Experiment 2

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Section/Group: 22BCS_IOT_603A
Semester: 6th
Date of Performance: 15-01-25
Subject Name: AP Lab-2
Subject Code: 22CSP-351

1. **1.1Aim:** Given an array of integers nums and an integer target, return the indices of the two numbers such that they add up to target. Each input has exactly one solution, and you cannot use the same element twice.

2. **Objective:**

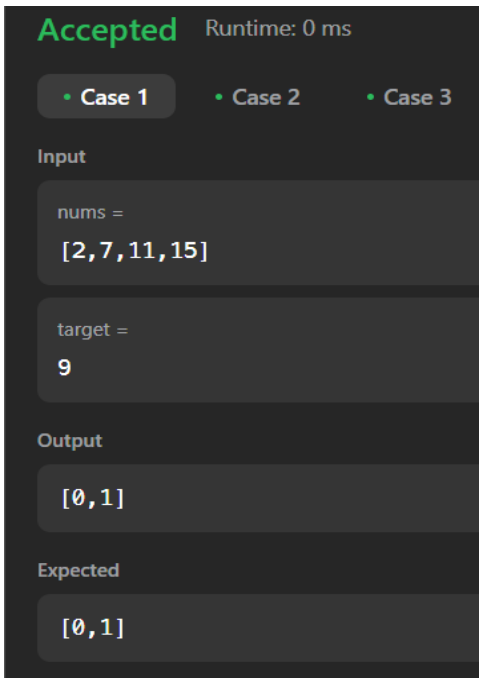
1. Develop an understanding of fundamental algorithmic techniques such as hash maps (Problem 1), dynamic programming (Problem 2), stack operations (Problem 3 and 4), and greedy algorithms.
2. Learn to write algorithms that minimize time and space complexity, ensuring the solutions are efficient and scalable for large inputs.
3. Apply problem-solving skills to real-world scenarios, such as navigation (Problem 2), file system management (Problem 3), and data structure design (Problem 4).
4. Gain hands-on experience with data structures like arrays, stacks, and hash maps, enhancing the ability to select and use the appropriate structure for a given problem.
5. Improve critical thinking and debugging skills by identifying edge cases and ensuring the correctness of solutions across diverse scenarios.

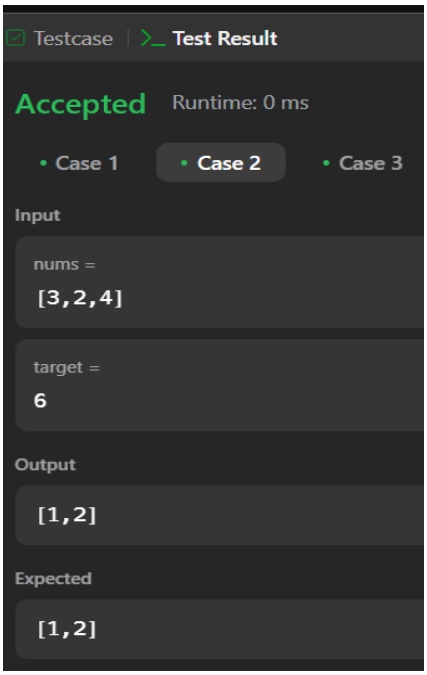
3. **1.1Code:**

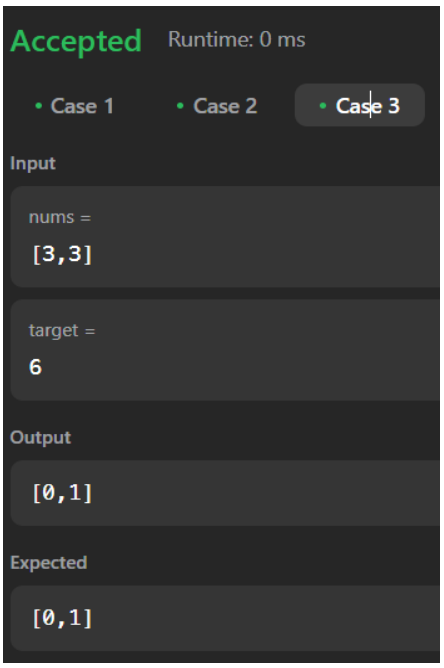
```
class Solution {
public int[] twoSum(int[] nums, int target) {
    HashMap<Integer, Integer> numMap = new HashMap<>();
    for (int i = 0; i < nums.length; i++) {
```

```
            int complement = target - nums[i];
            if (numMap.containsKey(complement)) {
                return new int[] { numMap.get(complement), i };
            }
            numMap.put(nums[i], i);
        }
        return new int[] {};
    }
    public static void main(String[] args) {
        Solution solution = new Solution();
        int[] nums = {2, 7, 11, 15};
        int target = 9;
        int[] result = solution.twoSum(nums, target);
        System.out.println(result[0] + " " + result[1]); }}
```

