NICIS
NATIONAL INTEGRATED CYBERINFRASTRUCTURE SYSTEM
SANReN

SANReN's 100 Gbps Data Transfer Service: Transferring data fast!

Short paper by: The SANReN large data transfer team: Kasandra Pillay, Johann Hugo, Ajay Makan, Thokozani Khwela, Thuso Bogopa and Manqoba Shabalala

Presented by Dr Kasandra Pillay

Monday 19th November
INDIS workshop, SC24, Atlanta, Georgia

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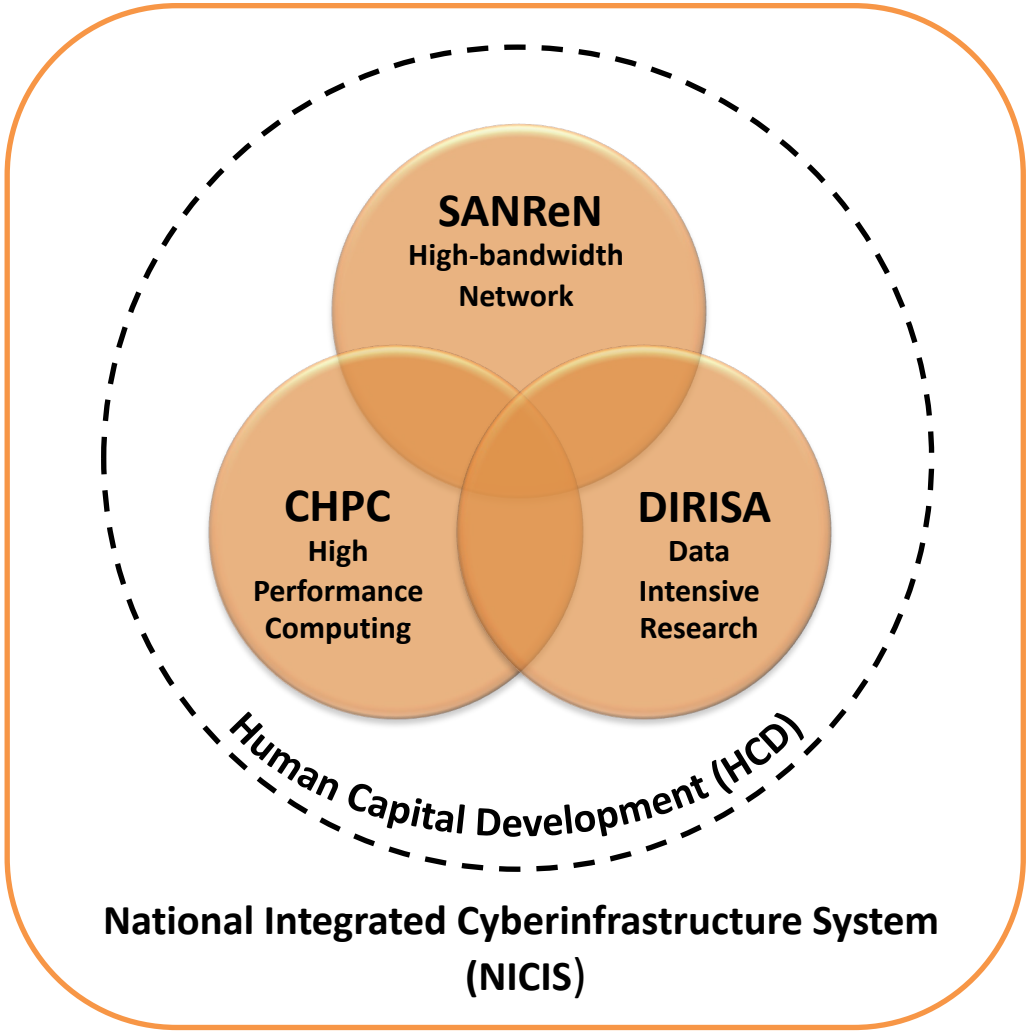
Background: NICIS

- National Integrated Cyberinfrastructure System (NICIS)
- Structure
  - South African Research Network (SANReN)
  - Centre for High Performance Computing (CHPC)
  - Data Intensive Research Initiative of South African (DIRISA)
  - HCD encompasses the 3 pillars
- NICIS is a hosted programme of the DSI
- Hosted at the CSIR as a centre in NGEI Cluster, Smart Society Division



