AENEAS WP4

Analysis of Global SKA Data Transport and Optimal European Storage Topologies

WP4 Tasks

- Task 4.1: Evaluation of existing data transfer protocols, storage sub-systems and applications

Partners: Chalmers (lead), GÉANT Ltd, Jülich, INAF, UMAN Stakeholders: CSIRO, SANReN, IT

- Task 4.2: Inventory of the storage and network capabilities of existing and planned European Facilities for SKA

Partners: INAF (lead), GÉANT Ltd Stakeholders: ASTRON, IT

- Task 4.3: Optimized design and cost model for a distributed ESDC data topology with world connectivity

Partners: GÉANT Ltd (lead), INAF, Chalmers, Jülich, UMAN Stakeholders: AARNet, CSIRO, SANReN, IT

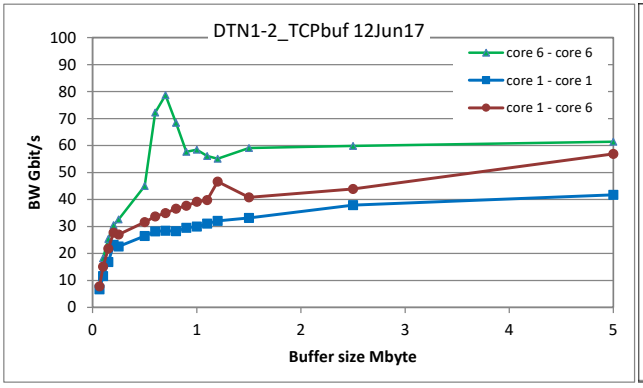
- Task 4.4: Proof of Concept Activities supporting the design of data access and transport within Europe and from the Host countries to Europe

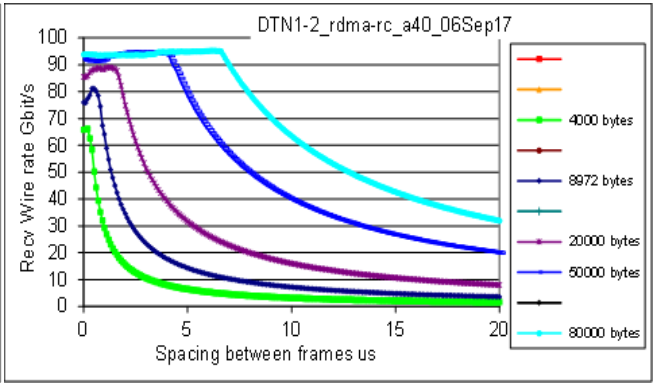
Partners: GÉANT Ltd (lead), Chalmers, UCAM, UMAN Stakeholders: AARNet, CSIRO, JIV-ERIC, SANReN, IT

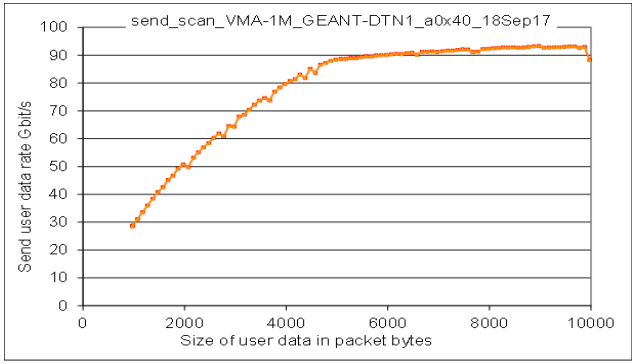
Progress & Status Task 4.1:

Evaluation of existing data transfer protocols, storage sub-systems and applications

- Test hosts set up at Onsala, JBO, GÉANT Cam & Lon, Jülich
- Low-level protocol – end host measurements
  - UDP, TCP, RDMA RoCEv2, kernel bypass libvma
- Good performance with careful tuning single flows 60 – 95 Gbit/s
- Technical Note started







Progress & Status Task 4.2:

Inventory of the storage and network capabilities of existing and planned European Facilities for SKA

- A report written giving an inventory of NREN capabilities.
- Basic survey for storage prepared.

