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NRENs as Enablers of eResearch

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What are NRENs?

- NRENs are specialised network infrastructure and service providers that exclusively supports a country's research and education communities
- Currently more than 50 NRENs active globally, e.g. Internet2, ESNet, SURFNet, JANET, AARNET, SANReN + TENET = SA NREN
- Most NREN's have CAPEX funded directly from government, OPEX by beneficiaries
- Most NRENs are not-for-profit organisations
- Primary strategy: Quality of Service (QoS) through over provisioning
- Major paradigm shift from commercial networks: Provide as much bandwidth as possible, with as little cost as possible

Source: TERENA COMPENDIUM of National Research and Education Networks in Europe, 2012

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What are NRENs?

- Services range from commodity Internet services to specialised NREN services geared for science and research (e.g. LightPaths)
- NREN community currently experiencing rapid technology driven changes, evolving business models, innovative service offerings and increased international collaboration
- Technologies ranges from broadband fibre optics to wireless
- NREN community fully supportive of open access and information sharing
- Test-beds for cutting edge telecommunication technology

Source: TERENA COMPENDIUM of National Research and Education Networks in Europe, 2012

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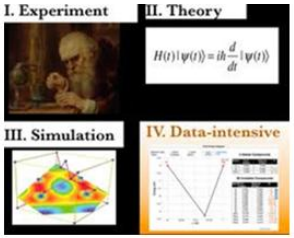
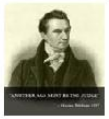
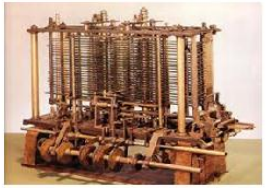
The Knowledge Triangle



Research





Research Infrastructure

Education

Innovation

To be a genuinely competitive in the knowledge economy, one must be competitive at:

- producing knowledge through research
- diffusing it through education
- applying it through innovation

Source: Colin Wright, SANReN, 2013

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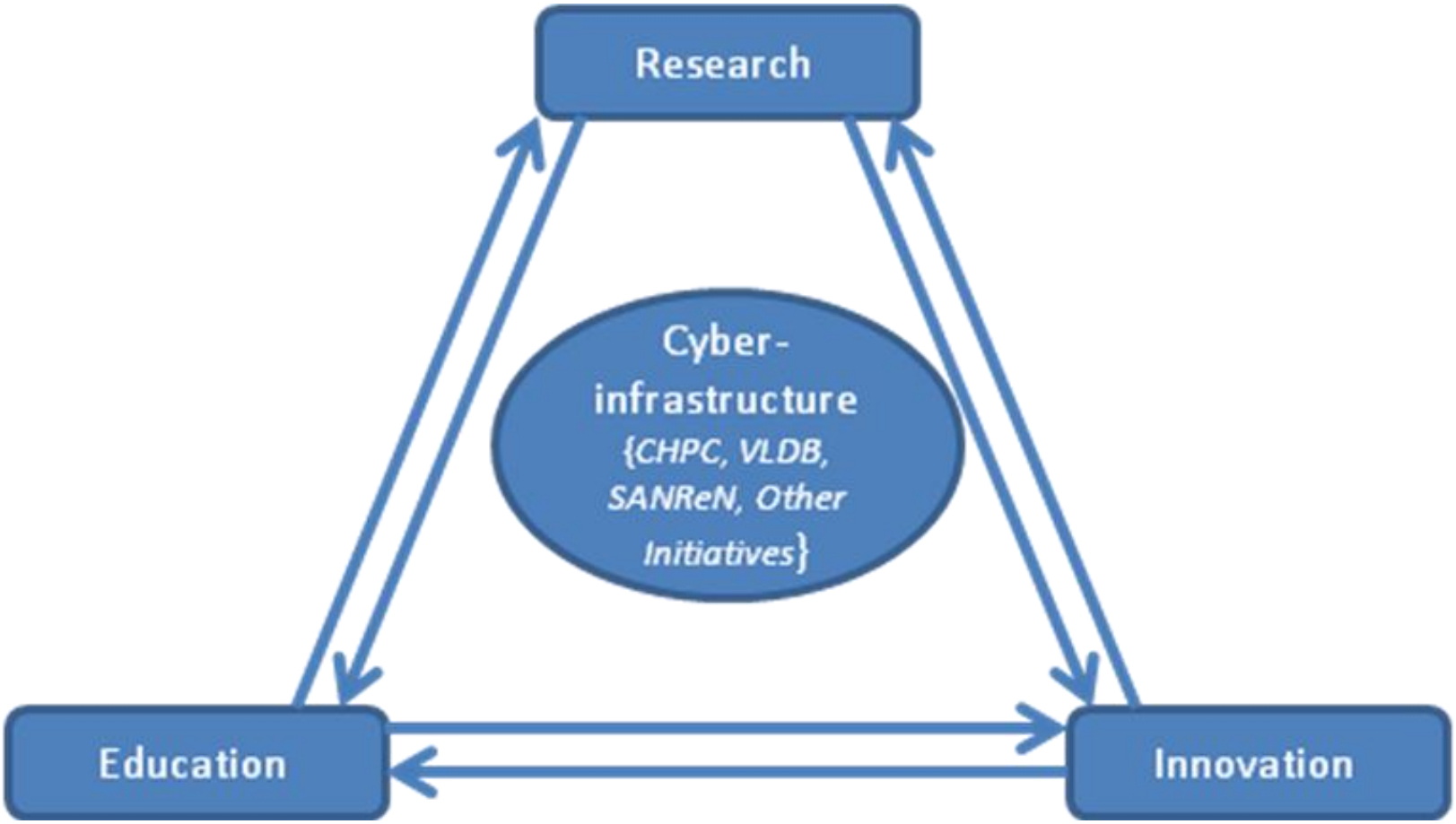

