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Lessons Learned: the Multi-Project Scheduling of Network Development for Local District Office using Critical Chain Method in Bojonegoro

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Abstract— Bojonegoro was chosen to represent Indonesia as Open Government Partnership (OGP) piloting area. To realize the program, Bojonegoro had created one of the OGP programs, the installation of network devices in the district and village areas. The project was implemented for 70 days, but there were some problems in work process. The projects gained obstruction such as limited time, resources, and uncertain models. Using the critical chain project management (CCPM) method, this research discovered the right model for point-to-point (P2P) project in a central tower as the meeting point of a wide area network (WAN). The researcher compiled two models for the model of P2P project development namely single-line activity, and multi-ring activity. Data was processed based on the results document and the results of interviews from several sources where it contains scheduling, type of transmitter, and the required resources. From the result and discuss finding, the right model used for the P2P project was multi-ring use which in terms of duration there was a buffer time difference of 11 days so that it takes 59 days while single-line takes 62 days from the time prediction for 70 days. And then in terms of resource note that the value of fluctuation for multi-ring is lower so that with this model the necessary resources can work quickly compared with the model of single-line activity.

Keywords—Lessons Learned, Multi-Project Scheduling, Critical Chain Project Management.

I. INTRODUCTION

Bojonegoro district was chosen to represent Indonesia as Open Government Partnership (OGP) area. Bojonegoro is one of the areas that was successfully implemented OGP directly, one of them manifested through activities held every week namely "Sobo Pendopo". By involving The Communications and Information Official Department as a coordinator and several local agencies involved in OGP development activities to realize the designed project for the district and village.

The initial development phase of the OGP program in Bojonegoro was to undertake a development project at the sub-district level covered 28 sub-districts in three collocation towers. One village and one point as the center were at Kominfo Building itself (33 points total). From the result of the interviews that had been conducted on May 26, 2017, with the Head of Information Technology Kominfo as PPK stated that the project was announced to be completed when all network devices at each point of the sub-district or village had been connected to the center point or Kominfo Building. The researcher's position in this study was as a technical consultant so that the resource data derived from the project reports and the findings in the field which were neutral to both, contractor and project owner.

From the planners only provided the Terms of Reference (KAK) to the contractor containing the technical features of the device to be installed. Whereas, the project was implemented simultaneously in collective stage at some point without generating lag time/buffer time. This terms of reference cannot be used by contractors as a guiding to the working project because it did not cover priority scale and job reference. From this description, this study aims to overcome the problem of scheduling project by analyzing the data that derived from parametric bottom-up estimates.

Critical Chain Project Management (CCPM) was presented by Dr. Elliyahu Goldratt in 1997. The CCPM method is implemented by collecting data schedule and the sum of labors and all resources equipment used. The first step in planning the project schedule based on the CCPM method was to move buffering time to the end of each job from the end of the project. Then to move the non-urgent work in the end. Using this method, we compared the CCPM method singleline and multiring. Singleline is a gradual execution of a project in one line when completed in the line one move to the next line. Whereas multiring is the work on the closest radius points to the center so that when worked well then proceed to the next point.

The research was done after the completed project so that this study is lessons learned where evaluating the activities that have been implemented in order to be a reference for project scheduling or further research. This study was entitled "The Multi-Project Scheduling of Network Development for Local District Office Using Critical Chain Method in Bojonegoro". The research was done by applying priority scheduling by comparing single-line and multi-ring models to find out the precise model used in the point-to-point project (P2P).

II. LITERATURE REVIEW

Research has done after the project was done, then the data was processed and presented derived from the field findings using the parametric technique. Activities include procurement & logistic delivery, installation of the master tower, foundation and spander installation of tower triangle installation, LED running text installation, P2P radio installation and configuration, router installation and configuration, and installation of wireless access point configuration at 33 points spread over village area district in Bojonegoro District.

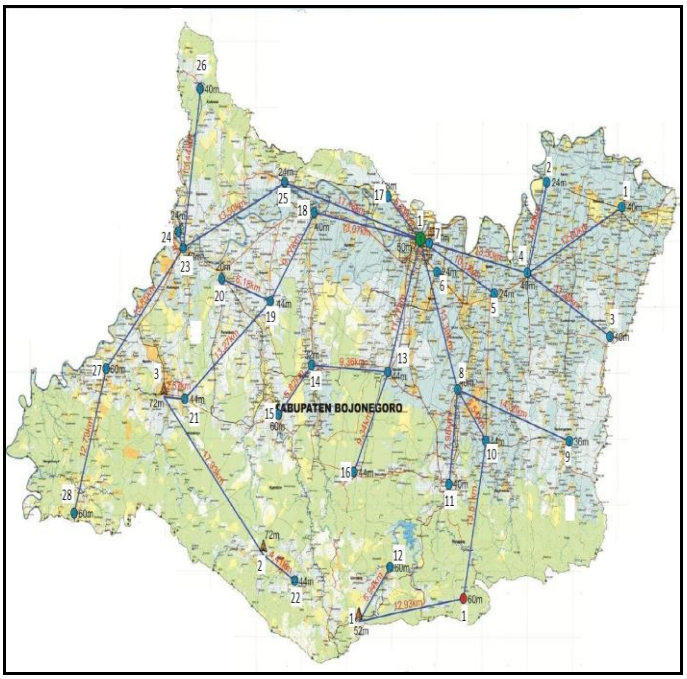

Figure 1. Point-to-Point (P2P) Location Mapping.

A. Clarification of the Transmitter

Different types and elements of the transmitter tower affect the variation and duration of activity as well as resource and duration of the project. Viewed of the transmitter type is distinguished by its structural and placement. The structural condition consists of two type namely self-supporting and guyed tower.

