

COTEE IT INFRASTRUCTURE

Novita IT Infrastructure Proposal

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VERZIJE

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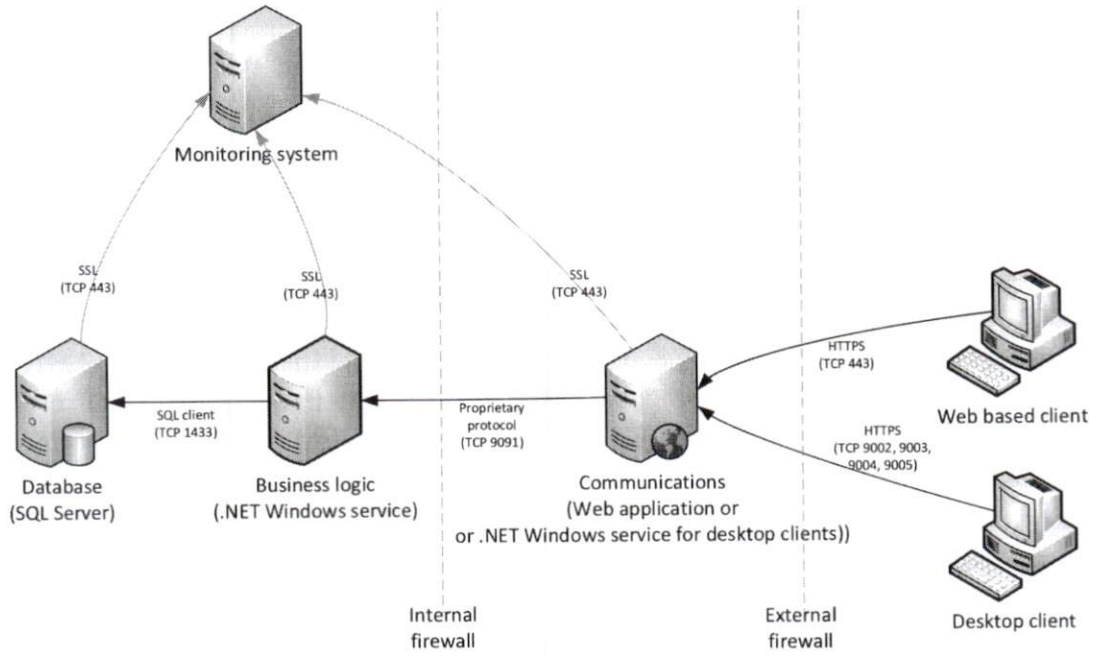


1 INTRODUCTION

COTEE is introducing a new Market Management System (MMS), software solution, which will run in COTEE own data center. Novita, the supplier, suggests setting up the IT infrastructure in a similar way as by other Market Operators (MO) and System Operators (SO) in region, where also similar service is provided.

1.1 GENERAL CONCEPT

Data is stored in relational database (SQL Server). Tables are normalized. Every user request is processed in a separate SQL transaction. All data changes are logged.



Business logic is written in C#. It is implemented as a Windows service. It can scale to many processor cores when processing complex data.

Communication servers have three different roles:

1. Web server hosting HTML based web application
2. Windows service which accepts requests from desktop clients on a specified port, authorizes them and forwards to the business logic.
3. Web server hosting setup files for desktop client programs.

Communication servers are typically installed in DMZ zone.

All Novita server applications (services) are monitored in two ways:

1. Monitoring status of services (running, stopped)
2. Monitoring logs (Windows Event Log, NLog)

All servers on the picture above can be physical or more likely virtual servers.

2 SERVER AND NETWORK

2.1 SERVER ARHITECTURE

We recommend two environments:

- **Test environment**, serving both as a **development** and **pre-production environment** – new functionalities and fixes are tested here. When moving to production, the stable version is also deployed on this environment, allowing customers to connect and perform their own testing.
- **Production environment**, for regular use.

Each system is divided into two parts: the business logic (BL) and communication (COM). We propose that the databases (Microsoft SQL) are also hosted on the BL server. The communication part handles interactions between users and the business logic, while the business logic part ensures proper data processing and communication with the database.

Software requirements:

- For BL and COM servers we recommend last **Windows Server 2025 server**.
- For database server (also deployed on BL server) we recommend **SQL Server 2022 or 2025**.

