

Redundant Internet service provision - customer viewpoint



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Agenda

- ❖ Requirement of redundant
- ❖ Types of redundant
 - Backup
 - Load-sharing
 - Multihoming
- ❖ Challenge to service provider
- ❖ Solution for consumers
- ❖ Another redundant issue - MPLS VPN
- ❖ Next challenge

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Requirement of redundant

❖ Internet access is a very important service today for:

➤ Enterprise/business

- Tools of operation
- Decreasing the cost
- Increasing the revenue

➤ Consumers

- Communication tools
- Entertainment

❖ Customers need redundant service provision

Requirement of redundant

- ❖ It was expensive to build a redundant Internet topology for end-user before:
 - Use leased line/ISDN for backup only
 - Less circuit utilization
 - Expensive network equipments
 - Complex network operation

Requirement of redundant

- ❖ Today, new type of circuit provides simple and convenient way to build a redundant Internet access service
 - FTTx
 - xDSL
 - Wireless
- ❖ More and more cheap and efficient network equipments appear
- ❖ SP could provide enough redundant service for customer requirements

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Types of redundant

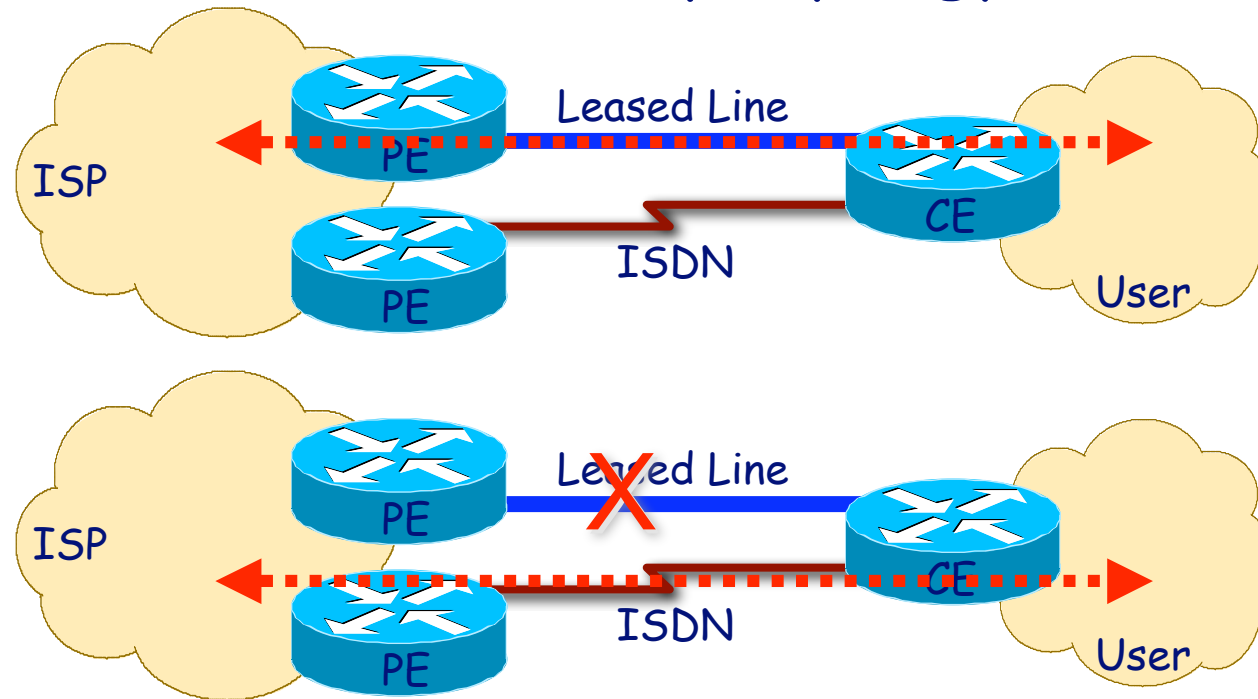
❖ 3 types of redundant (1)

➤ Backup

- Redundant circuit
 - ✓ Primary: expensive, better quality
 - ✓ Backup: cheap, less bandwidth
- Use backup circuit only when primary circuit is failure