4. 1.1Output





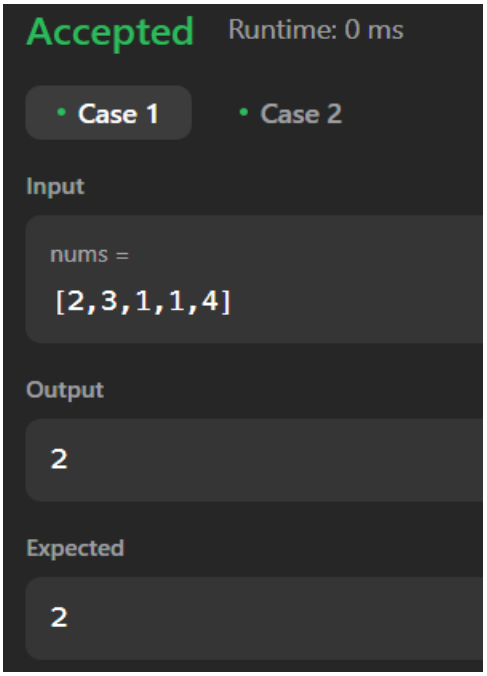


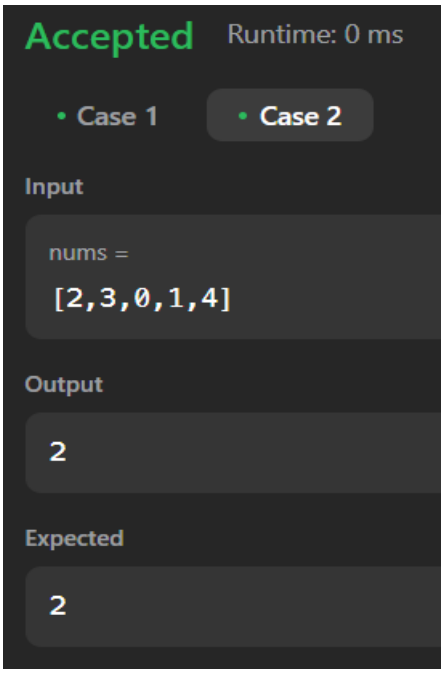
1.2Aim: You are given a 0-indexed array nums of length n. You are initially positioned at nums[0]. Each element nums[i] represents the maximum length of a forward jump from index i. Return the minimum number of jumps to reach nums[n - 1].

1.2Code:

```
    class Solution {
  public int jump(int[] nums) {
    int jumps = 0, currentEnd = 0, farthest = 0;
    for (int i = 0; i < nums.length - 1; i++) {
      farthest = Math.max(farthest, i + nums[i]);
      if (i == currentEnd) {
        jumps++;
        currentEnd = farthest;
      }
    }
    return jumps;
  }
  public static void main(String[] args) {
    Solution solution = new Solution();
    int[] nums = {2, 3, 1, 1, 4};
    System.out.println(solution.jump(nums));
  }
}
```

