

SA2 Testbeds as a Service

Jerry Sobieski (Activity Leader)
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- Objective: Provide the network research community with the ability to rapidly and easily create experimental networks to test novel concepts at scale.
 - Dynamic Packet Testbeds
 - *Dynamically defined and instantiated*
 - *Some with added features:*
 - *novel hardware (e.g. OpenFlow, mobile, sensors)*
 - *Possible autoconfigured networking aspects (IP addressing, routing, etc.)*
 - Dark Fiber Testbed
 - *Access to long haul fiber infrastructure*
 - *With/without amplification*

- Draws from numerous predecessor projects:
 - *FEDERICA, Network Factory, OFELIA, NOVI, MANTICHORE, GEYSERS, DRAGON, GENI, PLANET LAB,*
- SA2 Activity leader: Jerry Sobieski (NORDUnet)
 - T1: Hardware and Systems Engineering: (Jerry Sobieski acting)
 - T2: Software Development TL: **Blazej Pietrzak (PSNC)**
 - T3: Service Management TL: **Peter Szegedi (TERENA)**
 - T4: Multi-Domain Interoperability TL: **Fabio Farina (GARR)**



Coni **Jerry Sobieski**



Blazej Pietrzak



Peter Szegedi



Fabio Farina

Why do we need a production “Testbeds” service?



- The modern Network Researcher requires realistic networks to understand what happens in real networks and how to better design/manage them...
 - Realistic geographic footprint, operational/engineering characteristics, administrative/policy environments, traffic loads and real [opt-in] early adopter users (!), ...
 - Real control over the network, with ability to insert experimental technologies
- A Testbed service (particularly an automated dynamic service) can reduce research ramp up time.
 - From concept to testing can be as little as a few minutes...
- Provides production service personnel with first hand experience with emerging technologies
 - Think of virtual networks...

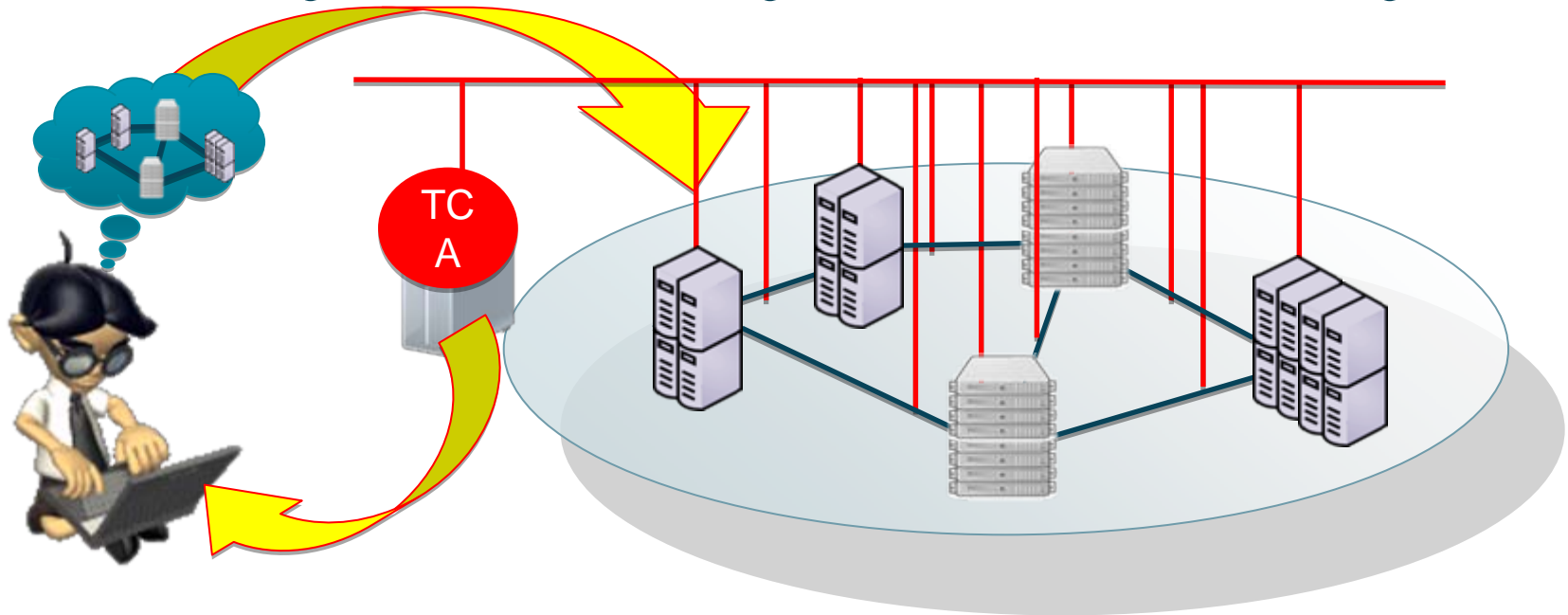
- SA2 will deliver two key Testbed Services:
 - **Dynamic “Packet” Testbeds** – dynamically allocated, virtualized networks provisioned over packet oriented transport and switching infrastructure with a pan-European footprint.
 - **“Dark Fiber” Testbeds** – manually engineered photonic testbeds over dark/dim fiber for along long haul transport routes between a limited set of major EU metro areas.

