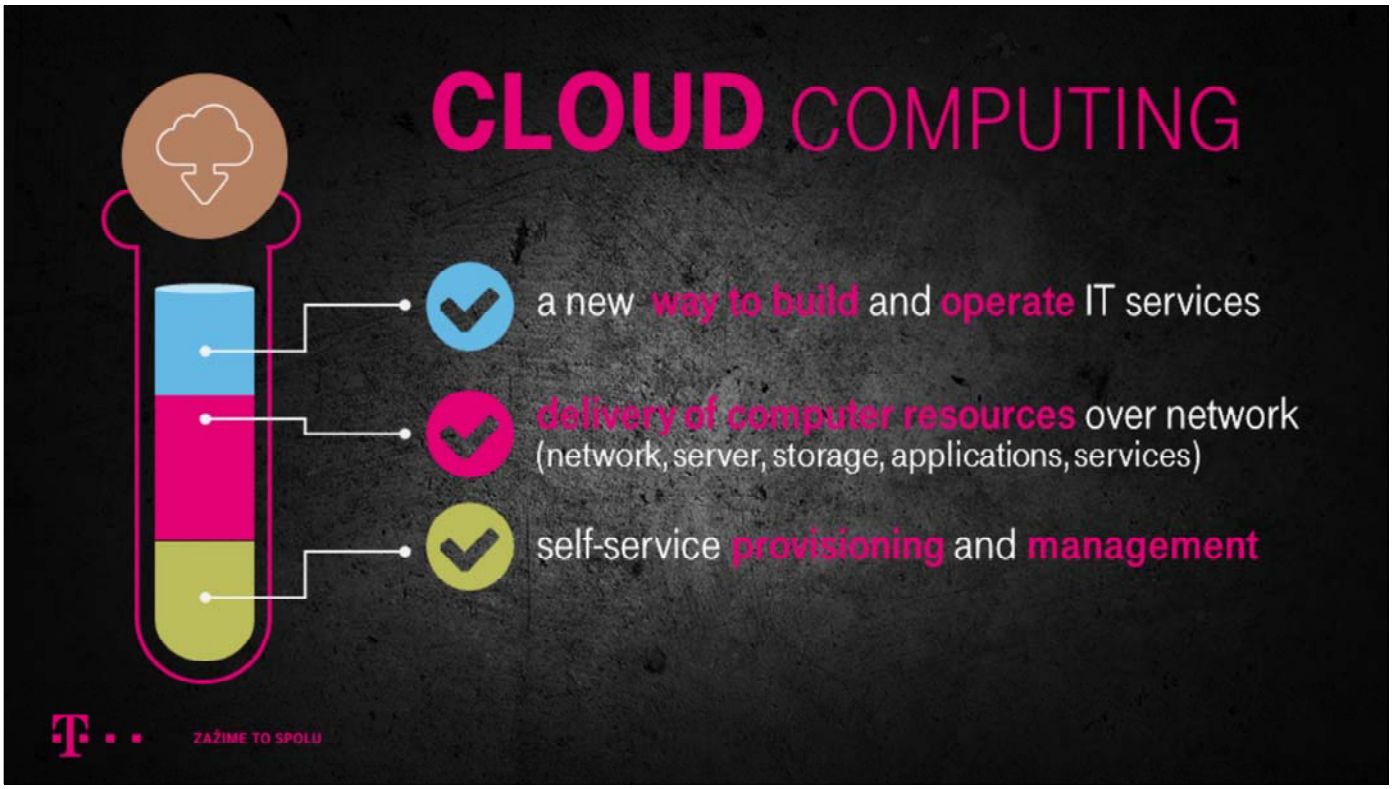
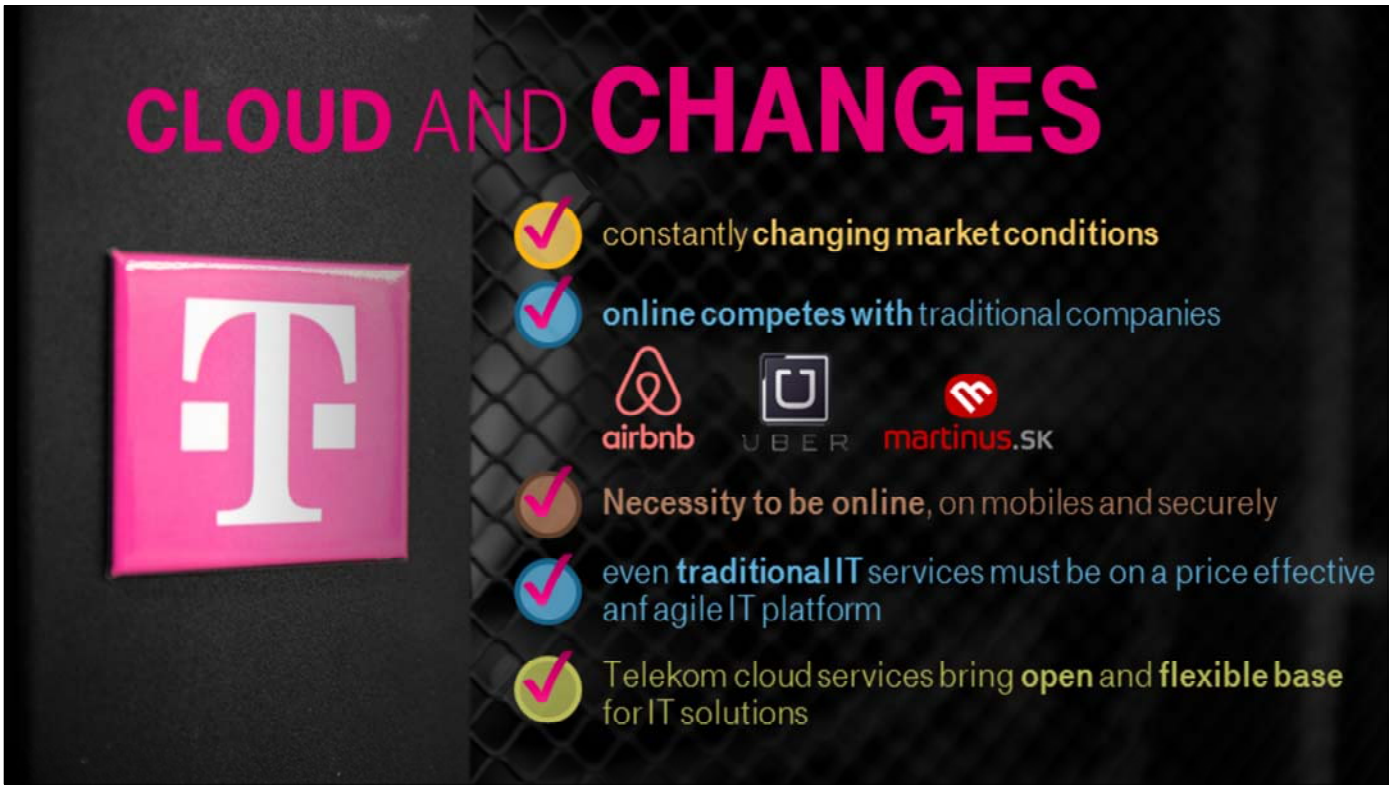
- This is presentation about virtual servers: TelekomCloud Server. The last version of this document is available at http://virtualnyserver.telekom.sk/
- How are ideas created and problems solved? Rarely it is a single person coming up with a solution on first iteration and writing it down themselves
- Collaboration between people is how innovation is born

- With no doubt, IT environment of companies and organizations is gradually moving to cloud
- Main motivation of entering the cloud, flexibility and lower costs, are becoming irresistible
- Cloud-related organizational agility and security are becoming dominant factors
- That is why cloud strategy should be a part of IT planning in all organizations

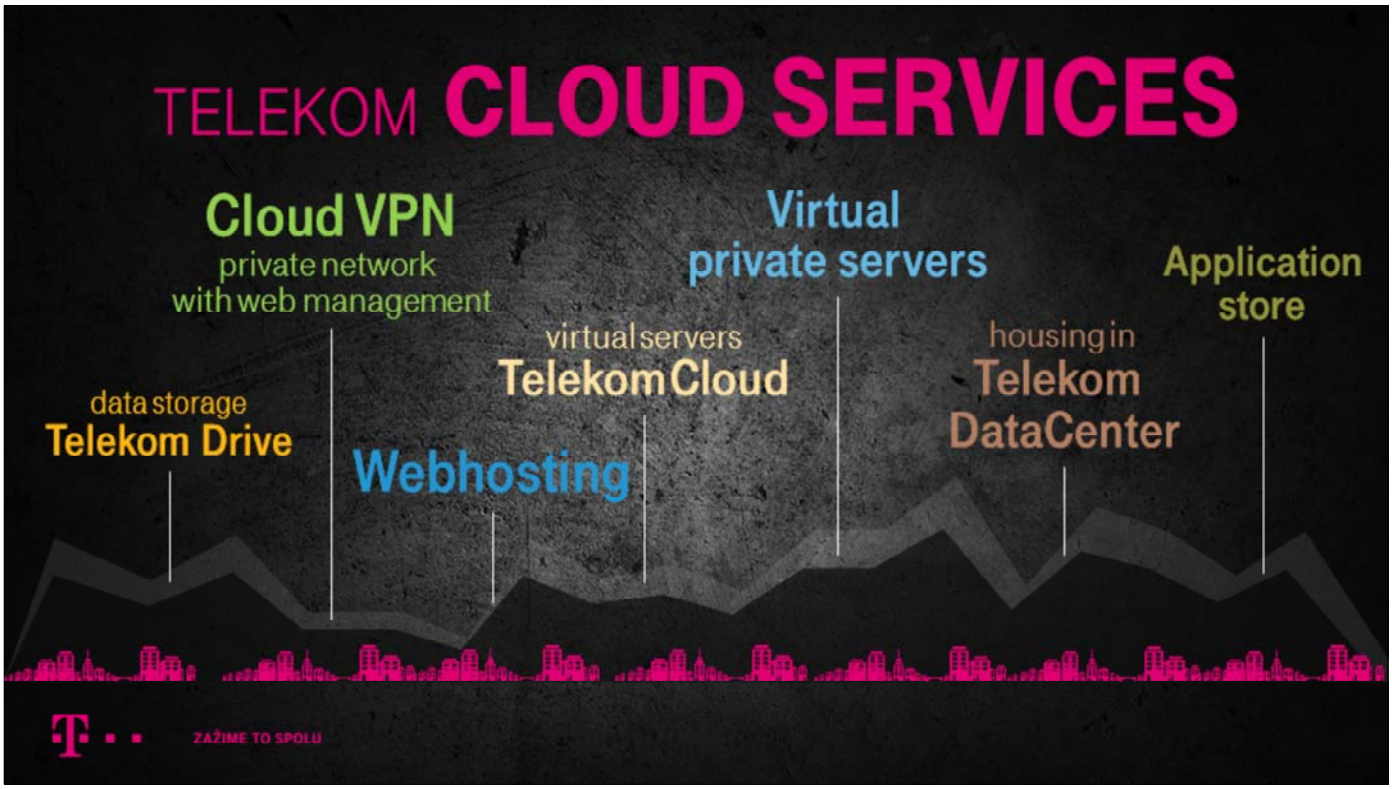


- Cloud computing represents a significant evolution in how information technology and services are produced and delivered.
- Cloud computing is a versatile and convenient way to deliver computing resources (network, server, storage, applications, services) to customers over the network.
- Customers can create and manage cloud services themselves – typically with a low level of interaction with the service provider.



