2.1. PROJECT MANAGEMENT NETWORK MODELS AND SOFTWARE. BASIC DEFINITIONS. GANTT CHART. INTRODUCTION TO GANTTPROJECT SOFTWARE.

Let's consider the key concepts used in project planning, implementation and control.

Definition 2.1. Activity (task, work, job) is an action performed to achieve the project objective. It refers to the achievement of specific results at a lower level of detail.

Activity is the core element of project activities. It takes time to complete, and failure or delay in completing it can delay the start of other activities. The moment of work completion means the receipt of some product (the result of work).

Definition 2.2. A milestone (the start or end of an activity) is an event or date in the course of a project; it is used to show the status of completion of a particular activity.

In the context of a project, managers use milestones to indicate important milestones to be achieved during project implementation.

The sequence of milestones defined by the manager is often referred to as a milestone plan. The dates on which the respective milestones are achieved form the milestone calendar. An important difference between milestones and activities is that they have no duration. Because of this property, they are often referred to as events.

Definition 2.3 A network diagram (network, **PERT diagram**) is a graphical representation of project activities and their interrelationships.

In project management, the word "network" refers to a complete set of activities and project milestones with established dependencies between them. The abbreviation PERT stands for Program (Project) Evaluation and Review Technique. The PERT method was developed in the USA in 1958 during the development of the Polaris missile system.

Gantt charts are considered to be the classic version of a network diagram.

Definition 2.4. A Gantt chart is a horizontal line diagram on which project activities (tasks) are represented by time stretches characterized by start and end dates, possible delays, and other time parameters.

These diagrams are named after the American engineer Henry Gantt (Gant, 1910).

The heart of time management is the notion of the relationship between activities.

Definition 2.5. Activity (task) A is said **to precede** task B if task B cannot start before task A is completed due to project constraints. Thus, task B can start after task A is completed (at the moment of task A completion or later). In this case, task A is called the **predecessor** ([ˈpredəˌsesər]) of task B, and task B is called the follower of task A. We will call this relation a simple precedence relation and denote A → B.

It's obvious that

- a single work may have several (or no) predecessors or followers;
- a simple relation of precedence has the property of transitivity.

Direct descriptions of simple precedence relations are tabular forms.

The simplest example. Let's consider a construction of a house as a set of 3 activities: A is a construction of foundation, B is a construction of rooms, D is roofing.

The table of followers has the following form:

Activities	Activities-followers
A	B
B	D
D	–

The table of predecessors has the following form.

Activities	*Predecessors*
A	–
B	A
D	B

INTRODUCTION TO GANTTPROJECT

The *MS Project* package is considered to be a standard software package that provides solution of most routine tasks arising during project planning and execution.

OpenProject and *GanttProject* packages can be recommended as free variants with a open licenses that allow to implement the main functions of *MS Project*. Let's dwell on the main functions of GanttProject. Installation for computers running under MS Windows operating system is performed from the official site.

https://www.ganttproject.biz/download#download30

The basic version is free of charge.

