

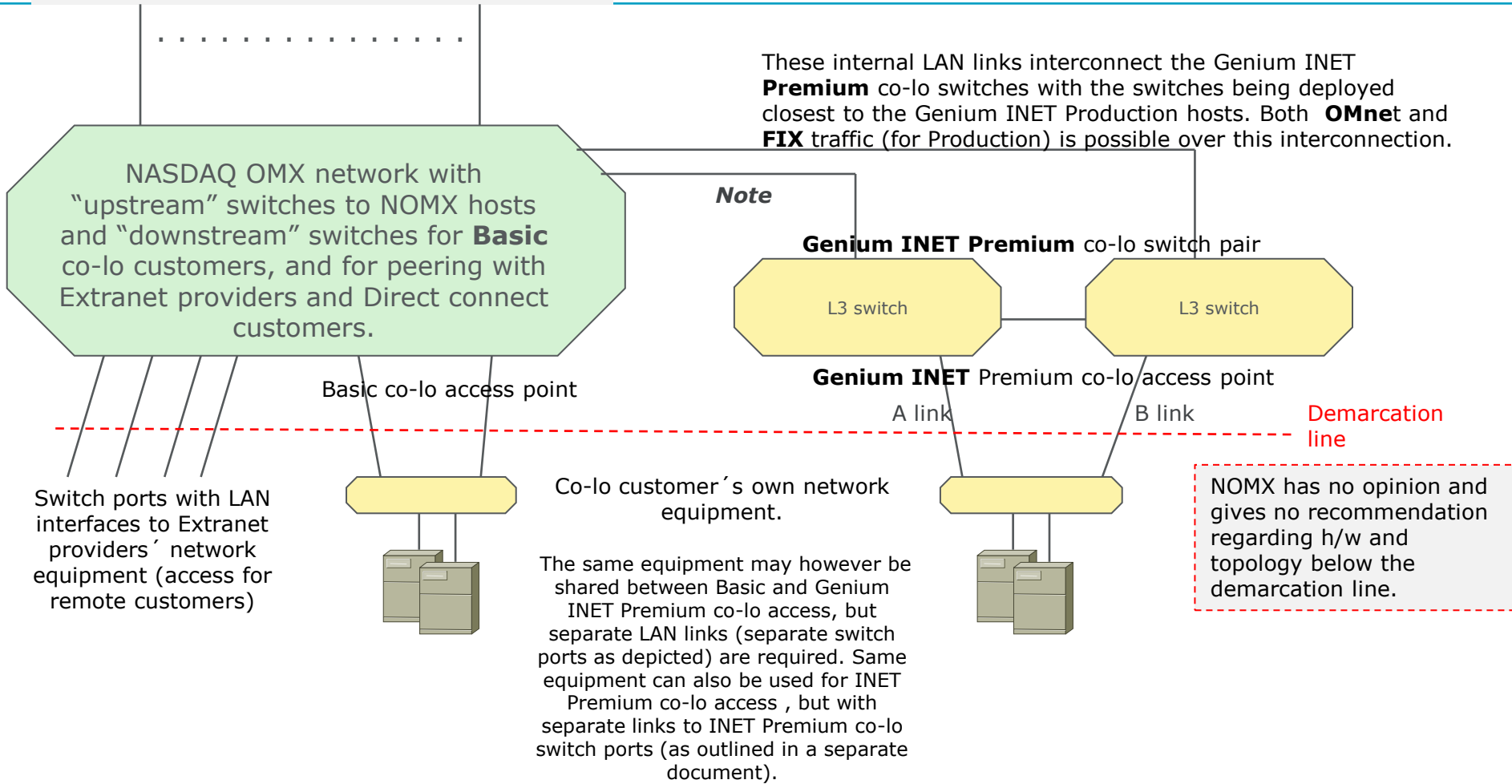
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**Logical overview of NOMX Premium Co-  
location network for Genium INET - setup for  
the Nordic Markets.**

**N.B:** a separate document contains the overview for **INET**

Version 2.0  
December 18<sup>th</sup>, 2011

**All NOMX** services available to both remote customers and Basic co-location customers



**Note:** the Genium INET Production net accessible for Premium co-lo customers over the interconnection is: **194.110.100.0/24**

**This is a close up of the Premium Co-lo part from page 2.**

“Shared” hosts means that they are shared between all customers; i.e. between Premium co-lo customers and those accessing via Extranet (Basic co-lo and remote customers). “Customer dedicated” hosts means that one or more host(s) is dedicated to a customer (for the customer’s exclusive use); and regardless of whether the customer accesses via Premium co-lo or not.