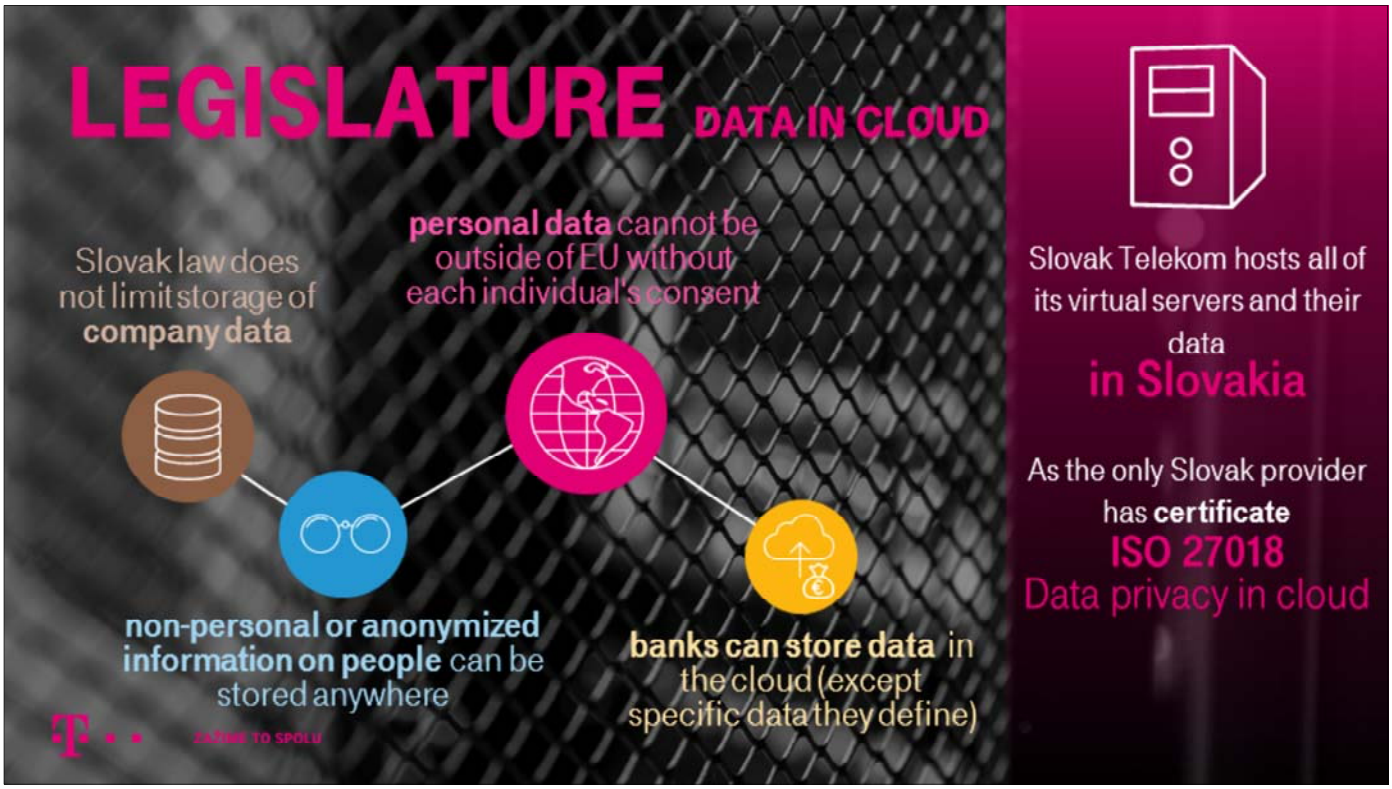
- Businesses and organizations are constantly exposed to changing market conditions, regardless of size or segment. Event traditional brick-and-mortar industries are suddenly facing new competitors in the form of online companies.
- To stay profitable, companies and organizations must change their current IT services and introduce new services.
- It is necessary to introduce online and mobile applications, that can provide services anywhere on any device in a secure manner.
- In addition, managers are looking to focus on their "core" competencies and pass supporting functions to external suppliers.
- Even traditional IT services, such as ERP software, messaging, and document management, must be built on an infrastructure that is cost-effective, flexible and agile.
- Slovak Telekom cloud services provide precisely this solution - an open and flexible foundation on which modern organizations can transform their business.

- The cloud model allows a very wide range of IT services. Based on the level of provided infrastructure the services are divided into three basic types:
  - Infrastructure as a Service (IaaS) - virtual servers with self-service set-up and management.
  - Platform as a Service (PaaS) - software infrastructure offered as a base to run IT services, such as database or application server.
  - Software as a Service (SaaS) - end-user software sold as a service provided by service providers.
- The role of a cloud provider is to build and operate the physical network, server, and disk infrastructure, and the related connectivity. The individual layers do not require any specific dependency. PaaS or SaaS services may or may not be operated on a shared platform of virtual servers - IaaS.

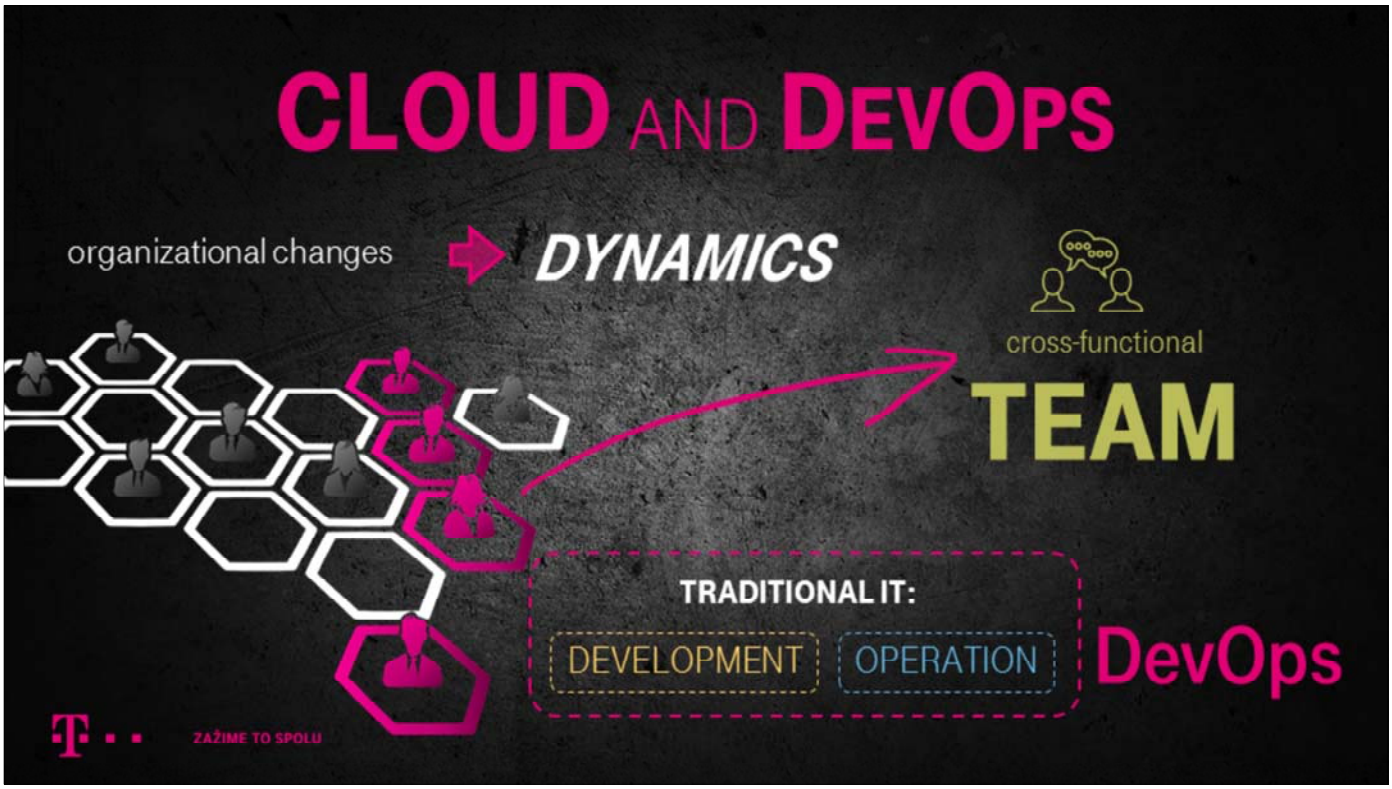


- Slovak Telekom provides a wide range of cloud services related to hardware and software infrastructure to operate IT solutions.
  - TelekomDrive Data Storage - secure storage for sharing files and documents in the Telekom data centre.
  - Cloud VPN - self-service set-up and management of VPN and security mechanisms.
  - Web hosting - the most economical way of hosting websites and applications on Linux, Apache, MySQL, and PHP.
  - TelekomCloud IaaS Public Cloud - virtual servers running on Linux and Windows platforms with a self-service portal for creating and managing virtual servers.
  - Virtual Private Cloud - a dedicated portion of the TelekomCloud infrastructure and its customization according to customer needs.
  - Telekom DataCenter - housing services at Slovak Telekom data centres in Bratislava.
  - App Store - ready-made SaaS software solutions, provided as services hosted at Telekom and its application partners (Office 365, CRM, accounting, Market Locator, etc.).

- Every customer is sensitive when it comes to security aspects of storing data and operating IT services in the cloud environment. Customers are interested to know, how they can rely on Telekom with covering their needs for high security.
- In the first place, you should realistically assess whether your own data centre or server room is sufficiently secure. Telekom is likely to have more resources to build and operate cutting-edge security technologies than the vast majority of commercial or government organizations in Slovakia. We have decades of experience in selecting, training, and guiding the specialists responsible for computer or physical security.
- Data security and protection is all about trust. Although customers do not have real control over how Telekom protects the cloud environment, we do everything possible to consistently achieve the highest level of security.
- People at Telekom believe that we can rely on the existing confidential relationship that we already have with thousands of corporate and government clients in Slovakia. We have been providing highly sensitive communication, data, and ICT services for decades.
- Many customers actually have security as the main reason for entering the TelekomCloud infrastructure.
- To be in the cloud securely, it is crucial to have a safe data connection between a client and a Telekom data centre. This is where Telekom provides a unique advantage over international cloud providers: customers needn't be connected to cloud services exclusively over the Internet, where it is impossible to guarantee security or any kind of SLA



- Organizations classify information they process and store into different categories based on level of sensitivity.
- Personal data is a unique category due to its storage in the cloud being regulated by Slovak Act No. 122/2013 Col. on Personal Data Protection.
- Storing business data as well as anonymised personal data is not governed by law.
- It is important to state, that Slovak, and EU laws allow the storage of personal data in the cloud. The law lays down the rules which determine several conditions, for example, the contractual relationship between cloud service provider and a customer. Sensitive personal data may also be stored in the cloud under the condition that it is stored within the European Union. Theoretically, data can be stored even outside the EU, but all affected individuals would have to agree with that.
- In general, banks can also store data and run applications in the cloud, with the exception of some specific type of data selected by banks themselves based on security risk.
- Slovak Telekom hosts all its cloud services in data centres in Slovakia. The only exceptions are a few applications in the App Store, such as MS Office 365 and Cloud Backup, that are hosted by partner companies outside Slovakia yet within the EU.



