
Full Duplex OSPF Wireless

*MikroTik User Meeting
Jakarta 2011*

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Spectrum Indonesia

About Me

- Spectrum Indonesia - 2006
 - Research & Training Supervisor
 - MikroTik Certified
 - MTCNA
 - MTCWE
 - MTCTCE
 - MTCUME
 - Certified Trainer
- DIY Wireless

About Training

- Regular
 - Basic/Fundamental
 - Pre MTCNA
 - MTCNA
 - Advance
 - MTCRE
 - MTCTCE
 - MTCUME
 - MTCWE

Bootcamp Training



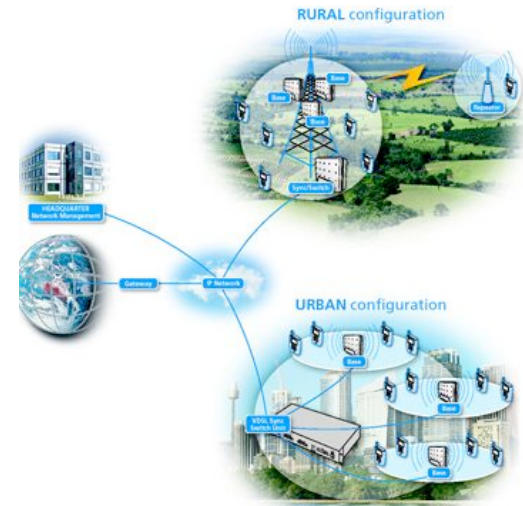
2011

Training Info

<http://www.trainingmikrotik.co.id>

<http://training.spectrumindo.com>

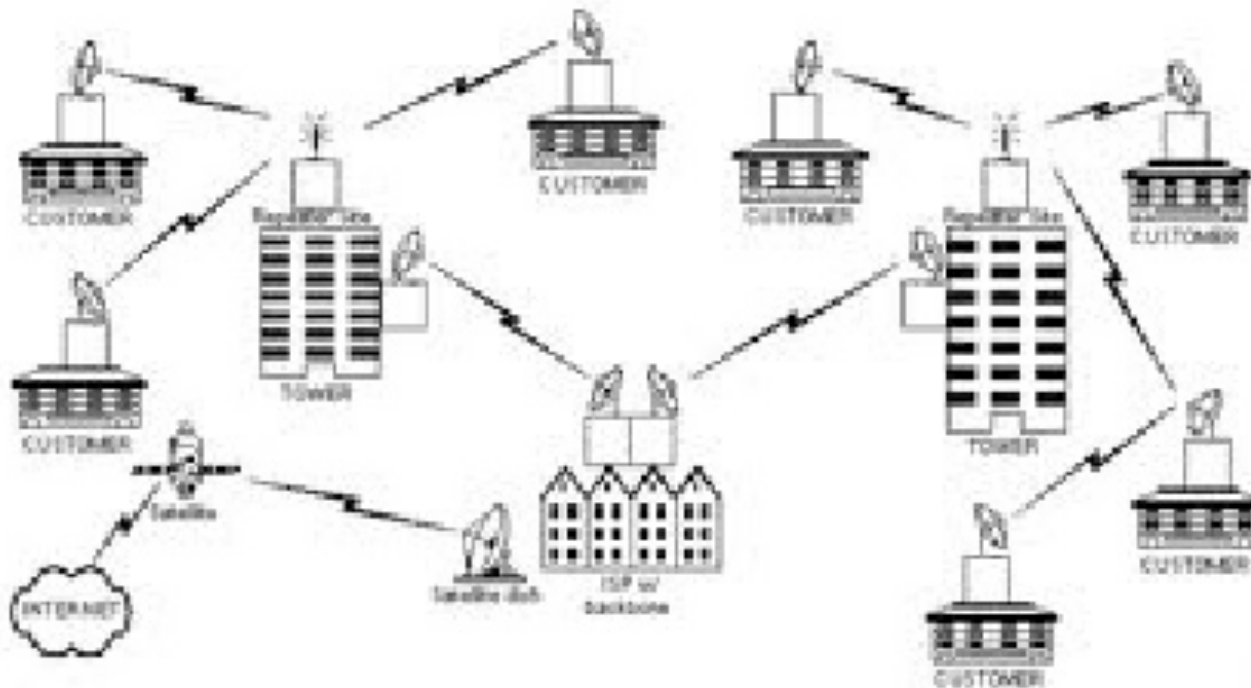
Wireless



Konsep Koneksi Wireless

- Akses Point (AP) dengan satu (atau lebih) station
- Ada kesamaan **SSID** (antara AP dan Station)
- Menggunakan **Band** yang sama
- Station mengikuti Frekuensi yang di-set di AP

Wireless Back Bone PtP



Batasan Wireless - Throughput

- BW sangat terbatas
- Jarak
 - Data Rate
 - Semakin jauh jarak, Data Rate makin rendah
 - Semakin kecil Data Rate Throughput makin kecil
- Dari waktu ke waktu kebutuhan BW makin meningkat



