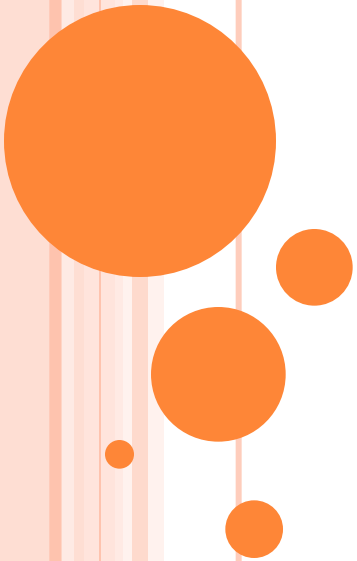

Grid Computing

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What is Grid?

Computational Grid is an independent, comprehensive, overall hardware and software infrastructure offering inexpensive access to high volume of computational resources.

Carl Kesselman and Ian Foster in “The Grid: Blueprints for a new Computing Infrastructure”

Grid by Global Grid Forum

"System considering services and resources issues of integration, virtualization and management in distributed heterogeneous environment, in which system are managed sets of users and resources (virtual organizations) crossing the boundaries of traditional administrative and organizational domains (real organizations)".

Here, the term resource is used not only for entities, that can be organized in pools (computers, software licenses, IP addresses) or entities that provides some capacity (disks, networks, storages), but also processes, virtual organizations, print jobs etc.

Grid by Enterprise Grid Alliance

Enterprise Grid Computing is an architecture style, aggregating IT resources in dynamically provisioned pools, managed at higher abstraction level, that enables the organization:

- Dynamically to provide resources to meet the applications and business priorities requirements;
- Consolidates computational resources in a few pools of resources, simplifying by that provisioning;
- Enables resources and workloads scaling.

Enterprise Grid Computing is focused on functionality provided by Grid to the Data Centers. No specific components, attributes or configurations are specified, because they diverge in time.

Grid by Oracle

"Eventually, Grids will be geographically distributed, heterogeneous, crossing organization boundaries, but initially, they will be implemented in the organizations on a group of homogenous resources in one data center".

This approach constraints the Grid, but simplify its implementation.

Grid computing is:

- Virtualization;
- Provisioning;
- Scaling.

Virtualization, Provisioning & Scaling

Virtualization unpins the static link between resources provisioned to the application and the application.

Provisioning dynamically provides resources to the applications.

Scaling gives flexibility in commission of new resources and applications to Grid.

These three elements enable enterprise infrastructure to be more flexible and its resources to be better utilized.

Virtualization

Virtualization unpins the static links between IT components provisioned their consumers. Traditionally, IT components are statically provisioned to their consumers. In Grid environment provisioning is dynamic.

Virtualization adds a level on IT resources, and every component is represented through an interface at this level. The real implementation of virtualized components, in this level, is hidden and the original can be changed without any impact on the entities using it.

Provisioning

IT components are provisioned to its consumers for utilization. In traditional IT environments provisioning is static, that means once IT components are provisioned for specific applications, this provisioning does not change.

In Grid computing environments provisioning is dynamic. Resource provisioning for the applications is changed in the time depending of workloads and business needs.

Service-Oriented Architecture

Service-Oriented Architecture is an architecture style targeted to create loosely coupled interactions among services.

Services provides object-oriented capsulated business logic or functions of IT components. Usually, Web services are used for interactions in Service-Oriented Architecture.

OASIS and W3C develop standards for Web services and Service-Oriented Architecture.

Concluding Remarks about Grid Definition

In Global Grid Forum (research and scientific) definition of Grid an attempt is done to be covered all possible use cases of Grid. In such a way, Grid issue become very broad and long research and development is needed.

Enterprise Grid Alliance and Oracle are focusing on a subset of Grid, that is the most important for utilization of Grid and that could be implemented for the numerous and most important class of users – enterprises.

Global Grid Forum (GGF) Standardization Efforts

The mission of GGF is “to permanently leads the adoption of Grid computing in the research and industry”.

GGF intends to define Grid specifications, that can become broadly accepted standards for the international society to exchange of ideas, experience, requirements and best practices.

Open Grid Services Architecture (OGSA) is the GGF solution for information and resource share among organizations utilizing products from different vendors.

OGSA v1.0

OGSA v1.0 is informative document defining the architectural framework of Grid. The last one consists of several categories of services among which are infrastructure services, execution management services, data services and services supporting the management.

