The 6net project

An IPv6 testbed for the European Community

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Infrastructure of the 6NET-Project

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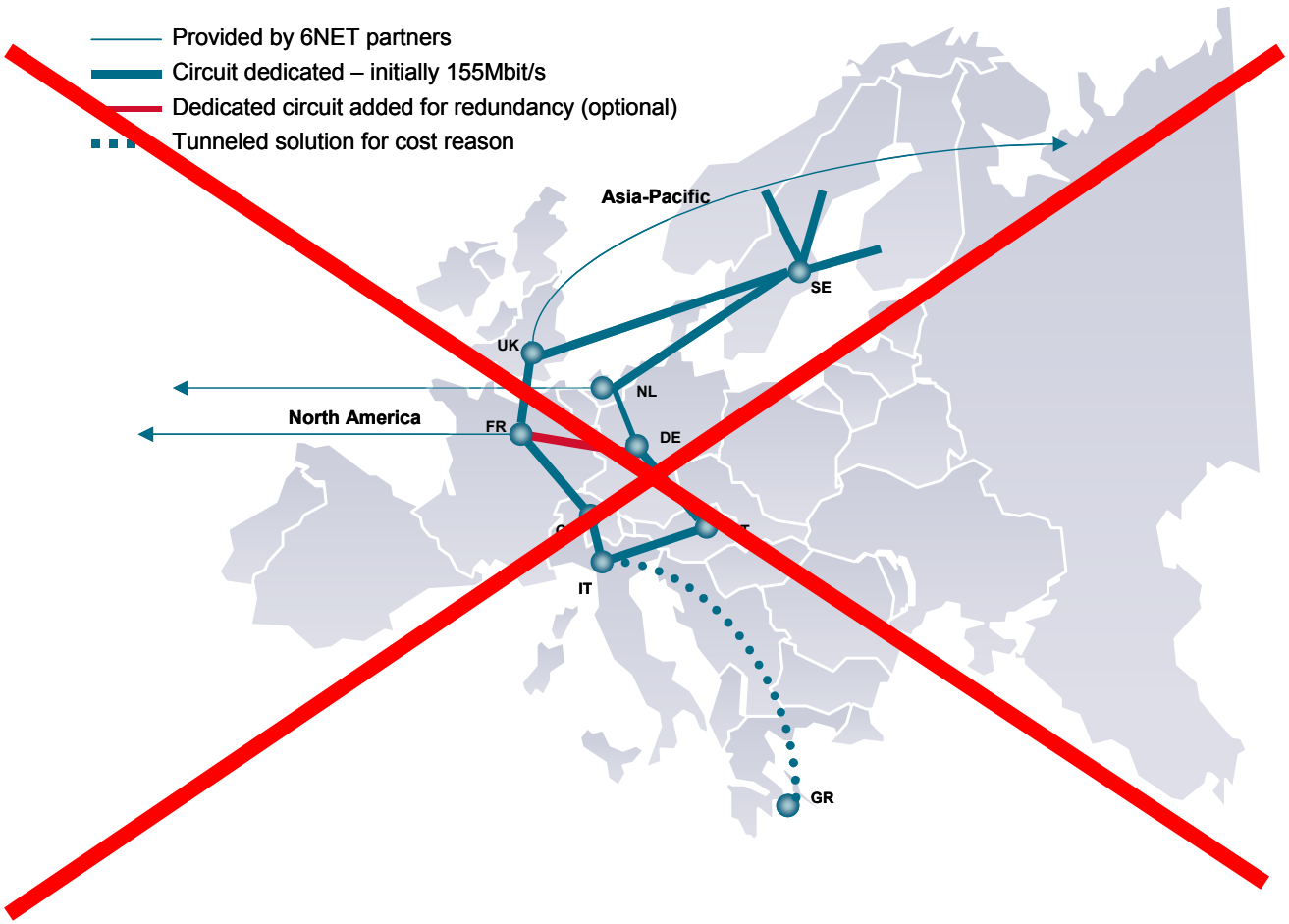
What is the initial goal?