- Testbeds are fundamentally graph topologies consisting of “resources”
 - Node resources may be any of a set of network elements that inspect and act upon some portion of a data packet
 - Link resources are network transport facilities that transparently transport data from between nodes.
- The Dynamic Packet Testbed service constructs a “testbed” topology via interaction with automated agent(s) or human direction

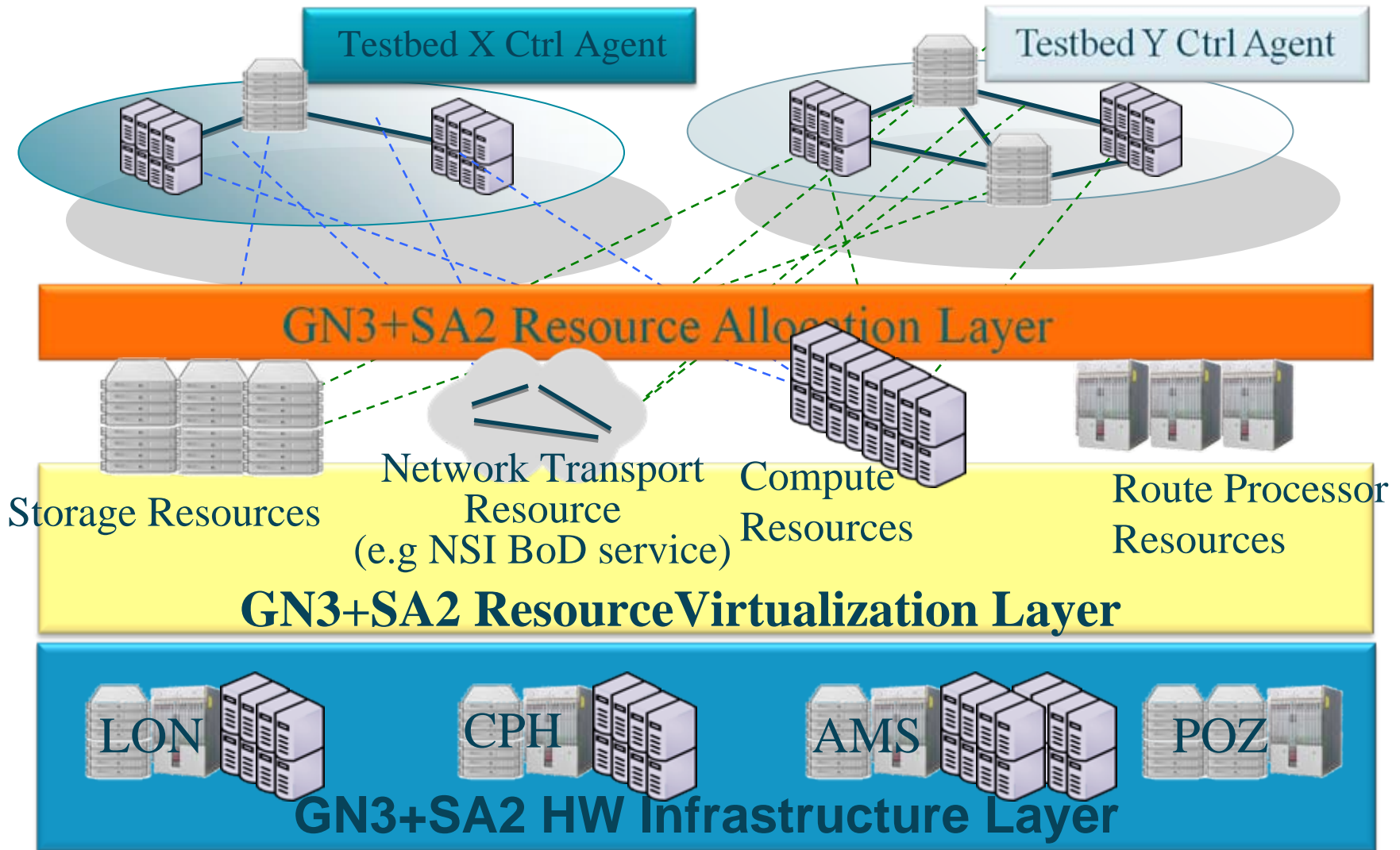
- Network Researcher (“user”) defines the network topology they require:
 - Either via human interactive Web GUI or via programatic API
 - Define functional capabilities of switching/forwarding nodal resources
 - *The switching nodes include (initially) bare metal computational elements that can be applied in a very general fashion*
 - *Nodes will include virtual routers for instantiating conventional networks for use by experimenters*
 - *Nodes can incorporate novel hardware such as OpenFlow switching or novel transport interfaces.*
 - Define adjacencies via network transport link resources interconnecting the forwarding/switching nodes

