IR.3504 Convergent Services and Technologies
IT/Virtualization Basics

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Summary

At the end of this talk, you should be able to answer the following questions:

- ❑ What are the basic IT components that compose any organization ?

- ❑ What are the main application architectures that we see in the enterprise world ?

- ❑ Who are the main actors of the application ecosystem ?

- ❑ What is an VNF ? How is it different from SDN ? Who decides how it's made ?

Summary

➢ IT Hardware components

- Servers,
- Data Storage,
- Archival Disk
- Backup Disk

➢ Client / Server Architecture
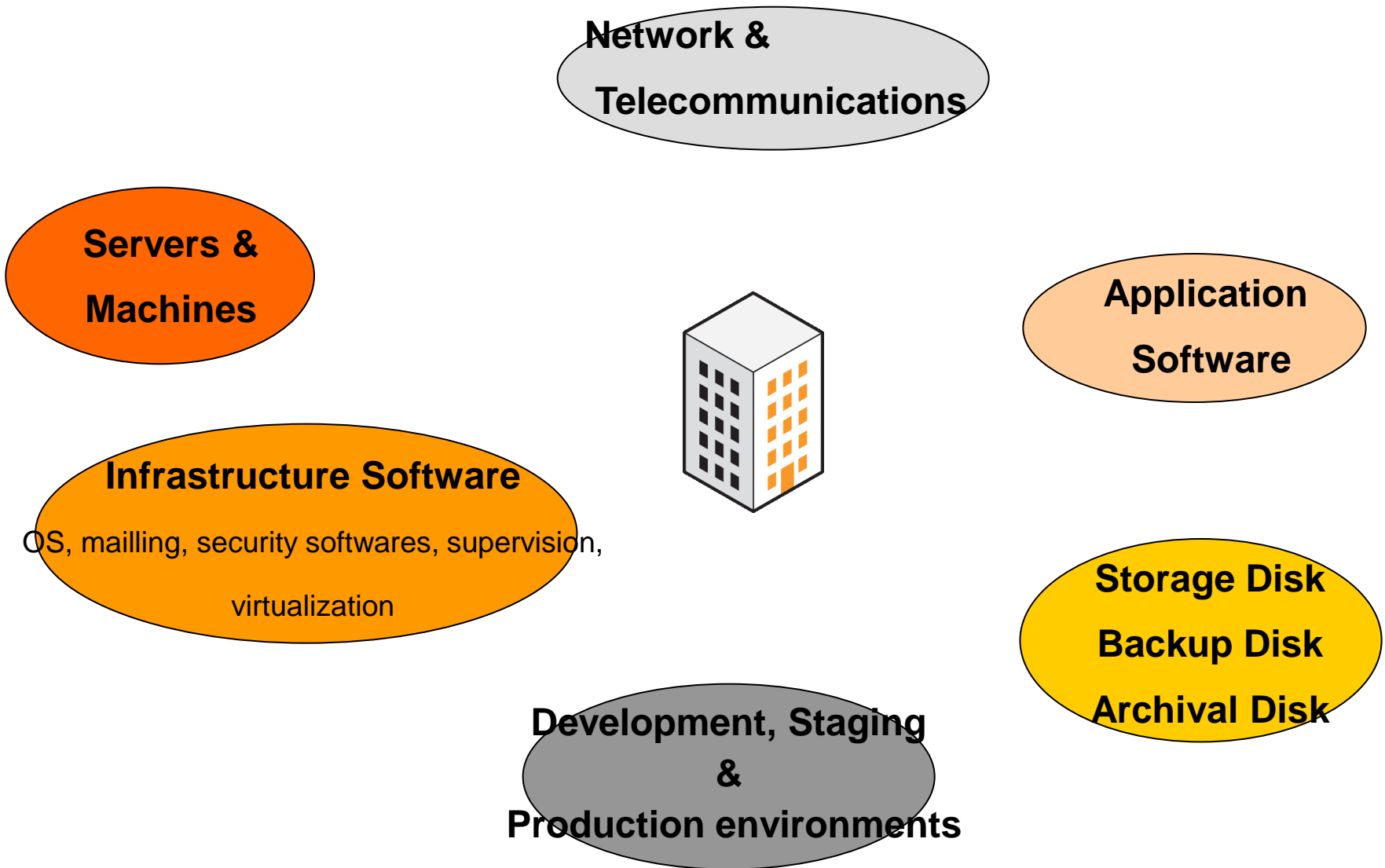
- Main Frame
- Centralized
- Multi-tiers

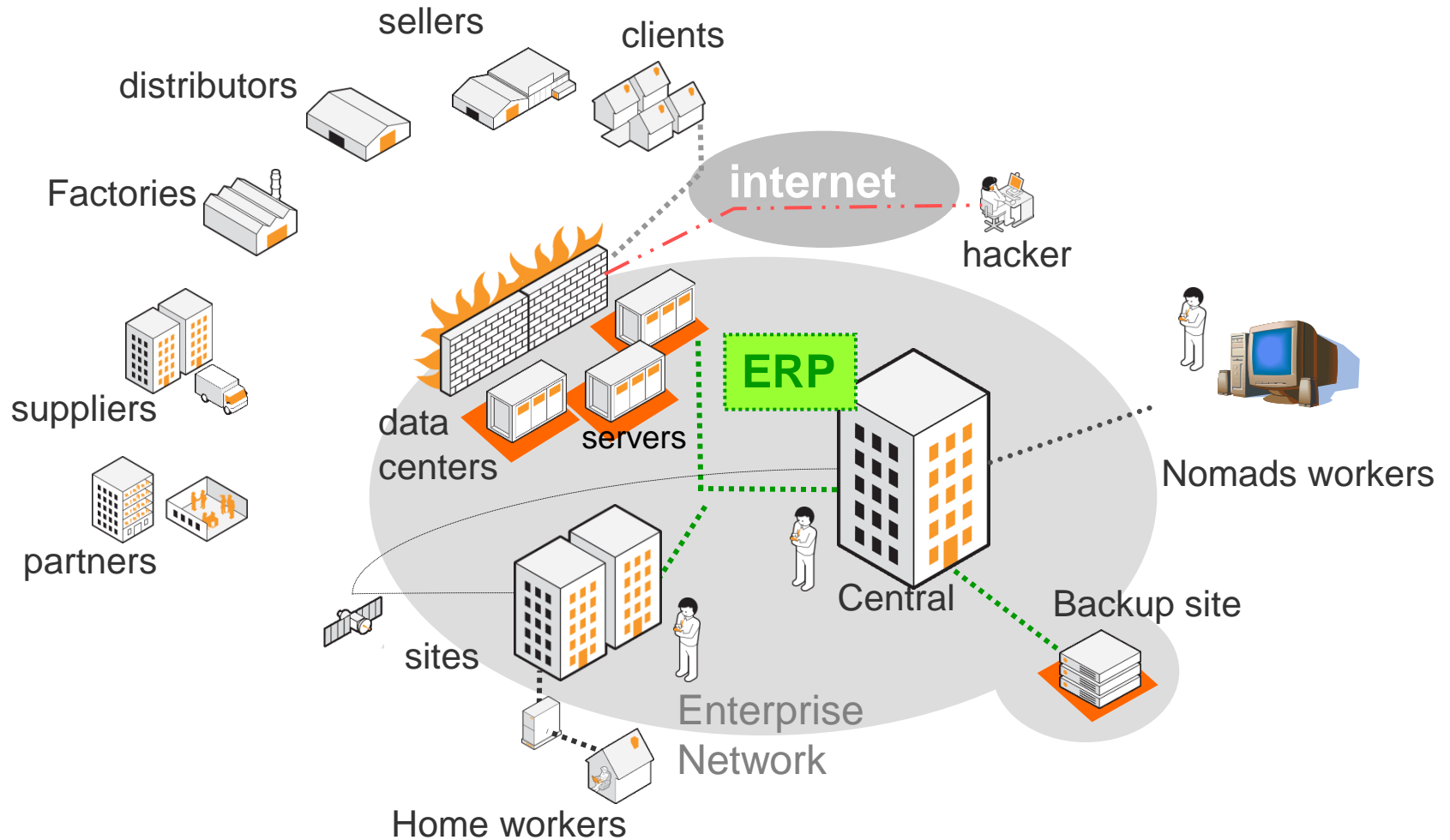➢ Applications

- Ecosystem and Licenses

➢ Network Function Virtualization

- ETSI Management And Orchestration model (MANO)
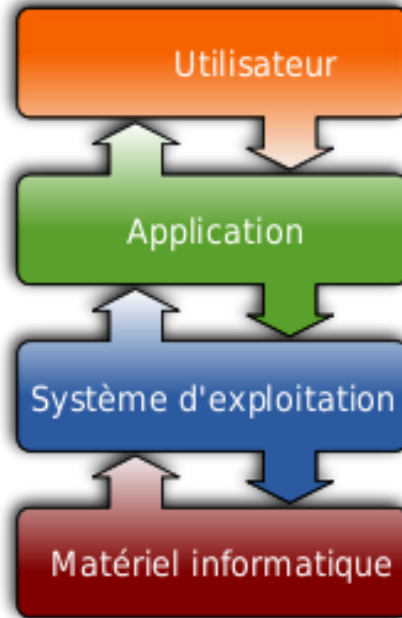- The VNF world: Baremetal, VM, Docker

The enterprise environment

Network & Telecommunications

Servers & Machines

Application Software

Infrastructure Software

OS, mailling, security softwares, supervision, virtualization

Storage Disk

Backup Disk

Archival Disk

Development, Staging & Production environments

Entreprise Environment

sellers

clients

distributors

Factories

internet

hacker

ERP

suppliers

data centers

servers

Nomads workers

partners

Central

Backup site

sites

Enterprise Network

Home workers

Hardware Equipments

Servers

- ❑ Fujitsu-Siemens
- ❑ HP DL380, 580
- ❑ SUN : E25K
- ❑ AS 400
- ❑ NEC

Utilisateur

Application

Système d'exploitation

Matériel informatique

Clusters

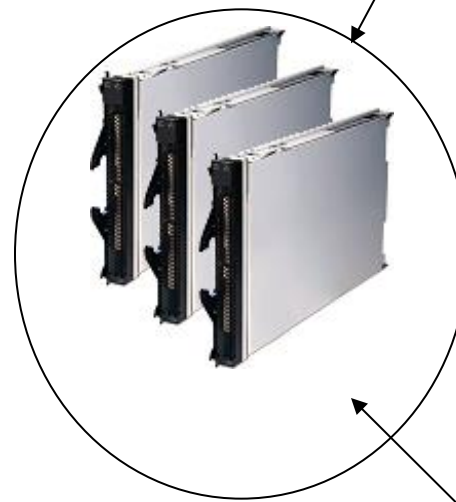> **Server Group, linked and contacted as a single server :**

