GÉANT perspective of Virtual Networks and Implementation

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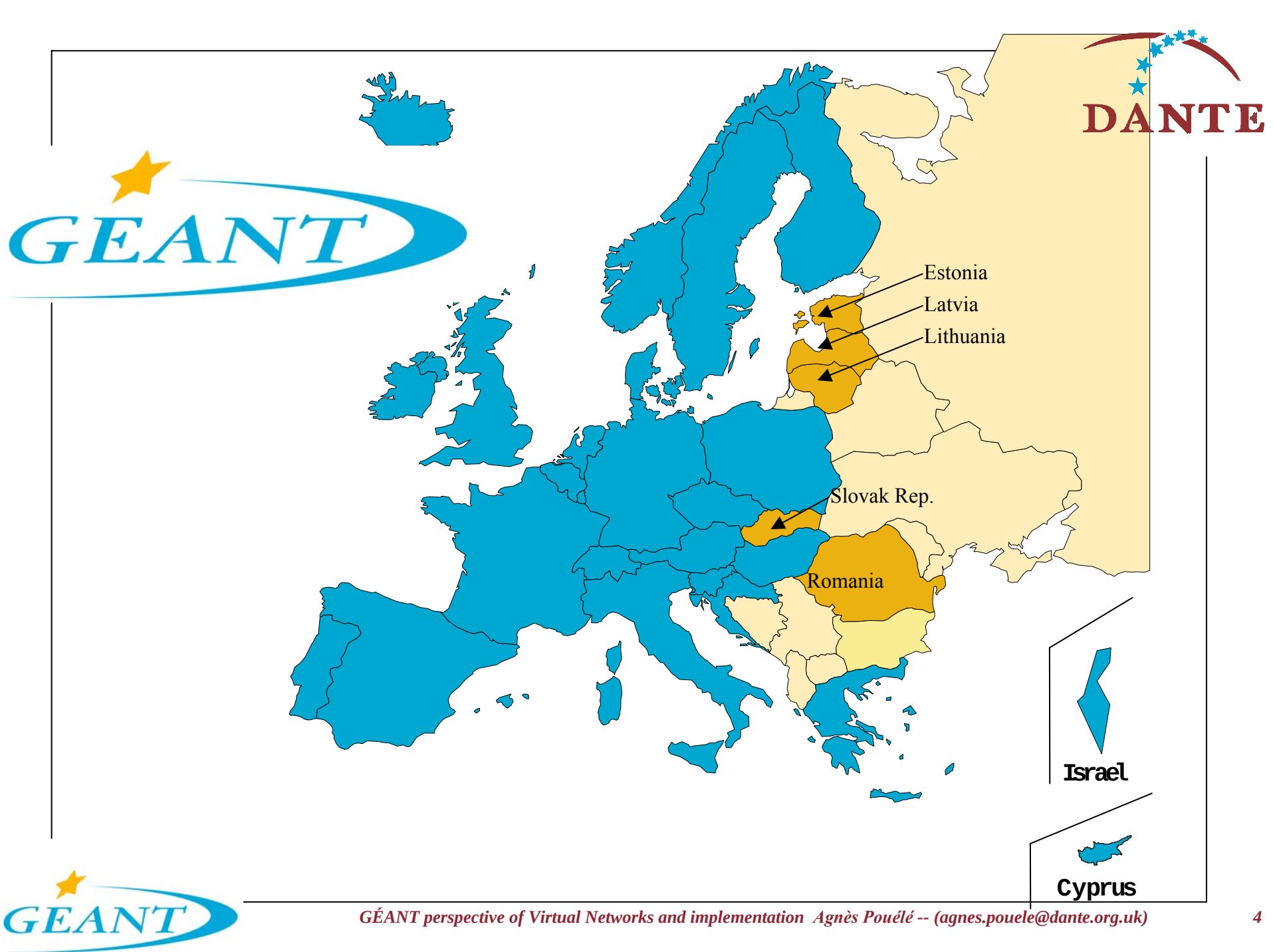
Agenda