- If your main reason for entering the public or private cloud is the ability to make dynamic changes, it is also necessary to adapt your organization.
- Traditional IT environments split the development and provision of IT services into functional areas, such as networking, operations, application development, and storage. These roles are also organizationally divided into separate departments, which creates a problem in situations when it is necessary to change a given IT service or to scale it. Any change may concern several IT departments, each with its own processes, priorities, and/or culture.
- The DevOps concept is about connecting operations and development into a combined team responsible for both these functional areas.
- The resulting team is then responsible for the entire cycle of development and running the applications, and a large portion of change cycles.
- The indisputable advantage of DevOps teams, as well as other cross-functional teams, is their dynamics. This is because the required changes are being executed by a single unit.

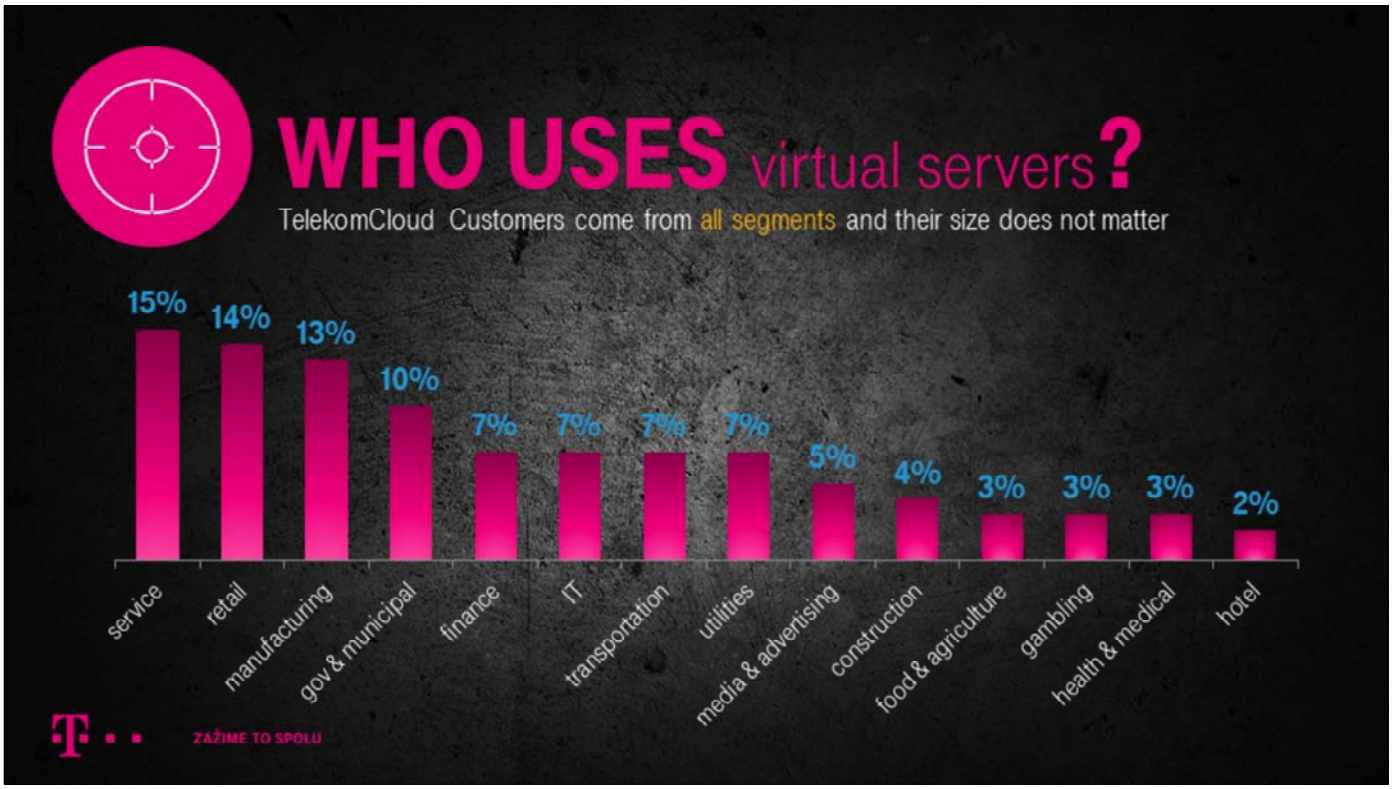
- That's three train wagons!
- 210 tons of coal would otherwise produce:
  - 49 tons of ash
  - 1,3 tons of tiny ash
  - 5,5 tons of SO2
  - 430 kg NOX
  - 300g Arzen
  - 158 tons of CO2
- It may not be a lot now, since Slovakia still burns a few millions of tons of coal every year. But basically, your company server and its surrounding infrastructure such as a switch and router burn twice as much energy, as our efficient virtual servers at Telekom datacenters.
- So think about what the impact will be in the future, when things move to cloud

- How are ideas created and problems solved? Rarely it is a single person coming up with a solution on first iteration and writing it down themselves
- Collaboration between people is how innovation is born

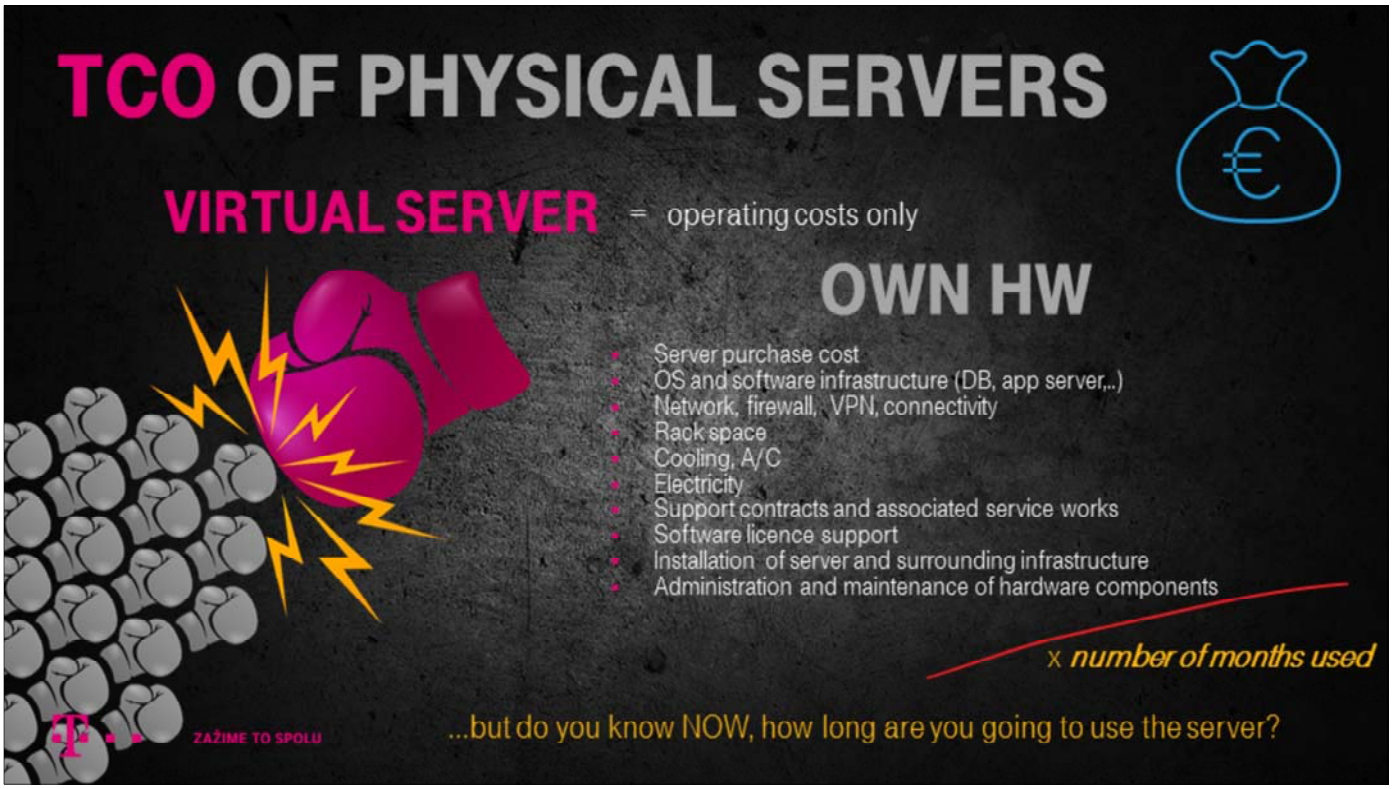
- Most ideas are not a result of one person coming up with a solution to a problem. Innovation is created by people. Lots of people.
- Collaboration largely increases the chance of associations among several independent ideas. One idea leads to next. Good ideas are made up of two half-ideas of two different people. Or more.
- Energy makes the biggest difference. Work is so much more fun, if we can collaborate in real time. The difference between writing a document on your own, and collaborating online is like playing a soccer ball yourself against the wall vs. having a team of friends in a soccer match against another team. The energy makes all the difference!
- Innovations come after many iterations. Cloud speeds them up greatly.
- You need people to push big ideas into the real world. Cloud gives you direct contact to people, that enable your idea to become a reality