- Fault Tolerance
- Load balancing

1 Cluster of 3 Nodes

Several
Rack
Servers

3 Blades
= 3 Servers with CPU and RAM

SAN Racks
With Disks

Blades

> **Blades or Server Card**

- ❏ Small Dimensions
- ❏ Electric Power, Air conditioning, Network access, connectors on same frame
- ❏ Reliability
- ❏ Mutualized supervision equipments

> **Issues**

- ❏ Warmth release
- ❏ Electric Connector

Servers usages

➢ Application servers (ERP, …)

    ❑ Systems (Mainframe IBM, BULL, …)
    ❑ UNIX Servers
    ❑ Mini systems (AS 400)
    ❑ Windows servers

➢ Office & Architecture Servers

    ❑ Messaging servers (Lotus Notes, Exchange, ..)
    ❑ Printing servers
    ❑ Database & Files Servers
    ❑ Citrix Servers

➢ Backup servers

    ❑ Servers with central software planning
    ❑ Backup Drivers
        ▪ Mutualization
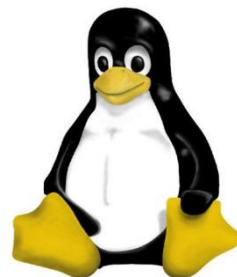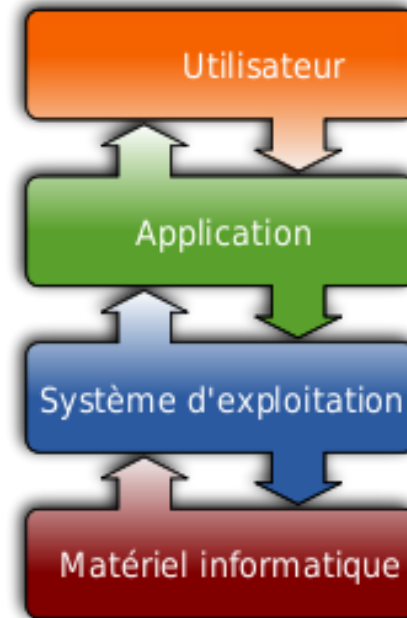   ▪ High availability up to 100%

Operating Systems

➤**Windows**

➤**Unix:**

❑ SUN : Solaris

❑ HP: UX

❑ IBM: AIX

➤**Linux**

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Storage and Archival solutions

➢ **Data Storage**

➢ **Data Backup**

➢ **Data Archival**

Data Bases

➢ **Data Base is the main element of storage inside the enterprise :**

❑ Clients, Billing, Finance, stocks …

➢ **Different applications to manage storage :**

❑ Databases : Oracle, My SQL, Informix, DB2, …..

❑ Database is based on Files, Tables and index : DB is managing consistency between data stored :

– Data Format
– Authorized Values
– Low Level constituency

Storage types

➢ **Storage Servers :** NAS = Network Attached Storage

❑ Storage Racks : Disk Storage Solution
  - Data secured
  - External Data system (out of servers)
  - Mutualized Storage for several application servers
  - High availability up to 100%
  - 150 € for 900 Go

➢ **Storage Network :** SAN = Storage Area Network
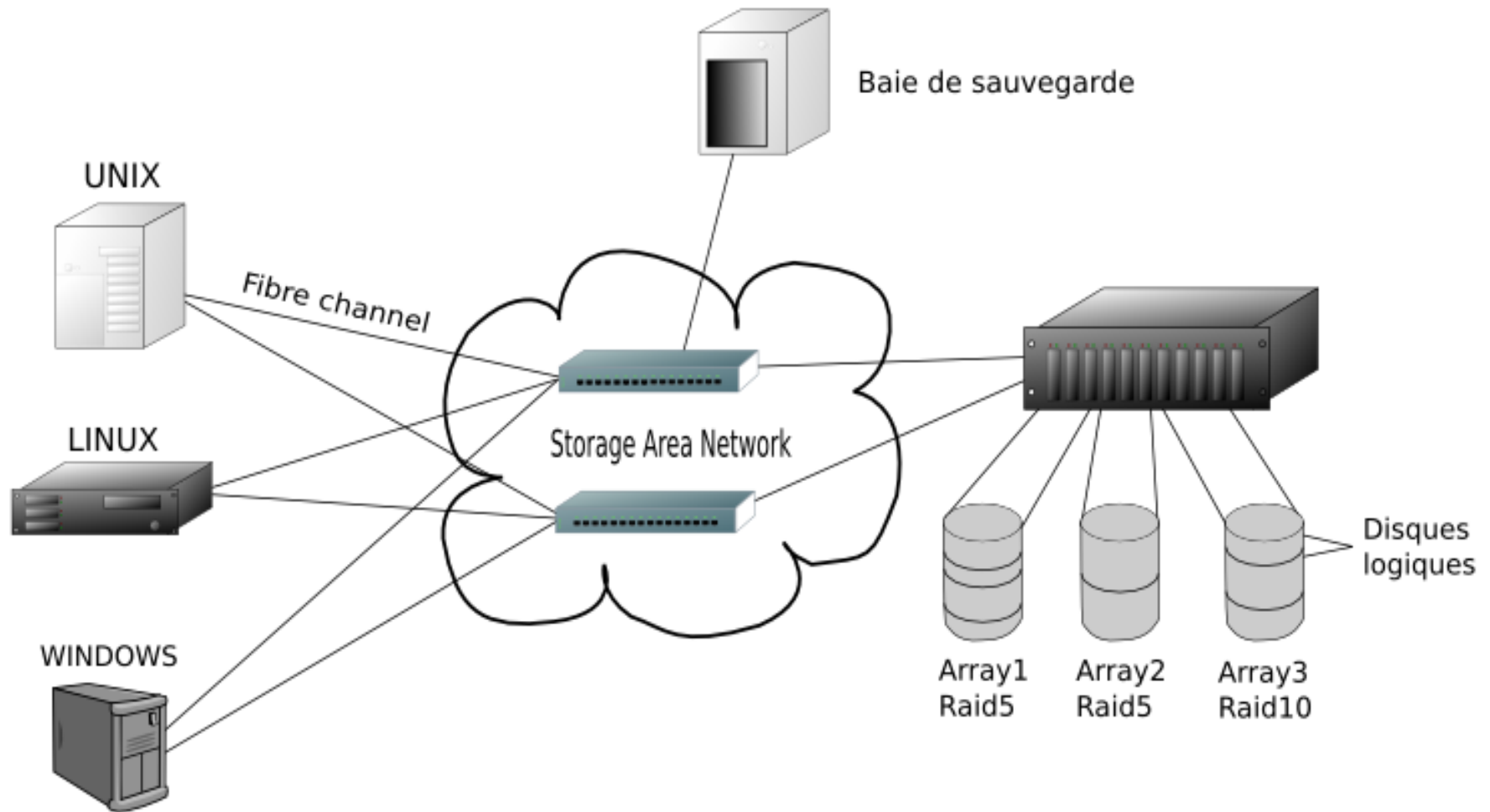
❑ SAN is a complete architecture :
  - Very High Speed Fiber Network
  - Dedicated interconnection equipments
  - Command Servers

➢ DAS = Direct Attachment Storage

❑ Disk connected directly to the application server
  - Quick response
  - Dedicated access to a single server. No Data sharing with other servers
  - In case of server failure, no Data access

SAN : Storage Area Network

Storage : for what enterprise needs ?

➢**Why backup solutions ?**

❑Vital information security (restored in case of disaster or system failure)

❑Legal constraints

❑Backup Solution architecture : backup servers, storage racks, robots, mutualization, backup software

➢**Why Archival solutions ?**

❑Legal constraints

- Controls
- Archival Data cannot be destroyed or modified
- Sarbanes Oxley (SOX-LSF)

❑ Specific needs : Payslip, financial data
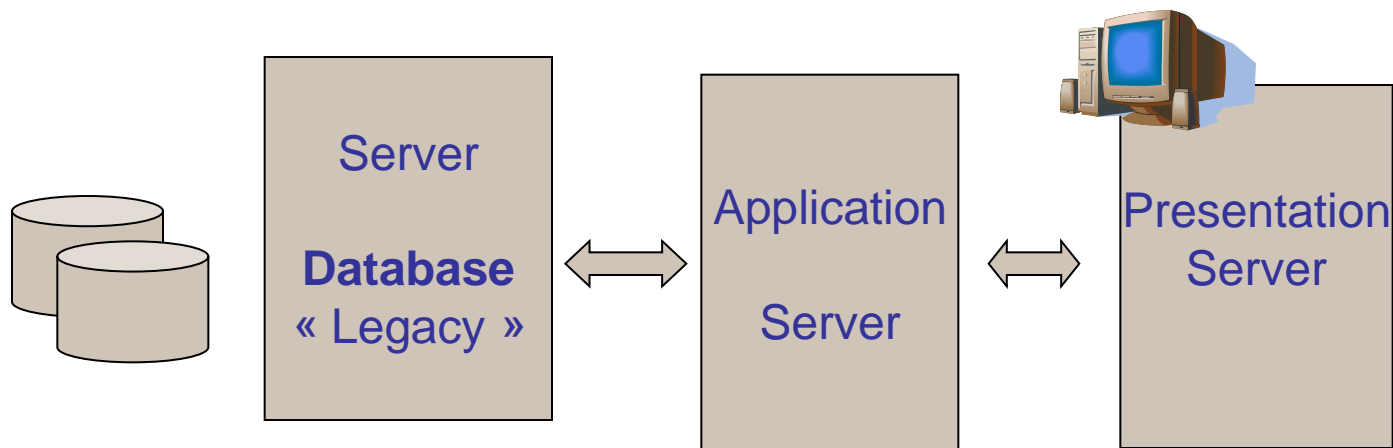
Application Architectures

architecture : MainFrame

➢ **Mainframes are former first machines used in IT production**

➢ **Mainframe concept is to centralize all applications on single server, and to send information to final users on their passive devices (screen display)**