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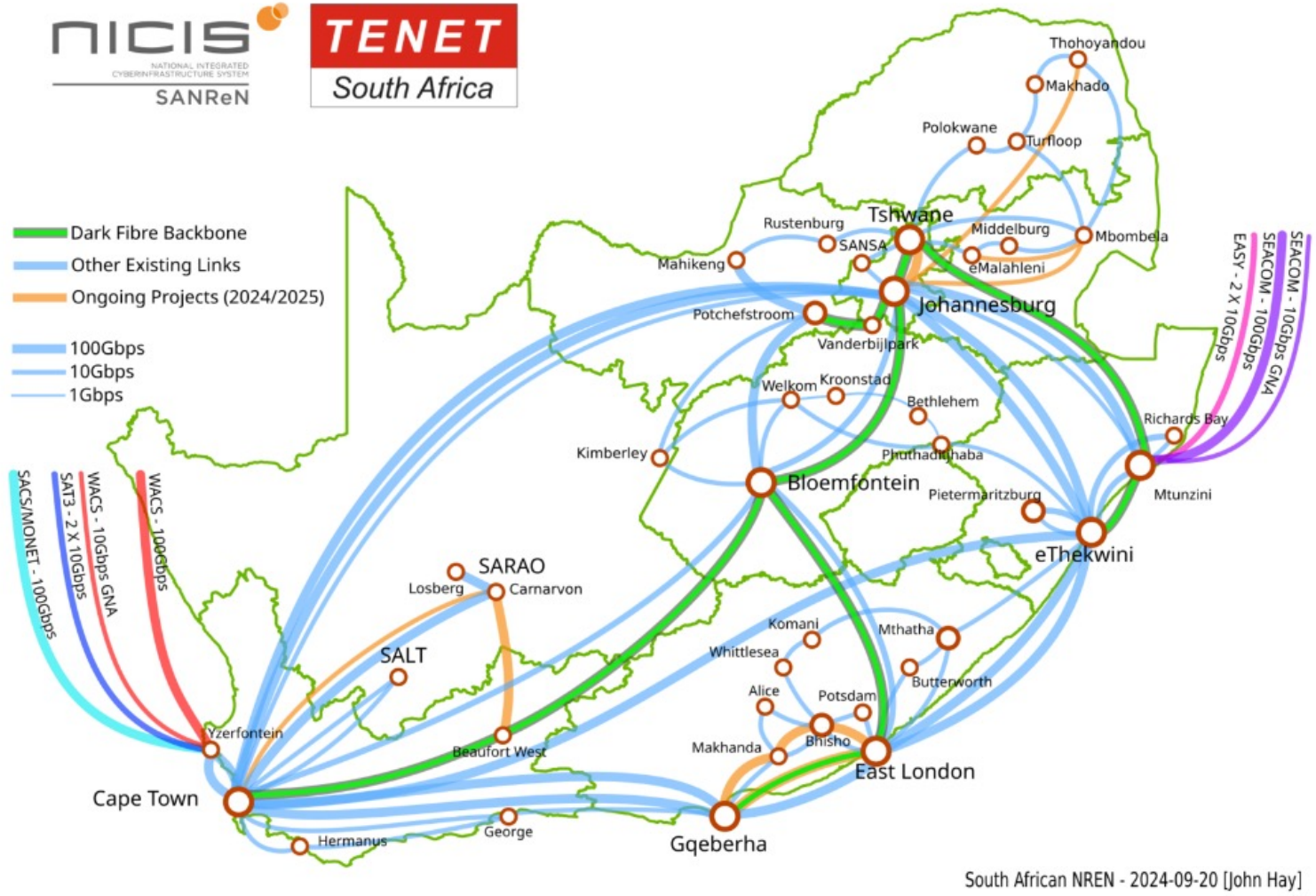
SANReN, https://www.sanren.ac.za/ | CHPC, https://www.chpc.ac.za/ | DIRISA, https://www.dirisa.ac.za/