Source: Colin Wright, SANReN, 2010

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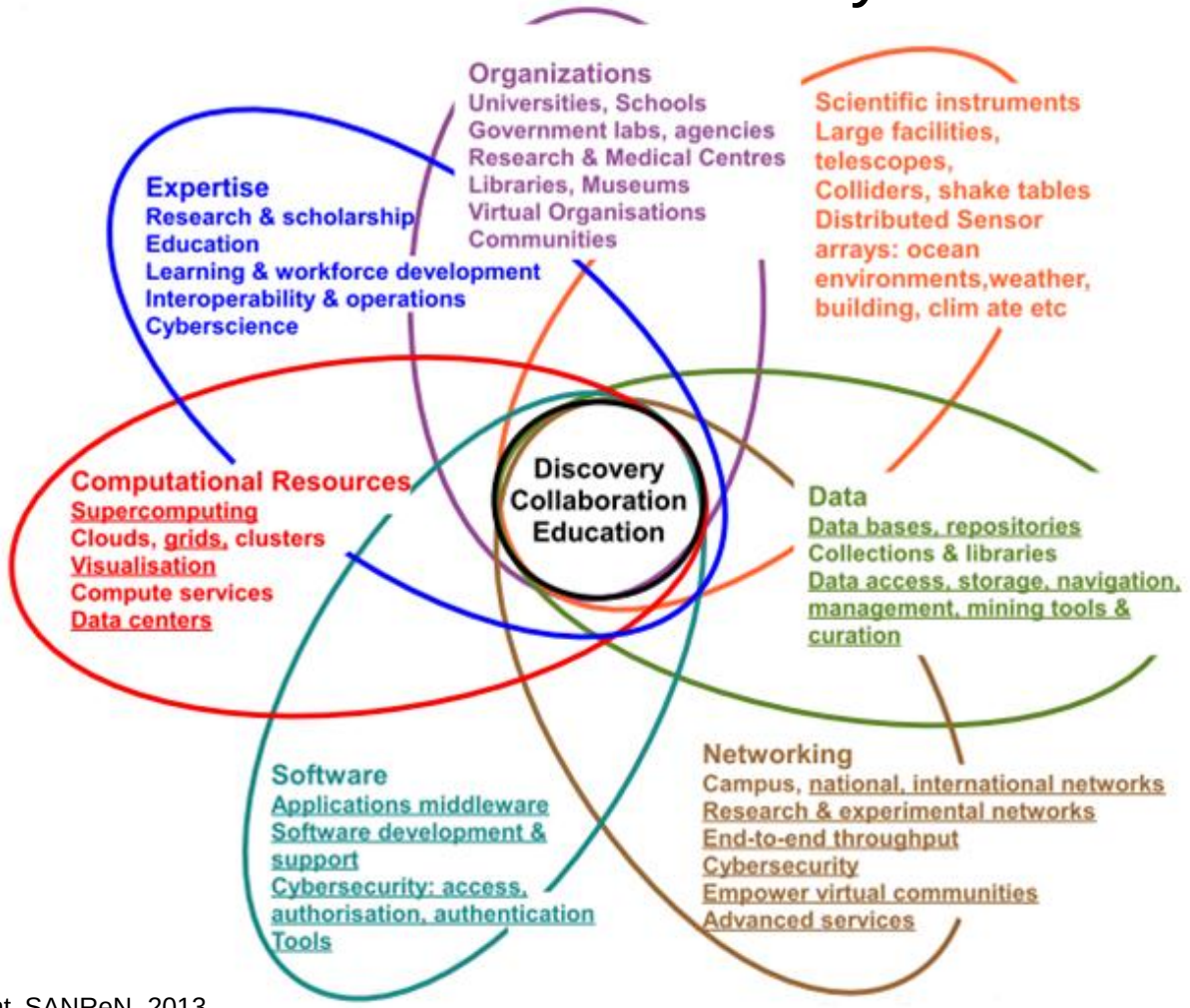
NRENs as Part of the Cyberinfrastructure Ecosystem