1.2 Output:

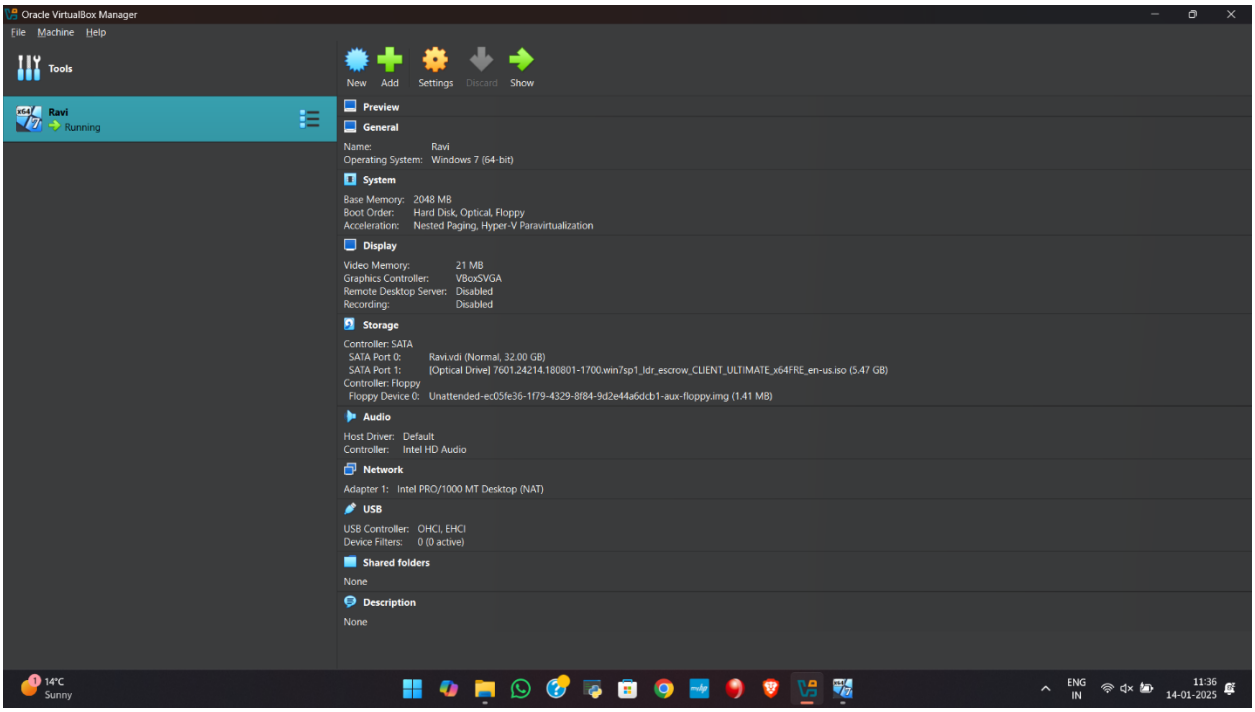


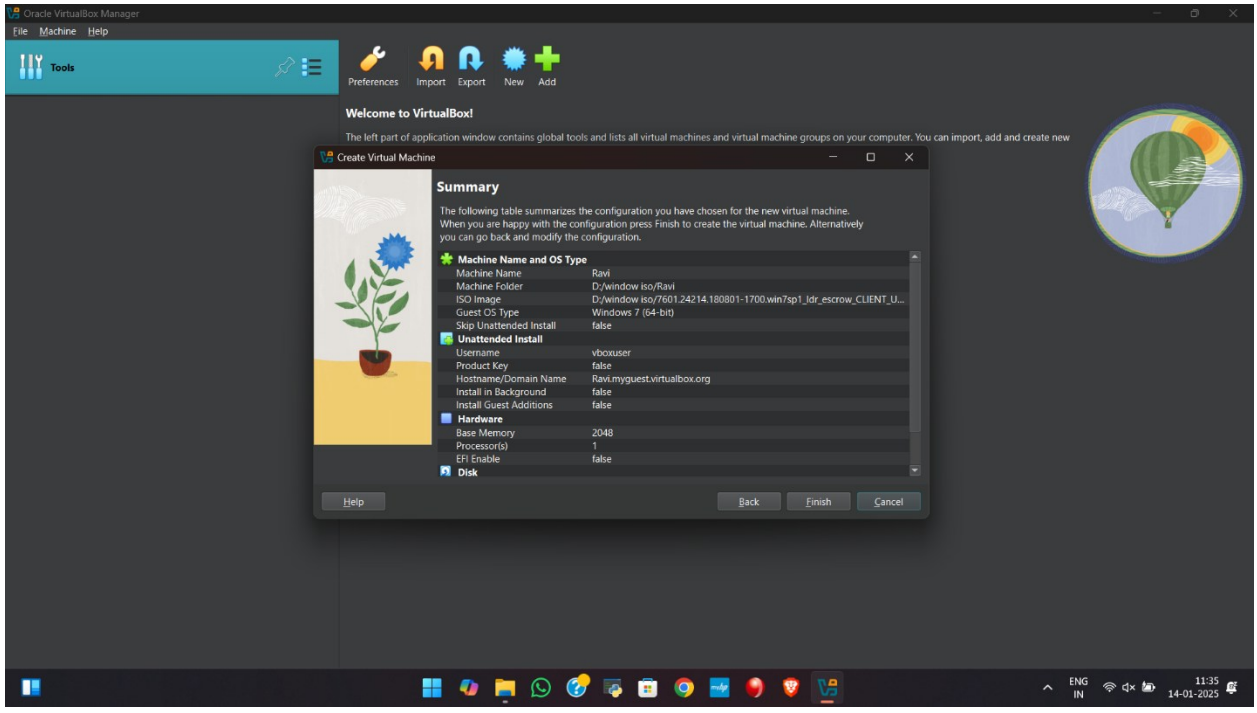


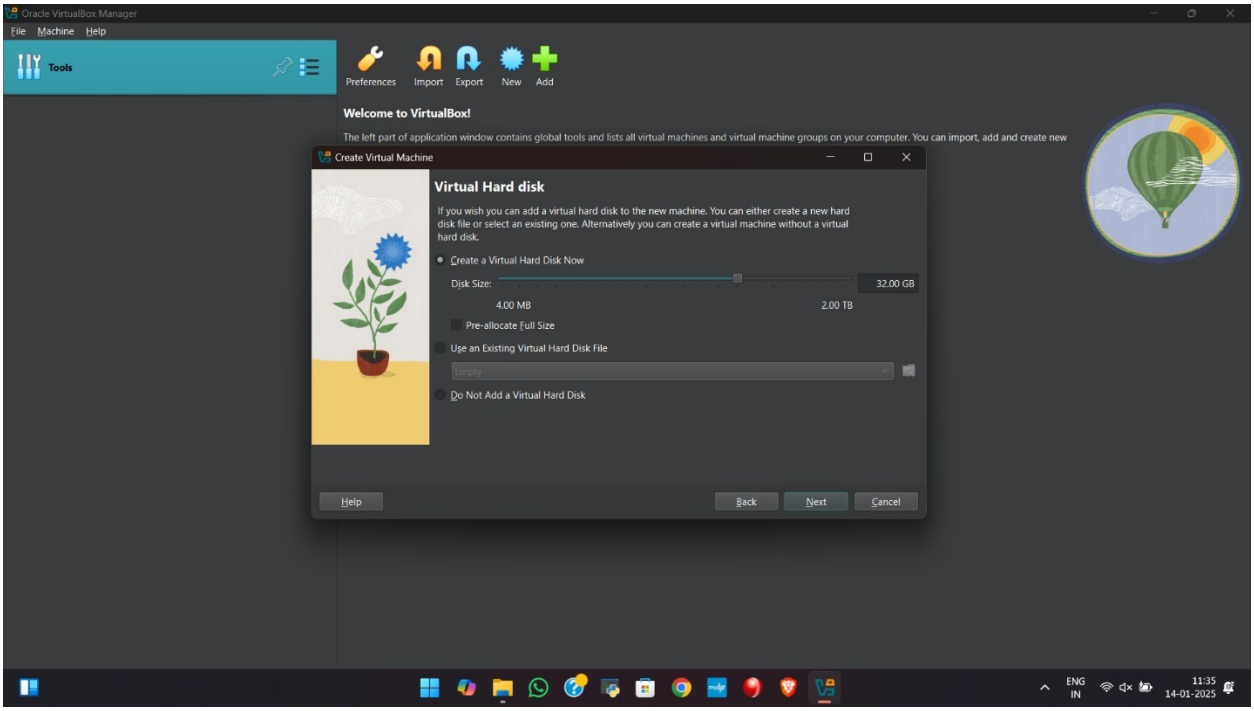
5. Learning Outcome:

- **Algorithm Design**: Learn how to break down problems into efficient and modular solutions using data structures like stacks, arrays, and hash maps.
- **Data Structure Mastery**: Gain hands-on experience with stacks, queues, and dynamic arrays for solving real-world problems.
- **Edge Case Handling**: Understand how to handle corner cases such as empty inputs, redundant operations, or boundary conditions.
- **Efficiency Optimization**: Practice minimizing time and space complexity for better performance in coding problems.
- **Problem-Solving Patterns**: Develop reusable techniques like lazy transfer (queue via stacks), path simplification, and greedy or iterative traversal.