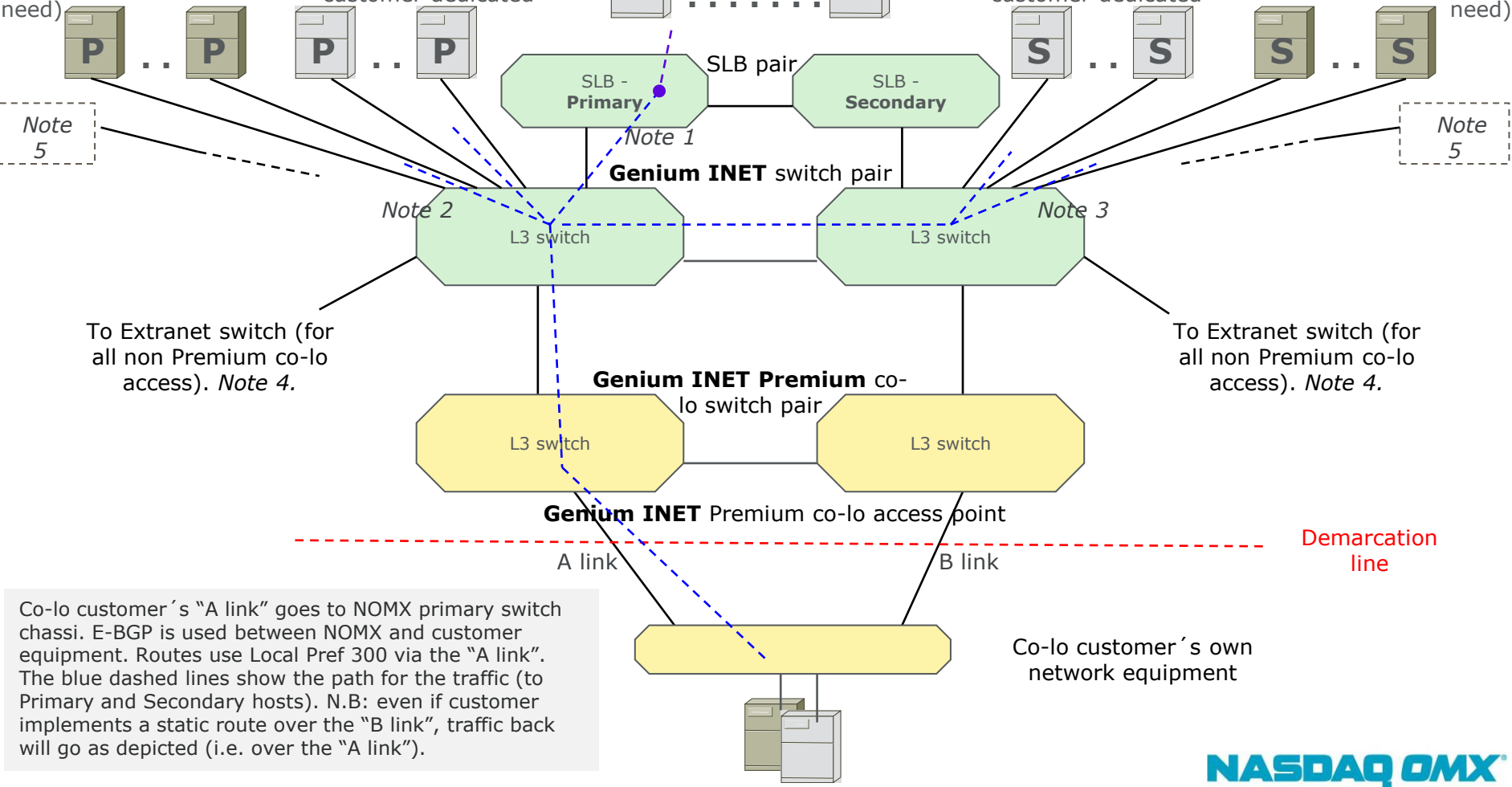
**FIX hosts – Primaries;**  
 “shared” and “customer dedicated” (number depending on the total need)