The User Process

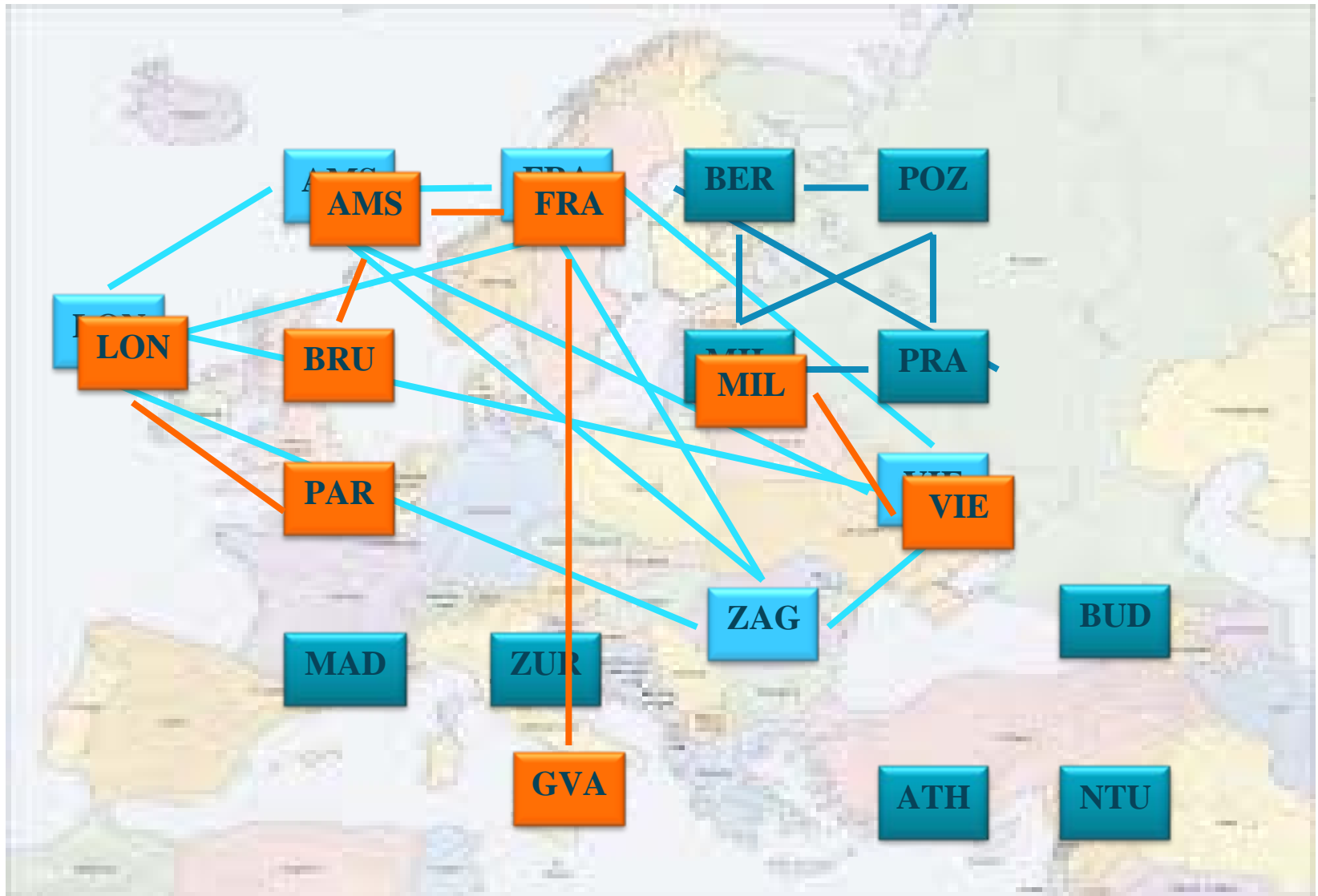
1. User has an idea and creates a testbed *instance* – an insulated environment for containing and running experimental networks
2. User Identifies/reserves desired computational and transport resources...
3. Construct a “meta-control” network for managing the testbed resources...
4. Delegate control to the designated user Testbed Control Agent.



