



NORWEGIAN STATE EDUCATIONAL LOAN FUND

ATTACHMENT 2A – CURRENT SOLUTION – CORE SYSTEMS

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1 Introduction

The IT Systems of Lånekassen (the Norwegian State Educational Loan Fund) are currently operated by two different Service Providers through two different contracts:

1. The Core Systems

The Core Systems consist of the Modulis application and various support systems for development and management of the Modulis application, as well as a virtual workspace for the users to access the application. There are multiple environments of both the Modulis application and its support systems: a production environment, a pre-production / acceptance test environment and several other test environments.

2. The Administrative IT Systems

Consists of clients, local area network, office support tools, Citrix, etc.

This document describes the existing solutions for the Core Systems.

The purpose of the document is to provide an overview of the services Lånekassen has today. The document contains a description of the current situation and should in no way be perceived as a guidance for future solutions or design patterns.

1.1 The Core Systems

The Operation Agreement for the Core Systems includes the operation of infrastructure and services that constitute the operating platform for Core Systems, and the operation of the Core Systems themselves. This is illustrated in the following figure:

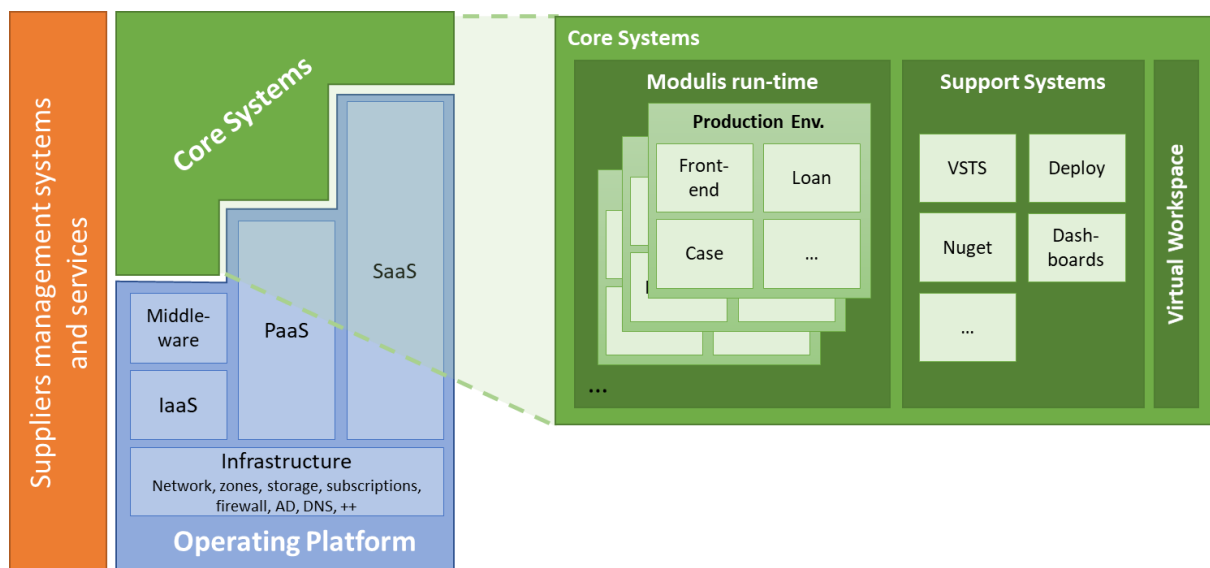


Fig. 1: Illustration of the components included in the operation of the Core Systems

As shown in the figure, the Core Systems consist of the following operating areas:

- **The Modulis application**, a proprietary professional application consisting of different standard off the shelf products with some adjustments, in addition to in-house developed applications, instantiated in several different environments
- **The Support systems** for managing and deploying the run-time solution
- **The Virtual Workspace** for secure access to the solution

Today, the client side of the Modulis application and the Virtual Workspace is located on the premises of, and operated by, the Service Provider of the Administrative IT Systems. Staff at Lånekassen access the Modulis application through the Virtual Workspace.

