



# Assignment 01: Architectural Drivers

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Course: PA1453

Group 9



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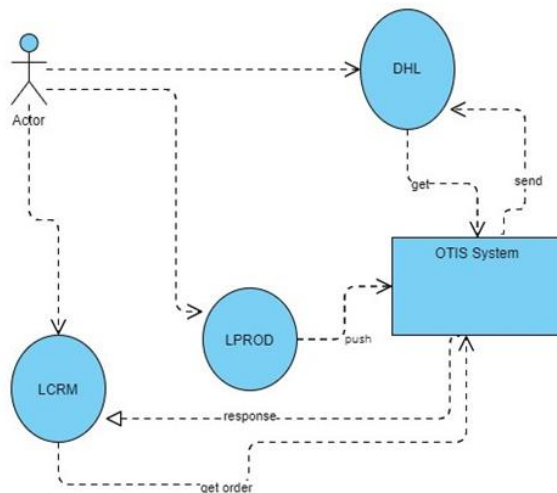
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## Introduction

As a matter of fact, the architecture of a system describes its major components, their relationships, and how they interact with each other. The primary goal of the architecture is to identify requirements that affect the structure of the application. So, A well-laid architecture reduces the business risks associated with building a technical solution and builds a bridge between business and technical requirements. Here, OTIS system is going to play a role as a solution with its special architecture for making that bridge. In fact, 2-8 weeks were needed to process just a status report. It was really bothering Lycia's clients. Thus, clients complain that information is shared too late with them. As we know, time is the most precious human asset. So, Lycia Glass not only wanted to improve its business values but also, desired to prevent wasting time. OTIS is interacting with three systems including Lycia Customer Relation Management System (LCRM), Lycia Production Record System (LPROD), and DHL Express Logistics System (DHL). Also, 10 Functional Requirements and 9 Non-functional Requirements serve as constraints or restrictions on the design of the system across the different backlogs. Regarding the summary of the system, we have tried to make it simpler to understand by visualization.





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Figure 1: Summary of the OTIS system

## Design Purpose

As the customer wants the OTIS system to be delivered within the next six months, the time frame for creating this design should be kept as short as possible. It is important to create design before the development. Design defines main components of the system, its features and infrastructure. So with design we minimize risk of incorrect development decisions which have the highest impact for the product.

OTIS system could be considered a prototype since this could be the first system within the glass manufacturing industry. The system in itself will be a completely new one built from scratch. However, external systems might need to be modified to an extent to work/communicate effectively with the new OTIS system.

The system aims to give customers direct access to order details and reports and minimize internal employee involvement in report generation. So, the plan will cover two main business goals: reducing Backoffice expenses, minimizing efforts spent by whole departments for report generation and ongoing customer engagement and collaboration. By achieving 1<sup>st</sup> goal organization may even reorganize the entire department by assigning more valuable tasks to specialists that manually generate reports. In addition, the following product may be helpful in the whole industry. Still, it is up to the company's management to define what would be economically beneficial to sell software products or engage more customers in their specific industry.

Also, from reading the system specification document, the customer seems to be primarily concerned with availability, usability, security and performance. They are asking for a responsive system that is secure and available 24/7 with an easy-to-use interface.



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## Primary Functionality

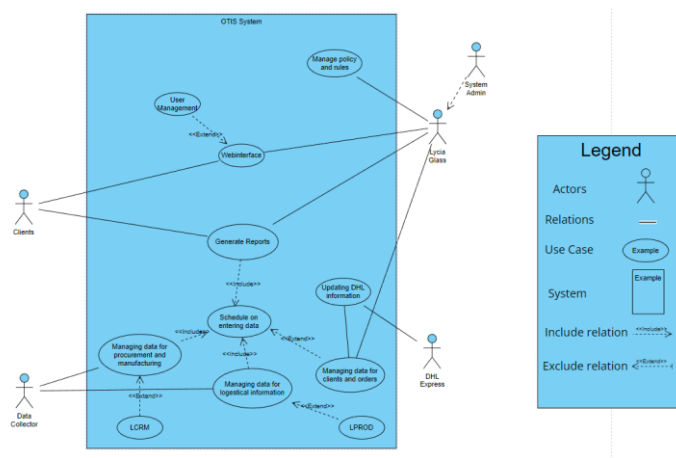


Figure 2: UML model

### Use case 1

Use case Section	Comment
Use case name	Generate reports
Scope	OTIS
Level	Managing data for procurement and manufacturing
Primary Actor	Clients
Stakeholders and interests	System admin, Lycia Glass employees and clients.
Preconditions	The client should have access to this module to request report(s)
Success Guarantee/Postconditions	Log In Access
Main Success Scenario	Log In Access



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Extensions	Generating reports manually by LPROD key account officer
Special Requirements	Availability
Technology and Data variation	N/A
Frequency of occurrence	Stakeholder's request should generate reports
Miscellaneous	N/A

Table 1: use case1 - fully dressed format description

It is a primary use case because clients ask Key Account Managers need to provide status reports with production data (quality parameters etc.) on their orders. The current system's reporting process is manual, inconsistent, and time-consuming. So, we need an alternative to provide these reports frequently in a consistent way and automatically.