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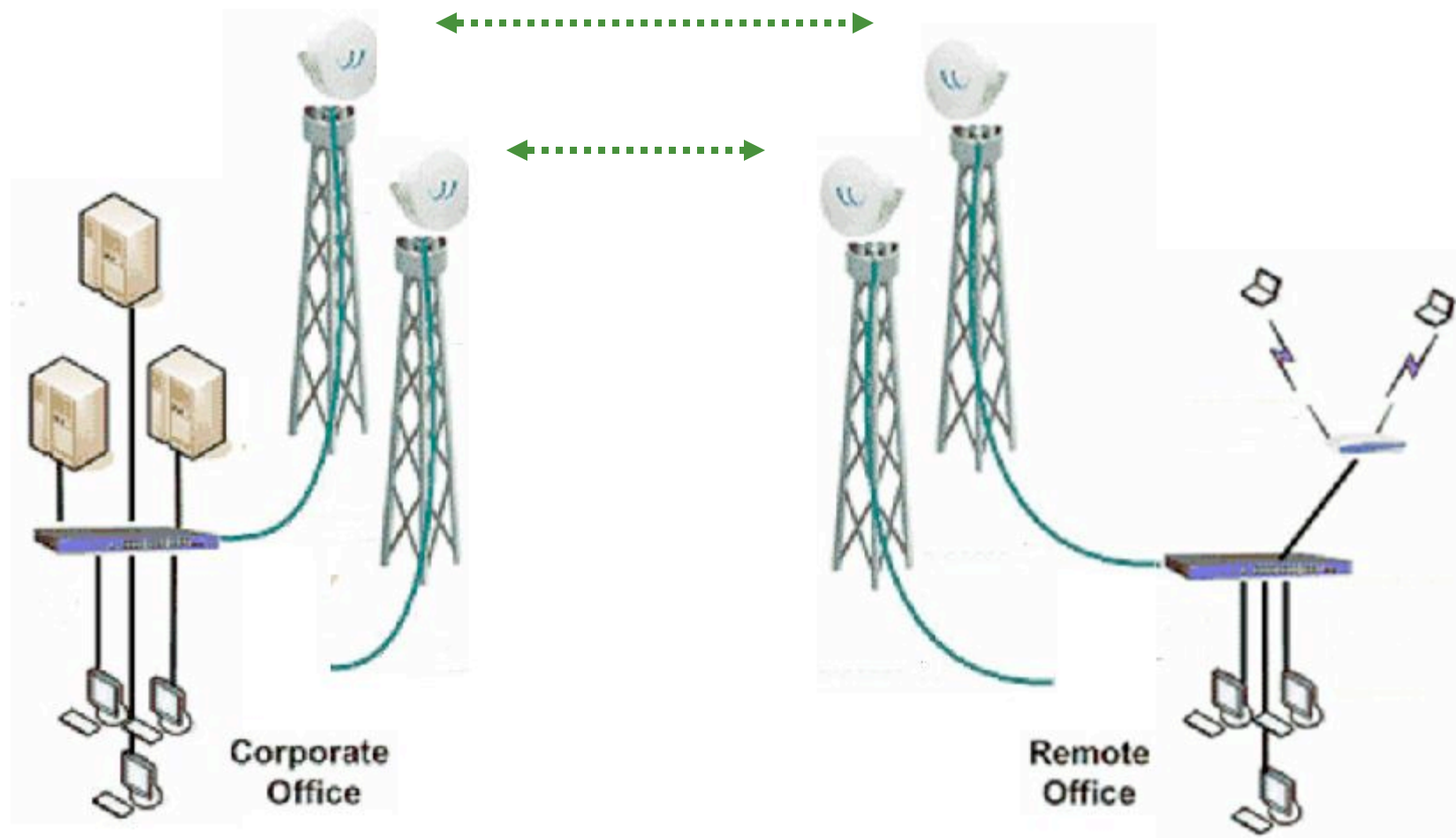
Single Link - Half Duplex



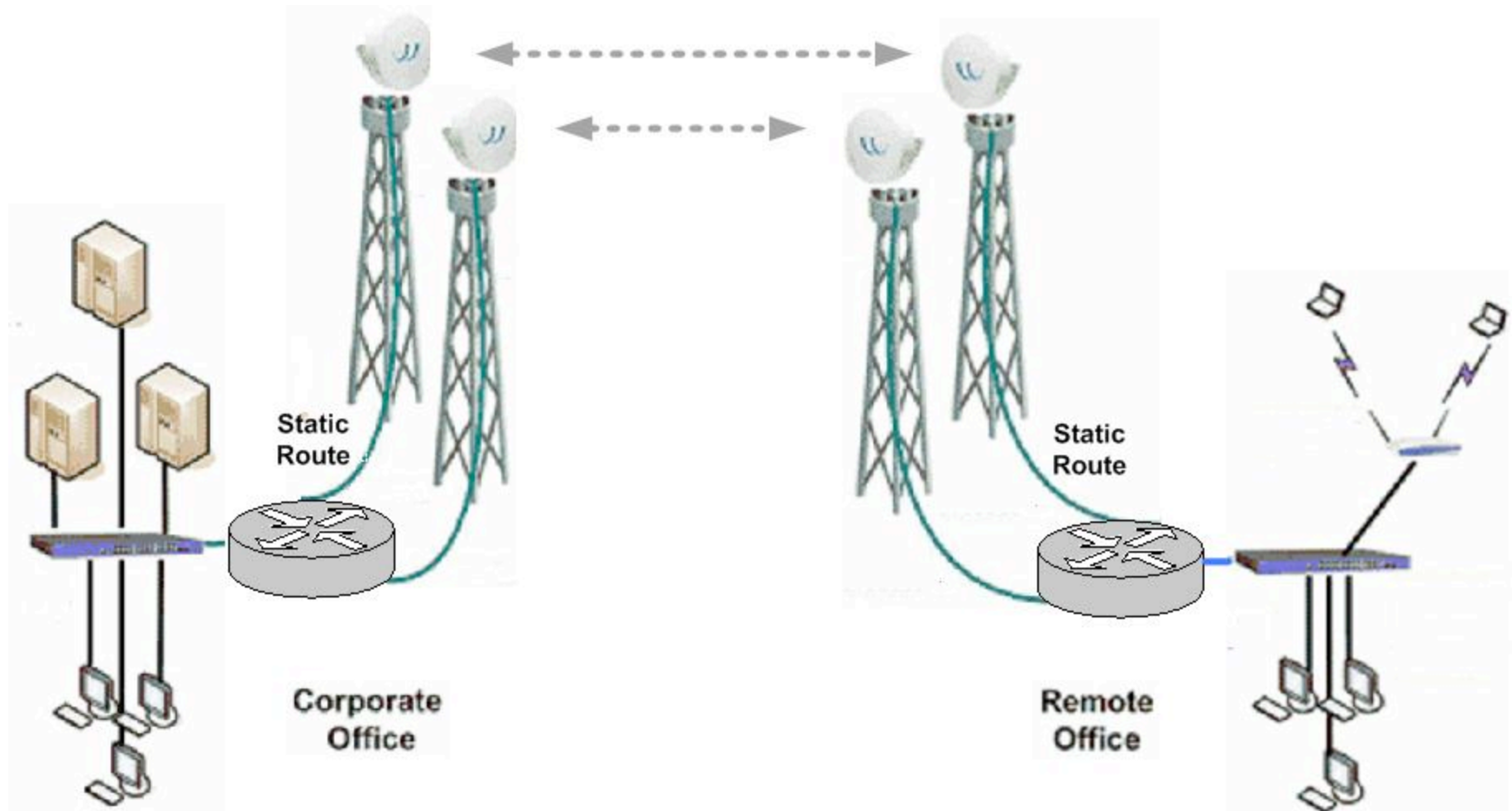
Single Link - Kelemahan

- Jika link putus, downtime relatif lama
- Throughput tidak maksimal (mode Half Duplex)
- Half Duplex:
 - Metode komunikasi dimana Tx dan Rx dilakukan secara bergantian pada interface radio yang sama