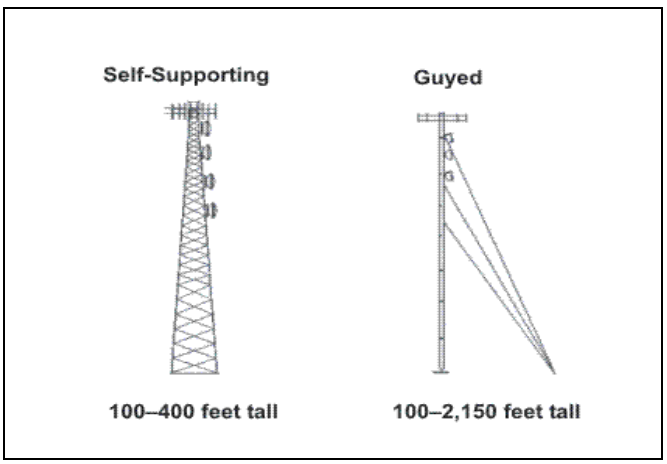

Figure 2. Structural Condition of Tower

In terms of placement consists of Greenfield tower and rooftop tower. A Greenfield is the placement of the direct transmitter above the ground whereas a Rooftop builds transmitter on top of a building.

B. Project Management

The main challenge in a project was to achieve project objectives and it was aware of the limits previously understood. These limitations were like the scope of work, the time of work, and the working budget. Therefore, the project had to be well-defined to run as expected. To achieve the objectives of a project development, it was important to note about the project management itself. The steps in the project lifecycle were shown in Figure 3 below.

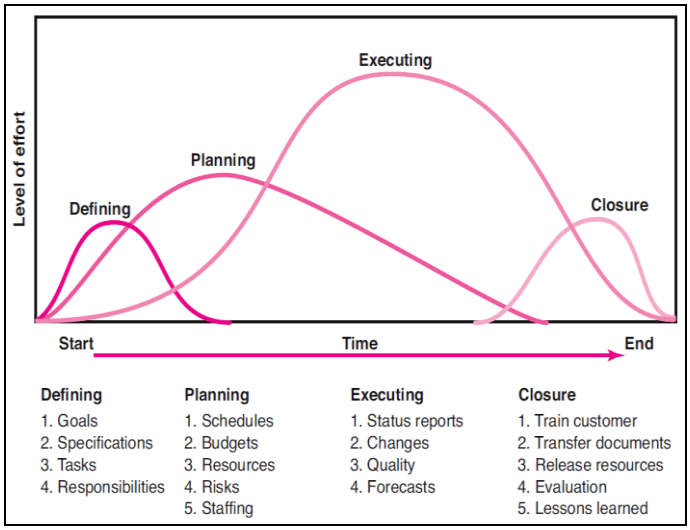

Figure 3. Project Life Cycle

Research position at the phase where the project had been done/closing stage. There were two last stages in closing stage namely evaluation and lesson learned. In the evaluation stage was to re-evaluate the final results of work. This stage was done by the internal team that had been described in the previous preliminary chapter and executed with the results of the BAST event news. Therefore, the research conducted related to lessons learned which will address the problems.

C. Work Breakdown Structure

The process of dividing the work towards smaller work elements and details were arranged in a top-down hierarchy. The purpose of using a work breakdown structure (WBS) was to facilitate in terms of time estimation, cost, and to provide the desired achievement of work information. Integrating WBS with the organization breakdown structure would facilitate the division of labors, responsibility (responsibility), allocation resource and coordination between functional projects.

The work package is the smallest element of WBS, integrated with the organization breakdown structure and gaining information about the activities undertaken, the start-end time of the work, the budget estimation of each work, the resources needed to perform the work, the responsible work, and the objectives to be achieved to facilitate progress monitoring.

D. Method of Scheduling Critical Chain

In scheduling, there were two things to watch out for, firstly how to prioritize activity and resource allocation, secondly how to cope uncertainly. In the critical chain, the priority of activities and resource allocation was done by the theory of constraint. While for uncertainty activity done by the approach of common cause variation.

E. Critical Chain Buffer

Slack, in the critical chain accumulates in the buffer, so that each work was completed immediately after the predecessor activity was completed. Job delays will lead to reduced buffer time, whereas early activity completion will increase buffer time. This will facilitate project control and monitoring as not only the project manager focused on buffer consumption, but also on any critical activity.

F. Buffer Type

There are two types of buffers used in relation to delay protection that occurred in the project and critical chain work. The distinguishing attributed of each buffer is the number, location of placement, ambiguity, and size. Here are a picture and explanation of the buffer type

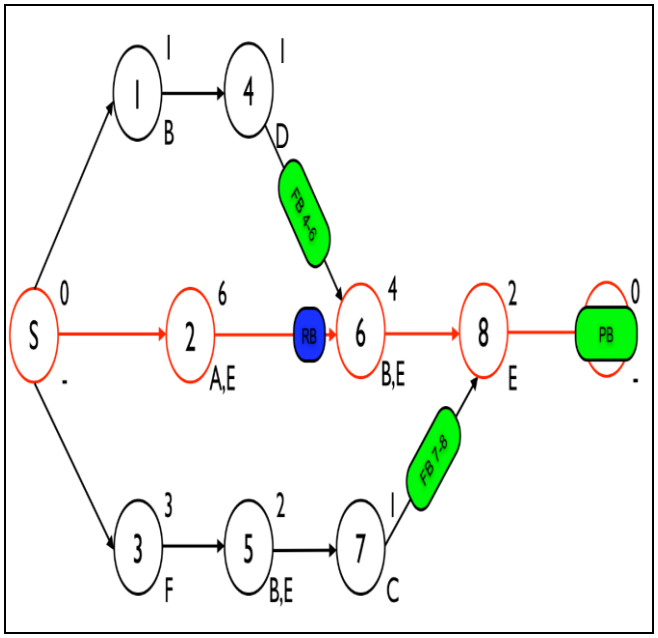

Figure 4. Buffer Type in Critical Chain

The single buffer works for the protection against project delay due to delays that occur in the critical path. Usually added to the last activity with project deadline time. Delays in trajectory critical will reduce the project buffer. On the contrary, the completion of earlier activities will add project buffer. Multiple buffers that serve to protect against delays that occur in critical activities due to the feeding chain, where feeding chain is a sequence of non-critical activities attached to the critical path.