**OMnet hosts - Primaries;**  
 “customer dedicated”

**OMnet hosts, “shared” -**  
 number depending on the total need

**OMnet hosts - Secondaries;**  
 “customer dedicated”

**FIX hosts – Secondaries;**  
 “shared” and “customer dedicated” (number depending on the total need)



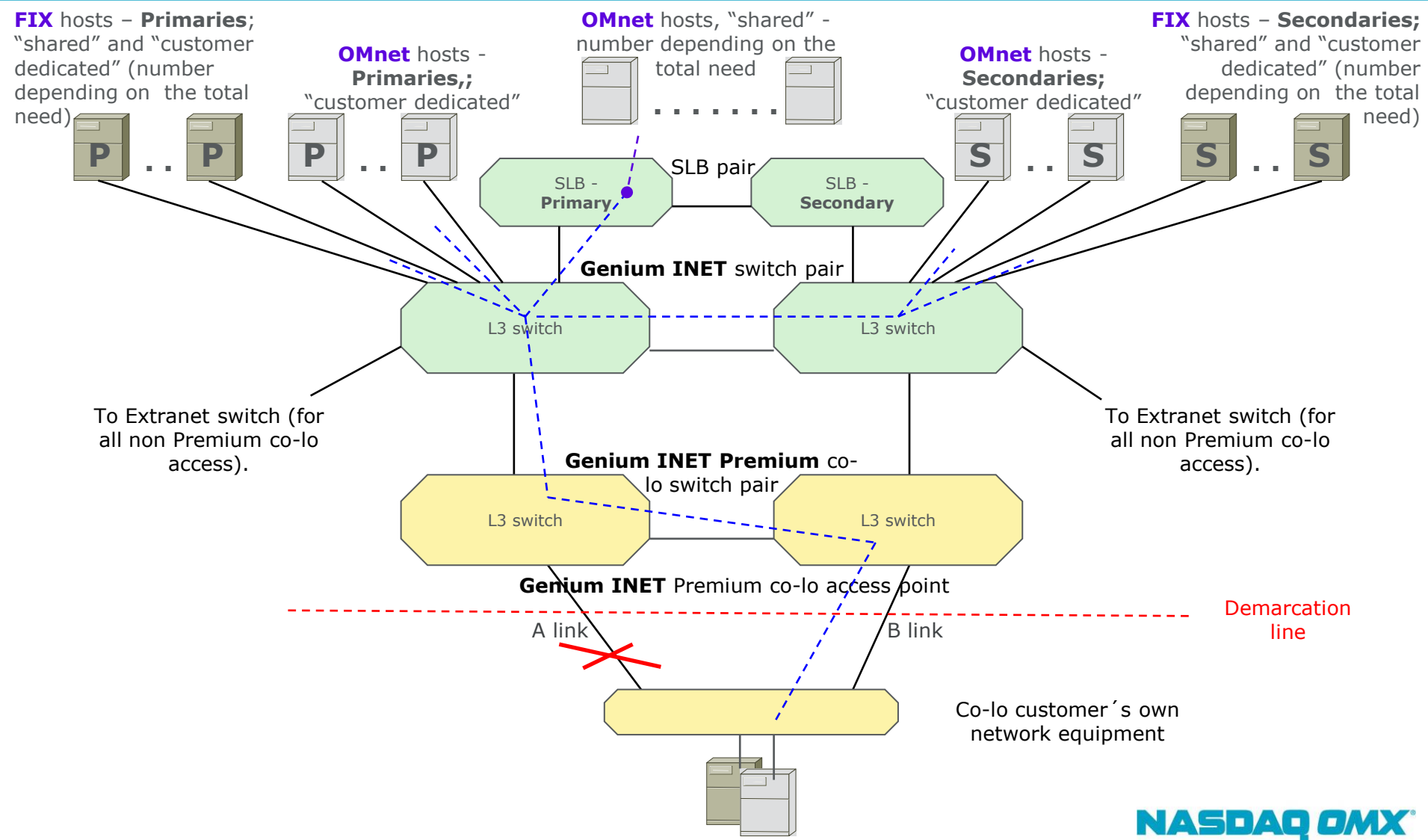
Co-lo customer’s “A link” goes to NOMX primary switch chassi. E-BGP is used between NOMX and customer equipment. Routes use Local Pref 300 via the “A link”. The blue dashed lines show the path for the traffic (to Primary and Secondary hosts). N.B: even if customer implements a static route over the “B link”, traffic back will go as depicted (i.e. over the “A link”).

## Premium Co-lo Connections to Genium INET

- **Note 1:** Connections to “shared” Production servers for **OMnet** is to an IP address owned by the SLB (server Load Balancer) pair. One SLB is always the primary and load balances to the servers constituting a server farm. If a server fails there are other servers in the farm available for handling a reconnection. A switch hop (not depicted) exists between SLB and servers. The Production IP address and TCP port to connect to is the same as for those connecting as in Note 4, and listed on the member web under Genium INET (-> Connectivity and Protocols).
- **Note 2:** Connections to Primary Production hosts not behind the SLB pair. A Premium co-lo customer connects to the IP address and TCP port that has been handed out earlier (for connections as in Note 4), or to a new address which is handed out when a new service (**FIX** “shared”, **FIX** “dedicated” or **OMnet** “dedicated”) is ordered. Also the new service may be accessed as in Note 4.
- **Note 3:** Connections to Secondary Production hosts not behind SLB pair. Connection information as above in Note 2. Traffic with these hosts passes an extra switch hop as depicted.
- **Note 4:** Connections entering from Extranet switches where all other (non Premium co-lo) customer access is handled. The green boxes on the picture are hence common to ALL access to Genium INET Production.
- **Note 5:** For simplicity reasons, the Genium INET ITCH IP Multicast flow (which is a market data option) is not further depicted here. The last page gives some more notes. For getting lost ITCH Multicast messages, re-requests are made by the client and to an ITCH Re-request server residing in the same (below mentioned) IP net as the FIX and OMnet hosts.