Lan

Application X
Installed on
MainFrame

← Keyboard

Screen
Display →

Passive Client PC
Keyboard / Screen
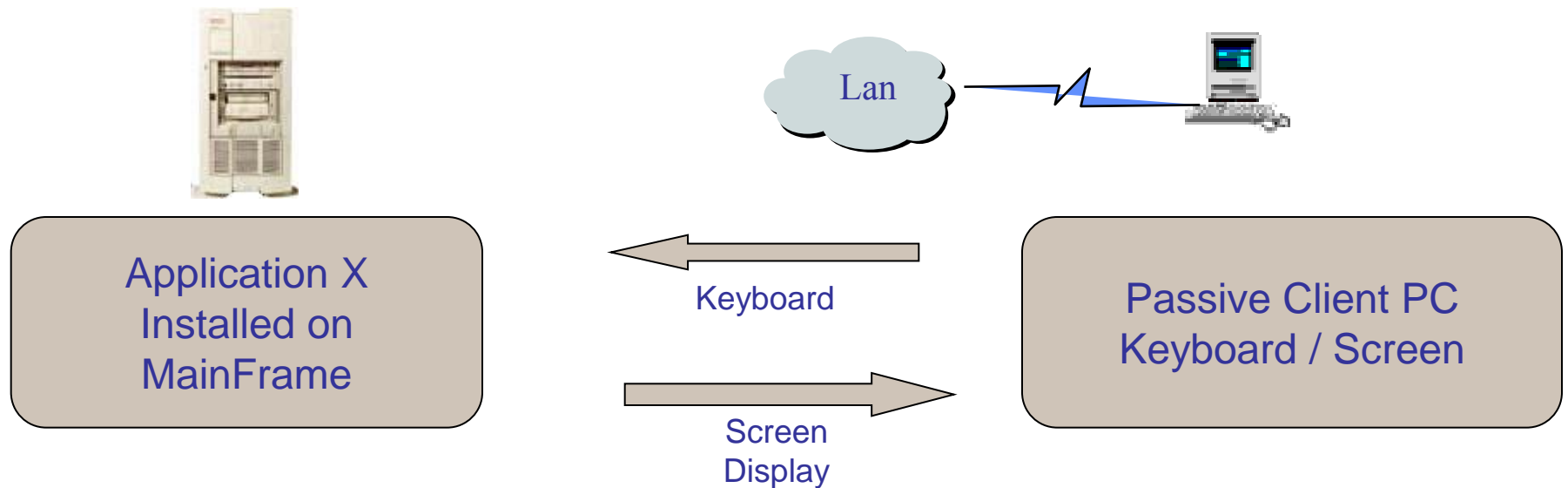
3-Tier architecture

➢ **Data processing production has evolved from Mainframe architecture to 3-Tier which allows processing sharing to optimize communication flows**

- Database Server (storage, updates,…)
- Application Server hosting (logic application)
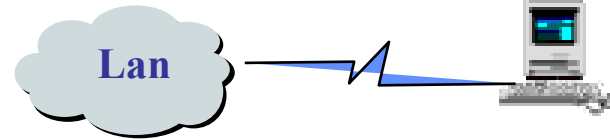- User computer participate to part of the processing

Server

Database « Legacy »

Application Server

Presentation Server

« Heavy Client» Architecture

> **Application / Software is installed on the server & on the client PC**
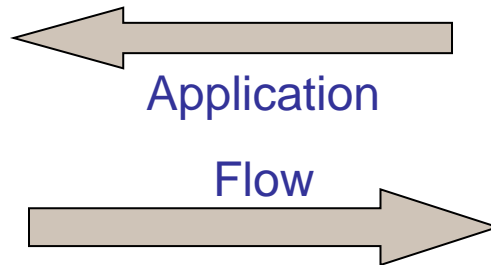
Server

Client PC

Lan

Application X Installed on the server

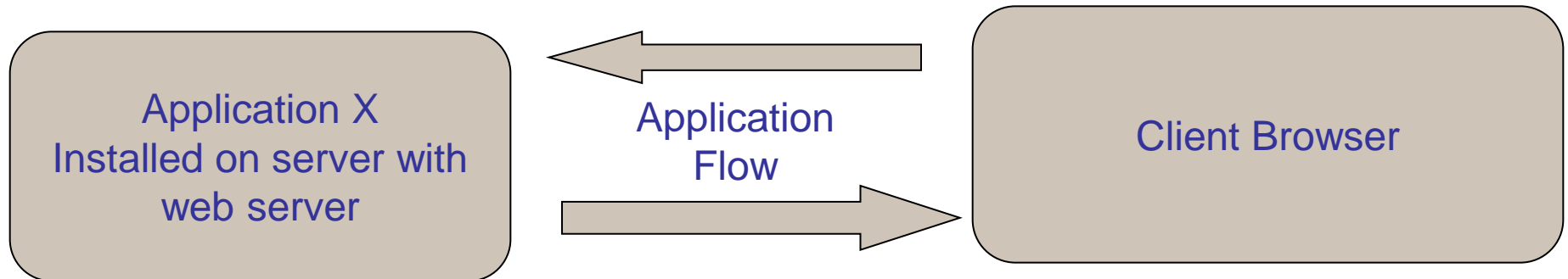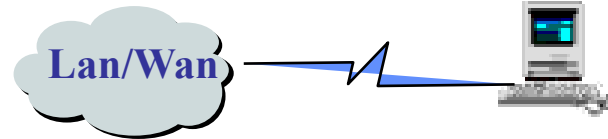Application

Flow

Application X Installed on client PC

Thin Client architecture

➢ **Access to the application is done through web interface (HTML) with client browser (IE, Firefox, Opera…)**

Web Server

Client PC

Lan/Wan

| Application X Installed on server with web server | Application Flow | Client Browser |

Citrix architecture

❑ « Heavy client » is installed on Citrix Server, accessed with ICA flows from client

Application X Server part installed on server

Application Server

Citrix Server

Client PC

Lan

or Wan

Application X Client part installed on Citrix Server

Citrix Flow (ICA)

Browser or generic client (ICA)
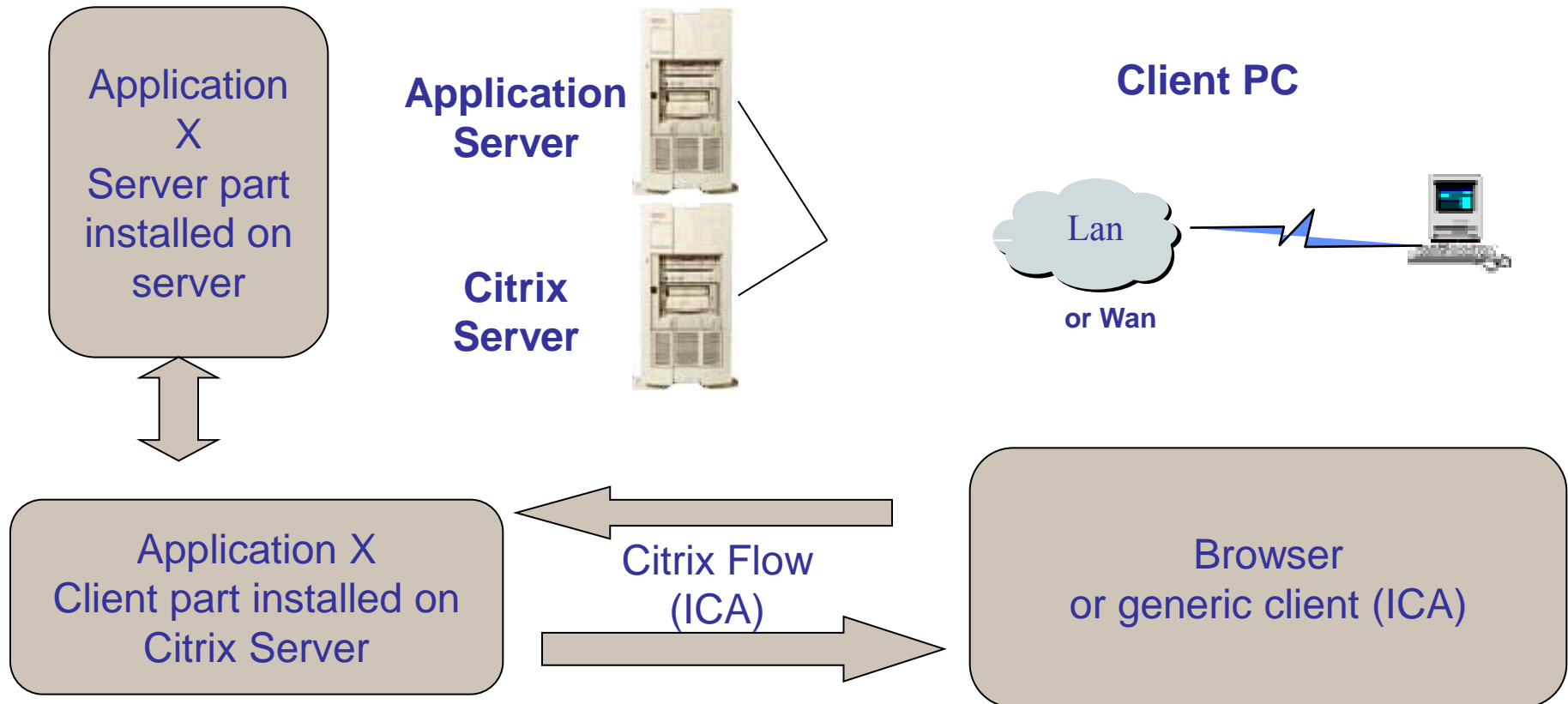
Distributed architecture

LAN

Regional Servers

National Servers

Data Flow

Data Flow

Agency Servers

Physical Servers are distributed on several production sites
- Data Consolidation and transfer to Main site
- Every site has no IT skills
- Global common exploitation rules