Furthermore, the user directory for the Lånekassen staff is placed in the Administrative IT Systems, and user authentication and authorization is done to this domain.

The following figure shows all IT Systems, both the Core Systems and the Administrative IT Systems:

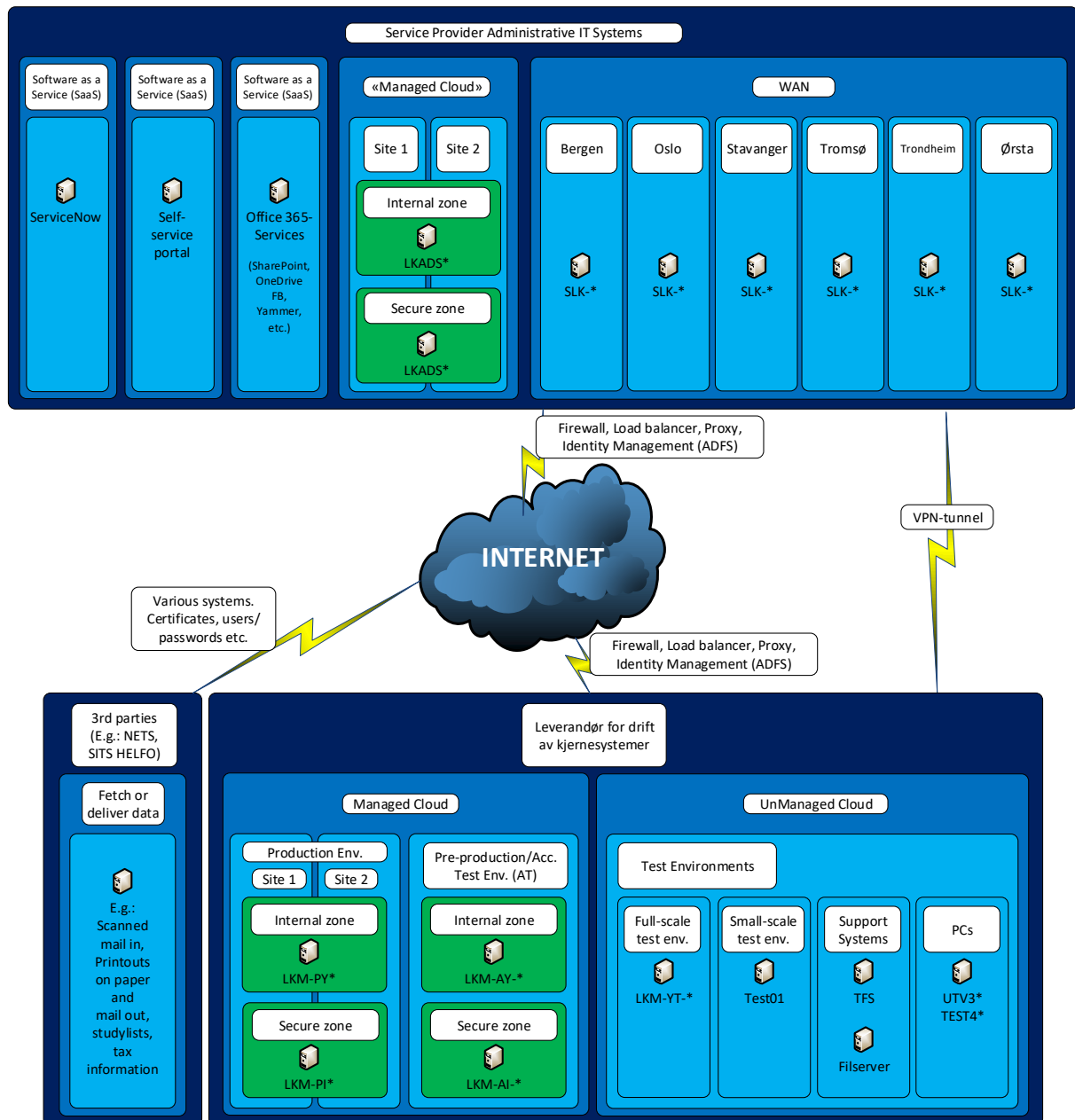


Fig. 2: The lower half depicts the Core Systems (as described in this document), and the upper half depicts the Administrative IT Systems.

