# International Research Network Backbone Collaboration

The rapid growth in scientific data (from genomic sequencers to new telescopes and sensor networks) commensurate with global R&D activities requires not only significant increases in international network capacity, but also a new approach to network architecture and deployment. These emerging challenges require national and international scientific funding agencies to develop a coordinated strategy for the acquisition and operation of international R&E networks to support scientific discovery and learning globally. This strategy has the following components:

1. Development of a coordinated strategy by key scientific funding agencies to meet the networking needs of science, engineering and education for the next 5-10 years. This would include:
    a. Developing appropriate light weight (simple, low overhead) policies on open sharing, network usage, connectivity and operations, and
    b. Developing long-term funding and support of international networking

2. Establishment of a "global" network backbone with multiple 10 Gig/40 Gig/100 Gb links to meet the aggregated needs of international research and education

3. Design and deployment of an Open Exchange Point node architecture with initial high-speed interconnections and upgrade paths that will create the International Research Network Backbone and provide connection points for additional countries and aggregators
    a. Exchange points will generally be operated by the countries and/or National Research & Education Networks (NRENs) in which they are located.
    b. Each exchange point has at least two connections to the Backbone for redundancy and reliability.
    c. Exchange points allow additional international links to NRENs, aggregators and regional consortia.
    d. Exchange points provide an innovative and experimental platform for new networking technologies to support new scientific research and instruments.
    e. Exchange points provide layer 1-3 connectivity services with policies supporting bi-lateral peering at layers 2-3.

4. The Global Network Backbone and Exchange Point architecture is designed in full cooperation with experienced operational NRENs
5. Formation of a coalition of key global partners willing to provide necessary resources to build and support the backbone

A concept drawing for a Global Research Network can be seen below. Please note that this is not a specific proposal. Many issues have yet to be addressed including architecture, bandwidth requirements, location, national and regional network connectivity and exchange point design.

International Research Network Backbone Concept
Notational only
Architecture, aggregation nodes, locations, bandwidth, connectivity to be determined
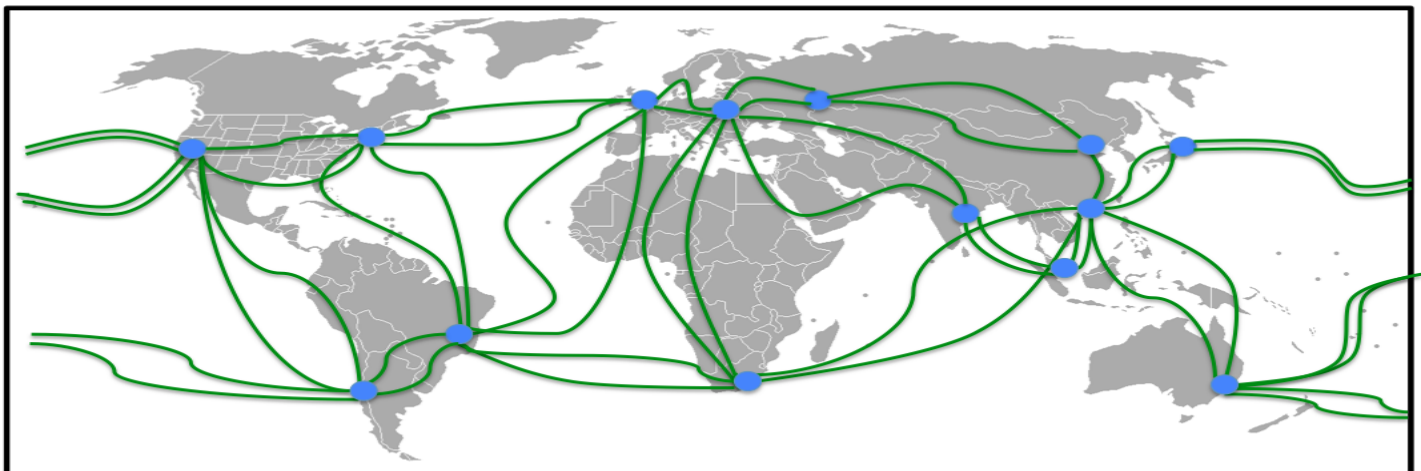
Aggregation nodes: Primary connection to International Backbone; every country and economy has the opportunity to be an aggregation node or connect to one

Shared High Bandwidth network (multi 10/100 Gig) interconnecting Aggregation nodes with redundant links

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Guiding principles:

Coordination Statement: Supporting global research and education communities by funding globally interoperable networked infrastructures, coordinated innovative services and human network community building.

This is will be achieved through global coordination, planning, rationalization, and governance where national and regional funding entities and agencies coordinate, plan, execute, and govern through appropriate coordination and governance bodies, and coordinated investments (e.g. simultaneous calls, joint calls)

- **Open exchange points**: "policy-light" operation of open exchange points allowing for bi-lateral peering at all layers is encouraged

- **Open shared transit**: although by definition links and exchanges are between two regions, utilization of the appropriated capacity will not be limited to funding party(ies) but rather will be open to the largest R&E communities possible including for transit

- **End-to-end interoperability**: funders and operators are engaged to ensure end-to-end visibility & interoperability across appropriated links and paths, eventually extended to end systems

- **Close partnership with RENS**: funders are committed to a short, closed loop of engagement with the community of RENs

- **Resilience**: investments will be organized in a way limiting single point of failure and ensuring physical and logical path and route diversity

- **Regional development**: funders are committed to the concept of aggregation of demand at regional level (e.g. Europe or USA are considered as regions in this context)

- **Technology agnostic**: funders are open to different technology architectures

- **Open innovation**: funders consider essential the joint/coordinated development and adoption of advanced services within intra-domain, inter-domain and user level

Means of action

- **Infrastructure building**: following the principles evocated above, funders are committed to invest in the required capacity and services fulfilling the objective stated.

- **Joint research and development**: funders are committed to invest in a globally interconnected testbed creating the place for developing innovative services

- **Human network community building**: funders are committed to invest in global human capital strategy in the form of staff, experts and students exchange, training, and coordinated global events