Types of redundant - Backup

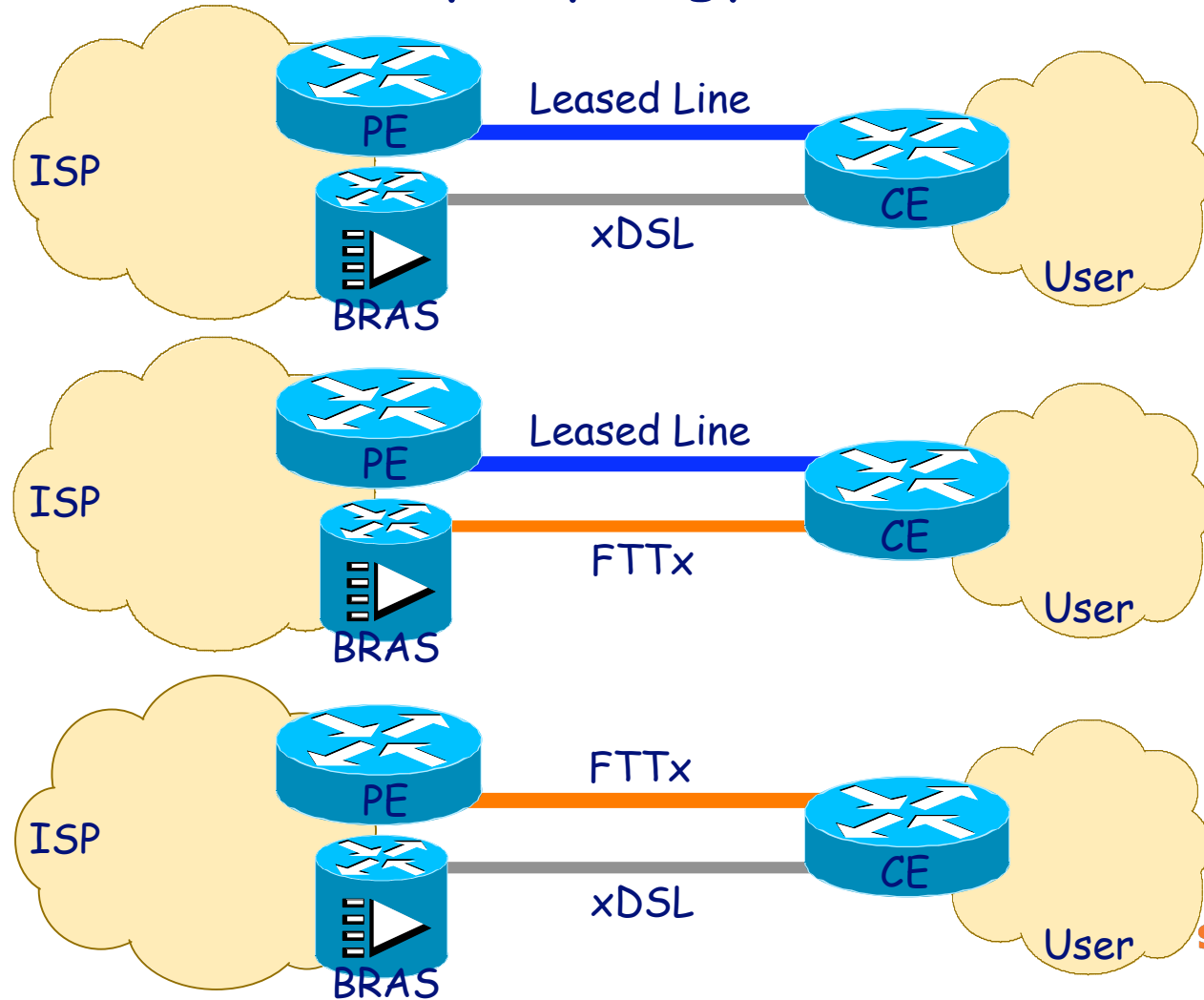
❖ Traditional circuit backup topology



❖ Customers need cheaper and higher bandwidth backup solution

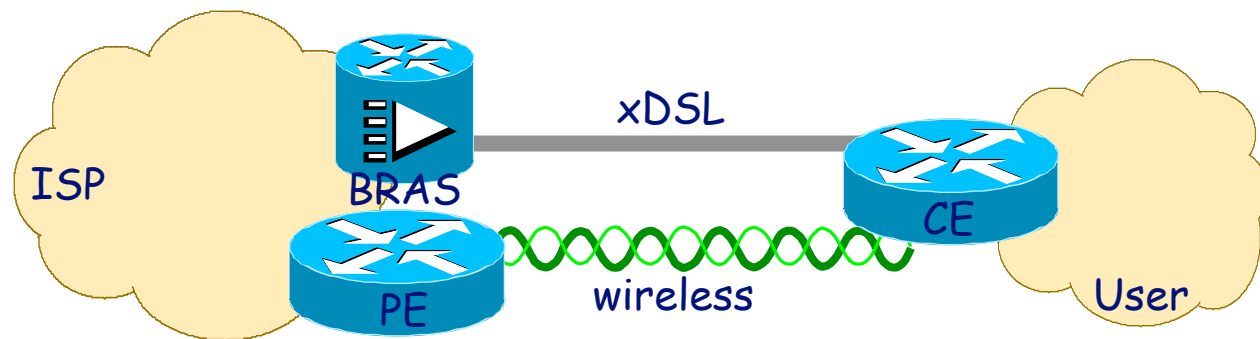
Types of redundant - Backup

❖ New circuit backup topology



Types of redundant - Backup

❖ New circuit backup topology



❖ When customers use two permanent circuits, they hope to use these two circuits at the same time

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Types of redundant

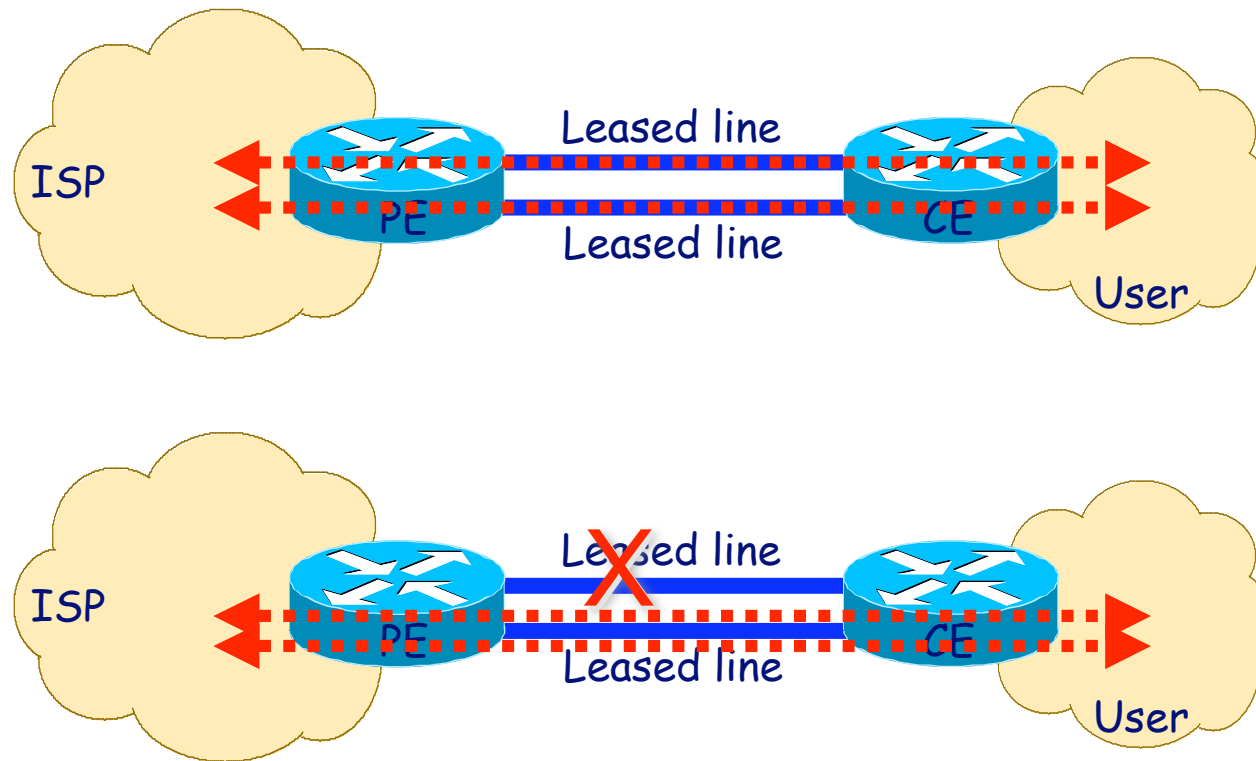
❖ 3 types of redundant (2)

