DESIGNING SYSTEM CONTROL USING LOAD ORIENTED MANUFACTURING CONTROL (LOMC) TO IMPROVE THROUGHPUT ON DEPARTMENT MACHINING IN PT. XYZ

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***Abstract*— Industrial development in Indonesia is increasing along with the advancement of science and technology. PT. XYZ is one of the companies that plays an important role in the aircraft industry. PT. XYZ have several departments to make their products. One of the department is the department to make component parts. In that department there are several machine that called Department machining. PT. Indonesia Aerospace (IAe) at this time, in releasing part that will be produce at Department machining using MRP (Material Requirement Planning) I method. Production planning in MRP (Material Requirement Planning) I does not calculate for capacity on the production floor and WIP (work in process). Because it does not consider that, there is often a mismatch between the plan and the actual so that it causes delays in completing the part with the specified time. Department machining in PT. XYZ can only complete parts on time by as much as 53% and 47% experience delays in completion in January 2019. To overcome this, a good production scheduling planning method is needed considering the conditions on the production floor and controlling production activities is needed called shop floor control (SPC). Load Oriented Manufacturing Control (LOMC) is a method of planning a production scheduling that takes into account the condition of the production floor. From using Load Oriented Manufacturing Control (LOMC) the release date, start date and finish date can be more accurate and can reduce discrepancy of 29,5%. Control systems using Load Oriented Manufacturing Control (LOMC) can use applications to make it easier to determine when parts will be produced so there is no bottleneck and can increase throughput. In this application there is a menu for adding parts to be produced, calculating capacity, and for knowing when the part is started and finished.**

Keyword: Shop Floor Control, Load Oriented Manufacturing Control, Throughput, Work In Process

***Abstrakt*— *Perkembangan industri di Indonesia semakin meningkat seiring dengan kemajuan ilmu pengetahuan dan teknologi.* PT. XYZ *adalah salah satu perusahaan yang memainkan peran penting dalam industri pesawat terbang.* PT. XYZ *memiliki beberapa departemen untuk membuat produk mereka. Salah satu departemen adalah departemen untuk membuat bagian-bagian komponen. Di departemen itu ada beberapa mesin yang disebut Department machining. PT. Indonesia Aerospace (IAe) saat ini, dalam merilis* part *yang akan diproduksi di* Department machining *menggunakan metode* MRP (Material Requirement Planning) I. *Perencanaan produksi di* MRP (Material Requirement Planning) *I tidak memperhitungkan kapasitas di lantai produksi dan WIP (*Work In Process*). Hal tersebut mengakibatkan sering ada ketidaksesuaian antara* plan *dan aktual sehingga menyebabkan keterlambatan dalam menyelesaikan bagian dengan waktu yang ditentukan.* Department machining *di* PT. XYZ *hanya dapat menyelesaikan order tepat waktu sebanyak 53%, dan 47% mengalami keterlambatan penyelesaian pada Januari 2019. Untuk mengatasinya, metode perencanaan penjadwalan produksi yang baik diperlukan dengan mempertimbangkan kondisi di lantai produksi dan pengendalian* shop floor control (SPC). *Load Oriented Manufacturing Control (LOMC) adalah metode perencanaan penjadwalan produksi yang memperhitungkan kondisi lantai produksi. Dengan menggunakan Load Oriented Manufacturing Control (LOMC) tanggal rilis, tanggal mulai dan tanggal selesai bisa lebih akurat dan dapat mengurangi ketidaksesuaian antara* plan dan *actual sebesar 29,5%. Kontrol sistem menggunakan Load Oriented Manufacturing Control (LOMC) dapat menggunakan aplikasi untuk mempermudah dalam menentukan kapan bagian yang akan diproduksi sehingga tidak ada bottleneck dan dapat meningkatkan* throughput. *Dalam aplikasi ini ada menu untuk menambahkan bagian yang akan diproduksi, menghitung kapasitas, dan untuk mengetahui kapan* part *itu dimulai dikerjakan dan selesai dikerjakan.*

Kata Kunci: **Shop Floor Control, Load Oriented Manufacturing Control, Throughput, Work In Process**

I. INTRODUCTION

Industrial development in Indonesia is increasing along with the advancement of science and technology. PT. XYZ is one of the companies that plays an important role in the aircraft industry. PT. XYZ is the only manufacturing company in Indonesia engaged in the manufacture of aircraft. PT. XYZ with approximately 16000 employees, goods produced by PT. XYZ are recognized by many countries with many requests from various parties, the optimum production planning and control is needed to increase profits, production, and customer satisfaction. PT. XYZ have several departments to make their products. One of the department is the department to make component parts. In that department there are several machine that called Department machining.