Steps to make virtual machine:






Oracle VirtualBox Manager
File Machine Help
Tools
Preferences Import Export New Add
Welcome to VirtualBox!
The left part of application window contains global tools and lists all virtual machines and virtual machine groups on your computer. You can import, add and create new
Create Virtual Machine
Virtual Hard disk
If you wish you can add a virtual hard disk to the new machine. You can either create a new hard disk file or select an existing one. Alternatively you can create a virtual machine without a virtual hard disk.
Create a Virtual Hard Disk Now
Disk Size:
32.00 GB
4.00 MB
2.00 TB
Pre-allocate Full Size
Use an Existing Virtual Hard Disk File
Empty
Do Not Add a Virtual Hard Disk
Help
Back
Next
Cancel
ENG IN
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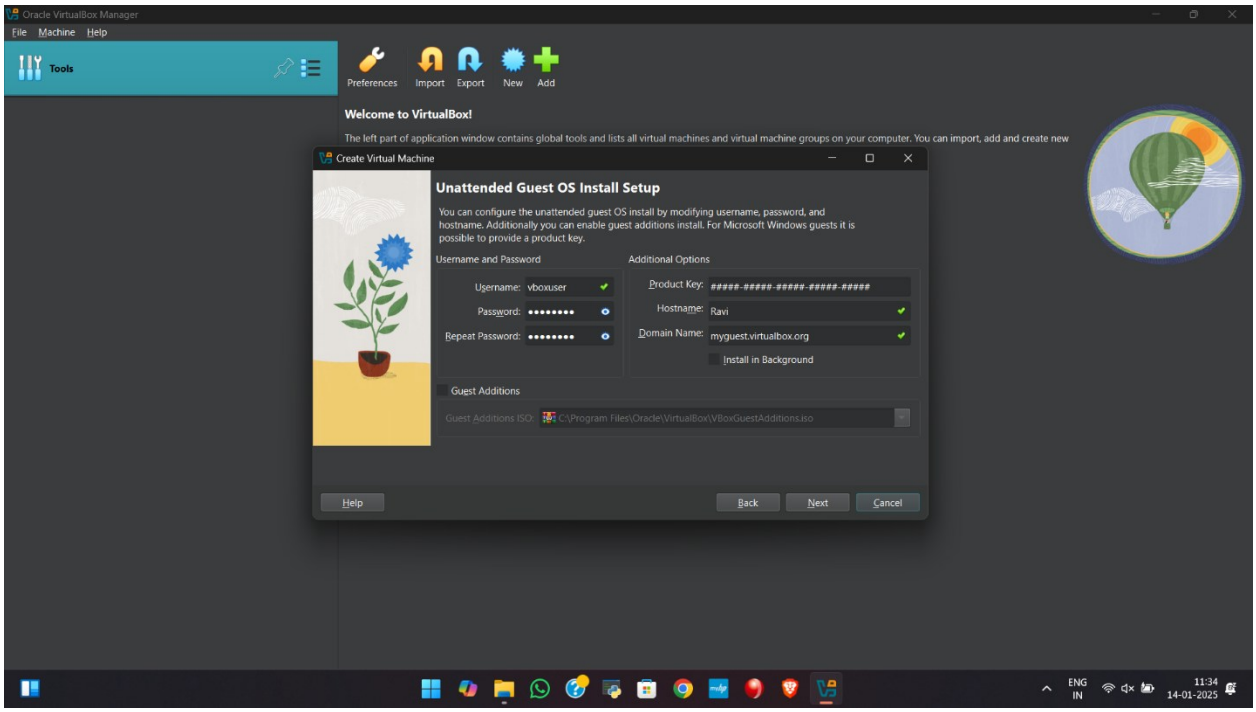
Oracle VirtualBox Manager
File Machine Help
Tools
Preferences Import Export New Add
Welcome to VirtualBox!
The left part of application window contains global tools and lists all virtual machines and virtual machine groups on your computer. You can import, add and create new
Create Virtual Machine
Unattended Guest OS Install Setup
You can configure the unattended guest OS install by modifying username, password, and hostname. Additionally you can enable guest additions install. For Microsoft Windows guests it is possible to provide a product key.
Username and Password
Username: vboxuser
Password:
Repeat Password:
Additional Options