- To keep initial setup simple
- Create awareness of initial configuration
- To NOT block future routing/security policies (currently there is only limited definition)
- To roll out a Network (with realistic assumptions)
- Information in this document is deducted from:
  - The wp1 Geneva Meeting early January
  - Topology information from Dante
  - Lab experience when testing in IPv6 lab environment
  - Feedback from wp3/wp1 on initial staged configuration
  - D3.1.1 and D1.1.1

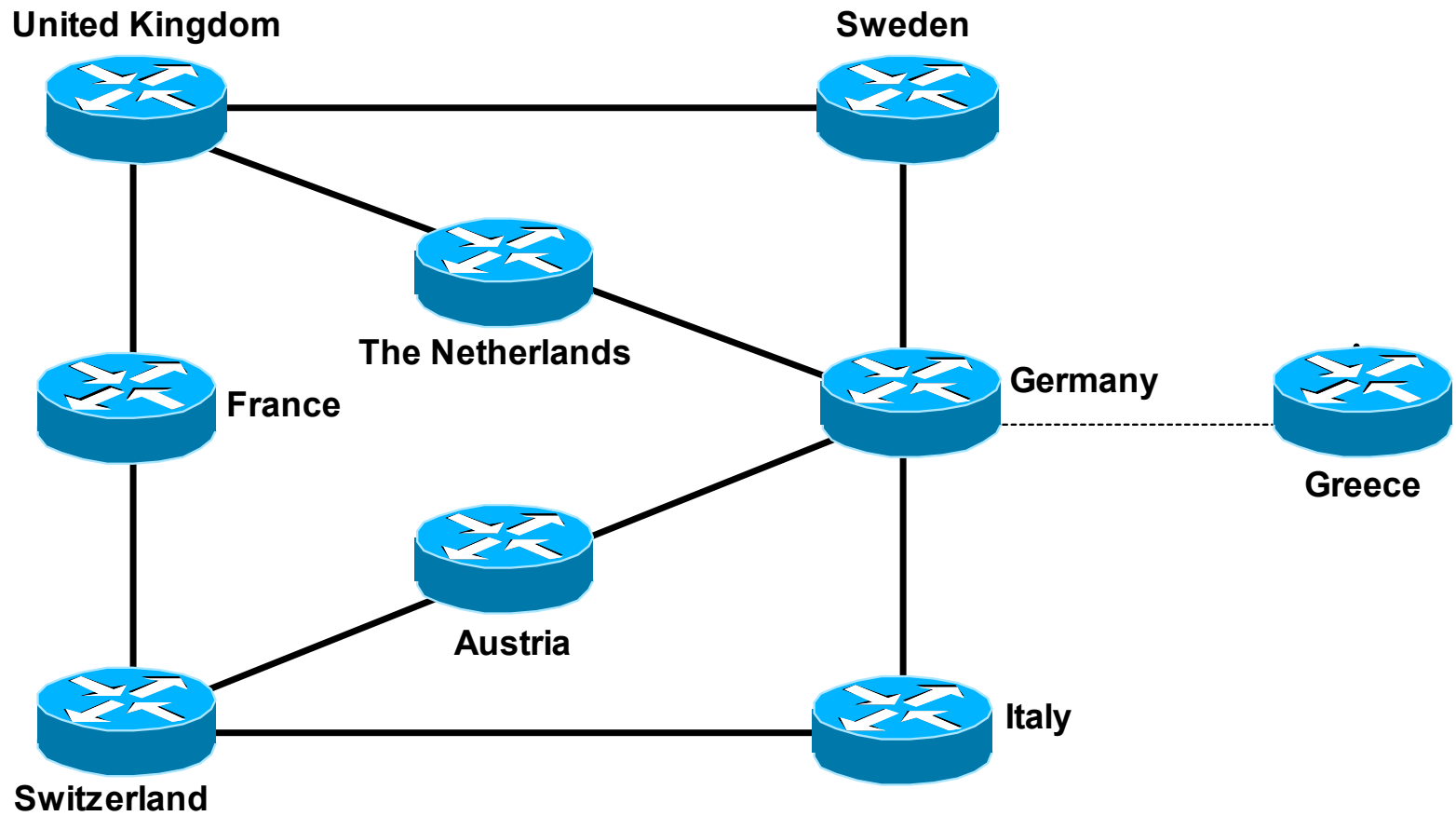
What is NOT the initial goal

- Put Routing/Security policies in place that make it difficult to migrate to the advanced and agreed policies
- Make full-blown real-life configuration with all possible features enabled from day 1

