



Service Challenges for Networks and Grids

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4th TERENA NRENs and Grids Workshop,
Amsterdam, 6 December 2006



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Motivation

- Networks traditionally provide basic connectivity services
 - Most are manually provisioned
- Grids are moving from R&E to Production environments and hence require:
 - advanced network services
 - a degree of automation



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Advanced Network Services

- Why grids require advanced network services?
 - Mission critical applications on Grids
 - Geographically diverse resources
 - Optimum resource utilisation
 - High reliability and deadline scheduling
 - Shared versus Dedicated resources
- Networks have recognized the need to offer advanced network services
 - Research activities in progress
 - Various service challenges need to be addressed

European Research Initiatives



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- Recognized need to provide advanced (value added) services
- Various research initiatives under FP6 for advanced network services e.g. **GN2**
- Objectives
 - To build a multi-gigabit pan-European network (GÉANT2)
 - Conduct joint research into development of network technologies and services
 - Offer advanced services on production network





Benefits for Grids (1)

What's in it for Grids?

- Higher bandwidth – up to 10G (for now)
- Choice of dedicated or shared circuits
- More resilient IP service
- More choices for end site connectivity
 - IP, 1 GE/10GE, Light Paths over SONET/SDH/10GE LAN PHY
 - Sub 1GE (or > 1GE) connectivity
- New L1 and L2 P2P protected services
- Other services like IPv6 multicast
- **Is that all?**



Benefits for Grids (2)

What's in it for Grids?

- Service Oriented Architecture
- Single service access point
 - Single request for multi-domain services
- Well defined standardised web service interfaces
 - Hides complex heterogeneous underlying systems
- Uniform resource discovery mechanisms
 - Ability to query Topology Information at all layers



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Service Challenges

- Network resource discovery
- On-demand & advanced provisioning
- End-to-end multi-domain provisioning
- Heterogeneous environment
 - multi-vendor / multi-service / multi-layer
- Fair Allocation Policy for shared resources
- Service level agreements
- End-to-end monitoring
- Standardisation of Grid-Network Interfaces
- AAA issues
- Operational interface

Network Resource Discovery



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- To interact with networks, Grids require information about networks
 - Topology (Connectivity, Adjacency)
 - Network Characteristics
 - Service Availability / Location
- Networks need to provide information
 - clear and consistent manner
 - using a common language (Ontology)
 - across layers/technologies
- GN2-SA3 WI-13 common Network Information Service



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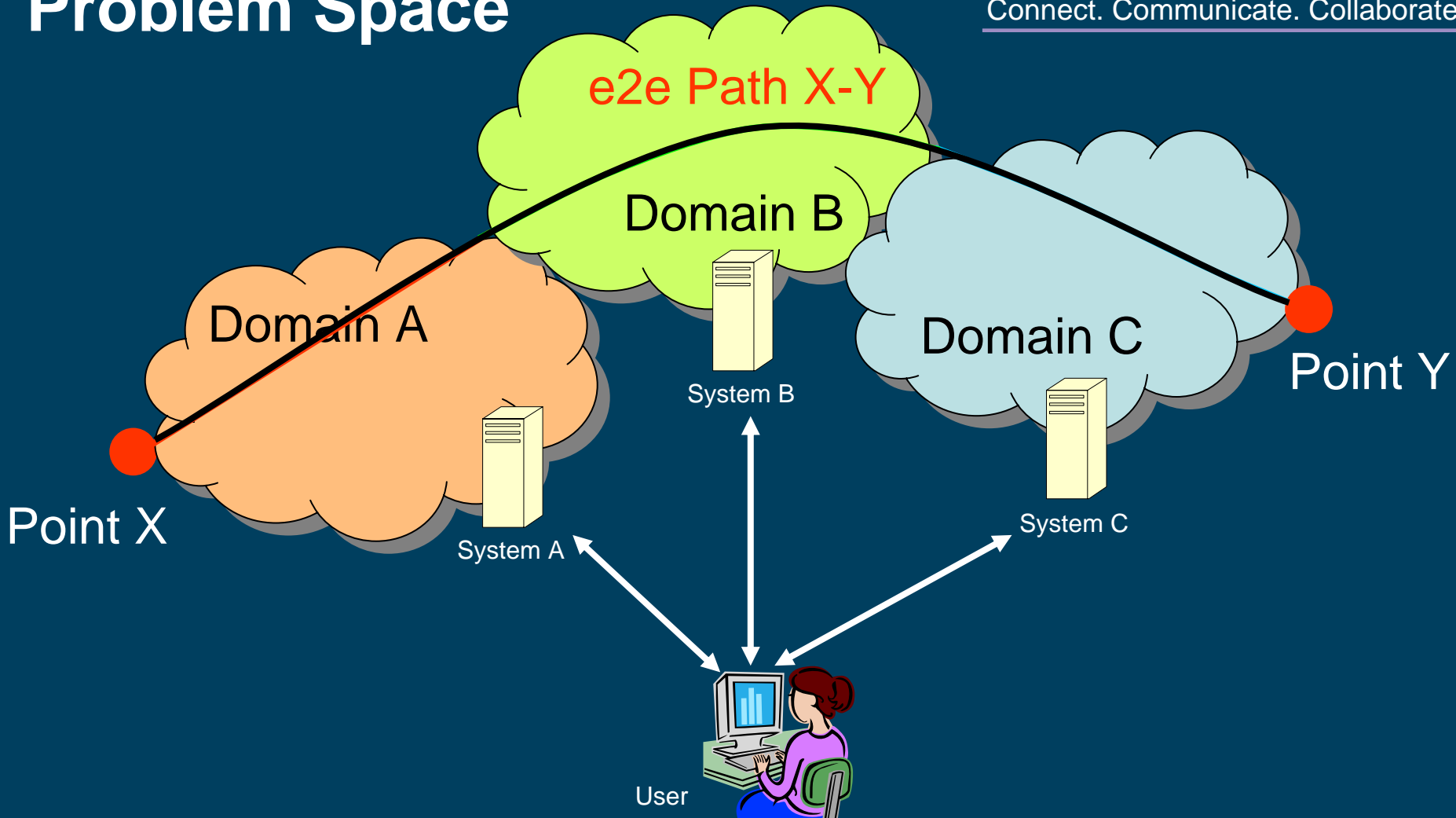
Service Provisioning