➤ Load-sharing

- Redundant circuit
 - ✓ Usually use the same type of circuit
 - ✓ Sometimes two circuits with the different type but the same bandwidth is possible
- Sharing traffic among those circuits
- Redundant PE/CE (option)
 - ✓ Prevent any single-point failure

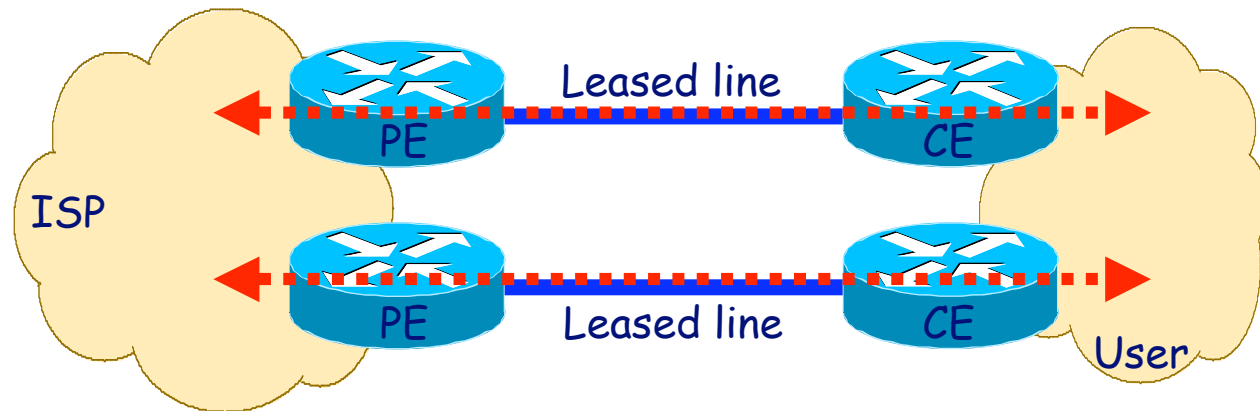
Types of redundant - Load-sharing

❖ Basic topology of load-sharing



Types of redundant - Load-sharing

❖ Advanced topology of load-sharing



- ❖ Some customers think to connect to only one SP is risky
- ❖ They need redundant option on SP issue

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Types of redundant

❖ 3 types of redundant (3)

➤ Multihoming

- Redundant circuit
 - ✓ Usually use the same type of circuit
 - ✓ Sometimes two circuits with the different type but the same bandwidth is possible
- Sharing traffic between those circuits
- Redundant CE (option)
 - ✓ Prevent single-point failure on CE router
- Redundant service provider
 - ✓ Prevent single-point failure on SP

Types of redundant - Multihoming

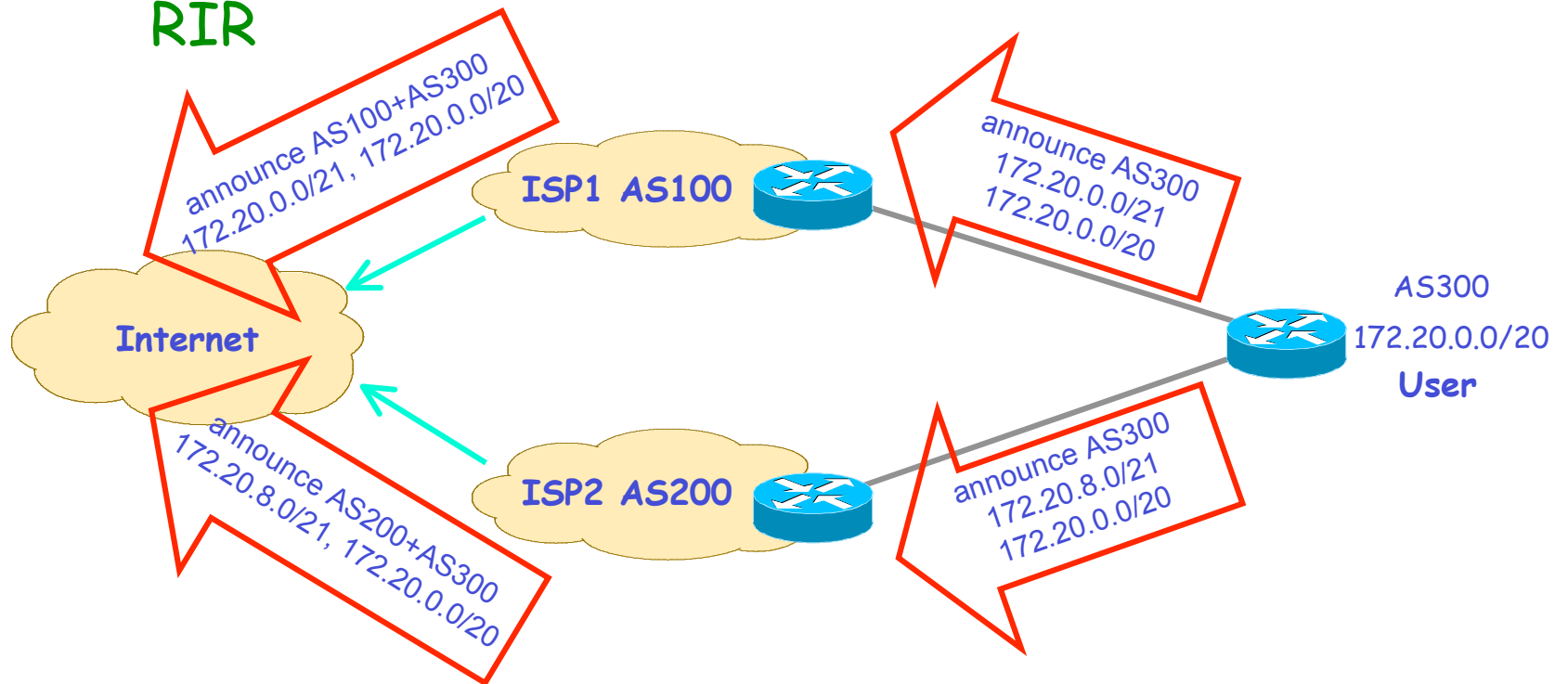
- ❖ Lots of documents talks about BGP multihoming
- ❖ Only discuss REAL cases that our customer ask us to provision here
- ❖ Our customer uses the IP block(s) from RIR (TWNIC) only
 - seednet did not provide IP blocks for multihoming service