Double Link - Half Duplex



Double Link – Half Duplex_Alternatif



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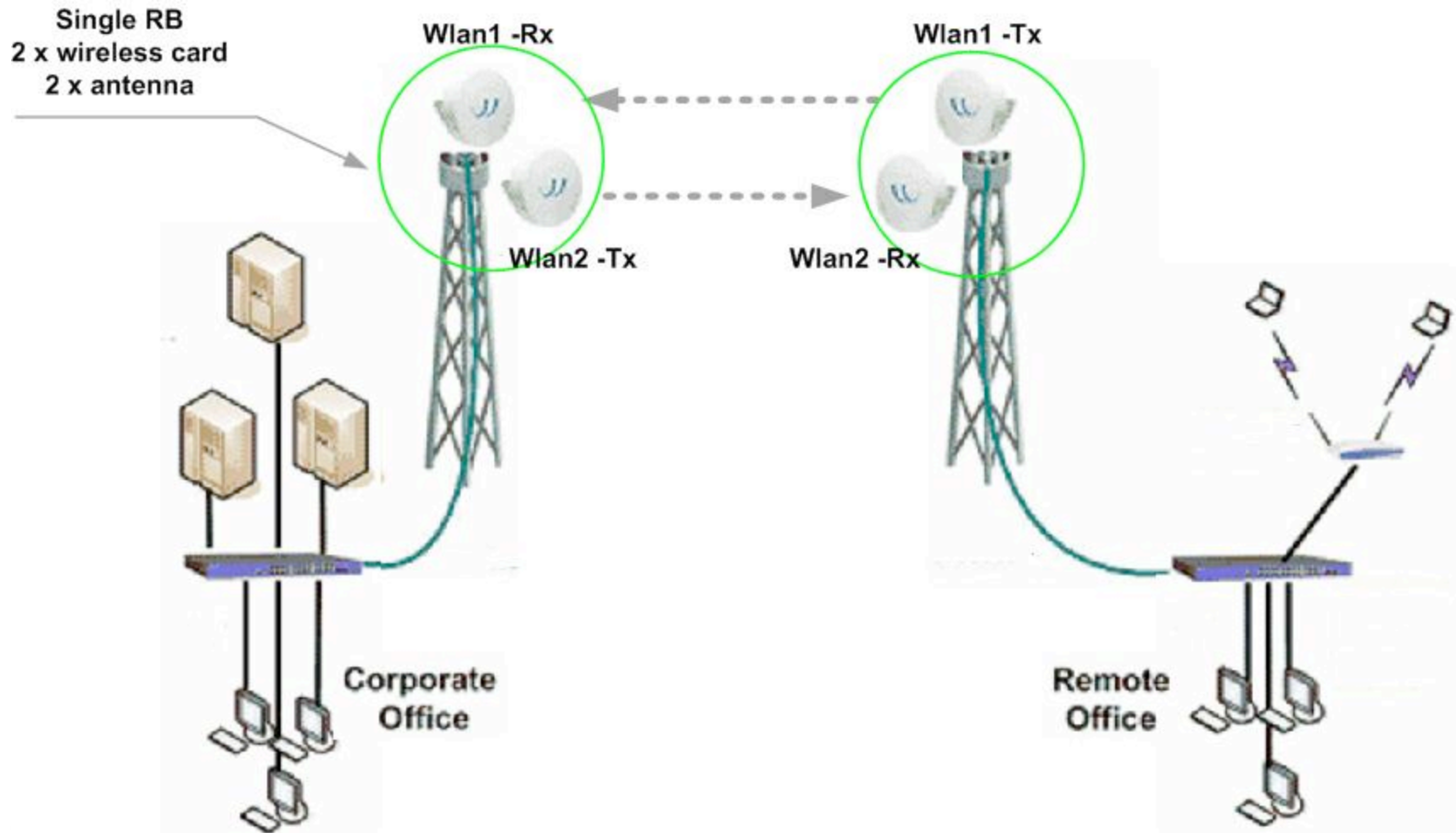
Double Link - Half Duplex_Kelemahan

- Jika link utama down, harus melakukan perubahan manual
 - ❑ Memasang UTP back up radio
 - ❑ Mengubah routing/gateway
- Butuh waktu untuk recovery :
 - ❑ Down time tergantung seberapa cepat respon teknisi dan backup link diaktifkan

Dual Nstreme - Full Duplex

- Proprietary MikroTik
- Double link dengan frekuensi (atau Band) berbeda dan masing-masing link spesifik 1 arah (Tx atau Rx only)
- Throughput maksimal, Tx dan Rx bisa dilakukan secara bersamaan pada interface wireless berbeda

Dual Nstreme - Full Duplex_Topologi



Dual NSTREME - Interface

- Untuk menggunakan Dual NSTREME, aktifkan interface fisik pada mode “nstream-dual-slave”

Interface <wlan2>

General Wireless HT WDS Nstream Traffic

Mode: nstream dual slave

Band: 5GHz

Frequency: 5180 MHz

SSID: 46

Scan List:

Security Profile: default

Semua konfigurasi yang ada disini akan diabaikan

Dual NSTREME - Interface

The screenshot shows the 'Interface <nstreme1>' configuration window. The 'General' tab is selected. The 'Tx Radio' is set to 'wlan1' and the 'Rx Radio' is set to 'wlan2'. The 'Remote MAC' is '00:00:00:00:00:00'. The 'Tx Band' is '5GHz' and the 'Tx Frequency' is '5220' MHz. The 'Rx Band' is '2.4GHz-G' and the 'Rx Frequency' is '2447'. The 'Disable CSMA' checkbox is unchecked. The 'Framer Policy' is 'none' and the 'Framer Limit' is '2560'. The 'Wireless Tables' window is open on the left, showing 'Interfaces' and 'Nstreme' tabs. The 'Nstreme' tab is selected, and the 'VirtualAP' option is checked. The 'Nstreme Dual' option is also checked.