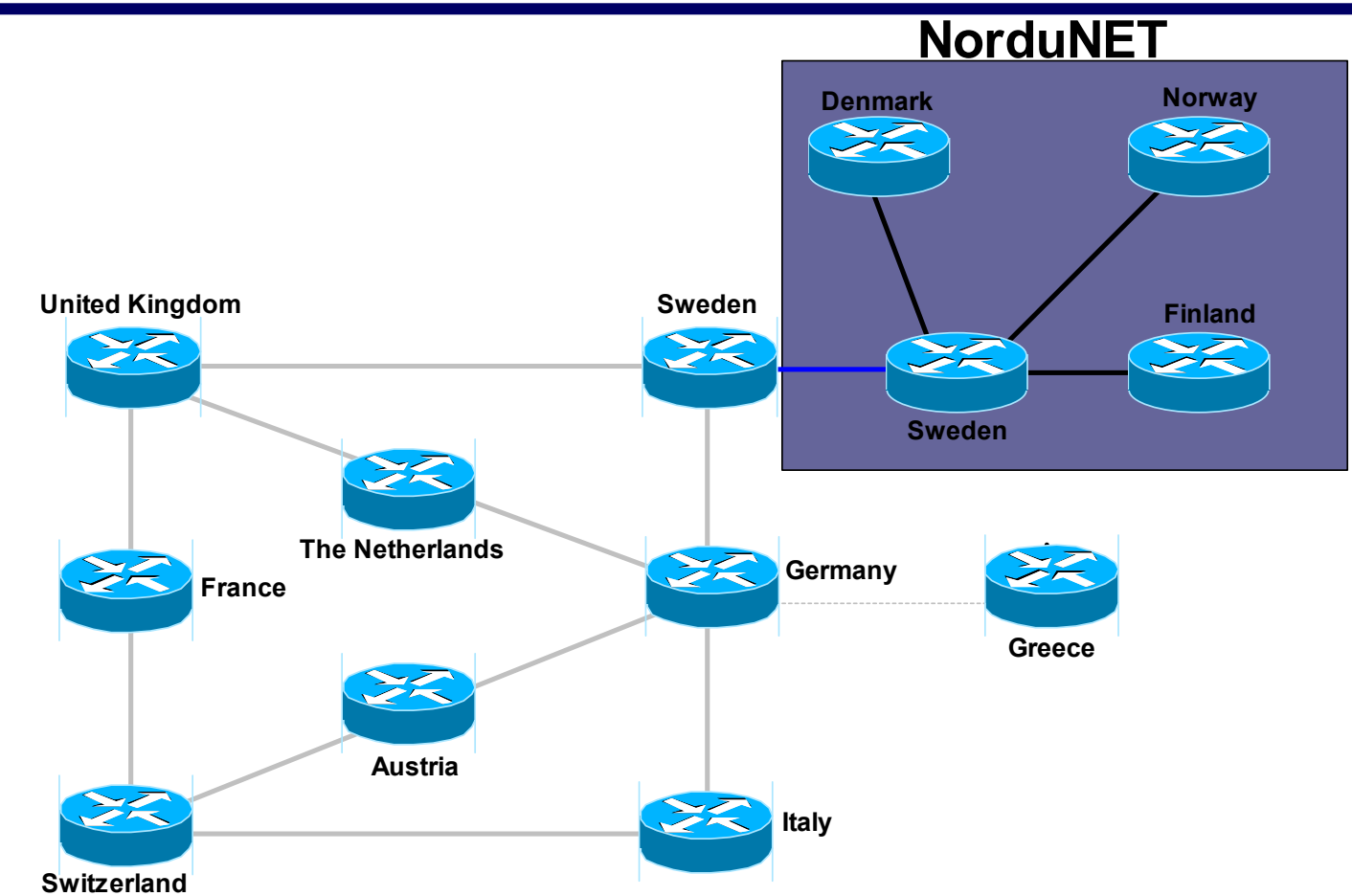
Original Layout



The Layout – 6NET



The Layout – 6NET



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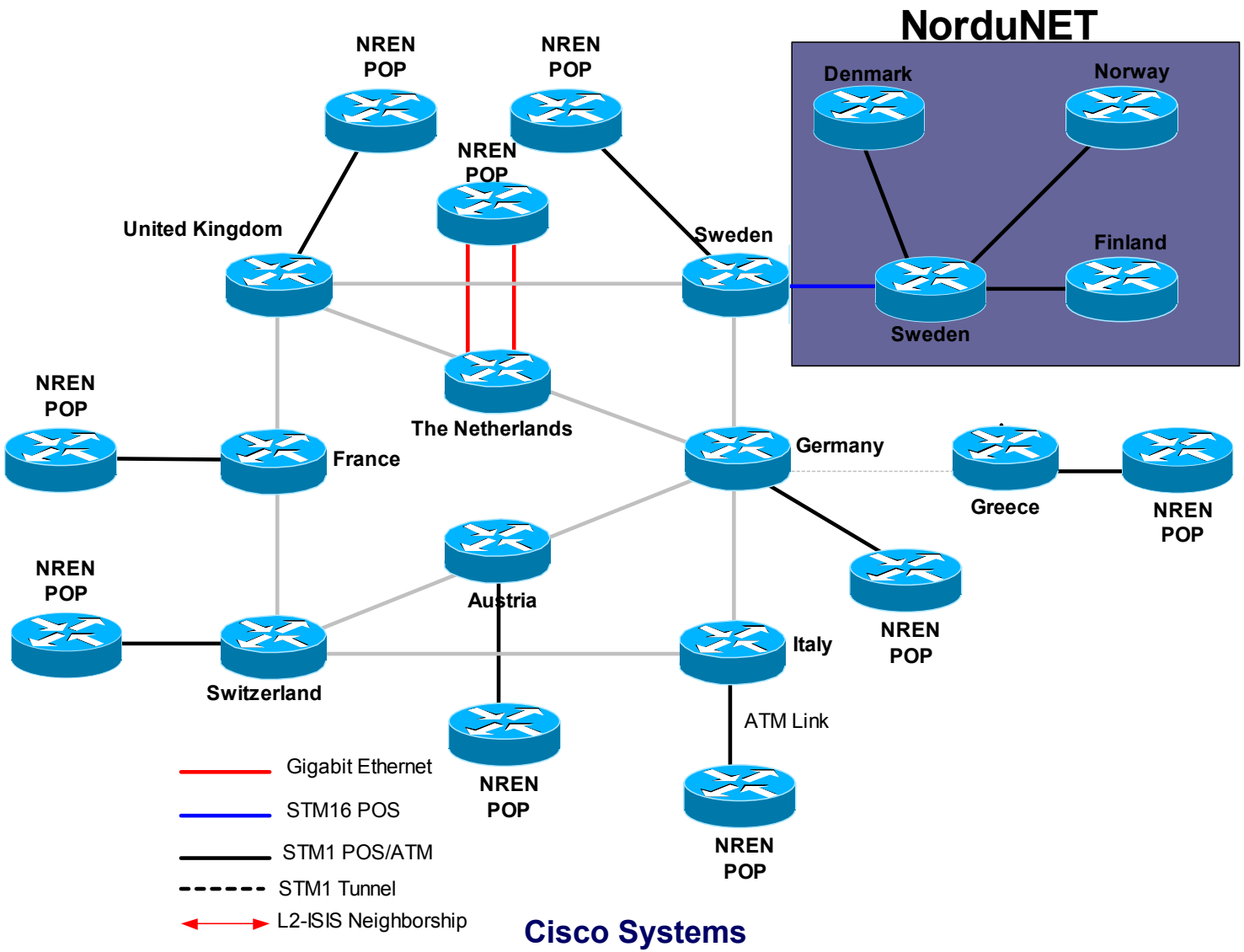
The Layout – 6NET



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Naming Convention (1)

Location Abbreviations:

at – Austria
ch – Switzerland
de – Germany
fr – France
gr – Greece
it – Italy
nl – Netherlands
se – Sweden
uk – United Kingdom

Core PoP routers:

Sweden:	se6.se.6net.org
Netherland:	nl6.nl.6net.org
Germany:	de6.de.6net.org
Austria:	at6.at.6net.org
Italy	it6.it.6net.org
Switserland:	ch6.ch.6net.org
France:	fr6.fr.6net.org
UK:	uk6.uk.6net.org
(Greece:	gr6.gr.6net.org)

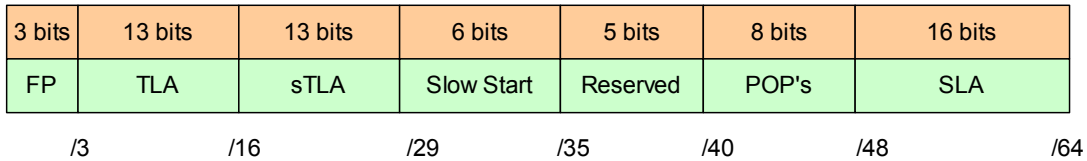
Naming Convention (2)

Each interface as seen in the naming convention shall have its own name.