SA2 Testbeds Phase 1

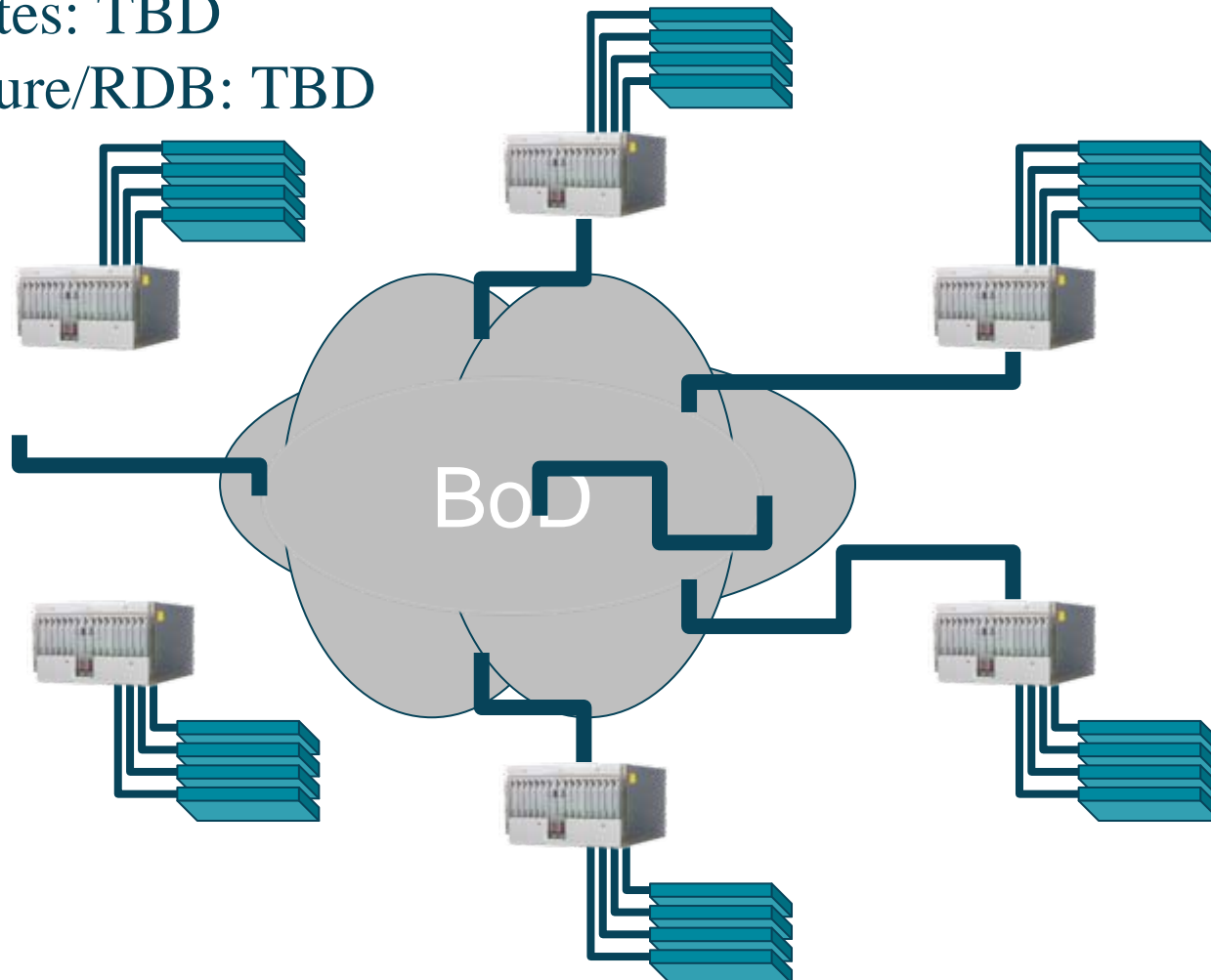


Engineering/Deployment Planning