Source: Colin Wright, SANReN, 2013

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The Many Responsibilities of NRENs

- ***Essential global platform*** – platform for collaboration
- ***Innovation incubator*** – playground for new technologies (see next slide)
- ***Demand-side market maker*** – students capitalize on NREN platforms to create new technologies
- ***Market aggregator*** – provide advanced services at lower costs
- ***Knowledge multiplier*** – catalyst for knowledge creation
- ***Economic development engine*** – buying power, innovation engine, new market creator, trusted party

Source: David Lambert, Internet2, 2013

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The Many Responsibilities of NRENs

- ***Transformation vehicle*** – empowers R&E responses to change
- ***Collaboration enabler*** – provides key technologies (e.g. vID federations)
- ***Community developer*** – fosters regional collaboration, change ways in which content, applications and services are developed
- ***Political stabilizer*** – create collaborative relationships that transcend cultures and outlast political regimes

Source: David Lambert, Internet2, 2013

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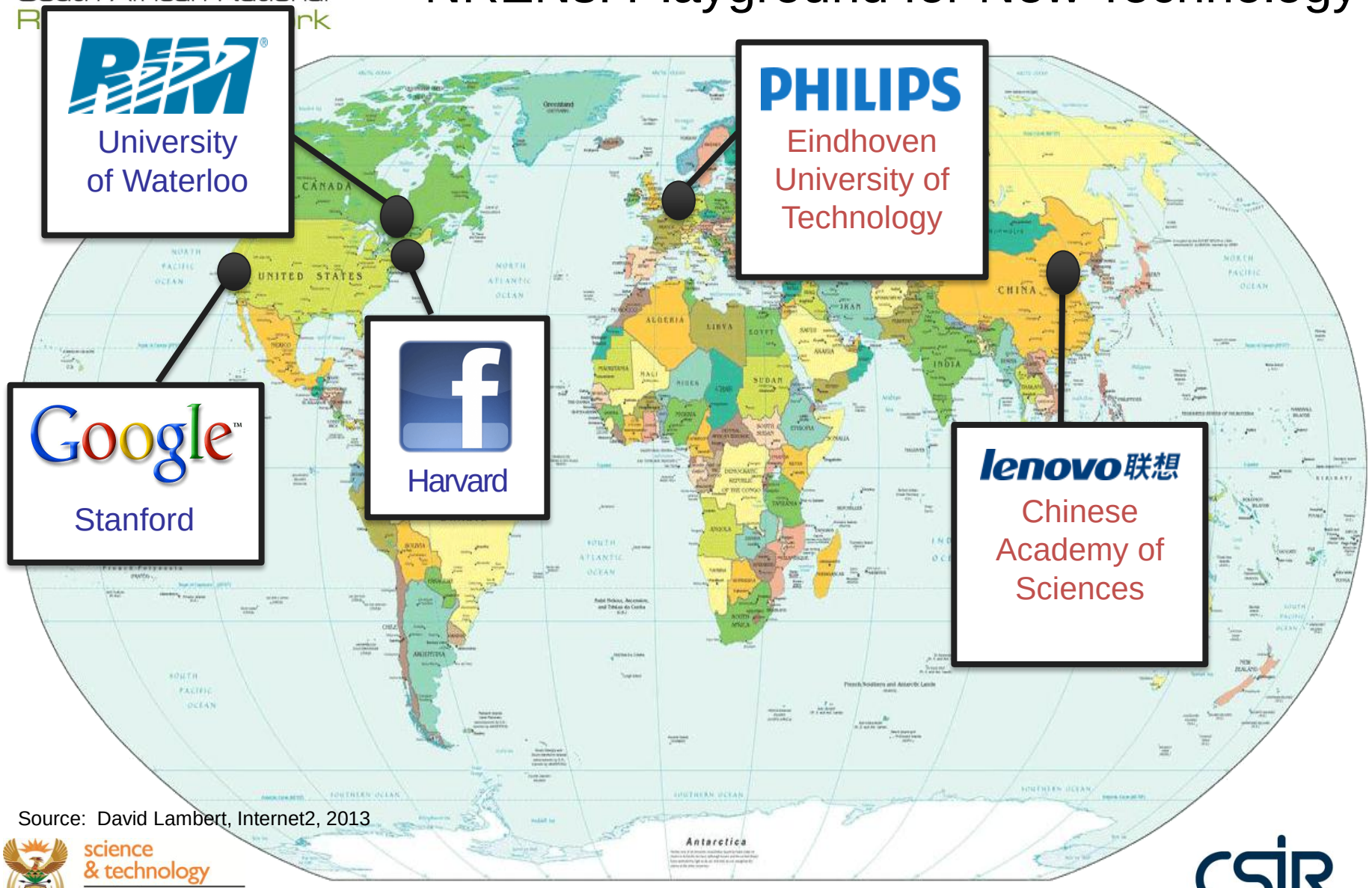
NRENs: Playground for New Technology