Example: For the Austria 6NET core router

fast ethernet: fe0	fe0.at6.at.6net.org
Gig Ethernet: ge0	ge0.at6.at.6net.org
Loopback: lo0	lo0.at6.at.6net.org
POS from Austria to Germany	de.at6.at.6net.org

IPv6 Addressing



(1) FP, TLA, sTLA, Slow-start: Defined by the prefix **2001:0798::/35** given by RIPE to Dante

(2) The *reserved* part is all 0 for 6NET

(3) POPS hierarchy: *POPS (8 bit) (sequencial number per pop)*

(4) SLA: *Where for <SLA>:*

Range: 0000 till 00FF: Loopback addresses

Range: 0100 till 01FF: Intra-pop point-to-points

Range: 0200 till 02FF: connections to NREN-pop's

Range: 0300 till 03FF: external 6NET connectivity

Range: 0400 till 04FF: POP Local Ethernets

Note: Using this convention there is room for 256 prefixes with /64 address-space for each point-to-point link or broadcast media, With /128 prefix-lenght for loopback

IPv6 Addressing cont.

- **Example:**

Example: **Switzerland Summary prefixes**

Loopbacks:	**2001:0798:0012:0000::/56**
Intra-pop Point-to-points:	**2001:0798:0012:0100::/56**
Connections to NREN-R.:	**2001:0798:0012:0200::/56**
External 6NET connection:	**2001:0798:0012:0300::/56**
Pop local Ethernets:	**2001:0798:0012:0400::/56**

IPv6 Addressing cont.

POP IPv6-addresses:

POP Location	IPv6 POP addressing: 2001:0798:<pop>::/48
Core:	2001:0798:0::/48
Sweden:	2001:0798:25::/48
Netherland:	2001:0798:22::/48
Germany:	2001:0798:14::/48
Austria:	2001:0798:10::/48
Italy	2001:0798:20::/48
Switzerland	2001:0798:22::/48
France:	2001:0798:16::/48
UK	2001:0798:28::/48
Greece:	2001:0798:17::/48

IPv6 Addressing cont.

Backbone link IPv6-addresses:

Connectivity between	Prefix	IPv6 address on side (1)	IPv6 address on side (2)
UK(1) – FR (2)	2001:0798:0:1::/64	2001:0798:0:1::1/64	2001:0798:0:1::2/64
FR (1) – CH (2)	2001:0798:0:2::/64	2001:0798:0:2::1/64	2001:0798:0:2::2/64
CH (1) – IT (2)	2001:0798:0:3::/64	2001:0798:0:3::1/64	2001:0798:0:4::2/64
IT (1) – DE (2)	2001:0798:0:4::/64	2001:0798:0:4::1/64	2001:0798:0:4::2/64
DE (1) – NL (2)	2001:0798:0:5::/64	2001:0798:0:5::1/64	2001:0798:0:5::2/64
NL (1) – UK (2)	2001:0798:0:6::/64	2001:0798:0:6::1/64	2001:0798:0:6::2/64
UK (1) – SE (2)	2001:0798:0:7::/64	2001:0798:0:7::1/64	2001:0798:0:7::2/64
SE (1) – DE (2)	2001:0798:0:8::/64	2001:0798:0:8::1/64	2001:0798:0:8::2/64
DE (1) – AT (2)	2001:0798:0:9::/64	2001:0798:0:9::1/64	2001:0798:0:9::2/64
AT (1) – CH (2)	2001:0798:0:a::/64	2001:0798:0:a::1/64	2001:0798:0:a::2/64
DE (1) – GR (2)	2001:0798:0:b::/64	2001:0798:0:b::1/64	2001:0798:0:b::2/64