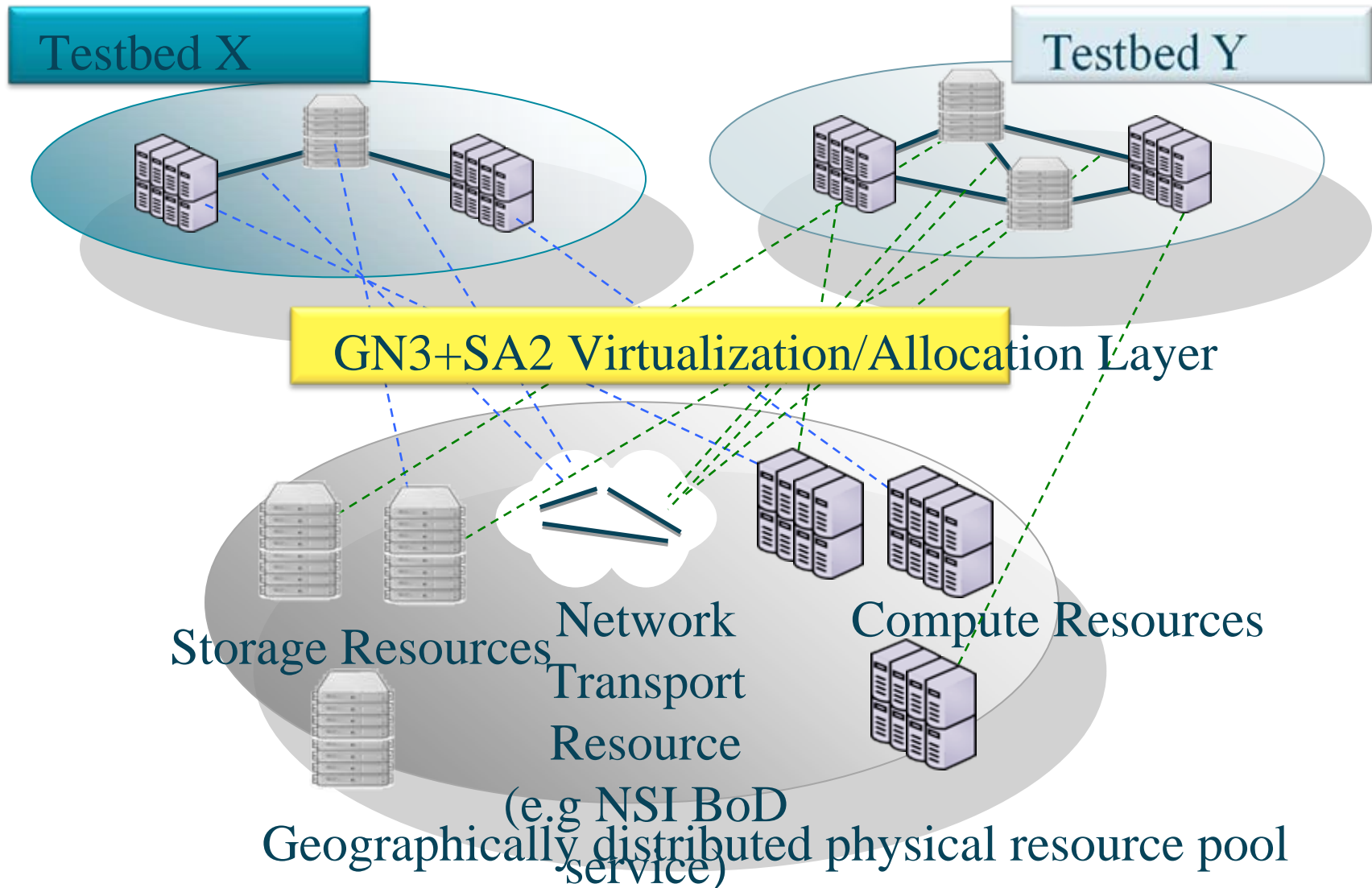


Base Infrastructure Architecture