LAN

LA N
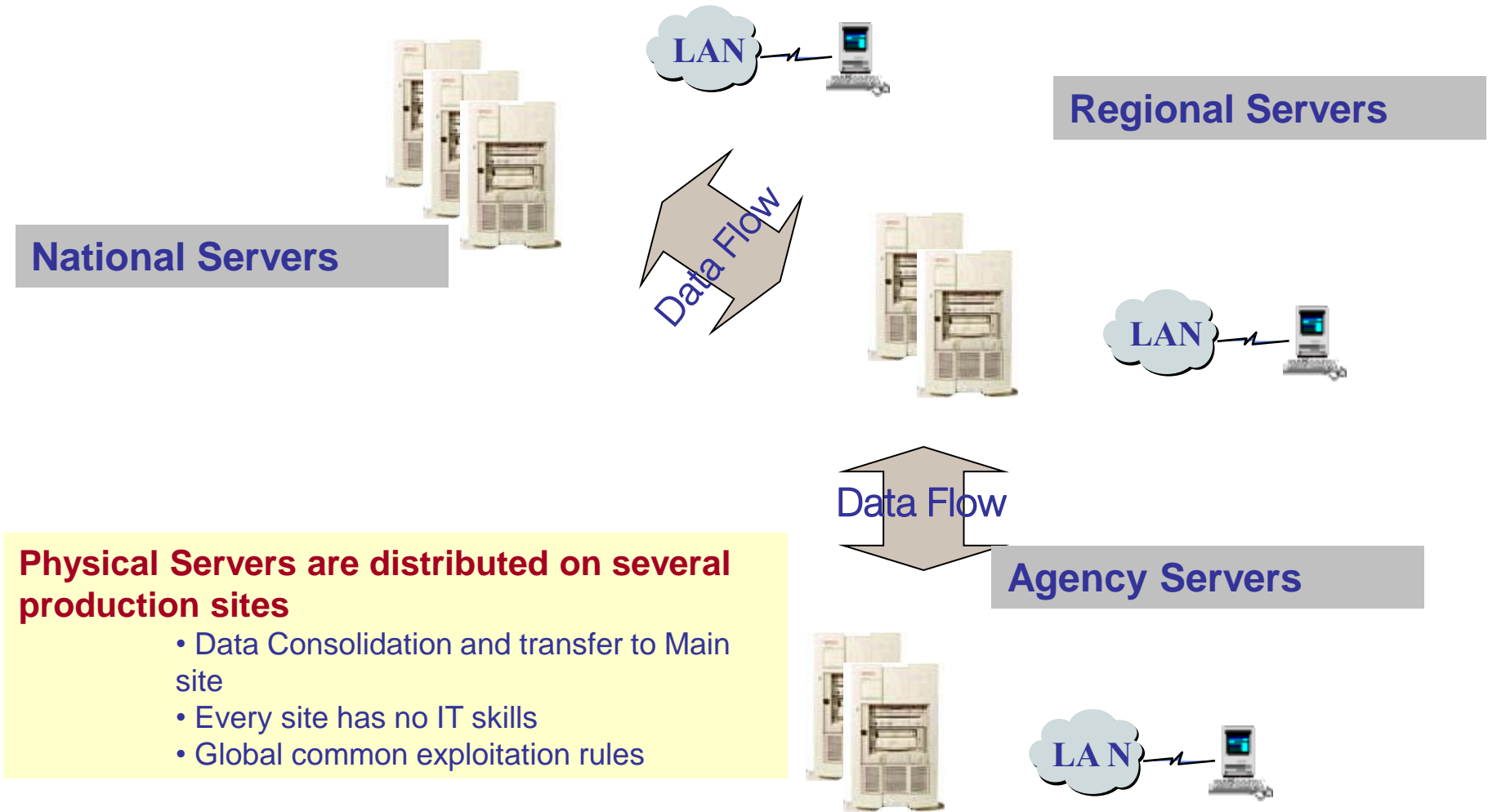
Centralized architecture

All physical servers are on a single site

- All enterprise data localized on single main site
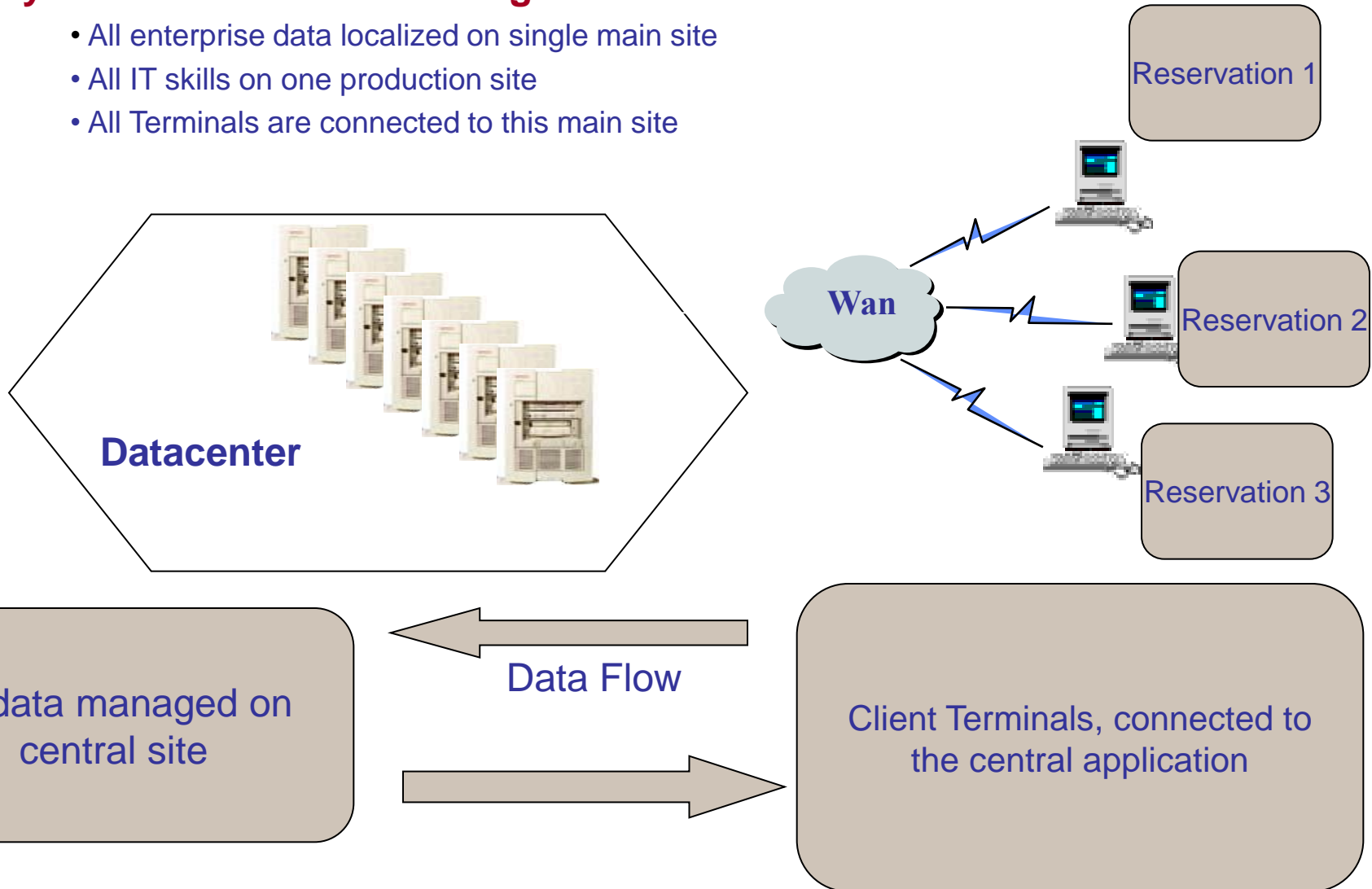- All IT skills on one production site
- All Terminals are connected to this main site

Datacenter

Wan

Reservation 1

Reservation 2

Reservation 3

All data managed on central site

Data Flow

Client Terminals, connected to the central application

Client/Server architecture : trends

➢ **Trend is migration from heavy client => thin client**

❑ Web Client

▪ Application migration to new version compatible with web client

❑ Thin Citrix Client

▪ Few application modifications : heavy client is installed on the server side (installed of PC client)

➢ **Trends to centralization**

➢ **Trends to virtualization**
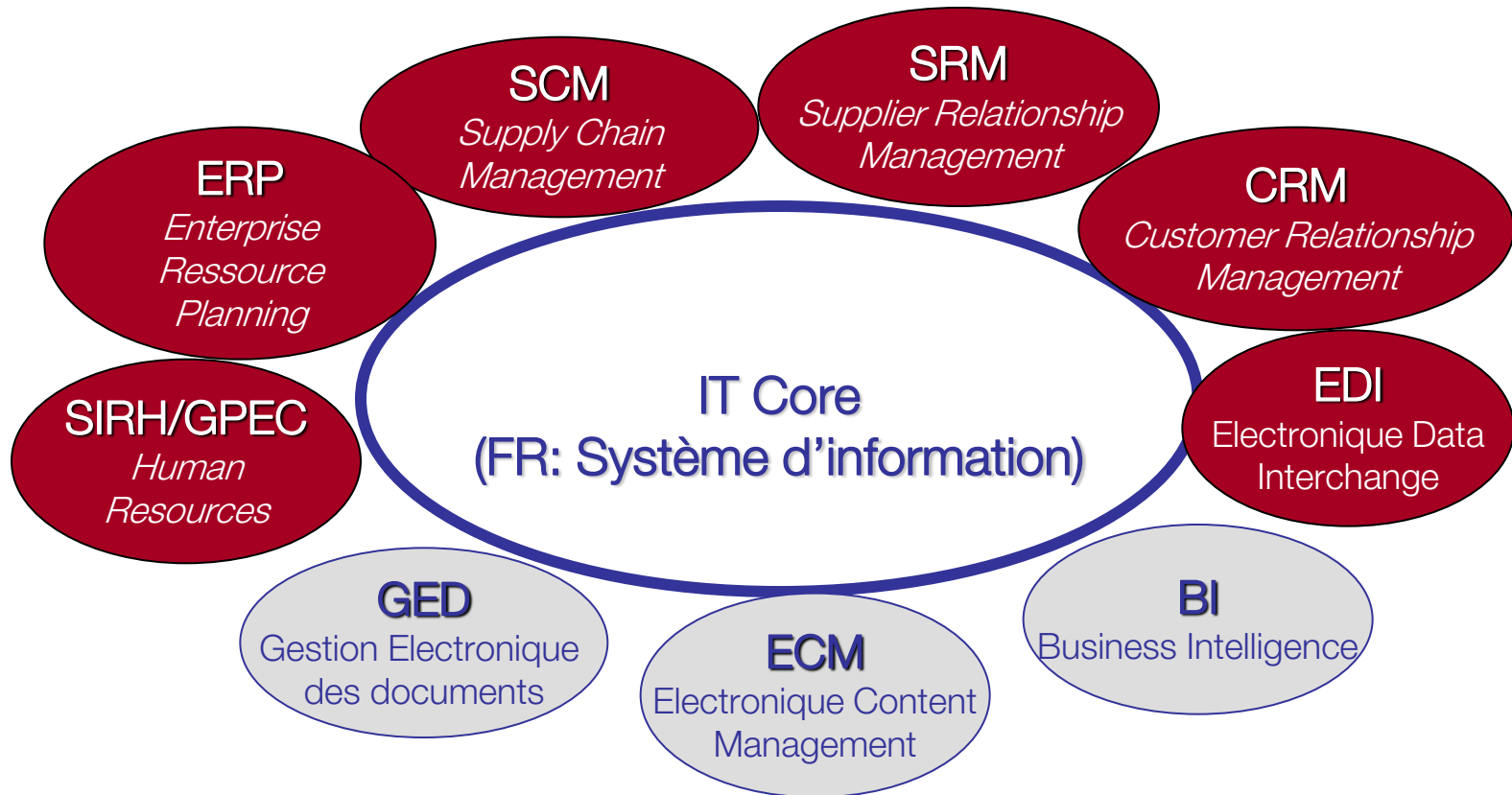
❑ Desktops