VIRTUAL
SERVERS

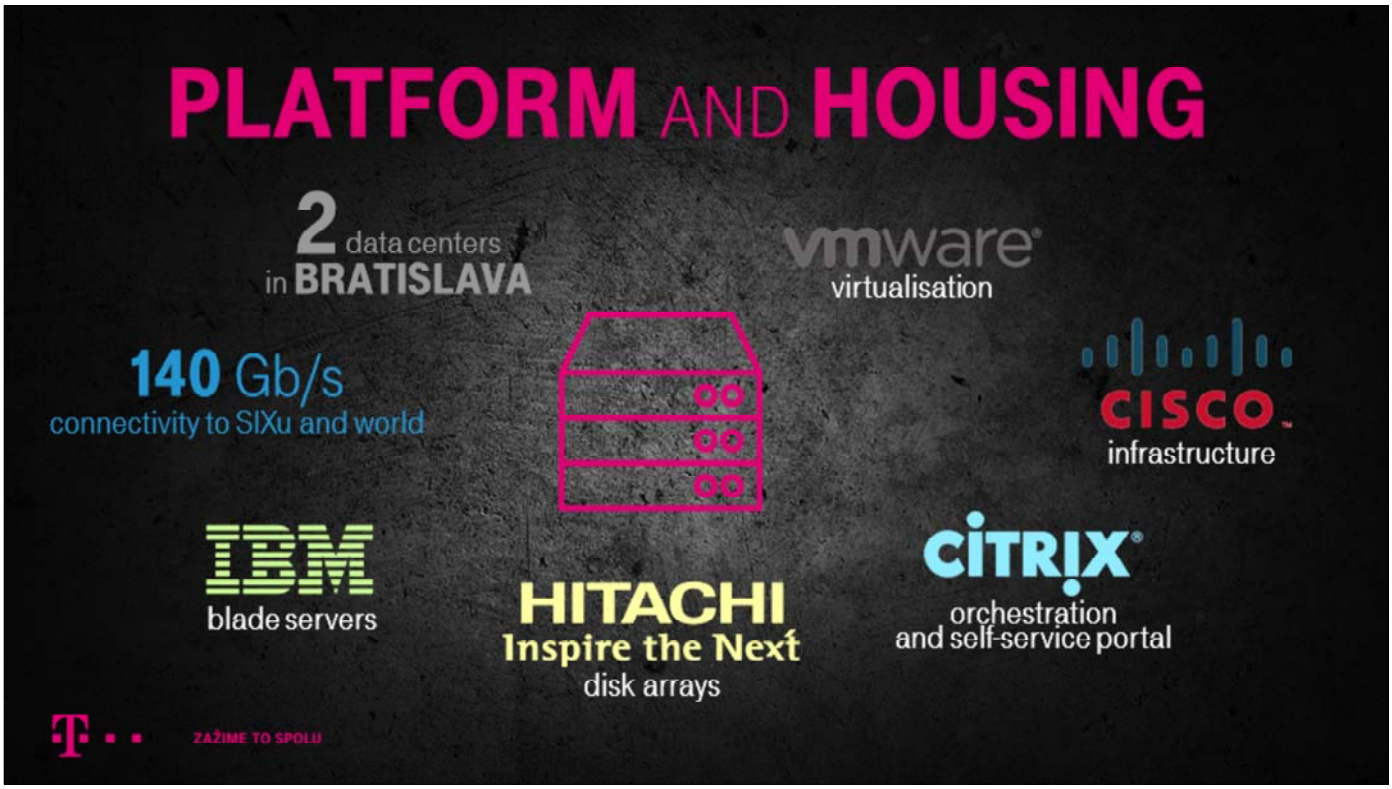
- Virtual server fully replaces the standard company internal physical server
- Advances in cloud computing are based on an IT virtualization concept and the availability of fast network connectivity. Virtualization allows simultaneously running multiple instances of an operating system on a single physical server
- Two platforms are being offered – Linux and Windows. But customers can also bring their own OS into the cloud. Like Redhat Linux for instance.



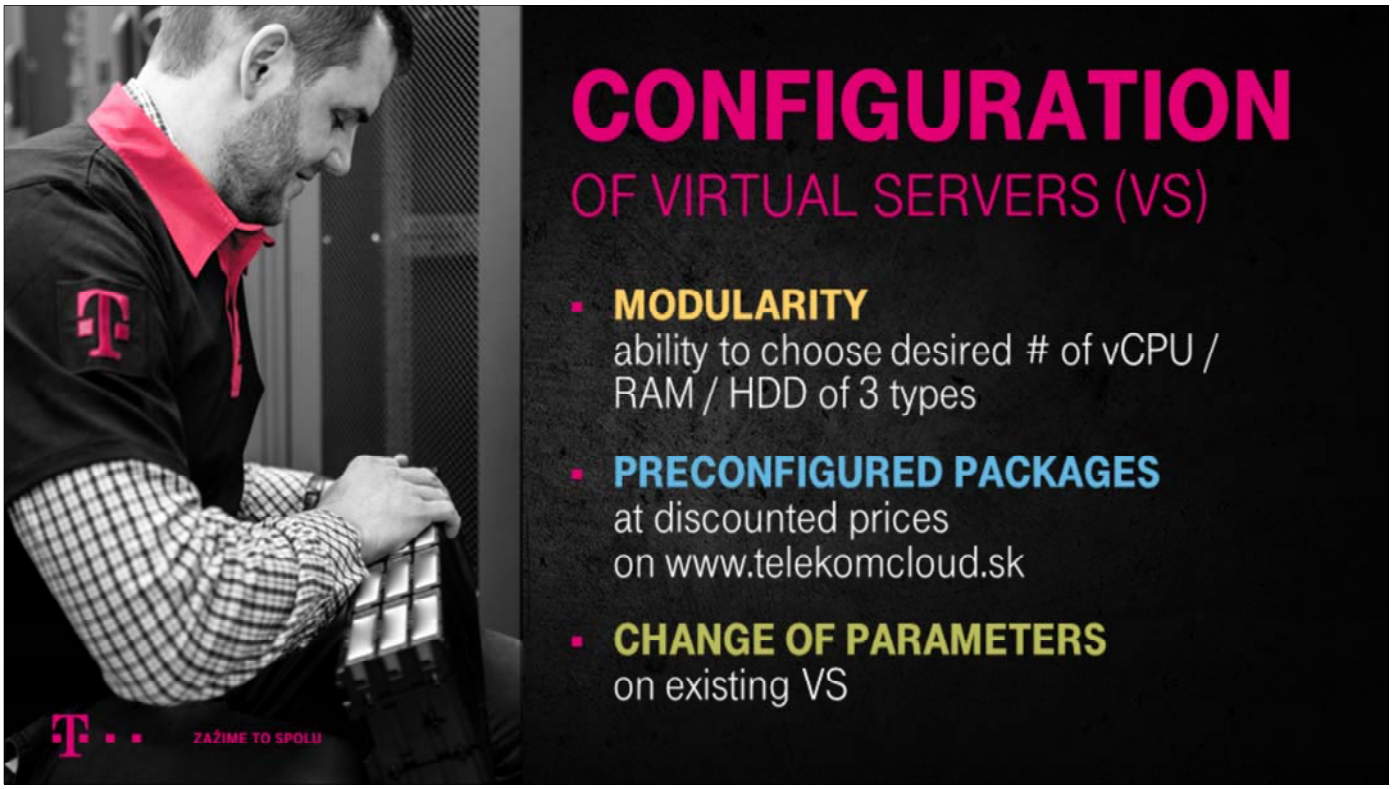
- This graph shows segmentation of TelekomCloud customers based on their total numbers (not by revenue)
- No particular industry segment sticks out, virtual servers are for everyone
- Most customers come from the segments of service, retail, and manufacturing



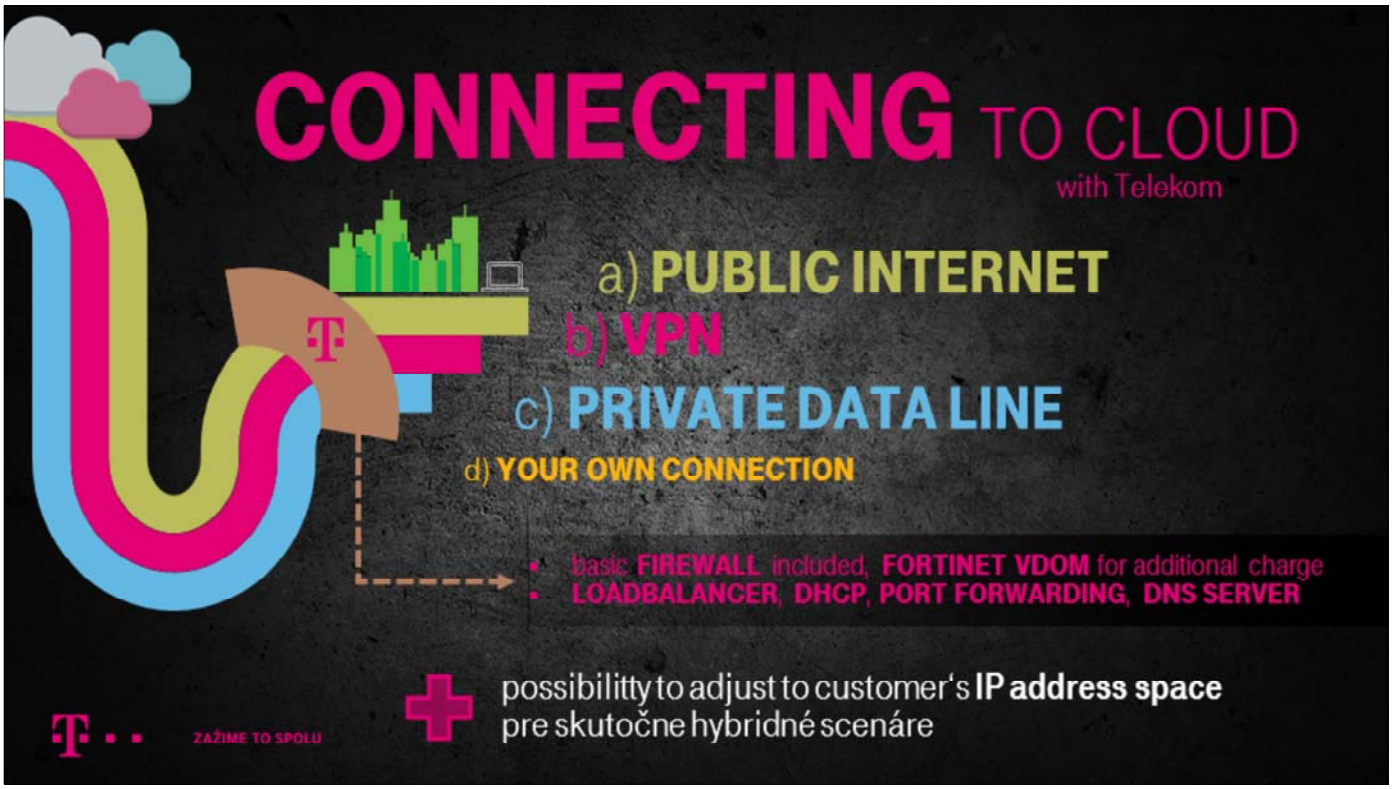
- Hosting business applications in the cloud avoids investments into own hardware and software infrastructure. The fees for cloud services are paid on a pay-as-you-go basis, and depending on the actual amount used. So the initial higher investment into infrastructure is avoided, which has a positive impact on cash flow as cloud is a pay-as-you-go service. In calculating the total cost for a certain period (TCO - Total Cost of Ownership), for the typical purchase of an infrastructure it is necessary to consider all the costs associated with owning on-premise company servers
- The summed total cost is then divided by the number of months that the entire infrastructure is to be utilised. This is often not based on actual usage but rather accounting regulations. The depreciation period for hardware in Slovakia is currently six years, which does not necessarily correspond to the actual time period of using the investment. In reality the dynamically changing requirements for the hardware infrastructure can lead to a situation whereby hardware is used much less, or in contrary requires significant expansion after a short period of time.