PT. Indonesia Aerospace (IAe) at this time, in releasing part that will be produce at Department machining using MRP (Material Requirement Planning) I method. Production planning in MRP (Material Requirement Planning) I does not calculate for capacity on the production floor and WIP (work in process). Because it does not consider that, there is often a mismatch between the plan and the actual so that it causes delays in completing the part with the specified time.

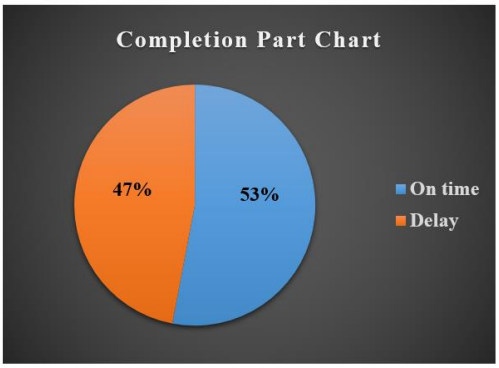

Figure I.1 Completion Part Chart

Based on Department machining in PT. XYZ data, Department machining can only complete parts on time by as much as 53% and 47% experience delays in completion in January 2019.

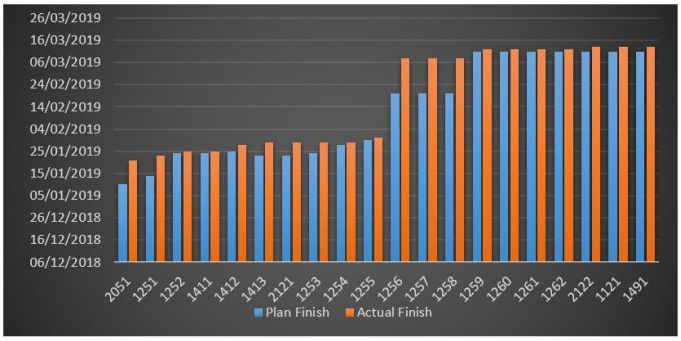

Figure I.2 Comparison Chart

Figure I.2 explain about inaccuracies in order completion. This is due to inaccuracies in the calculation of production scheduling. To overcome this, a good production scheduling planning method is needed taking into account the conditions on the production floor. Load Oriented Manufacturing Control (LOMC) is a method of planning a production scheduling that takes into account the condition of the production floor. From these problems, LOMC (Load Oriented Manufacturing Control) is a production scheduling planning method that takes into account the condition of the production floor where the LOMC (Load Oriented Manufacturing Control) method determines the available capacity at each work station, the load limit and when the part should be released so it can reduce mismatches between plans and actual product completion and can control and reduce WIP (Work In Process) which is caused by the flow of material that is not smooth on the production floor. Load Oriented Manufacturing Control (LOMC) method can improve the throughput because make the flow for production flow.

Load Oriented Manufacturing Control (LOMC) can be the system control that better make in the electronic because more easily monitored the production floor. The information of Load Oriented Manufacturing Control (LOMC) by electronic using load oriented manufacturing control method is more efficient and effective compared to conventional systems. This research tried to implement Load Oriented Manufacturing Control (LOMC) concept in PT. XYZ. The result of the research showed that Load Oriented Manufacturing Control could improve throughput and minimize work in process (WIP).

II. LITERATURE REVIEW

II.1 Capacity Planning

Capacity is the result of production or processing volume (throughput), or the number of units that can be handled, received, stored, or produced by a facility for a certain period of time (Heizer, 2009). Operational

managers pay attention to capacity because, first, they want to meet the capacity to meet consumer demand, secondly, capacity affects the efficiency of operating costs, thirdly, capacity is very useful in knowing output planning, capacity maintenance costs, and very decisive in analyzing investment requirements. Capacity planning is the activity of determining and updating capacity needs (Handoko, 1999).