Production environment must be fault tolerant (cluster based). COTTE MMS consists of two different Novita business systems (scheduling and settlement). In order to optimize number of virtual machines the components with similar functionality will be installed on the same virtual server. This means business logic for both two systems will be installed on one common server, the same for the database and communications.

Servers will be installed on two network segments:

- DMZ zone for web applications and communication gateways that need to be accessible from the internet
- Internal segment for databases, business logic and communication server for internal users.

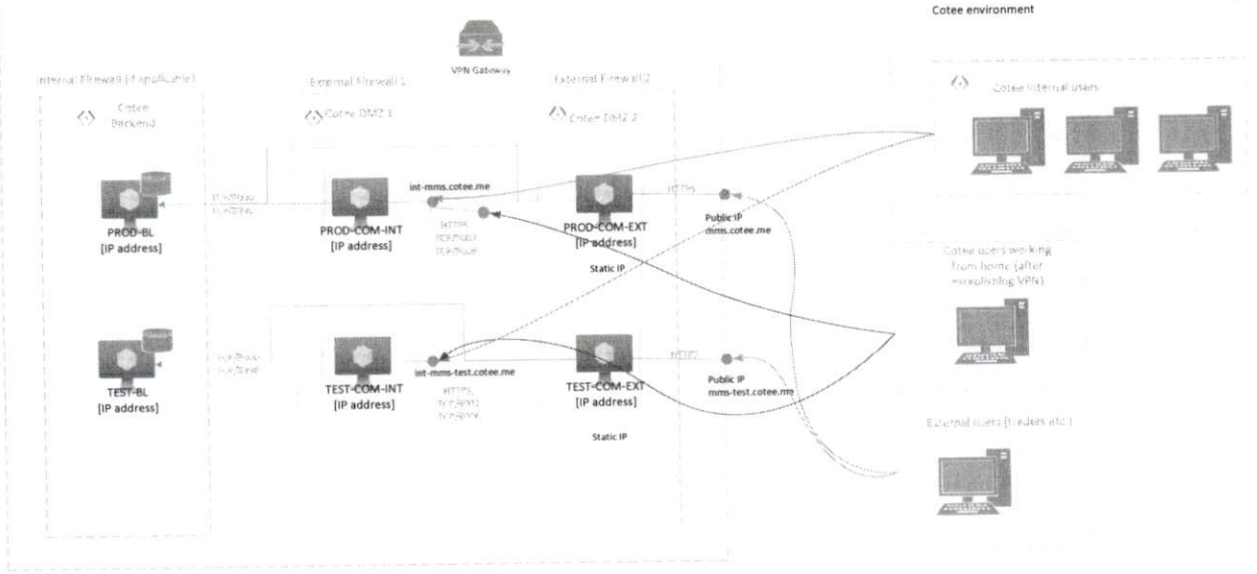
All servers use internal/local (if applicable) and Windows firewall with appropriate opened ports.

Internal (COTEE) users will be able to access the following services:

- Web application (HTTPS/443)
- Web services (HTTPS/443)
- Windows client download (HTTPS/443)
- Windows client (TCP/9002 and 9005, HTTP/2 gRPC).

External (market participants, CGES end other) users will be able to access the following services:

- Web application (HTTPS/443)
- Web services (HTTPS/443).


Cotee environment
VPN Gateway
Internal Firewall (Tapplicable)
External Firewall 1
External Firewall 2
Cotee Backend
Cotee DMZ 1
Cotee DMZ 2
Cotee internal users
PROD-BL
[IP address]
PROD-COM-INT
[IP address]
int-mms.cotee.me
PROD-COM-EXT
[IP address]
Static IP
Public IP
mms.cotee.me
Cotee users working from home (after establishing VPN)
TEST-BL
[IP address]
TEST-COM-INT
[IP address]
int-mms-test.cotee.me
TEST-COM-EXT
[IP address]
Static IP
Public IP
mms-test.cotee.me
External users (traders etc.)

2.2 SERVER REQUIREMENTS

Server software is provided with a standard Windows Installer package that allows easy and fast deployment to the servers. Usually the scripts are used automate the deployment packages.