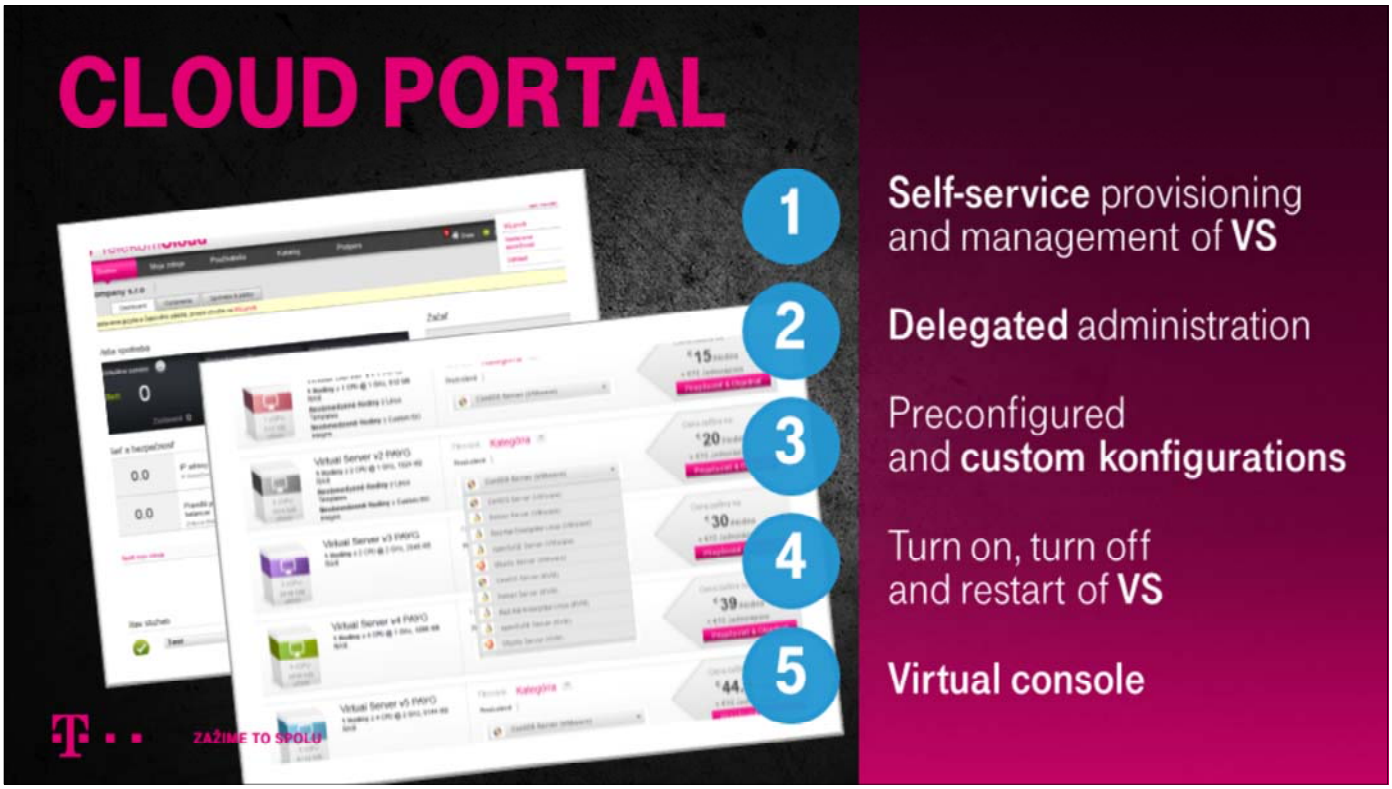
- Slovak Telekom built its public cloud in 2012 in cooperation with its daughter company, PosAm.
- The public cloud is installed in two data centres in Bratislava, on IBM blade servers, Hitachi Data Systems disk arrays, and Cisco networking and SAN technology.
- Virtualization is built on the VMware hypervisor. Virtual server orchestration and self-service portal are provided by a Citrix solution.
- Data centres where Telekom operates its public cloud are connected using a robust telecommunications network, fully owned by Telekom, with protection against DDoS and other types of network attacks.



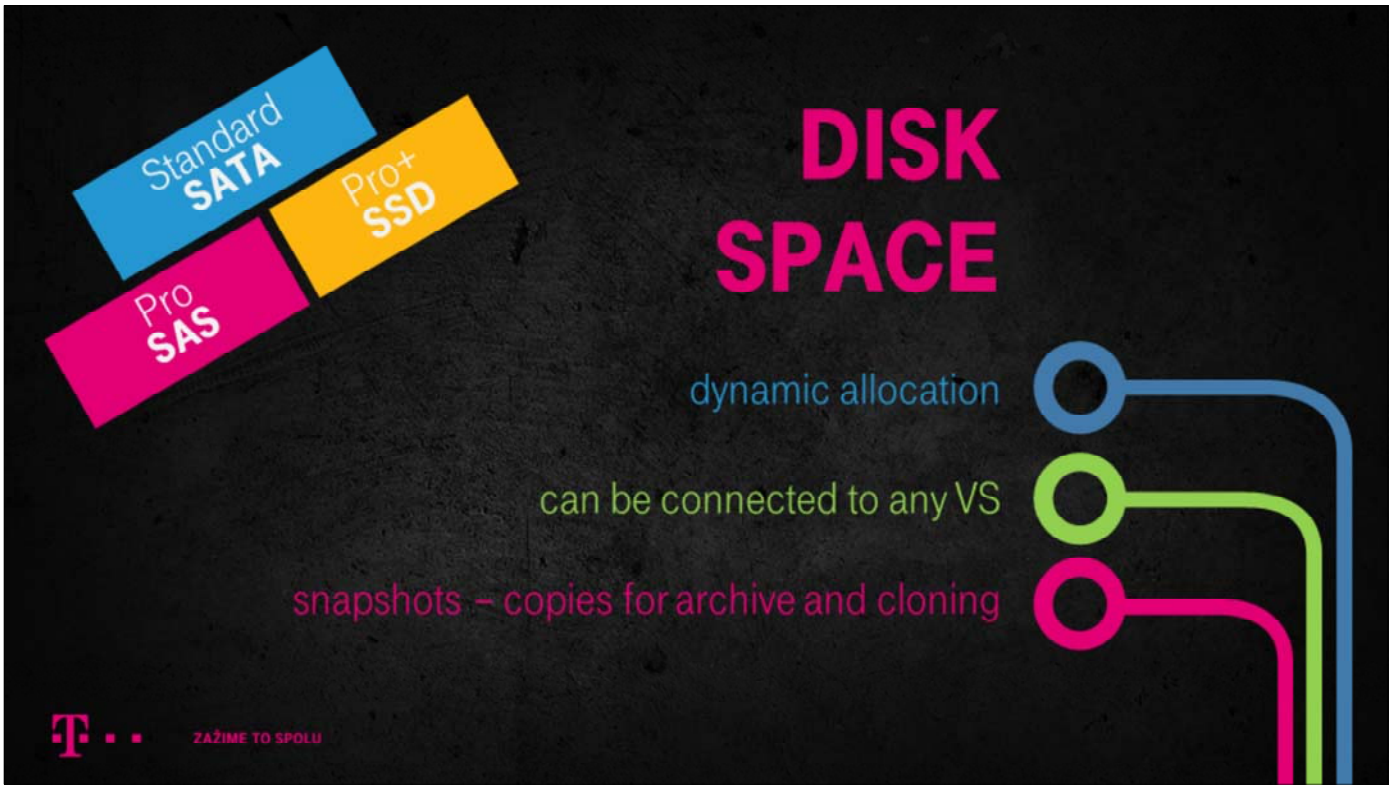
- For creating virtual servers a large number of preset configurations is available, however, custom configurations can be provided upon request.
- RAM and CPU parameters can be changed without reinstalling the server, but only on a switched-off server (a hypervisor feature).
- Parameters can be changed in both directions, i.e. upgrade or downgrade can be performed at the required frequency. Furthermore, if the virtual server has been upgraded, additional computing resources will be additionally charged monthly at an hourly rate.