**For routing purposes:** the only destination net to consider here is NOMX Genium INET Site A IP net **194.110.100.0/24**

# This layout shows the case when customer's "A link" is down.



# This layout shows the case when the NOMX switch for customer's "A link" is down.

Same availability as on previous page but different path.

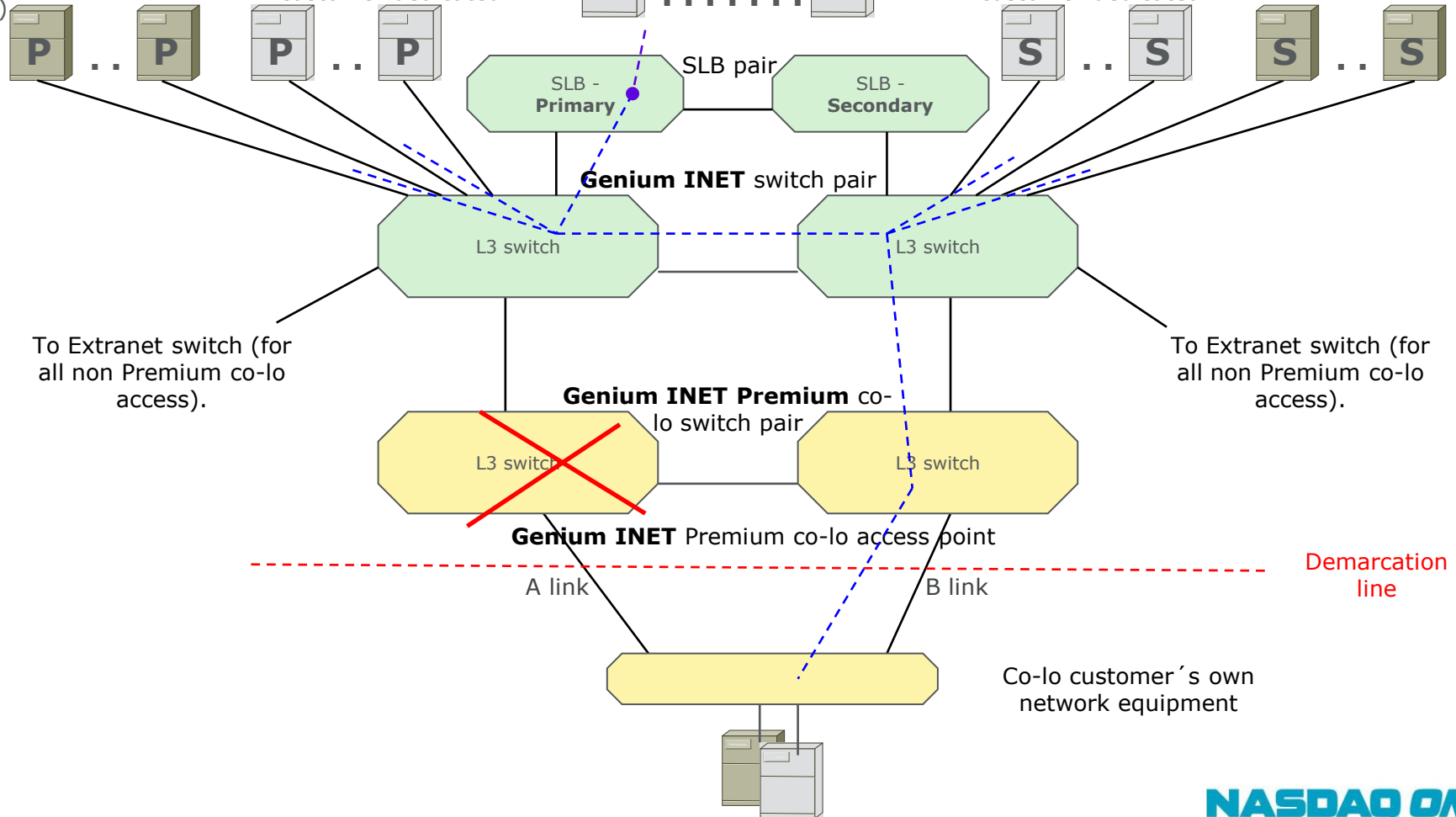
**FIX hosts – Primaries;**  
"shared" and "customer dedicated" (number depending on the total need)

**OMnet hosts - Primaries;**  
"customer dedicated"

**OMnet hosts, "shared" -**  
number depending on the total need

**OMnet hosts - Secondaries;**  
"customer dedicated"

**FIX hosts – Secondaries;**  
"shared" and "customer dedicated" (number depending on the total need)



# This layout shows the case when the NOMX switch for Primary hosts are down.

Services behind SLB and in Secondary hosts are available.