Server	Specification
Test/Pre-Production business logic with SQL	**Name**: TEST-BL **Equipment**: min 4 CPUs, 24 GB RAM OS disk: 150 GB SSD Data disk: 1TB GB SSD **Licences:** Windows Server Standard edition, SQL Server Developer edition (free)
Test/Pre-production internal communications server	**Name**: TEST-COM-INT **Equipment**: 2 CPU, 8 GB RAM OS disk: 128 GB SSD **Licences:** Windows Server Standard edition
Test/Pre-production external communications server	**Name**: TEST-COM-EXT **Equipment**: 2 CPU, 8 GB RAM OS disk: 128 GB SSD Static IP required **Licences:** Windows Server Standard edition
Production business logic with SQL	**Name**: PROD-BL **Equipment**: min 4 CPUs, 32 GB RAM OS disk: 150 GB SSD Data disk: 1TB GB SSD **Licences:** Windows Server Standard edition, SQL Server Standard edition
Production internal communications server	**Name**: PROD-COM-INT **Equipment**: 2 CPU, 8 GB RAM OS disk: 128 GB SSS **Licences:** Windows Server Standard edition
Production external communications server	**Name**: PROD-COM-EXT

	Equipment: 2 CPU, 8 GB RAM OS disk: 128 GB SSD Static IP required **Licences:** Windows Server Standard edition

Additional ports might need to be open for data exchange with other COTEE systems. 1 Gbit internal network is adequate for proposed solution.

2.3 CLIENTS REQUIREMENTS

Desktop client software is provided as a ClickOnce deployment package, distributed via a web page. The end user can simply click and install the package with no need for administrative privileges. The updates are fully automated with no need for manual intervention. **For Desktop Clients** – hardware requirements are 4 GB of free RAM and 100 MB free disk space. Windows 11 is required for desktop clients. Microsoft .NET Framework 8 or later (expected 10) must be installed.

Web clients software is provided as an Angular application. **For Web clients** (Web Browser) requires lates version of Microsoft Edge, Mozilla Firefox or Google Chrome.

The system following mechanisms for user authentication:

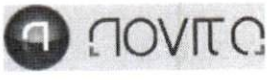
- Windows integrated – this is preferred authentication method for internal users. Users don't need to logon as they area already authenticated with the operating system which also takes care of password policies
- Username + password – authentication is done by the Novita server. Username and password are stored in SQL Server database. This mechanism can be used by external users who are not members of COTEE domain.
- Certificate – Administrator can also enable use of electronic certificates. User's public key is stored in application SQL Server database. Private key is stored on user's computer or smart card/token. Certificates are issued outside of the system.
- Microsoft Office 365 / Azure integrated authentication, if users have such accounts.

2.4 NETWORK RULES

The following network rules should be put in place in primary site:

Direction	Protocol / port
Internal users-> Production PROD-COM-INT internal communications server (DMZ 1) **Internal users -> Test/Pre-production** TEST-COM-INT communications server (DMZ 1)	https / 443 tcp / 9002, HTTP/2 gRPC (scheduling) tcp / 9005, HTTP/2 gRPC (settlement)
Internet-> Production PROD-COM-EXT external communications server (DMZ 2) **Internet-> Test/Pre-production** PROD-COM-EXT external communications server (DMZ 2) **Internal users-> Production** PROD-COM-EXT external communications server (DMZ 2) **Internal users -> Pre-production** PROD-COM-EXT external communications server (DMZ 2)	https / 443
Production **PROD-COM-INT** internal communications server (DMZ 1)-> Production **business logic** (**BL**) server (Internal) Test/Pre-production **PROD-COM-INT** internal communications server (DMZ 1) -> Test/Pre-production **business logic** (**BL**) (Internal)	tcp / 9000 (scheduling) tcp / 8996 (settlement)
Production **PROD-COM-EXT** external communications server (DMZ 2)-> Production **business logic** (**BL**) server (Internal) Test/Pre-production **PROD-COM-EXT** external communications server (DMZ 2) -> Test/Pre-production **business logic** (**BL**) (Internal)	tcp / 8999 (scheduling) tcp / 8996 (settlement)
All servers ->Monitoring server at Novita	tcp / 10051 (monitor.novita.si)
All servers -> SFTP for Novita deploying packages transfer	ftp.novita.si / 22

The mentioned environments are not intended for file storage. A separate location must be defined for this purpose, shared disk etc.