Types of redundant - Multihoming

- ❖ Three ways to provision multihoming service
 - Customers use BGP to exchange routing information between SP with their AS# from RIR
 - Customers use BGP to exchange routing information between SP with private AS#
 - Customers do not use BGP to exchange routing information between SP

Types of redundant - Multihoming

- Customers use BGP to exchange routing information between SP with their AS# from RIR



- SP announce full Internet routes or default route only to customer

Types of redundant - Multihoming

- Discussion for customers use BGP to exchange routing information between SP with their AS# from RIR:
 - Customers have to apply AS# from RIR
 - ✓ It is no necessary if those customers use their BGP network for redundant Internet access only (e.g. NOT for transit)
 - Customers have to maintain BGP by themselves
 - ✓ Not so much engineers in customer site know well and have no fear on BGP
- Any more suitable solution?

Types of redundant - Multihoming

- Customers use BGP to exchange routing information between SP with private AS#



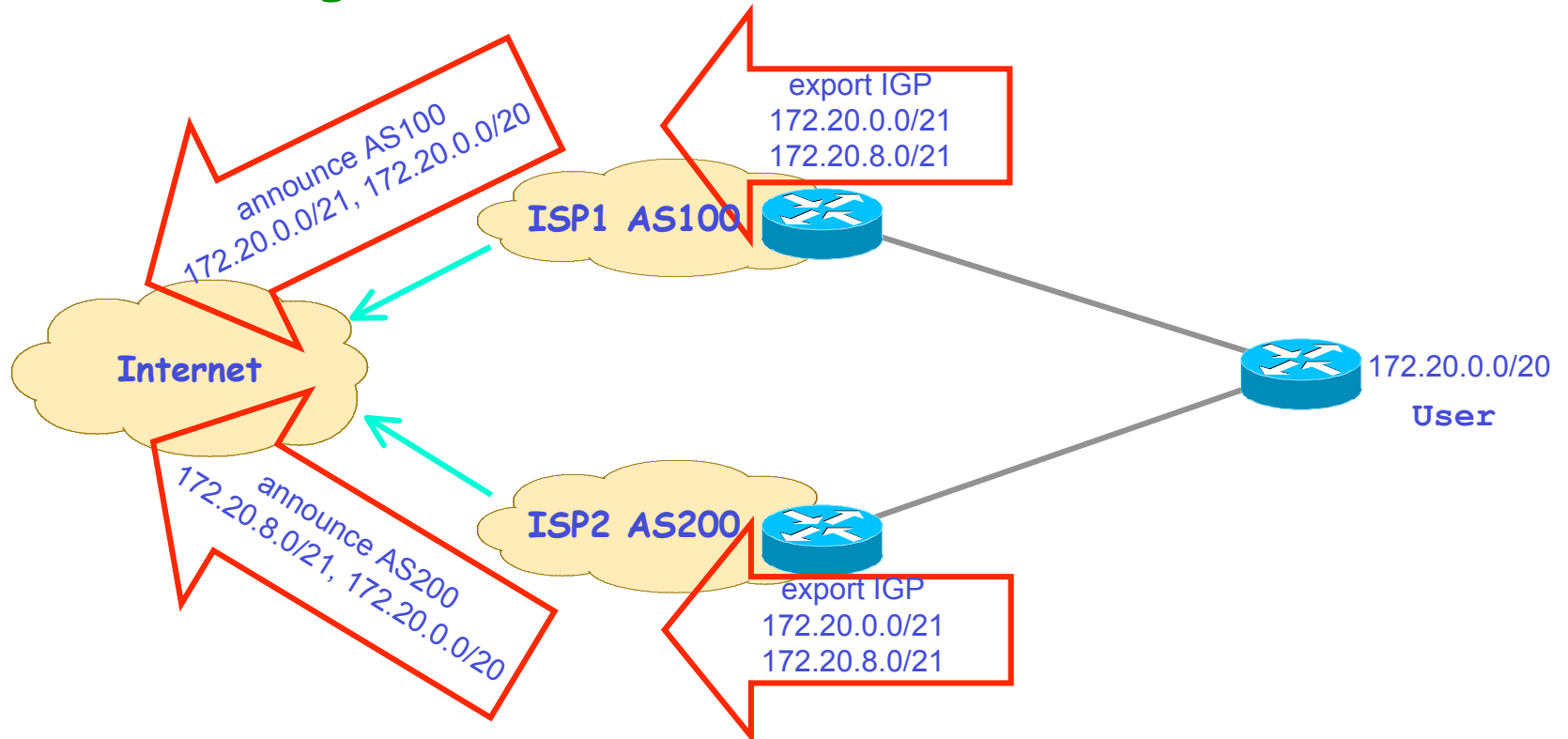
- SP announce full Internet routes or default route to customer

Types of redundant - Multihoming

- Customers use BGP to exchange routing information between SP with private AS#
 - Customer have to maintain BGP by themselves
 - ✓ Not so much engineers in customer site know well and have no fear on BGP
- Obviously, the ability for BGP is the key
- Any solution to remove BGP here?