South African NREN: Network

South African NREN Backbone Map: Terrestrial and undersea capacity

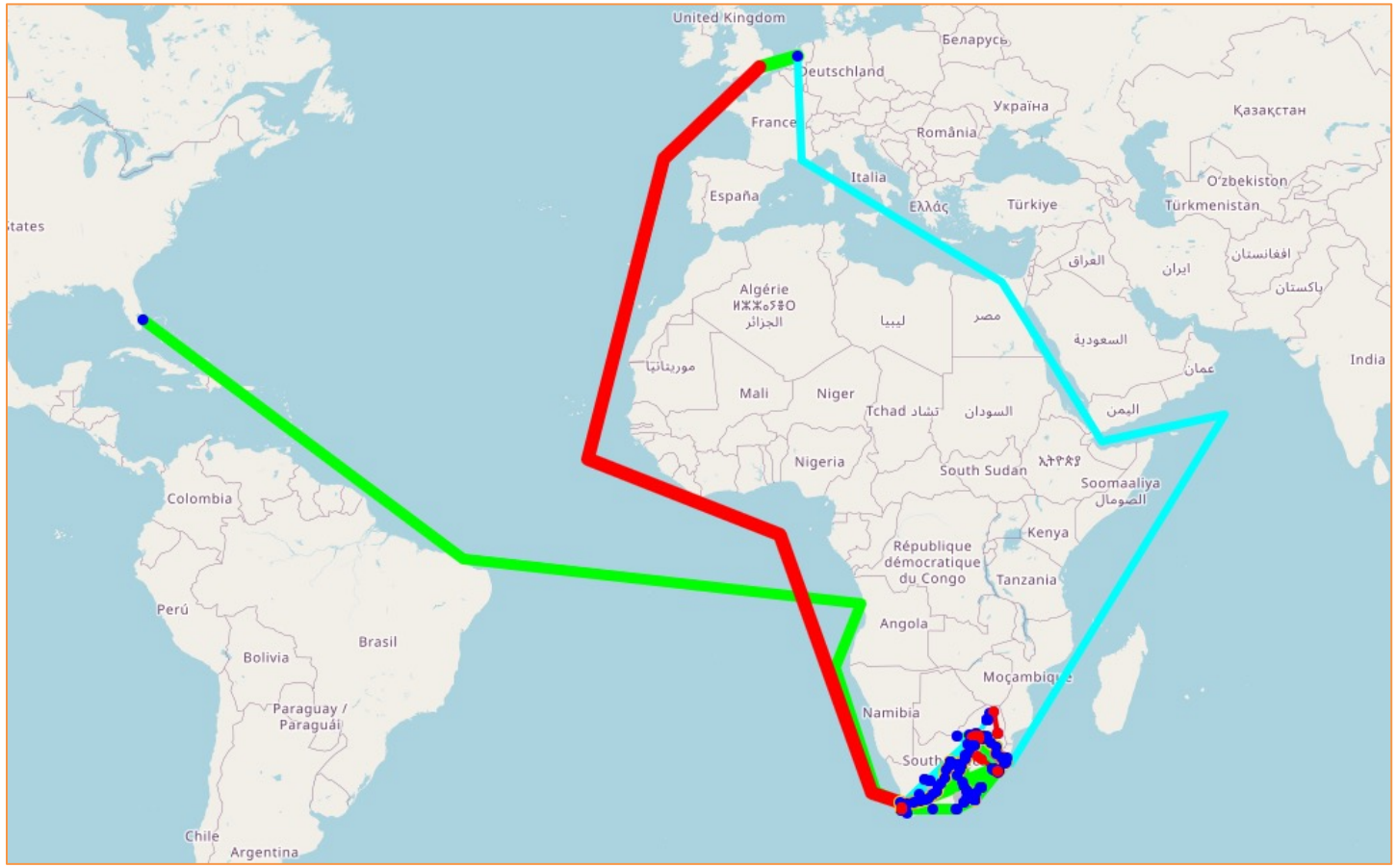


Infrastructure:

- a core national dark fibre backbone with several managed bandwidth backbone links at 100Gbps to mesh up the backbone
- backbone extensions (regional links) – typically at 10Gbps
- back-hauling from the submarine cable landing stations at Yzerfontein and Mtunzini
- capacity on undersea cables
- several metropolitan area networks

International capacity

- West African Cable System (WACS)
- South Atlantic 3 (SAT-3)
- Eastern Africa Submarine System (EASSy)
- SEACOM
- South Atlantic Cable System (SACS)