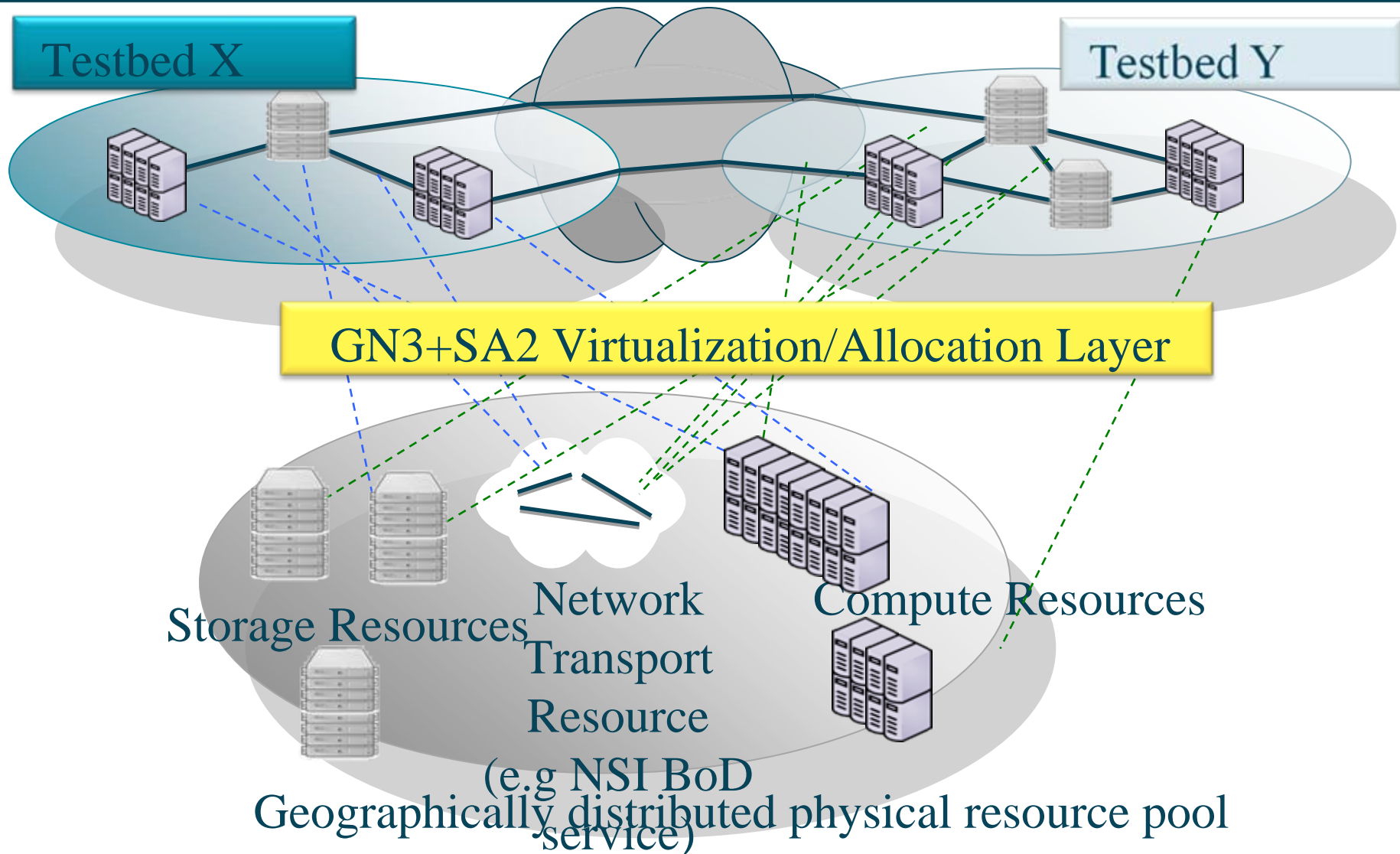
Specific sites: TBD
Infrastructure/RDB: TBD