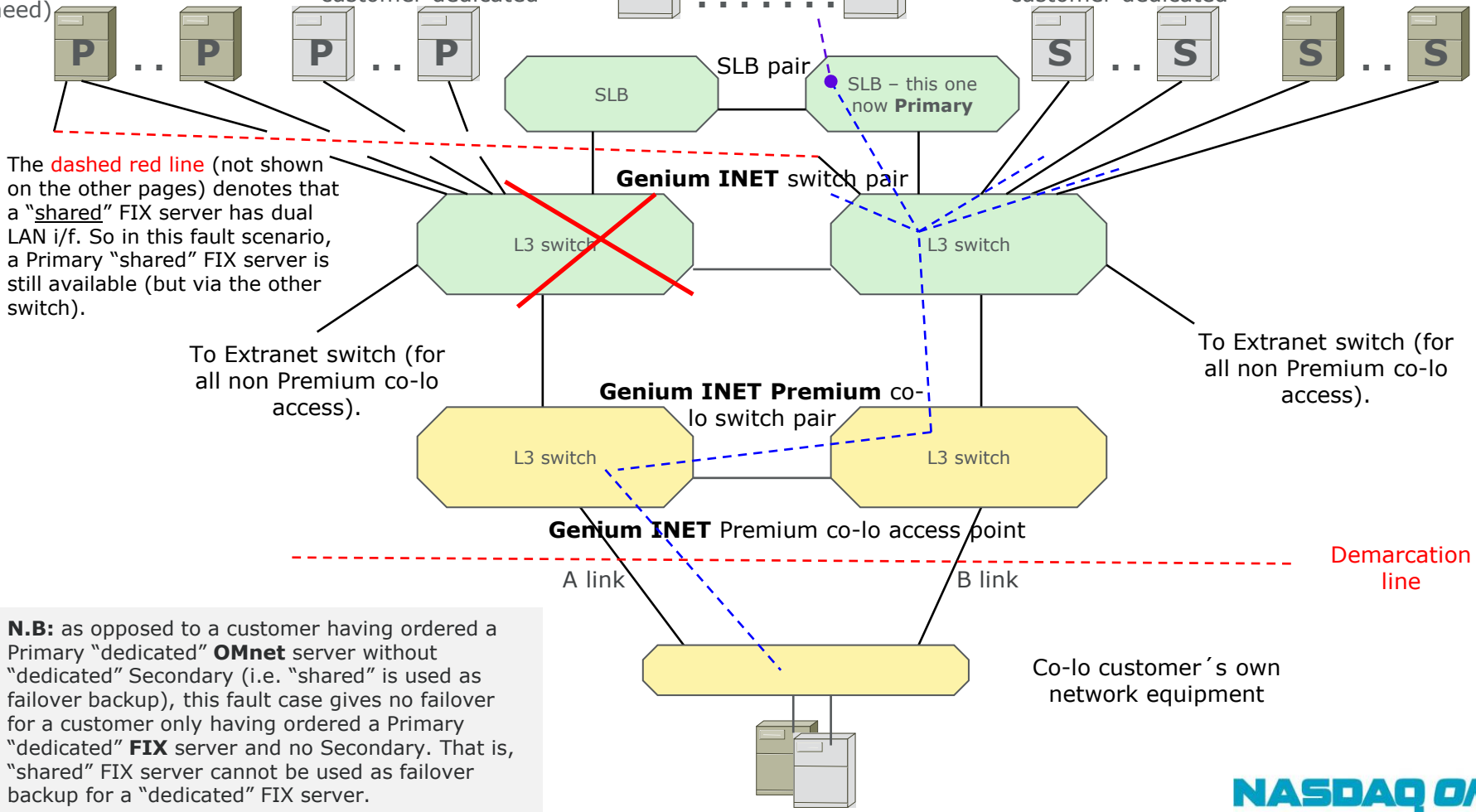
**FIX hosts – Primaries;**  
"shared" and "customer dedicated" (number depending on the total need)