South African NREN link status: https://linkmon.sanren.ac.za/nrenmap/

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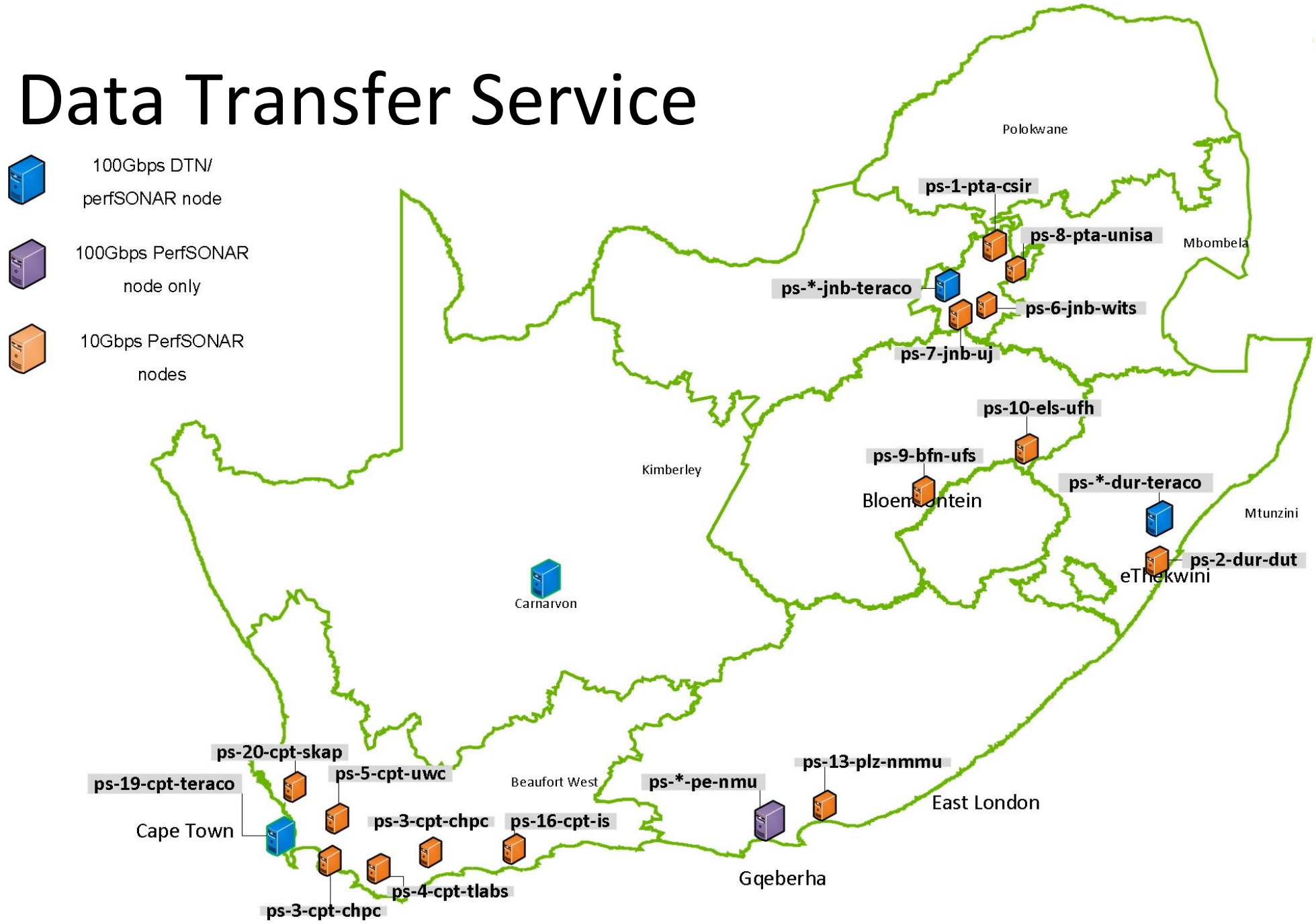
Novelty of combined DTN/perfSONAR node

- **Network perspective:** a DTN node and a perfSONAR node are located at the same networking level, and swapping physical locations will not influence performance.
- **Hardware perspective:** requirements almost identical, except for additional memory and storage requirements needed for a DTN node.
- **Budget perspective:** beneficial if these two functions can be combined on a single hardware platform – also avoiding high rack space cost.
- **Space perspective:** preferred at locations with limited rack space

