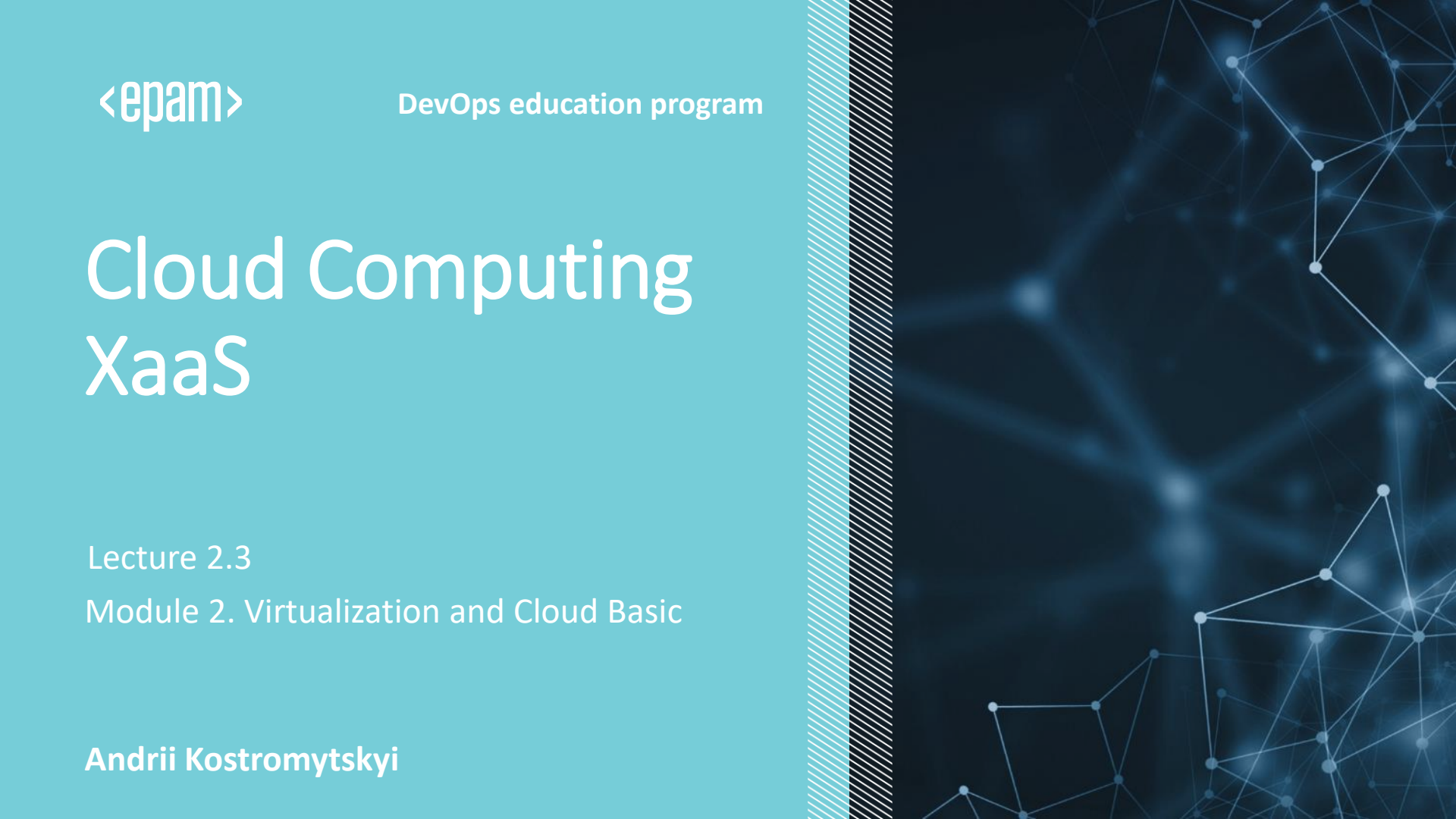

epam
DevOps education program
Cloud Computing
XaaS
Lecture 2.3
Module 2. Virtualization and Cloud Basic
Andrii Kostromytskyi

Agenda

- Cloud computing
- XaaS
- Virtual resources
- Types of clouds
- Data center
- Q&A

CLOUD COMPUTING

Cloud Computing Definition (by NIST)

In accordance with definition from National Institute of Standards and Technology (NIST),

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics, three service models, and four deployment models

Cloud Characteristics

NIST defines the following essential characteristics of Cloud-related services:
On-demand self-service: get the necessary resources when needed, without contacting support
Broad network access: access your resources from various locations and devices
Resource pooling: resources are immediately available due to resource adjustment control on meta level
Rapid elasticity: scale your resources dynamically, depending on your needs
Measured service: all provided services are measured and monitored

In addition, there is a number of points that are essential for users when they select to use Cloud:
Pay as you go: service is billed by actual usage
Costs reduction: pay only for what is used; wise resource usage and automation result in smaller bills
Ready for automation: cloud is convenient for automation solutions usage without much additional effort

Key architectural implementations in the cloud

- computing resources on request
- infrastructure virtualization
- dynamic migration of computing resources
- private computing resources

XAAS

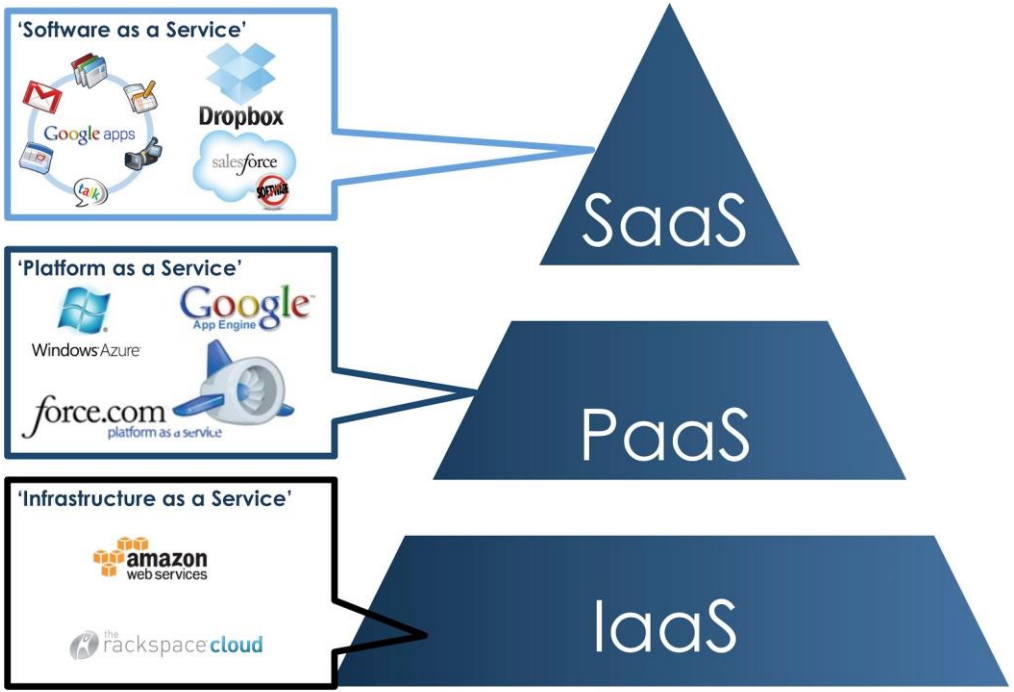
Three service models

- IaaS — Infrastructure as a Service. When there are network tools and servers in the cloud. It is assumed that all the necessary hardware is its own, and the computing and part of the network infrastructure are cloudy. The model is in demand among large enterprises. Roughly speaking, this is a server rented for a certain time. In financial terms, IaaS resembles the electricity market. The client can either purchase computing power at a fixed rate or pay on the fact, depending on the load (for example, seasonal). Resource Examples: : VMs/Servers/Storage/Load balancers/Network/Other