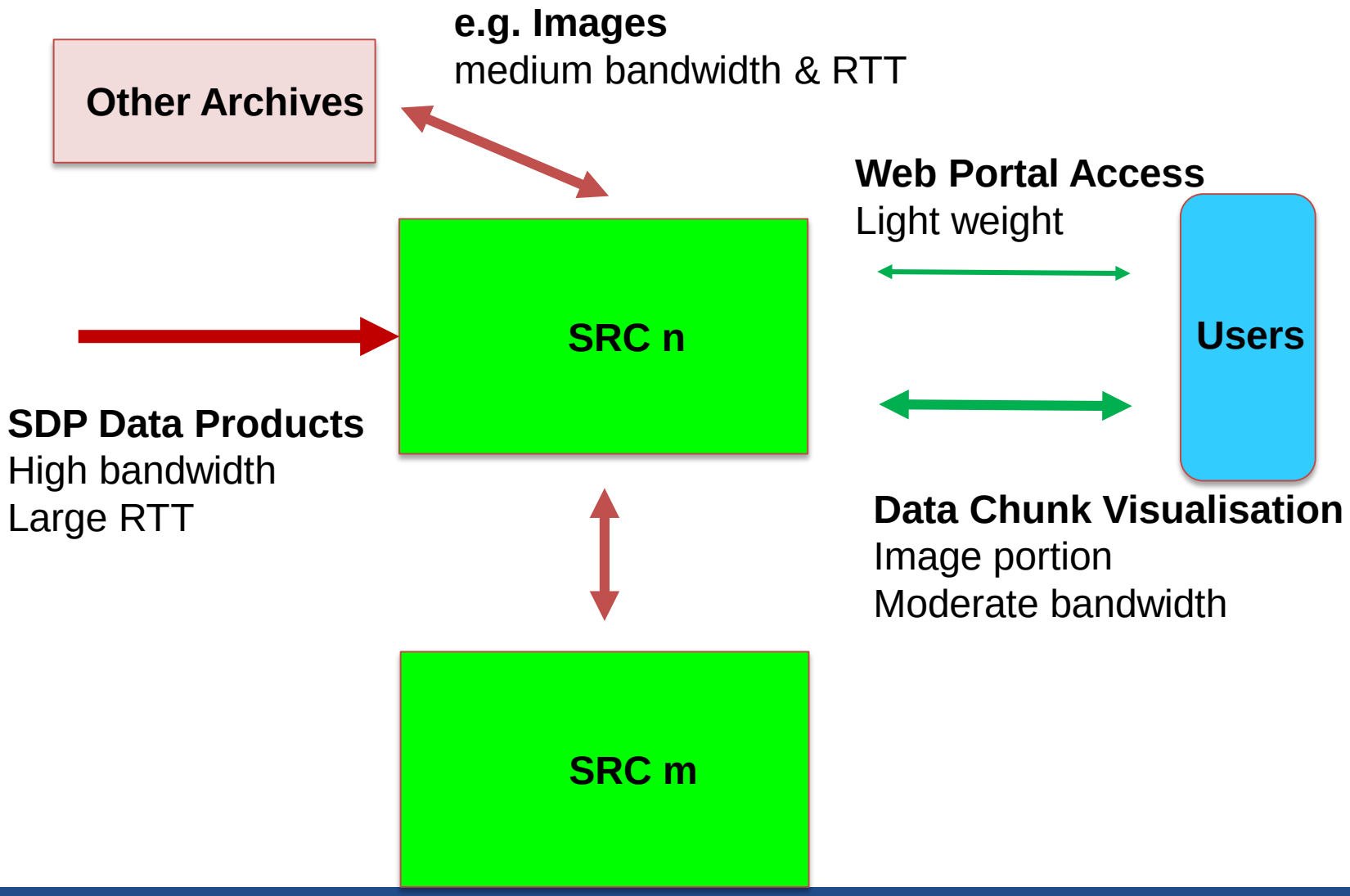
NREN	Country	GEANT access link	NREN backbone multiple of	End User connection up to
DFN	Germany	100 Gbps	1 Tbps	100 Gbps
FCCN	Portugal	20 Gbps	10 Gbps	10 Gbps
GARR	Italy	100 Gbps	100 Gbps	100 Gbps
JANET	United Kindown	100 Gbps	400 Gbps	100 Gbps
MNREN	Malta	10 Gbps	1 Gbps	1 Gbps
NORDUNET	Sveden	100 Gbps	100 Gbps	100 Gbps
PIONIER	Poland	100 Gbps	10 Gbps	10 Gbps
RedIRIS	Spain	60 Gbps 100 Gbps by end 2017	100 Gbps	10 Gbps
RENATER	France	N*10 Gbps	10 Gbps	10 Gbps
SURFNET	Netherlands	100 Gbps	400 Gbps	100 Gbps
SWITCHlan	Swisse	100 Gbps	100 Gbps	100 Gbps