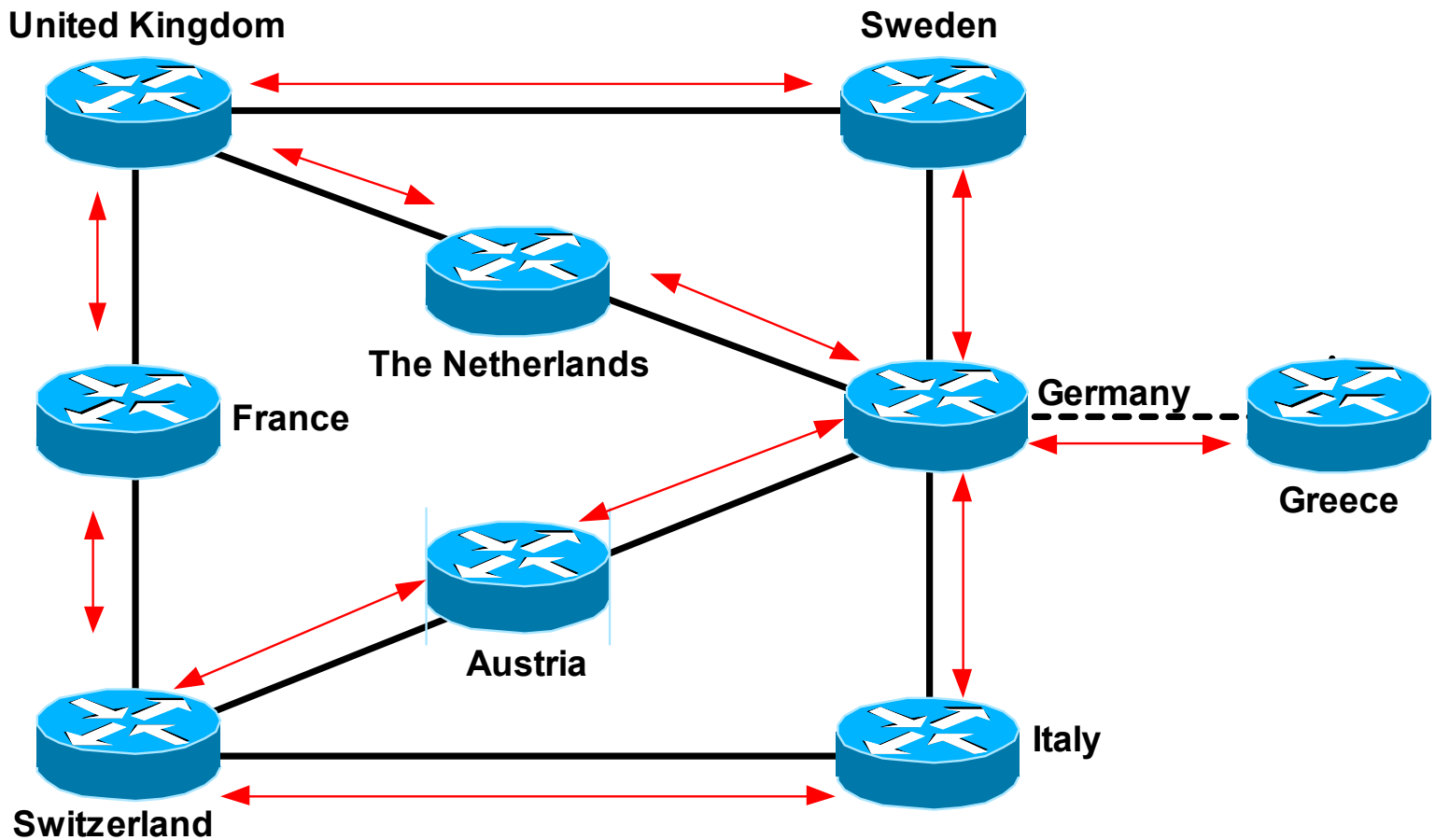
IPv6 Addressing cont.

6NET-Router to NREN-Router link IPv6-addresses:

6NET pop location	6NET pop address space	Point-to-Point prefix* 2001:0798:<pop>:<SLA= 0200>::/64
Sweden	2001:0798:25:0200::/56	2001:0798:25:0200::/64
Netherland	2001:0798:22:0200::/56	2001:0798:22:0200::/64
Germany	2001:0798:14:0200::/56	2001:0798:14:0200::/64
Austria	2001:0798:10:0200::/56	2001:0798:10:0200::/64
Italy	2001:0798:20:0200::/56	2001:0798:20:0200::/64
Switzerland	2001:0798:12:0200::/56	2001:0798:12:0200::/64
France	2001:0798:16:0200::/56	2001:0798:18:0200::/64
United Kingdom	2001:0798:28:0200::/56	2001:0798:28:0200::/64
Greece	2001:0798:17:0200::/56	2001:0798:17:0200::/64

* The host part of the address will be '::1' for the 6NET Core pop side, and '::2' for the NREN pop.

