# COMPUTER NETWORKS PROJECT DOCUMENTATION



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# Project Title: Smart City Network Infrastructure Design Using Cisco Packet Tracer

## 1. Introduction

In the modern digital age, smart cities are being built using advanced networking solutions to ensure efficient communication between different departments. This project focuses on designing and simulating a complete smart city network using Cisco Packet Tracer. The infrastructure includes essential departments such as Banking, Taxation, Schooling, Health Services, Fire Department, and Government Administration. Each department is segregated using VLANs to ensure security, performance, and scalability.

## 2. Objective

The objective is to simulate a secure and structured network design for a smart city using VLAN segmentation. The design enables inter-department communication, centralized resource access, and efficient IP management. It also focuses on implementing core network technologies such as router-on-a-stick, DHCP, DNS, subnetting, and ACLs for access control.

## 3. Tools and Technologies

- Cisco Packet Tracer  
- Cisco 2960 Switches (Access Layer)  
- Cisco 2811 Routers (Core Layer)  
- PCs and Servers  
- VLANs and Inter-VLAN Routing  
- DHCP and DNS Configuration  
- Access Control Lists (ACLs)  
- Subnetting  
- Hierarchical Network Design Model

## 4. Network Requirements

Each department must:  
- Operate on a separate VLAN and subnet  
- Be assigned a unique IP range for identification and control  
- Access shared servers such as DNS, Web, and Email located in the DMZ  
- Use DHCP for automatic IP configuration (except servers)

## 5. Departmental VLANs and IP Scheme

|  |
| --- |
| Banking Sector |
| Taxation Department |
| Schooling System |
| Health Services Sector |
| Fire Department |
| Government Admin Dept. |
| Server Farm (DMZ) |

## 6. Network Design Layout

- Core Layer: Cisco routers with subinterfaces for VLAN routing  
- Access Layer: Switches connecting PCs, phones, and servers to respective VLANs  
- Trunk Links: Between switches and routers for VLAN tagging  
- DHCP Server: Assigns dynamic IPs to client devices  
- DNS Server: Resolves domain names to IPs  
- Web/Email Servers: Hosted in DMZ and accessible across VLANs

## 7. Configuration Plan

1. Configure basic settings on all devices (hostnames, passwords, banners, etc.)  
2. Create VLANs on switches and assign ports accordingly  
3. Establish trunk connections between switches and router  
4. Configure router subinterfaces for each VLAN with respective IP addresses  
5. Set up DHCP on router or separate server for dynamic IP allocation  
6. Assign static IPs to servers in the DMZ VLAN  
7. Configure DNS and Web services for network-wide access  
8. Use ACLs to restrict sensitive access between departments  
9. Verify connectivity using ping and DNS resolution commands

## 8. Testing and Verification

- Same-VLAN devices communicate without routing  
- Different-VLAN devices communicate via router (Inter-VLAN routing)  
- PCs receive IPs from DHCP server  
- All departments can access DNS and Web servers  
- ACLs enforce access control between VLANs as per policy

## 9. Conclusion

The smart city network designed in Cisco Packet Tracer fulfills the essential requirements of a modern digital infrastructure. With the use of VLANs, inter-VLAN routing, and core services like DHCP and DNS, the design ensures efficient, secure, and scalable communication between departments. The logical separation of sectors also enhances control and policy enforcement, making this design a robust model for future city planning.

### Departmental VLAN Table

|  |  |  |
| --- | --- | --- |
| Department | VLAN ID | IP Range |
| Banking Sector | 10 | 192.168.10.0/24 |
| Taxation Department | 20 | 192.168.20.0/24 |
| Schooling System | 30 | 192.168.30.0/24 |
| Health Services Sector | 40 | 192.168.40.0/24 |
| Fire Department | 45 | 192.168.45.0/24 |
| Government Admin Dept. | 50 | 192.168.50.0/24 |
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