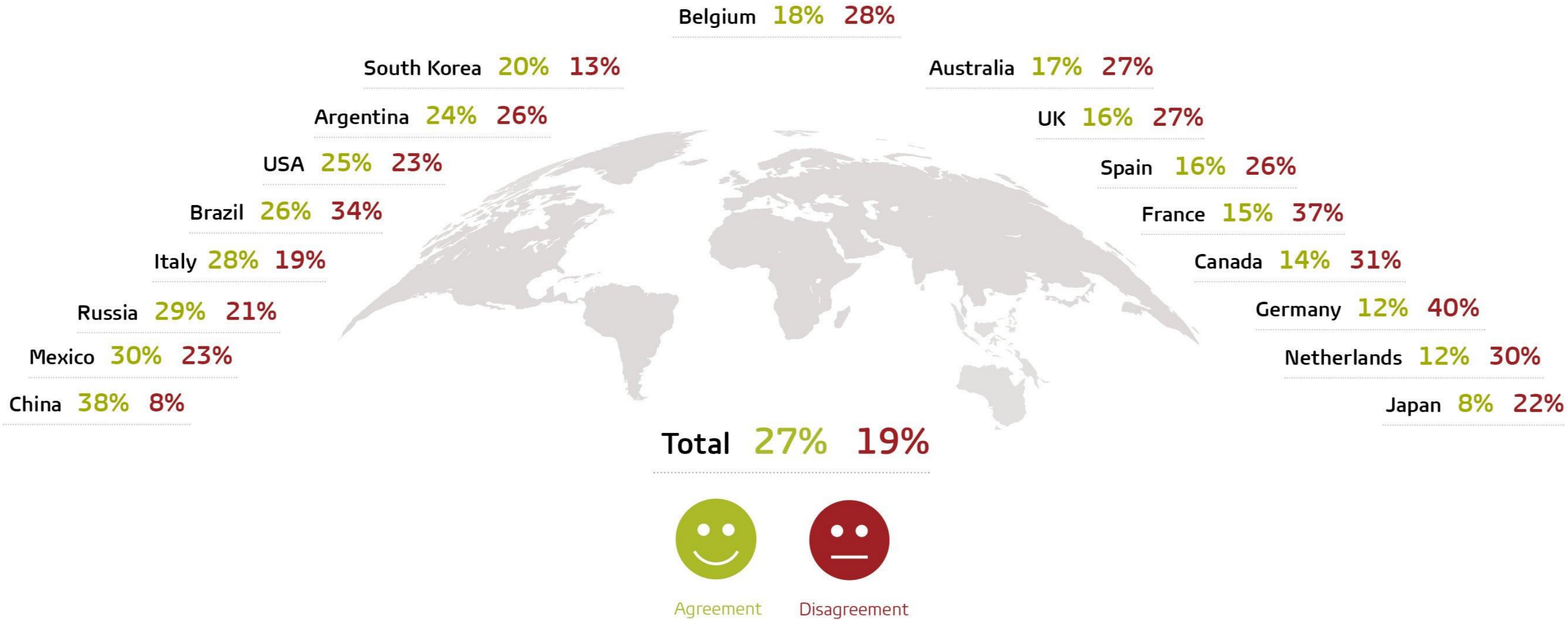
All DOH shortcoming and open issues identified in the «DNS over HTTPS (DoH) Considerations for Operator Networks» can lead to "reasonable network management" by the telecom operators.

On minor details.

WILLINGNESS TO SHARE PERSONAL DATA IN EXCHANGE FOR BENEFITS OR REWARDS



Country results



GfK survey among 22,000 Internet users (ages 15+) in 17 countries – top 2 boxes (agreement) / bottom 2 boxes (disagreement) out of 7-point scale – rounded

