



**ASEAN SCIENCE & TECHNOLOGY
RESEARCH & EDUCATION NETWORK ALLIANCE**

The logo for STREN (ASEAN Science & Technology Research & Education Network Alliance) features a stylized 'A' with a blue and red swoosh, followed by the word 'STREN' in a bold, sans-serif font, and a blue and grey abstract graphic to the right.

An ASEAN SCIRD Project

Presented

by Jon Lau, Deputy Director (NSCC)
at AP*Retreat
on 6 Sep 2015

ASTRENA–Introduction



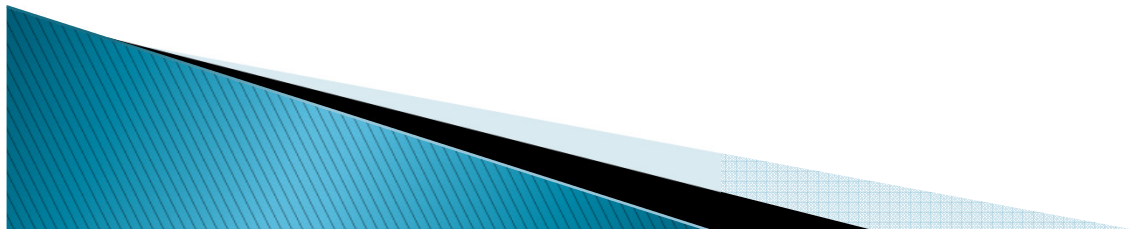
ASTRENA– Asean Science & Technology Research & Education Network Alliance

- ▶ A network alliance of RENs in ASEAN to promote integration and activities in ASEAN research & education
 - proposed in 1997 as an ASEAN Project and adopted by the Committee on Science and Technology of ASEAN
 - As a key action item in ASEAN Plan of Action on Science and Technology (APAST), and
 - Administered by the COST subcommittee, SCIRD.
- ▶ To create the framework to facilitate accelerated cooperation and collaboration on a bilateral or multilateral basis
- ▶ To position ASEAN competitively in linkages and exchanges with other regional networks such as APAN, North Asian networks, networks in South Asia, and beyond (including Europe and North America)

ASTRENA-Introduction



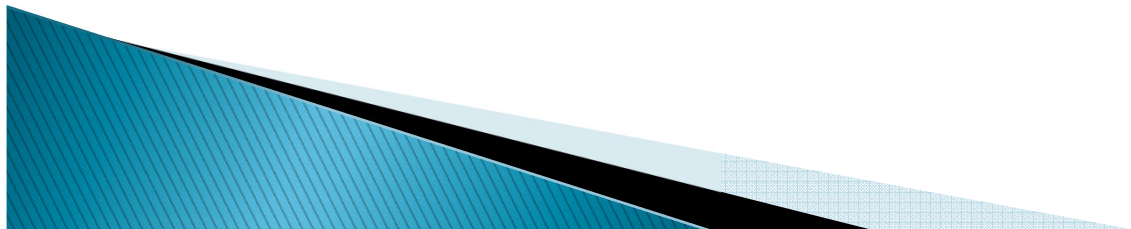
- ▶ First ASTRENA meeting held in Brunei in 2006
- ▶ ASTRENA was chaired by Brunei several years back and transferred to Singapore for Secretariat activities in 2012
- ▶ The Singapore Secretariat will resume its functions and support the new ASTRENA activities



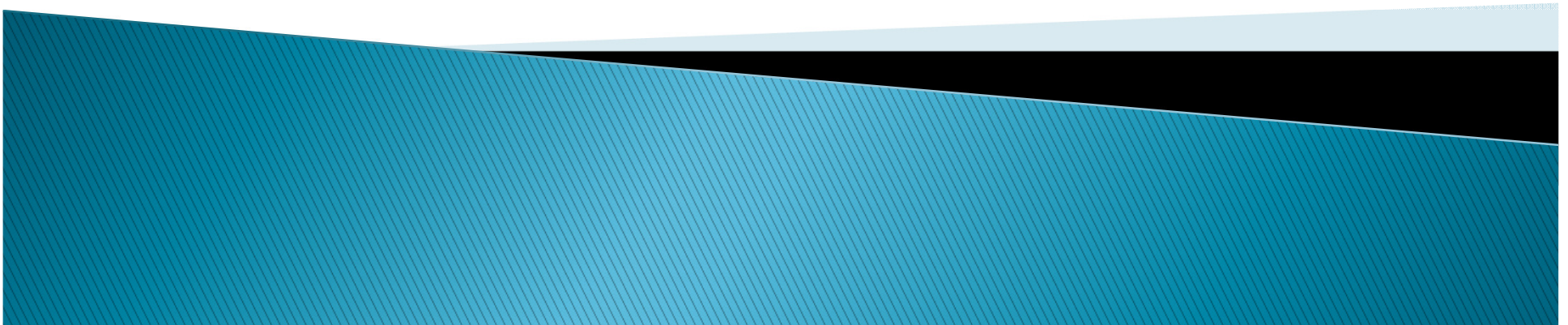
SuperASTRENA / ASTRENA2



- ▶ A new focus on High Performance Computing (HPC) collaborations among ASEAN countries
- ▶ To advance ASEAN's research capabilities through the use of available Supercomputers
- ▶ To leverage on ACA100 (AsiaConnectsAmerica100G) and ACE10 (AsiaConnectsEurope10G) via Singapore
 - ACA100 collaboration between NSCC and Internet2
 - ACE10 collaboration between by NSCC and TEIN*CC