#### Use case 2

Use case Section	Comment
Use case name	Schedule on entering data
Scope	OTIS
Level	Keeping reports updated
Primary Actor	OTIS system
Stakeholders and interests	AdministratorU
Preconditions	Having access to other systems (DHL, LPROD, LCRM) databases
Success Guarantee/Postconditions	The scheduler module should work properly, and reports should automatically generate and sponsor a place.
Main Success Scenario	Unconditional happy path scenario of success
Extensions	Entering data manually by LPROD, LPROD, and DHL systems.
Special Requirements	Performance
Technology and Data variation	N/A
Frequency of occurrence	data should be gathered every hour
Miscellaneous	N/A

Table 2: use case2 - fully dressed format description

Stakeholders are unaware of the data storing mechanism across different systems and just need to see their reports. So, we need to find related data, synchronize it and keep it in a good suitable



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format that the report generator can use immediately after their request. Because of that, it is a primary use case for this system.

### Use case 3

Use case Section	Comment
Use case name	User Management
Scope	OTIS
Level	Control Access by users
Primary Actor	System admin
Stakeholders and interests	OTIS, system admin
Preconditions	System admin accessible
Success Guarantee/Postconditions	Must do a successful login
Main Success Scenario	User removal from the system.
Extensions	N/A
Special Requirements	Security
Technology and Data variation	N/A
Frequency of occurrence	Security breaches or problems with the client's login information.
Miscellaneous	N/A

Table 3: use case 3 - fully dressed format description

Without security protocols, the integrity of the system can be questioned. If the reports generated from the OTIS service have been maliciously manipulated, the service's credibility will be diminished; therefore, this use case is decided to be under the primary category. To solve this issue, the use case, manage system users, was created that handles the access control over the system to guarantee no misuse and save the system's integrity.

### Why is it essential to discuss this use case as part of the architectural process?

The faster important parts of the system are found, the easier it is to quickly prevent difficulties in the system from causing damage to it. With this process, it is easy to find and decide the critical parts of the system and where the resources should be spent to increase efficiency of the system. All systems will have flaws in them, so it is important to know what flaws exist to mitigate the issue as much as possible in creating a system.



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## How do use cases relate to business goals?

They are both working on a goal under a specific time frame. OTIS system wants to create a system that updates information that later on will be delivered as reports to different clients or employees. These delivered reports are the end goal of this system. As for the business goal, there are many. One of those goals could be parts or the whole OTIS system; therefore, different use cases could be determined as business goals by a company.

## Quality Attributes

Kommenterad [VS1]: @Vitalii and @Omid and @Martin

We have chosen Performance, Availability, Usability and Security as our quality attributes. The reason is that these are the ones that most of the requirements and background information describe/ask for. Apart from these four, we can also see the need for other quality attributes like Modifiability, Portability and Scalability.

### Quality Attribute 01: Availability

General scenario:

Portion of Scenario	Possible Values
Source	The end user(customer), developer, admin, stakeholder,
Stimulus	Tries to interface with the system
Environment	Normal runtime, Failure/Error state or Downtime
Artifact	System
Response	The system logs the fault. The system informs the system administrator. Recovers from fault (within 15 minutes, as the system should be accessible 24/7. No more than 15min downtime/day is allowed)
Response Measure	Downtime/uptime of a system. Availability per. Availability percentage ( 98.9583 per cent) Time to detect the fault Time to repair the fault Time or time interval in which the system can be in degraded mode





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Table 4: General scenario: Availability

Concrete Scenarios:

1.

**Why?** The system should be available 24/7, with max 15min Downtime. (non-functional requirement 4)

**Source of stimulus:** customer/employee.

**Stimulus:** The customer/employee tries to interact with the system.

**Environment:** Normal runtime.

**Artifact:** System.

**Response:** The report should be viewable and/or downloadable for the user.

**Response measure:** Downtime of System in minutes

2.