Types of redundant - Multihoming

- Customers do NOT use BGP to exchange routing information between SP



- SP does not announce any route to customer

Types of redundant - Multihoming

- Customers do not use BGP to exchange routing information between SP
 - Customer have to maintain their output traffic by some ways
 - ✓ Flow based load-sharing
 - » Use equal cost default route only
 - » Asymmetric routing status happened
 - ✓ Policy-based routing (Cisco)
 - » Keep the symmetric routing status
 - » Use "PBR Recursive Next Hop" to increase the reliability
 - ✓ Filter-based forwarding (Juniper)
 - » Keep the symmetric routing status
 - » Use multiple routing table to increase the reliability

Agenda

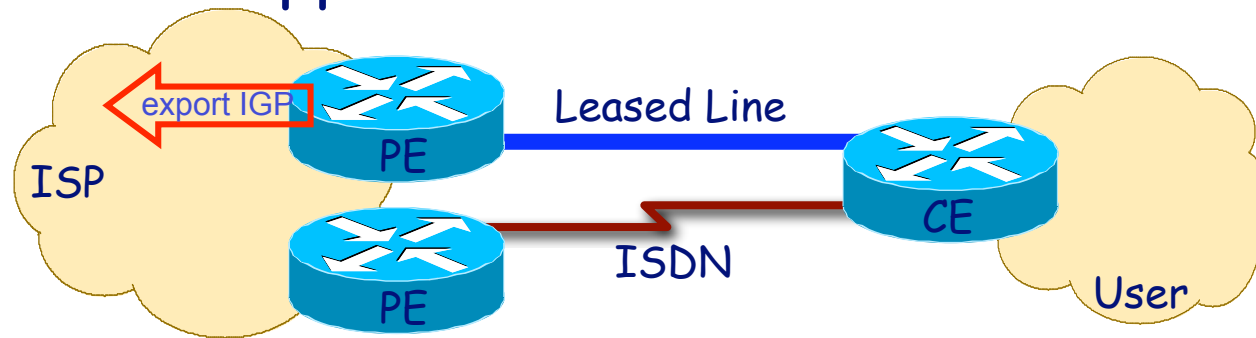
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Challenge to service provider

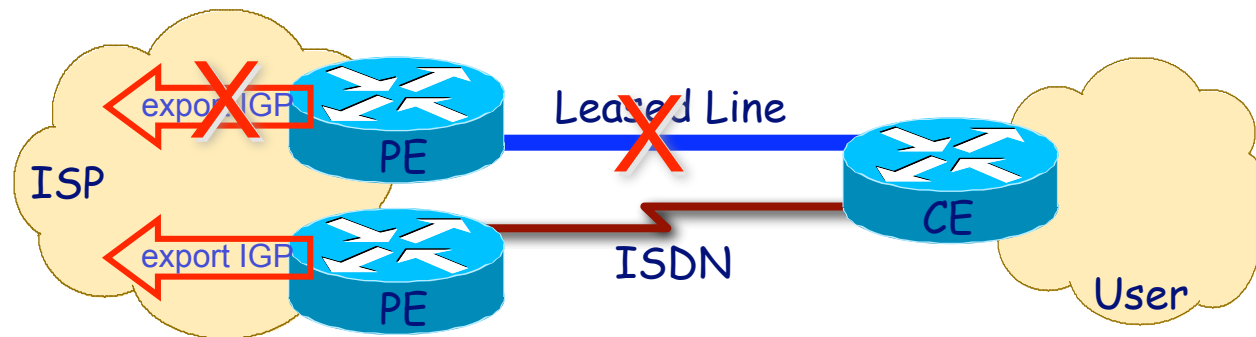
- ❖ To provide the new topology for backup and load-sharing redundant, SP needs new equipments and routing architecture too.
 - New equipments for new circuit
 - New routing architecture
 - Ways to control customer routes in SP backbone

Challenge to service provider

- ❖ In the old backup topology, backup route would not appear in backbone

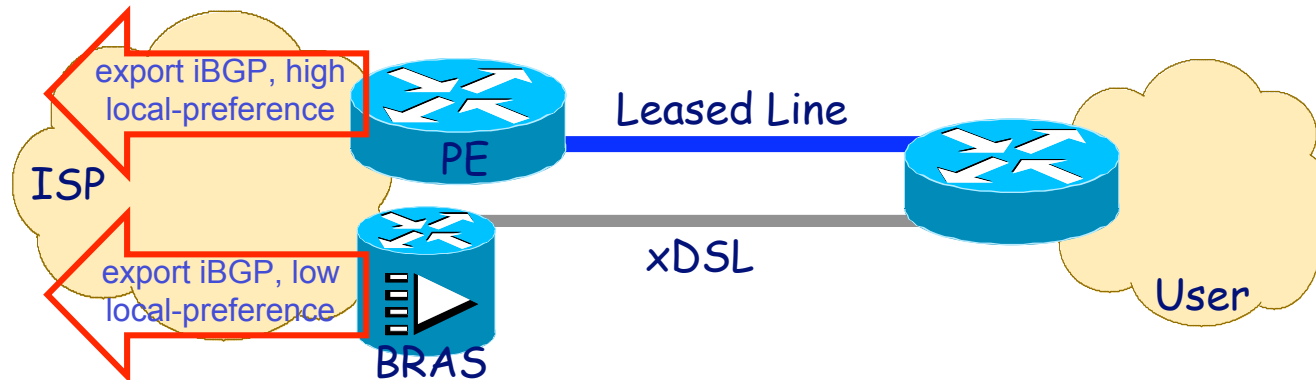


- ❖ When the primary circuit fail, the ISDN dial-up and change the routing status