G. Multi-Project Scheduling

Multi-project scheduling was based on single project activity. Here was the topology of the single project and multi-project.

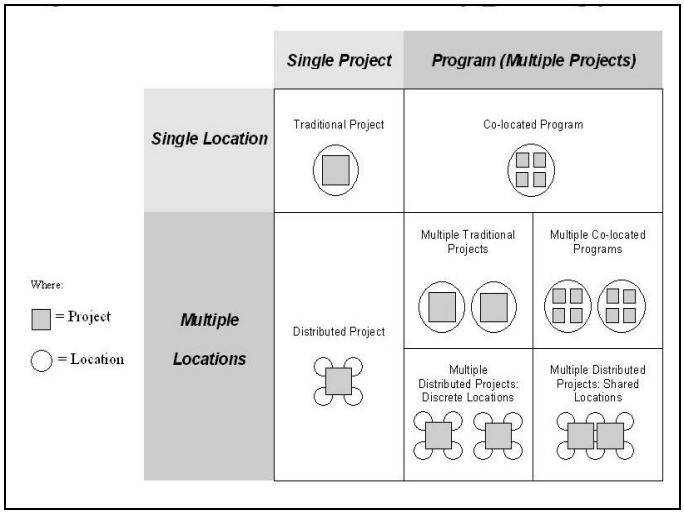

Figure 5. Topology Project Management

In multiple traditional projects, each project was done using the same resource, at the same time but having a different location. Resource used for project work had been determined amount and placement at each location.

III. RESULTS AND DISCUSSION

The methodological steps of this research are as follows:

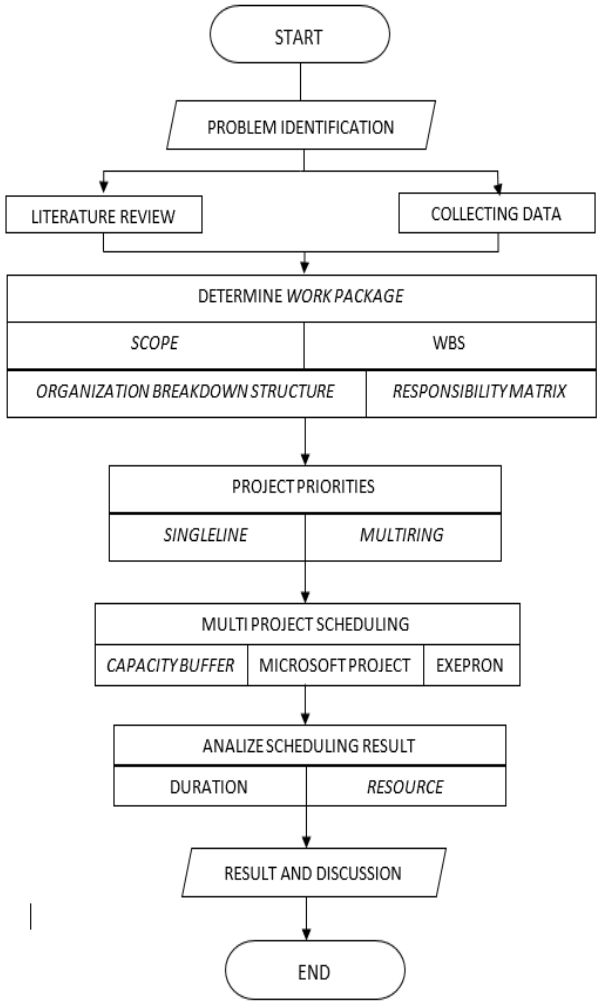

Figure 6. Methodology Flowchart

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H. Determination of Work Package

Scope determination, work breakdown structure (WBS), organization breakdown structure, and responsibility matrix are obtained from data collection analysis. One of the first steps to determine WBS is to determine organizational stress and ideal resource availability.

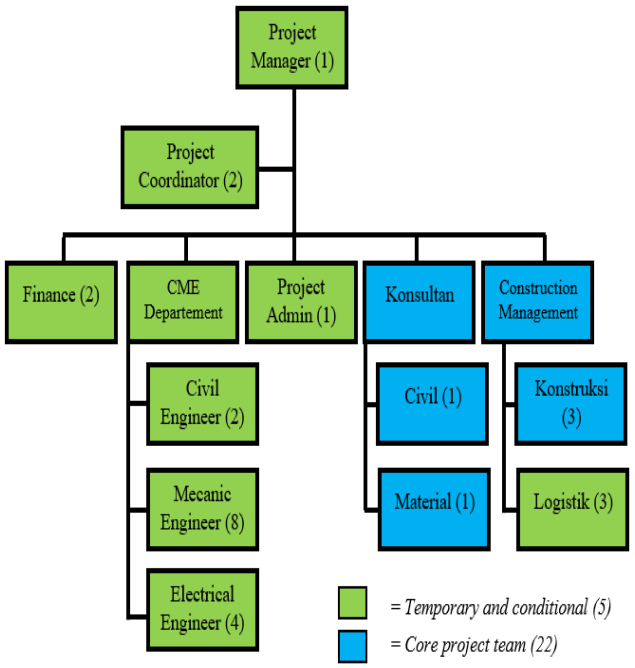

Figure 7. Organization Structure

The division of organizational structure based on the core project team and temporary aims to anticipate the resource needs due to the turn projects such as project location changes. Work breakdown structure (WBS) is done based on job report document which has added job specifications about activity at each level of WBS. Hereafter arranged chronological activity and estimated duration based on the necessary resource from each activity is determined resource responsible for each activity by determining the responsibility matrix.