- Introduction to GÉANT
- Requirements of GN1 project
- The MBS Service of TEN-155
- Provisioning of VPN layer 2
  - CCC and VPN layer 2 technology
  - Provisioning of VPN layer 2 inter-domain
- Draft model of VPN layer 2 service
- Perspective on upcoming technologies

Introduction to GÉANT

- GÉANT is a 10 Gbps Pan-European Network that supports the development activities of the European National Research & Education Networks (NRENs)
- GÉANT was launched in December 2001 and is the successor of TEN-155


DANTE
GÉANT
Estonia
Latvia
Lithuania
Slovak Rep.
Romania
Israel
Cyprus
GÉANT

Requirements of GN1 project

- The current working plan defined under the GN1 project are :
  - GÉANT Network Operations
  - Adoption of new Technologies&Piloting of New Services

- **Among the Services to be provided by GÉANT and specified in GN1 work plan are VPNs Services.**

GN1 specification

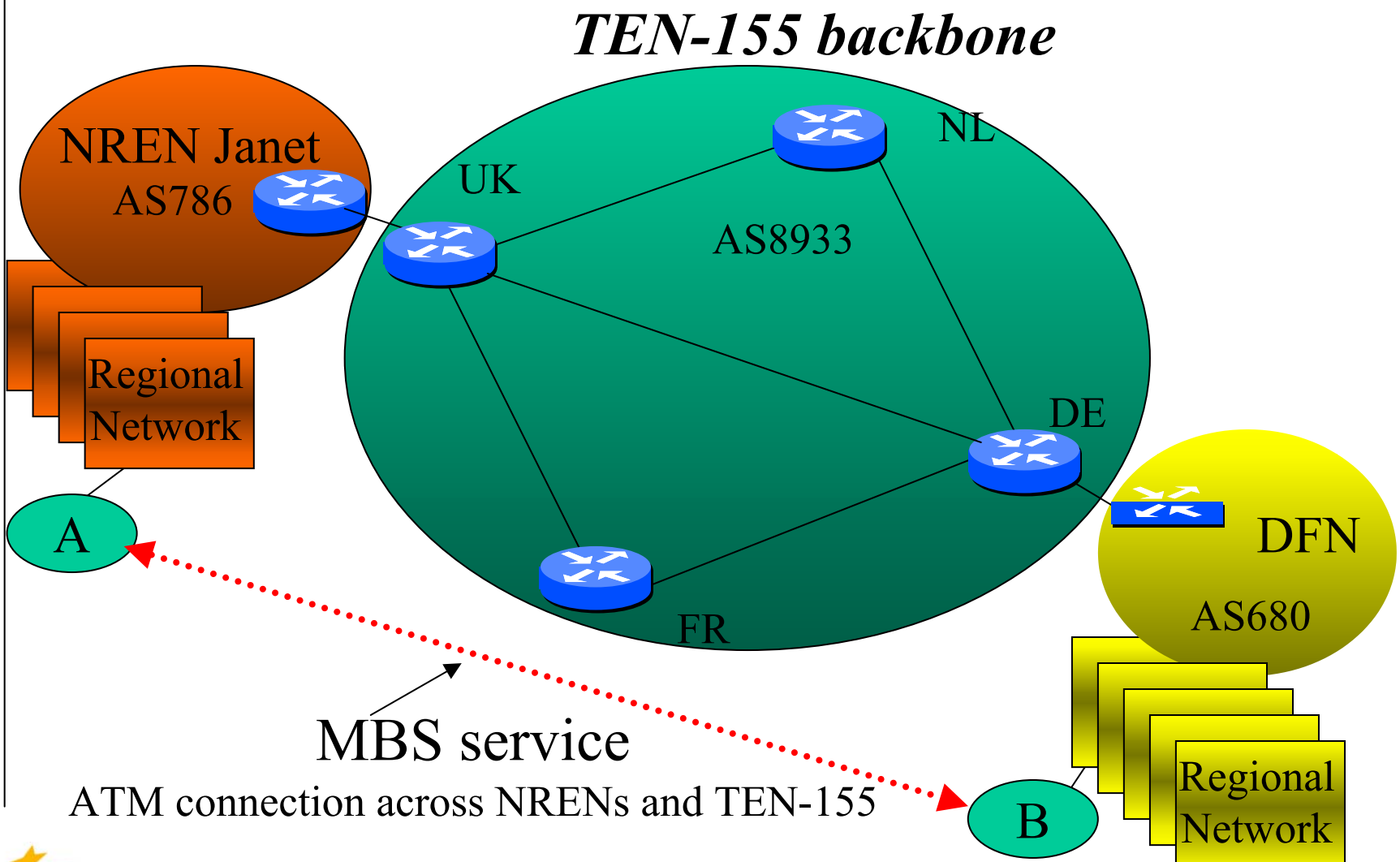
A Virtual Private Network (VPN) service will offer the ability to configure connectivity within the network and to provide **partitioned network capacity** to specific **groups of users** …provides degree of **isolation** ..