Progress & Status Task 4.3:

Optimized design and cost model for a distributed ESDC data topology with world connectivity

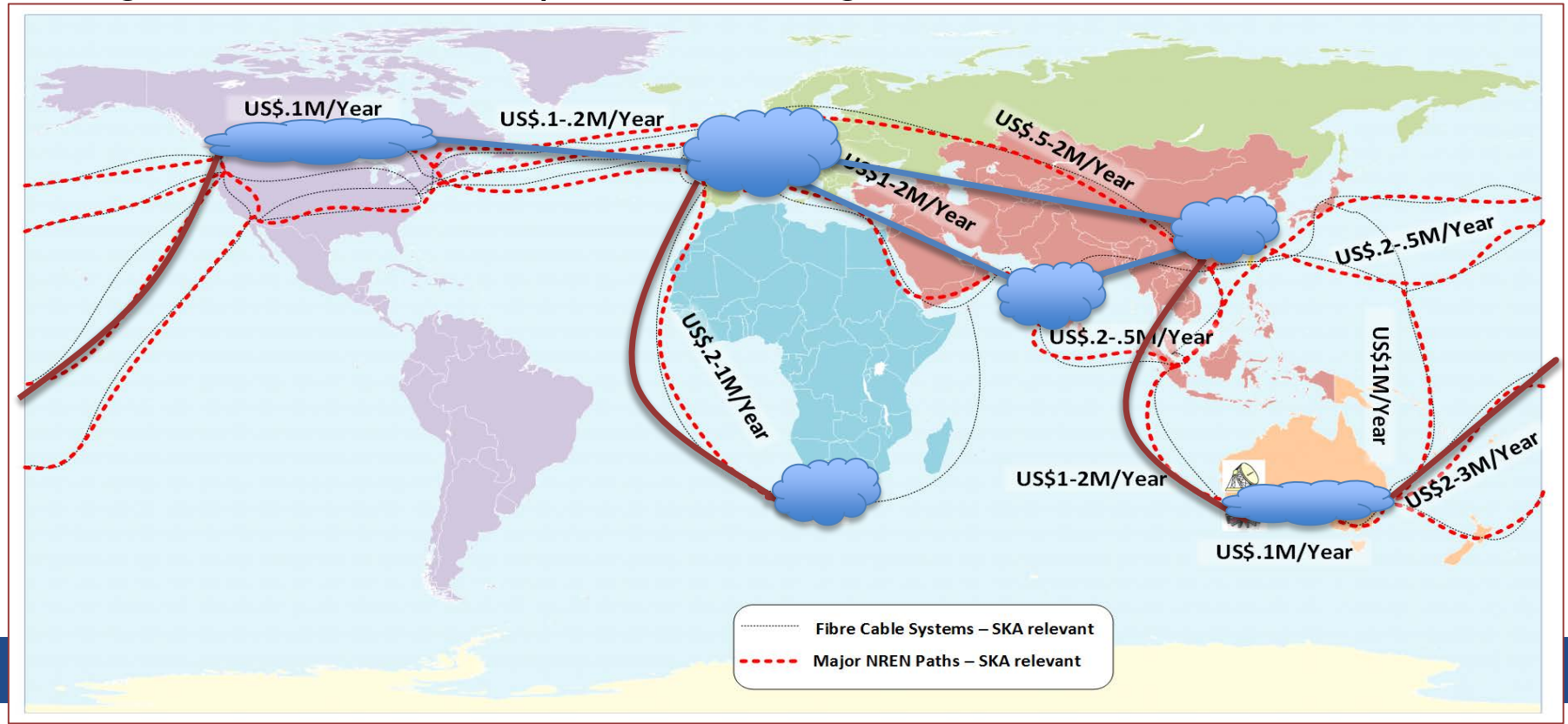
- Close links with WP3 to establish network requirements
  - General user access
  - High bandwidth data moving from the telescopes
  - Communication between European sites
  - Communication between other Regional Centres
- Global network
  - SKAO Regional Centre Coordination Group
  - Sharing ideas with NRENs