**Why?** The system should take appropriate steps to recover from an error/failure and log all errors. (non-functional requirement 6)

**Source of stimulus:** System.

**Stimulus:** System has encountered an error/failure.

**Environment:** Error/Failure state or even Downtime

**Artifact:** System

**Response:** The system should preferably recover on its own. If it cannot, the dev team would have to repair it. I'd propose that the system responds to the user with a maintenance window and details and recovers within 15 minutes.

**Response measure:** Recovery time, Repair time

## Quality Attribute 02: Performance

General Scenario:

Portion of Scenario	Possible Values
Source	End-user, developer, admin, stakeholder, system
Stimulus	The user tries to interact with the system.
Environment	Normal runtime or when the system is under heavy stress
Artifact	System
Response	The system should respond to users' interactions promptly.



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Response Measure	Response time, throughput
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Table 5: General scenario: Performance

Concrete Scenarios:

1.

**Why?** After importing new data, the report must be generated within 5 minutes every hour.  
(non-functional requirement 1)

**Source of stimulus:** System

**Stimulus:** All new data from ERP is imported to the server to update the information on it.

**Environment:** Normal runtime.

**Artifact:** System.

**Response:** The system generates a report for the customer

**Response measure:** Report is generated within 5 minutes

2.

**Why?** "The reports should be downloaded in less than 15 seconds based on existing data."  
(part 1 of the non-functional requirement 2)

**Source of stimulus:** customer/employee.

**Stimulus:** The customer/employee tries to download a report.

**Environment:** Normal runtime.

**Artifact:** System

**Response:** Report is downloaded to the customer/employee's device.

**Response measure:** Time in seconds.

### Quality Attribute 03: Security

General scenario:

Portion of Scenario	Possible Values
Source	User or system that is either authorized or unauthorized.
Stimulus	Source tries to interact with the system.
Environment	Normal runtime
Artifact	System
Response	Depending on whether the source is authorized and the interaction type is allowed, the response should allow or deny the request/interaction.
Response Measure	Interaction allowed or denied.



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Table 6: General scenario: Security

Concrete Scenarios:

1.

**Why?** The reports should only be issued if they adhere to all reporting/data access rules. (part 2 of the non-functional requirement 2)

**Source of stimulus:** customer/employee.

**Stimulus:** A customer/employee who is either authorized or unauthorized tries downloading a report.

**Environment:** Normal runtime.

**Artifact:** System.

**Response:** If the customer/employee is authorized and the data is deemed accessible, they should be issued a report; however, either the user is unauthorized, or the data is inaccessible, either an error message could be shown.

**Response measure:** Access granted/denied.

2.

**Why?** OTIS should log all data access events. (Functional requirement 9) The system must record all events in audit logs regarding data import, modification, sharing, access, and report generation. Log all data access events. (Functional requirement 9) The system must record all events in audit logs regarding data import, modification, sharing, access, and report generation.

**Source of stimulus:** hacker.

**Stimulus:** Tries to break access glass packaging break system access control to export all order information.

**Environment:** Normal runtime.

**Artifact:** System.

**Response:** Malicious request blocked. If a user is authorized, allow access or deny it if unauthorized. Access attempt logged into the audit trail.

**Response measure:** Alert within 1 hour about malicious web requests.

#### Quality Attribute 04: Usability

General scenario:

Portion of Scenario	Possible Values
Source	End-user, admin, stakeholder
Stimulus	Tries to interact with the system for the nth time.
Environment	Normal runtime



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Artifact	System
Response	The system interface should be easy to understand/learn how to use.
Response Measure	User satisfaction.

Table 7: General scenario: Usability

Concrete Scenarios:

1.

**Why?** OTIS should generate customizable reports based on the client's reporting requirements. (functional requirement 3)

**Source of stimulus:** Customer/employee.

**Stimulus:** Customer/employee tries to customize a report based on the data they need via the provided user interface.

**Environment:** Normal runtime.

**Artifact:** System.

**Response:** A viewable/downloadable report with all the data the user asked for.

**Response measure:** User satisfaction, response time.

2.

**Why?** OTIS should be able to set alerts regarding their order and be notified. (functional requirement 5)

**Source of stimulus:** Customer/employee.

**Stimulus:** Sets an alert for one or multiple orders.

**Environment:** Normal runtime.

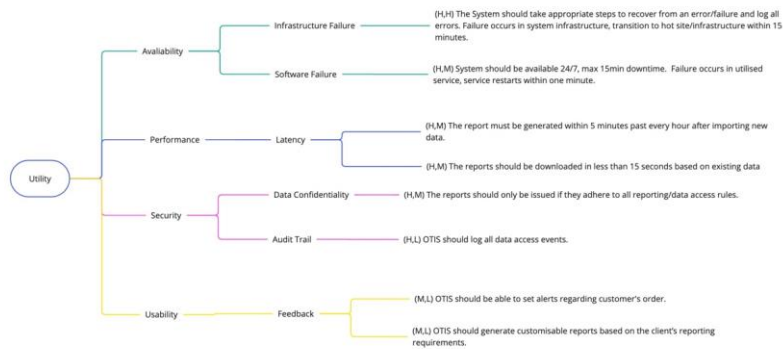
**Artifact:** System.