**OMnet hosts - Primaries;**  
"customer dedicated"

**OMnet hosts, "shared" -**  
number depending on the total need

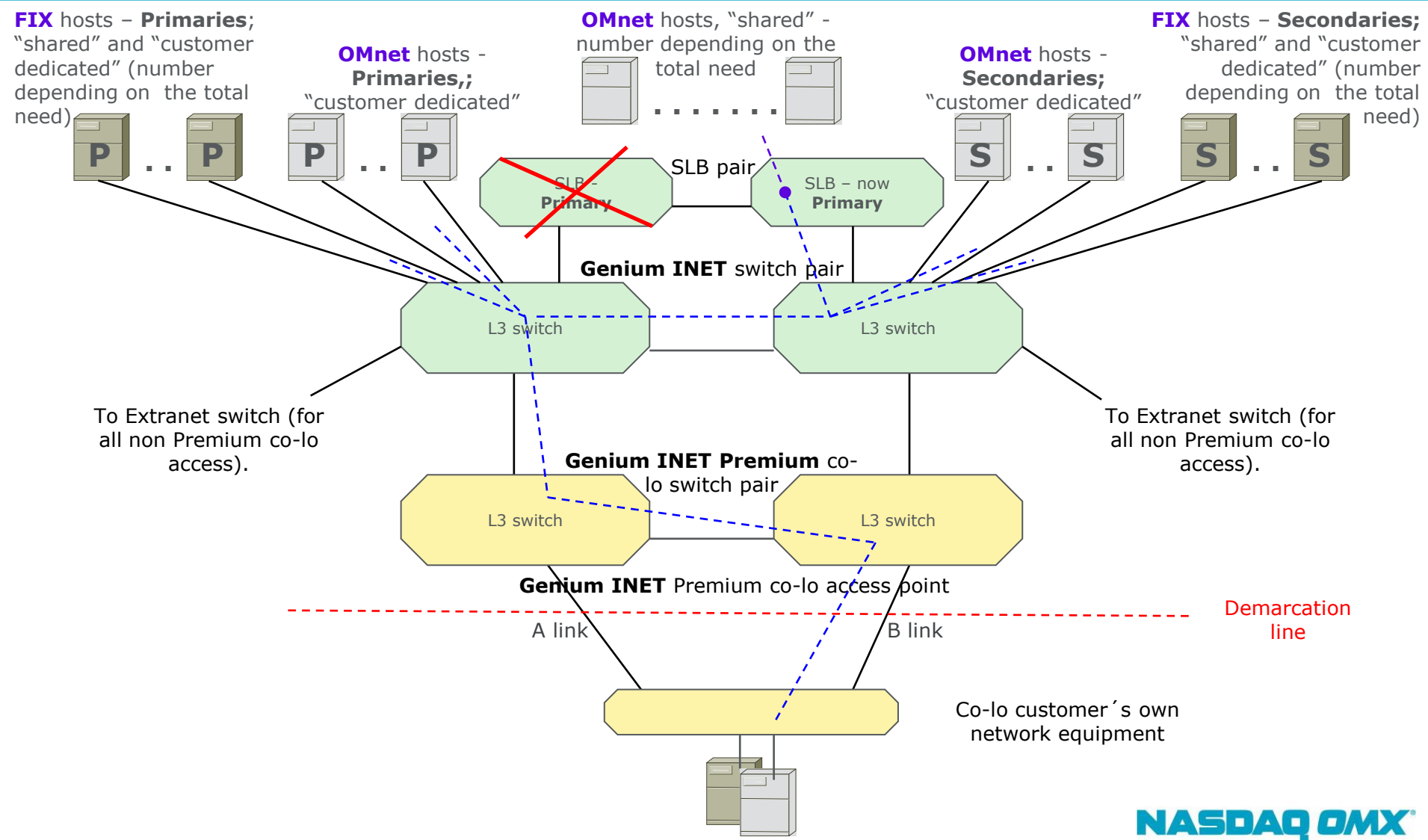
**OMnet hosts - Secondaries;**  
"customer dedicated"