Interface <nstreme1>

General Nstreme Dual Data Rates Status ...

Tx Radio: wlan1

Rx Radio: wlan2

Remote MAC: 00:00:00:00:00:00

Tx Band: 5GHz

Tx Frequency: 5220 MHz

Rx Band: 2.4GHz-G

Rx Frequency: 2447

☐ Disable CSMA

Framer Policy: none

Framer Limit: 2560

Wireless Tables

Interfaces Nstreme

+ - ✓ ✕

VirtualAP

WDS

Nstreme Dual

Interface fisik (harus ada 2)

Frekuensi TX (transmit), di sisi pasangan harus dipasang band dan frekuensi yang sama namun sisi Rx

Band dan frek Rx

Dual NSTREME - Interface

Interface <nstreme1>

General Nstreme Dual Data Rates Status ...

Tx Radio: wlan1

Rx Radio: wlan2

Remote MAC: 00:00:00:00:00:00

Tx Band: 5GHz

Tx Frequency: 5220 MHz

Rx Band: 2.4GHz-G

Rx Frequency: 2447

☐ Disable CSMA

Framer Policy: none

Framer Limit: 2560

Wireless Tables

Interfaces Nstreme

+ - ✓ ✕

VirtualAP

WDS

Nstreme Dual

MAC-ADDRESS
interface
DualNSTREME di
sisi pasangannya

Dual NSTREME – Status Signal

- Dual NSTREME Status

Interface <nstreme1>

General	Nstreme Dual	Data Rates	Status	Traffic
Rx Signal Strength: -43 dBm				
Tx Signal Strength: -34 dBm				
Rx Rate: 6Mbps				
Tx Rate: 36Mbps				

Dual Nstreme - Full Duplex_Kelemahan

- Tidak support dengan wireless selain MikroTik
- Penggantian frekuensi/band dilakukan di dua sisi, Tx dan Rx
- Jika salah satu link down, koneksi antar site terputus
- Harus menggunakan wireless card mini PCI yang terpasang langsung di RouterBOARD

Wireless OSPF Full Duplex

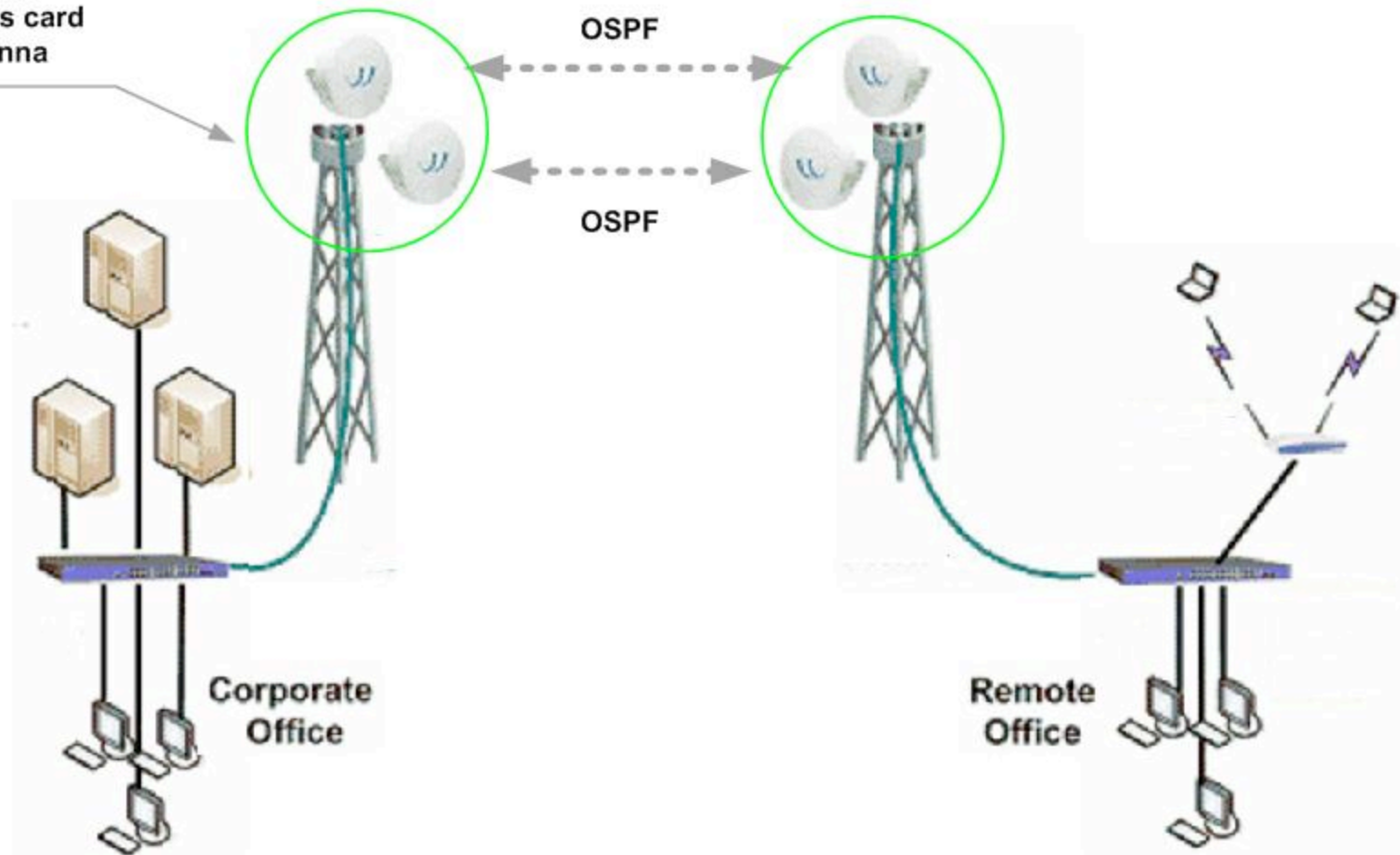
- Metode identik Dual NSTREME
- Menggunakan dual link radio Half Duplex
- Mode radio: AP_bridge – Station / Bridge - Station
- Double link Half Duplex dikombinasikan dengan Dynamic Routing (OSPF)
- Tx/Rx interface ditentukan berdasarkan cost interface OSPF