OGSA and supporting standards are under development, which means that enterprises still can not develop Grid with OGSA, but it is important that OGSA is used by many standardization organizations and by many software vendors, and as result all standardization efforts are synchronized by OGSA.

Enterprise Grid Alliance (EGA) Standardization Efforts

EGA intention is to adopt Grid computing in and among the organizations.

EGA tries to force Grid technologies utilization in data centers, behind the firewall, in private and public enterprises.

EGA focuses on requirements of enterprise data centers and develops specifications meeting these requirements.

EGA plans are in three phases.

EGA Phase 1: Core

In this phase EGA focuses on Enterprise Grid computing in a single administrative domain. This includes ERP, CRM, BI and data integration in the enterprise.

All applications are behind the firewall of one data center of single organization.

The main idea is to be created specifications for interactions among Grid components from different vendors in one data center.

EGA Phase 2: Inclusion & Extensions

In this phase focus is on broader set of applications, such as simulators, modelers, financial portfolio analyzers.

The main idea is to be shared computing resources among Grids of partner organizations.

This means support of service calls among applications, scheduling of computational intensive tasks, management of workflows etc.

EGA Phase 3: Unification & Conclusion

In this phase, Grid paradigm will include resource share among enterprises, which means extension of data storages, applications and computational resources through specialized network or Internet.

In this last phase, new business models for service provision will emerge, that will enable enterprises to purchase IT resources in the same way as they purchase electricity.

This model of utilization computing will be achieved through “capacity by demand”, dynamic commission of capacity and full support of broader scope of applications in the enterprises.

Enterprise Grid Computing (EGC)

The main Grid idea is Computing As a Service (CaaS), which means that the user has not to care where his data resides and which computer execute his request. He will be able to request information and received it timely in accordance with his requirements.

Vendor's Point of View to EGC

EGC is an infrastructure that meets business requirements and more efficiently utilize IT resources, decreasing overall expenses.

EGC is applicable only in the boundaries of one enterprise.

EGC enable resources (computations, data storages, data bases, applications and so on) are provisioned when and where they are needed.

Infrastructure that provide EGC is called Enterprise Grid.

Enterprise Grid Computing Architecture

Main characteristics of this architecture are:

- Resource virtualization
- Dynamic resources provisioning to their consumers
- Centralized management of resources.

Enterprise Grid Computing Architecture - Virtualization

Virtualization unbound resource ownership from its consumer. It is a level between the resource and the consumer.

Consolidation of all similar resources in global pools is the first step to virtualization.

Resources are not only physical ones (servers, storages, data bases), but abstract ones are too (information, application logic).

Enterprise Grid Computing Architecture - Provisioning

In today enterprise architectures, physical resources are provided statically to their consumers taking in account the maximal requirement of the application.

In an enterprise, where resources are virtualized and separated from its owners, resource provisioning can be dynamic as needed. The resource is returned when the application do not need more for it.

Information can be dynamically provided after the virtualization of its source – the information consumer does not have to know at which system the information resides – the information is simply provisioned by demand.

Resource provisioning in today enterprises is done manually by people responsible for that. In EGC, resource provisioning is done automatically following policies set up by the administrators. Such an provisioning is possible only when all resources are virtualized and dynamically provisioned.

Enterprise Grid Computing Architecture - Management

In EGC, very important is the centralized IT resource management. In such a way, all Grid resources in the enterprise are managed. Administrators use centralized control to manage, monitor and provide all resources as servers, data storages, data bases etc.

Dynamic resource provisioning can be simplified when all similar resources are managed from one place using common interface.