**FIX hosts – Secondaries;**  
"shared" and "customer dedicated" (number depending on the total need)

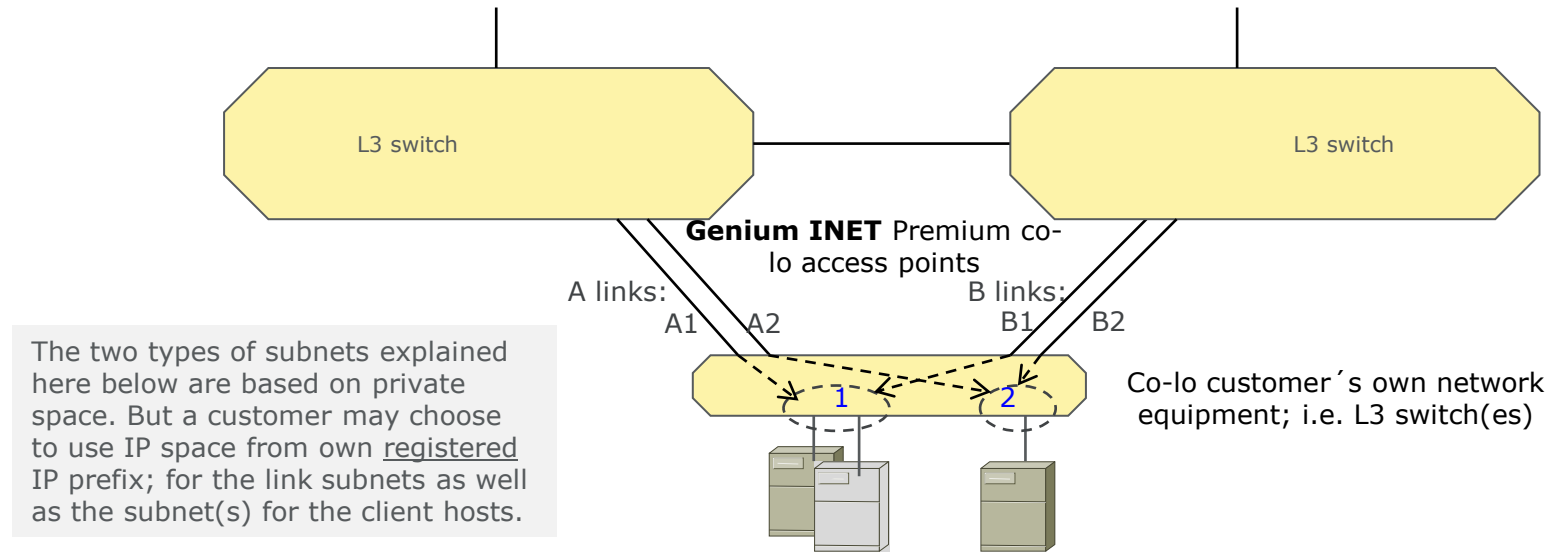


**N.B:** as opposed to a customer having ordered a Primary "dedicated" OMnet server without "dedicated" Secondary (i.e. "shared" is used as failover backup), this fault case gives no failover for a customer only having ordered a Primary "dedicated" FIX server and no Secondary. That is, "shared" FIX server cannot be used as failover backup for a "dedicated" FIX server.

# This layout shows the case when the SLB normally acting as Primary is down.



The previous pages have assumed a customer access-point consisting of one pair of access links (i.e. an "A link" and a "B link" consuming one pair of switch ports in the NOMX switches for Genium INET). More access links are possible, but will demand more IP nets to be assigned.



The two types of subnets explained here below are based on private space. But a customer may choose to use IP space from own registered IP prefix; for the link subnets as well as the subnet(s) for the client hosts.

For each individual LAN link a small subnet (30 bits mask) will be assigned from the private space 10.212.18.0/23. In this example with four links (two "A" and two "B"), there will hence be four 10.212.18.x/30 subnets.