The work package is a component of the project network. The information on the work package is derived from milestones and deliverables, work breakdown structure, and responsibility matrix. Then determined the work package based on the type of transmitter type.

I. Transmission Development Priorities

The duration of each transmitter is processed based on the work package and with the help of software, Exepron can be known the buffer time at each point to get the critical point of workmanship at each point.

a). District Network Point

The scheduling results at the sub-district point are as follows:

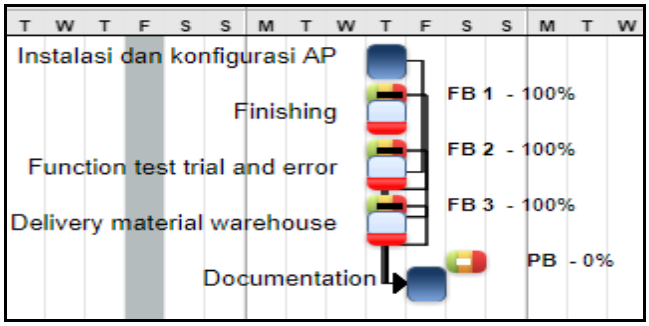

Figure 8. Result of Local District Point Scheduling

And got information at the sub-district point are as follows:

Kantor kecamatan	*Value*
Jumlah *tasks*	5
Durasi proyek	3 hari
Durasi *critical chain*	2 hari
Durasi PB	1 hari
Durasi FB 1, FB 2, FB 3	1 hari

Catatan : PB = *Project Buffer*, FB = *Feeding Buffer*

Figure 9. Schedule Information of Local District Point

There is FB which is a series of work packages performed simultaneously with AP installation shown with FB 1, FB 2, FB 3 with 100% percent and marked with red color in table chart.

b). New Mini Tower

The duration of the new mini tower scheduling applies to all of the transmitter points. Here is the scheduling of the new mini transmitter.

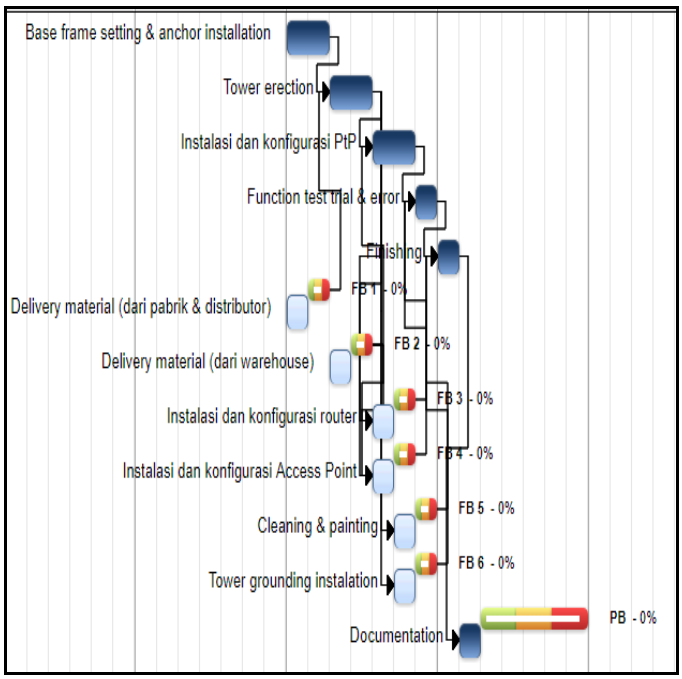

Figure 10. Result of in New Mini Tower Scheduling

New Mini guyed tower scheduling results were derived new as follows:

Mini tower baru	***Value***
Jumlah *tasks*	12
Durasi proyek	14 hari
Durasi *critical chain*	9 hari
Durasi PB	5 hari
Durasi FB 1	1 hari
Durasi FB 2	1 hari
Durasi FB 3	1 hari
Durasi FB 4	1 hari
Durasi FB 5	1 hari
Durasi FB 6	1 hari

Catatan : PB = *Project Buffer*, FB = *Feeding Buffer*

Figure 11. Information on the Results of Mini New Tower Scheduling

Cross-critical duration is 9 days from the number of tasks namely 12 types of tasks. There are 6 feeding buffers (FBs) that are marked with a color mark beside a feeding chain which means that FB can be done along with cross-critical activities.

c). Mini Tower Existing

Mini tower scheduling results were obtained existing as follows.