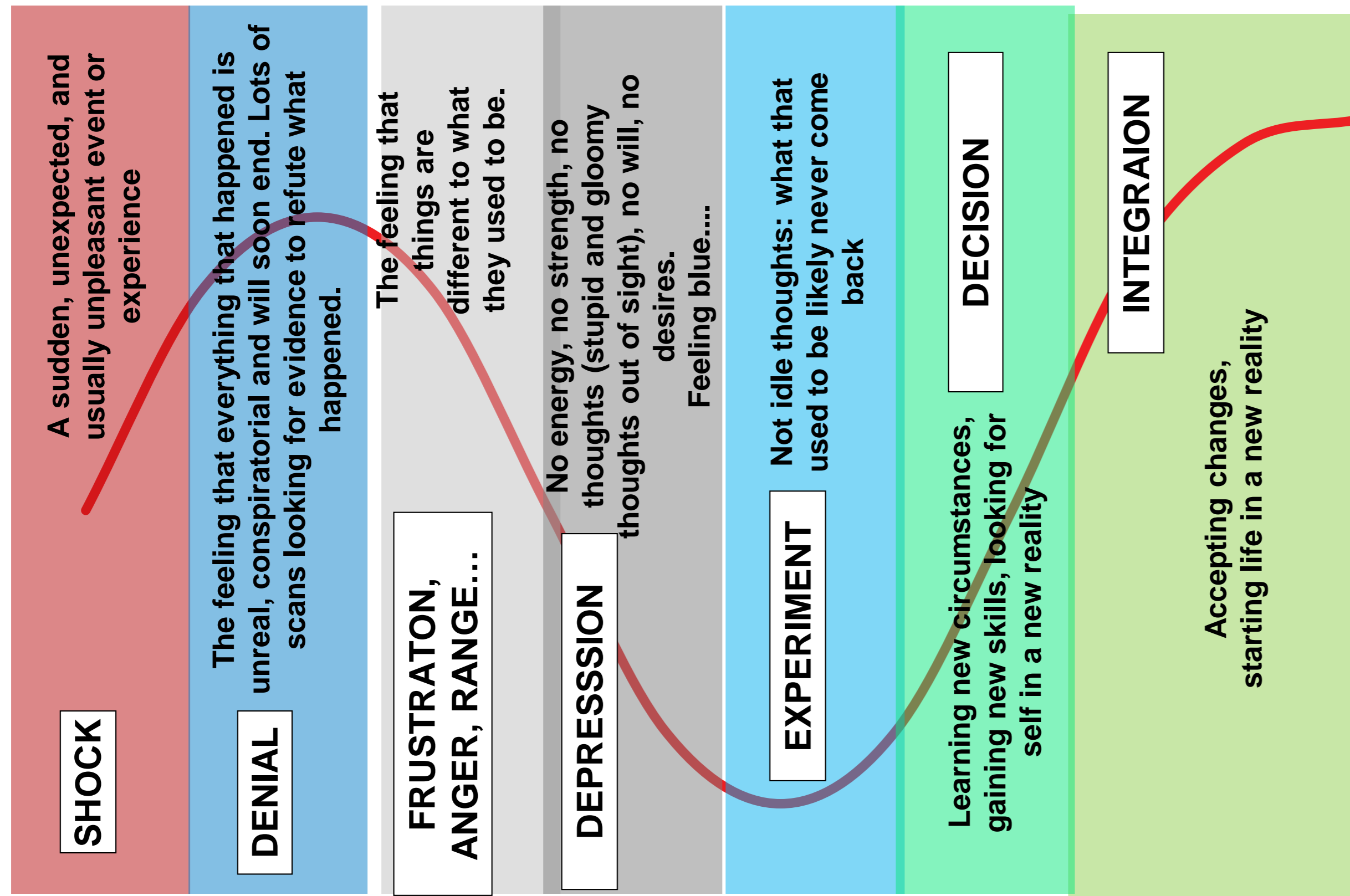
© GfK 2017

**Most customers prefer comfort and convenience
A minor detail can become crucial**

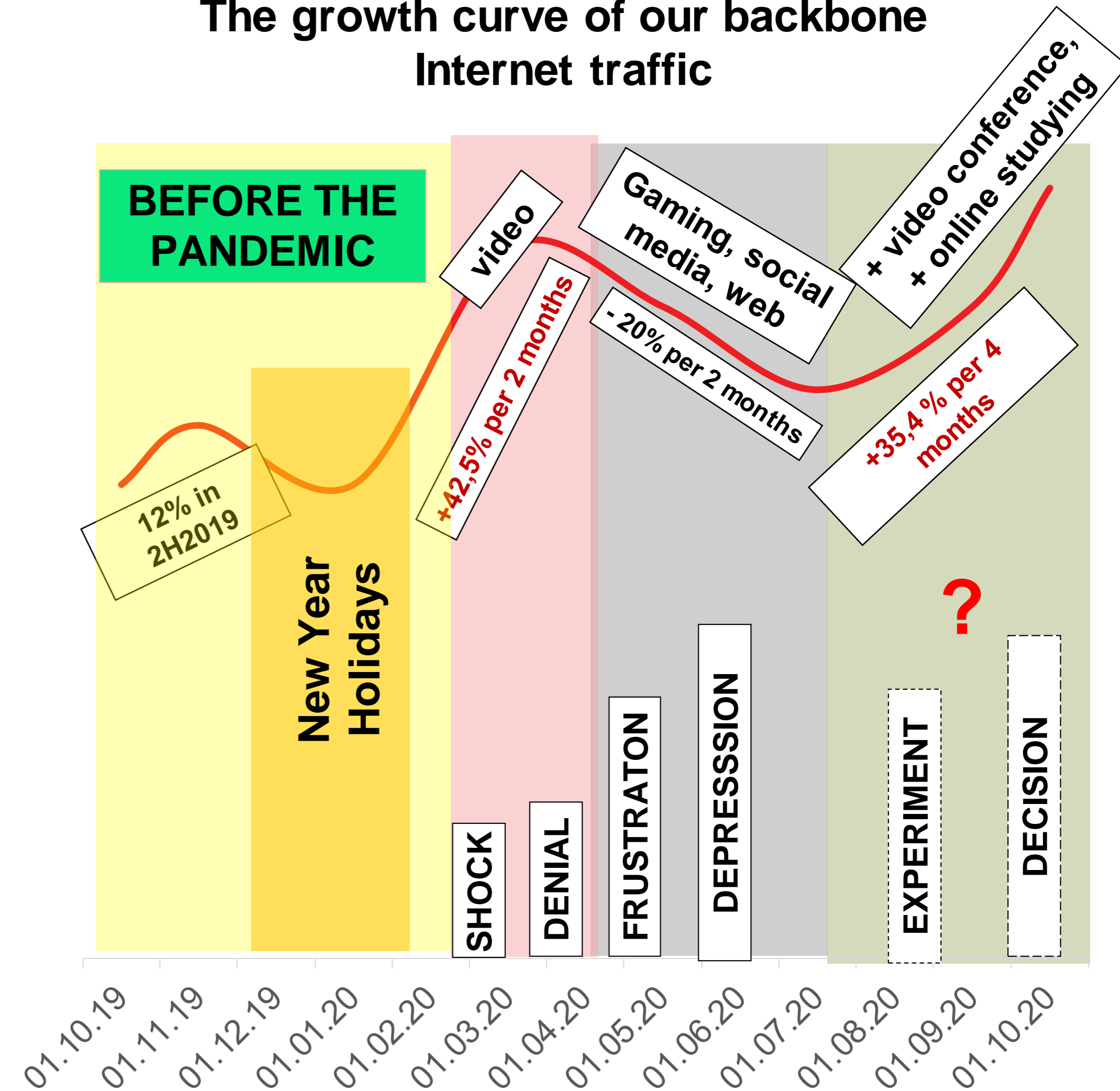
WANTS

On the relationship between the Internet traffic growth and Change curves

Typical change curve based on the Kubler-Ross Model¹



The growth curve of our backbone Internet traffic



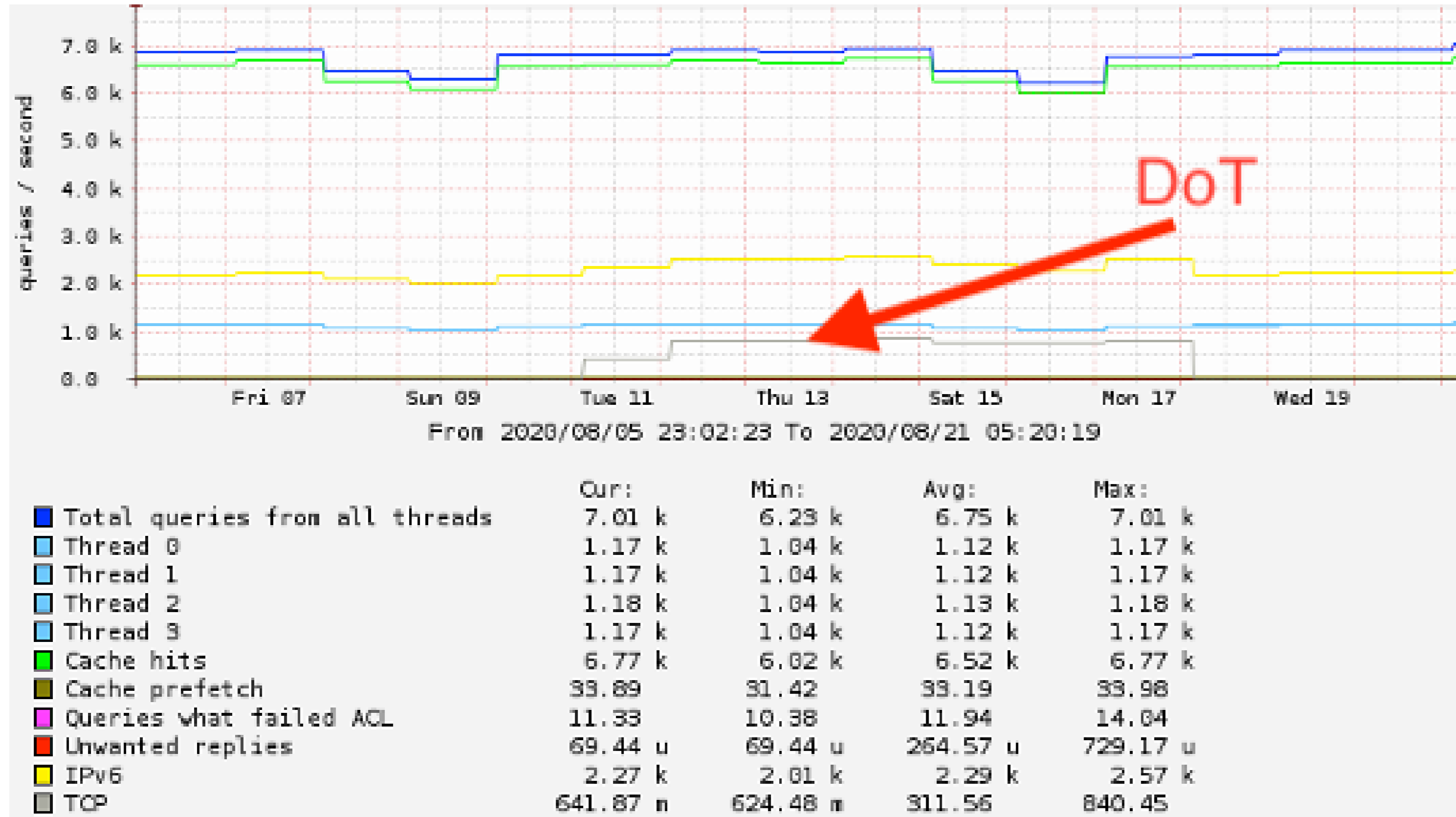
Expected traffic growth in 2020 vs 2019 ~ 60% - 65%

¹ Elisabeth Kübler-Ross was a Swiss-American psychiatrist, a pioneer in near-death studies, and author of the internationally best-selling book, On Death and Dying (1969), where she first discussed her theory of the five stages of grief, also known as the "Kübler-Ross model".

https://en.wikipedia.org/wiki/Elisabeth_K%C3%BCbler-Ross

We can not enter the same river twice.

About our experiment with DoT in European part of Russia



In August, we conducted an experiment with DoT in the European part of Russia.

5 million mobile subscribers could use our DOT servers simultaneously

The share of DOT requests was 13%. Most requests were mainly from Android OS devices.

Apple has included DoT / DoH support since iOS14, It was opened on September 15.

This is a picture of one virtual machine with one aggregation per day.

Daily traffic on one VM was about 9k-10k requests per second.

Network load on the servers doubled. The doubling of DNS traffic was caused by 13% of requests.

The CPU load on the servers tripled.

This was not a surprise. The servers had to look for data in the cache and act as traffic encryption.