Task 4.3: Network Connectivity to a SRC



Task 4.3: Global Overlay & Dedicated links

- Not a commitment just a first thought
- L3 VPNs linked over the academic network
- Dedicated links from telescopes
- Integrated SDN ?
- A global “Network compute and storage cloud” for SKA ?

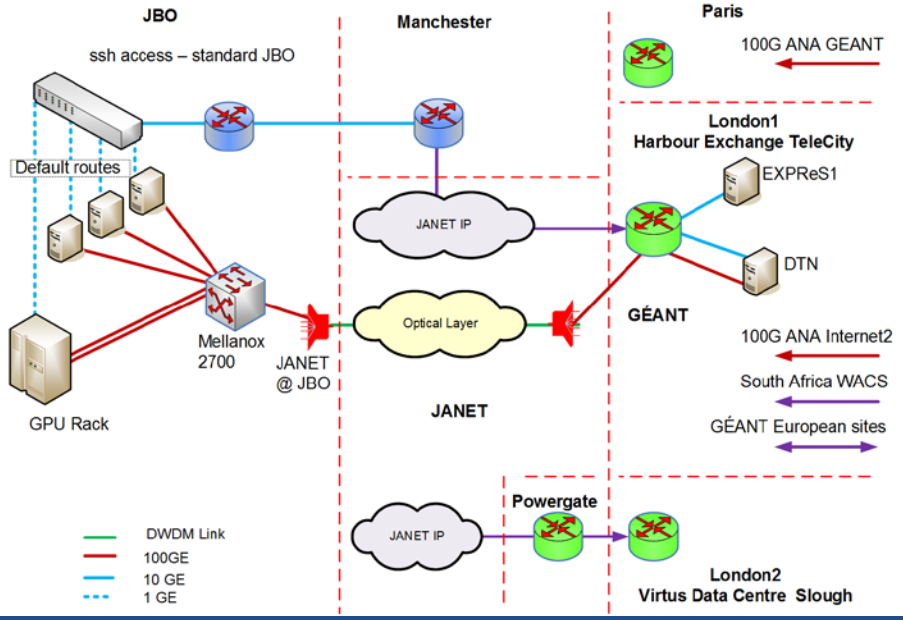


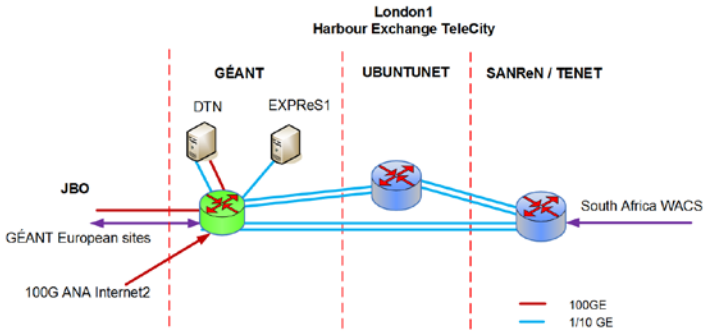
Progress & Status Task 4.4:

Proof of Concept Activities:

Data access and transport within Europe and from the Host countries to Europe

- The 100 Gigabit between JBO and GÉANT PoP London moving forward.
- Path between SANReN and London Open Exchanges ready Nov 17.
- GÉANT DTN hosts being qualified to go into the PoPs.
- Worked with AARNet on 10 Gigabit TCP London – Canberra.