Product Key:
Hostname: Ravi
Domain Name: myguest.virtualbox.org
Install in Background
Guest Additions
Guest Additions ISO: C:\Program Files\Oracle\VirtualBox\VBoxGuestAdditions.iso
Help
Back
Next
Cancel
ENG IN
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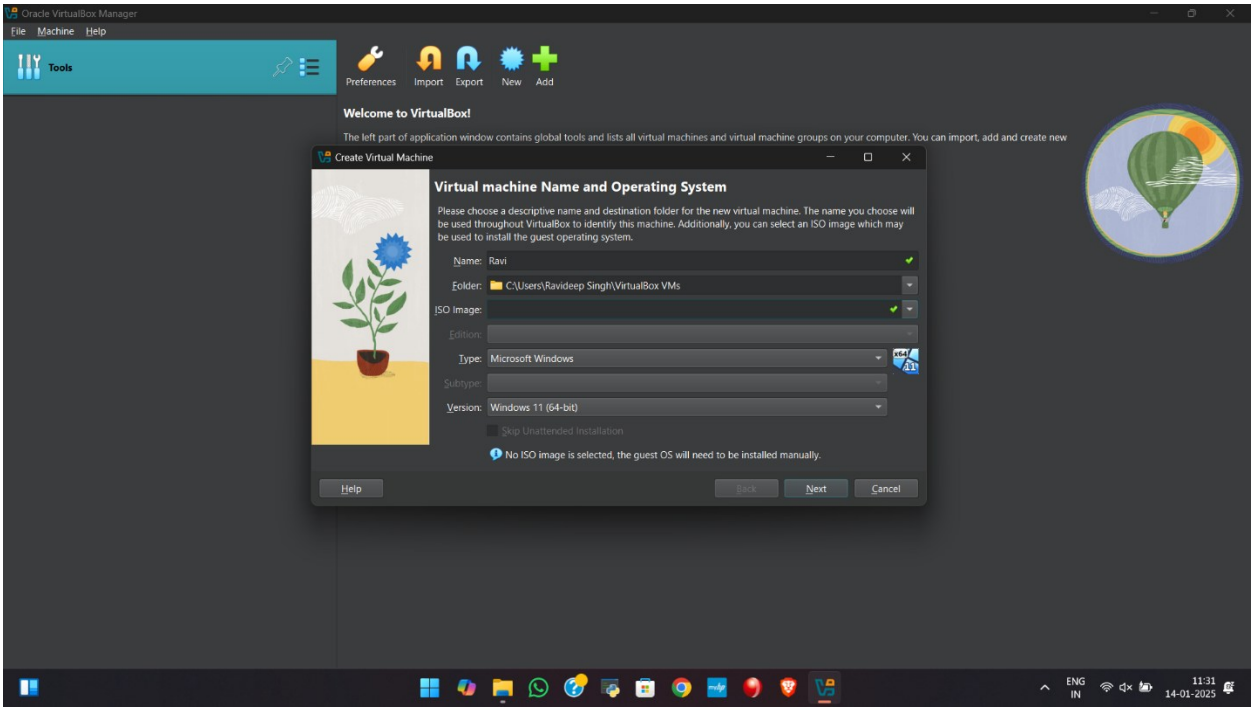
Oracle VirtualBox Manager
File Machine Help
Tools
Preferences Import Export New Add
Welcome to VirtualBox!
The left part of application window contains global tools and lists all virtual machines and virtual machine groups on your computer. You can import, add and create new
Create Virtual Machine
Virtual machine Name and Operating System
Please choose a descriptive name and destination folder for the new virtual machine. The name you choose will be used throughout VirtualBox to identify this machine. Additionally, you can select an ISO image which may be used to install the guest operating system.
Name: Ravi
Folder: C:\Users\Ravideep Singh\VirtualBox VMs
ISO Image:
Edition:
Type: Microsoft Windows
Subtype:
Version: Windows 11 (64-bit)
Skip Unattended Installation
No ISO image is selected, the guest OS will need to be installed manually.
Help Back Next Cancel
ENG IN
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Oracle VirtualBox Manager
File Machine Help
Tools
Ravi
Running
Ravi [Running] - Oracle VirtualBox
File Machine View Input Devices Help
Recycle Bin
Right Ctrl
USB Controller: OHCI, EHCI
Device Filters: 0 (0 active)
Shared folders
None
Description
None