IGP routing: ISIS



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Initial ISIS Details

- L2-only neighborship will be utilized (no L1 anywhere)
-CLNS address of router is constructed with an area and system-id based on location and ordinal number . <49.0001>.<2byte pop-id>.<4byte sequencial#>
-initial ISIS timer tuning (lsp-generation-interval, SPF and PRC backoff algoritm):
    -Spf-interval 1 1 10
    -Prc-interval 1 1 10
    -Lsp-gen 5 1 50
- ISIS metric style wide usage
- following non-default Cisco ISIS parameters will be enabled: *<Ignore-lsp-errors>* , *<Log-adjacency-changes>* , *<No-hello-padding>*

Initial ISIS Details

- IIH and ISH password authentication will be implemented
- L1 and L2 LSP authentication will not be implemented

-Passive interfaces: loopback interfaces and interfaces between 6NET pop and NREN pop will be passive

- Initial Interface ISIS-metric assumption:

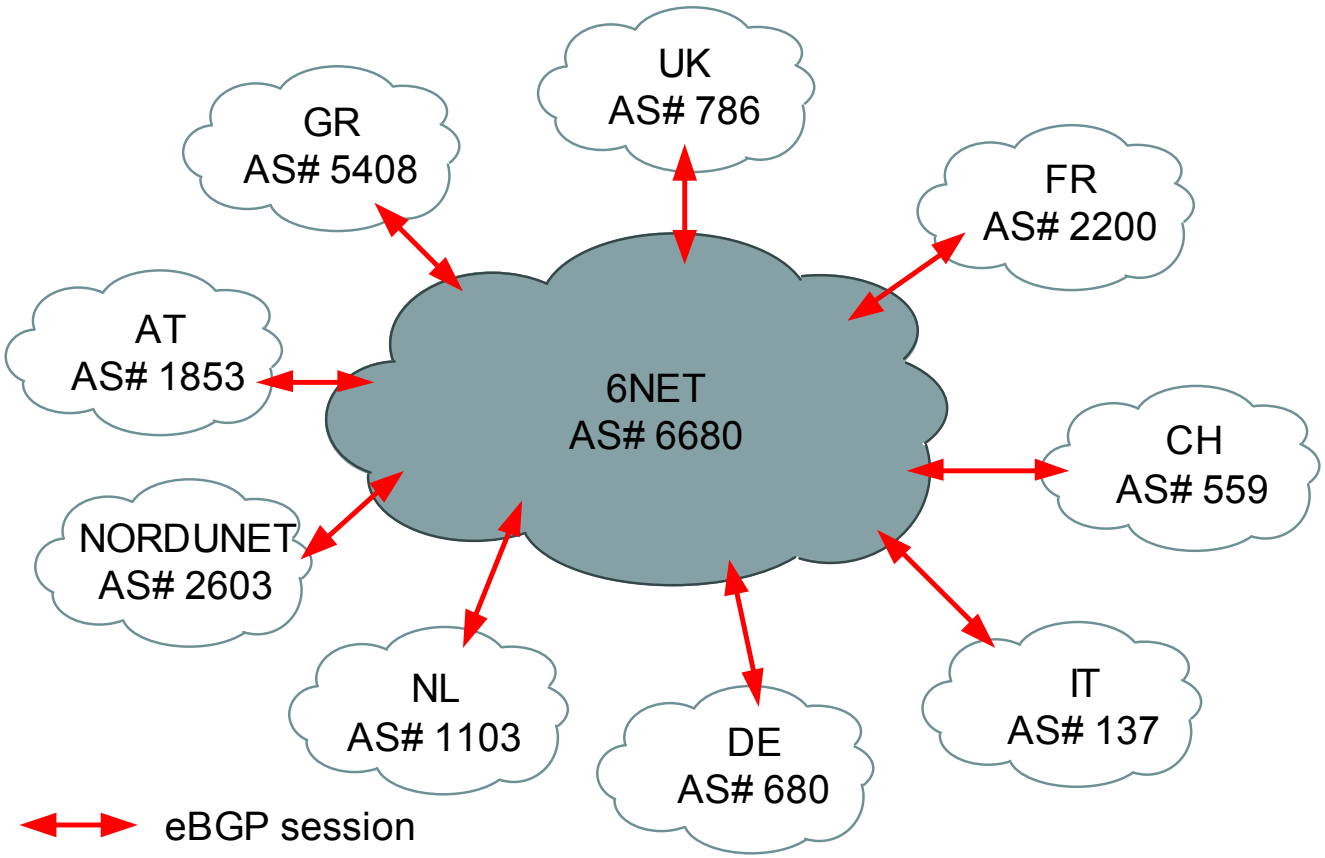
Link Speed (Mbps)	ISIS Metric
1	10000
10	1000
100	500
155	400
1000	300
2500	200
10000	100

CLNS addresses

CLNS Addresses of 6NET routers:

Country	<domain>	<System ID>	<NSEL>
Sweden	49.0001	0025.0000.0001	00
Netherlands	49.0001	0022.0000.0001	00
Germany	49.0001	0014.0000.0001	00
Austria	49.0001	0010.0000.0001	00
Italy	49.0001	0020.0000.0001	00
Switzerland	49.0001	0012.0000.0001	00
France	49.0001	0016.0000.0001	00
United Kingdom	49.0001	0028.0000.0001	00
Greece	49.0001	0017.0000.0001	00

EGP protocol: mBGP



mBGP router-id

mBGP router ID of 6NET routers:

6NET pop router location	BGP router-id
Austria	62.40.98.14
Switzerland	62.40.98.78
Germany	62.40.98.142
France	62.40.98.206
Greece	62.40.98.238
Italy	62.40.99.78
Netherlands	62.40.99.142
Sweden	62.40.99.238
United Kingdom	62.40.100.78

BGP Routing Details

BGP Authentication:

(1) md5 Authentication will be used for eBGP and iBGP peering sessions

(2) The following initial passwords have been elected:

For eBGP sessions: **<External BGP Password>**

For iBGP sessions: **<Internal BGP Password>**

Summarisation:

(1) Each 6NET AS-border router will be configured with a '2001:0798::/35' to the null0 interface

(2) This route will be used for summary reason.

(3) This route will be filtered for iBGP sessions, and not filtered for eBGP sessions

(4) Goal: very stable summary /35 prefix for 6NET environment

BGP Routing Details

Peer-group:

Two peer-groups will initially be implemented:

one group will be used for iBGP peers:
6NET_INTERNAL_6NET_PEER

another for initial eBGP peers:
6NET_EXTERNAL_NREN_POP

RESULT: BGP configuration becomes easier to read
Setup becomes more performant

eBGP:

(1) no use of next-hop-self

(2) peering will happen directly over the POS interface

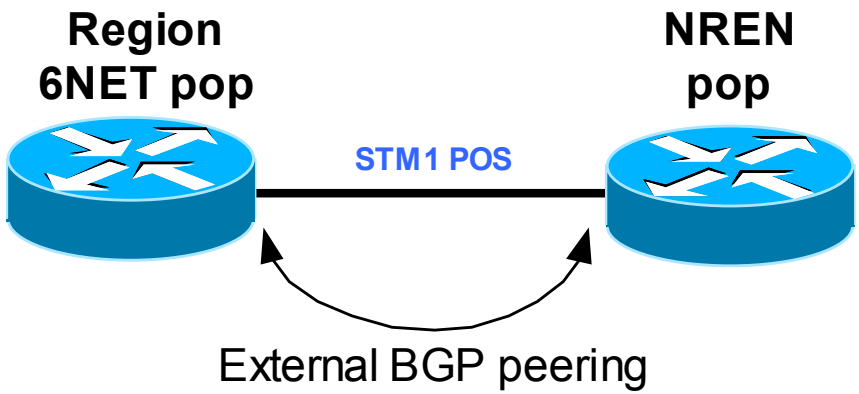
(3) no use of eBGP multihop

(4) no initial use of route-dampening

(5) no initial route-filtering

RESULT: Initial eBGP policy is open for definition (but not implemented during Staging configuration)

BGP Routing Details



iBGP:

(1) peering between the IPv6 loopback addresses

(2) **no** route-reflector used?

(3) Synchronisation will be switched off

(4) The summary ‘2001:0798::/35’ entry in the BGP table will be filtered out between iBGP peers. (to avoid the creation of 9 entries in the BGP table pointing to ‘2001:0798::/35’)

(5) no other NLRI filters initially implemented

Initial BGP Filtering Setup

```
route-map IBGP_PEER_FILTER_ROUTE_MAP deny 10
 match ipv6 address prefix-list STATIC_TO_BGP_FILTER
!
route-map IBGP_PEER_FILTER_ROUTE_MAP permit 20
 match ipv6 address prefix-list ANY_PREFIX
!
route-map STATIC_TO_BGP_FILTER_ROUTE_MAP permit 10
 match ipv6 address prefix-list STATIC_TO_BGP_FILTER
 set origin igp
!
route-map STATIC_TO_BGP_FILTER_ROUTE_MAP permit 20
 match ipv6 address prefix-list ANY_PREFIX
 set origin igp
!
!
ipv6 route 2001:0798::/35 Null0
!
!
ipv6 prefix-list ANY_PREFIX seq 5 permit ::/0 ge 1
!
ipv6 prefix-list STATIC_TO_BGP_FILTER seq 5 permit
2001:0798::/35
!
```