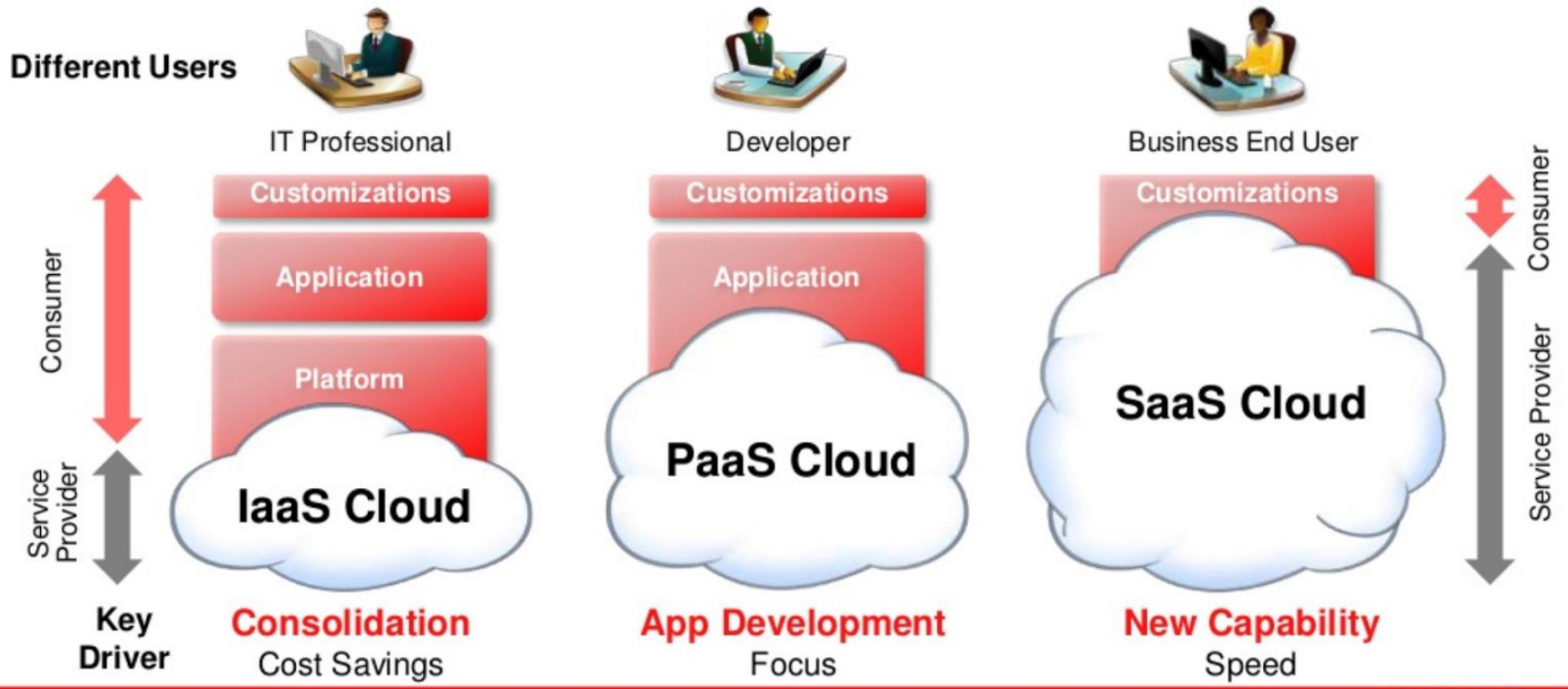
- PaaS — platform as a service. In the hands of the user are only their own data and applications that he uses. The operating system, virtual machine, network infrastructure, servers are the cloud. According to this model, the provider provides a customized and ready-made set of services and tools for work, for example, to create a web application. Examples: Development tools/Web servers/Databases/Programming language execution environments/Other

- SaaS — software as a service. In this option, the client rents a finished application or software product developed by the supplier, stored on its server and managed by it. By and large, we all use SaaS when we start mail on Gmail: CRM/Email/Virtual desktop/Games/Other