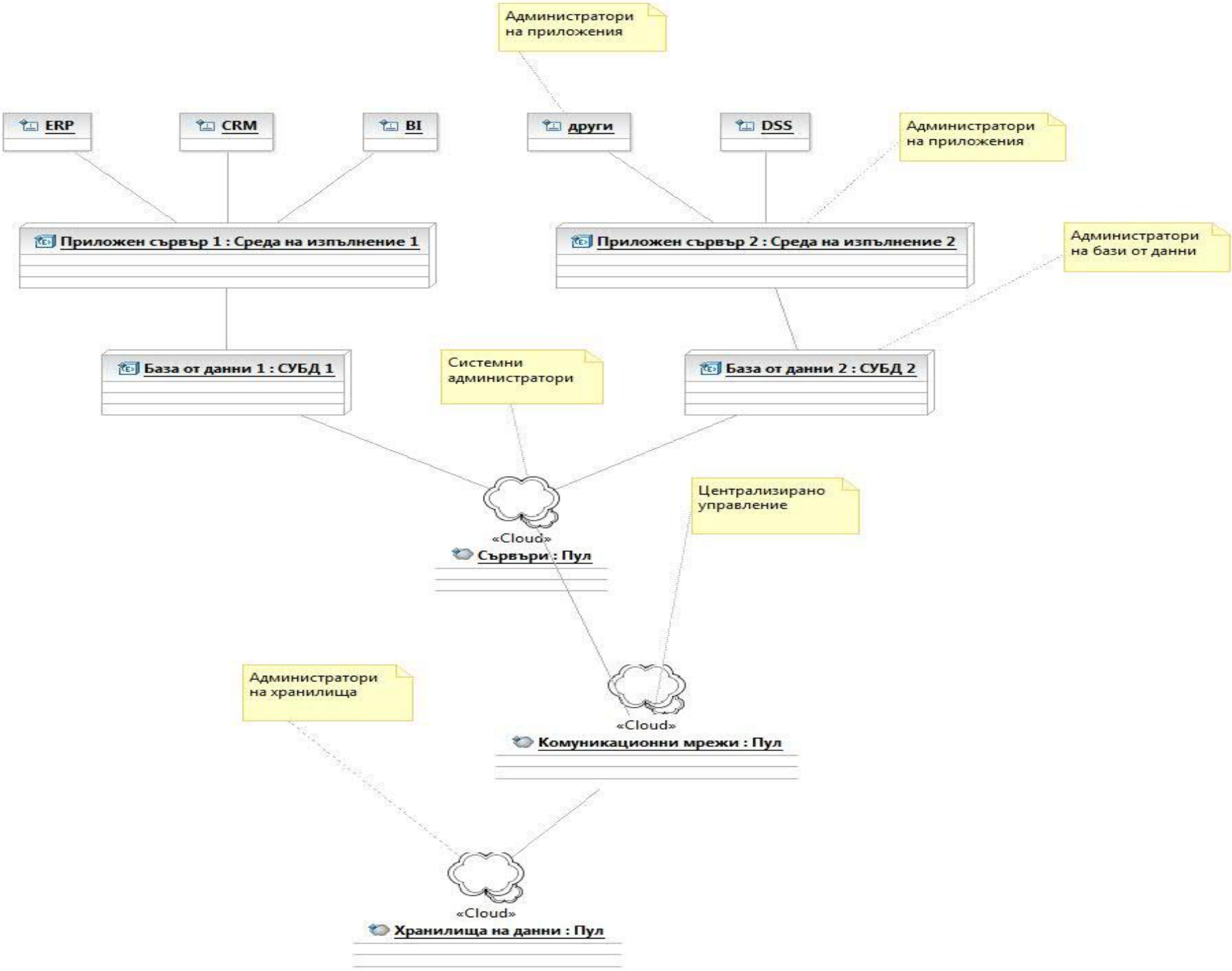
Enterprise Grid Computing Architecture - SOA

At higher level, applications and application's modules are represented as services (Web services) in the context of Service-Oriented Architecture.

These services virtualize programmed process business logic and workflows separating application user interfaces, operating system and programming language.

The mechanism of representing applications as services enables module reuse. It, also, enable dynamic binding of services in dynamic workflows.

The easiness of definition and redefinition of workflows enable initiatives for efficiency and reengineering of business processes. In such a way, service-oriented architecture offers an agile application infrastructure that can meet the new business requirements and competitive pressure.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Комуникационни мрежи : Пул
«Cloud»
Хранилища на данни : Пул

Enterprise Grid Computing - Adoption

There are three strategic steps to EGC adoption:

1. Standardization of all components in the enterprise;
2. Consolidation of IT infrastructure;
3. Centralization and automatization of IT management functions.

Standardization helps resources to be virtualized and organized in pools.

Consolidation includes IT components to shared among many consumers.

Automatization decrease human participation in repeatable managerial tasks and procedures.

Computing as a Service (CaaS)

CaaS is the target of EGC. Enterprises with CaaS do not need to have its own data centers, instead they will use resources from outside sources in quantities needed for their operations.

In some enterprises, Information Technologies As a Service (ITaaS) is in practice. There, IT are offered to the business units by specialized departments. Business units have Service Level Agreement (SLA) for their applications with the vendor. Business units pay to IT department used computing power.

There are big enterprises, that offer on the market computing power not only to the founding enterprise.

