PROJECT MANAGEMENT INFORMATION SYSTEM AT CV. ORIZA SATIVA

Mochammad Irfan Priatna[1], Gentisya Tri Mardiani, S.Kom., M.Kom[2]

[1,2] Universitas Komputer Indonesia
Jl. Dipatiukur 112-116, Bandung 40132, Indonesia
E-mail : mochammadirfanpriatna@gmail.com[1]

ABSTRACT

CV ORIZA SATIVA is a company engaged in service chartering (construction). Project construction which have been handled CV. ORIZA SATIVA to start from environment road project , Project School Fencing, Project Irrigation Passage and Project road concrete. Based on result observation in CV. ORIZA SATIVA, Project Always is done carefully, but not a few when projects runs experiences resistance in workmanship like inappropriate schedule and cost plan, drawing doesn't work for every day, supervision advances project from the angle sometimes not in line with planning, this thing happened because error calculation estimation expense and time, Lack supervision is field, and inexistence risk management.

Based on problems, hence required scheduling analysis to apply Metode Critical Path Method (CPM), analysed estimation time and expense project using Metode Earned Value Management (EVM) and requires risk management to handle and calculates risk that is possibly happened applies method Earn Monetary Value (EMV).

Based on analysis result, system built enough assisting clarifies daily schedule, assists observes project advances, also risk which possibly happened when project to run has can be identified and calculated how much which must be released and way handling.

***Keyword**: Project Management, Information System, Critical Path Method, Earned Value Management, Expected Monetary Value.*

1. INTRODUCTION

CV. ORIZA SATIVA is a company engaged in the service of chartering (construction) which is located at Kampung Tipar RT/RW 04/02 village of Cikelet Subdistrict Tipar Garut, dating back to October 16, 2014. Most of the tenants CV. ORIZA SATIVA originated from the local government procurement methods garut directly rather than through direct procurement tenders, opened after the draft local regulations about a GRANT which is the plan annual local government approved jointly by the regional government and PARLIAMENT.

On the basis of documents Warrants work (SPK), planning the project schedule is always done well, but a planning schedule that is used in reference to planning the schedule of perminggu based on the schedule of implementation time, while planning for the each day rely on estimates of the situation, thus Implementing the field a little confusion by not tergambarnya to work each day, resulting in melesetnya the time of completion of the project by the time it was planned.

Based on the results of interviews with the person in charge of technical supervision of project progress, especially in terms of time is sometimes not in line with the planning, because the planning schedule used in reference to the planning schedule perminggu realization of time resulting in exceeding the planned time.

The technical person in charge also convey the risks that occur during the project such as delivery delays of the material, a worker was unable to attend due to illness, of course it will interfere with the process of project work and impact other work on the process when those risks are not immediately addressed. In addition to impeding the course of the project, the risk will also have an impact on the costs that must be incurred to the enterprise. As a result the company had to pay to tackle those risks.

Of barriers that have been outlined, the need for a solution to resolve the obstacles projects that can support all activities so that all such activities become more effective and efficient, the system that will be created can eventually facilitate the technical person in charge of the work in making the daily work schedule planning that can clarify the daily work that is done, the scrutiny will be made online this later can see whether the progress of the project in accordance with the planning and wherever and

whenever, also the technical person in charge can estimate and calculate the amount of costs that must be incurred to risks encountered.

2. CONTENT OF RESEARCH

2.1 Scheduling Analysis

Critical Path Method (CPM) or known by critical path according to Soeharto [3] i.e. path have a series of components of the activity, with the total amount of time the oldest and shows the completion of the project the fastest. Thus, the critical path consists of a set of critical activities, starting from the first until the last activity on the project.