Source: David Lambert, Internet2, 2013

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SANReN and TENET: The SA NREN

- SANReN's mandate:
  - Roll-out fully CAPEX funded broadband connectivity to all publicly funded universities, sciences councils and projects of national interest
  - HCD and research in broadband technologies
  - Develop advanced services (e.g. eduroam, LightPaths, Science DMZs, perfSONAR)
  - Custodian for the SAGrid initiative
- SANReN and TENET relationship:
  - Both not-for-profit organisations together form the South African NREN (SANREN)
  - SANReN designs, plans and manages the roll-out of the NREN
  - SANReN develops experimental services and hands over to TENET when mature
  - TENET manages the network and its services on a day-to-day basis
  - TENET handles all contracting with beneficiaries, as well as cost recovery
  - SANReN + TENET = SA NREN

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SANReN and TENET: The SA NREN

- SANReN's current reach:
  - 10 Gbps core network, 4 major metro networks, 149 sites with primarily 1 Gbps / 10 Gbps fibre connectivity; SEACOM and WACS connectivity
  - All main campuses of SA universities; research councils e.g. CSIR and ARC; SKA core site; MeerKAT; CHPC; SANAP
  - Current average bandwidth available per site 1.9 Gbps

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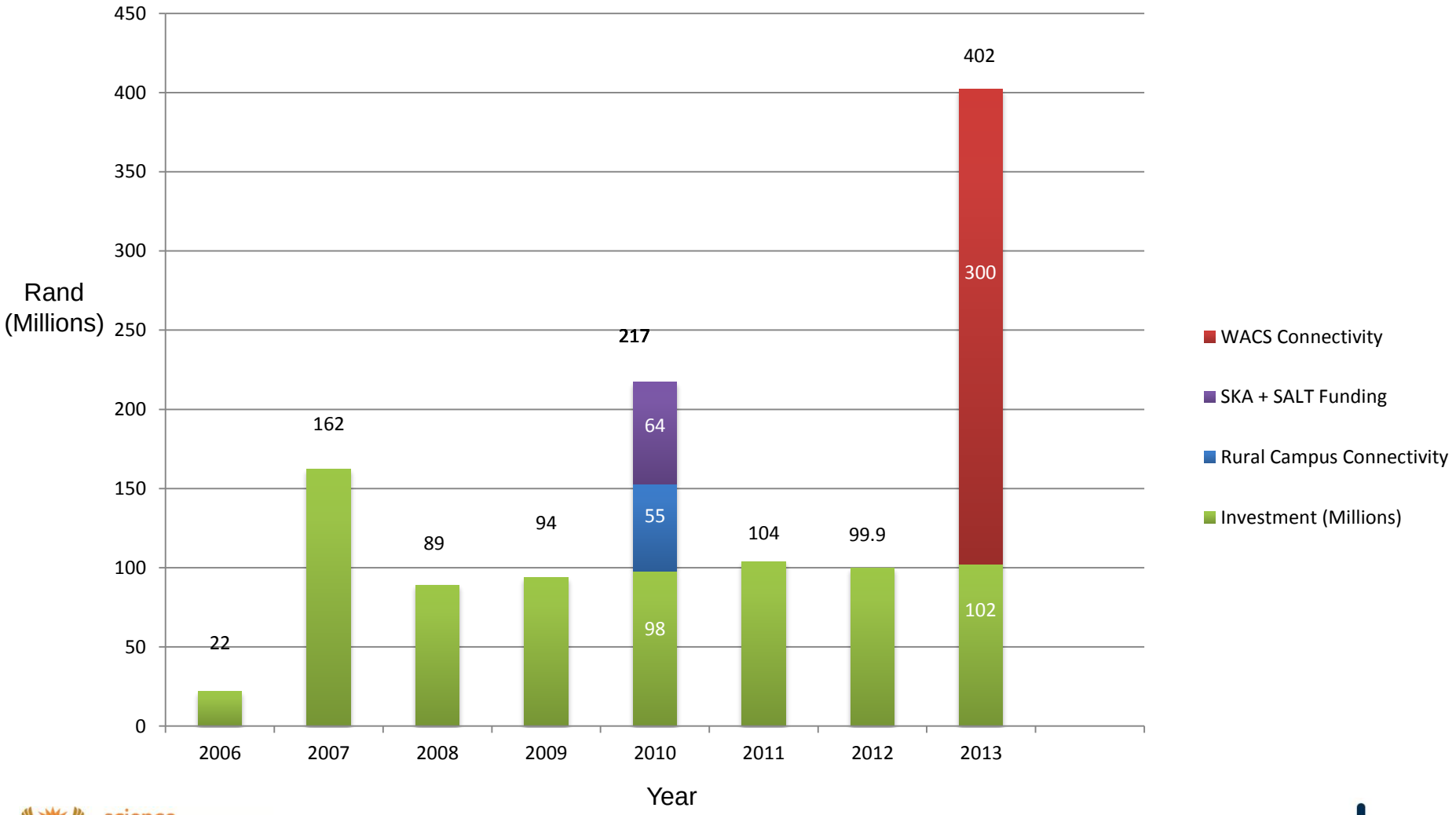
DST Investment in SANReN