THE MBS Service from TEN-155

- TEN-155 was an IP network built on ATM STM1 trunks upgraded in year 2000 at 622 Mbps.

- The TEN-155 Managed Bandwidth service provided International test-bed with QoS.

MBS service from TEN-155



Provisioning of VPN layer 2 into GÉANT

- In a first phase we'll provision Point-to-Point tunnels from NREN access to NREN access.

- The technology used will be Circuit Cross Connect, private encapsulation from Juniper.

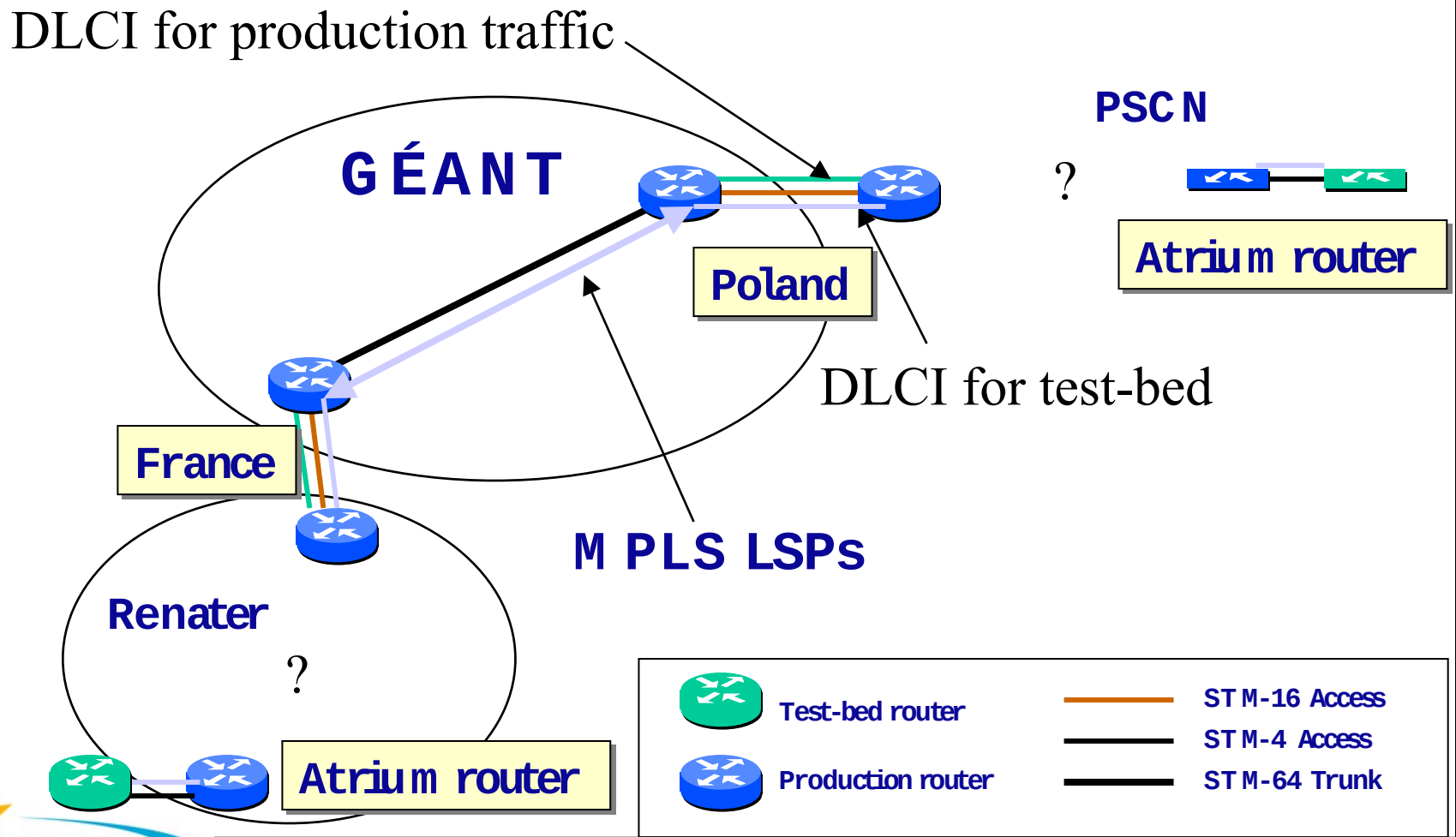
CCC technology

- Layer 2 over MPLS
  - ATM interface
    - ATM PVC
  - POS interfaces
    - Cisco-HDLC, PPP, Frame Relay
  - Ethernet
    - VLAN