2.1.1 *Critical Path method Analysis*

Critical Path method (CPM) is a method in the planning scheduling project based on a network diagram that contains path activities during the conduct of the project took place

Table 1. Activity Data Project environment Kampung Cimipir

No.	Uraian	Kode Pekerjaan	Kegiatan Pendahulu	Durasi (Hari)
1.1	Pas. Papan Bowplank Propil	1.1	-	1
1.2	Bongkaran dan Pembersihan Lokasi	1.2	1.1	2
2.1	Pek. Lapis Pondasi Bawah (Telford)	2.1	1.1	8
2.2	Pek. Lapis Pondasi Agregad Kelas B	2.2	1.2, 2.1	6
2.3	Pek. Lapis Resap Pengikat (Prime coat)	2.3	2.2	7
2.4	Pek. Agregad Penutup Burda	2.4	2.3	6

Based on a series of activities in environmental road construction project of Kampung Cimipir in table 1 then produced a diagram of the network work like in Figure 1 diagrams the network work

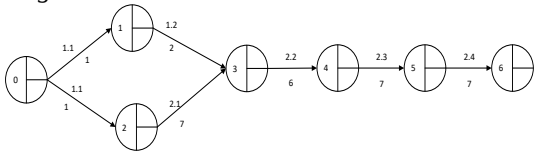


Figure 1. Diagram Jaringan Kerja

The calculation to determine the time of completion in the CPM method consists of two phases, namely calculation of forward and backward calculation. The following description of each of these stages.

1. ***Forward Calculation***

Advanced calculations used to calculate the earliest start time (ES) and the earliest finish time (EF), by performing the following calculation.

ES = $ES_{sebelumnya}$ + lama kegiatan sebelumnya

$ES_{0-1} = 0$
$ES_{0-2} = 0$
$ES_{1-3} = 1$
$ES_{2-3} = 1$
$ES_{3-4} = 1 + 8 = 9$
$ES_{4-5} = 9 + 6 = 15$
$ES_{5-6} = 15 + 7 = 22$

Serta Perhitungan EF :
EF = ES + lama kegiatan

$EF_{0-1} = ES_{0-1} + D_{0-1} = 0 + 1 = 1$
$EF_{0-2} = ES_{0-2} + D_{0-2} = 0 + 1 = 1$
$EF_{1-3} = ES_{1-3} + D_{1-3} = 1 + 2 = 3$
$EF_{2-3} = ES_{2-3} + D_{2-3} = 1 + 8 = 9$
$EF_{3-4} = ES_{3-4} + D_{3-4} = 9 + 6 = 15$
$EF_{4-5} = ES_{4-5} + D_{4-5} = 15 + 7 = 22$
$EF_{5-6} = ES_{5-6} + D_{5-6} = 22 + 6 = 28$

as shown in table 2. forward Calculation Table.

Table 2. Forward Calculation

No	Kode Pekerjaan	Pekerjaan		Durasi (dalam hari)	Paling Awal	
		i-node	j-node		Mulai (ES)	Akhir (EF)
1	1.1	0	1	1	0	1
2	1.2	0	2	1	0	1
2	1.2	1	3	2	1	3
3	2.1	2	3	8	1	9
4	2.2	3	4	6	9	15
5	2.3	4	5	7	15	22
6	2.4	5	6	6	22	28

From table 2. forward calculation produces a picture diagram calculations forward as shown in Figure 2. forward calculation work diagram

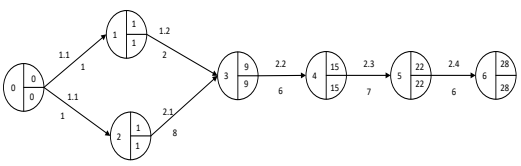


figure 2. forward calculation work diagram

2. *Backward Calculation*

The calculations backwards starting from the Finished (terminal event) to Start (initial event), and used to calculate the slowest start time (LS) and the slowest completion time (LF):

LS = LF – lama kegiatan

$LS_{5-6} = 28 = 28$
$LS_{4-5} = 28 - 6 = 22$
$LS_{3-4} = 22 - 7 = 15$
$LS_{2-3} = 15 - 6 = 9$
$LS_{1-3} = 9 - 2 = 7$
$LS_{0-2} = 1 - 1 = 0$
$LS_{0-1} = 7 - 1 = 6$