Challenge to service provider

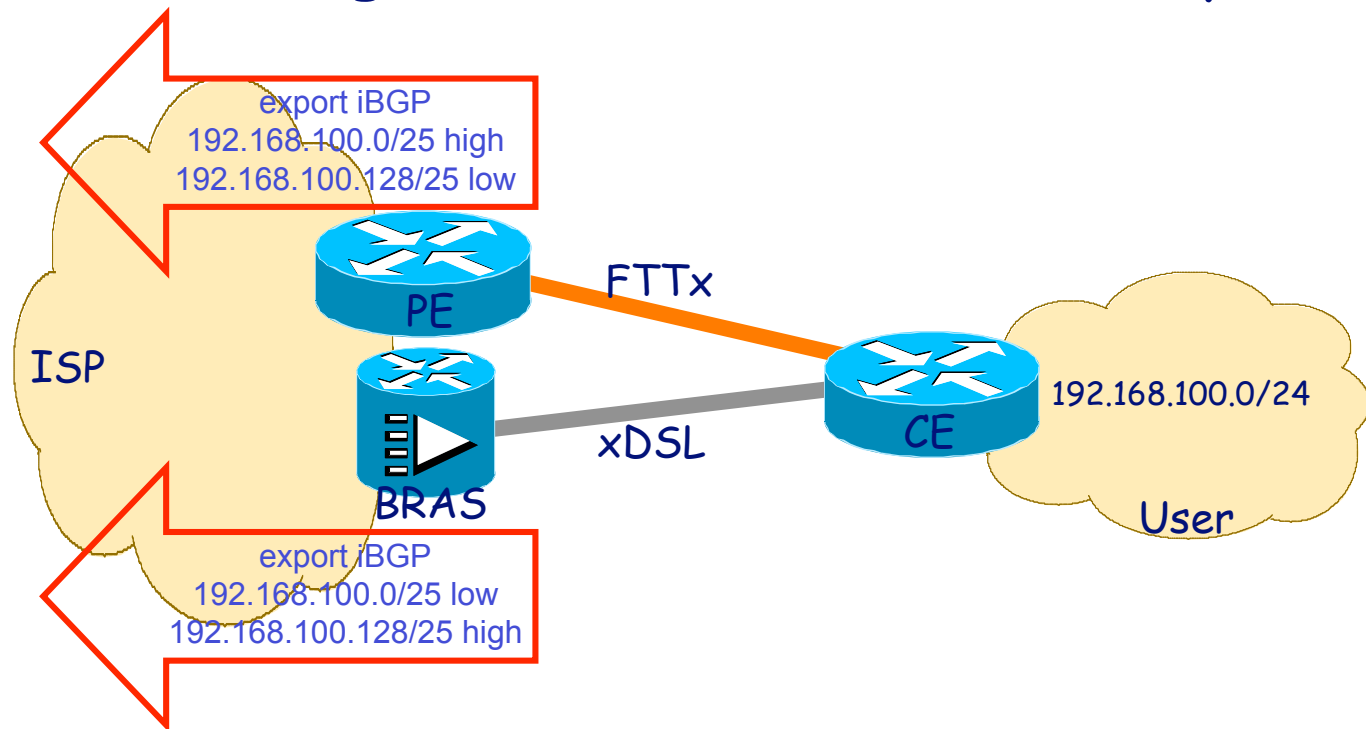
- ❖ In the new backup topology, customers use permanent circuit for backup
 - Backup route leaks in the network
 - Need to differentiate the primary/backup routes in the backbone network



- Have to re-configure backbone routing topology if the old one is not suitable now

Challenge to service provider

- ❖ In the redundant load-sharing topology, suitable routing architecture is necessary too



- Customers have to maintain default route by themselves

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Solution for consumers

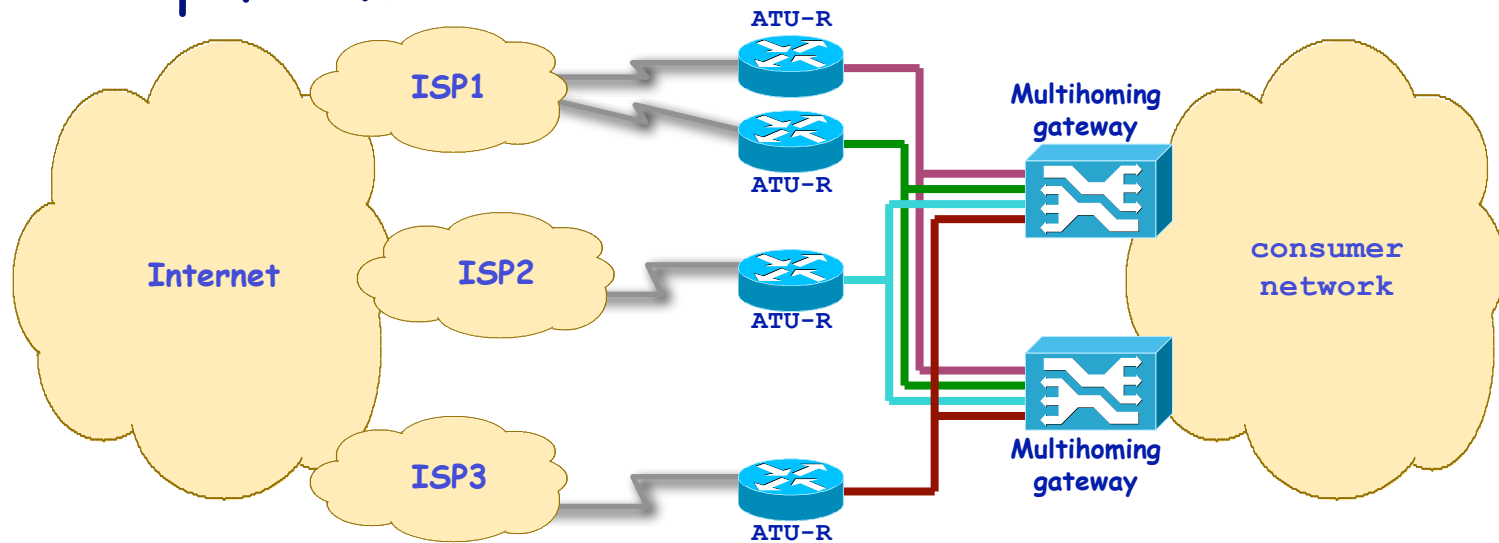
- ❖ Basically, only enterprises will use those redundant solution above
- ❖ Sometimes consumers/SOHO would use Internet access for crucial purpose:
 - Health and Medical Care
 - Small business
- ❖ Any solution for consumers/SOHO to own their reliable Internet access?