2 High level solution description

Before the contents of the Core Systems are described in detail, a general introduction to the existing environments, and an overview of the services they contain, will be presented.

2.1 The Modulis run-time solution

Modulis is primarily based on Microsoft technology with Windows Server, SQL Server, BizTalk and IIS with .NET web services. In addition, a customized version of Software Innovations' Public 360 is used for business logic and as a frontend for the Lånekassen staff.

In addition to the production environment, Modulis is instantiated in several test environments. Simplified, there are three types of environments in today's solution:

- **The Production Environment**

The full-scale production environment in which the Modulis application is running

- **The Pre-production / Acceptance Test Environment (AT)**

A full-scale test environment of the Modulis application, used for pre-production verification purposes by the Service Provider and final acceptance tests by the Customer

- **Test Environments**

Test environments of the Modulis application, used in development. There are two different types of test environments:

- Small-scale test environments with services consolidated on multi-purpose servers
- Full-scale test environments with services on load-balanced, dedicated servers

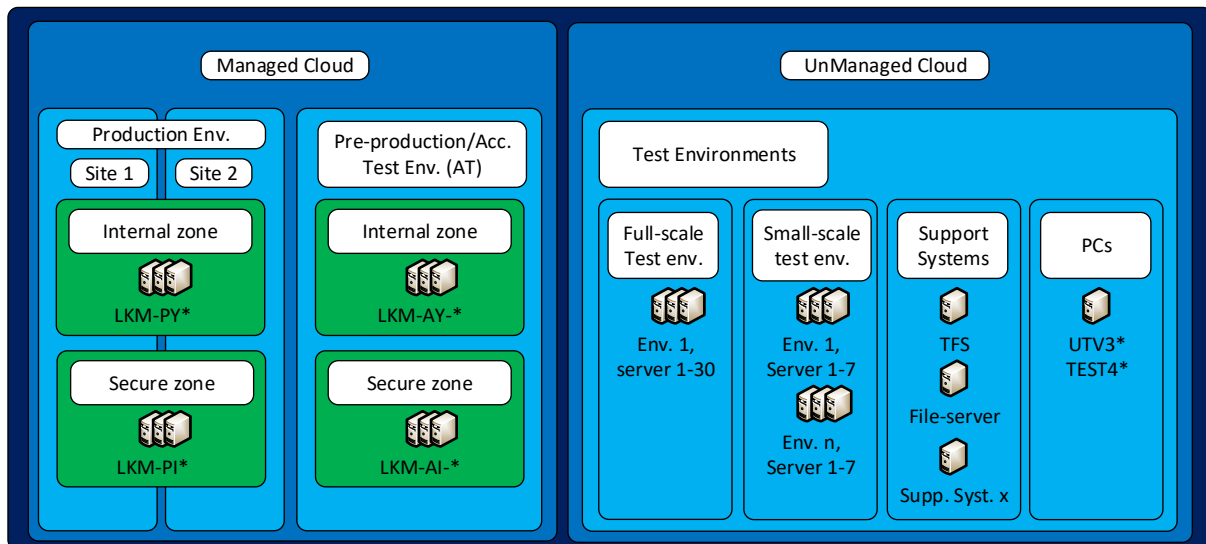


Fig. 3: Sketch of the Core Systems

Lånekassen is responsible for Application Management of Modulis and has its own development team for this purpose.

Today, the solution is delivered as a virtualized solution from the Service Providers own premises.

