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| ExperimentNo.10 |
| Performthe simulationofSoftware DefinedNetworkusing Mininet. |
| DateofPerformance: |
| DateofSubmission: |

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**Aim:**PerformthesimulationofSoftwareDefinedNetworkusingMininet.

**Objective:**DevelopingtheunderstandingofMininetforSoftwareDefinedNetwork.

**Theory:**

Software Defined Networking (SDN) represents a paradigm shift innetworkarchitecture,

promoting more flexible, manageable, and dynamic networks. Unlike traditional network

management, which relies onhardwareconfigurationsandstaticprotocols,SDNseparates thecontrolplanefromthedataplane,allowingforcentralizedmanagementandprogramming of the network. Mininet is awidelyusednetworkemulatorthatenablesthesimulationof SDNenvironments,providingaplatformfortestinganddevelopingSDNapplicationsand protocols.

**UnderstandingSoftwareDefinedNetworking(SDN)**

SDN decouples the network control logic from the underlying hardware, enabling more straightforward and dynamic management of the network. The core components of SDN include:

1. **SDNController**:Acentralizedcontrolunitthatmanagesthenetwork.Ithasaglobal

viewofthenetworkandmakesdecisionsonhowpacketsshouldbeforwarded.

2. **DataPlane**:Composedofnetworkdevices(switchesandrouters)thatforwardtraffic basedontherulessetbytheSDNcontroller.

3. **NorthboundAPIs**:InterfacesbetweentheSDNcontrollerandnetworkapplications, allowingapplicationstointeractwithandcontrolthenetwork.

4. **SouthboundAPIs**:InterfacesbetweentheSDNcontrollerandnetworkdevices, commonlyusingprotocolslikeOpenFlowtocommunicate.

**IntroductiontoMininet**

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Mininetisanopen-sourcenetworkemulatorthatallowsthecreationofvirtualnetworksusing

software-based switches, hosts, and links, all running on a single machine. It provides a

realisticenvironmentfordeveloping,testing,andexperimentingwithSDN.

**KeyFeaturesofMininet**:

● Emulatesanentirenetworkofend-hosts,switches,routers,andlinks.

● ProvidesarealisticplatformforSDNdevelopmentusingOpenFlow.

● Supportscomplexnetworktopologiesandscalablesimulations.

● Easytoinstallanduse,makingitaccessibleforeducationalandresearchpurposes.

**SettingUpaSoftwareDefinedNetworkUsingMininet**

**1.InstallMininet**:

● Mininetcanbeinstalledonavarietyofplatforms,includingUbuntu,usingpackage

managersorfromsource.

● Ensurealldependenciesareinstalled,includingOpenvSwitch,whichiscommonly

usedwithMininet.

**2.CreateaNetworkTopology**:

● DefinethenetworktopologyusingMininet’sPython-basedAPI.

● Specifythenumberofhosts,switches,andthelinksbetweenthem.

● Customtopologiescanbecreatedtoemulatereal-worldnetworkscenarios.

**3.IntegrateanSDNController**:

● ChooseanSDNcontroller(e.g.,POX,Ryu,ONOS,orOpenDaylight)andsetitupto

managetheMininetnetwork.

● StartthecontrollerandconfigureMininettoconnecttoit.

● ControllerstypicallyusetheOpenFlowprotocoltocommunicatewiththeswitchesin

theMininetnetwork.

**4.ConfigureNetworkDevices**:

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● UseMininet’sCLIorPythonscriptstoconfigurethevirtualswitchesandhosts.

● SetupIPaddresses,routes,andothernetworkparametersasneeded.

● ImplementanyadditionalconfigurationsrequiredfortheSDNcontrollertomanage

thenetworkeffectively.

**5.DeploySDNApplications**:

● WriteanddeploySDNapplicationsthatinteractwiththenetworkthroughthe

northboundAPIsoftheSDNcontroller.

● ExamplesofSDNapplicationsincludetrafficengineering,networkmonitoring,

securityenforcement,andloadbalancing.

● TestanddebugtheapplicationsusingtheMininetenvironment.

**6.SimulateNetworkScenarios**:

● UseMininettosimulatevariousnetworkscenariosandobservehowtheSDN

controllerandapplicationsrespond.

● Testnetworkfailures,topologychanges,andtrafficvariationstoevaluatethebehavior

andperformanceoftheSDNsolutions.

● CollectandanalyzenetworkmetricstogaininsightsintotheeffectivenessoftheSDN deployments.

**PracticalApplicationsandBenefits**

**1.ResearchandDevelopment**:

● MininetprovidesaplatformforresearcherstotestanddevelopnewSDNprotocols

andapplicationsinacontrolledenvironment.

● Itenablesexperimentationwithinnovativenetworkingconceptswithouttheneedfor

physicalhardware.

**2.EducationandTraining**:

● MininetiswidelyusedinacademicsettingstoteachSDNconceptsandpractical

networkingskills.

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● Studentscangainhands-onexperiencewithSDNanddevelopadeeperunderstanding

ofmodernnetworkmanagement.

**3.TestingandValidation**:

● NetworkengineerscanuseMininettotestandvalidatenetworkconfigurationsand

SDNapplicationsbeforedeployingtheminproductionenvironments.

● Thisreducestheriskofnetworkoutagesandensuresthatsolutionsarerobustand

scalable.

**4.NetworkManagementandOptimization**:

● SDN,coupledwithMininet,allowsforthesimulationofnetworkmanagement

strategiesandoptimizationtechniques.

● Itenablestheevaluationofdifferentapproachestoimprovenetworkperformance,

security,andefficiency.

**Conclusion**

Simulating Software Defined Networks using Mininet offers a powerful and flexible environment for exploring the potential of SDN. By providing a realistic and scalable platformfortestinganddevelopment,MininetfacilitatesthecreationandvalidationofSDN applications and protocols. Whether for educational purposes, research, or professional development,MininetenablesuserstoharnessthepowerofSDNtocreatemoredynamic, manageable,andefficientnetworks.Throughhands-onexperimentationandsimulation,users cangaintheskillsandinsightsneededtoleverageSDNinreal-worldnetworkingscenarios.

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