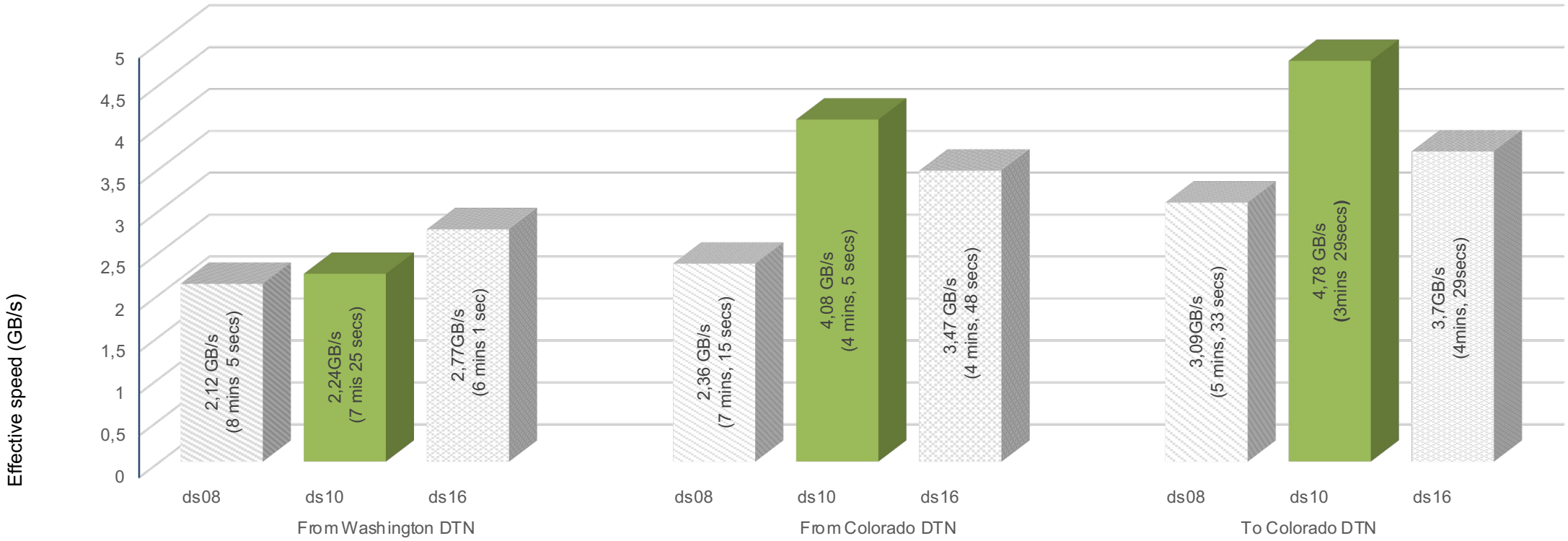
The SANReN DTN/perfSONAR hardware have the following specification:

- *Server*: Supermicro AS-1114S-WN10RT;
- *CPU*: Single socket, 2nd GEN AMD EPYC 7502P Rome Processor;
- *Memory*: 128GB - 8x (16GB DDR4 3200);
- *Network*: Dual 100 Gbps Nvidia Mellanox ConnectX-6; and
- *Disks*: PCI Express 4.0 NVMe. KCD6XLUL1T92