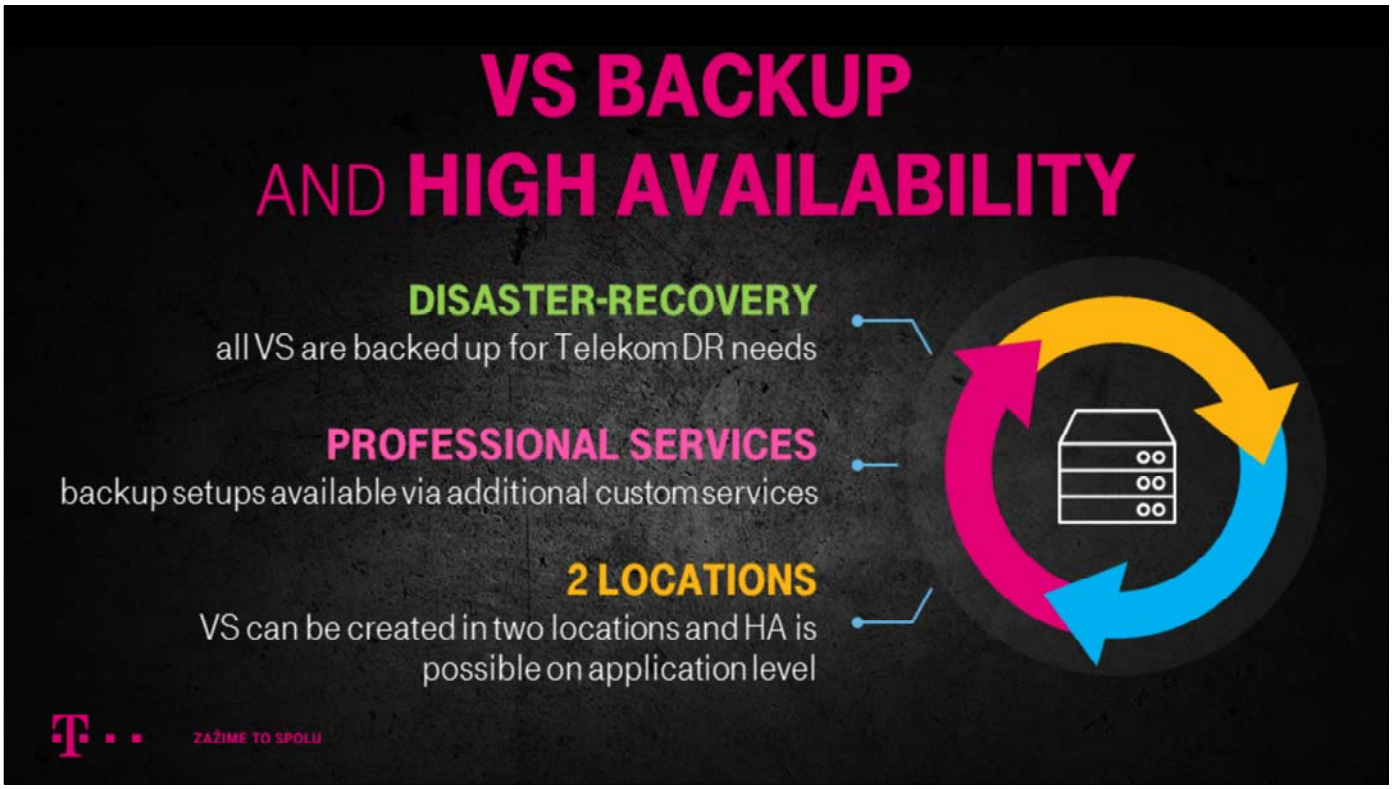
- Connectivity is absolutely essential for cloud services. Upon entry to the cloud it is therefore important to consider the speed, type, and method of connecting the cloud service with the user. The customer can connect to the cloud services using three basic modes.
- For IT services provided to users via the public Internet, such as online commerce, reservation systems, and web portal, it is particularly important that the service provides sufficient connectivity. Telekom provides connectivity to the Internet for all its cloud services free of charge and without any traffic volume restrictions. However, this is a shared service without any speed guarantee.
- Shared access to the public Internet network on the TelekomCloud IaaS platform is limited by the speed of 100 Mbit/s per IP address in order to avoid the possible congestion of the whole line by a small number of services during attacks, etc. For the vast majority of Internet projects, this type of connection is sufficient. However, it is also possible to buy an additional connection at a dedicated speed. Telekom provides its customers with protection from DDoS attacks as an optional add-on service.
- While operating company internal applications in the public cloud, it is possible to connect to a public IP address over the public Internet. However, this may not be optimal from the security or practical point of view. It is advisable to use a VPN or MPLS connection. A third of all TelekomCloud customers accesses cloud services through a private data network. For a hybrid infrastructure, where the customers operate the IT services partly on their own and partly on the cloud servers, this is an optimal solution. A significant advantage is when the cloud service provider can also provide private data lines with a highly secured method of connection and with a contractually guaranteed level of coverage for a particular data service: this is the case with Telekom.
- There is a high practicality level of network connection using VPN or MPLS connectivity to the TelekomCloud. Virtual servers, load-balancers, and other TelekomCloud components may use an internal IP addressing specific to the customer. Hence from the network point of view the IT services can be built on a public cloud only using a very transparent extension of the customer's current internal company network.



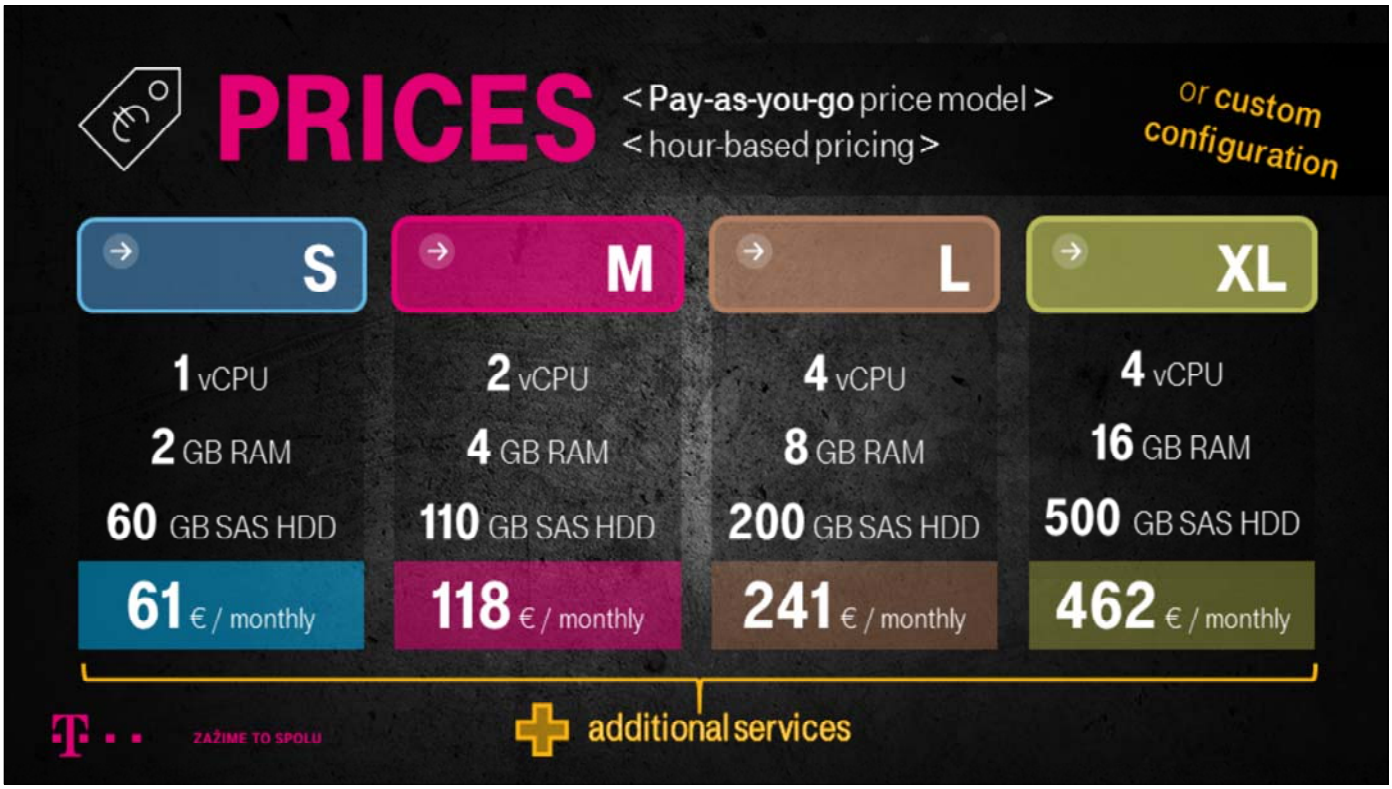
- Customers can take charge of setting up and managing their own virtual servers through a localised portal based on the Citrix CloudPortal platform. For server administration, multiple user accounts with different levels of delegated administration can be created.
- For creating virtual servers a large number of preset configurations is available, however, custom configurations can be provided upon request.
- The CloudPortal user interface allows controlling the status, monitoring, switching on/off, and hard-resetting of virtual servers.
- A web-interface remote console can be used to access the server. The remote console allows a virtual server screen to be displayed when a problem with standard network access occurs. The console allows server installation to be performed when customers want to install their own ISO image.
- RAM and CPU parameters can be changed without reinstalling the server, but only on a switched-off server (a hypervisor feature).
- Parameters can be changed in both directions, i.e. upgrade or downgrade can be performed at the required frequency. Furthermore, if the virtual server has been upgraded, additional computing resources will be additionally charged monthly at an hourly rate.



- Disk space can be allocated dynamically, with the disks being offered in three types:
  - *Pro* - SAS disks with a high throughput for standard use.
  - *Pro+* - SSD (FMD) disks for applications requiring the highest data read and write speeds.
  - *Standard* - SATA disks for more economical file storage.
- After being created, the disk can be connected to any virtual server but cannot be shared. It can only be connected to one server at a given time. However, the disks can be disconnected from and connected to the virtual servers at any time without any further restrictions.
- For backup purposes snapshots can be created from the disks, which allow a copy of a disk to be created for archiving or later recovery. The snapshots can also be used to create disk clones or templates for creating additional virtual servers. The snapshots can be created manually as well as automatically on an hourly, daily, weekly, or monthly basis. However, snapshots are not designed to protect against data loss during storage device outages, since they are located in the same disk array.



- Telekom backs up all virtual servers in-house on the TelekomCloud platform for disaster recovery at the level of entire virtual servers. Backups are performed regularly and are used to restore data in the event of primary hardware loss.
- Telekom does not currently provide the option to allow customers access to these backups for their own use. Therefore, it is the customer's responsibility to provide an additional in-house data backup for their own needs, with their own backup schemes, for which any of the Telekom professional services can be utilised.
- TelekomCloud virtual servers are set-up in two locations, shown in the self-service CloudPortal interface as "DC1" and "DC2". Customers can utilise this setup for their IT-services architecture that requires high availability - by setting up a backup server at the secondary site. Generally, it is the customer's responsibility to secure a high-availability functionality between the two sites at the application level.



The fee for using the servers is based on a “pay-as-you-go" pricing model, where the customer is charged for the disk, memory, and CPU at an hourly rate. For greater clarity, the price list and online price calculator show the monthly cost.