❑ Servers

Tell me a story…

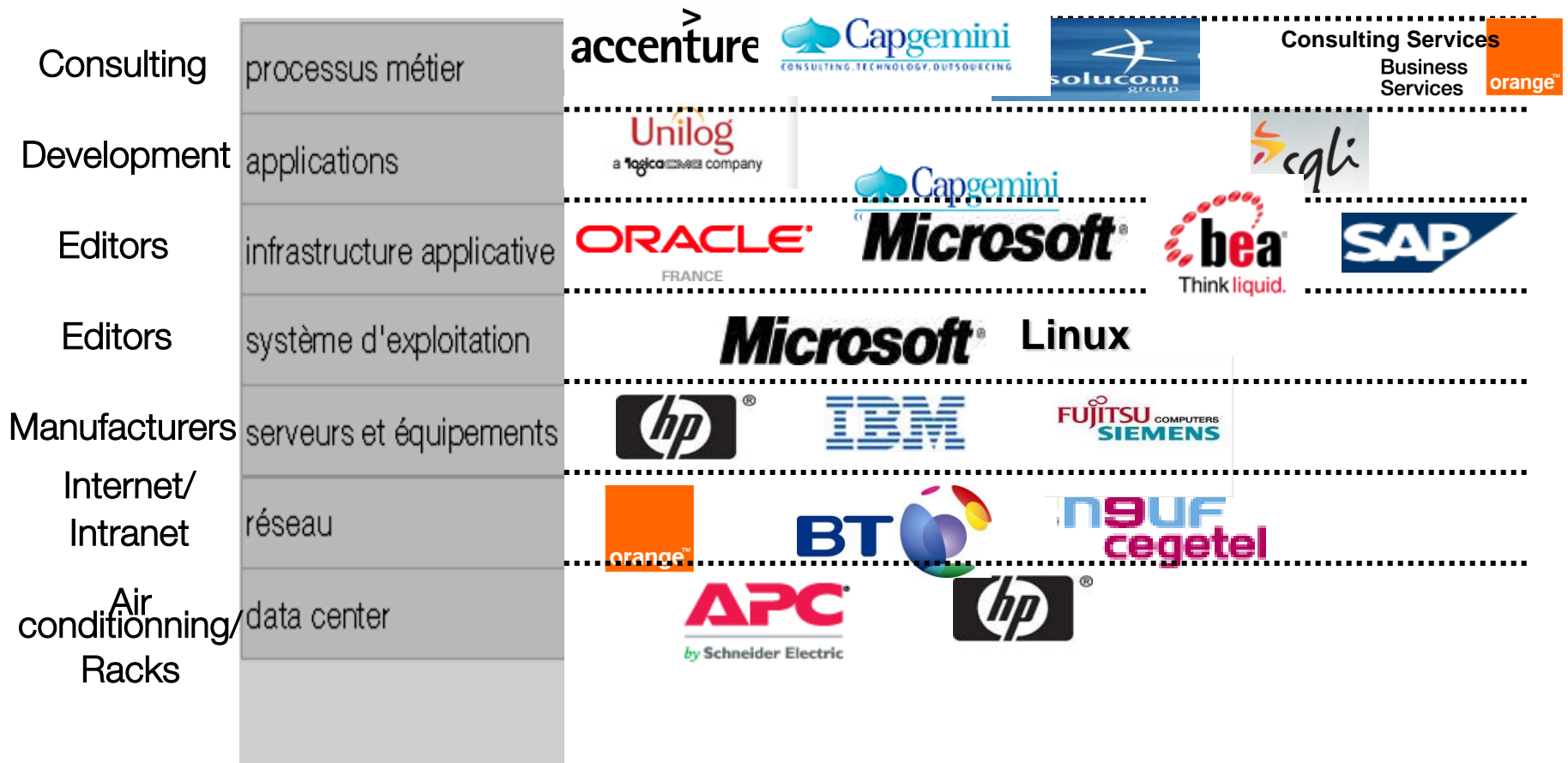**At the end of this talk, you should be able to answer the following questions:**

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Applications

Applications of enterprises

SCM
Supply Chain Management

SRM
Supplier Relationship Management

ERP
Enterprise Ressource Planning

CRM
Customer Relationship Management

IT Core
(FR: Système d'information)

SIRH/GPEC
Human Resources

EDI
Electronique Data Interchange

GED
Gestion Electronique des documents

ECM
Electronique Content Management

BI
Business Intelligence

Application infrastructure ecosystem

Consulting	processus métier
Development	applications
Editors	infrastructure applicative
Editors	système d'exploitation
Manufacturers	serveurs et équipements
Internet/ Intranet	réseau
Air conditionning/ Racks	data center

Consulting: accenture, Capgemini CONSULTING.TECHNOLOGY.OUTSOURCING, solucom group, Consulting Services Business Services orange

Development: Unilog a logica CMG company, Capgemini, cgli

Editors: ORACLE FRANCE, Microsoft, bea Think liquid., SAP

Editors: Microsoft, Linux

Manufacturers: hp, IBM, FUJITSU SIEMENS COMPUTERS

Internet/Intranet: orange, BT, neuf cegetel

Air conditionning/Racks: APC by Schneider Electric, hp

Office system applications architecture
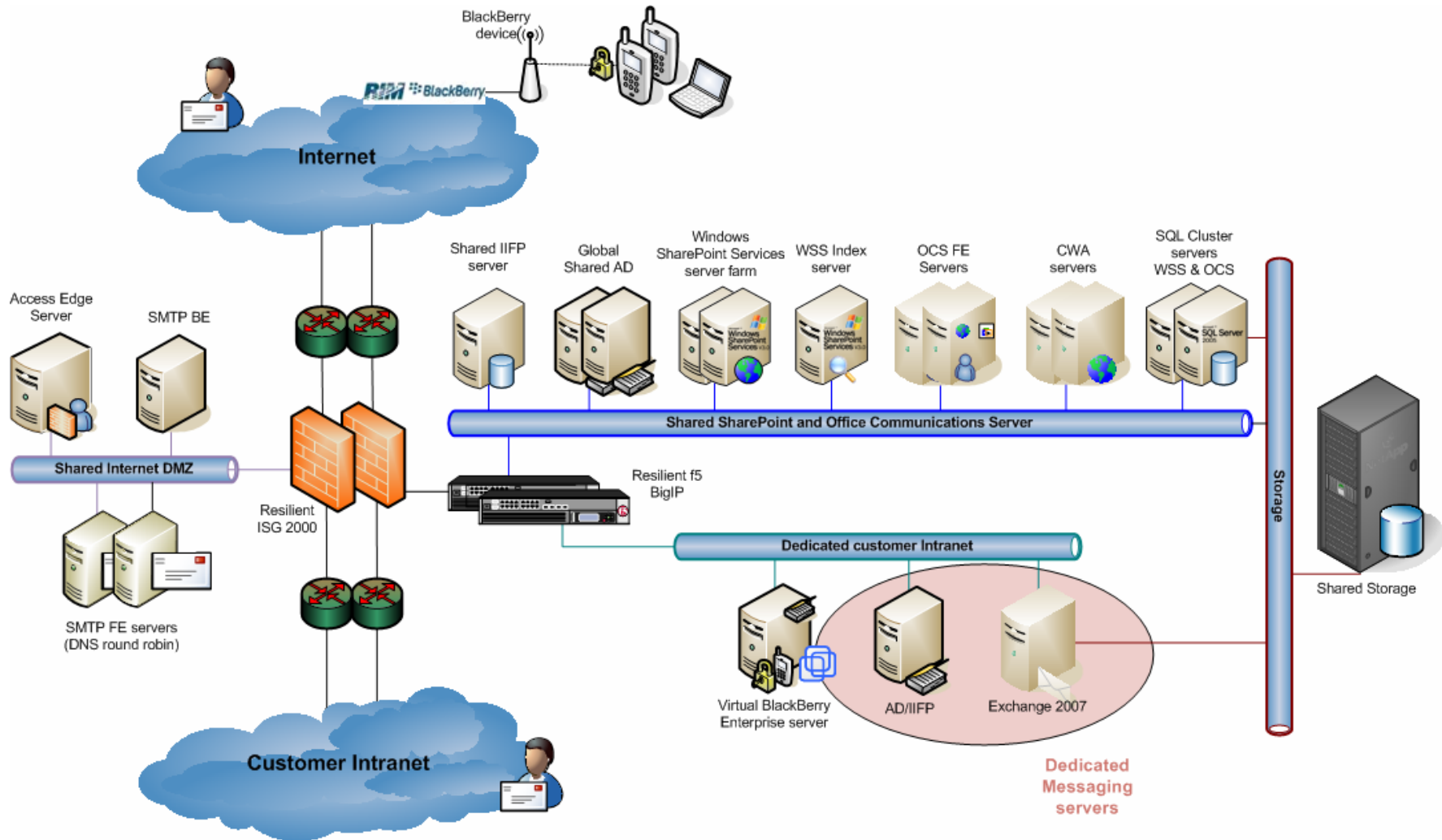
Licenses