SANReN Data Transfer Service



Benchmark and test procedure results



Results of Globus transfers from Cape Town DTN

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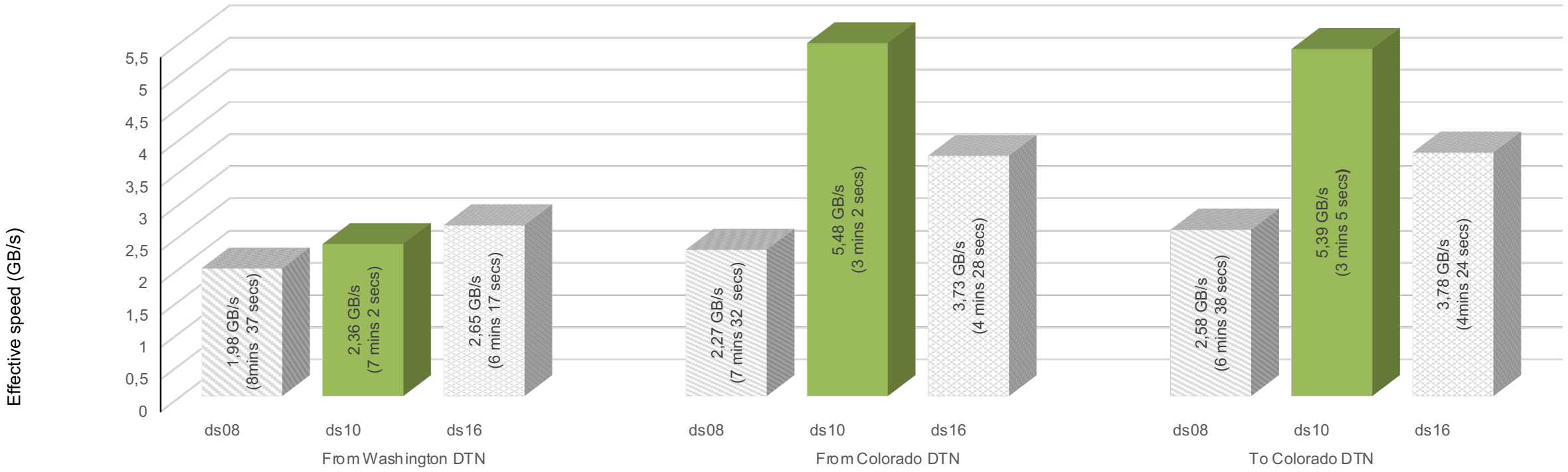

Results of Globus transfers from Johannesburg DTN

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Benchmarking our 100Gbps DTNs

According to ESnet scorecard, an ‘acceptable’ result is 1TB in 1 hour. (https://fasterdata.es.net/DTN/data-transfer-scorecard/)

- Best test results to National Center for Atmospheric Research (NCAR) Globally Accessible Data Environment (GLADE)

- Cape Town DTN best test result is

1TB data transfer from Colorado (NCAR GLADE) to Cape Town shows

3 mins, 29 seconds (4.78GB/s)

- Johannesburg DTN best test result is

1TB data transfer from Colorado (NCAR GLADE) to Johannesburg shows

3mins, 2 seconds (5.48GB/s)

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Use case:

Physics data for the H-Line, Low Energy Nuclear Astrophysics Beamline project

Data size: 10TB

From: Tandetron Facility, iThemba Labs, Cape Town.

To: Texas A&M University, Texas, USA and INFN-LNS, Bologna, Italy.

- Network analysis and troubleshooting using the perfSONAR network toolkit
- Liased with US and Italian NRENs (ESnet and GARR) respectively.
- Liased with TENET to correct path routing and troubleshooting network links from iThemba Labs to Cape Town.
- Made available the SANReN Cape Town data transfer node for data sharing.
- Approximately 10TB of data was transferred from the experiment, over a week.

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Use case:

African Health Institute (AHRI)

Data size: 2TB
From: Africa Health Instituted (AHRI), Durban, South Africa
To: Harvard University, Research Computing HPC, USA

- Attempted to upload 2TB of genome FASTQ files from sftp.ahri.org to the Harvard server
- Initial current speeds that they were achieving (700kbps), it would have taken approx. 35days to complete the transfer.
- Using the SANReN 100Gbps Johannesburg DTN a peak transfer rate of 8Gbps was achieved and the transfer took approximately 40-45min to complete.

Data size: 1TB
From: Africa Health Instituted (AHRI), Durban, South Africa
To: Colorado State University, USA

Use case:

Very Long Base Line Interferometry (VLBI) experiments

Data size: 80TB for processing and then output 100GB.
From: Manchester, United Kingdom and University of Cape Town, South Africa
To: University of Pretoria (UP), South Africa

- The project is dedicated to uncovering supermassive black holes
- UP has a dedicated computing cluster for data processing 10s -100s of galaxies.
- Currently limited by the UP international bandwidth and computational cluster.
- These data transfers are conducted using a tool called JIVE for VLBI.
- Attempting to leverage SANReN's data transfer node infrastructure to replace/supplement the UP cluster.