II.2 Load Oriented Manufacturing Control

Load-oriented manufacturing control is a new solution for job shops producing parts in small lots. Based upon a statistical view of job shop manufacturing, load oriented manufacturing control contrasts with conventional deterministic short term planning methods. The nucleus of load oriented manufacturing control is the technique of load oriented order release. This simple and consistent technique was developed during research at the University Hannover, West Germany (Kanet, 1982). Since then load oriented order release was completed by further techniques and has been successfully implemented in at least 20 factories. Several software companies are offering load oriented manufacturing control systems.

III.3 Procedure of Load Oriented Manufacturing

The procedure of Load Oriented Manufacturing Control is as follows:

1. Capacity Planning
2. Release Order Planning
3. Sequencing
4. Monitoring data calculation

III. METHODOLOGY

This study aims to produce a production capacity planning in the production process on Department machining part production line to control machine capacity in the Department machining using the Load Oriented Manufacturing Control (LOMC) method which is expected to optimize production and achieve completion time targets. The systematic process can be seen in the conceptual model in the Figure III.1

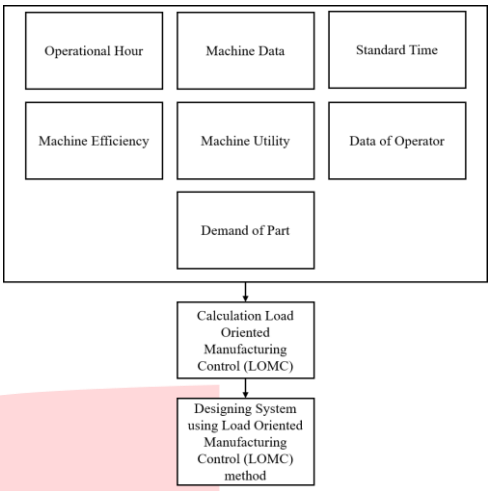

Figure III.1 Conceptual Model

Systematic problem solving is divided into 2 steps, namely the collection and data processing step and the analysis and conclusion step. As for the steps carried out in this study can be seen in Figure III.2

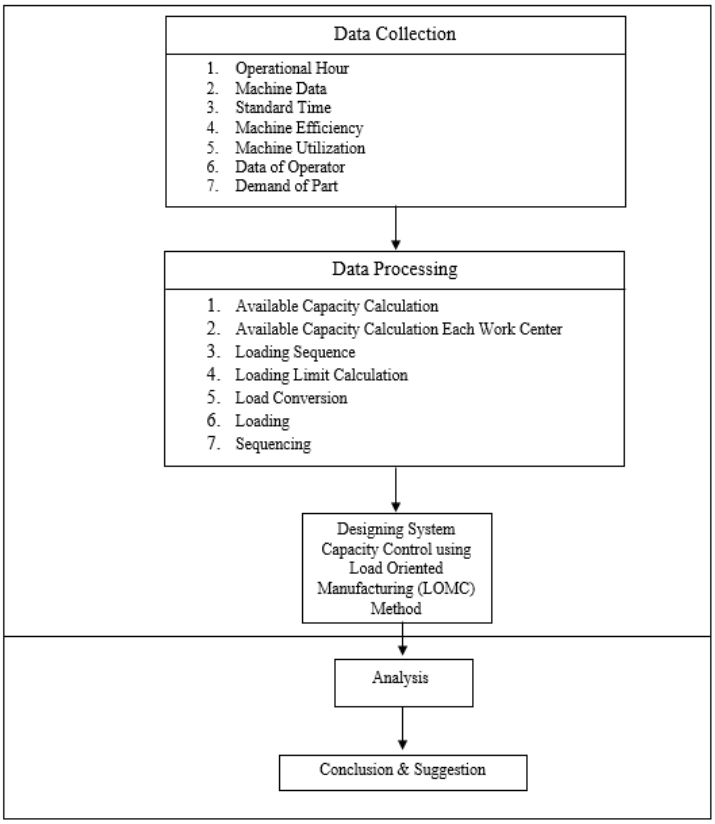

Figure III.2 Systematic Problem Solving

IV. RESULT AND DISCUSSION

IV.1 Initial Schedule

The existing schedule for machine center within the release date, start date and finish date showed in Table V.1. PT. XYZ in releasing the production schedule does not consider the capacity contained in the production floor and work in process (WIP).