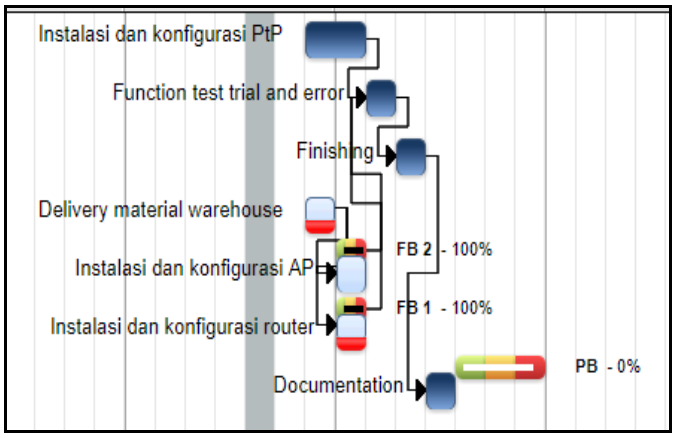

Figure 12. Results of Mini Tower Existing Scheduling

Obtained information as follows:

Mini tower *existing*	***Value***
Jumlah *tasks*	7
Durasi proyek	8 hari
Durasi *critical chain*	5 hari
Durasi PB	3 hari
Durasi FB 1	1 hari
Durasi FB 2	1 hari

Catatan : PB = *Project Buffer*, FB = *Feeding Buffer*

Figure 13. Scheduling results of Existing Mini Towers

d). Collocation

Collocation in the project is the provider's transmitter. Use of collective transmitter because the location point from the transmitter to the receiver is blocked by the landscape and difficult to build a new transmitter. Here's the scheduling result on the collocation transmitter.

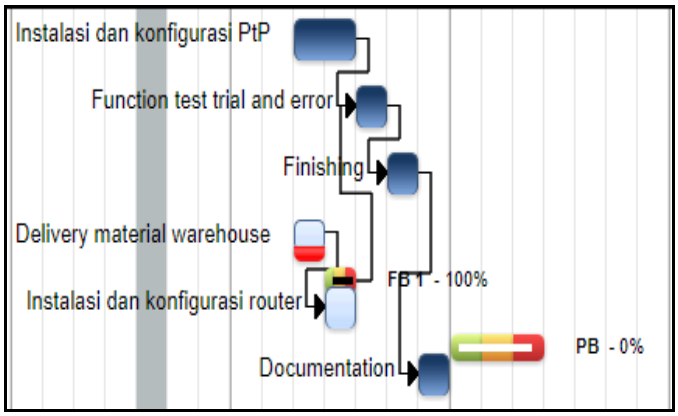

Figure 14. Collocation scheduling results

From the above scheduling results obtained the following results.

Collocation	***Value***
Jumlah *tasks*	6
Durasi proyek	8 hari
Durasi *critical chain*	5 hari
Durasi PB	3 hari
Durasi FB 1	1 hari

Catatan : PB = *Project Buffer*, FB = *Feeding Buffer*

Figure 15. Information on Collocation Scheduling Results

As with existing towers, cross-critical collocation also indicates that the network installation activity in collocation is a gradual activity and it must be ensured that the work is completed before the next work will be done.

e). Tower Center

Unlike other transmitters, the camouflage tower has a rooftop type where the transmitting location is in the roof/building. Here are the scheduling results in the central tower.

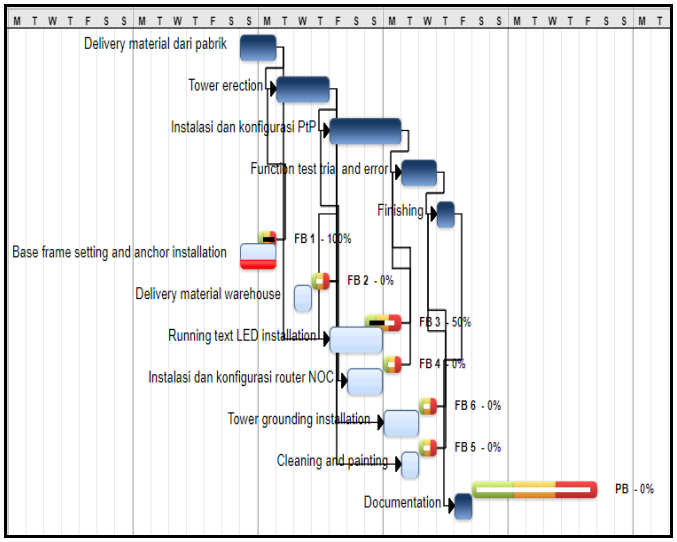

Figure 16. Central Tower Scheduling Results

Here is the information obtained from the central tower scheduling results.

Tower Pusat	*Value*
Jumlah *tasks*	12
Durasi proyek	20 hari
Durasi *critical chain*	13 hari
Durasi PB	7 hari
Durasi FB 1	2 hari
Durasi FB 2	1 hari
Durasi FB 3	3 hari
Durasi FB 4	2 hari
Durasi FB 5	1 hari
Durasi FB 6	2 hari

Catatan : PB = *Project Buffer*, FB = *Feeding Buffer*

Figure 17. Information on Central Tower Scheduling Results

There is a 100% feeding buffer on the baseframe installation this shows the activity is done in conjunction with the delivery activity which has the same successor in the tower erection. Both of these activities are very important because they affect each other against the continuity of the project across the critical.

J. Location and Priority of the Transmitter

Figure 1 shows the location map of the 33 transmitters to be installed. From the picture indicates the line connecting the connection P2P from one location to another location. This research developed two models of singleline activity and multiring activity. Single-line is used by completing a single line from the center to the end of the transmitter line, which aims to allow the network path to be completed one way at a time. Whereas multiring is indicated central transmitter as the core of a circle. This model is developed by working on the activity starting from the center then if it has been continued in the spreading of the next path.

a). Singleline Activity

Here is a description of the transmitter work activity route in the development of the sub-district network if done according to the transmitter or workflow in singleline.