Figure 2.1 shows the initial view of the screen at the first start of the installed programme.
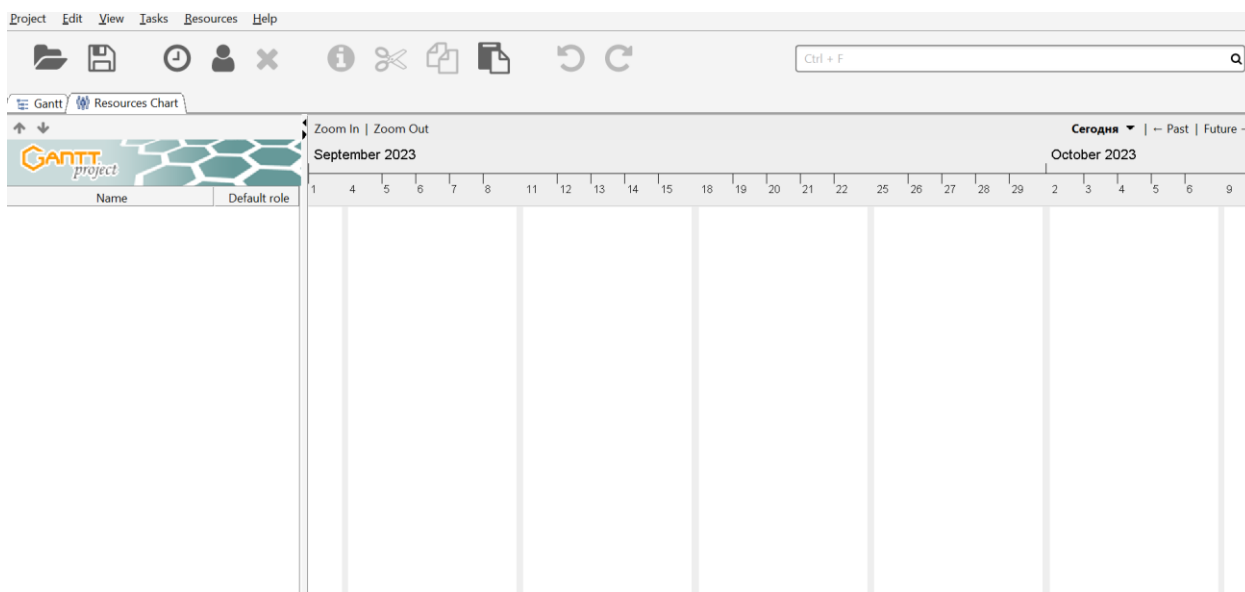

Fig 2.1. Screen view when GanttProject is started for the first time

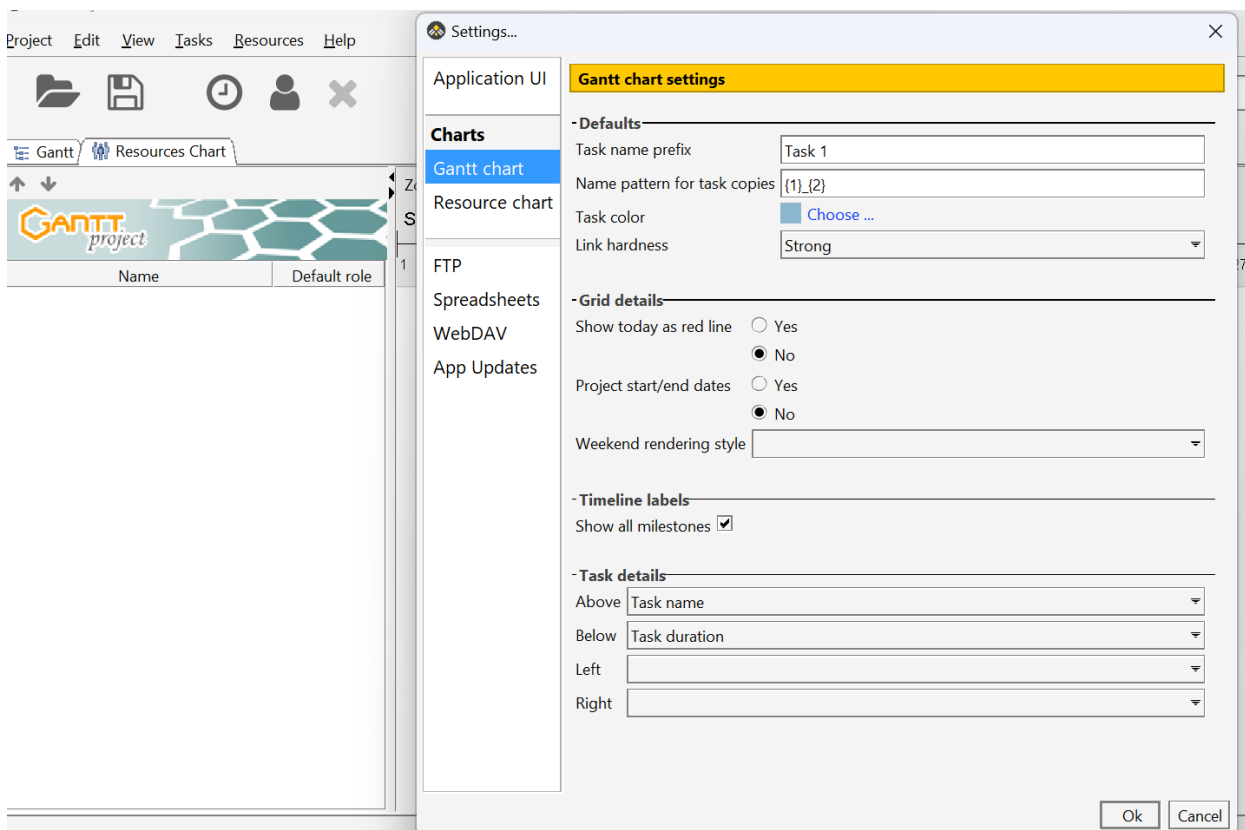In the "Edit"/"Settings"/"Gantt Chart" menu we can immediately enter some headings:

Fig. 2.2. Chart settings

Let's practice with the project of building a house. Let the table of works with predecessors and duration of each task be given.

Activities	*Predecessors*	*Duration (days)*
A	–	5
B	A	8
D	B	4

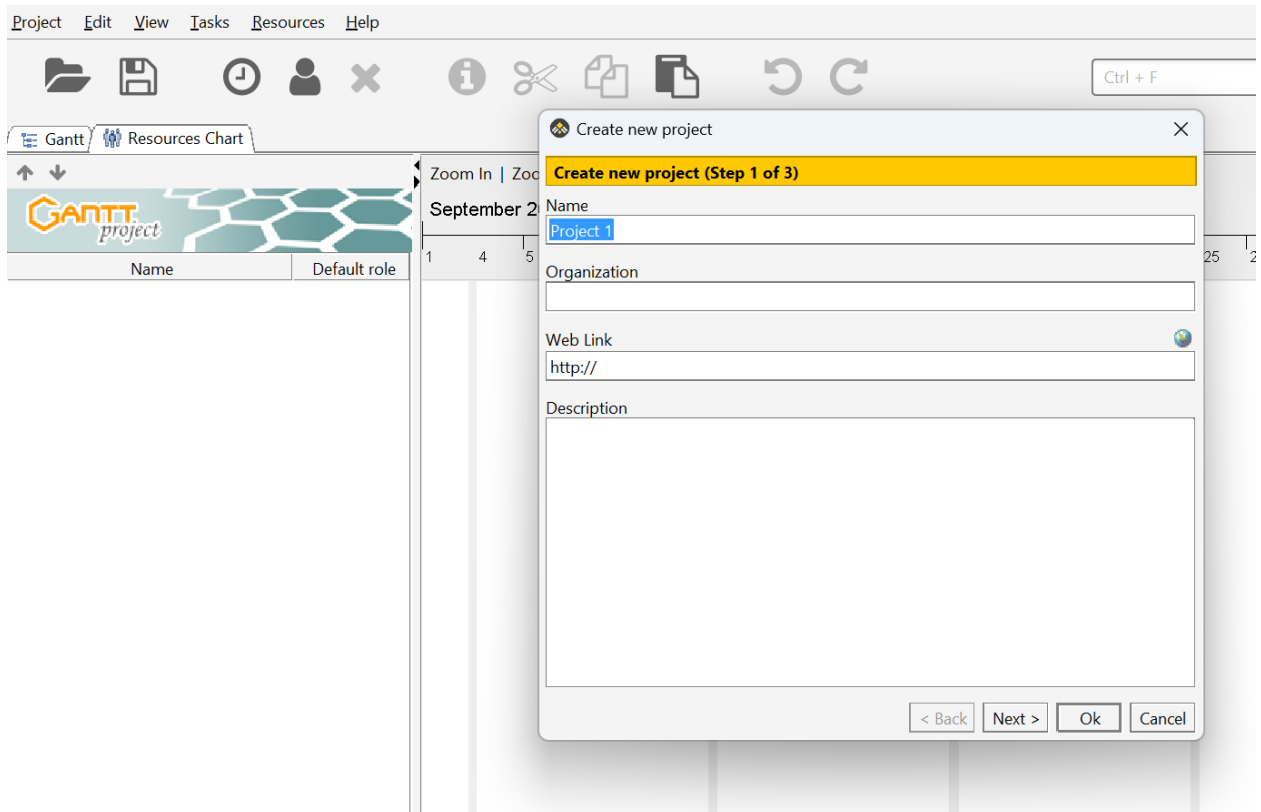1. Organize a new project ("Project" button in the menu):