Table V.1 Initial Schedule

Part Number	Release	Start	Finish	Schedule Finish
2051	02/01/2019	03/01/2019	04/01/2019	04/01/2019
1251	03/01/2019	03/01/2019	04/01/2019	04/01/2019
1252	03/01/2019	03/01/2019	04/01/2019	04/01/2019
1411	03/01/2019	03/01/2019	08/01/2019	08/01/2019
1412	03/01/2019	03/01/2019	10/01/2019	10/01/2019
1413	03/01/2019	03/01/2019	10/01/2019	10/01/2019
2121	03/01/2019	03/01/2019	21/01/2019	10/01/2019
1253	03/01/2019	03/01/2019	11/01/2019	11/01/2019
1255	03/01/2019	03/01/2019	23/01/2019	14/01/2019
1256	03/01/2019	03/01/2019	23/01/2019	23/01/2019
1257	03/01/2019	03/01/2019	23/01/2019	23/01/2019
1258	03/01/2019	03/01/2019	23/01/2019	23/01/2019
1259	04/01/2019	04/01/2019	23/01/2019	23/01/2019
1260	04/01/2019	04/01/2019	24/01/2019	24/01/2019
1261	04/01/2019	04/01/2019	24/01/2019	24/01/2019
1262	04/01/2019	04/01/2019	24/01/2019	24/01/2019
2122	04/01/2019	04/01/2019	25/01/2019	24/01/2019
1121	04/01/2019	04/01/2019	25/01/2019	24/01/2019
1491	04/01/2019	06/01/2019	28/01/2019	25/01/2019

Table V.I given the information about the discrepancy about the actual and schedule. From the table above, parts produced have experienced a delay of 47%.

IV.2 Schedule Using Load Oriented Manufacturing Control

From the results of data processing with the Load Oriented Manufacturing Control (LOMC) method is obtained by sorting job orders that will be released first determined by the priority rules of FIFO (First In First Out). From the results of data processing using the Load Oriented Manufacturing Control (LOMC) method results obtained the release date, start date and finish date. By using the Load Oriented Manufacturing Control (LOMC) method the calculation results can be more accurate and can improve throughput.

Table V.2 Schedule Using Load Oriented Manufacturing Control

Part Number	Release	Start	Finish	Schedule Finish
2051	02/01/2019	03/01/2019	03/01/2019	04/01/2019
1251	02/01/2019	03/01/2019	03/01/2019	04/01/2019
1252	03/01/2019	04/01/2019	04/01/2019	04/01/2019
1411	03/01/2019	07/01/2019	07/01/2019	08/01/2019
1412	04/01/2019	07/01/2019	09/01/2019	10/01/2019
1413	08/01/2019	09/01/2019	10/01/2019	10/01/2019
2121	08/01/2019	10/01/2019	11/01/2019	10/01/2019
1253	09/01/2019	11/01/2019	11/01/2019	11/01/2019
1254	09/01/2019	11/01/2019	14/01/2019	14/01/2019
1255	11/01/2019	14/01/2019	16/01/2019	14/01/2019
1256	16/01/2019	17/01/2019	17/01/2019	23/01/2019
1257	16/01/2019	17/01/2019	17/01/2019	23/01/2019
1258	16/01/2019	17/01/2019	17/01/2019	23/01/2019
1259	17/01/2019	18/01/2019	18/01/2019	23/01/2019
1260	17/01/2019	18/01/2019	18/01/2019	24/01/2019
1261	18/01/2019	21/01/2019	21/01/2019	24/01/2019
1262	18/01/2019	21/01/2019	21/01/2019	24/01/2019
2122	18/01/2019	21/01/2019	22/01/2019	24/01/2019
1121	21/01/2019	22/01/2019	22/01/2019	24/01/2019
1491	21/01/2019	22/01/2019	23/01/2019	25/01/2019

Table V.2 are the result calculation using Load Oriented Manufacturing Control (LOMC). From the table above give the information that the finish date faster than schedule finish date. Determining the order completion time using Load Oriented Manufacturing Control (LOMC) method can be done more accurately than the existing method because Load Oriented Manufacturing Control (LOMC) considering the capacity in the production floor and work in process (WIP). Using Load Oriented Manufacturing Control (LOMC) in determining the order completion can reduce discrepancy about 29,5%.