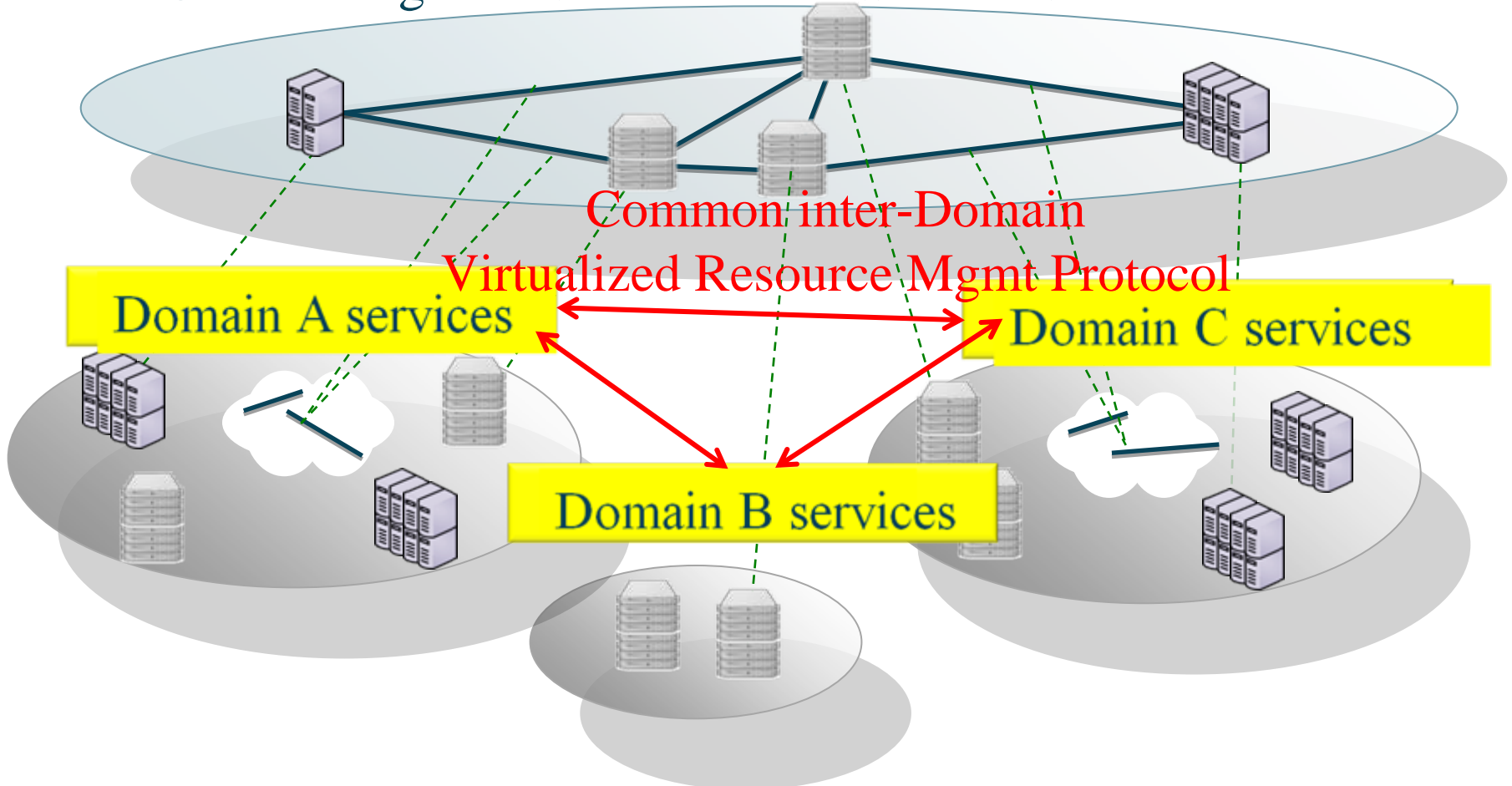
SA2 Testbeds Phase 1



SA2 Testbeds Phase 1plus



Global integrated virtualized network service domain



Geographically distributed physical resource pool

Who can use the TaaS?



- Anyone
- Initial plans are to have four levels of authorization to use the Dynamic Packet Testbeds:
 - Basic kick-the-tires beginner. Mostly anonymous, most capabilities, but only limited scale in testbeds themselves
 - Intermediate – more credentials required. May require charge accounting (policy decision TBD)
 - Advanced – experienced testbed clients wishing to test non-standard resources – e.g. they want to insert their own hardware or software for use in the testbed.
 - Zeus – can do anything. Intended for service operations and engineering personnel who are responsible for overall control and mgmt of the SA2 Service.
- Access to the DF Testbed is based on simple proposal.

- April 1, 2013 Start GN3plus
- May 1, TaaS Service Definition
 - Status: almost finished – 3 weeks late.
- June 1, TaaS Architecture and Engineering Plan
 - Status: Working (probably a couple weeks behind sched.)
- Sept 1 – Internal demo (not formal ms)
 - Begin migration from FED/NetFac -> SA2 TaaS
- Nov 15 – Demo (SC2013?)
 - User guides, Operations guides, etc
- Dec 31, 2013 – Phase 1 production service
- 2014 – Expand scope and breadth of the service – especially the inter-domain aspects..

- The migration from GN3 to GN3plus (moving from Alcatel transport optics to Infinera) has resulted in several GEANT fiber segments no longer being utilized for production services
 - The Fiber remains under GEANT contract until 2015
- How do we leverage the sunk investment?
- Make these fiber routes available to the optical network research community for long haul experiments and proofs of concept

Where is this Dark Fiber?



- Well... Actually its “dim” fiber...
 - It currently retains the EDFA amplification system
 - Though this can be turned off, removed, bypassed, etc if necessary