- Activity 1: (1)NOC → (6)Kapas, (1)NOC → (7)Bojonegoro (This line does not require wireless transmitter tower because there is fiber optic network), (1)NOC → (5)Balen, (1)NOC → (17) Trucuk
- Activity 2: (1)NOC → (4)Sumberejo → (2)Kanor, (4)Sumberejo → (1)Baureno, (4)Sumberejo → (3)Kepohbaru
- Activity 3: (1) NOC → (8)Sukosewu → (9)Kedungadem, (8)Sukosewu → (11)Temayang, (8)Sukosewu → (10)Sugihwaras → (1)Soko → (1) BTS Gondang → (12)Gondang.
- Activity 4: (1)NOC → (13)Dander → (16)Bubulan, (13)Dander → (14)Ngasem → (15)Ngambon
- Activity 5: (1)NOC → (18)Kalitidu → (19)Gayam → (20)Purwosari, (19)Gayam → (21)Tambakrejo → (3)BTS Tambakrejo → (2) BTS Sekar (22)Sekar
- Activity 6: (1)NOC → (25)Malo → (23)Padangan → (26).Kedewan, (23)Padangan → (24)Kasiman, (23)Padangan → (27)Ngraho → (28)Margomulyo

b). Multiring Activity

From the results of multiring surveys conducted by determining the nearest point of the district point with the network flow from the NOC. The following activities if using multiring activity.

- Activity 1: (1)NOC → (6)Kapas, (1)NOC → (7)Bojonegoro (This line does not require wireless transmitter tower because fiber optic network is installed), (1)NOC → (5)Balen, (1)NOC → (17)Trucuk
- Activity 2: (4)Sumberejo, (8)Sukosewu, (13)Dander, (18)Kalitidu, (25)Malo
- Activity 3: (2)Kanor, (1)Baureno, (3)Kepohbaru, (9)Kedungadem, (10)Sugihwaras, (11)Temayang, (16)Bubulan, (14)Ngasem, (15)Ngambon, (19)Gayam, (20)Purwosari, (23)Padangan
- Activity 4: (1)Soko, Temayang, (21)Tambakrejo, (24)Kasiman, (26)Kedewan, (27)Ngraho, (28)Margomulyo
- Activity 5: (1)BTS Gondang, (12)Gondang, (3)Tambakrejo, (2)BTS Sekar, (22)Sekar

There are 5 activities to complete from the multiring model. The collection and selection of the location of each activity based on consideration of the priority workmanship when using the multiring model.

K. Multiproject Scheduling

Scheduling is done by sorting out a single project and then assigned a work packet. Work packages are arranged at each sub-district point or transmitting installation location. Next, determine the point of the transmitter location based on the transmitter type as a reference for making the activity scheduling using MS project.

- District office point: Bojonegoro and Kapas
- New mini tower: Gondang, Kedungadem, Ngraho, Temayang, Soko Temayang, Sekar
- Existing mini tower: Balen, Baureno, Bubulan, Dander, Gayam, Kalitidu, Kanor, Kasiman, Kedewan, Kepohbaru, Malo, Margomulyo, Ngambon, Ngasem, Padangan, Purwosari, Sugihwaras, Sukosewu, Sumberejo, Tambakrejo, Trucuk
- Collocation: BTS Gondang, Sekar BTS, BTS Tambakrejo
- Tower Center: Regency Secretariat Building (Main Tower)

Scheduling retrieves data from the scheduling results of each type of transmitter that has been processed using experon software and based on the type of transmitter at each location. Chronology and sequence of activities adjusted to previous exepron scheduling results. The time duration of each activity performed is already specified in exepron so there is no need to change the duration of time within MS Project.

L. Multiproject Scheduling

Multi-project scheduling is done based on single project scheduling and capacity buffer. Based on the model of planned scheduling there are two models namely singleline and multiring. The resource is determined based on data that has been obtained and used in accordance with the responsibility matrix in the work package shown in the following figure.

Resource Name	Type	Initials	Max Units
Project Manager	Work	R1	100%
Project Coordinator	Work	R2	200%
Finance	Work	R3	200%
Civil Engineer	Work	R4	200%
Mechanic Engineer	Work	R5	800%
Electric Engineer	Work	R6	400%
Project Admin	Work	R7	100%
Konsultan Material	Work	R8	100%
Konsultan Civil	Work	R9	100%
Konstruksi	Work	R10	300%
Logistik	Work	R11	300%

Figure 18. Resource used in MS Project

There is a percentage of units where the work weights in each resource on each milestone. So the resource can do more than one milestone at a time.

M. Multi-project Scheduling Results

From the result of single project processing and known critical chain and feeding buffer then proceed multi-project scheduling. From multi-project scheduling, it is known that the result of two models, namely singleline and multiring activity as follows.

a). Singleline Activity

From singleline scheduling, we get the following result data.

Task Name	Duration
Single Line Activity	70 days
Initiation and Planning	28 days
Execution	45 days
Closing	15 days
Project Buffer	8 days

Figure 19. Recapitulation of Singleline Activity Scheduling Results.

From the above data it is known that the total duration of work for 62 days so that there are 8 days remaining and has a critical cross of 33 activities.

b). Multiring Activity

In multiring scheduling, the following results are obtained.

Task Name	Duration
Multi Ring Activity	70 days
Initiation & Planning	28 days
Execution	43 days
Closing	15 days
Project Buffer	11 days

Figure 20. Recapitulation of Multiring Activity Scheduling Results.

Multi-project multi-project scheduling shows the duration required to complete the project is 59 days so that the remaining 11 days work. In the multiring model has a critical cross of 50 activities.

N. Scheduling Duration

Here is the scheduling result of singleline and multiring activity.