➢ **Commercial (Oracle, SAP, …)**

➢ **Different calculation modes (users number, simultaneous or not, servers number, server processing)**

➢ **Shareware : free try**

➢ **Freeware : free**

➢ **Open source**

❑ Author does not demand royalties

❑ Source code access

❑ Improvement from user community

TMA : Tierce maintenance applicative
TPM : Third Party Maintenance

➢ **Application maintenance :**

❏ Debugging
❏ Features evolutions :
  ▪ Compulsory (legal) so priority !
  ▪ Asked by users to responds to business issues

➢ **TMA is Third Party application maintenance**

❏ Application developer
❏ Hosting provider
❏ Consulting services

ASP : Application Service Provider

➢**ASP :**

❑ Application access with web client or thin client
❑ Generic applications (CRM : Customer Relationship Management or Client Database)

➢**Different billing processes**

❑ Per transactions
❑ Per users access
❑ Monthly revenue

➢**Nowadays : SAAS (Software as a Service)**

34

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Virtualization

Openstack

> **Infrastructure as a Service, just like Amazon, for everyone and opensource**
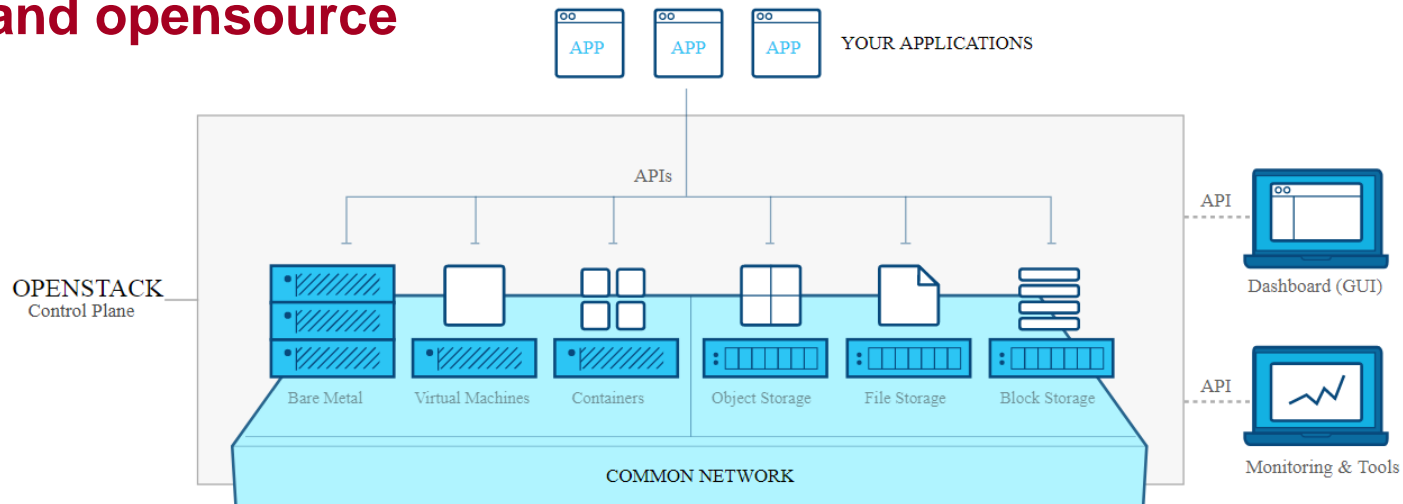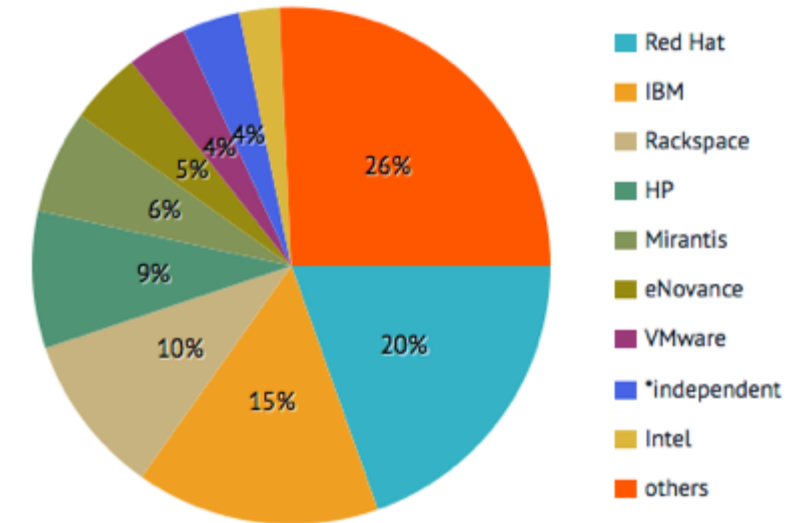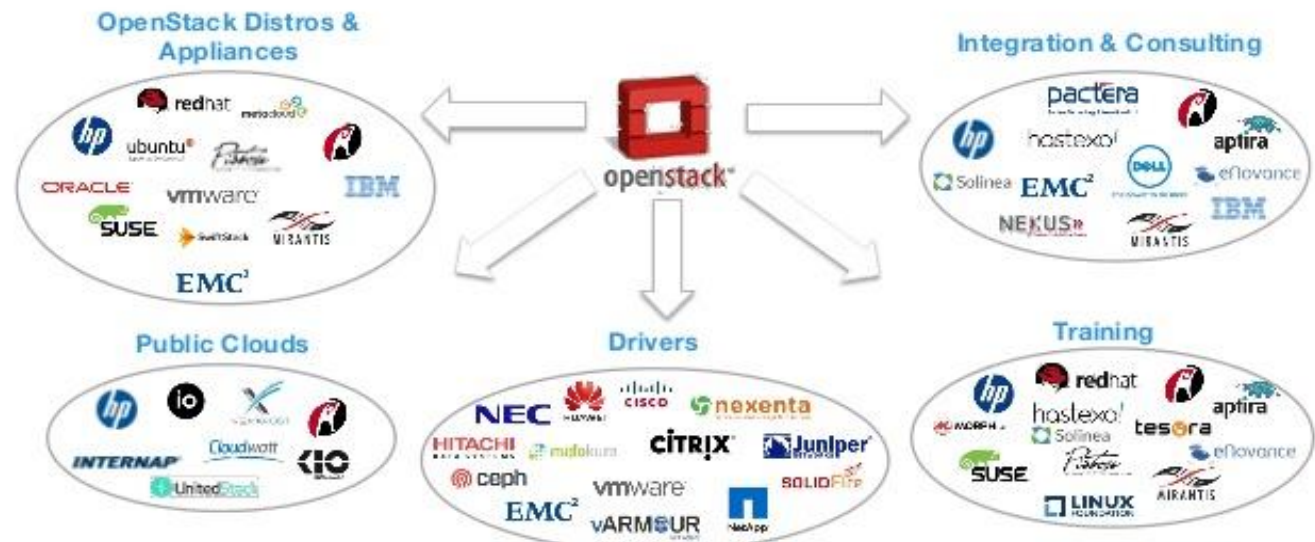

> **Basic openstack components**
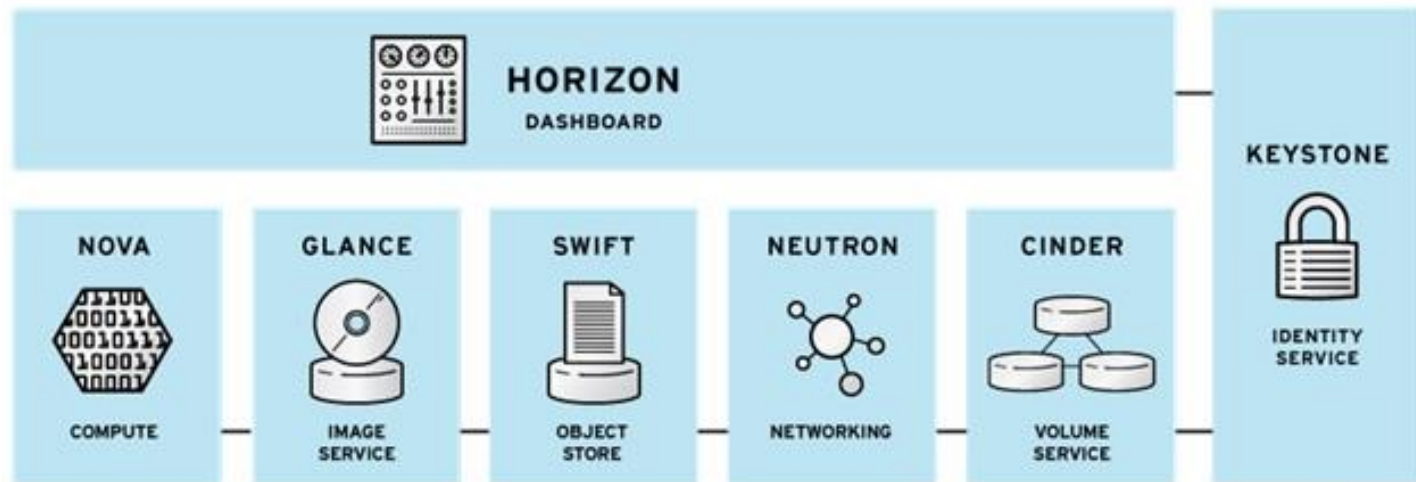
Openstack

> **Companies contribute to different openstack projects according to their interest, strategy, and future**
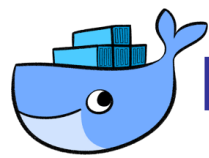
- ❑ They may patent some innovations
- ❑ They can market some components, drivers
- ❑ They develop expertise and influence