Serta perhitungan LF
LF = $LF_{setelahnya}$ - lama kegiatan

$LF_{5-6}=LS_{5-6}-D_{5-6}=28-6=22$
$LF_{4-5}=LS_{4-5}-D_{4-5}=22-7=15$
$LF_{3-4}=LS_{3-4}-D_{3-4}=15-6=9$
$LF_{2-3}=LS_{2-3}-D_{2-3}=9-8=1$
$LF_{1-3}=LS_{1-3}-D_{1-3}=9-2=7$
$LF_{0-2}=LS_{0-2}-D_{0-2}=1-1=0$
$LF_{0-1}=LS_{0-1}-D_{0-1}=7-1=6$

as shown in table 3. Table of calculation of the Backward

Table 3. calculation of the Backward

No	Kode Pekerjaan	Pekerjaan		Durasi (dalam hari)	Paling Akhir	
		i-node	j-node		Mulai (LS)	Akhir (LF)
1	1.1	0	1	1	6	7
2	1.2	0	2	1	0	1
2	1.2	1	3	2	7	9
3	2.1	2	3	8	1	9
4	2.2	3	4	6	9	15
5	2.3	4	5	7	15	22
6	2.4	5	6	6	22	28

From table 3. Backward calculations produce a picture diagram of advanced calculations such as seen in Figure 3. The working diagram calculations.

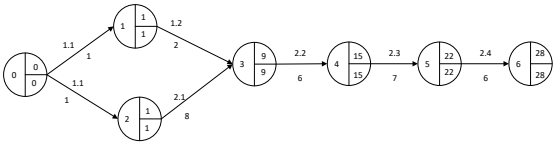


figure 2. backward calculation work diagram

3. *Total Float Calculation*

Slack or Total Float (TF) is the amount of time allowed an activity can be postponed, with the formula

TF = LF- EF,

$TF_{0-1} = LF_{0-1}-EF_{0-1} = 7-1 = 6$

$TF_{0-2} = LF_{0-2}-EF_{0-2} = 1-1 = 0$

$TF_{1-3} = LF_{1-3}-EF_{1-3} = 9-3 = 6$

$TF_{2-3} = LF_{2-3}-EF_{2-3} = 9-9 = 0$

$TF_{3-4} = LF_{3-4}-EF_{3-4} = 15-15 = 0$

$TF_{4-5} = LF_{4-5}-EF_{4-5} = 22-22 = 0$

$TF_{5-6} = LF_{5-6}-EF_{5-6} = 28-28 = 0$

as shown in table 4. The Results Of Calculation Of CPM

Table 4. The Results Of Calculation Of CPM

No	Pekerjaan		Durasi (dalam hari)	Paling Awal		Paling Akhir		Total Float (TF)
	i-node	j-node		Mulai (ES)	Akhir (EF)	Mulai (LS)	Akhir (LF)	
1	0	1	1	0	1	6	7	6
2	0	2	1	0	1	0	1	0
2	1	3	2	1	3	7	9	6
3	2	3	8	1	9	1	9	0
4	3	4	6	9	15	9	15	0
5	4	5	7	15	22	15	22	0
6	5	6	6	22	28	22	28	0

Based on table 4. The results of the calculation of the CPM acquired a foregone conclusion that the line should have a float or delay is on activities 1 and 2 with a total maximum delay allowed is 6 days, thus forming a network of Critical Path Method as shown in Figure 3. Network Critical Path Method.

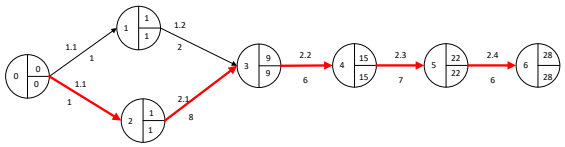


figure 3. Network Critical Path Method

2.2 Analysis Of Cost Control

Analysis of cost control, namely how to display progress information cost and schedule of the project. This indicator controls the position and inform the project progress within a certain period during the project progress using Earn Value Management (EVM).

2.2.1 Earn Value Management (EVM) Analysis

EVM is a method that integrates the relationships between costs and time as well as give an overview about the condition of the continuity of the project. Based on the problems that previously pointed out in therefore will be analyzed the condition of project PJL Kp. Cimipir method of using Earned Value Management (EVM), and can be seen in table 5. The plan of the work projects and 6. Report Of The Workmanship.