Application Services Providers (ASP)

ASP offer application software and/or services with this software via Internet. Enterprises have access the ASP software applications via Internet.

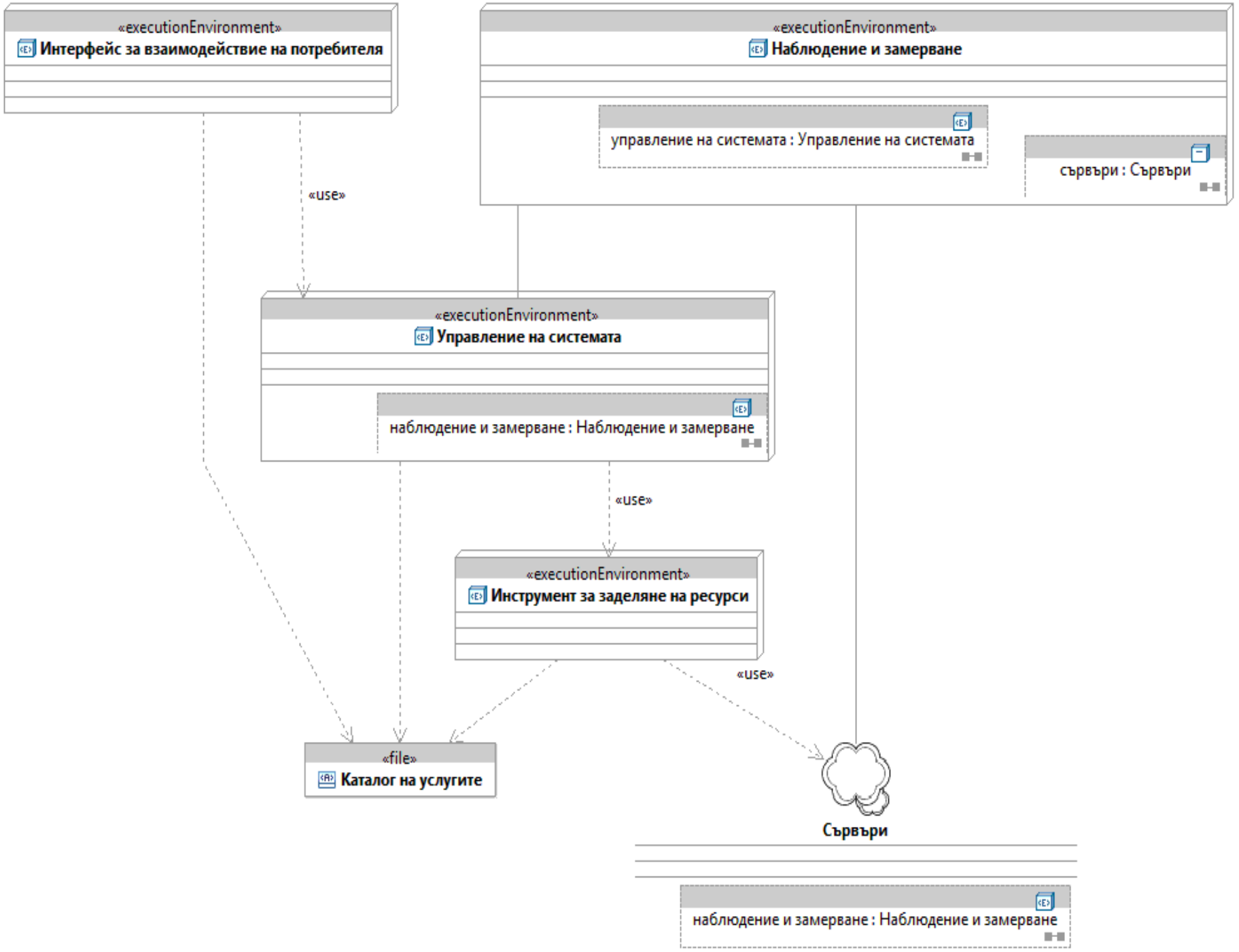
This business model is called Software as a Service (SaaS).

After some time, computing will be utilized as electricity nowdays.

Cloud computing

Cloud computing architecture is a massive network of "cloud servers" connected in parallel Grid. Usually, these servers are virtualized.

User interaction interface permits users to select a service from service catalog. Then this request is send to the system management to find suitable resources in the cloud. Resource provisioning tool provide selected resources. Provisioned resources are provided as a stack or a Web service.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