REFERENCES
SHIP GROUP
INTERSTORE GROUP
OZETA NEO
EUROPEAN FASHION COMPANY
McROY CZECH
ADASTRA
arreco SOLUTIONS
SLOVAK PARCEL SERVICE
PROGRAM TRENČÍN
VLM SR
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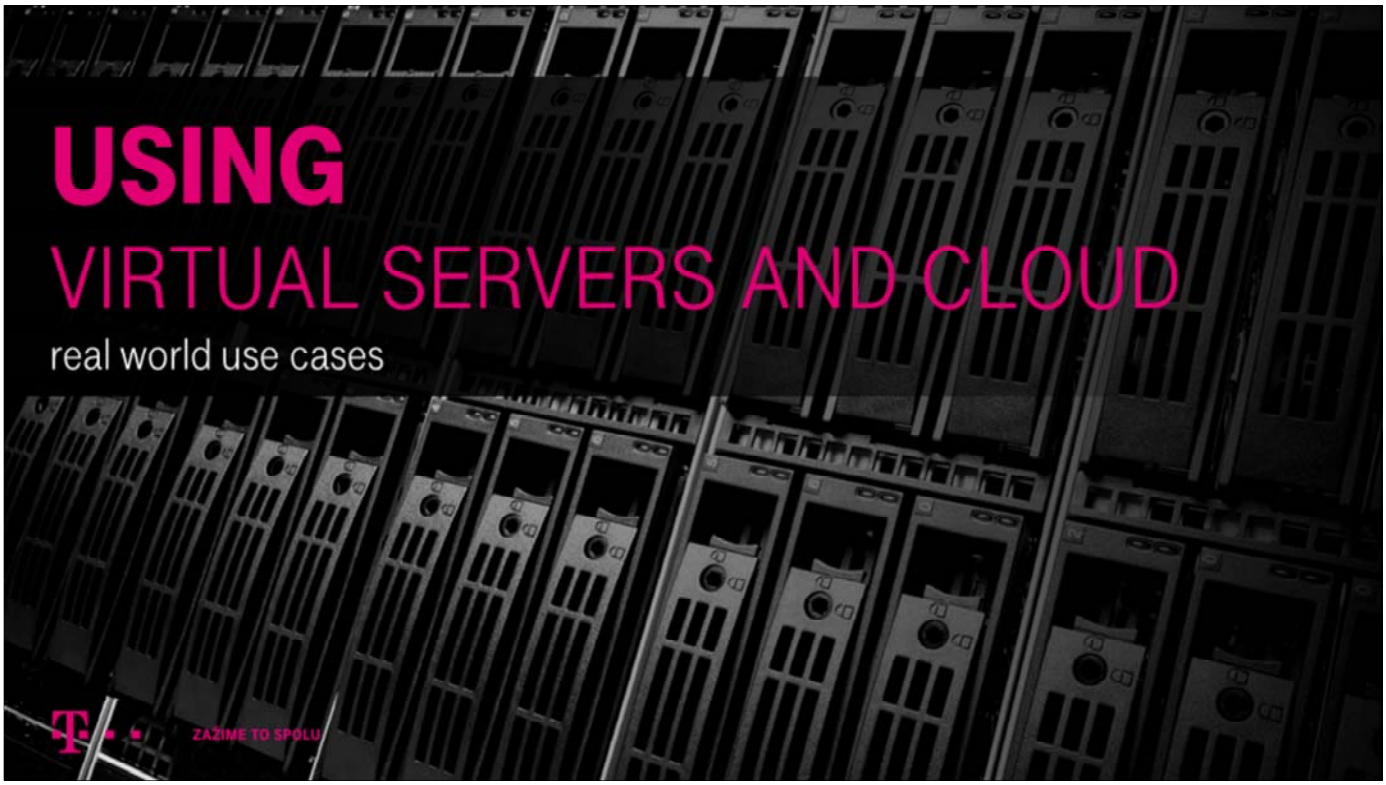
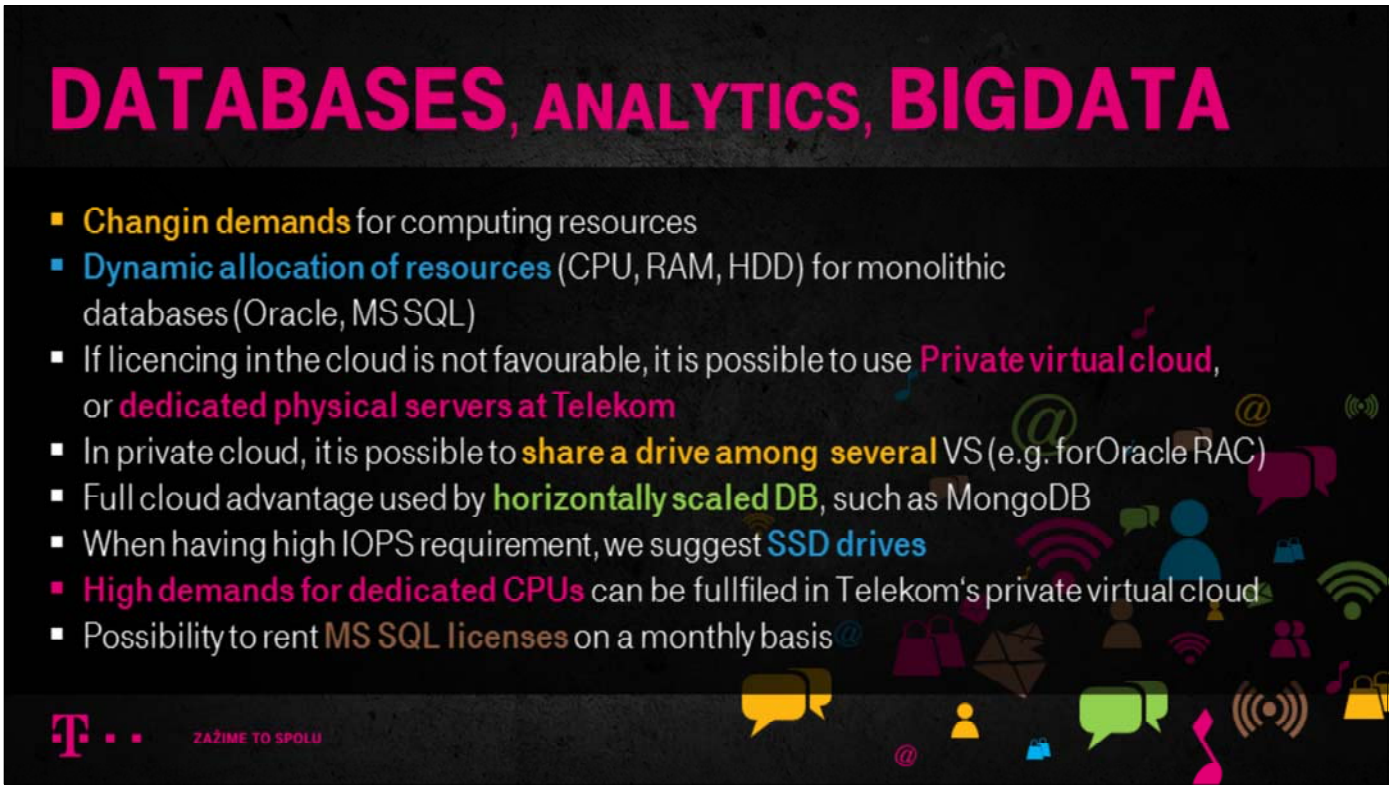

USING
VIRTUAL SERVERS AND CLOUD
real world use cases
ZAŽIME TO SPOLU

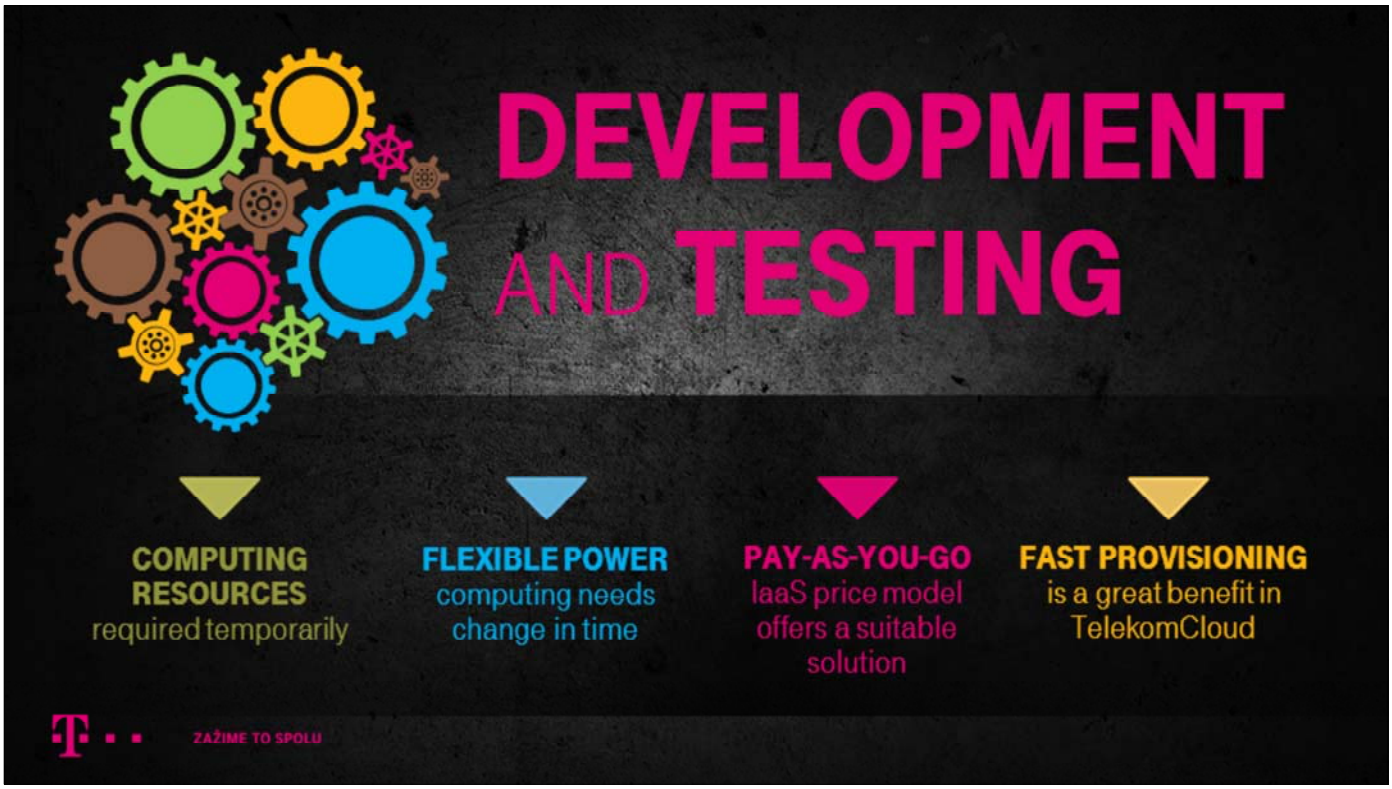
- A simple form of presence in the cloud is TelekomDrive data storage. It is a tool through which companies can share any files and documents between their users.
- This cost-effective service is also suitable for storing corporate backups in a secure place outside the company.
- The service provides direct access to data from end devices such as PCs, laptops, smartphones and tablets, or through a web interface.
- Customers can also manage their access privileges between individual users and encryption their data.
- The cost of the service ranges from 70 cents per 1 GB per month.

- A virtual server in the TelekomCloud is a fully-featured replacement for a conventional corporate server designed to run internal company applications such as accounting, payroll, logistics, and ERP systems.
- With regards to an application dedicated solely to internal business users, it is advisable to create a connection via a private data line (MPLS) or a VPN connection via the Internet.
- For customers requiring high availability, TelekomCloud allows creating virtual servers at different locations and then creating a high-availability setup at the application level.
- Possible changing demands on hardware resources predetermine hosting in the public cloud with the option of dynamic scaling. If very high demand is concentrated on a single server that cannot be scaled horizontally, it is recommended to use a virtual private server solution or to lease a custom dedicated physical server.