OSPF Full Duplex vs Dual Nstreme

- Full Duplex (Tx dan Rx menggunakan interface terpisah), throughput maksimal
- Back Up Link / Failover otomatis (2x Half Duplex Link)
- Penambahan/pengurangan link bisa dilakukan secara modular (radio terpisah)
- Bisa menggunakan banyak jenis perangkat wireless (mode bridge)
- Penggantian frekuensi lebih simple, karena hanya dilakukan di sisi AP

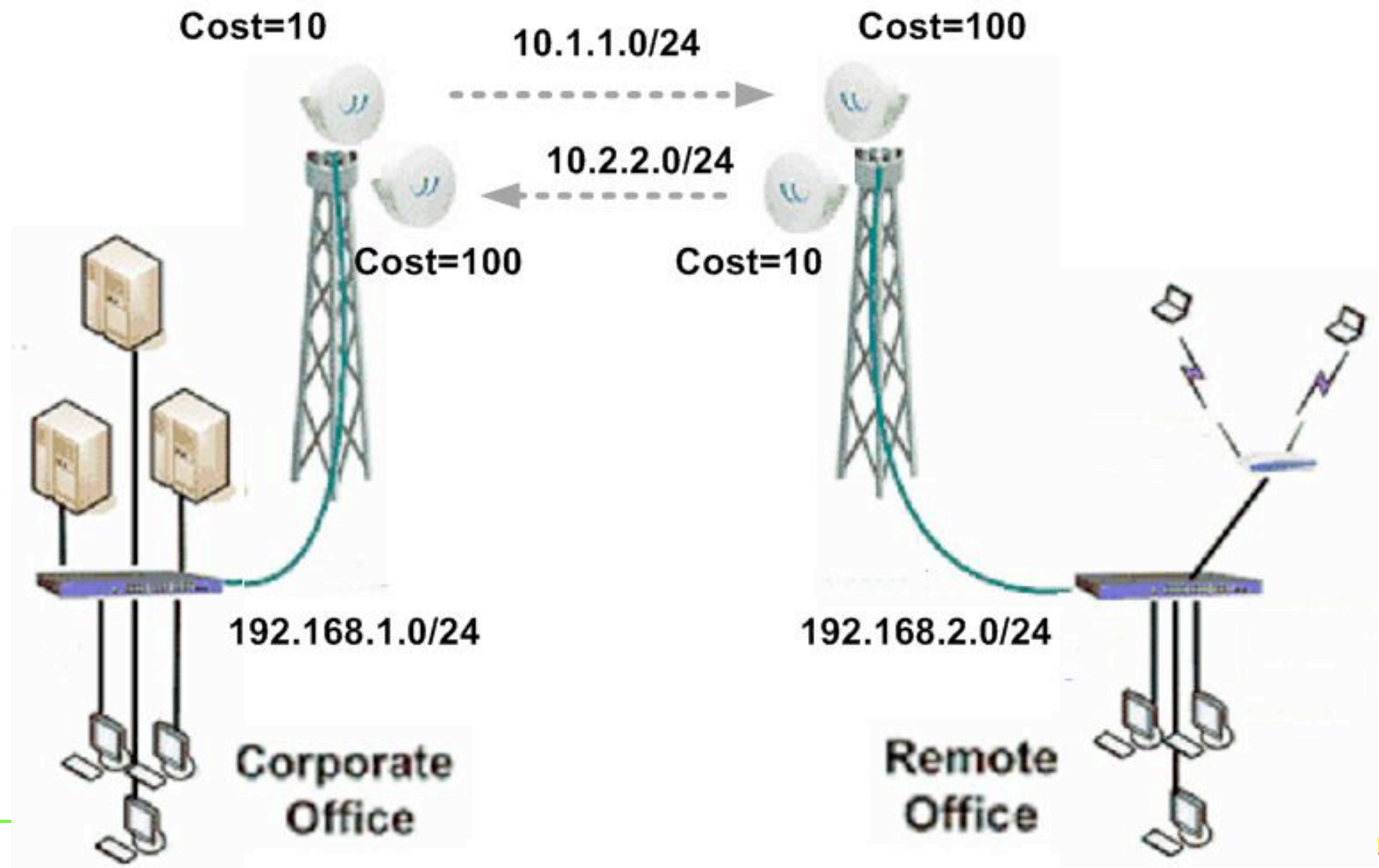
OSPF Full Duplex – Topologi

Single RB
2 x wireless card
2 x antenna



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OSPF Full Duplex - Setup



OSPF Full Duplex – Corp. Wireless

```
[admin@MikroTik] > interface wireless print
Flags: X - disabled, R - running
0  R name="wlan1" mtu=1500 mac-address=00:0C:42:61:6F:A5 arp=enabled
   interface-type=Atheros 11N mode=ap-bridge ssid="satu" frequency=5180
   band=5ghz-a channel-width=20mhz scan-list=default
   wireless-protocol=unspecified wds-mode=disabled wds-default-bridge=none
   wds-ignore-ssid=no bridge-mode=enabled default-authentication=yes
   default-forwarding=yes default-ap-tx-limit=0 default-client-tx-limit=0
   hide-ssid=no security-profile=default compression=no

1  R name="wlan2" mtu=1500 mac-address=00:0C:42:61:6B:D7 arp=enabled
   interface-type=Atheros 11N mode=ap-bridge ssid="dua" frequency=5785
   band=5ghz-a channel-width=20mhz scan-list=default
   wireless-protocol=unspecified wds-mode=disabled wds-default-bridge=none
   wds-ignore-ssid=no bridge-mode=enabled default-authentication=yes
   default-forwarding=yes default-ap-tx-limit=0 default-client-tx-limit=0
   hide-ssid=no security-profile=default compression=no
```