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Use case:

Wits University – Global Change Institute

Data size: 12TB

From: Australian National University National Computational Infrastructure (NCI)

To: Global Change Institute, University of Witwatersrand, South Africa

- The data was retrieved successfully in July via a SANReN DTN.

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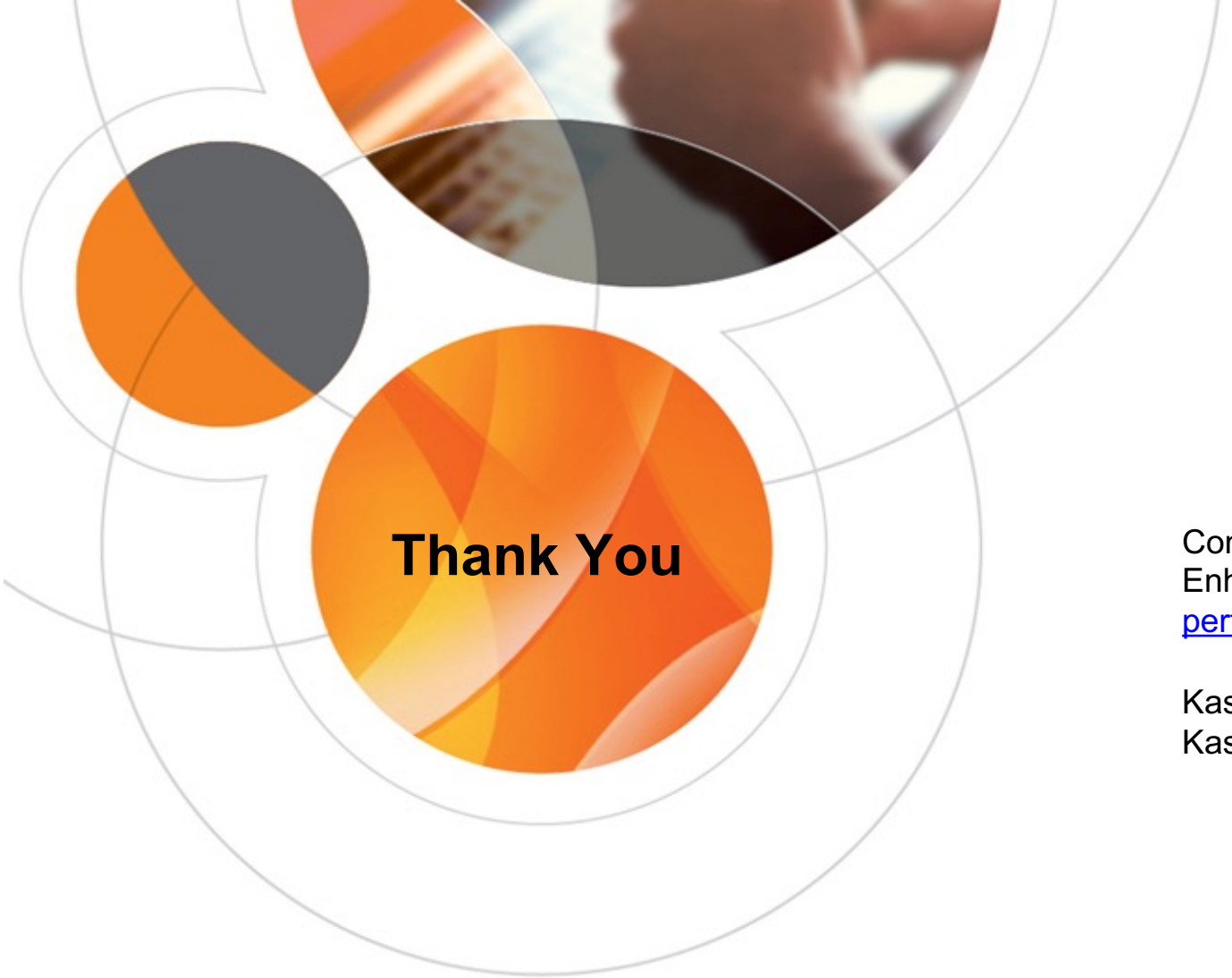

Thank You

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Supercomputing24 participation

1. Short paper accepted at INDIS (Monday 18th November, 12.18pm – 12.24pm)
2. Presentation at SciNet theatre (Tuesday 19th November, 16.40pm – 17.00pm)
3. Exhibit at the California Institute of Technology (Caltech) booth 845