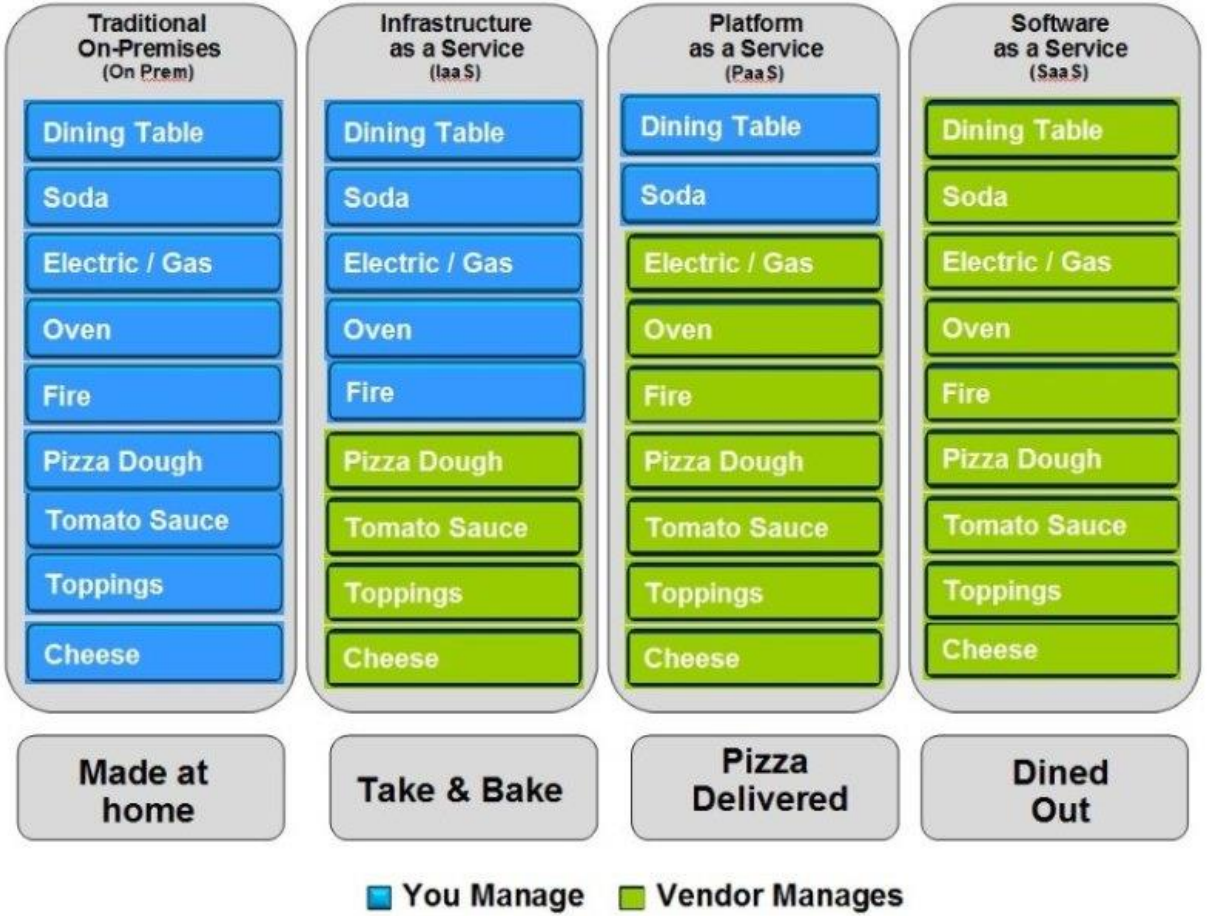
Examples IaaS, PaaS, SaaS



Service Types: IaaS, PaaS, SaaS



Pizza as a Service

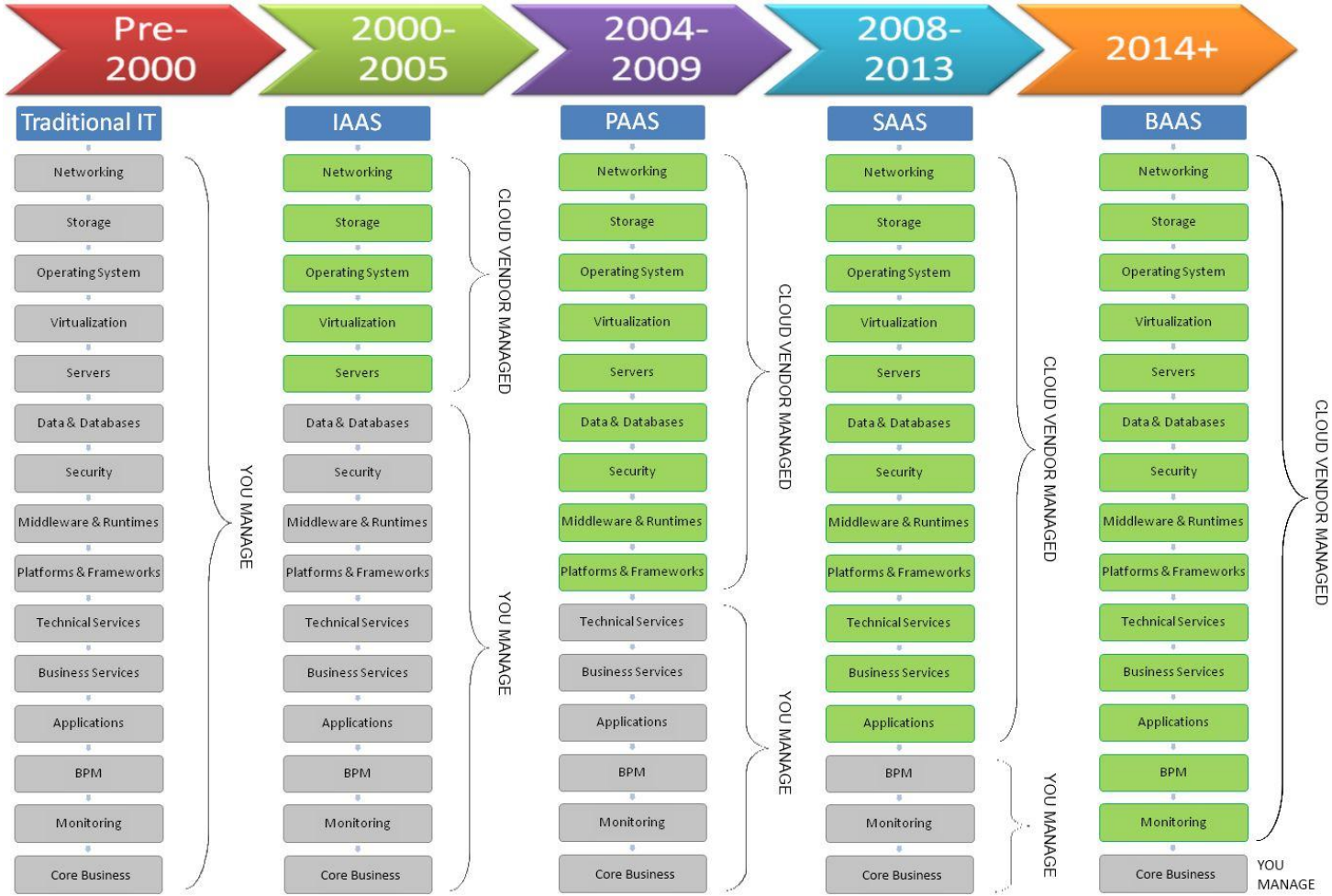


Pizza as a Service 2.0

http://www.paulkerrison.co.uk

Tradition On-Premises (legacy)	Infrastructure as a Service (IaaS)	Containers as a Service (CaaS)	Platform as a Service (PaaS)	Function as a Service (FaaS)	Software as a Service (SaaS)	
Conversation	Conversation	Conversation	Conversation	Conversation	Conversation	Configuration
Friends	Friends	Friends	Friends	Friends	Friends	Functions
Beer	Beer	Beer	Beer	Beer	Beer	Scaling...
Pizza	Pizza	Pizza	Pizza	Pizza	Pizza	Runtime
Fire	Fire	Fire	Fire	Fire	Fire	OS
Oven	Oven	Oven	Oven	Oven	Oven	Virtualisation
Electric / Gas	Electric / Gas	Electric / Gas	Electric / Gas	Electric / Gas	Electric / Gas	Hardware
Homemade	Communal Kitchen	Bring Your Own	Takeaway	Restaurant	Party	