- To operate efficiently, Grids require
 - On-demand & advanced service provisioning
 - End-to-end multi-domain service provisioning
- Across heterogeneous environment
 - multi-vendor / multi-service / multi-layer
- Networks need to provide
 - a GUI and a programmatic interface
 - single service access point
 - automatic network element configuration

End-to-End Services Problem Space



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AMPS

- Advance Multi-domain Provisioning System
- IP still relevant?
 - Not everyone can afford dedicated circuits
- Single request can book an end-to-end path traversing multiple domains
- Reduces high lead times of manual process to seconds
- Inclusive approach
 - Premium IP enabled or over-provisioned networks
- Deployed in GÉANT2, pilot in some NRENs soon
- Interoperability testing with GRNet ANS, ESN Net OSCARS and Internet2 BRUW



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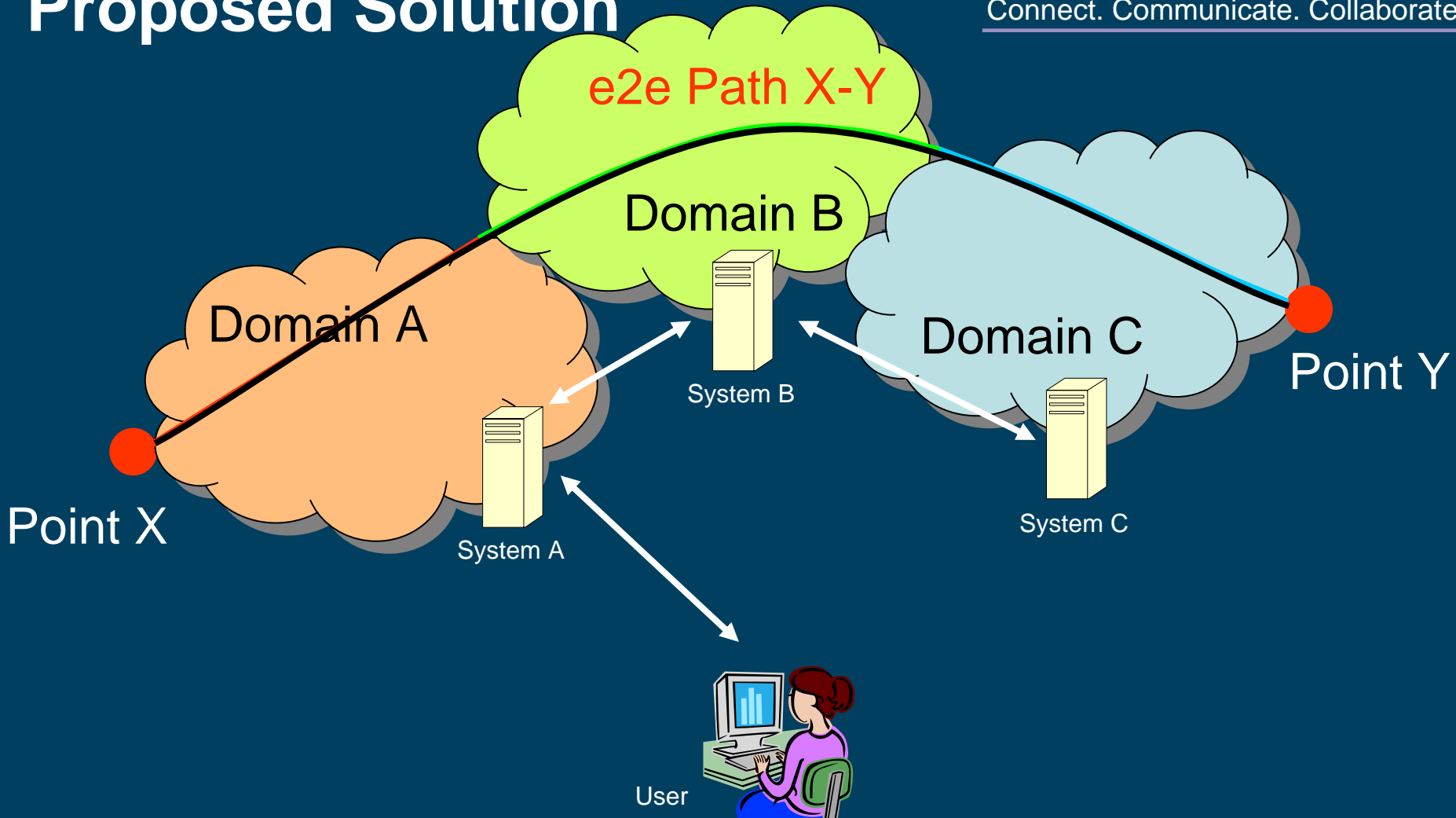
Bandwidth on Demand

- A 'Joint Research Activity' investigating the provision of 'Bandwidth on Demand' services to the community
- The environment:
 - Multi-domain
 - Multiple technologies
 - GFP over SDH, L2 MPLS VPN, Native Ethernet
 - Requirements for:
 - end-to-end non-contended capacity
 - a standardized interface for service requests at end-points
 - service level indication to end-users
 - advance reservation (scheduled)

End-to-End Services Proposed Solution



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Allocation Policy

- How to allocate resource fairly?
- Free: first come first serve
 - Possible misuse
- Charging systems ?
- Each domain is independent and can apply local policies
- Need for Grids to get policy agreements with each domain
- More work needs to be done in this area
 - Especially at lower layers