Fig. 2.3. Organizing a new project in GanttProject

Let's enter the tasks corresponding to our 3 tasks (A, B, D) (the "Tasks" button in the top menu). The "Properties" submenu section or the right mouse button in the left column of the main field (for the corresponding job) allows you to enter the properties of the task. For now, let's limit ourselves to the start date (today) and duration (in days). We will not consider the dependence of jobs on each other for now. A screenshot of the screen at the stage of entering the properties of one particular task is shown in Figure 2.4 below.
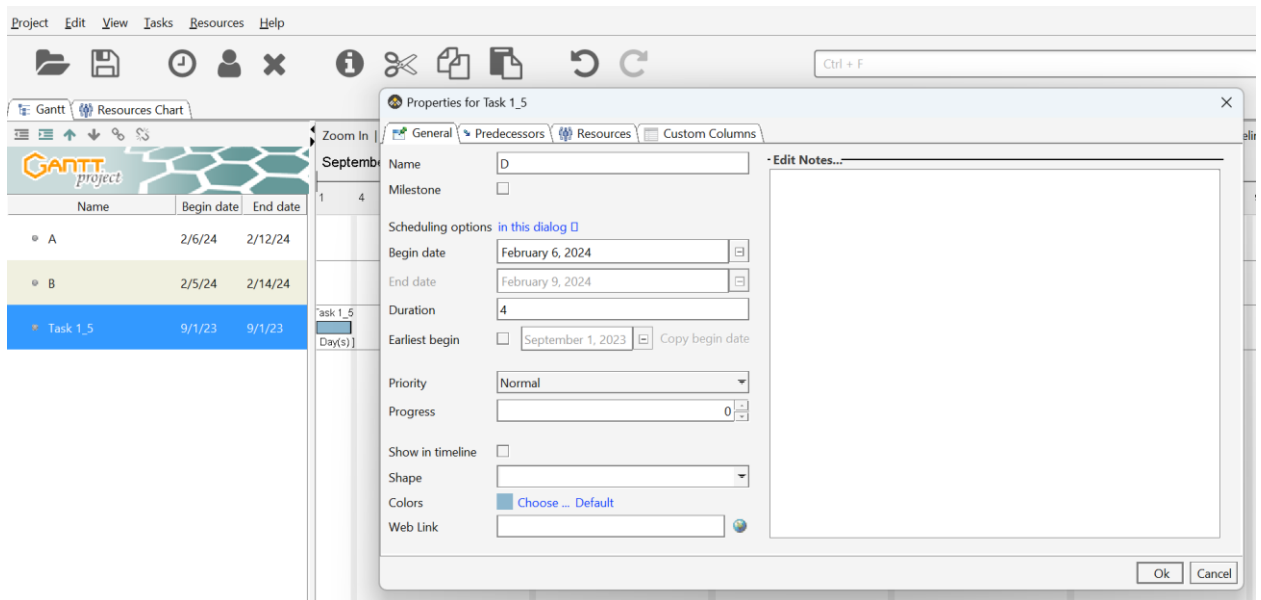
Fig. 2.4. Data entry of a specific task (activity)