- The Routes:

● LON-PAR	673km	170dB	9amps
● FRA-GVA	749km	165dB	8amps
● AMS-FRA	665km	157dB	8amps
● BRU-AMS	290km	70dB	3amps
● MIL-FKN	643km	157dB	9amps
● FKN-VIE	462km	98dB	6amps

How does one build a DF Testbed?



- Write a brief proposal:
 - Review the Dark Fibre Technical Annex describing the route details
 - Describe your research goals, and what you require to engineer the DF facilities to your needs
 - You MUST provide a substantive justification for testing in an actual long haul environment (as opposed to a lab)
 - Feel free to contact either of the following for advise and council:
 - *Jerry Sobieski SA2 Activity Leader*
 - *Guy Roberts (DANTE) DF Testbed Technical Coordinator*
 - Submit the proposal to SA2 for consideration –
 - *primary criteria will be based upon availability or sharing of the segments required,*
 - *and availability of support personnel to assist with the engineering*
 - *SA2 is not evaluating the research, just the pragmatics of the scope of effort that will be required to support the effort*

- SA2 would like the NRENs to participate in the SA2 capability
 - Initially, this means offering up infrastructure and resources according to the SA2 Arch and Eng plan
 - The NRENs can be our first experimental test of multi-domain interoperability – either by federation or integration

- There is 3.2 MegaEuros available for Open Calls
 - There are numerous calls for photonic and optical technologies for path provisioning in various scenarios
 - There are calls for CDN technologies, Open Flow trials, NSI protocol conformance, etc....
- All of these could take advantage of the TaaS for some aspects of the calls...
 - Deadline for proposals is...now.
- You do NOT need an Open Call award to participate in either the Dynamic Packet Testbed or the Dark Fiber Testbed.
 - You will

Testbeds as a Service



- The Service is being defined
 - And will iteratively be refined over time
- Please consider being part of it as the service emerges

- Thanks!