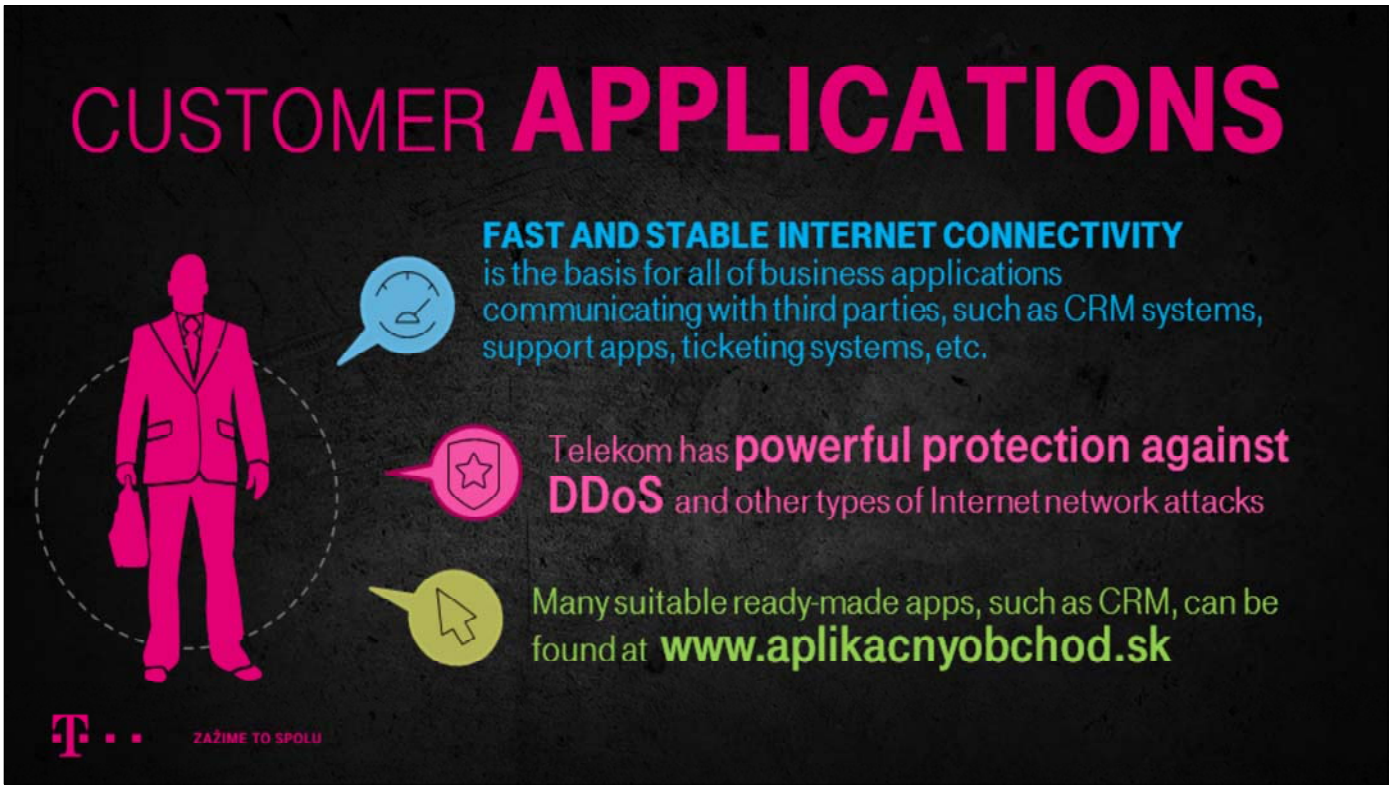


- Data analysis applications are characterised by the changing demands on computing resources, making the dynamics of the cloud ideal for these applications.
- Solutions based on typical monolithic applications, such as Oracle and MS SQL databases that run on a single virtual server, utilise dynamically-allocated computing resources. Allocating an additional memory or processors to a given virtual server running on the TelekomCloud platform requires restarting the operating system. Otherwise, the process takes place dynamically.
- Some types of typical packaged software applications do not provide a favourable licensing model in the cloud environment. This part of the infrastructure can then be allocated and operated on a virtual private server, or a dedicated physical server - everything in the data centre and managed by Telekom.
- For the monolithic databases, a high availability requirement can be met by using a typical server cluster working over a shared disk. An example is the Oracle RAC. The standard TelekomCloud public cloud does not allow two virtual servers to share a single disk. However, the configuration is feasible in a public private cloud by separating the portion of architecture from the public cloud.
- Other database types may become popular in the future, such as MongoDB, which allow horizontal scaling and are resistant to individual virtual server outages. Additional resources can be allocated by adding multiple instances of the same application, and by balancing the load between them. Such a system is resistant to load fluctuations of the entire cloud, and is independent of the infrastructure under the applications or of the hypervisor properties.
- With a traditional SQL database, which also has a very high demand on throughput to disks without the possibility of horizontal scaling, it is appropriate to perform performance tests when entering cloud. Public cloud providers, including the TelekomCloud platform, limit the overall IOPS throughput to avoid clogging up the shared disk arrays. The highest possible throughput in the TelekomCloud infrastructure can be achieved using SSD (FMD) disks. For hardware-intensive projects, the TelekomCloud platform allows allocating dedicated resources with a separate non-shared infrastructure. The high resource-demanding SQL database is a classic case for a solution based on a virtual

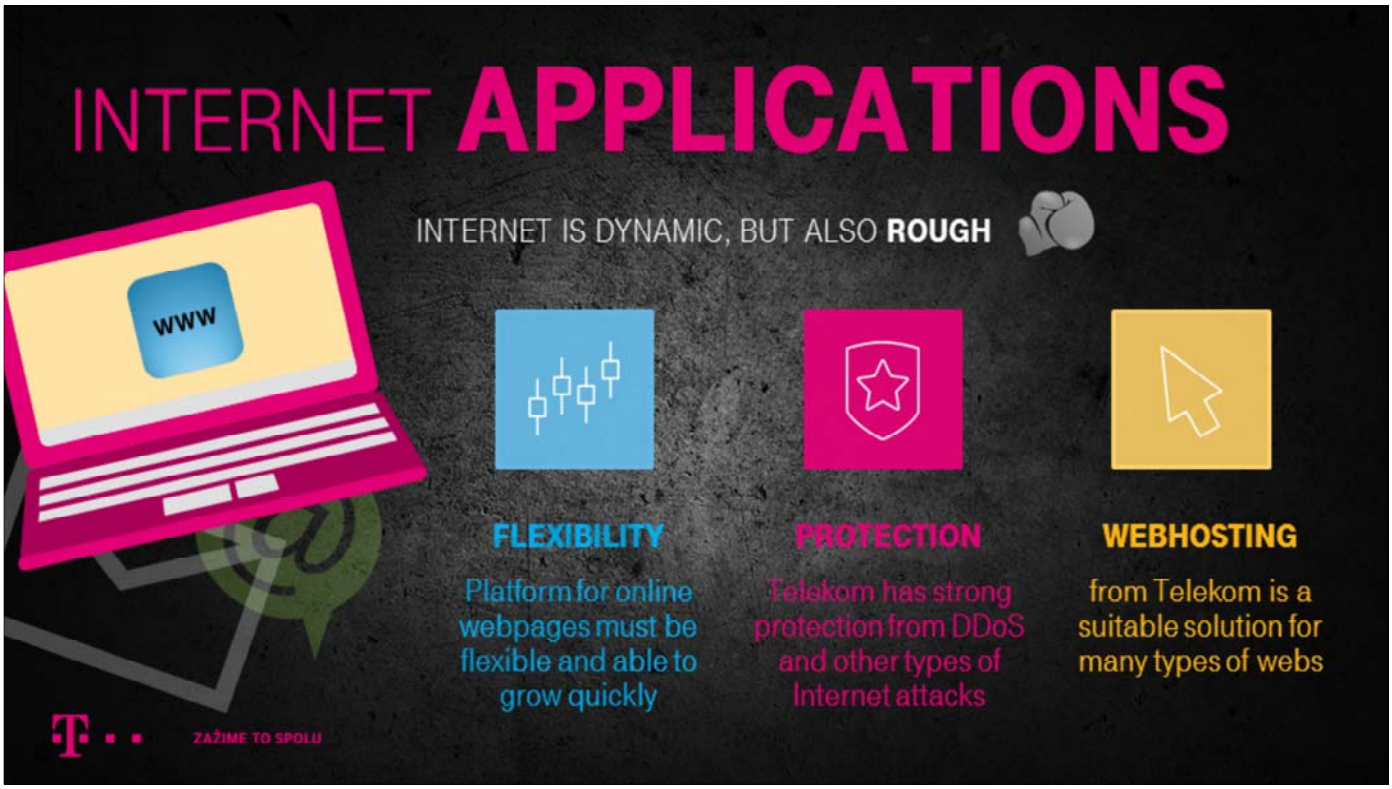
private cloud, or on a rented dedicated server.



- Applications in this area are characterised by being created for a shorter time period, and their computing resources are changing dynamically. For this reason, the IaaS public cloud features and the pay-as-you-go pricing model provide many advantages for these applications.
- While the development environment requires specific tools, the test environments need to replicate the actual production infrastructures. Both, however, are specific in that they require maximum power only for short periods of time, and it is strictly desirable to have both located outside the production environment. So an optimal solution for these applications is to use the TelekomCloud service. The advantage is the speedy set-up of the service, when a virtual server suitable for testing purposes can be created within a few minutes.



- Business applications that are increasingly communicating with third parties, such as customer information systems, support ticketing systems and the like, require first of all a strong and stable connection to the Internet. Hence they are generally very suitable for placement in a data centre operated by a service provider.
- Some of these types of applications, such as e-commerce or ordering systems, can be operated on a Telekom web hosting service.
- However, if the customer requires increased performance or availability, the ideal solution is the TelekomCloud virtual server or virtual private servers.



- Presenting an application on the Internet is subject to various influences, both wanted and unwanted.
- Once a web application is published on the Internet it is likely that in a few hours it will attract botnets (automated servers) that seek to exploit a web application for other operations, such as spreading viruses and unwanted emails. These attacks, though mostly unsuccessful, can generate excessive load and cause unavailability of the Internet application, and in some cases of the infrastructure on which the application runs.
- More wanted effects include a sudden increase in website traffic due to the interest of a large number of users.
- In these cases the advantage of cloud is its flexibility in adapting to the current situation, for example simply by adding servers into the application architecture. The resulting load is evenly distributed between all the servers, and allows the application to continue to be available due to its increased performance.
- If there is a failure of part of the infrastructure, the application in the cloud can simply redirect the requests to another server, and thus continue to function without the user noticing any difference at all.

- For security reasons organizations of all sizes should invest in technologies and processes that ensure data protection against various disaster events. However, only the largest companies and organizations can ensure in-house the availability and integrity of data across a range of adverse events. Therefore it is advisable for companies to have replicated data or backups in a remote, trusted location outside their premises - the cloud provider can meet these needs and requirements.
- For small- and medium-sized companies it may be sufficient to back up important data in an easy-sharing TelekomDrive data storage.
- The TelekomCloud IaaS platform is suitable for disaster recovery purposes by larger customers who want to protect their on-premise data and servers against outages or damage. There are two basic scenarios for utilising the shared TelekomCloud resources by customers for the disaster recovery of their on-premise solutions:
    - To back up on-premise data to the TelekomCloud customers use their own backup software to create backups of their on-premise infrastructure. In the TelekomCloud the customer creates a virtual disk and publishes it to their backup software, where it subsequently stores the backups according to the customer's backup policies.
    - For disaster recovery in the TelekomCloud customers use the technology to replicate their own virtual servers in the TelekomCloud environment. Telekom provides this solution on the Veeam Availability Suite v9 platform. After a disaster event in the on-premises environment, the customer initiates the start of replicated virtual servers at the TelekomCloud.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