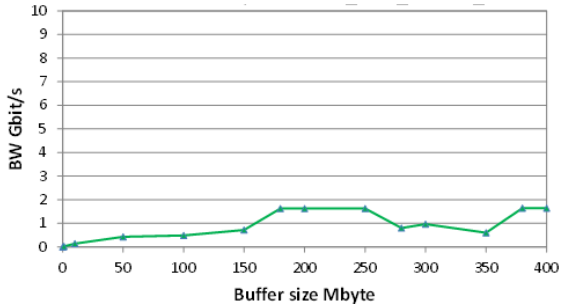




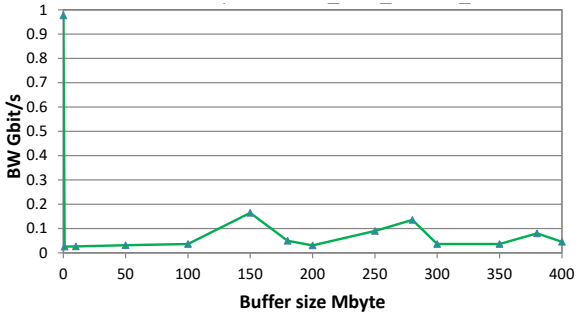
Task 4.3: 10 Gigabit TCP GÉANT London to AARNet Canberra