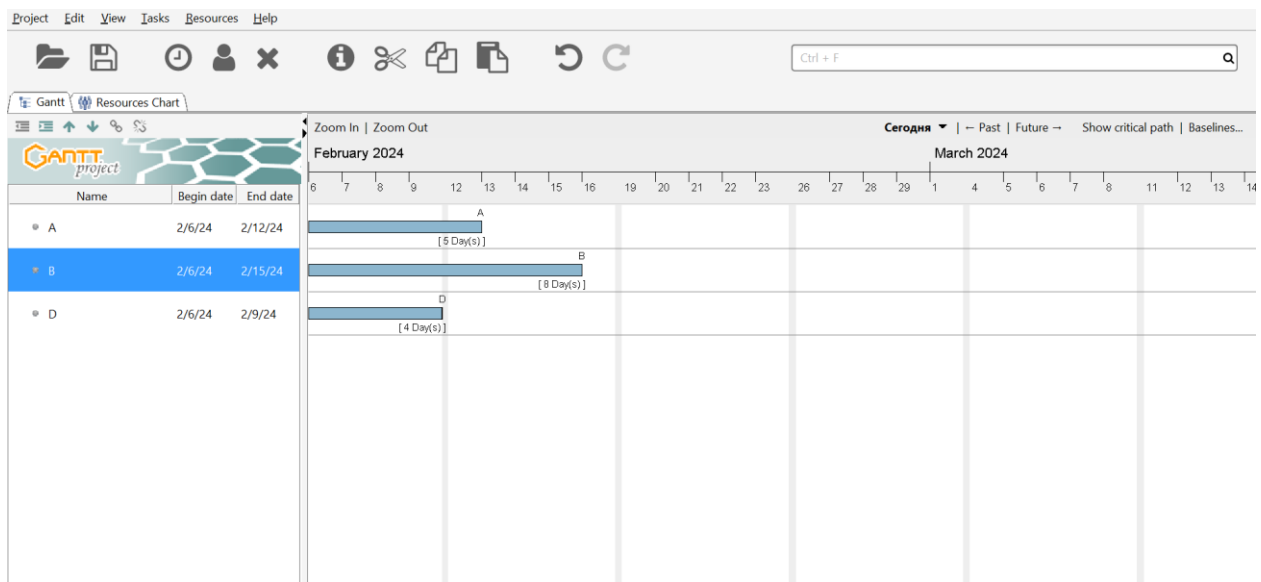After entering data on all 3 tasks we have the following figure:

Fig. 2.5. Data on all tasks without taking into account
the dependencies between them

All tasks (activities) start on the same day, there are no dependencies of tasks on each other. Note that the context menu opened by the right mouse button on the corresponding task allows

- to move tasks through the list (arrows "Up", "Down");
- to make a task a subtask of another task (arrow "Level in");
- perform standard operations of copying, cutting, pasting and deleting.

The "Properties" submenu section allows you to manually enter the beginning of each task. But it is more convenient for us to see how to take into account the dependence of tasks on each other.