Table 5. The plan of the work projects

No.	Uraian	Bobot (%)	Minggu			
			1	2	3	4
I	**MATA PEMBAYARAN UMUM**					
1.	Pas. Papan Bowplank Propil	1,68	1,68	1,68	1,68	1,68
2.	Bongkaran dan Pembersihan Lokasi	1,88	1,88	1,88	1,88	1,88
II	**MATA PEMBAYARAN UTAMA**					
1.	Pek. Lapis Pondasi Bawah (Telford)	34,91	25,10	34,91	34,91	34,91
2.	Pek. Lapis Pondasi Agregad Kelas B	7,66		6,56	7,66	7,66
3.	Pek. Lapis Resap Pengikat (Prime coat)	14,34			12,86	14,34
4.	Pek. Agregad Penutup Burda	39,53				39,53
			28,66%	45,03%	58,99%	100%

Table 6. Report Of The Workmanship

No.	Uraian	Bobot (%)	Minggu			
			1	2	3	4
I	**MATA PEMBAYARAN UMUM**					
1.	Pas. Papan Bowplank Propil	1,68	1,68	1,68	1,68	1,68
2.	Bongkaran dan Pembersihan Lokasi	1,88	1,88	1,88	1,88	1,88
II	**MATA PEMBAYARAN UTAMA**					
1.	Pek. Lapis Pondasi Bawah (Telford)	34,91	26,18	34,91	34,91	34,91
2.	Pek. Lapis Pondasi Agregad Kelas B	7,66		6,38	7,66	7,66
3.	Pek. Lapis Resap Pengikat (Prime coat)	14,34			12,29	14,34
4.	Pek. Agregad Penutup Burda	39,53				39,53
	Bobot Aktual (%)	100	29,74	44,85	58,42	100
	Biaya aktual AC(Rp.)		**44.448.169**	**74.571.298**	**97.133.895**	**166.268.222**

From table 5 and table 6 it is known there are several variables which must be counted, namely calculation of planned value (PV), earned value (EV), schedule a Variant (SV), cost variance (CV), schedule performance index (SPI), cost performance index (CPI), estimate the actual cost (EAC) and estimate time to complete (ETC) for all variables is calculated until the 4th week because right in the 4th week of the project has reached 100%.

1. Planned Value (PV) Calculation

The calculation of planned value obtained from the% weighting plan each week multiplied by the actual budget cost (BAC), bac is the contract value that is already agreed upon, namely Rp. 166,268,222.25.

Calculation of PV in week -1 :
PV = (%progress rencana) x BAC
= (28,66%) x Rp. 166.268.222,25
= Rp. 47.652.472
Calculation of PV in week -2 :
PV = (%progress rencana) x BAC
= (45,03%) x Rp. 166.268.222,25
= Rp. 74.870.580
Calculation of PV in week -3 :
PV = (%progress rencana) x BAC
= (58,99%) x Rp. 166.268.222,25
= Rp. 98.081.624
Calculation of PV in week -4 :
PV = (%progress rencana) x BAC

= (100%) x Rp. 166.268.222,25
= Rp. 166.268.222

2. Earned Value (EV) Calculation

The calculation of earned value obtained from the actual weights per week% multiplied by the actual budget cost (BAC).

Calculation of EV week -1
EV = (%progress aktual) x BAC
= (29,74%) x Rp. 166.268.222,25
= Rp. 49.448.169

Calculation of EV week -2
EV = (%progress aktual) x BAC
= (44,85%) x Rp. 166.268.222,25
= Rp. 74.571.298

Calculation of EV week -3
EV = (%progress aktual) x BAC
= (58,42%) x Rp. 166.268.222,25
= Rp. 97.133.895

Calculation of EV week -4
EV = (%progress aktual) x BAC
= (100%) x Rp. 166.268.222,25
= Rp. 166.268.222,25

3. Cost Variance (CV) Analysis and Schedule Variance (SV) Analysis

Analysis of the variants consists of Cost Variance (CV), and Schedule Variance (SV). CV indicates whether project spending smaller or bigger budget than he should, while SV indicates whether the project is faster or slower than the schedule.

The calculation of CV and SV week -1
CV = EV - AC
= Rp.49.448.169 – Rp.49.448.169
= Rp. 0
SV = EV – PV
= Rp. 49.448.169 – Rp. 47.652.472
= Rp. 1.795.697
The calculation of CV and SV week -2
CV = EV - AC
= Rp. 74.571.298 – Rp. 74.571.298
= Rp. 0
SV = EV – PV
= Rp. 74.571.298 – Rp. 74.870.580
= Rp. -299.282
The calculation of CV and SV week -3
CV = EV - AC
= Rp. 97.133.895 – Rp. 97.133.895
= Rp. 0
SV = EV – PV
= Rp. 97.133.895 – Rp. 98.081.624
= Rp. -947.729
The calculation of CV and SV week -4
CV = EV - AC
=Rp.166.268.222,25-Rp.166.268.222,25
= Rp. 0
SV = EV – PV
=Rp.166.268.222,25–Rp.166.268.222,25
= Rp. 0

4. Performance Index Analysis

Analysis of the index consists of a Schedule Performance Index (SPI) and Cost Performance (CPI).