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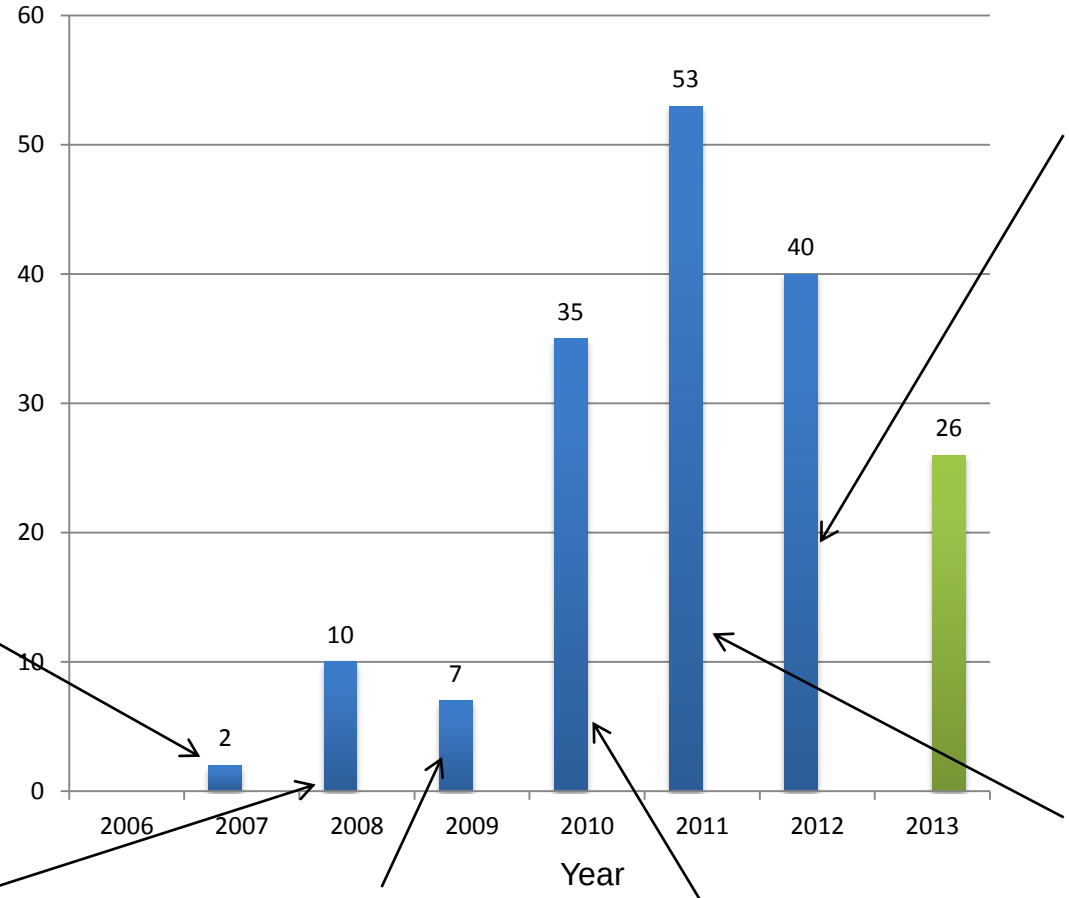
SANReN Sites Connected



Backbone extensions come online (19 sites), RCCP (7 sites) and numerous internal/other projects (14 sites)

Links to Hartebeeshoek Radio Astronomy and CSIR Satellite Applications Centre constructed. Equipment specification and procurement the focus of work in 2007.