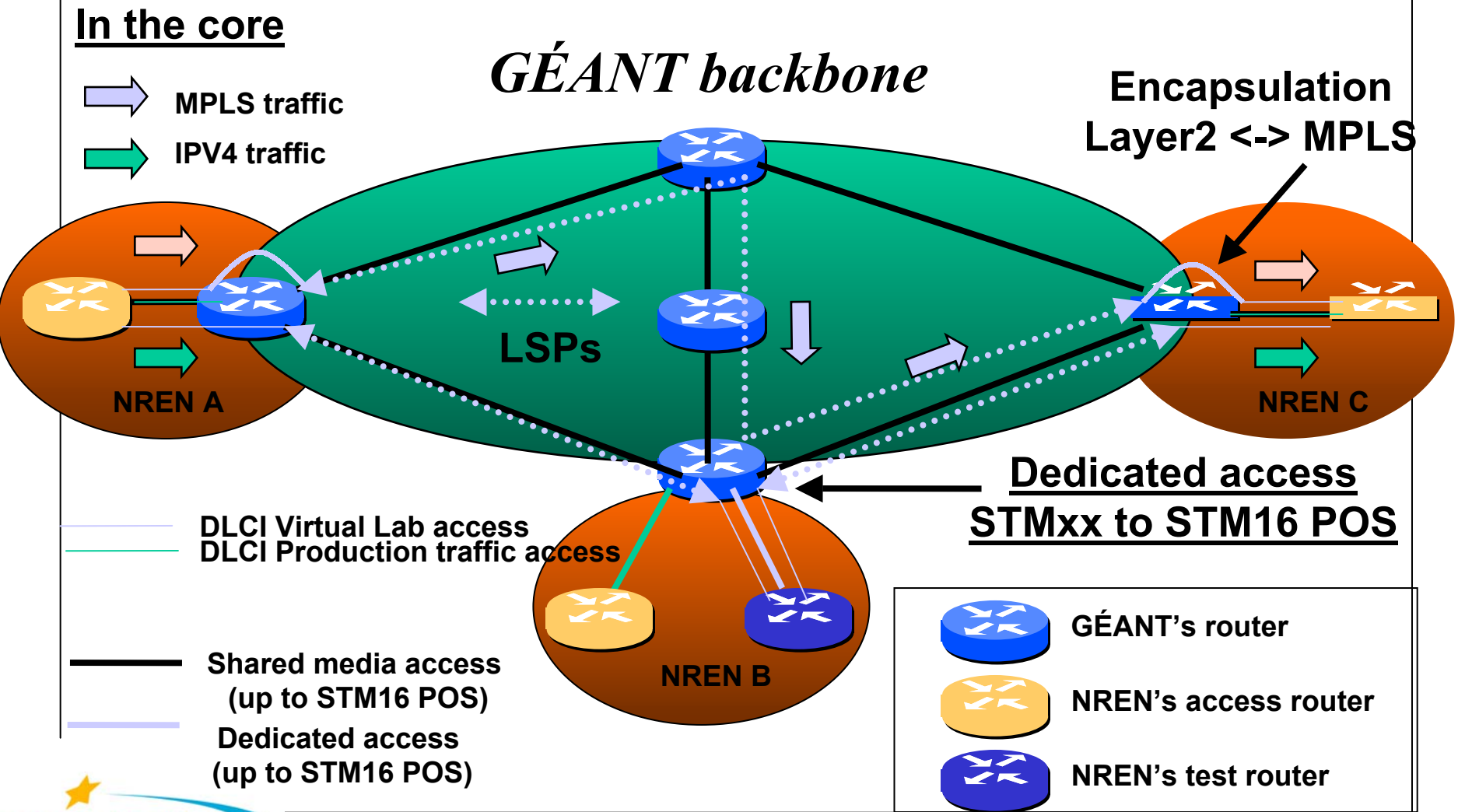
VPN Layer 2

- Three projects have requested tunneling layer 2 for carrying transparently specific traffic.
  - ATRIUM
    - Interconnection of test-bed based in Poland and France or Belgium
  - Datagrid
    - Layer 2 tunnel between Garr and Cern (Bologna to Chicago
  - 6NET
    - Connection of Greece with 6NET network

MPLS/CCC connection set-up by GÉANT between Renater and PSCN for the interconnection of ATRIUM test-beds.



Example of Virtual Test bed



CCC technology drawbacks

- Not interoperable
- Two LSPs per CCC connection
- Must be the same layer 2 at both end of the tunnel