OSPF Full Duplex – Remote Wireless

```
[admin@MikroTik] > interface wireless print
Flags: X - disabled, R - running
0  R name="wlan1" mtu=1500 mac-address=00:0C:42:61:6F:A2 arp=enabled
   interface-type=Atheros 11N mode=station ssid="satu" frequency=5180
   band=5ghz-a channel-width=20mhz scan-list=default
   wireless-protocol=unspecified wds-mode=disabled wds-default-bridge=none
   wds-ignore-ssid=no bridge-mode=enabled default-authentication=yes
   default-forwarding=yes default-ap-tx-limit=0 default-client-tx-limit=0
   hide-ssid=no security-profile=default compression=no

1  R name="wlan2" mtu=1500 mac-address=00:0C:42:61:6F:B6 arp=enabled
   interface-type=Atheros 11N mode=station ssid="dua" frequency=5180
   band=5ghz-a channel-width=20mhz scan-list=default
   wireless-protocol=unspecified wds-mode=disabled wds-default-bridge=none
   wds-ignore-ssid=no bridge-mode=enabled default-authentication=yes
   default-forwarding=yes default-ap-tx-limit=0 default-client-tx-limit=0
   hide-ssid=no security-profile=default compression=no
```

OSPF Full Duplex – Corporate_OSPF

```
[admin@MikroTik] > ip address print
Flags: X - disabled, I - invalid, D - dynamic
#   ADDRESS          NETWORK      INTERFACE
0   10.1.1.1/24       10.1.1.0    wlan1
1   10.2.2.1/24       10.2.2.0    wlan2
2   192.168.1.1/24    192.168.1.0 ether1
```

OSPF Full Duplex – Corporate_OSPF

```
[admin@MikroTik] > routing ospf network print
```

Flags: X - disabled, I - invalid

#	NETWORK	AREA
0	10.1.1.0/24	backbone
1	10.2.2.0/24	backbone

```
[admin@MikroTik] > routing ospf interface print
```

Flags: X - disabled, I - inactive, D - dynamic,

#	INTERFACE	COST	PRIORITY	NETWORK-TYPE
0	wlan1	10	1	broadcast
1	wlan2	100	1	broadcast

OSPF Full Duplex – Corporate_OSPF

```
[admin@MikroTik] > routing ospf instance print
```

```
Flags: X - disabled
```

```
0  name="default" router-id=0.0.0.0 distribute-default=never  
   redistribute-connected=as-type-1 redistribute-static=no  
   redistribute-rip=no redistribute-bgp=no redistribute-other-ospf=no  
   metric-default=1 metric-connected=20 metric-static=20 metric-rip=20  
   metric-bgp=auto metric-other-ospf=auto in-filter=ospf-in  
   out-filter=ospf-out
```


OSPF Full Duplex – Remote_OSPF

```
[admin@MikroTik] > ip address print
```

Flags: X - disabled, I - invalid, D - dynamic

#	ADDRESS	NETWORK	INTERFACE
0	10.1.1.2/24	10.1.1.0	wlan1
1	10.2.2.2/24	10.2.2.0	wlan2
2	192.168.2.1/24	192.168.2.0	ether1

OSPF Full Duplex – Remote_OSPF

```
[admin@MikroTik] > routing ospf network print
```

Flags: X - disabled, I - invalid

#	NETWORK	AREA
0	10.1.1.0/24	backbone
1	10.2.2.0/24	backbone

```
[admin@MikroTik] > routing ospf interface print
```

Flags: X - disabled, I - inactive, D - dynamic,

#	INTERFACE	COST	PRIORITY	NETWORK-TYPE
0	wlan1	100	1	broadcast
1	wlan2	10	1	broadcast

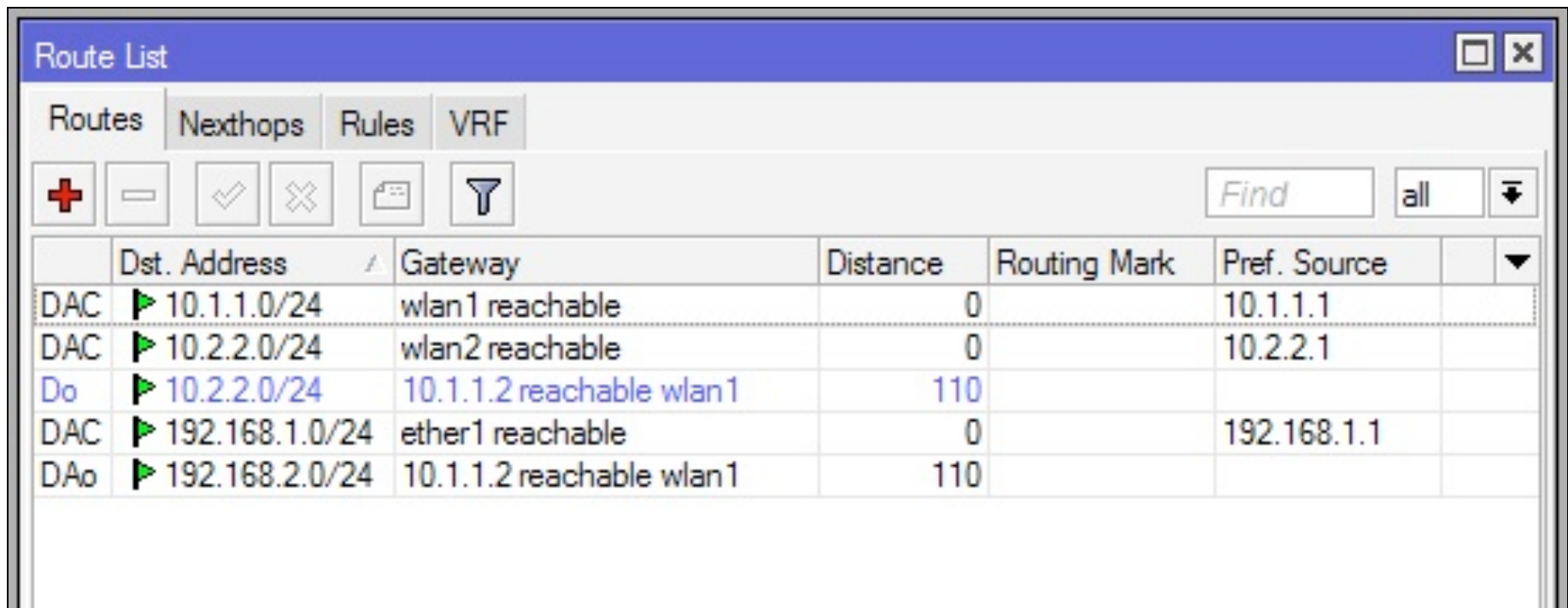
OSPF Full Duplex – Remote_OSPF

```
[admin@MikroTik] > routing ospf instance print
```

```
Flags: X - disabled
```

