A cluster is a data structure that groups data, like arrays. However, there some important difference for cluster:

- Cluster can group different types of data (such as numerical, and string data).
- Cluster has fixed size.
1.1 Creating Cluster Controls and Indicators

Cluster controls or indicators can be created by
(Moden>Array, Matrix & Cluster):

• Place a cluster shell on the front panel.
• Define the data type: Drag and place any data types.
• You can select “change to control” or “change to indicator” (right click).
A Cluster can be created on the Front Panel.
1.2 Cluster Order

The elements of a cluster are ordered according to when they are placed in the cluster. The first element is labeled with 0, and so on.

The cluster order determines the order in which the elements appear as terminal on the Bundle and Unbundle functions.

- You can view and change the order of the element by right-clicking the border and choosing "Reorder Controls In the Cluster"
1.3 Cluster Functions

Bundle and Unbundle Functions: Functions>>Programming>>Cluster & Variant.

1.3.1 The Bundle Function

The bundle function is used to assemble individual elements into a single new cluster or replace elements in an existing cluster. The following VI shows how to use the Bundle function to create a cluster.
Assignment 1 Build a cluster and then change its element

Using two Bundle functions to build and change its element: The first Bundle function is used to build a cluster, while the second Bundle function is used to change one element (the numerical number 3 changed as 1). Show the results. The final Front Panel should be the same as the following figure. The left Boolean switch is used to control whether or not to change the numerical number.
Assignment 2  Using For Loop to Build a Cluster

Using a For Loop to build a cluster as shown in the following figure. The cluster has 3 inputs: a floating-point real number, an integer, and an array of number generated by the For Loop. The output is wired to a wavefront graph to display the random numbers.
1.3.2 Unbundle Function

The Unbundle function extract individual elements of a cluster. The output components are in the order from top to bottom in the same order as in the cluster.

- Unbundle function appear with two output terminals. It can automatically just the number of the output terminals once wired.

Assignment 3  Unbundle a Cluster

The following example shows the Unbundle function being used to unpack the elements. The clusters has four elements, and each element is split from the cluster and wired to individual indicator for viewing on the front panel. Write the labVIEW Code.
Assignment 3: The Using of Unbundle function.
1.3.3 Creating Cluster Constant on the Block Diagram

- Cluster constants can be created on the Front Panel by using cluster controls.
- Cluster constants can also be created on the Block Diagram by using **Cluster Constant** function.

The following example shows how to use Cluster Constant function to build cluster which contains constants.
Assignment 4  XY Graph Plot

Build a VI that generates and plot 500 random numbers on a XY Graph indicator. Compute the average of the random numbers and display the result on the Front Panel.

Using the Statistic Express VI found in the Mathematics >>Probability and Statistics palette to compute the average of the random numbers
Assignment 5  XY Graph

Create a VI that plots a circle using an XY Graph. (using 20 data to sample the circle).
Assignment 6  Course Grade (Assume 10 students)

Design a VI that produces an array of clusters containing the course average, letter grade, and class rank for each students in a class, given three arrays with the examination courses as input. There is one array of scores for each examination. The course average is determined as following: 30% from the first exam, 30% from the second exam, and 40% from the final exam. The letter grade is determined from the course average by the criteria list in Table 1.

Rank the students so that the student with the highest grade has a rank of 1 and the student with the lowest grade in the class has a rank equal to the number of the students in the class. You may use “Sort 1D Array” and “Search 1D Array” functions within a loop to find the student’s rank.

Bundle all of the information (course average, letter grade, and class rank) into an array of cluster where each cluster contains all the data for one individual student. Display this array of cluster on the front panel.
Table 1. For Assignment 6

<table>
<thead>
<tr>
<th>Course Average</th>
<th>Letter Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0% ~ 59%</td>
<td>F</td>
</tr>
<tr>
<td>60% ~ 69%</td>
<td>D</td>
</tr>
<tr>
<td>70% ~ 70%</td>
<td>C</td>
</tr>
<tr>
<td>80% ~ 89%</td>
<td>B</td>
</tr>
<tr>
<td>90% ~ 100%</td>
<td>A</td>
</tr>
</tbody>
</table>