CN 211 Group Assignment Team Configuration Guide (2026)

Based on assignment: `CLAUDE_CONFIGS/CN 211 Group Assignment 2026_2026 Academic Year 06-02-2026.pdf`

Prepared for: Team implementation, documentation, and presentation readiness

Packet Tracer platform: Cisco 2911 routers + HWIC-2T serial WAN + Cloud-PT Frame Relay

> **Assignment-fit objective:** This guide is aligned to the marking areas: web pages, link connections, host configurations, DHCP/DNS, wireless, router configurations, and access to websites from any institution network.

1) Devices and Topology Used

Site	Core Devices	Why this choice
UDOM	1x Cisco 2911, 1x switch, 1x server, 1x AP, PCs/Laptops	Router handles routing + DHCP; server handles DNS+HTTP; AP enables wireless mark allocation.
BUNGE	1x Cisco 2911, 1x switch, 1x server, 1x AP, PCs/Laptops	Same architecture for consistency and easier troubleshooting.
MIPANGO	1x Cisco 2911, 1x switch, 1x server, 1x AP, PCs/Laptops	Same architecture to keep static routing deterministic.
CBE	1x Cisco 2911, 1x switch, 1x server, 1x AP, PCs/Laptops	Same architecture to simplify presentation and verification.
WAN Core	Cloud-PT with serial modules (`PT-CLOUD-NM-1S`)	Matches assignment style and simulates provider cloud with Frame Relay PVCs.

2) Physical Port Mapping (As Implemented)

Site	Users	Server Link	AP Link	Cloud WAN

	Switch Link			Link
UDOM	Router `Gi0/0` to switch	Router `Gi0/1` to server LAN	Router `Fa0/0/0` to AP	Router `Se0/1/0` to Cloud `Se0`
BUNGE	Router `Gi0/0` to switch	Router `Gi0/2` to server LAN	Router `Fa0/0/0` to AP	Router `Se0/1/0` to Cloud `Se2`
MIPANGO	Router `Gi0/2` to switch	Router `Gi0/1` to server LAN	Router `Fa0/0/0` to AP	Router `Se0/1/0` to Cloud `Se1`
CBE	Router `Gi0/1` to switch	Router `Gi0/0` to server LAN	Router `Fa0/0/0` to AP	Router `Se0/1/0` to Cloud `Se3`

3) IP Addressing Plan and Subnetting Logic

Design chosen: private IPv4 block `10.0.0.0/8` with per-site grouped /24 LANs and one shared WAN /24.

Why: clean separation, no overlap, easy to memorize during viva, and simple static routes.

Network Purpose	Subnet	Gateway	Reason
UDOM Users	10.1.1.0/24	10.1.1.1	Dedicated user broadcast domain.
UDOM Server	10.1.2.0/24	10.1.2.1	Server isolation and stable DNS/HTTP addressing.
UDOM WiFi	10.1.3.0/24	10.1.3.1 (Vlan1)	Separate wireless scope and troubleshooting.
BUNGE Users	10.2.1.0/24	10.2.1.1	Same pattern for consistency.
BUNGE	10.2.2.0/	10.2.2.1	Hosts DNS+HTTP.

Server	24		
BUNGE WiFi	10.2.3.0/24	10.2.3.1 (Vlan1)	Wireless segregation.
MIPANGO Users	10.3.1.0/24	10.3.1.1	Same addressing logic.
MIPANGO Server	10.3.2.0/24	10.3.2.1	Hosts DNS+HTTP.
MIPANGO WiFi	10.3.3.0/24	10.3.3.1 (Vlan1)	Wireless segregation.
CBE Users	10.4.1.0/24	10.4.1.1	Same addressing logic.
CBE Server	10.4.2.0/24	10.4.2.1	Hosts DNS+HTTP.
CBE WiFi	10.4.3.0/24	10.4.3.1 (Vlan1)	Wireless segregation.
WAN (Serial FR)	10.10.10.0/24	N/A	Shared transit among 4 routers in cloud PVC mesh.

> **Subnetting explanation for presentation:** /24 means mask 255.255.255.0, 256 addresses per subnet, 254 usable host IPs. We chose /24 for readability and enough host capacity per LAN.

4) DHCP Pool Distribution and Why

Pool Type	Range Strategy	Reason
User LAN Pool	Network x.x.x.0/24, excluded .1-.20	.1 reserved for router gateway; .2-.20 reserved for static infra growth (servers/printers/admin).
Wireless Pool	Network x.x.x.0/24, excluded .1-.20	Same rule to avoid conflicts and keep operational consistency.

DNS Option in DHCP	Local server subnet DNS IP (x.x.2.2)	Users resolve both local and remote institutional domains from nearest local DNS.

5) DNS Server Design and Why

Each server runs DNS and contains all four A records:

```
www.udom.ac.tz    -> 10.1.2.2

www.bunge.gov.tz  -> 10.2.2.2

www.mipango.ac.tz -> 10.3.2.2

www.cbe.ac.tz     -> 10.4.2.2
```

Why: any site can resolve every institution domain without depending on one central DNS server. This avoids single-point failure in the demo.

6) Web Server Page Setup and Why

On each server: `Services > HTTP = On` and update `index.html` with institution-specific heading, domain, and identity text.

Why: rubric explicitly awards web-page quality and institutional identity.