Solution for consumers

- ❖ There are many “multihoming gateway” network equipment
- ❖ The function of those equipment include:
 - Load balance capacity
 - Security
 - VPN
 - QoS
 - Common service
 - Basic routing
 - Reliability
 -

Solution for consumers

- ❖ Consumers/SOHO could buy those equipment and use them for redundant Internet access
- ❖ This kind of redundant does NOT need the help from SP



- ❖ SP has to increase the quality to keep the customers

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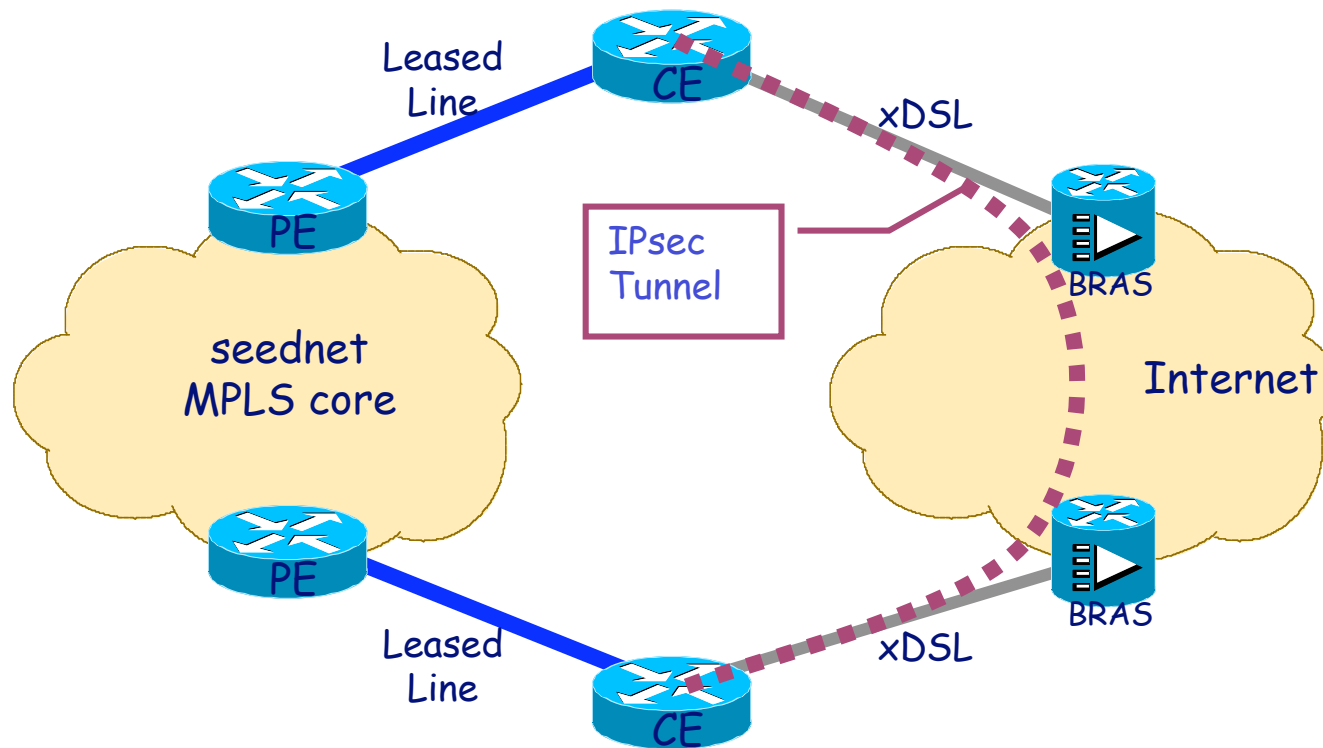
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Another redundant issue - MPLS VPN

- ❖ If customers only want to use backup or load-sharing solution, they could use the architectures above
- ❖ But to use multihoming solution is difficult, Inter-AS MPLS VPN is not widespread like Internet access
- ❖ Mostly customers use MPLS VPN for crucial service
- ❖ How can we propose suitable solution for MPLS VPN redundant?