Cape Town network completion and numerous backbone extensions mean the number of new sites connected was the largest yet

SANReN Johannesburg network implemented causing surge in number of connected institutions.

Resources and finances utilised to build the national backbone network. Few sites were connected, but the network now had a far reach and caused major price reductions.

Tshwane and Ethekwini metropolitan areas come online, causing a large increase in number of sites connected

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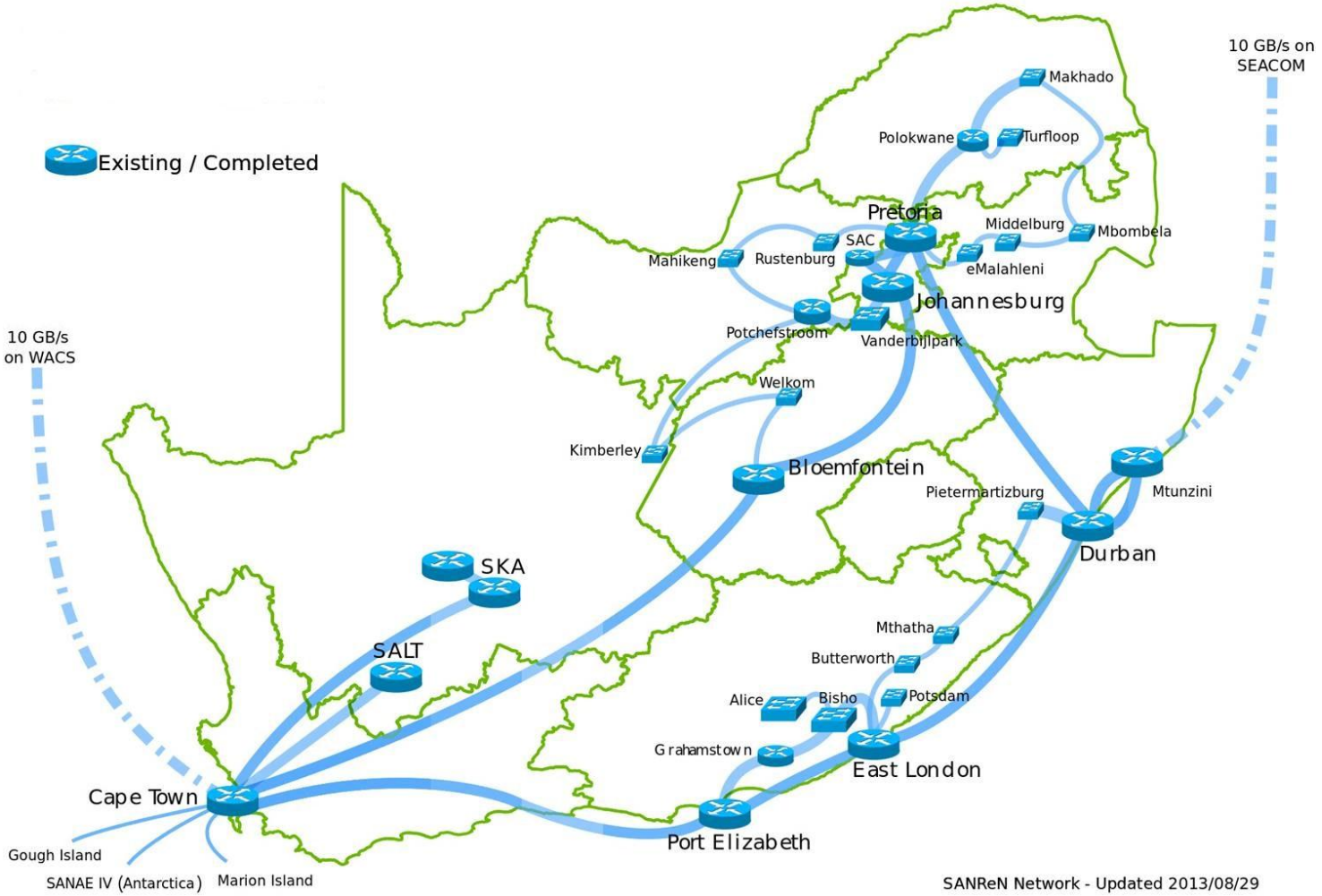
SANReN Backbone Network