VPN layer 2 technology

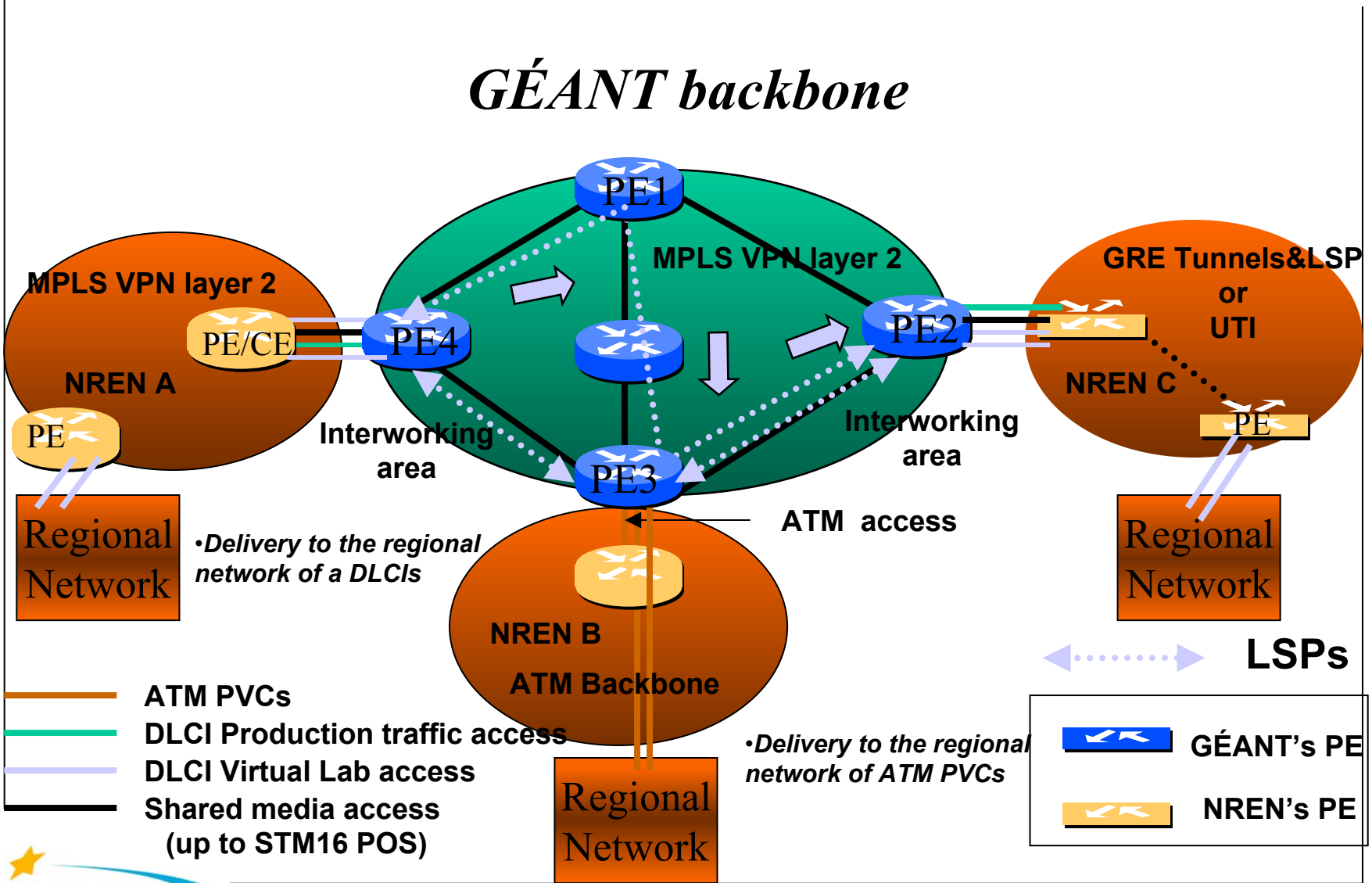
- Currently, several drafts are under process at the IETF for the standardization of VPN layer 2
  - Martini drafts
    - draft-martini-l2circuit-encap-mpls-04.txt
    - draft-martini-l2circuit-trans-mpls-08.txt
  - Kompella drafts
    - draft-kompella-ppvpn-l2vpn-01.txt
  - …
  - IP based interworking
    - draft-shah-ppvpn-arp-mediation-00.txt

Extension of VPN layer 2 across Multiple domains

- In GÉANT context we need to extend the point-to-point connection across multiple domain (University-NRENs-GÉANT-NRENs-University)

- All these domains are not MPLS aware

VPN layer2 Inter-domain extension



Draft Model of VPN layer 2 service

- The Virtual Lab Service
  - Goal
    - Build of international test-beds.
  - Coverage
    - The service itself will be limited, in the beginning, to the delivery of layer two tunnels to the NRENs accesses.
  - Technology used
    - Cross Connection Circuit from Juniper
    - VPN layer 2

The Virtual Lab Service

- Access to the service
  - Shared access (with production traffic and Virtual Lab traffic on it)
    - IP traffic and Virtual lab traffic are on the same physical link separated at layer 2 by virtual channel
      - **POS STM16 FR-DLCI**
      - **ATM PVCs**
  - Dedicated access
    - Any layer 2

The Virtual Lab Service

- Delivery of Virtual test bed accordingly to the specific needs of experiments.
  - With TE
    - For test-bed which need Constraint based routing.
    - In addition of booking the requested BW, the test bed itself can be built with LSPs following the “lowest delay path” across GÉANT.