Following the results of the calculation of the Cost Performance Index (CPI) and Schedule Performance Index (SPI).

Calculation of the CPI and SPI week -1
CPI = EV/AC
= Rp. 49.448.169 / Rp. 49.448.169
= 1
SPI = EV / PV
= Rp. 49.448.169 / Rp. 47.652.472
= 1,03
Calculation of the CPI and SPI week -2
CPI = Rp. 74.571.298 / Rp. 74.571.298
= 1
SPI = Rp. 74.571.298 / Rp. 74.870.580
= 0,99
Calculation of the CPI and SPI week -3
CPI = Rp. 97.133.895 / Rp. 97.133.895
= 1
SPI = Rp. 97.133.895 / Rp. 98.081.624
= 0,99
Calculation of the CPI and SPI week -4
CPI=Rp. 166.268.222,25 / Rp. 166.268.222,25
= 1
SPI=Rp. 166.268.222,25 / Rp. 166.268.222,25
= 1

5. estimate actual cost (EAC) dan estimate time to complete (ETC)

Following is the result of the calculation of the Estimate of the Actual Cost (EAC) and the Estimate Time to Complete (ETC)

EAC & ETC in week -1
EAC = BAC/CPI
= 166.268.222,25/1
= 166.268.222,25
ETC = OTE/SPI
= 28/1,03
= 27,18 = 28

EAC & ETC in week -2
EAC = BAC/CPI
= 166.268.222,25/1

= 166.268.222,25
ETC = OTE/SPI
= 28/0,99
= 28,28 = 29

EAC & ETC in week -3
EAC = BAC/CPI
= 166.268.222,25/1
= 166.268.222,25
ETC = OTE/SPI
= 28/0,99
= 28,28 = 29

EAC & ETC in week -4
EAC = BAC/CPI
= 166.268.222,25/1
= 166.268.222,25
ETC = OTE/SPI
= 28/1
= 28

6. Results Of The Analysis Methods Of EVM

Based on the results of the analysis of variants, indices and estimate, then the obtained results recap table analysis method of EVM as Table 7. The Results Of The Analysis Method Of EVM.

Table 7. The Results Analysis Method Of EVM.

Minggu ke-	Analisa Varian		Analisa Indeks Kerja		Analisa Estimasi	
	Waktu	Biaya	Waktu	Biaya	Waktu	Biaya
	SV (Rp)	CV (Rp)	SPI	CPI	ETC (Hari)	EAC (Rp)
1	1.795.697	0	1,03	1	28	166.268.222,25
2	-299.282	0	0,99	1	29	166.268.222,25
3	-947.729	0	0,99	1	29	166.268.222,25
4	0	0	1	1	28	166.268.222,25

From the results of the analysis method using EVM first week working time-based index gain 1.03 or value > 1, this indicates that the job exceeded the planned target, being right on week 2 and 3, the performance of the project rated bad because of the time the workmanship exceed planned time perminggunya but does not exceed the overall time. On week 4, when the work has been returned with the appropriate planning and overall it can be concluded that the project is not experiencing delays and costs (CPI) issued equal the total budget (BAC) Rp. 166.268.222.25 showed costs incurred in accordance with the planned.

2.3 Project Risk Management Analysis

Project risk management is a very important activity to do when going to work on a project. Project risk management serves to identify the likelihood of the risk happening when the project progresses to later dealt so as not to lead to shortages or even failure of the project. The following are the stages for identifying risks and responses using Expected Monetary Value (EMV).

1. Risk Identification

Identification of Risks namely recognizing the risks that can occur when the project is underway. This identification process is done using interviews with the technical person in charge. The results of the analysis of the identification of the risks has been done can be seen in table 8 the identification of risks.

Table 8. the identification of risks.