You Manage Vendor Manages


Pre-2000
2000-2005
2004-2009
2008-2013
2014+
Traditional IT
IAAS
PAAS
SAAS
BAAS
Networking
Storage
Operating System
Virtualization
Servers
Data & Databases
Security
Middleware & Runtimes
Platforms & Frameworks
Technical Services
Business Services
Applications
BPM
Monitoring
Core Business
YOU MANAGE
CLOUD VENDOR MANAGED
CLOUD VENDOR MANAGED
CLOUD VENDOR MANAGED
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YOU MANAGE
YOU MANAGE
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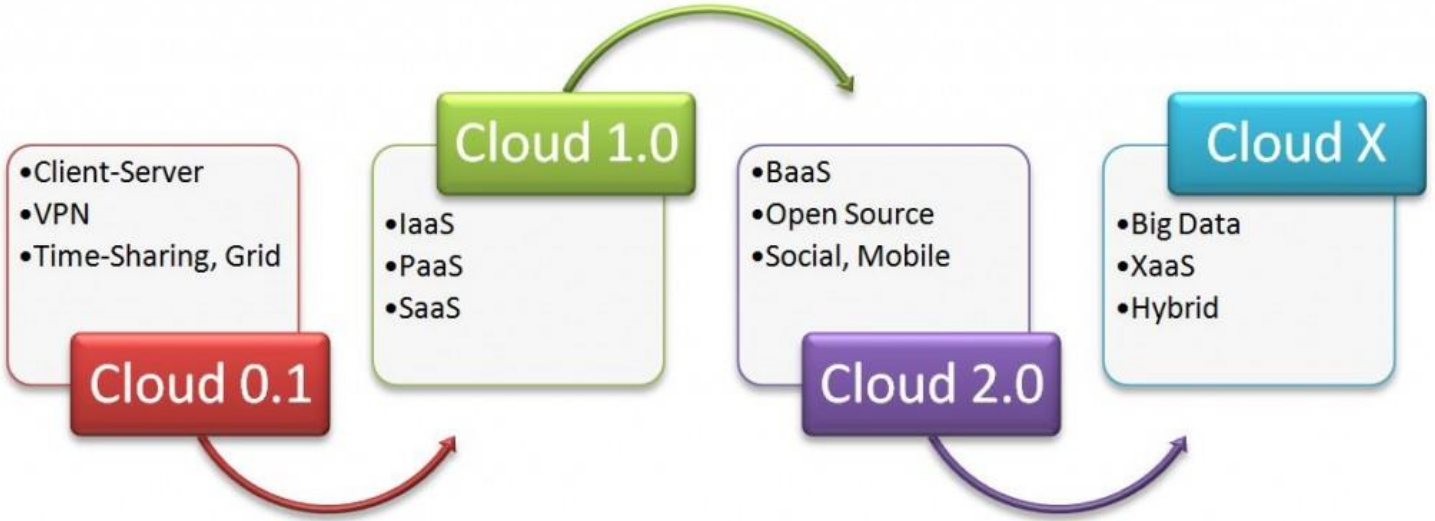
YOU MANAGE

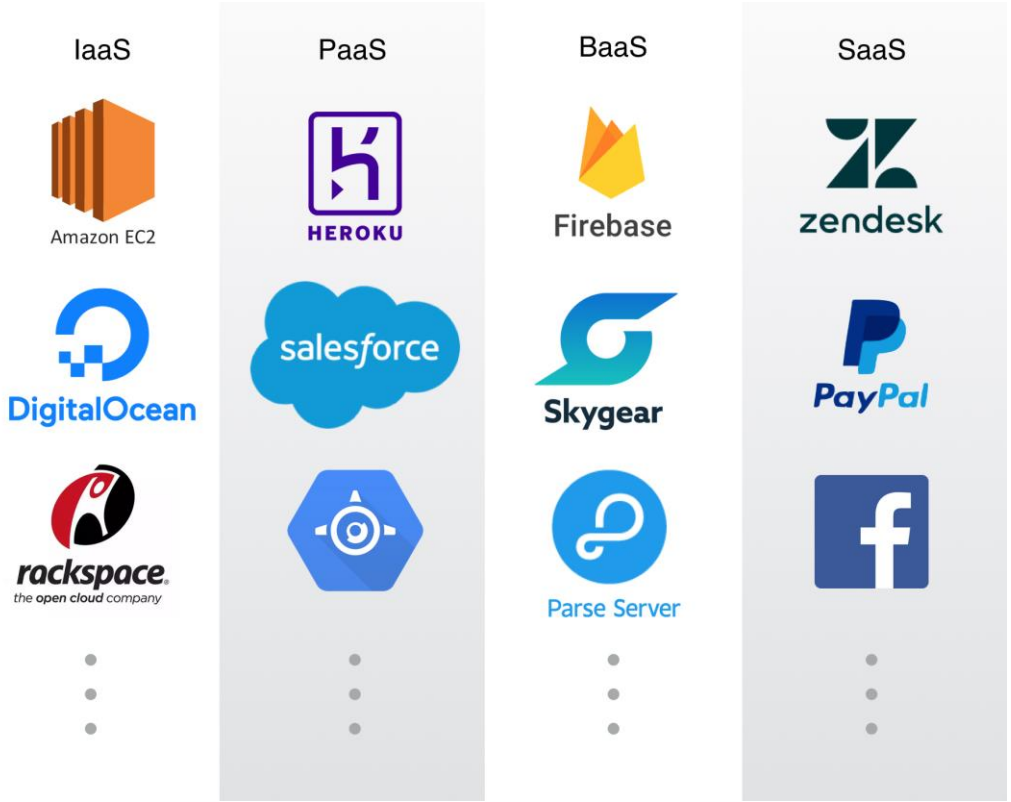
XaaS – Everything as a Service

- everything in the cloud, including Big Data



Examples IaaS, PaaS, BaaS, SaaS

STaaS - Storage as a Service
DRaaS is a virtual backup data center in the cloud
BaaS - cloud and local infrastructure backup
BaaS - Backend as a Service,
BaaS - Business as a Service,