The Virtual Lab Service

- With Bandwidth Guarantees (Diffserv)
  - Queuing of MPLS packets accordingly of the Experimental CoS bits value.
    - Use of WRR in the core (For now not needed)
    - Use of Rate limitation on the access
- With Resiliency
  - Point-to-point connections can be protected with backup LSPs in the core.
  - Permits to protect sensitive application (low loss)

The Virtual Lab Service

- Monitoring of Virtual lab via SNMP
  - Monitoring of each trunk (LSP) per VLab
    - BW usage ..
- Troubleshooting
  - To be investigated

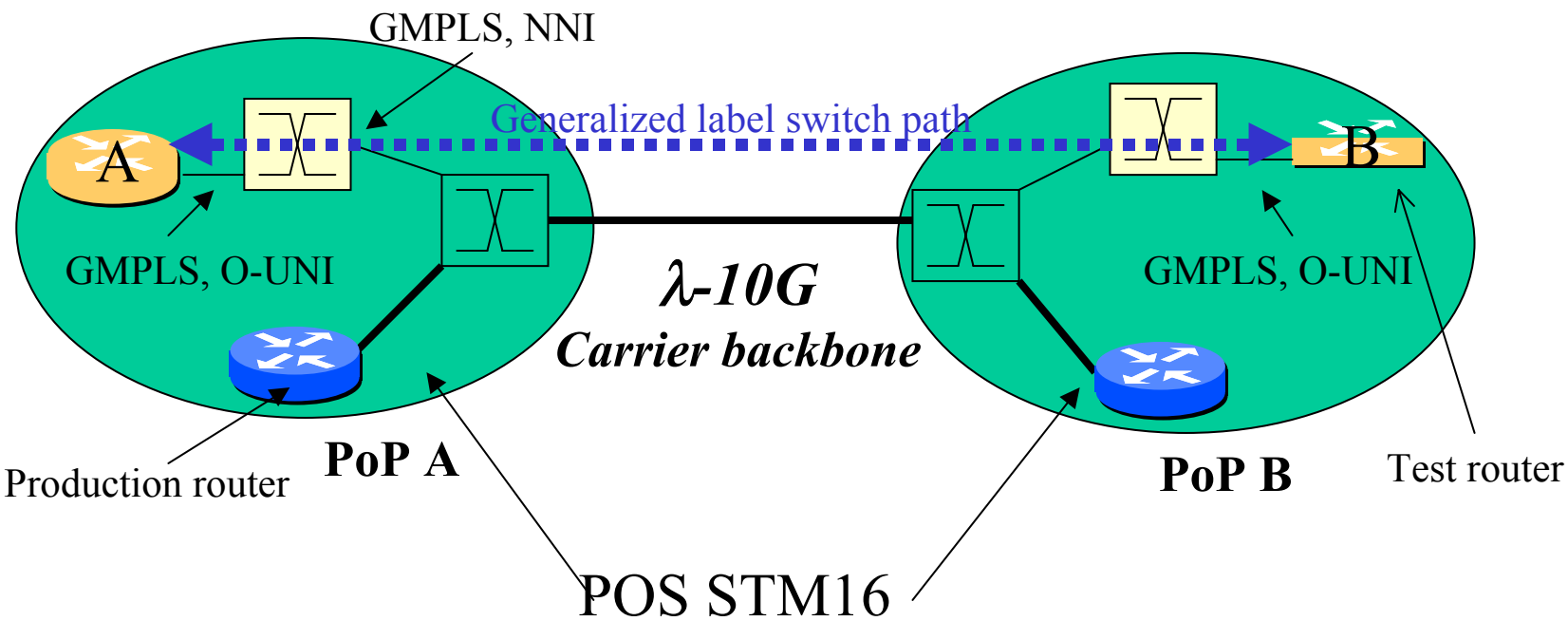
Perspective on upcoming technologies

- G-MPLS …..
  - GMPLS represents a natural extension of MPLS to allow MPLS to be used as the control mechanism for configuring not only packet-based paths, but also paths in non-packet based devices such as optical switches, TDM muxes, and SONET/ADMs.

Delivery of VoPN

- Delivery of Soft permanent channels on VoPN's access via a transparent backbone.
  - OXCs added in the PoPs which communicates through the core backbone via GMPLS.
  - The core backbone doesn't run GMPLS and provides transparent point-to-point links.
  - The OXC and attached routers run GMPLS.

Provisioning of Soft permanent channels



Provisioning of optical channels through the interaction of the management and control planes.

GMPLS is responsible for the establishment of the Soft permanent channel.

Questions ?