IV.3 System Control Load Oriented Manufacturing Control Impact

PT. XYZ previously did not have a good production process planning system. Production process planning system was created to be able to facilitate the control of the production floor. In this application there is a menu for adding parts to be produced, calculating capacity, and for knowing when the part starts and is finished. Therefore, with this application it is expected that companies can have a system that can simplify minimizing work in process and increase throughput.

The application used has two menus such as data and information. The menu data has sub menu namely input, production, operator and capacity.

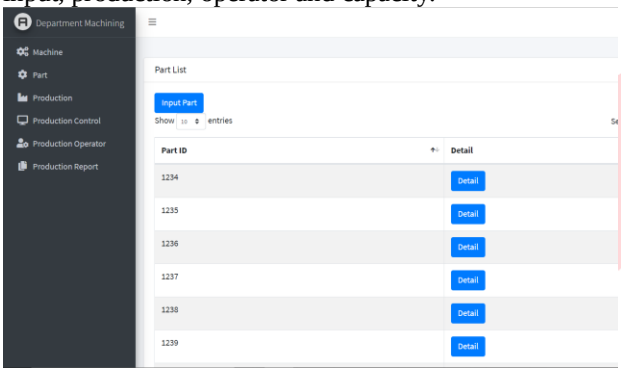

Figure IV.1 Input Menu

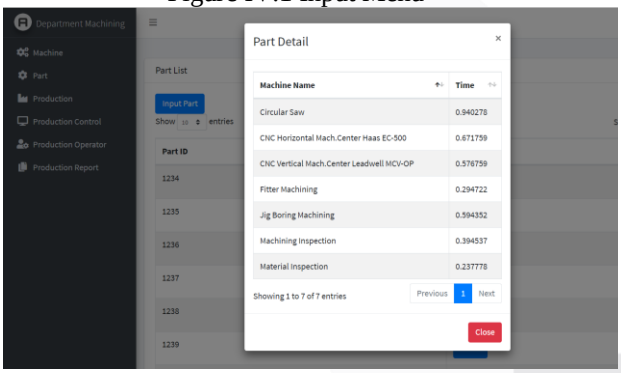

Figure IV.2 Input Menu (Continued)

Figure IV.4 and Figure IV.5 are interface from the input menu. The function of this input menu is to add parts to be produced.

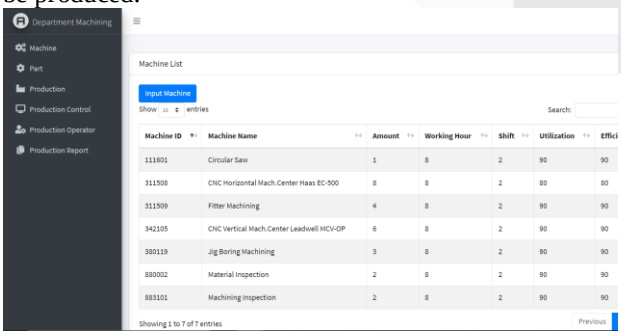

Figure IV.3 Machine List

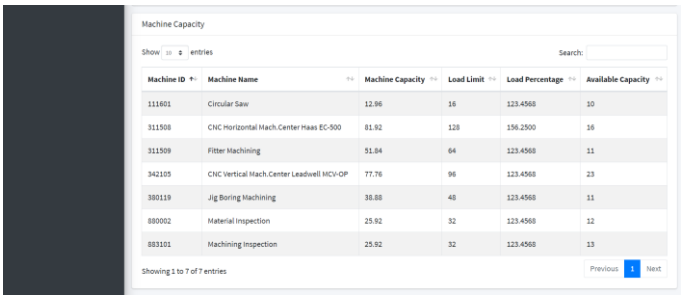

Figure IV.4 Capacity Calculation

Figure IV.6 and Figure IV.7 are the interface of the machine list and capacity calculation.