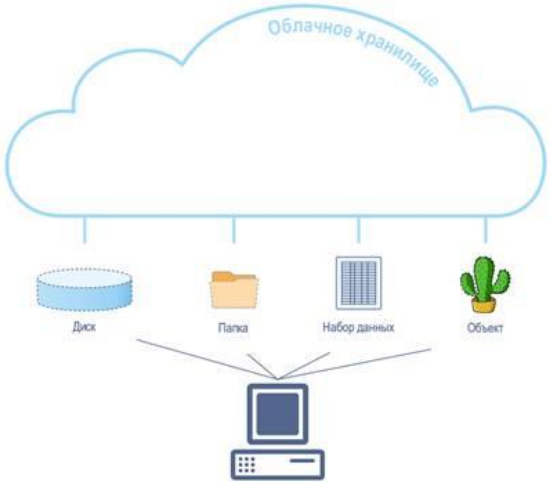
VIRTUAL RESOURCES

The main types of virtual resources

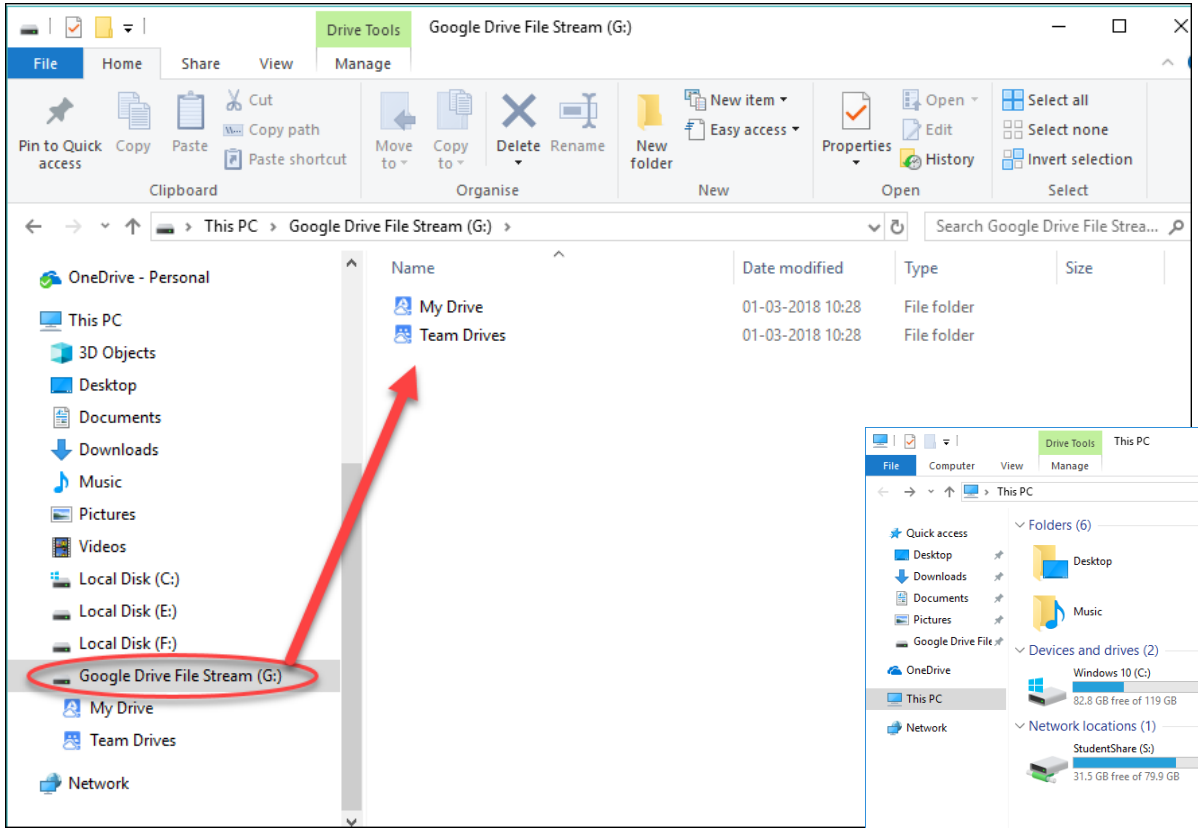
- Storage, virtual disks
- Virtual computing resources (processor, memory).
- Productivity and bandwidth resources.
- Serverless solutions (Lambda)

Cloud storage

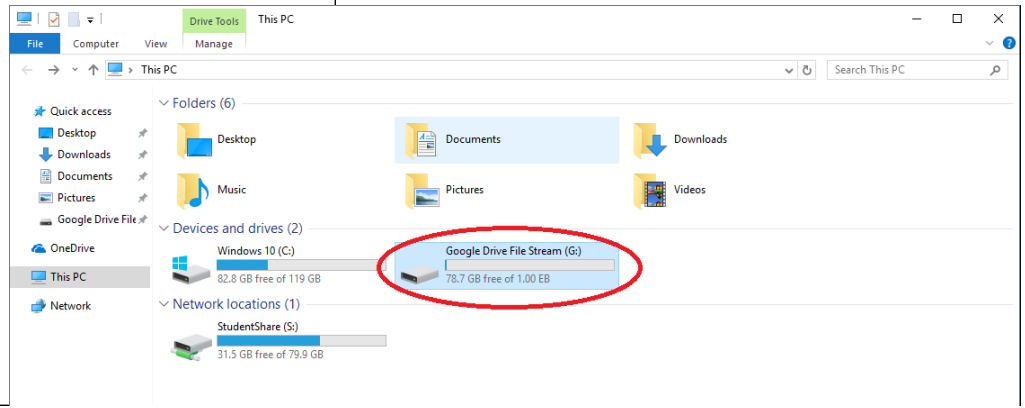
Cloud resource type	Data type	Note
Disc	Files, folders	You can manage the disk file system, partition it into logical disks, etc .; available disk space is limited by the size of the disk provided
Folder	Files, folders	You cannot manage the file system and the logical structure of the disk space; storage size is limited by tariff, not disk size
Data set	Numbers, strings and other atomic data	The application must "know" the logical connections between these data in order to use them correctly
Object	A set of related data	As a rule, this set corresponds to something from the real world: user, document, organization, product, etc..