   (Tuesday 19th November – Friday 22nd November)
4. Presentation at the California Institute of Technology (Caltech) booth 845

   (Date, time)
5. "Flood the gates " demo, Caltech booth 845

   (Thursday 21st November, time)
6. Manning HPC Around the World (Date and time)

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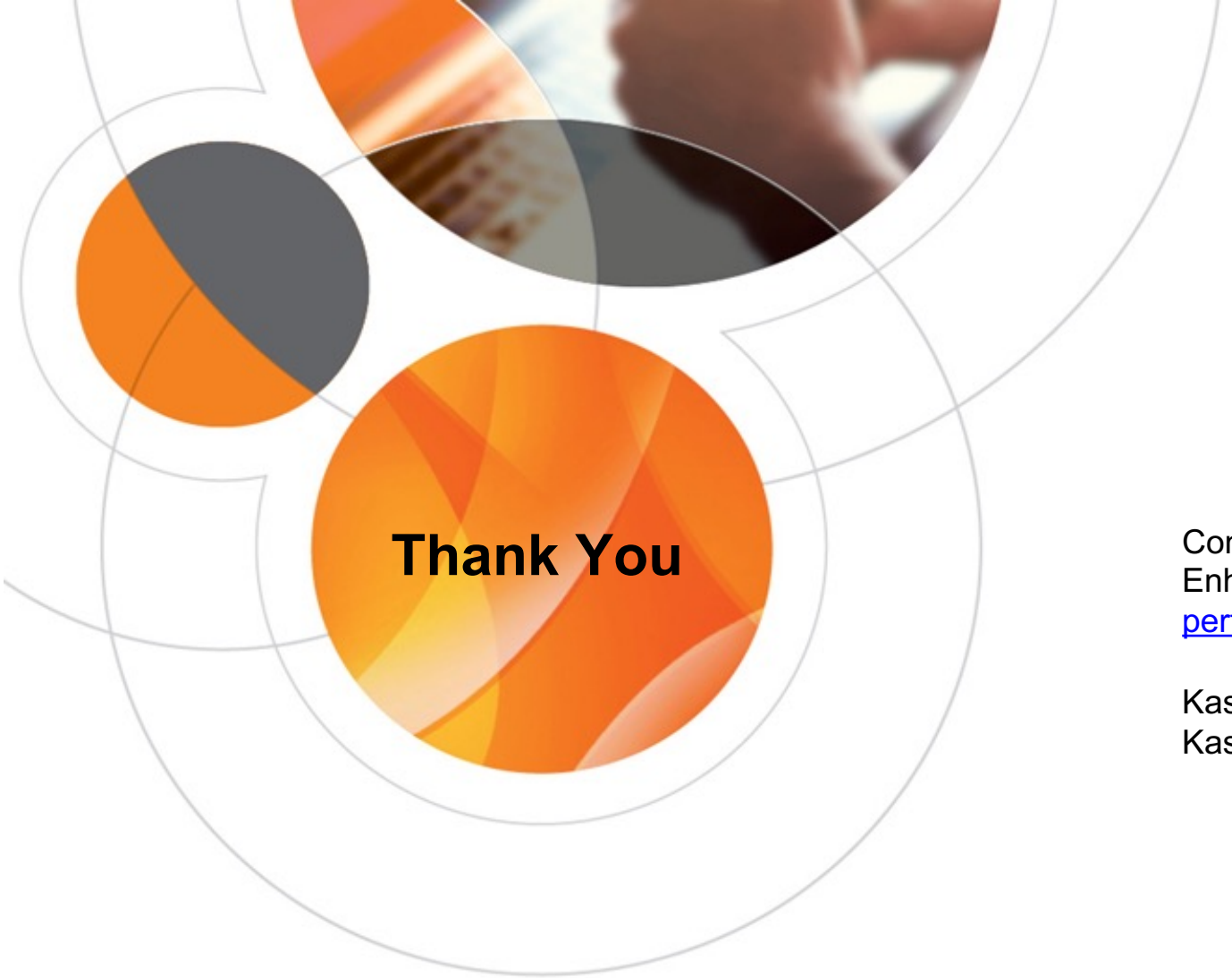

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