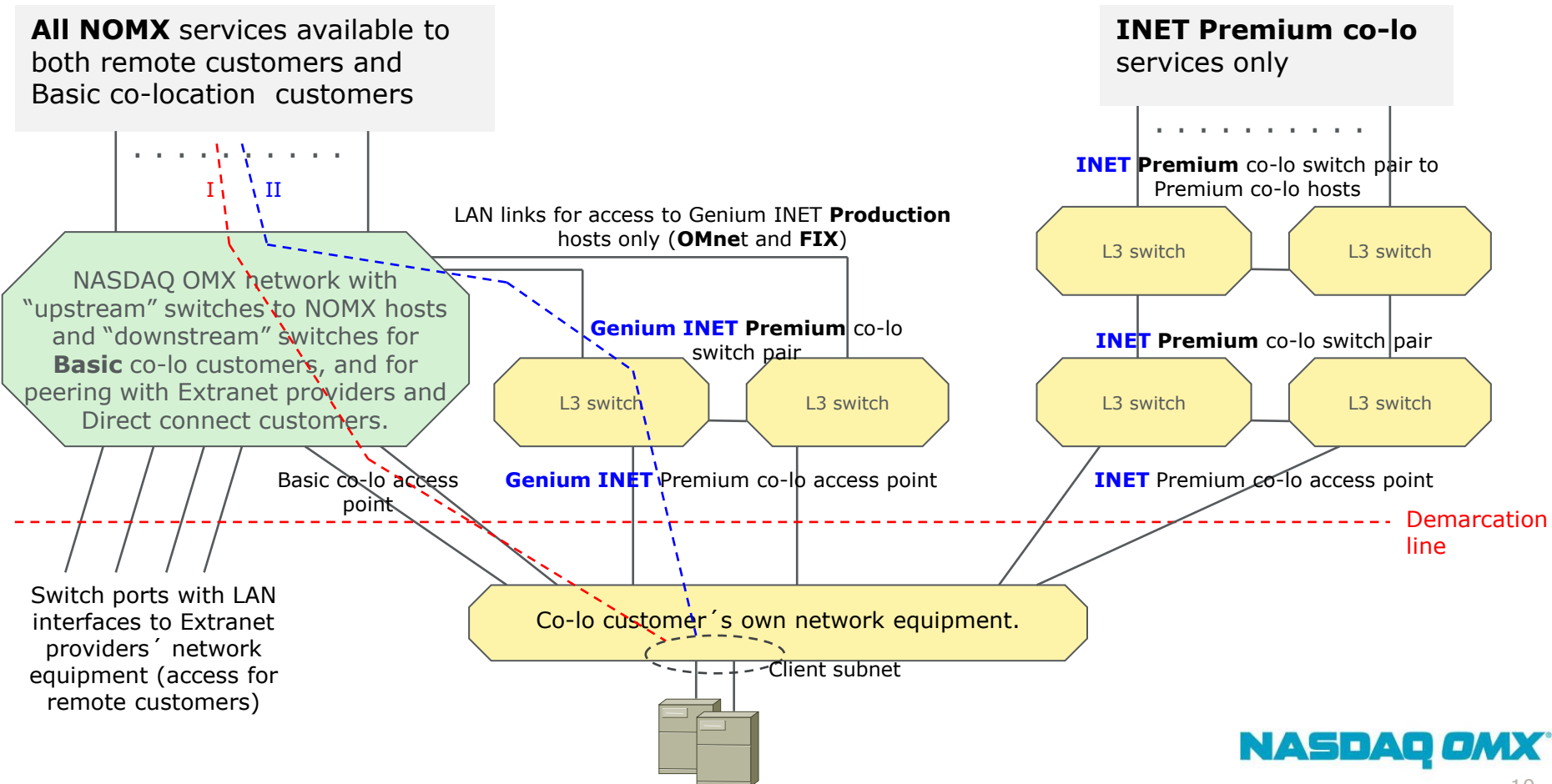
Each customer will be assigned an IP subnet (allocated from the private space 10.62.0.0/16) for the hosts acting as Genium INET (OMnet and FIX) clients. But if more than one link pair has been ordered, there will also be more than one subnet assigned for the hosts. As depicted for this example, two subnets are assigned. The customer announces "client subnet 1" only over the "A1,B1" pair and "client subnet 2" only over the "A2,B2" pair. And NOMX will route traffic accordingly, where the arrows in the picture shows over which link pair NOMX may route to "client subnet 1" and "client subnet 2" respectively.

In the case where the customer will use Genium INET ITCH Multicast, it may be ordered that NOMX pushes out the Multicast flow on only one link pair. The customer can thus dedicate a link pair for Multicast only. If say, "A2,B2" is only used for ITCH Multicast, there is no traffic to clients for NOMX to route via "A2,B2". This in turn means that "client subnet 2" is not needed and all customer's hosts can reside on "client subnet 1".

Even though **Genium INET** is not accessed via the same NOMX switches as **INET**, the "client subnet(s)" mentioned here can be the same. Hence, the customer can choose whether different "client subnets" shall be assigned or the same subnet used for both Genium INET and INET. It is also possible to use the same subnet for Basic co-lo; and if so, routing principles will be as explained on **NASDAQ OMX** next page.

This page explains the routing path when the same "client subnet" is used for both Basic co-lo and Premium co-lo for Genium INET. If say the customer is using Basic co-lo, the routing path is according to the **red dashed** line (marked as "I"). When the customer announces the subnet over the Genium INET Premium co-lo access point, NOMX will instead route according to the **blue dashed** line (marked as "II"). N.B: the **blue** route going into effect applies only to the Genium INET Premium co-lo services; the **red** route still applies to the other NOMX services. **Important** though: a customer choosing to access Genium INET simultaneously from both Premium co-lo and Basic co-lo, needs to have different client subnets for Genium INET Premium co-lo and Basic co-lo.

INET Premium co-lo on the other hand is over separate NOMX network equipment; the mentioned routing issue is therefore of no concern. INET Premium co-lo is shown here just to give a "full" co-lo picture.



## Genium INET ITCH Multicast, which has not been depicted in this document

For a customer using Genium INET ITCH Multicast (which is only provided as an IP Multicast flow), there is a primary flow ("A") and a secondary flow ("C"). Flow "A" is sent out from the NOMX switch where the customer has its A link, and flow "C" is sent out from the NOMX switch where the customer has its B link. These two flows and the Re-request servers (primary and secondary) for getting lost ITCH messages, are the same as also used for Basic colo.

Further information is found in the following description on the member web, path *Genium INET Nordic -> Connectivity and Protocols* (and under headline *Documents for Genium INET ITCH market data protocol*): [Genium INET ITCH UDP Multicast Offering](#). For details regarding IP addresses and UDP ports, there is a separate page showing what applies to Co-location.