Google drive



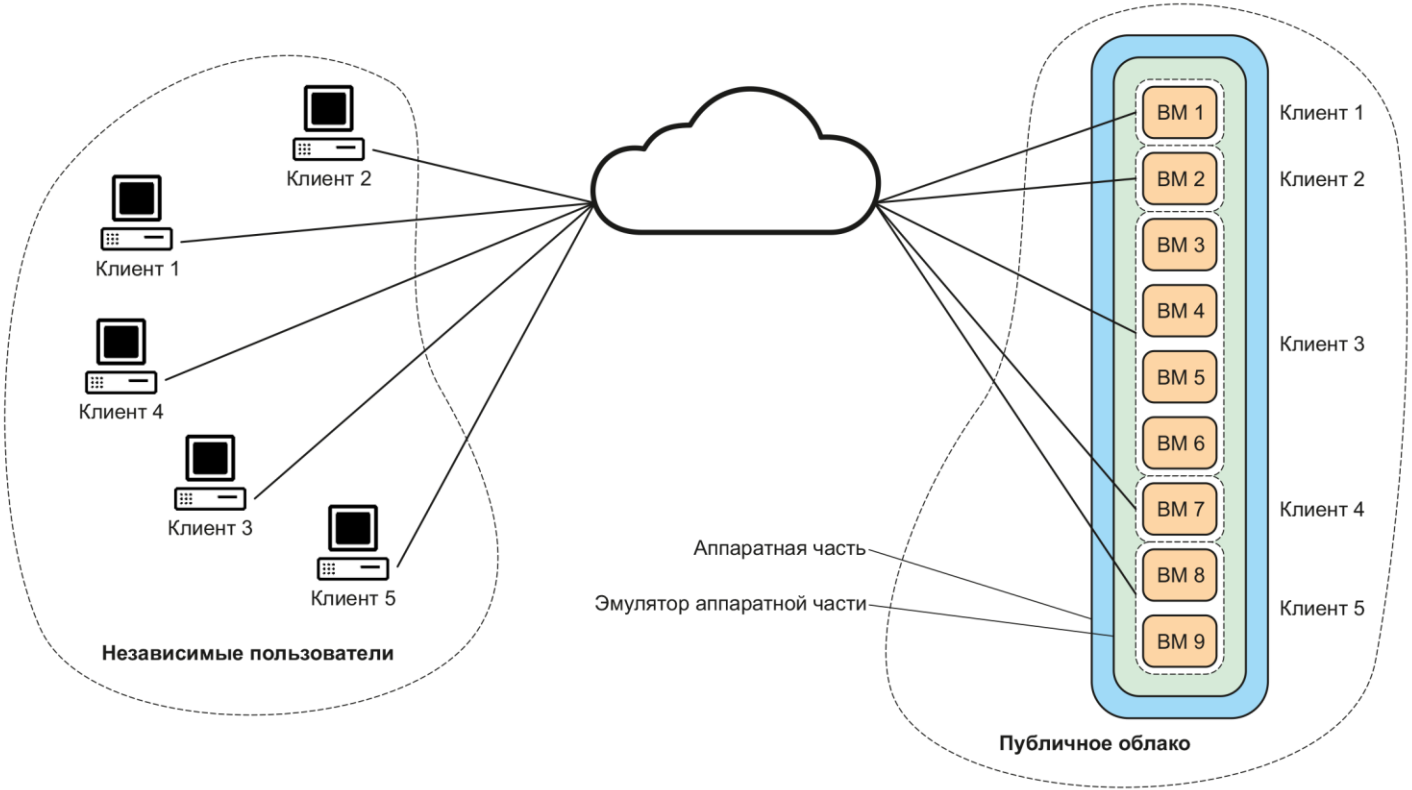
drive file stream



TYPES OF CLOUDS

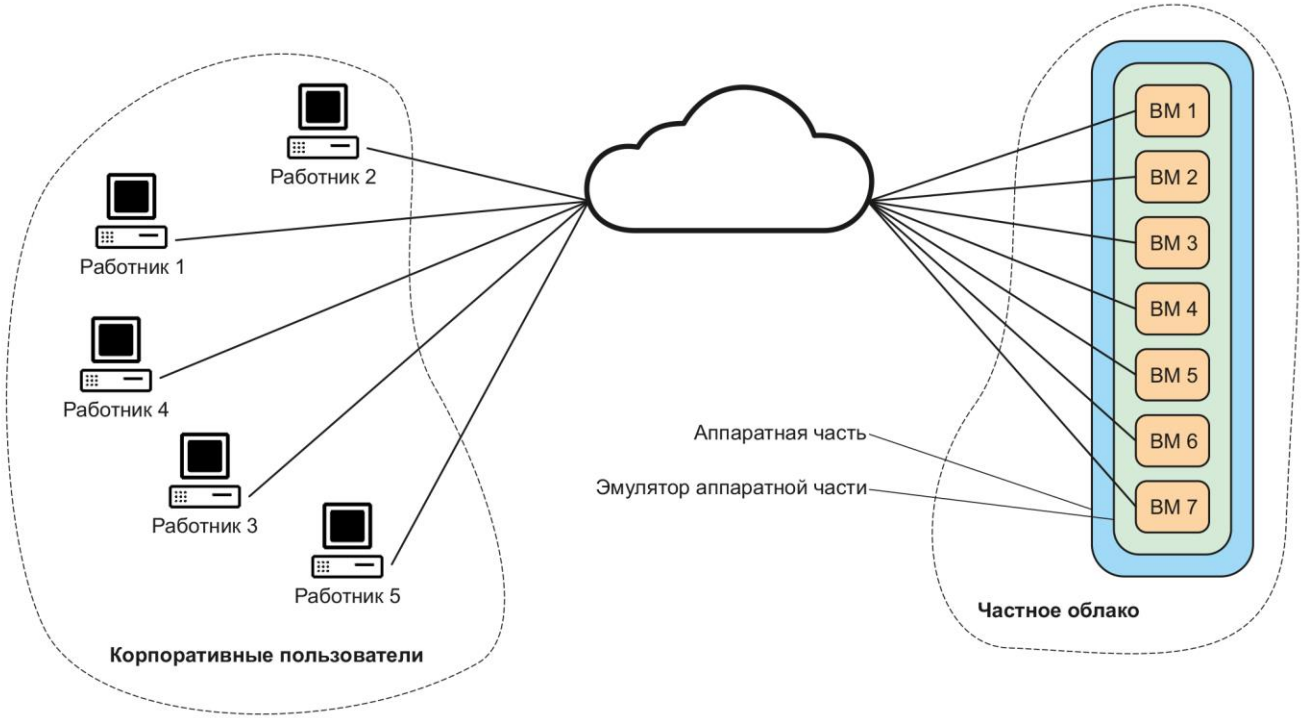
Types of clouds. Public

Public Cloud, in which services are provided through network open for public use. Generally, a public cloud and a private cloud may have similar technical structure, however, the level of security measures in a public cloud is much higher, considering the availability of infrastructure resources to general public and access over non-secure channels.

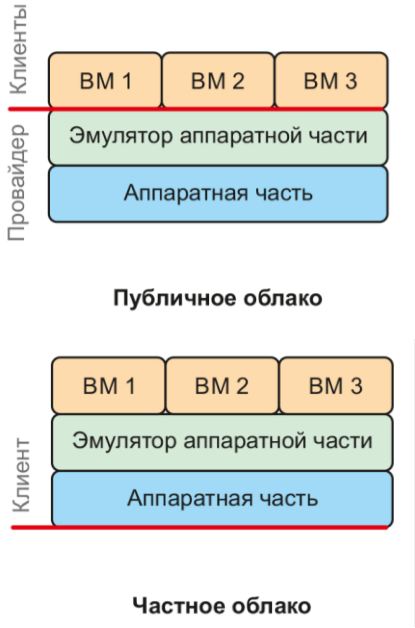


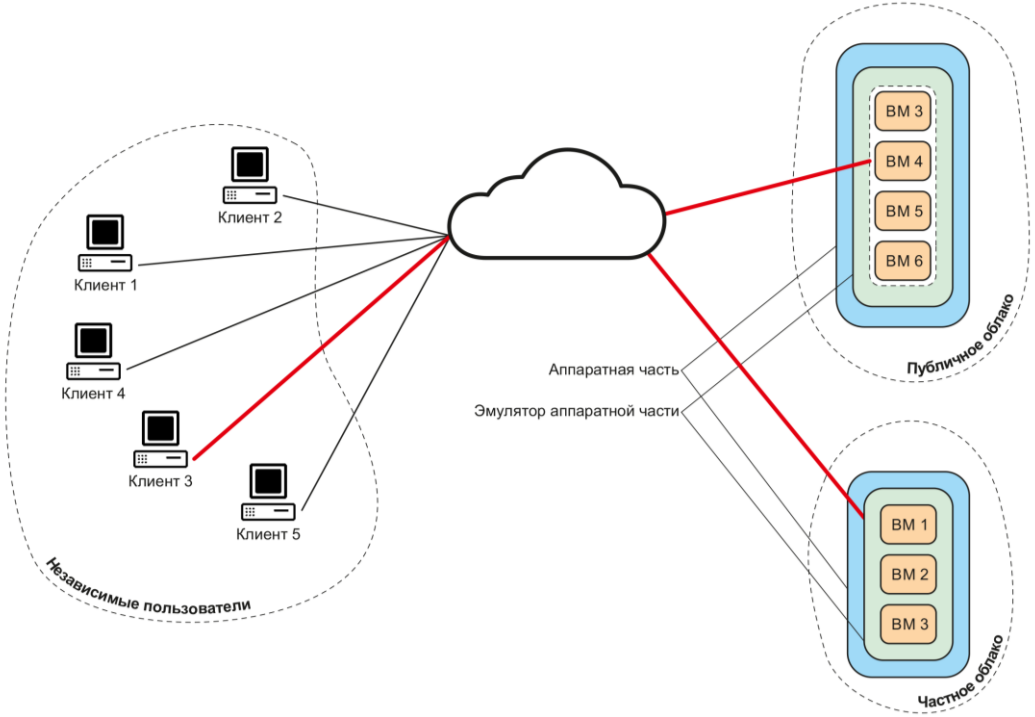
Types of clouds. Private

Private Cloud, infrastructure for a single organization. In a private cloud, cloud infrastructure is operated solely for a single organization, whether managed internally or by a third-party, and hosted either internally or externally. Undertaking a private cloud project requires a significant level and degree of engagement to virtualize the business environment, and requires the organization to reevaluate decisions about existing resources. When done right, it can improve business, but every step in the project raises security issues that must be addressed to prevent serious vulnerabilities.