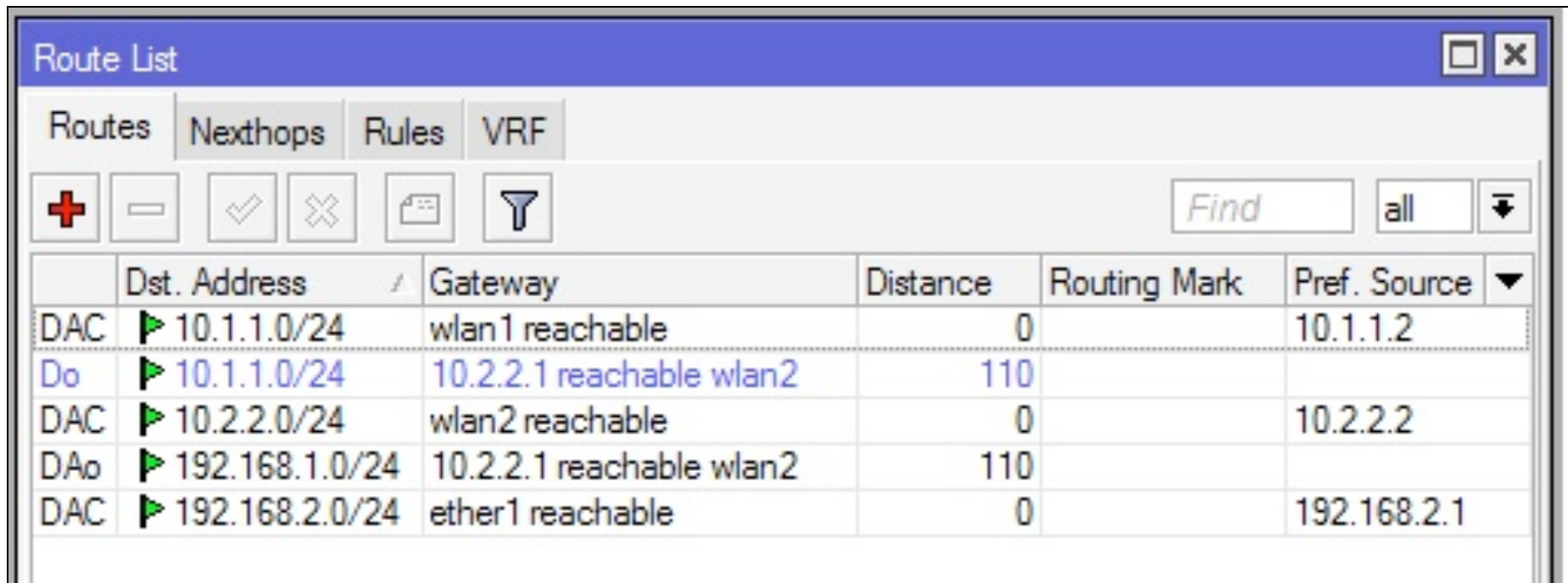
```
0  name="default" router-id=0.0.0.0 distribute-default=never  
   redistribute-connected=as-type-1 redistribute-static=no  
   redistribute-rip=no redistribute-bgp=no redistribute-other-ospf=no  
   metric-default=1 metric-connected=20 metric-static=20 metric-rip=20  
   metric-bgp=auto metric-other-ospf=auto in-filter=ospf-in  
   out-filter=ospf-out
```

OSPF Full Duplex – Corporate_Route



	Dst. Address	Gateway	Distance	Routing Mark	Pref. Source	
DAC	▶ 10.1.1.0/24	wlan1 reachable	0		10.1.1.1	
DAC	▶ 10.2.2.0/24	wlan2 reachable	0		10.2.2.1	
Do	▶ 10.2.2.0/24	10.1.1.2 reachable wlan1	110			
DAC	▶ 192.168.1.0/24	ether1 reachable	0		192.168.1.1	
DAo	▶ 192.168.2.0/24	10.1.1.2 reachable wlan1	110			

OSPF Full Duplex – Remote_Route



The image shows a 'Route List' window with a blue title bar and standard window controls. Below the title bar are four tabs: 'Routes' (selected), 'Nexthops', 'Rules', and 'VRF'. A toolbar contains icons for adding (+), subtracting (-), checking (✓), unchecking (✗), a document icon, and a funnel icon. To the right of the toolbar is a 'Find' text box, a dropdown menu set to 'all', and a search button. The main area is a table with the following columns: an empty column, 'Dst. Address', 'Gateway', 'Distance', 'Routing Mark', and 'Pref. Source'. The table contains five rows of data, each starting with a status icon and a label (DAC, Do, DAC, DAo, DAC).

	Dst. Address	Gateway	Distance	Routing Mark	Pref. Source
DAC	▶ 10.1.1.0/24	wlan1 reachable	0		10.1.1.2
Do	▶ 10.1.1.0/24	10.2.2.1 reachable wlan2	110		
DAC	▶ 10.2.2.0/24	wlan2 reachable	0		10.2.2.2
DAo	▶ 192.168.1.0/24	10.2.2.1 reachable wlan2	110		
DAC	▶ 192.168.2.0/24	ether1 reachable	0		192.168.2.1

OSPF Full Duplex – Traffic

Interface List

Interface: Ethernet EoIP Tunnel IP Tunnel GRE Tunnel VLAN VRRP Bonding

Find

	Name	Type	L2 MTU	Tx	Rx	Tx Pac...	Rx Pac...	Tx ▼
R	ether1	Ethernet		12.1 Mbps	12.4 Mbps	1 005	1 027	
R	ether2	Ethernet		0 bps	0 bps	0	0	
R	ether3	Ethernet		0 bps	0 bps	0	0	
R	wlan1	Wireless (Atheros 11N)	2290	12.4 Mbps	0 bps	1 024	0	
R	wlan2	Wireless (Atheros 11N)	2290	0 bps	12.1 Mbps	0	1 002	