Public Internet

London to Canberra ISP 1

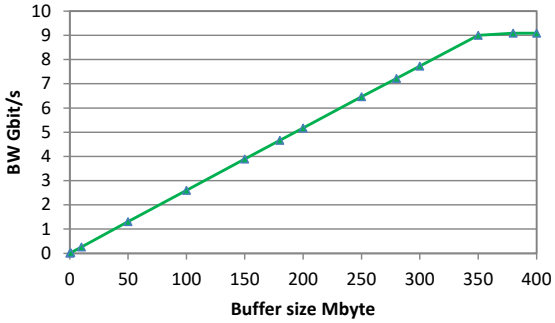


London to Canberra ISP 2

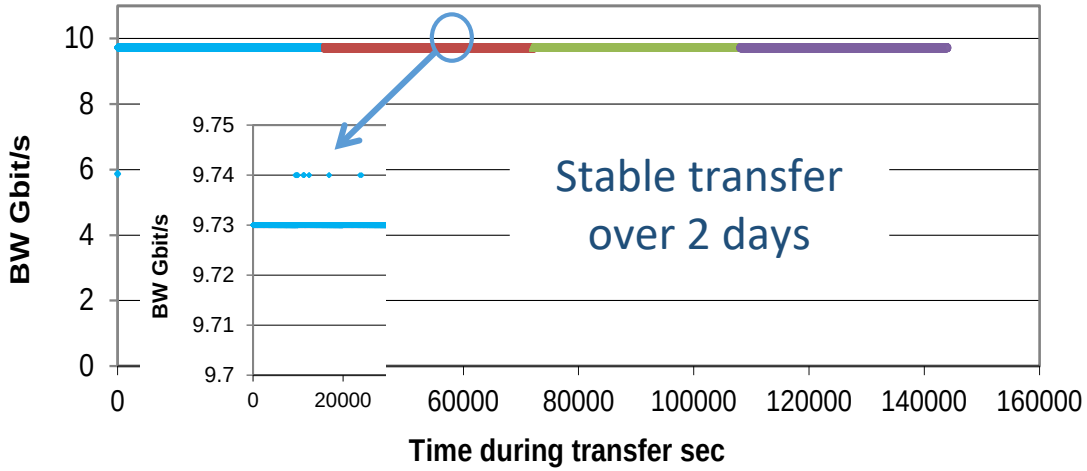


GÉANT and R&E partners

London to Canberra using GEANT + R&E networks via US to AARNet



- RTT 304ms
- 9.73 Gbit/s
- No retransmits
- Stable 40 Hrs



WP4 Current Milestones

Milestone number	Milestone name	Related work package(s)	Due date (in month)	Means of verification	Status
6	Protocols and end hosts evaluation	WP4	7	Technical note written	Measurements made, Tech doc started.
7	Storage sub-systems evaluation	WP4	8	Technical note written	Not started
10	Joint Milestone (WP3) on data moving applications & tools	WP3 WP4	9	Internal memo	Working with WP4
11	List of possible regional site locations	WP2 WP4	9	List of possible sites established	NREN inventory done Selection criteria discussed

Input

- From WP2: T1 to form list of possible sites for ESDC. T4.2 (M9 Jul17)

Joint Milestone
Related WP
WP4 Lead

Future Work Task 4.1: MS10
Joint Milestone (WP3) data moving applications & tools

- Investigate what is being used by the LHC experiments and Astronomy e.g. LOWFAR.
  - Workflow manager,
  - replica manager,
  - catalogue systems,
  - file transfer/access manager,
  - data transfer and storage tools and protocols
- Document what the components do and how they fit together
- Note how they are optimised for HEP data and compute models
  - HEP data is embarrassingly parallel
  - Gives the possibility to separate Storage & Compute services
  - Use of cloud Amazon S3 & “disk-less” compute sites
- Suggest how the tools and protocols could be used for SKA data

Future Work Task 4.2: MS11
Network Criteria to participate as an ESDC site.

- ***NREN infrastructure***
  - NREN backbone for routed IP at least 4*10Gig or preferably100Gig now and 100G by 2022
- ***NREN – GEANT access link***
  - At least 4*10Gig or preferably 100Gig now and 100G by 2022
- ***Site – NREN access link***
  - At least 4*10Gig or preferably 100Gig now and 100G by 2022
- ***Campus network infrastructure***
  - Adequate network BW between Boarder Router and Sci DMZ location
- ***Science DMZ***
  - Boarder router capable of ACLs to support Sci DMZ (stateless firewall)
  - 10GE min 40 Gig between DTN nodes and Boarder Router
  - DTN nodes to have high performance NICs
  - High performance access from DTN nodes to parallel file storage system
- ***Achievable Data transfer speeds***

  (1 PB at 10 Gbit/s takes 222 hrs.)

WP4 Future Milestones

Milestone number	Milestone name	Related work package(s)	Due date (in month)	Means of verification	Notes
19	Data transfer test South African site to European site	WP4	13	Technical note written	
20	Joint Milestone (WP4) on SKA Sci DMZ recommendations	WP3 WP4	14	Internal memo	
21	Best practice recommendations Data moving applications, protocols and storage	WP3 WP4	14	D 4.1 written	D4.1 Best practice recommendations
22	Specification for SKA Science DMZ	WP3 WP4	14	Specification document written	
25	radio astronomy data over global routes from South Africa to Europe	WP3 WP4	18	WP3 Technical note written	
					D4.2 Site Catalogue
27	Joint Milestone (WP4) on demonstration of moving data from observatory sites (SA) to ESDC	WP3 WP4	19	Demonstration completed	
30	Joint Milestone (WP4) on data replica manager	WP3 WP4	21	Internal memo	
31	Specifications for SKA Replica Manager	WP3 WP4	21	Specification document written	
33	Joint Milestone (WP4) on demonstration of moving data from observatory sites (AUS) to ESDC	WP3 WP4	24	Demonstration completed	

Joint Milestone
Related WP
WP4 Lead
Deliverable

Questions ?

Thanks to Richard Hughes-Jones

WP4 Partners & Stakeholders

Work package number	4		Lead beneficiary		GEANT LTD
Participant number	2	4	5	6	8
Short name of participant	UMAN	INAF	Chalmers	GEANT Ltd	Jülich
Person/months per participant:	6	1	20	22	9
Start month	1		End month	36	

Stakeholders: AARNet, ASTRON, CSIRO, IT,
JIV-ERIC, MPI Bonn, SANReN, STFC