Kode Risiko	Deskripsi Risiko
1	Jadwal tidak sesuai dengan rencana
2	Biaya tidak sesuai dengan rencana
3	Pekerja yang sakit
4	Peralatan rusak
5	Bencana Alam (Longsor, Hujan, dll)
6	Kecelakaan kerja

2. Risk Assesment

The granting of the value of the probability and the consequences of each Risk is carried out by discussing with parties of the company, i.e. with the person in charge of technical CV. ORIZA SATIVA.

The value of EMV positive value indicates the opportunities, while negative EMV showed the threat or threats which may be detrimental to the company. EMV is calculated by multiplying the value of the probability of how each Risk multiplied by the likelihood of money spent when the risk occurs with the formula

EMV = Probabilitas x Konsekuensi

EMV : The money is expected when the risk occurs
Probabilitas : The value of the percentage likelihood of Ris
Konsekuensi : The value of the impact posed a risk of.

The following is a table of assessment calculations as shown in table 9. Assessment of risk

Table 9. Assessment of risk

Kode Risiko	Probabilitas (%)	Konsekuensi (Rp)	EMV
1	50	(-5.000.000)	-2.500.000
2	50	(-5.000.000)	-2.500.000
3	10	(-2.000.000)	-200.000
4	25	(-2.000.000)	-500.000
5	20	(-1.000.000)	-200.000
6	50	(-1.000.000)	-500.000
Total			-6.400.000

Negative numbers (-6.4 million) showed that there was a threat when the projects in progress, the company must issue and suggested the money amounting to Rp. 6.4 million to deal with the risks that may occur.

3. Risk Handling

From the results of the risk assessment has been done before, that Risk code 1 and 2 respectively have the same probability that is 50% of the respective consequences of (-5 million) and obtained the handling of kuantitatifnya (Risk- 2.5 million) Risk codes 3 and 4 have the same consequences are (-2 million) but the probability is different that is 10% and 25%, likewise with the code Risks similar consequences 5 and 6 respectively (-1 million) but with different probabilities i.e. 20% and 50%, so that the obtained results of the quantitative Risk handling kumulatip registration (-6.4 million). Next risk mitigation done or actions based on qualitative Risk handling. Action handling to each Risk can be seen in table 10. Handling Risks.

Table 10. Handling Risks

Kode Risiko	Deskripsi Risiko	Penanganan Risiko
1	Jadwal tidak sesuai dengan rencana	Memaksimalkan pengawasan dilapangan dengan sering datangnya ke lapangan, tidak terpaku pada mandor. Dan nilai penanganan Kuantitatif risiko sebesar (-2.500.000)
2	Biaya tidak sesuai dengan rencana	Selalu mengecek biaya yang dikeluarkan dari minggu ke minggu, hari ke hari untuk mengetahui biaya apa saja yang sudah dikeluarkan dan menekan biaya pengeluaran supaya mengurangi biaya yang kurang efektif. Dan nilai penanganan risiko Kuantitatif sebesar (-2.500.000)
3	Pekerja yang sakit	Memanfaatkan pekerja yang ada dan jika pekerjaan nya tidak tertangani oleh pekerja yang ada, rekrut pekerja baru menjadi pilihan terakhir yang keahliannya sama dengan pekerja yang sakit tersebut. Dan nilai penanganan risiko Kuantitatif sebesar (-200.000)
4	Peralatan rusak	dicoba untuk diperbaiki, kalau tidak bisa mencari penyewaan alat yang sama atau membeli jika biaya memungkinkan. Dan nilai penanganan risiko Kuantitatif sebesar (-500.000)
5	Bencana alam(Longsor, Hujan, dll)	Jika memungkinkan dilanjutkan, jika tidak, mengganti hari untuk pekerjaan yang belum selesai. Dan nilai penanganan risiko Kuantitatif sebesar (-200.000)
6	Kecelakaan kerja	Selalu dingatkan untuk menggunakan alat pengaman kerja. Dan nilai penanganan risiko Kuantitatif sebesar (-500.000)

3. End

Results from research that has been done, the conclusion that the application of project management information system on CV. ORIZA SATIVA built enough help managing the field in making the daily schedule of the project, as well as help the technical person in charge in supervising the progress of the project and in managing risks.

There are some suggestions that can be made for application development project management information systems, among other things:

1. Add a calculation of the number of workers needed in estimation of each project..

2. Add calculations automatically the amount of material needed in every project.

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