3. Now we consider one of the most important points. We need to determine the logical sequence of tasks. This is done on the basis of a table with data on predecessor works. It is sufficient to enter data only on the immediately preceding task (or tasks, since there can be several immediate predecessors). For example, task B is preceded by task A. Open the "Predecessors" tab of the properties of task B:
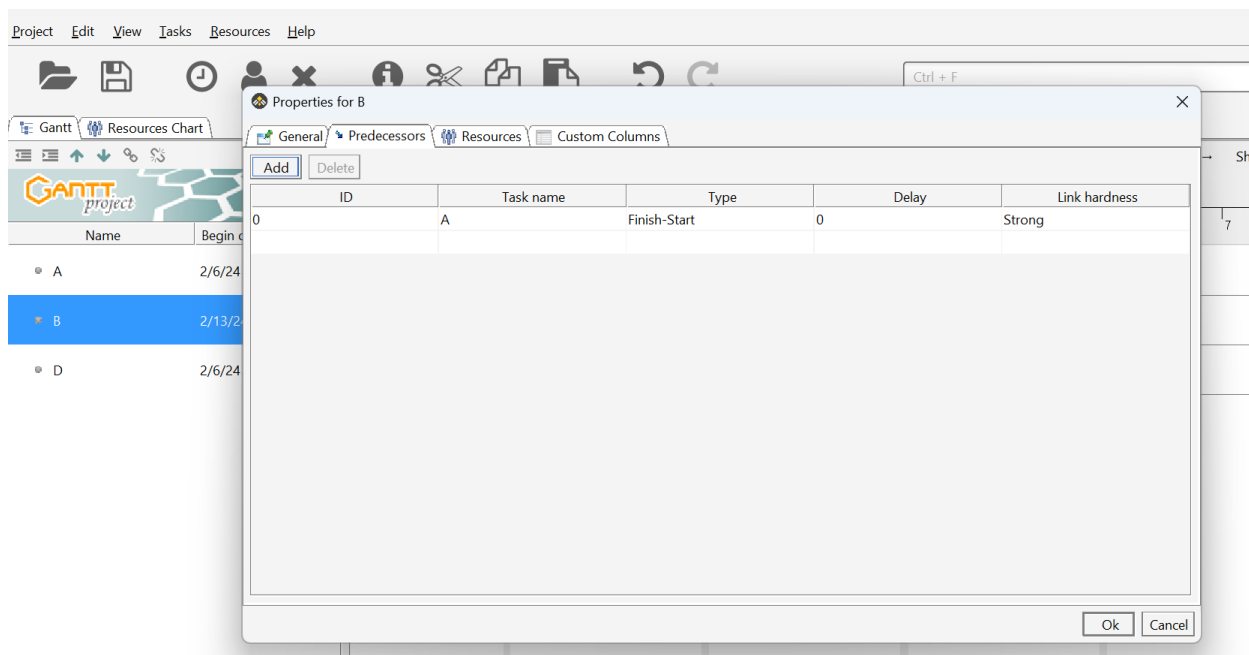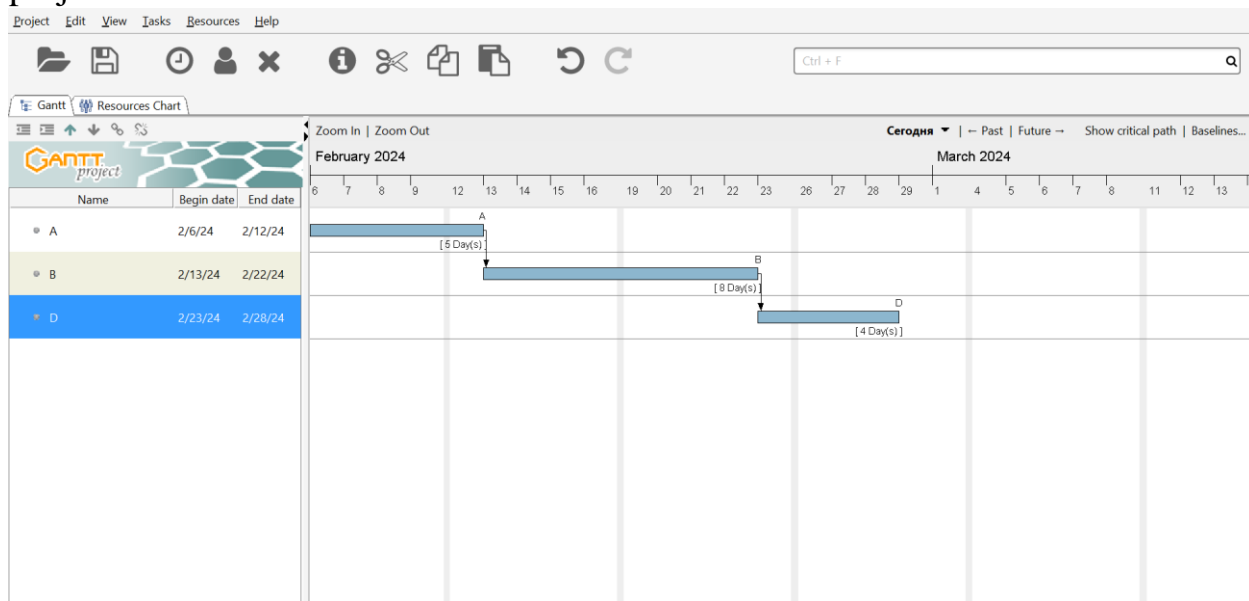

Fig. 2.6. Dependent tasks entry

By doing the same operation for the C work, we get the Gantt chart for our simplest project.

Next we will consider other properties of this software package.