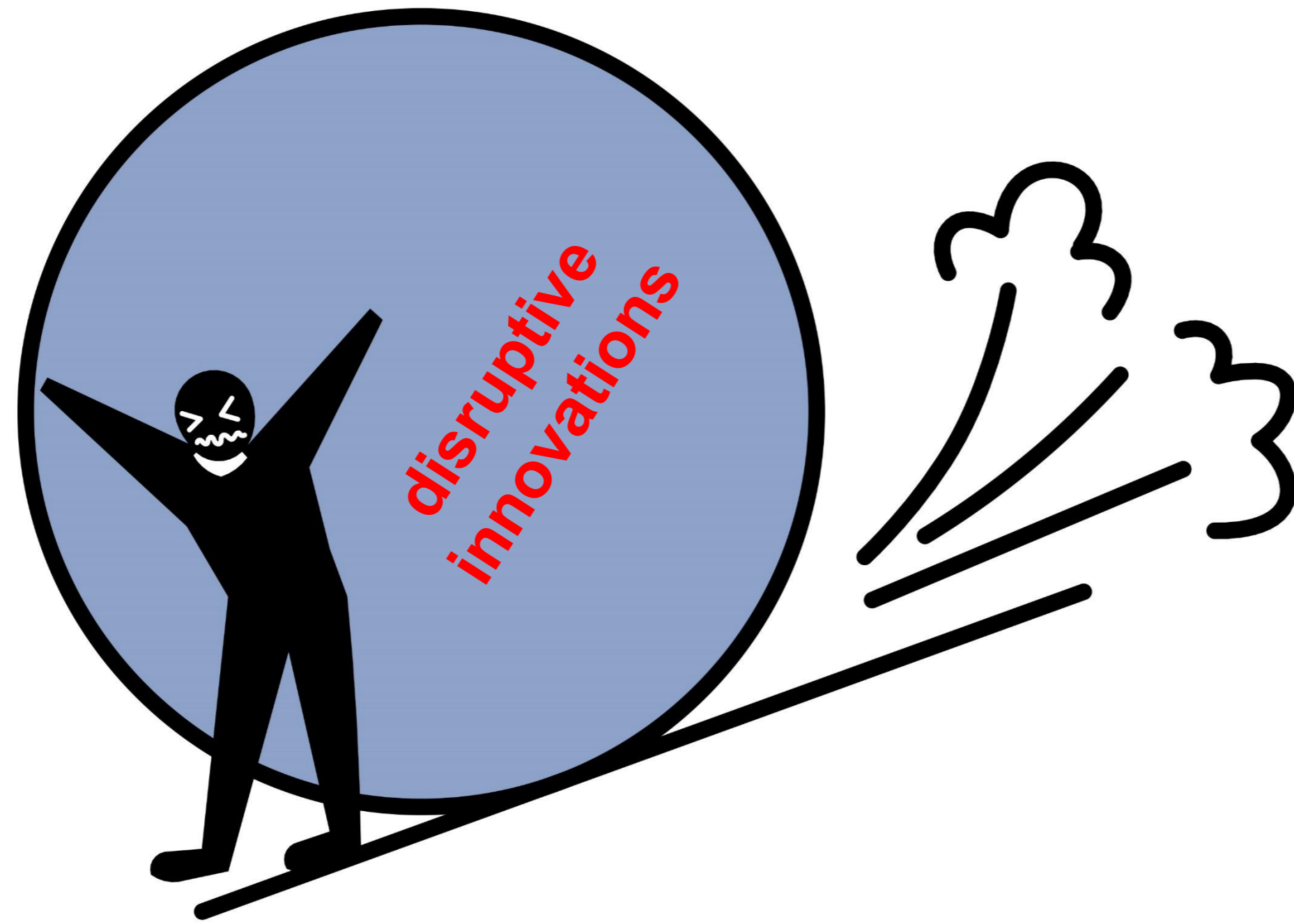
The experiment showed the need to change the architecture of DNS resolvers for DoT servers.

Now each server (VM) works independently of each other. Requests are evenly distributed among all servers.

For DoT servers, apparently, we need to make separate frontends that will terminate TLS flows on themselves and, as far as possible, hold it for some time for reuse within the subscriber's availability.

Most likely, the main reason for doubling the request traffic and tripling the CPU load was the fact that the traffic from the devices was evenly distributed among the servers and the connection was re-established

Instead of ending



Wrong position



Fatal decision

Thank you

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