7) Cloud-PT Frame Relay Configuration and Why

Configured via `Cloud > Config > Connections > Frame Relay` using full-mesh pairs among ports Se0/Se1/Se2/Se3.

Why this method:

- Maintains required cloud topology look-and-feel.
- Provides virtual WAN circuits (PVCs) between all sites.
- Works with static routes and serial interfaces on 2911 HWIC-2T.

Pair	Meaning
Se0 <-> Se1	UDOM <-> MIPANGO
Se0 <->	UDOM <-> BUNGE

Se2	
Se0 <-> Se3	UDOM <-> CBE
Se1 <-> Se2	MIPANGO <-> BUNGE
Se1 <-> Se3	MIPANGO <-> CBE
Se2 <-> Se3	BUNGE <-> CBE

8) Access Point Setup and Why

- AP cable to router `Fa0/0/0`.
- Router built-in switchports assigned to VLAN 1.
- `interface Vlan1` configured with WiFi gateway IP x.x.3.1.
- Wireless clients use DHCP pool x.x.3.0/24.

Why: AP interfaces are Layer-2 access connections; gateway must be on SVI (`Vlan1`), not on an unused routed Gig interface.

9) Clean Router Config Submission Guidance (Teacher Requirement)

Use only required operational lines in submitted router configs. Do not include extra defaults, crypto notices, unused features, or long auto-generated headers.

Use files in:

- `CONFIGURATIONS/routers_clean/UDOM-ROUTER_clean.txt`
- `CONFIGURATIONS/routers_clean/BUNGE-ROUTER_clean.txt`
- `CONFIGURATIONS/routers_clean/MIPANGO-ROUTER_clean.txt`
- `CONFIGURATIONS/routers_clean/CBE-ROUTER_clean.txt`

10) End-to-End Build Steps (Execution Order)

1. Place all devices and cable physical links exactly as per mapping.
2. Install HWIC-2T on each router and serial modules on cloud.
3. Configure cloud Frame Relay PVC pairs (full mesh).
4. Paste clean router configs site-by-site.
5. Configure each server static IP + DNS records + HTTP page.

6. Set AP SSIDs/security and keep AP management on DHCP.
7. Set PCs/laptops to DHCP and test.

11) Verification Checklist (Must Pass)

- `show ip int brief`: key interfaces up/up.
- `show frame-relay pvc`: all PVCs ACTIVE.
- `show ip route`: all remote LAN routes present.
- `show ip dhcp binding`: clients receiving leases.
- `nslookup` from PCs for all four domains.
- Browser from each site to all domain names.
- Ping remote server IPs x.y.2.2 across campuses.

12) Common Failure Modes and Fixes

Symptom	Likely Cause	Fix
Router resolves local domain but cannot ping remote domain IP	WAN serial/PVC issue	Check Cloud Frame Relay pairs and `show frame-relay pvc`.
AP clients not getting DHCP	Gateway configured on wrong interface (Gi instead of Vlan1)	Use `Vlan1` with x.x.3.1 and DHCP pool x.x.3.0/24.
Local server unreachable from local router	Server cabled to wrong router interface/subnet	Match server cable to the configured server LAN interface.
Router CLI says unrecognized host	DNS service/path not ready	Verify DNS records; router files already include `ip host` fallback.

13) Presentation Competency Q&A (Practice Bank)

1. Why did we choose static routing instead of a dynamic routing protocol?
2. Why use Cloud-PT Frame Relay PVCs instead of a plain switch in this assignment?
3. Explain the role of Serial0/1/0 on each router.
4. Why are LAN, server, and WiFi on separate subnets?
5. Why is the AP connected to Fa0/0/0 and gateway placed on Vlan1?
6. What happens if Vlan1 is down?

7. How does DHCP know which gateway and DNS to hand out?
8. Why exclude .1 to .20 in DHCP pools?
9. Why do servers use static IP, not DHCP?
10. Why is each DNS server populated with all four A records?
11. What is the difference between DNS failure and routing failure in symptoms?
12. How do you prove a Frame Relay WAN problem from CLI?
13. How do you prove DNS works even if web page fails?
14. How do you prove web service works even if DNS fails?
15. What mark category is improved by custom index.html pages?
16. How does your addressing avoid overlap?
17. How many usable hosts are in /24 and why was that enough?
18. Why no NAT in this design?
19. Could this design be extended to 5th campus? What changes are required?
20. What are drawbacks of static routing in scale?
21. What security improvements would you add for wireless?
22. Why is AP management IP allowed via DHCP?
23. How do you verify host config marks quickly before demo?
24. How do you check that all static routes are loaded?
25. How do you check that all domains resolve from each site?
26. How do you detect wrong cabling vs wrong IP plan?
27. Why use private 10.0.0.0/8 instead of public ranges?
28. What evidence proves websites are accessible from anywhere?
29. What commands would you show examiner first in live demo?
30. If one DNS server fails, what behavior do clients show and why?

14) Files Delivered in CONFIGURATIONS/

- `CONFIGURATIONS/routers_clean/*.txt` (clean submission-ready router configs)
- `CONFIGURATIONS/servers/*.txt` (per-server setup instructions)
- `CONFIGURATIONS/reference/CLOUD_FRAME_RELAY_PVC_TABLE.txt`
- `CONFIGURATIONS/reference/AP_SETUP.txt`
- `CONFIGURATIONS/CN211_TEAM_CONFIGURATION_GUIDE_2026.pdf`

End of guide.