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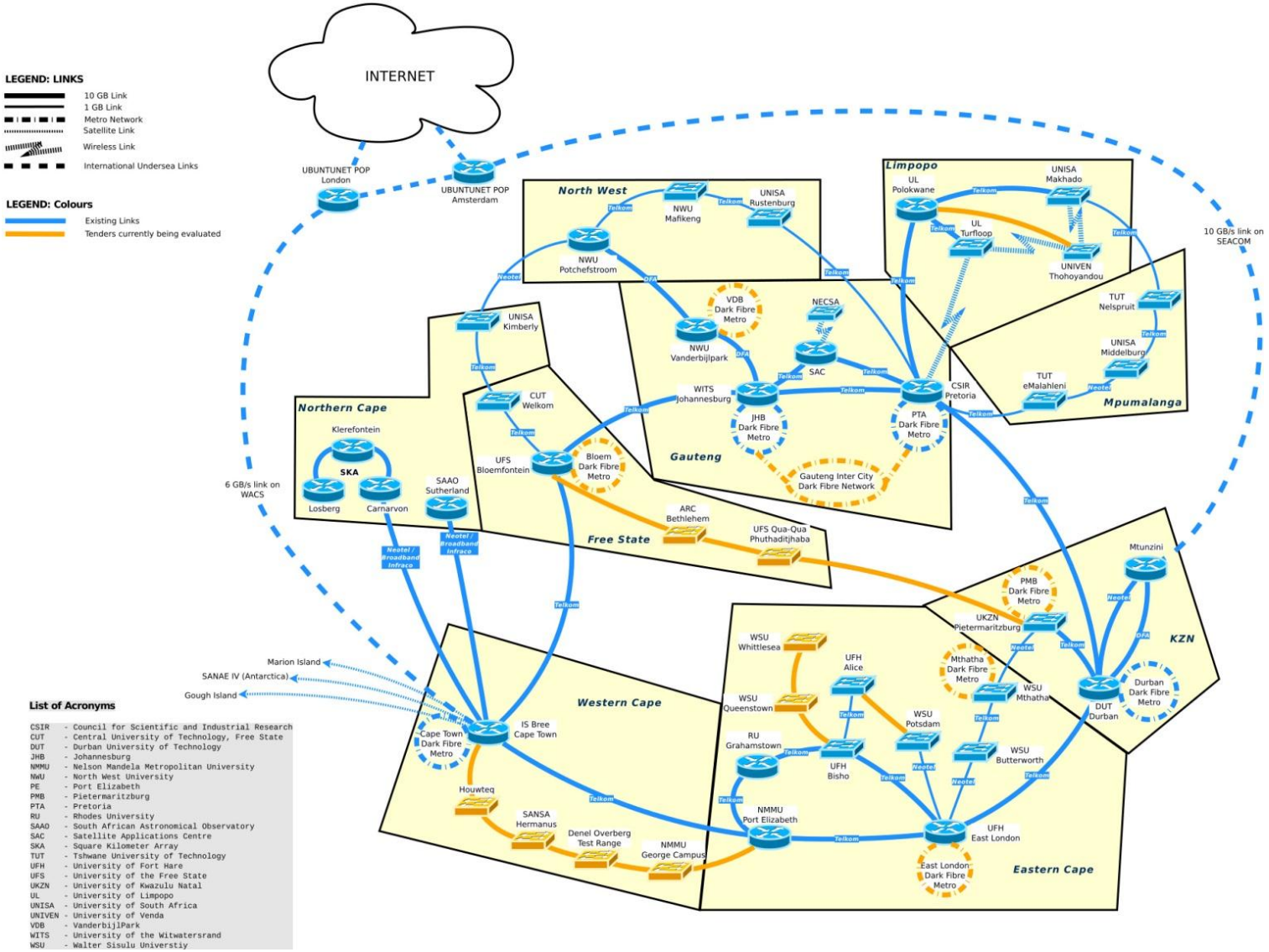
The SA NREN: Logical Network (Current)