Contribution by companies

Pie chart legend:
- Red Hat — 20%
- IBM — 15%
- Rackspace — 10%
- HP — 9%
- Mirantis — 6%
- eNovance — 5%
- VMware — 4%
- *independent — 4%
- Intel
- others — 26%
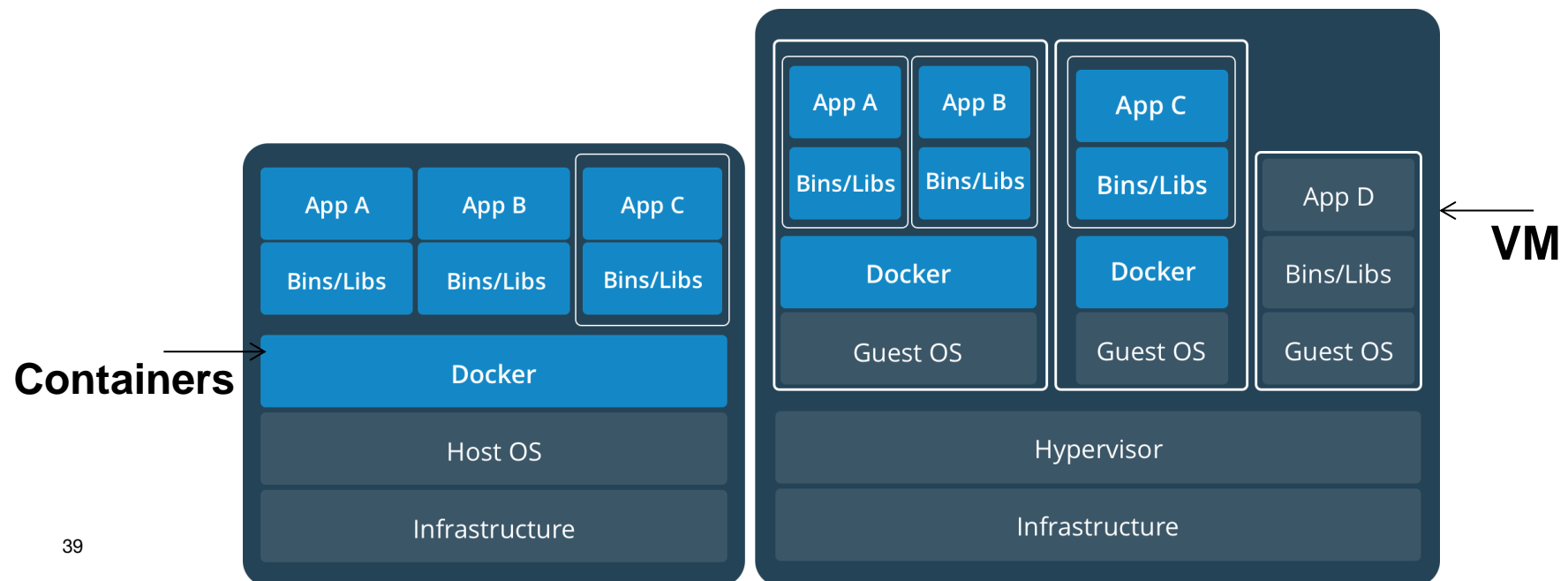
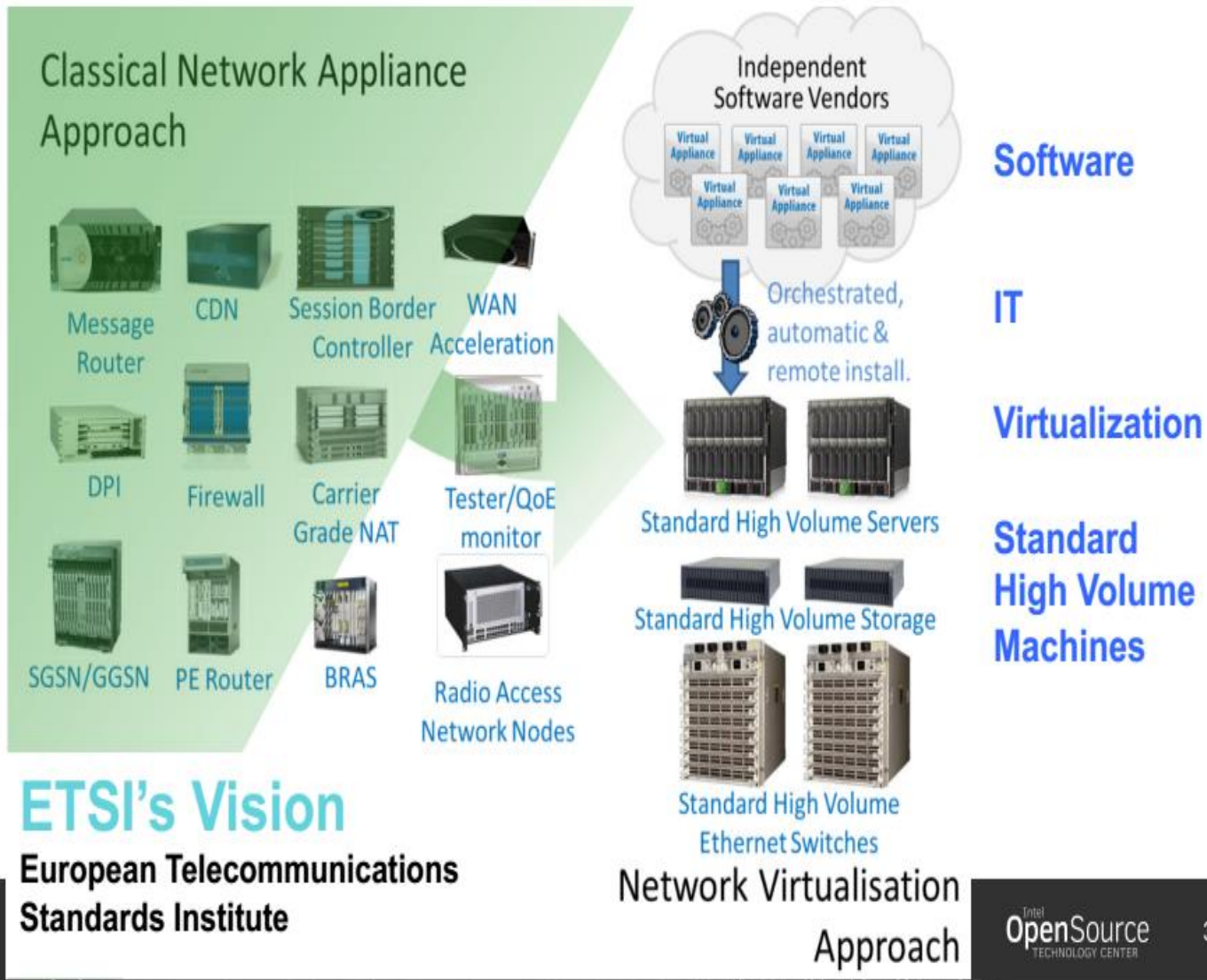## VIBRANT OPEN CLOUD ECOSYSTEM

Docker (and containers in general)

➢ **Containers are the current application deployment format**

❑ It is also free and opensource

❑ It can be used to "contain" almost any application and be deployed on a windows, linux, or Mac

❑ It is lightweight and highly composable

Containers →

App A	App B	App C
Bins/Libs	Bins/Libs	Bins/Libs

Docker

Host OS

Infrastructure

App A	App B
Bins/Libs	Bins/Libs

Docker
Guest OS

App C
Bins/Libs

Docker
Guest OS

App D
Bins/Libs
Guest OS

← **VM**

Hypervisor

Infrastructure

Network Function Virtualization

# From dedicated HW appliance to Virtualized functions

NFV Today

➢**Today**

❑ Network functions live in their dedicated physical appliances

❑ Existing standardization efforts (at ETSI/NFV) define how to deploy network functions on a cloud infrastructure. ETSI/NFV includes the automation of VNF lifecycle under the MANO block (Management and Orchestration).
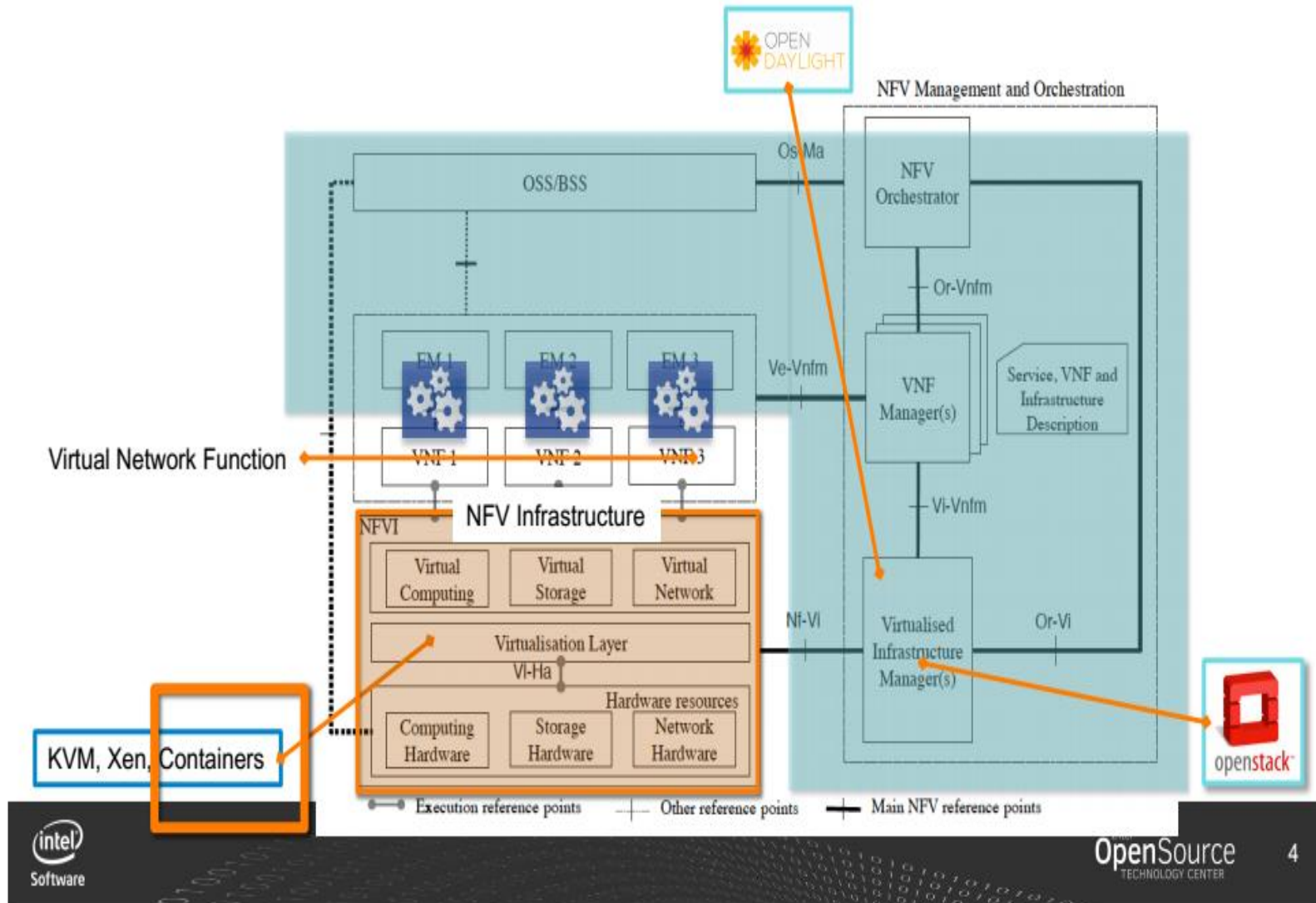
❑ Main focus on VM-oriented infrastructure

➢**Potential limitations**

❑ The VM-oriented approach may not be optimized for some VNFs

❑ B2C use cases: Dense/rapid deployments, performance-critical, other.