**Response:** When new information about the order is available, it should be notified to the user.

**Response measure:** Time, User satisfaction and gain of information about the order.



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Figure 3: Utility Tree

## Architectural Concerns



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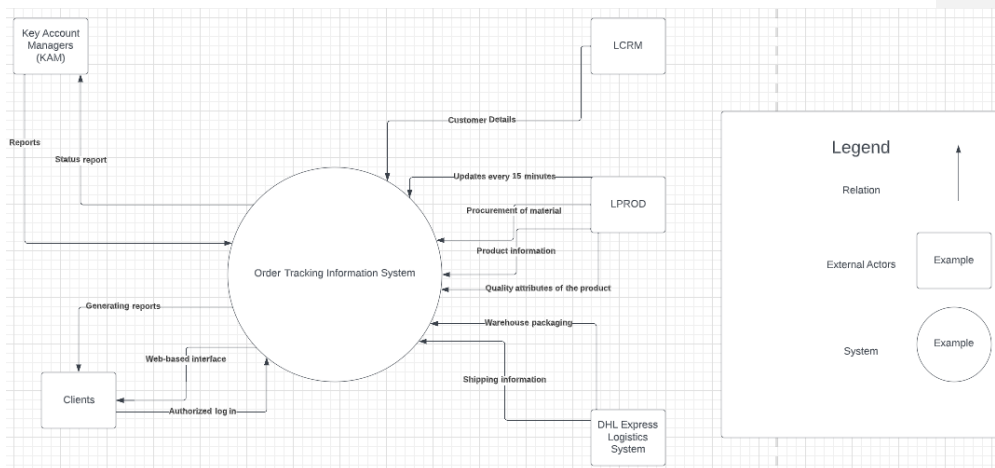


Figure 4. Context diagram of the OTIS system and its external systems.

#### Concern 01: Availability/importance of data from the LPROD system.

Since this one bottleneck will force all reports to be updated at the same time, which will stress the system at those times while having 0 impacts at all other times while also enforcing that reports will have old and maybe even irrelevant data until the next update, would it instead be possible to process and export data more often, for example, every 20min? Or does the processing of data take 45 min? Do the customers require data beyond the quality of the finished product?

#### Concern 02: Limitations on the DHL API.

From the requirements, we understand that each IP address should be able to initially make 500 requests per day and five queries/s, which will be increased to 5000 and 10 queries/s later. However, it is unclear if the request is sent from the OTIS systems IP address or the users. Since Lycia currently has over 400 clients spread across Europe, we can probably assume they will make report requests at similar times. This would mean that the guarantee of 10 queries/s would be impossible to uphold if more than ten users request information from DHL. Making it so that the API is called from the client (user's device) and not the server (OTIS) would seem like the only fix for this problem.



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This raises a few other concerns:  
Would one company/user need to check where their packages are 5000 times per day? (this upper limit seems higher than it needs to be)

Let us say a single customer has 100 different orders. What happens if they want to view/download reports for all orders simultaneously? What if more than 10 of them are currently being transported by DHL? It seems there is a need to limit/queue requests; however, such a limit could force downloads to take more than 15 seconds.

### Concern 03: The system should log all data

As the OTIS must record all events in the audit log, it may lead to network infrastructure load, as based on OTIS specification, there will be thousands of transactions that the system should handle, and those transactions need to be logged and transferred to some location. This raises the following concerns:  
Where to store logs? In some central log management system?  
What should be the log rotation period?  
How should long logs be available before achieving?

## Constraints

- OTIS Should provide a web-based interface to the clients. We think it might be more convenient for customers to use the mobile application to receive information about their orders. If it's a web-based interface, it might not be comfortable to use this app.
- The developer team should be experienced in web development using the Java Spring boot framework. That is the limitation that impacts development team composition. Also, it may require more Recruiters team to find a specialist on the market.
- It has not been mentioned in clear text. However, the company does have its own Cloud and network infrastructure that can support hybrid cloud deployments. Which would lead us to believe they would prefer if it was used rather than, for example, setting up a firebase database.