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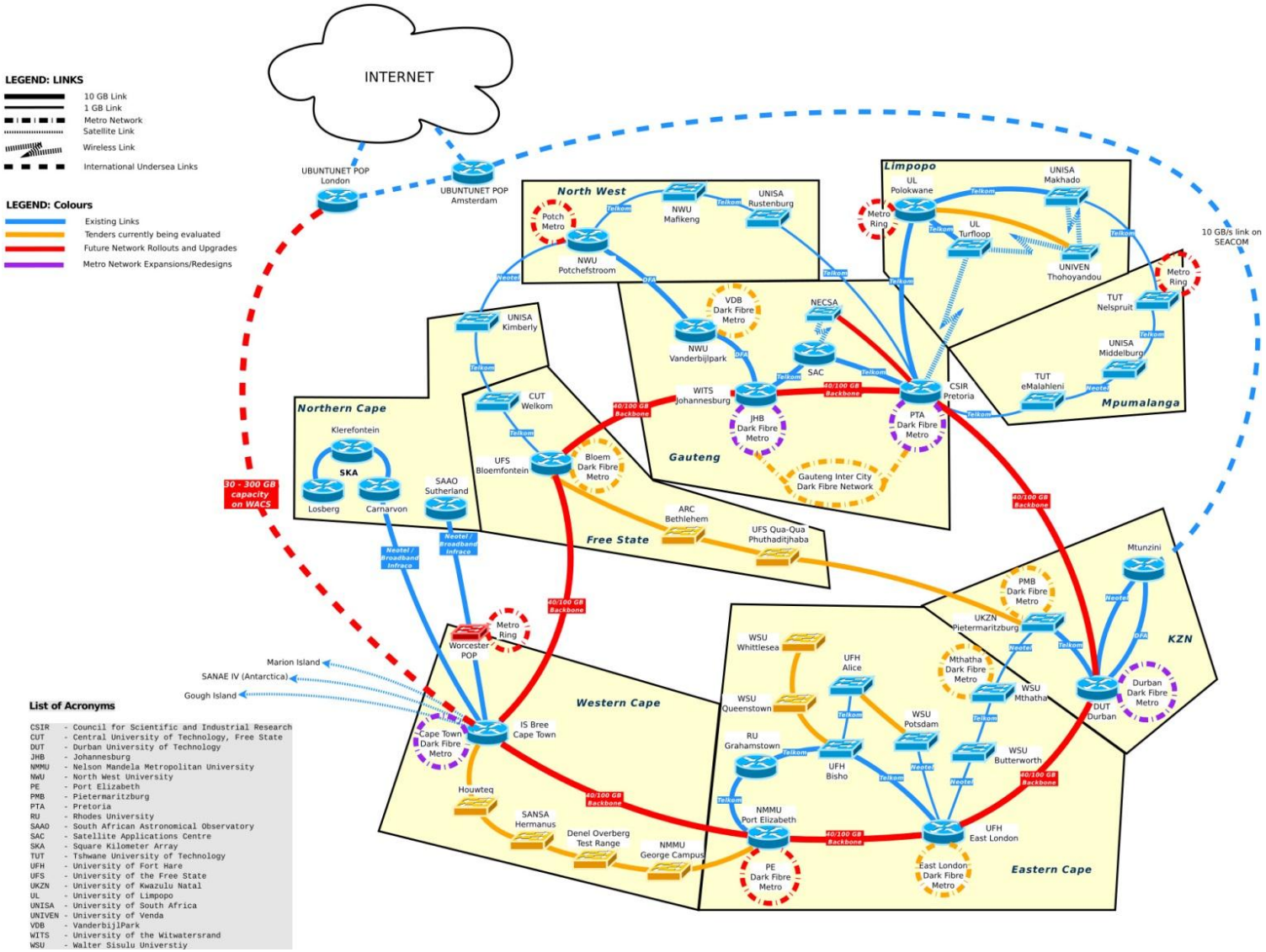
The SA NREN: Logical Network (Planned for Phase 3)



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The SA NREN's Contribution to Science

- SANReN (and SAGrid) provides support to:
  - MeerKAT, SALT (Connectivity, planning)
  - SANAE/SANAP (Connectivity, contracting)
  - HartRAO e-VLBI (2Gbps light path)
  - CERN / CHPC / Universities (SAGrid assistance)
  - Africa-VLBI (Planning, future Ghana connectivity)
  - Many other (e.g. CSIR, ARC, SANSA)

CHPC
CENTRE FOR HIGH PERFORMANCE COMPUTING

EUROPEAN VLBI NETWORK
Consortium for Very Long Baseline Interferometry in Europe

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Big Science: The SA NREN and SKA

- SANReN connectivity to SKA sites:
  - 10 Gbps from the core site to CHPC, extended to SKA Cape Town Office @ 1 Gbps
  - MeerKAT connectivity 10 Gbps
- Current SANREN international connectivity to SKA:
  - SKA shares 10 Gbps primary connectivity on SEACOM with other SANReN beneficiary institutions
  - SKA shares 10 Gbps backup connectivity on WACS with other SANReN beneficiary institutions

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Big Science: The SA NREN and SKA

- Future Large Data Services Enabled through FID:
  - Science Gateways and Science DMZs
  - LightPath services and GOLE access (e.g. GEANT, NetherLight)
  - Computing services via SAGrid and connectivity to CHPC
- Future SANREN international connectivity to SKA:
  - Dedicated SKA connectivity starting 10 Gbps (growing to 100 Gbps over 5 years) on WACS for SA and SADC sites
  - Dedicated SKA connectivity on WACS to handle potential east coast African sites, such as Ghana
  - Dedicated WACS connectivity for KAT 7 / MeerKAT, SALT, Africa-VLBI, CERN and other PNIs starting at 10 Gbps (growing to 100 Gbps over 5 years)

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WACS WEST AFRICA CABLE SYSTEM

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Questions and Comments

Please direct all questions and comments to:

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