Interface List

Interface: Ethernet EoIP Tunnel IP Tunnel GRE Tunnel VLAN VRRP Bonding

Find

	Name	Type	L2 MTU	Tx	Rx	Tx Pac...	Rx Pac...	▼
R	ether1	Ethernet		12.3 Mbps	12.1 Mbps	1 021	1 002	
R	ether2	Ethernet		0 bps	0 bps	0	0	
R	ether3	Ethernet		0 bps	0 bps	0	0	
R	wlan1	Wireless (Atheros 11N)	2290	0 bps	12.3 Mbps	0	1 016	
R	wlan2	Wireless (Atheros 11N)	2290	12.0 Mbps	675 bps	992	1	

OSPF Full Duplex – Disable Wlan1

Interface List

Interface: Ethernet, EoIP Tunnel, IP Tunnel, GRE Tunnel, VLAN, VRRP, Bonding

Find

	Name	Type	L2 MTU	Tx	Rx	Tx Pac...	Rx Pac...	Tx
R	ether1	Ethernet		12.2 Mbps	12.2 Mbps	1 015	1 013	
R	ether2	Ethernet		0 bps	0 bps	0	0	
R	ether3	Ethernet		0 bps	0 bps	0	0	
X	wlan1	Wireless (Atheros 11N)	2290	0 bps	0 bps	0	0	
R	wlan2	Wireless (Atheros 11N)	2290	12.2 Mbps	12.2 Mbps	1 009	1 011	

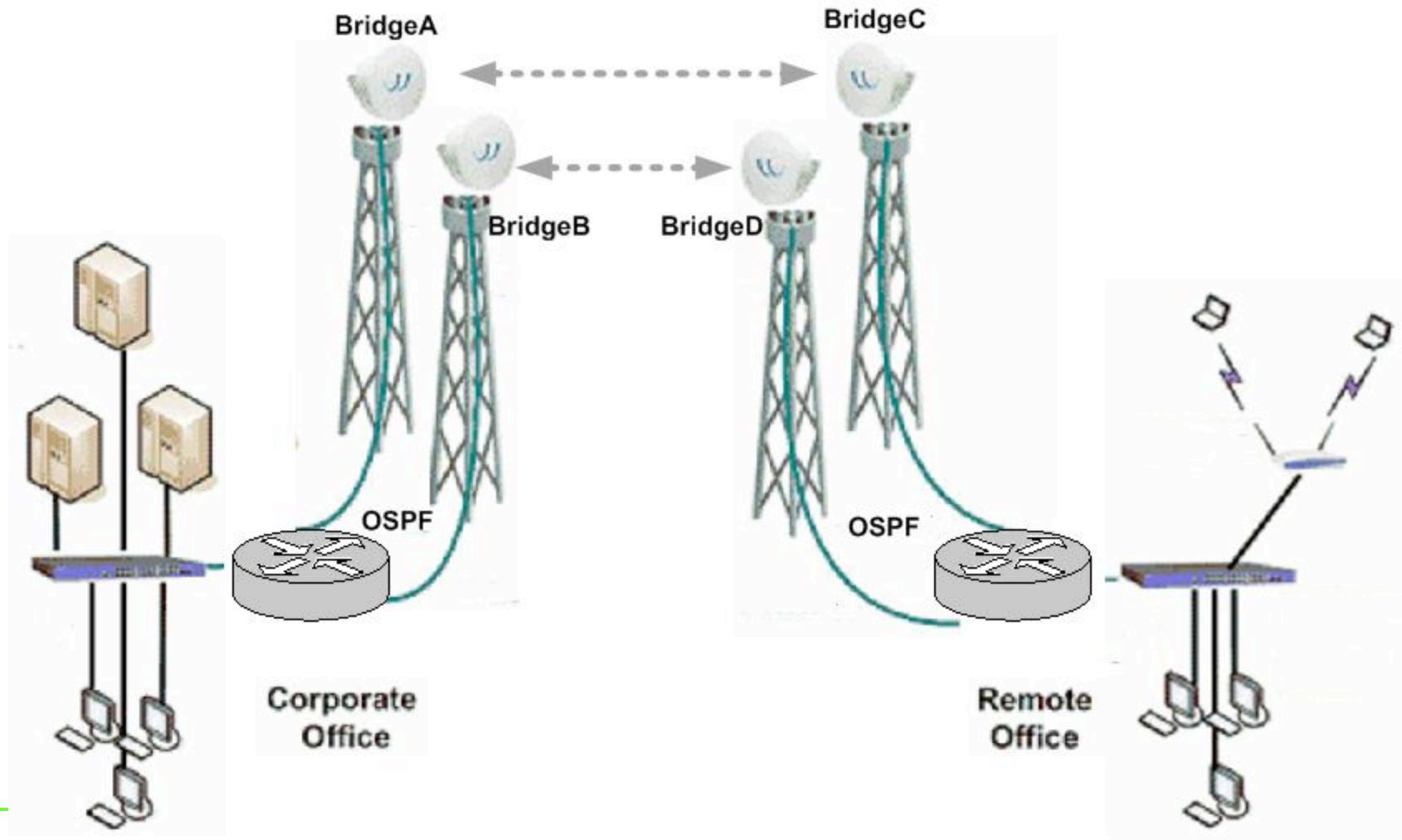
Interface List

Interface: Ethernet, EoIP Tunnel, IP Tunnel, GRE Tunnel, VLAN, VRRP, Bonding

Find

	Name	Type	L2 MTU	Tx	Rx	Tx Pac...	Rx Pac...	
R	ether1	Ethernet		12.3 Mbps	12.1 Mbps	1 018	1 002	
R	ether2	Ethernet		0 bps	0 bps	0	0	
R	ether3	Ethernet		0 bps	0 bps	0	0	
X	wlan1	Wireless (Atheros 11N)	2290	0 bps	0 bps	0	0	
R	wlan2	Wireless (Atheros 11N)	2290	12.1 Mbps	12.3 Mbps	1 005	1 020	

OSPF Full Duplex – Topologi_Alternatif



Thank You
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