3 SECURE COMMUNICATIONS

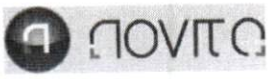
Communications between end-user applications and servers are encrypted using modern SSL / TLS encryption methods. No data (including user credentials) is ever exchanged in clear text.

All communication servers require valid SSL certificates. COTEE will provide SSL certificates:

- External certificates (ex. **mms.cotee.me** for Production and **mms-test.cotee.me** for Test/Pre-production) from commercial issuers;
- Internal certificates (ex. **int-mms.cotee.me** for Production and **int-mms-test.cotee.me** for Test/Pre-production) can be from commercial issuers or issued locally.

Data exchange with other systems relies on protocols supported by those systems. Some of them are not encrypted (for example internet email or FTP) and should be used with care.

ECP/EDX communication via AMQP is supported if ECP/EDX local endpoint is implemented.





4 DATA BACKUP AND RESTORE

Business data is stored only on the SQL server; for the other servers (virtual machines), we create backups only for the operating system and installed applications.

Virtual machine	Backup interval	Retention time
PROD-BL	13:00, 17:00 in 23:45	7 days
All others	23:45	7 days

The SQL server will store its backups on one of accessible disks. Backups of production databases is also copied to external disk array (ex. \\data.cotee.local\mms) for improved security.

Full backup of all databases is done once per day. Production databases are also incrementally backed up every hour, as follow:

- **Production databases**: Full backup every night at 2:06. Incremental backup Every hour at xx:06 except at time of full backup. Backups for last 3 days are kept.
- **Test/Pre-production databases**: Full backup every night at 2:06. Backups for last 3 days are kept.

This maintenance plan also includes integrity check and reindex, which will be configured together with Novita.

The system also performs archiving and cleanup of old data. On the 2nd day of each month at 2:00 AM (proposed time), a backup from regular folder is automatically moved to archive folder (ex. \\data.cotee.local\ArchiveBackupBeforeDelete) with a retention period of 10 years.

5 RESPONSIBILITY FOR IT TASKS

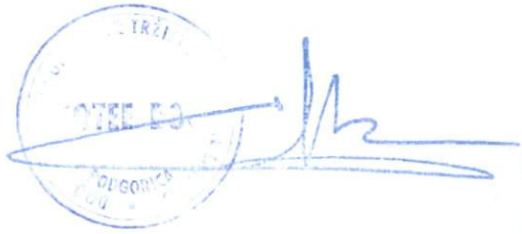
Configuration and mainenance of IT infrastructure is joint task for Novita and COTEE. For each task on of the partners is responsible and the other can only help if required. The table below outlines responsibilities:

Task	Responsible
Hardware procurement and configuration	COTEE
Windows Server and SQL Server licence procurement	COTEE
Configure network	COTEE



Configure remote access to the servers for support	COTEE
Install empty virtual machines (operating system only)	COTEE
Install SQL server	Novita
Configure virtual machines	Novita
Install and configure Market management sistem	Novita
Periodically install Windows and SQL Server service packs	Novita
Install and configure monitoring software on hardware devices	COTEE
Monitor physical servers and network	COTEE
Install and configure monitoring software on virtual machines devices	Novita
Monitor virtual machines and MMS applications	Novita
Configure SQL backups to local disk	Novita
Configure backups of complete virtual machines to external device	COTEE
Restore backups of complete virtual machines if necessary	COTEE





6 NOVITA SUPPORT AND VPN ACCESS

Primary channel for reporting issues or requesting help is Jira as it allows easy tracking of activities and statuses. New issues shall be always initiated thru Jira, phone or email shall be used for additional clarifications or in case Jira site is unavailable.

Helpdesk:

JIRA: http://jira.novita.si:8443

Support 24/7 phone: +386 59 077 888

support@novita.si

COTEE must provide VPN access for the following users. VPN access should allow secure remote connectivity to the required systems and services, ensuring that each designated user can perform their tasks without restrictions. On servers "Novita" administrative account should be provided.

Novita contact	Email
Gregor Malenšek	gregor.malensek@novita.si
Darijan Fujs	darijan.fujs@novita.si
Luka Centa	luka.centa@novita.si
Kristjan Šorotar Strehar	kristjan.sorotar.strehar@novita.si