❑ B2B use cases: Diversity of VNFs and business offers/plans

ETSI MANO model
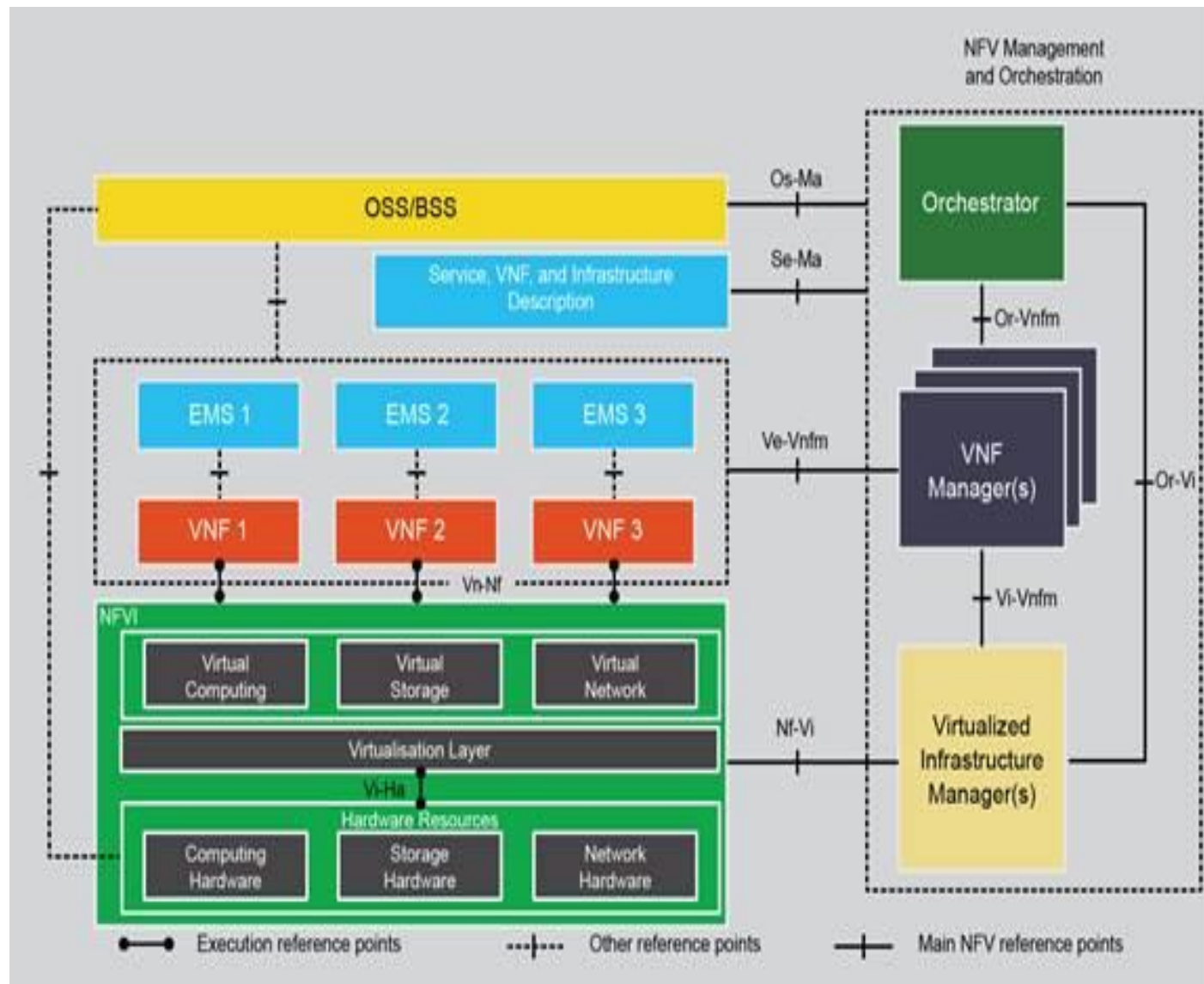
ETSI MANO model

Vendor VNF solutions state-of-the art

➤ **A 3 step approach for existing VNF**

- ❑ Virtualisation: Code just extracted from legacy hardware (existing)
- ❑ Cloudification: Software redesigned to be adapated to a cloud infra (on-going)
- ❑ Cloud native: towards a micro-service approach using containers (in labs)

➤ **Some new actors started to design VNF to become cloud-ready**

➤ **No commercial VNF yet aligned with phase 3 (true for all main VNF vendors)**

From Virtualization to Cloudification
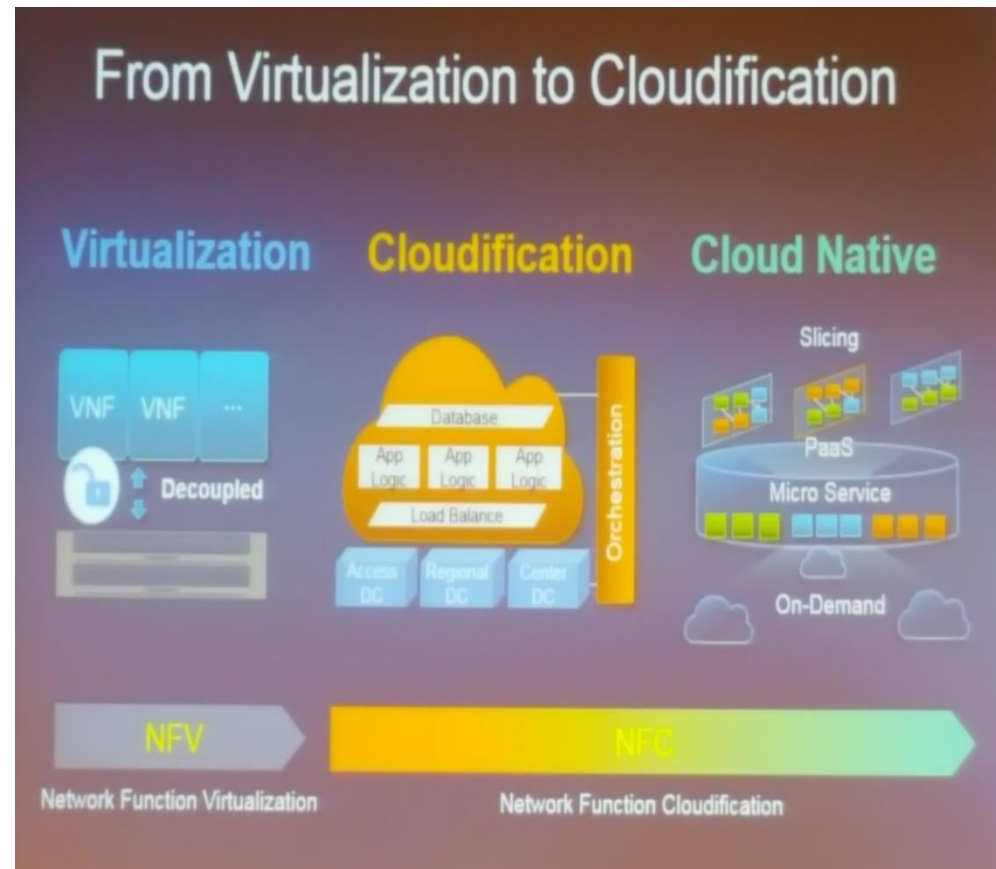
Critical aspects to consider for production

➢ **Docker (and containers) are an enabling technology. The global mission to deploy an application/VNF remains unchanged.**

➢ **Security**

- ❑ Containers may be considered as VRF in existing legacy equipments
- ❑ What threat model ? What changes compared to VMs/VNFs ?

➢ **Networking**

- ❑ Containers may require multiple interfaces in the context of NFV

➢ **Tools/Ecosystem**

- ❑ Separate set of specialized tools for VMs and Containers ?
- ❑ Orchestration/MANO impact mainly when not using containers on bare metal

➢ **Is your VNF Cloud native ?**

- ❑ No « complex » VNF is currently cloud native (in particular, 12 FA compliant).
- ❑ Docker pledges for cloud native and considers cattle-type deployment (short-lived containers, denser deployments, compliant with various orchestrators/VIMs)

NFV Tomorrow

➢ **Alternative**

❑ Use containers if/when possible

❑ The application must be cloud-ready (native) to benefit from the container technology

➢ **Key messages**

❑ Containers are an enabling technology, relevant for VNFs deployment use cases

❑ 2017 Cloud-native VNFs, 2019 for deployable solutions handled by Orchestrator Engines (ex. Kubernetes)

❑ The ecosystem around containers is the most important aspect of it

❑ This is why Docker thrives, while other alternatives try to follow and imitate

❑ Security, lifecycle, workflow, and other critical aspects should be studied in the case of Container-centric deployment then in a heterogeneous deployment context (VM, containers, unikernels?)

❑ Open question: should B2C and B2B use cases converge or diverge on the adopted approach ?

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