2.1.1 The Production Environment

The Production Environment consists of approx. 50 servers, and most services are load-balanced and redundant across data centers.

The environment is divided into an inner and an outer zone. The outer zone's online services are exposed to customers through firewalls and proxy servers, while the internal zone, which contains the application logic and data, is secured with additional firewalls. The solution consists of several separate networks (DMZ, etc.) per zone.

The environment is delivered on a shared platform and the Service Provider is responsible for everything related to the setup of infrastructure, hardware, redundancy and general operation and monitoring. Responsibility of installation of the application layer varies depending on whether it is standard products such as Microsoft SQL Server or products that require customizations like Software Innovation Public 360.

Application operation is mainly performed by the Service Provider, but Lånekassen acts as a third-line support function for things pertaining their own code.

2.1.2 Pre-production / Acceptance Test Environment (AT)

The Pre-production / Acceptance Test Environment (AT) is an almost identical copy of the Production Environment.

It has the same zone division, all services are load-balanced with the same principles, it has the same type of monitoring, the same shared platform, and a full-volume data set is present.

The AT environment is normally used for installation tests by the Service Provider, followed by a final acceptance test (regression test) by the Customer, before go-live of a new release of Modulis.

2.1.3 Test Environments

The Test Environments are delivered on a shared platform where the Service Provider is responsible for the availability and the capacity of the underlying hosting platform, as well as anti-virus services and backup of selected virtual machines.

Lånekassen is responsible for the remaining operation services, including setup of the domain, setup of virtual machines, software installation, licensing, maintenance, monitoring, decommissioning, and more.

2.1.3.1 Small-scale Test Environments

Test Environments that are functionally equivalent to the Production Environment with full-volume data sets, but many services are consolidated onto multi-purpose servers, and in addition, a few services are shared across all test environments due to licensing issues.

Therefore, there are significantly fewer servers (about 7) per test environment than production.

The differences between the Production and AT Environments and the Small-scale Test Environments are mainly that the Production and AT Environment have more monitoring and logging, zone division, and more capacity, and load balancing of services than the Test Environments.

2.1.3.2 Full-scale Test Environment (YT)

This is an environment which is very similar to the Production Environment. The services are load-balanced and redundant, and services are not consolidated on multi-purpose servers. However, the capacity is scaled down compared to the Production Environment.

The environment is called YT (in Norwegian “YtelsesTest”, which translates to Performance Test) as it was previously used for performance testing. Currently, it is used for final system testing.

2.2 Support Systems

Support Systems are delivered on the same shared platform as the Test Environments, and operating responsibilities are similar to those of the Test Environments, where the Service Provider provides the hosting platform and backup and anti-virus, and the rest is operated by Lånekassen.

Support Systems are used for management of Modulis.

Lånekassen has many different Support Systems, but the most important is Visual Studio Team Services (VSTS), which is used for most of the development aspects, including requirements management, resource management of personnel involved in development activities, source control, code building, automated unit and integration testing, test follow-up, etc.

Furthermore, Lånekassen has a proprietary deployment portal used for installation of relevant packages of Modulis in the different run-time environments, based on roles. In addition, all variables used in the environments are maintained in this solution.

Beyond this, there are a number of other smaller Support Systems where some are proprietary in-house systems, and others are procured from third parties. All Support Systems, like everything else on this platform, are operated by Lånekassen.

2.2.1 Virtual PCs

Lånekassen's developers and testers access the Test Environments and develop the solution through their own virtual PCs delivered on the shared platform for the Test Environments and Support Systems.

In the future, these virtual PCs will be decommissioned in favor of personal laptops.

2.3 Virtual Workspace

Lånekassen staff access the Production Environment and the AT Environment through a centralized Citrix solution in a dedicated safe zone. The continued use of Citrix is not required, and the new Service Provider is encouraged to find alternative cost-effective solutions.

3 Remaining chapters

The remaining chapters, which describe the different environments in more detail, are not translated from Norwegian to English. They can be translated on request.