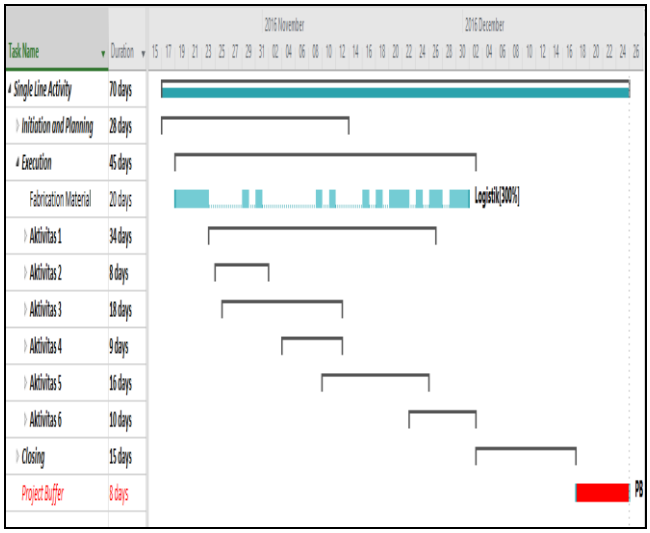

Figure 21. Scheduling Results of Singleline Activity

From the scheduling results derived data as follows:

Task Name	Durasi (*days*)	*Start*	*Finish*
Initiation & Planning	9	17-Okt-16	26-Okt-16
Fabrication Material	20	19-Okt-16	1-Des-16
Aktivitas 1	34	24-Okt-16	26-Nop-16
Aktivitas 2	8	25-Okt-16	1-Nop-16
Aktivitas 3	18	26-Okt-16	12-Nop-16
Aktivitas 4	9	4-Nop-16	12-Nop-16
Aktivitas 5	16	10-Nop-16	25-Nop-16
Aktivitas 6	10	23-Nop-16	2-Des-16
Closing	15	3-Des-16	17-Des-16

Figure 22. Scheduling Activities on Singleline

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In each activity, there is no need to wait for activity done because of work was done simultaneously.

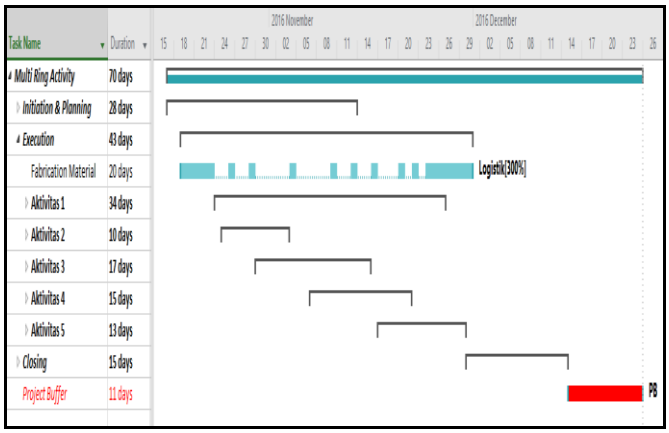

Figure 23. Scheduling Results of Multiring Activity

From the scheduling results derived data as follows:

Task Name	Durasi (*days*)	*Start*	*Finish*
Initiation & Planning	9	17-Okt-16	26-Okt-16
Fabrication Material	20	19-Okt-16	30-Nop-16
Aktivitas 1	34	24-Okt-16	26-Nop-16
Aktivitas 2	10	25-Okt-16	3-Nop-16
Aktivitas 3	17	30-Okt-16	15-Nop-16
Aktivitas 4	15	7-Nop-16	21-Nop-16
Aktivitas 5	13	17-Nop-16	29-Nop-16
Closing	15	30-Nop-16	14-Des-16

Figure 24. Scheduling Activities in Multiring

Activities in each model have different routes that affect the resources and activities. With regard to feeding chain and feeding, the buffer can minimize the occurrence of the crash between other activities. The final result of the comparison of the scheduling of both models is the remaining duration of the work namely on the singleline model left 8 days while multiring 11 days remaining duration of work.

O. Resource Allocation

Resource allocation using auto leveling in MS project shows simultaneous project work activities do not affect activity and useful resource to available resource. This can be known from the number of resources used do not exceed the number of resources available. The following is the recapitulation result for resource usage which takes into account the following conditions.

- The available resource is a resource that is available during the activity execution timeframe. The start and end dates of activity execution for each resource are shown in the start and finish columns while the duration of work is shown on the bar chart label.
- Resource usage is the number of resources used during the execution of the activity. Resource fluctuation is a different available resource with resource usage.

Resource	Jumlah	*Available Resource*	*Resource usage*	Fluktuasi
Civil Engineer	2	60	28	32
Electrical Engineer	4	116	25	91
Finance	2	2	2	0
Konstruksi	3	93	63	30
Konsultan Civil	1	14	14	0
Konsultan Material	1	2	2	0
Logistik	3	141	106	35
Mechanic Engineer	8	304	126	178
Project Admin	1	60	14	46
Project Coordinator	2	86	24	62