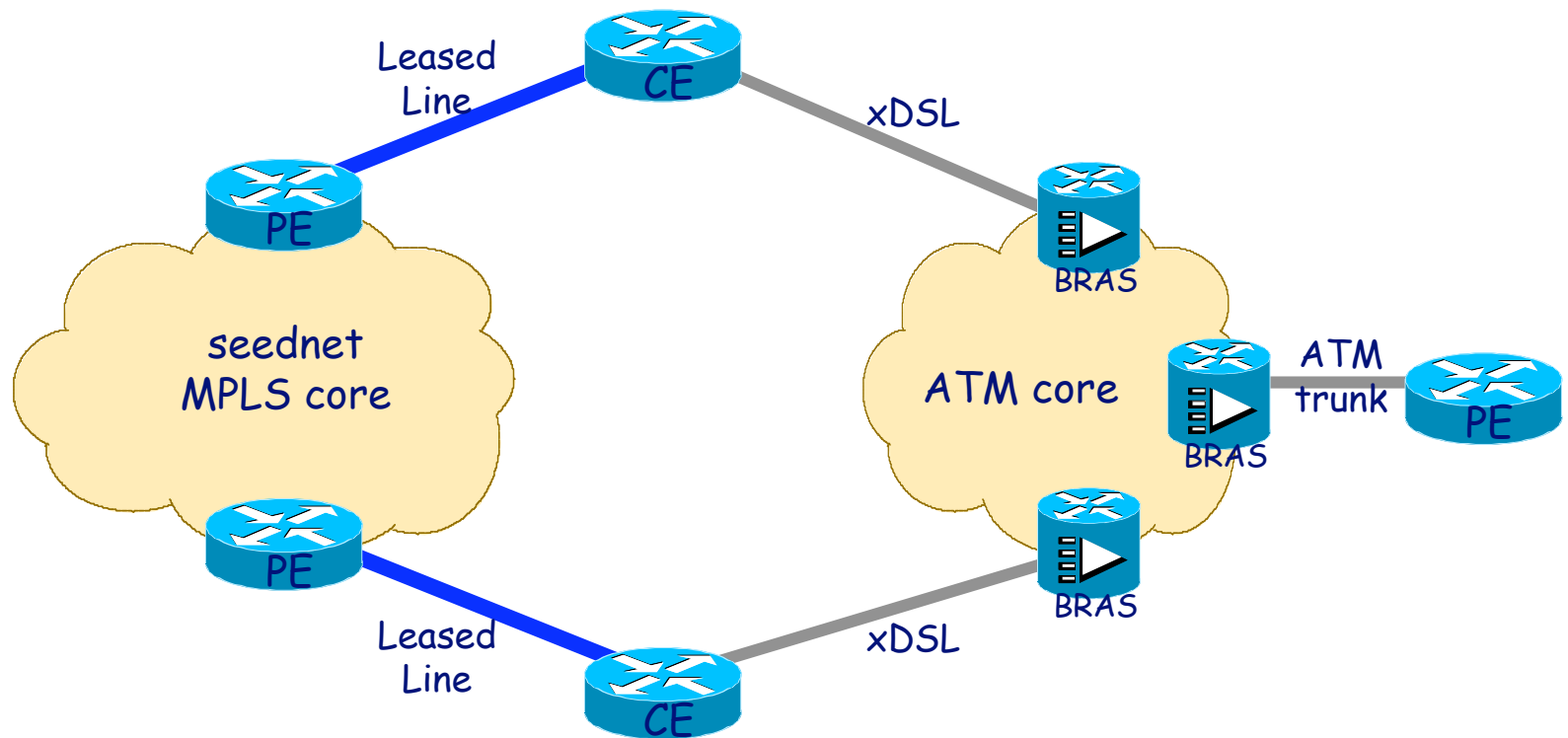
Another redundant issue - MPLS VPN

- ❖ Build redundant network on Internet
 - For security reason, IPsec is required



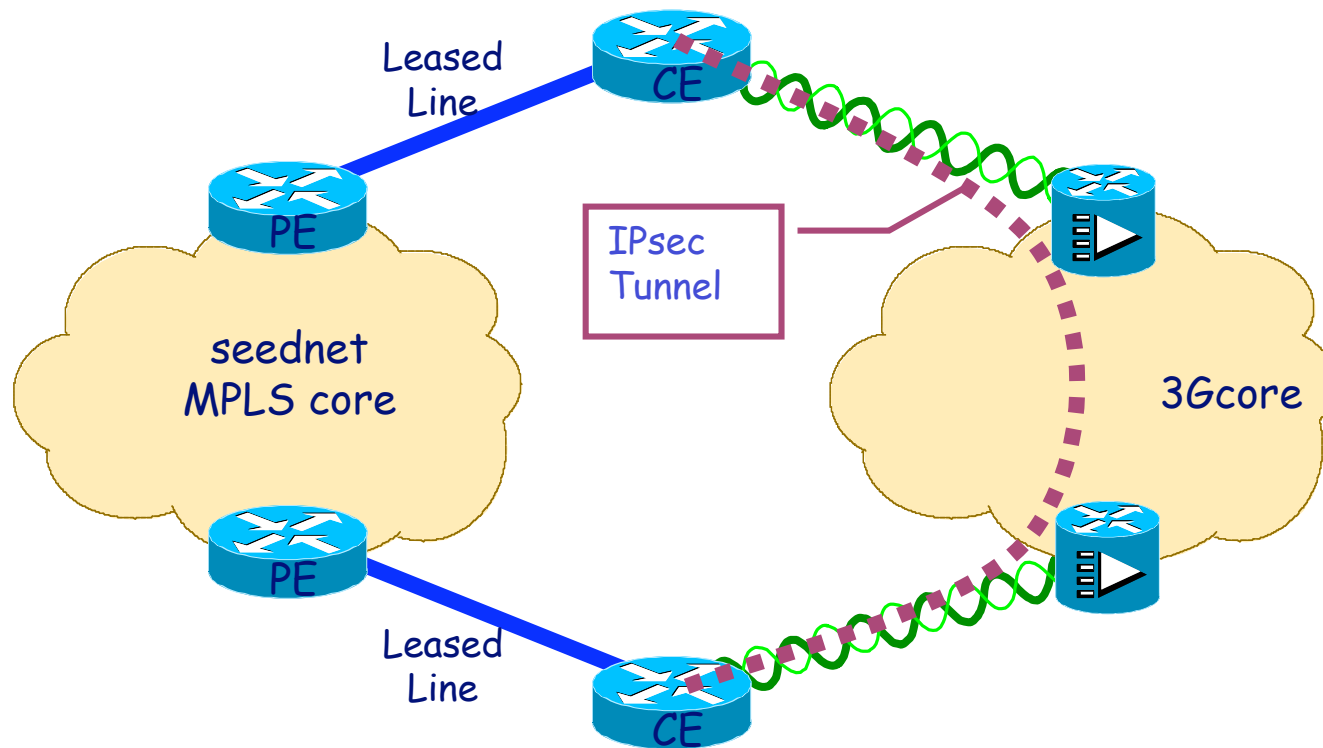
Another redundant issue - MPLS VPN

- ❖ Build redundant network on different SP network



Another redundant issue - MPLS VPN

- ❖ Build redundant network on 3G network



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Next challenge

- ❖ More redundant circuit type in future?
- ❖ More redundant service provision?
 - BGP anycast
- ❖ Next challenge to service provider??



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