Types of clouds. Hybrid





Hybrid Cloud combining the features of both private and public cloud. In a hybrid cloud, public and private cloud services are usually provided by different vendors and remain distinct entities. However, hybridization allows extending the capacity of each individual component by taking advantage of their unique functionality.

Top clouds

Amazon Web Services (AWS)
IaaS: Elastic Compute Cloud
PaaS: Simple Storage Service (S3); Elastic Block Store (EBS)
SaaS: DynamoDB; CloudSearch
Interfaces: Web Client; API

Microsoft Windows Azure
IaaS: Virtual Machines
PaaS: SQL Database; Cloud Services; Active Directory
Interfaces: Web Client; API

Google Cloud Platform (GCP)

IaaS: Compute Engine
PaaS: Container Engine
SaaS: App Engine
Interfaces: Apigee API platform

OpenStack
IaaS: Compute
PaaS: Object Storage
Interfaces: Web Client; AP

Magic Quadrant

Figure 1. Magic Quadrant for Cloud Infrastructure as a Service, Worldwide

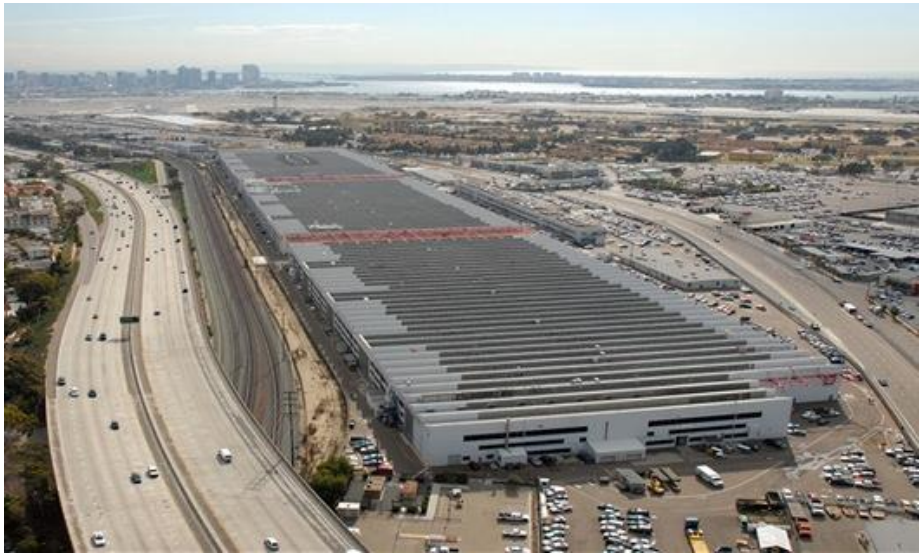
Source: Gartner (June 2017)

DATA CENTER

Data center

Data Processing Center (DPC) is a comprehensive centralized system that ensures business continuity with a high level of productivity and readiness of services, including:

- highly reliable server equipment,
- data storage system,
- active network equipment,
- architectural and technical solutions for redundancy and duplication of critical information systems services,
- "Providing" engineering infrastructure,
- physical protection of premises,
- management and monitoring systems,
- a set of organizational measures.



Classification

For reliability (TIA-942)

- Tier 1 (N) - equipment failures or repairs result in the shutdown of the entire data center; there are no backup power sources and uninterruptible power supplies in the data center; engineering infrastructure is not reserved;
- Tier 2 (N + 1) - a small level of redundancy; the data center has hollow floors and backup power sources, but repair work also causes the data center to stop working;
- Tier 3 (2N) - the ability to perform repair work (including replacement of system components, adding and removing those that have failed) without stopping the data center; engineering systems are reserved at once, there are several channels of distribution of power supply and cooling, however only one of them is constantly active;
- Tier 4 (2 (N + 1)) - it is possible to carry out any work without stopping the data center; engineering systems are twice reserved, ie duplicated both main and additional systems (for example, uninterruptible power supply is represented by two UPSs, each of which is already reserved according to the N + 1 scheme).

Tier Standards

Attribute / Statistic	Tier I	Tier II	Tier III	Tier IV
Power and Cooling Delivery Paths	1 Active	1 Active	1 Active 1 Passive	2 Active
Redundant Components	N	N + 1	N + 1	2(N + 1)
Support Space to Raised Floor Ratio	20%	30%	80 – 90%	100%
Initial Watts / sqft	20 – 30	40 – 50	40 – 60	50 – 80
Ultimate Watts / sqft	20 – 30	40 – 50	100 – 150	150+
Raised Floor Height	12”	18”	30 – 36”	30 – 36”
Floor Loading Pounds / sqft	85	100	150	150+
Utility Voltage	208, 480	208, 480	12 – 15 kV	12 – 15 kV
Months to Implement	3	3 – 6	15 – 20	15 – 20
Year First Deployed	1965	1970	1985	1995
Construction $ / sqft	$450	$600	$900	$1,100+
Annual IT Downtime Due to Site	28.8 hrs	22.0 hrs	1.6 hrs	0.4 hrs
Site Availability	99.67%	99.75%	99.98%	100.00%

Source: The Uptime Institute

Distributed data centers

Over the decades of their existence, data centers have come a long way from small computer rooms to data centers, data centers, cloud and distributed data centers.

Cisco Systems identifies the following goals for creating distributed data centers:

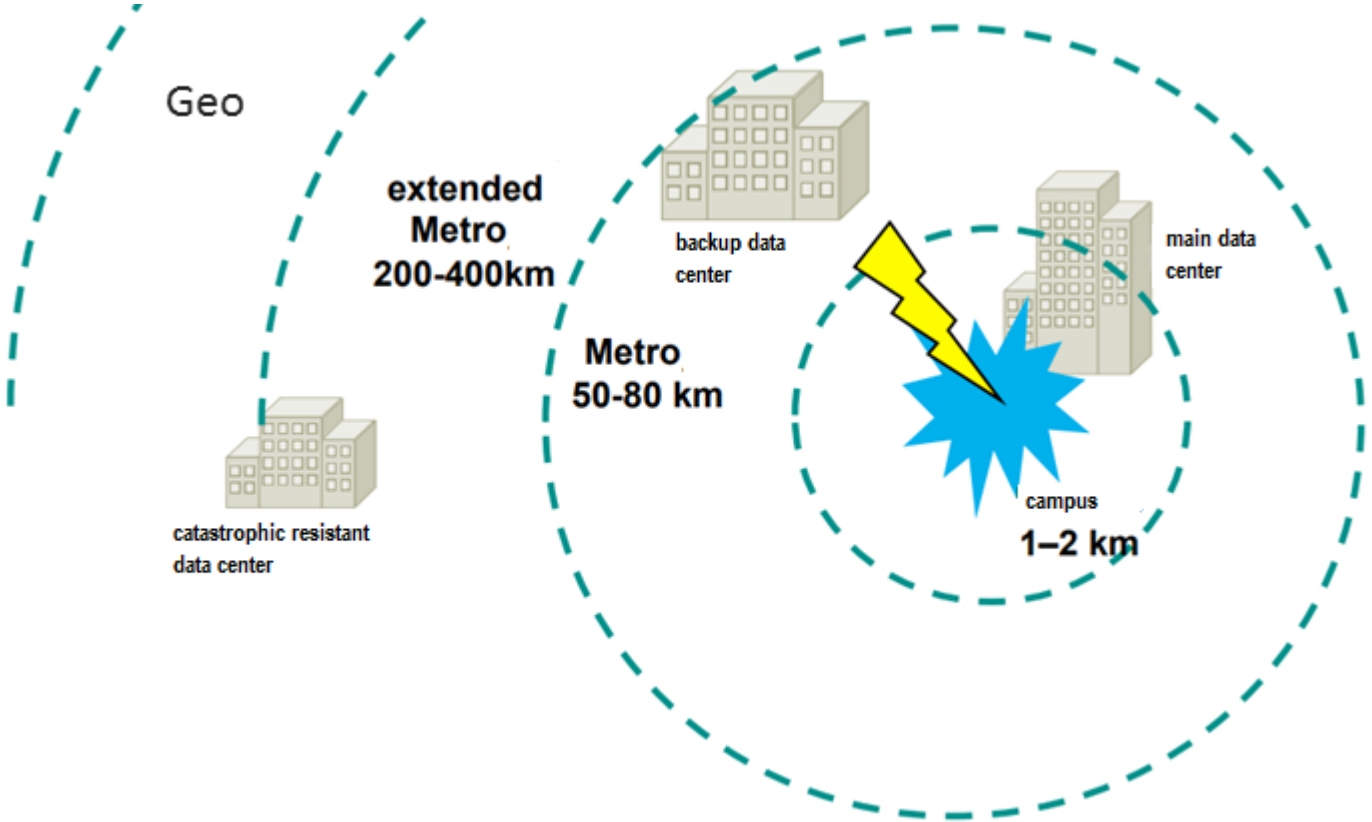
- Disaster resistance
- Continuity of data processing
- Application mobility
- Systems migration
- Productivity / capacity building
- Distributed services
- Geographically localized services

For average organizations, a centralized model is often sufficient, when all data, services and applications are concentrated in one data center, which provides guaranteed levels of data availability and security. However, there is often a need for a backup data center, combined with the main data center using high-speed communication channels in a single computer system

Classification of distributed data centers

by the distance between the

- Campus
- Underground
- Region
- Geo



Data Center De Novo

The largest specialized data center in Ukraine is the De Novo data center, with an area of 2117 m2 and a capacity of 3.3 MW

Data Center De Novo

ADVANTAGES

Ukraine's Number 1 Data Center

The market share exceeds 25%, according to IDC research in 2017.

The largest banks of the country trust us with their IT infrastructure.

Reliability

Compliance with the TIER III reliability level and NBU requirements.

The data center has operated for 8 years without a single stop.

SLA Guarante

99.982 % uptime according to SLA (service level agreement).

Financial responsibility up to 12 monthly payments.

Security

A centralized 24/7 monitoring system of the physical security and physical access.

Engineering infrastructure

Two high-voltage power lines from two independent substations.

A bank of 4 diesel generators.

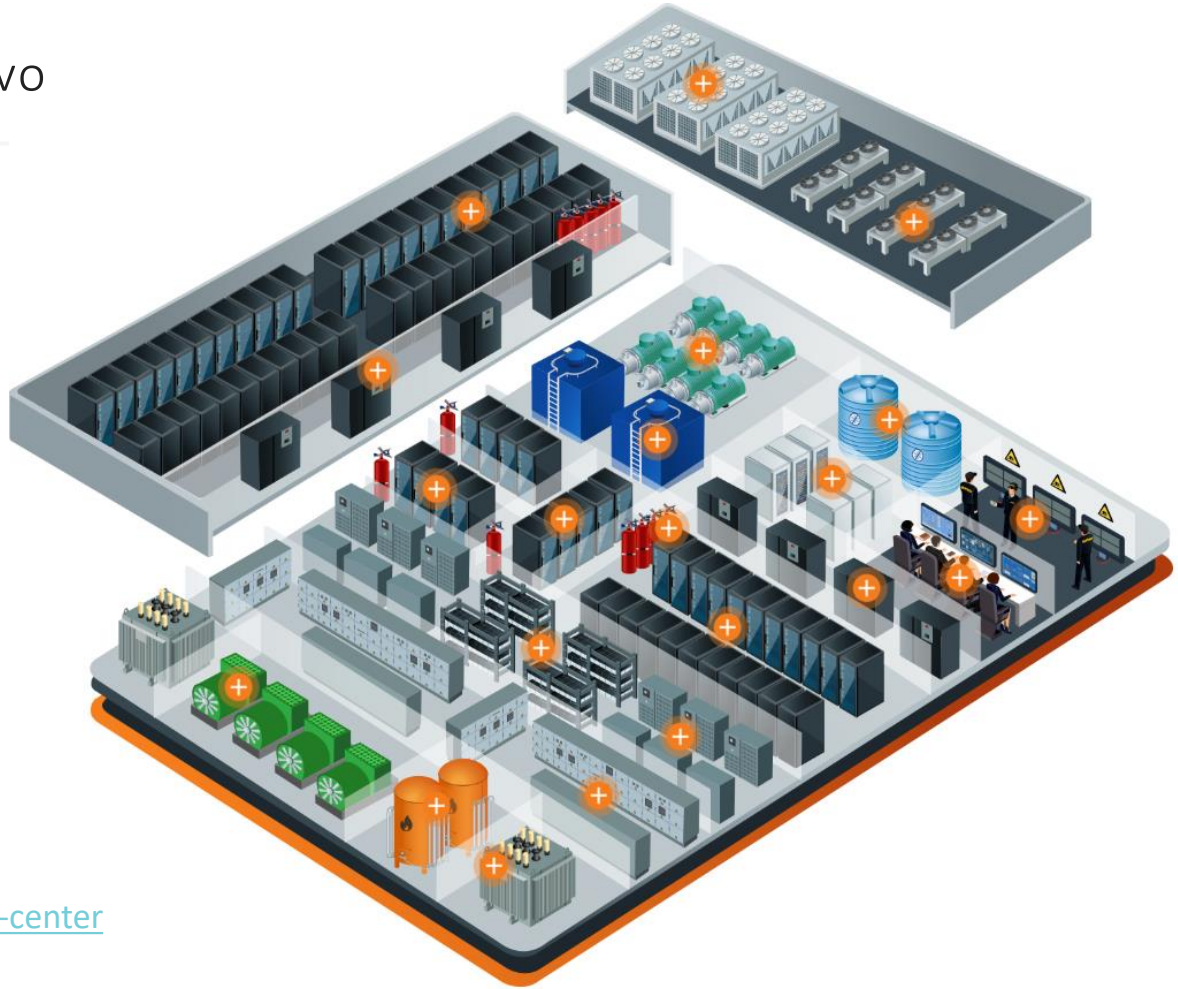
Individual automatic gas firefighting system in the module.

Required telecommunications available

14 trunk communication operators.

Two independent optical fiber routes to the UA-IX switching center.

Data Center De Novo



https://www.de-novo.biz/data-center

Q & A

Thank you!