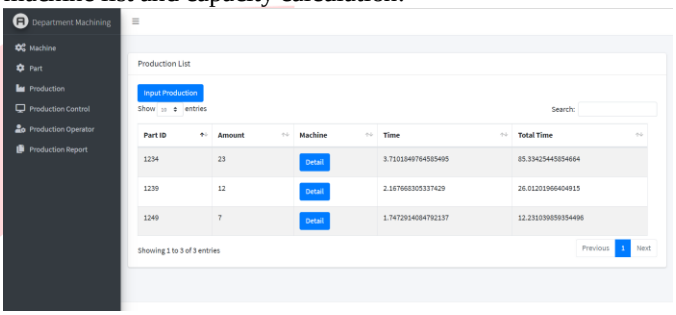

Figure IV.5 Production Menu

Figure IV.8 is the interface of production. This menu is a menu for knowing product that will be release and production.

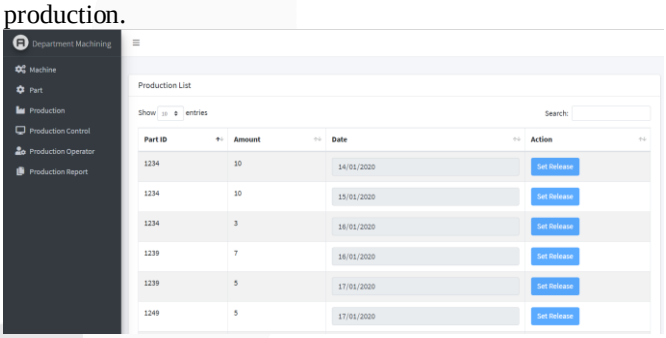

Figure IV.6 Production Control

Figure IV.9 show the interface about the production control. The amount of the part in this menu will depend on the calculation of the number of each work center.

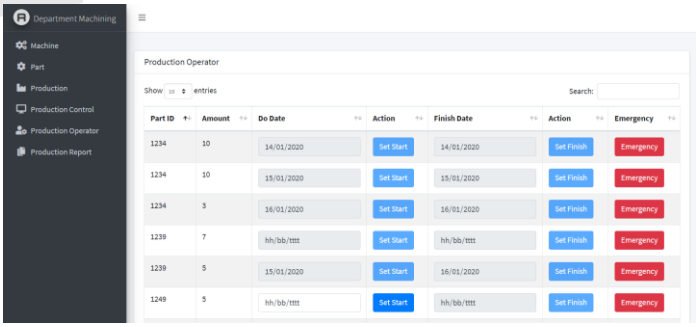

Figure IV.7 Operator Menu

Figure IV.10 is the interface of the system that will be used by operators in production.

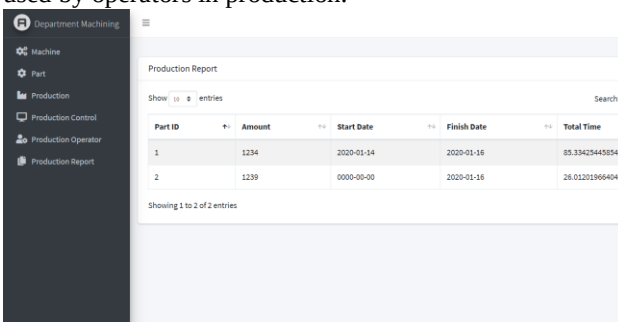

Figure IV.8 Production Report

Figure IV.11 is the interface of the production report menu. Production report menu is a menu that provides information and recap of parts that have been completed in production.

V. CONCLUSION

PT. Indonesia Aerospace (IAe) at this time, in releasing part that will be produce at Department machining using MRP (Material Requirement Planning) I method. Production planning in MRP (Material Requirement Planning) I does not calculate for capacity on the production floor and WIP (work in process). Because it does not consider that, there is often a mismatch between the plan and the actual so that it causes delays in completing the part with the specified time. This research is implement the Load Oriented Manufacturing Control (LOMC) to improve throughout at Department machining PT. XYZ. To overcome this, a good production scheduling planning method is needed taking into account the conditions on the production floor. Load Oriented Manufacturing Control (LOMC) is a method of planning a production scheduling that takes into account the condition of the production floor. From using Load Oriented Manufacturing Control (LOMC) the release date, start date and finish date can be more accurate and can reduce discrepancy about 29,5%. The system control using Load Oriented Manufacturing Control (LOMC) can simplify to determining when the part that will be produced so that there is no bottleneck and can improve throughput. In this application there is a menu for adding parts to be produced, calculating capacity, and for knowing when the part starts and is finished.

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