Figure 25. Recapitulation of Resources on Singleline Activity

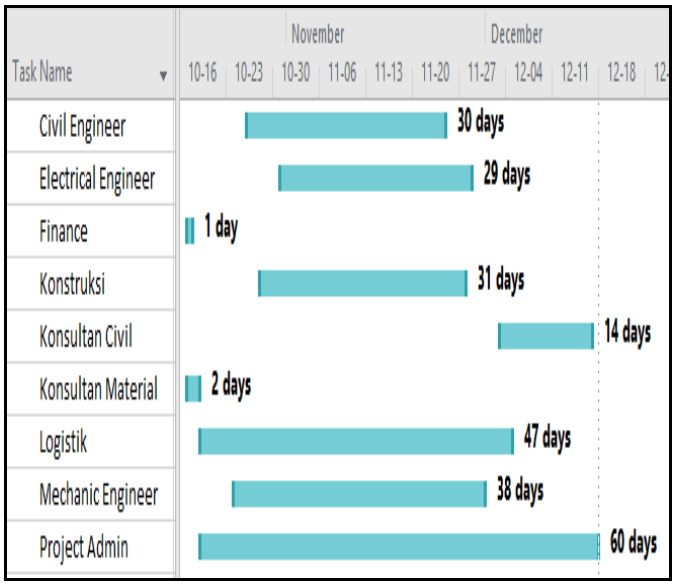

Figure 26. Recapitulation of Resource use Singleline Activity

Resource	Jumlah	*Available Resource*	*Resource usage*	Fluktuasi
Civil Engineer	2	44	24	20
Electrical Engineer	4	84	23	61
Finance	2	2	2	0
Konstruksi	3	72	54	18
Konsultan Civil	1	14	14	0
Konsultan Material	1	2	2	0
Logistik	3	132	102	30
Mechanic Engineer	8	280	225	55
Project Admin	1	57	25	32
Project Coordinator	2	80	36	44

Figure 27. Recapitulation of Resources in Multiring Activity

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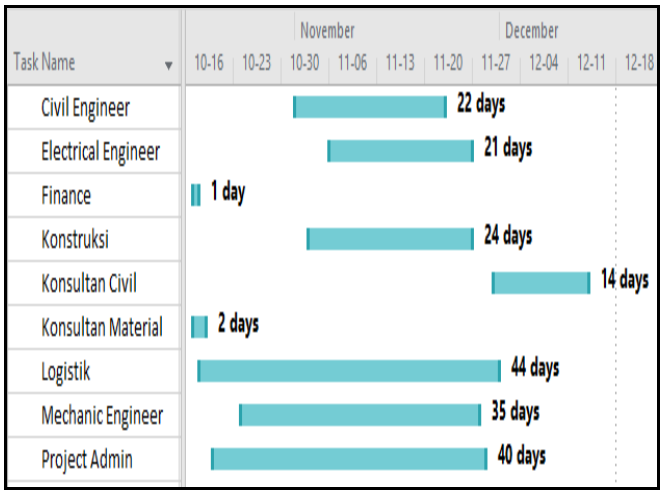

Figure 28. Recapitulation of Resource Usage Multiring Activity

By paying attention to the recapitulation table resource indicates some resource has fluctuation. The higher the fluctuation value of a resource the more delay activity.

Resource		Fluktuasi	
	Jumlah	*Singleline*	*Multiring*
Civil Engineer	2	32	20
Electrical Engineer	4	91	61
Finance	2	0	0
Konstruksi	3	30	18
Konsultan Civil	1	0	0
Konsultan Material	1	0	0
Logistik	3	35	30
Mechanic Engineer	8	178	55
Project Admin	1	46	32
Project Coordinator	2	62	44

Figure 29. Comparison of Fluctuations Between Singline and Multiring

The above data indicates that resource fluctuations in the singleline activity are larger than the multilevel so that compaction is allocated more optimal resources used in multiring rather than singleline models.

P. Scheduling Analysis

Based on the scheduling duration of either singleline or multiring shows the difference in the duration of work. The singleline the duration of work is 62 days and multiring is 59 days out of a total of 70 working days. For the type of work that is simultaneously required the duration of fast work in order to minimize the occurrence of slack on the project. By using an auto-leveling resource, it can be reduced so that the work was focused on the beginning of time as Parkinson law which uses all the duration of each activity to complete the activity. Hence, non-critical activity becomes a critical activity.

In terms of resource allocation, there were fluctuations between available resources and resources used in scheduling. Fluctuations occurred because each type of transmitter had different activities that required different resource requirements. This fluctuation also shows that the higher the value indicates the delay activity that tends to increase. Thus, from the results of the comparison of fluctuations known that multiring is the more minimal value compared to singleline activity. So, in terms of resource allocation the appropriate multiring model to be used as a critical scheduling model.

Q. Discussion on Scheduling Results

From the scheduling results based on the duration and allocation of resources obtained the following results.

- Based on scheduling using singleline, the project duration is 62 days with the remaining time of 8 days while multiring has the duration of 59 days with the remaining time of 11 days.
- The amount of resources used in the project remains the same as before either after it is scheduled to use a critical chain or no scheduling process.
- Resource allocation shows smaller fluctuations in the multiring model than the singleline.
- The scheduling result is in accordance with the duration of the project development that has been allocated for 70 days of work which includes 3 the main activities are Initiation, execution, and closing and include construction in one central tower, 3 sub-district BTS, one village, and 28 districts in Bojonegoro.

IV. CONCLUSION

In this section, showing the conclusions and suggestions related to the research that has been done.

R. Conclusion

From the results of the study that has been achieved. Then it can be assumed as follows:

- The duration of project work on both models has different durations. Singleline has a duration of 62 days while multiring has a duration of 59 days. From the project duration, it can be determined that multiring has a faster duration of project execution than a singleline.
- With resource allocation got the value of rise and fall namely difference between available resource with the useful resource. Where the singleline model has greater fluctuation than multiring. So, for a more appropriate multiring resource allocation used because of more activity compaction optimal because it can minimize the delay of activity and resource.

S. Suggestions

From the conclusions can be determined that the multiring model is the right model to be applied to a network development project that has a central term and point-to-point (P2P) with multiring considerations have a fast duration and resource allocation that can optimize work both in terms of the resource itself did not experience long delays and projects that were soon resolved.

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