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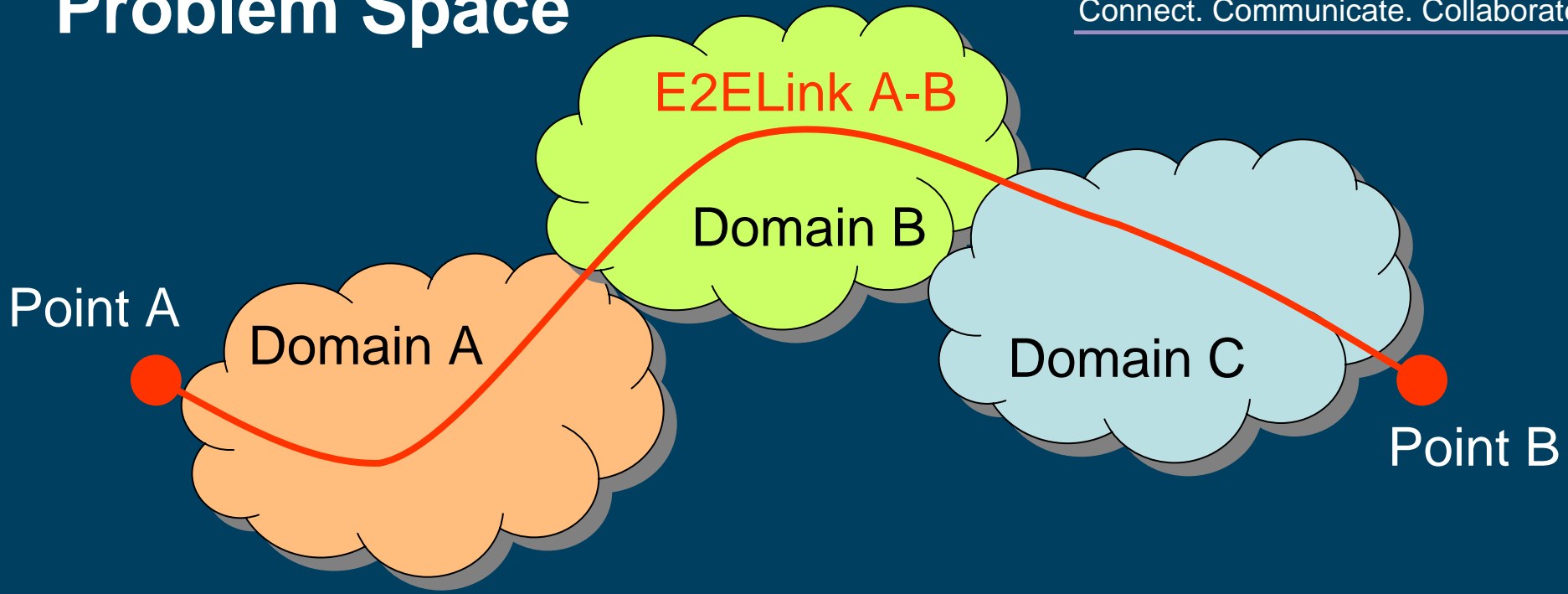
Service Level Agreements

- Need to define SLS and SLA
- Mechanism to exchange SLA
- Working with EGEE on defining/exchanging of SLA
 - Exploring Agreement Signalling (WS-Agreement)
- Issues:
 - What are the SLA parameters?
 - Is the SLA binding?
 - How to monitor?
 - What if one party defaults?

End-to-End Monitoring Problem Space



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Need (near) real-time monitoring (link status) of constituent DomainLinks
(and links between domains) and whole E2ELink A-B



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perfSONAR

- perfSONAR is a Monitoring infrastructure
- Facilitate the retrieval of monitoring information from multiple administrative domains
 - Abstracts heterogeneous monitoring tools
 - Using standardised web service interface
 - GGF NMWG schemas
- Enables e2e troubleshooting and SLA monitoring
- Raw data allows custom visualisation and analysis
- Data from Europe, Internet2, ESNNet, RNP Brazil
- Successful tests with EGEE NPM Diagnostic tool

perfSONAR

Empower the Community

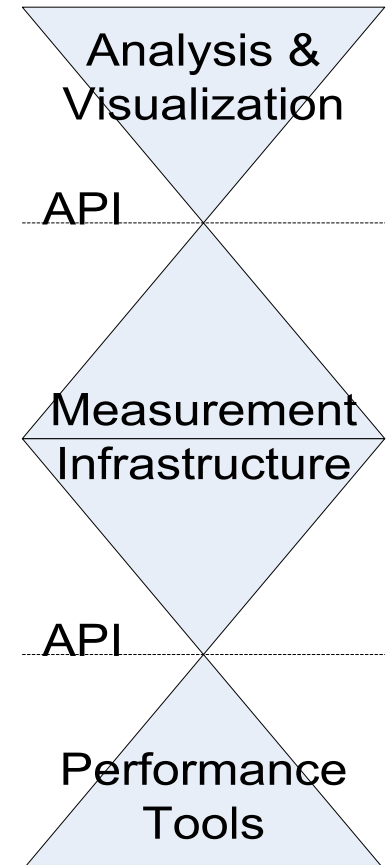


Decouple the Problem Space:

- Analysis and Visualization
- Performance Data Sharing
- Performance Data Generation

Grow the Footprint:

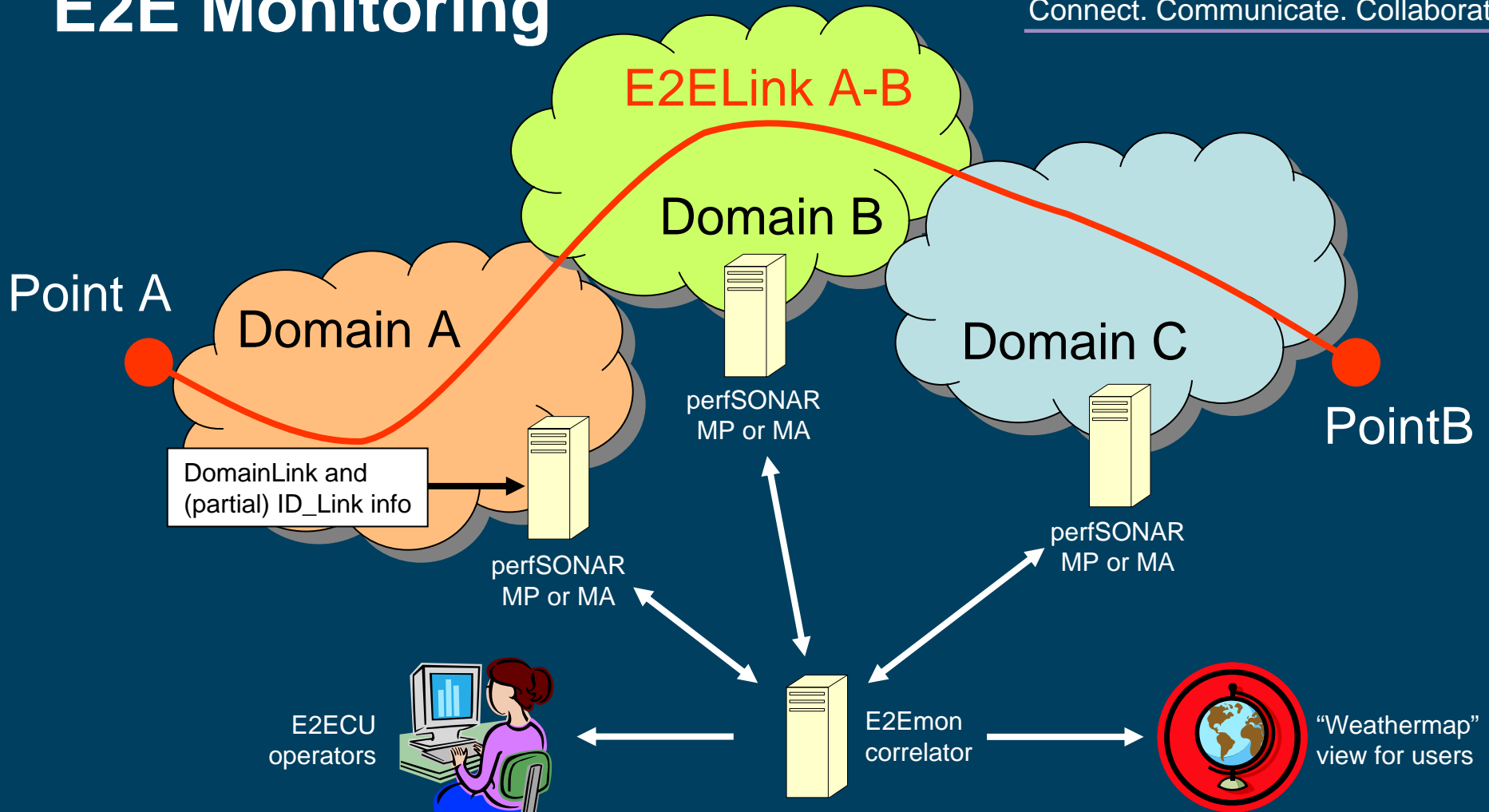
- Clean APIs and protocols between each layer
- Widespread deployment of measurement infrastructure
- Widespread deployment of common performance measurement tools





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E2E Monitoring





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AuthN .. AuthZ

- All network services will require authentication and authorisation
- Grid users will already have identity in their own domain
- eduGAIN is building an AA framework
 - Federate the national AA infrastructures
 - Use existing identity providers
- Each domain will enforce its own AuthZ policies
- Integration of Grid and Network AA infrastructures

Operational Interface between Grids and Networks



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- Interface between GOC and NOC
- Organised information flow to:
 - trace, diagnose and resolve problems
 - provide quality indicators
- Networks to signal problems to Grids
 - Trouble Ticket system integration
- Access to PERT system for performance issues
- Working with EGEE/EGEE-II (ENOC and E2ECU)



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Conclusion

- Grids require advanced services from networks
- Service challenges have to be met
- GN2 - a pan-European project
 - Introducing advanced services
- Various research activities in progress
 - More work needs to be done
- Interface standardisation needs immediate attention



Thank You

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Any further Questions, Comments, Feedback or Suggestions

please contact

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