About National Supercomputing Centre (NSCC) Singapore



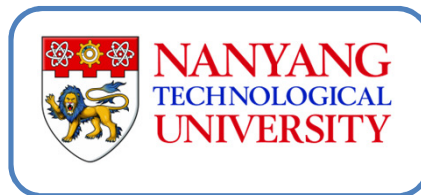


National Supercomputing Centre *Singapore*

6 Sep 2015

National Supercomputing Centre (NSCC) Singapore

- **State-of-the-art national facility** with computing, data and resources to enable **users to solve science and technological problems**, and **stimulate industry** to use computing for problem solving, testing designs and advancing technologies.
- Facility will be linked by **high bandwidth networks** to connect these resources and provide high speed access to users anywhere and everyone.



**National
Supercomputing
Centre**
Singapore

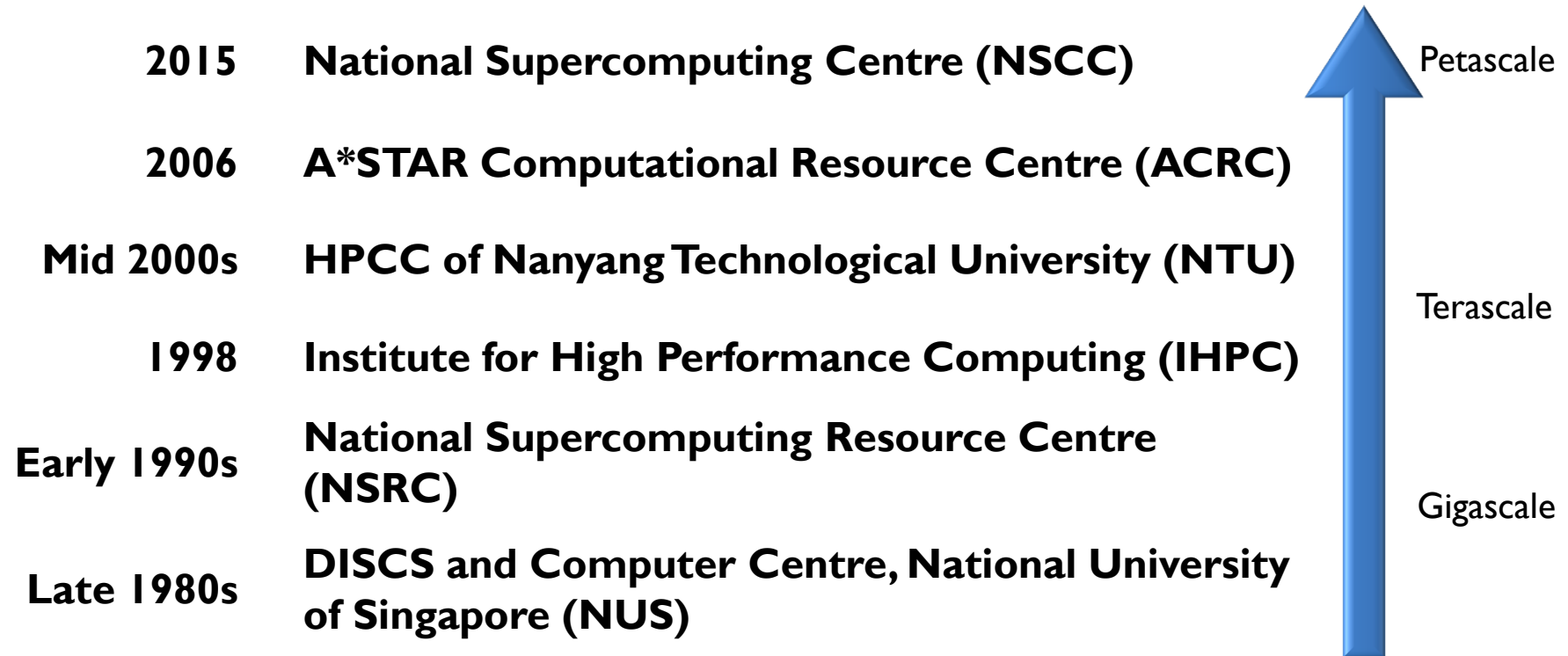
Objectives

1 Supporting National R&D Initiatives

2 Attracting Industrial Research Collaborations

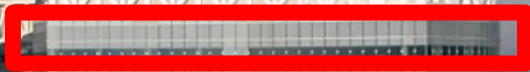
3 Enhancing Singapore's Research Capabilities

Historical Trajectory



NSCC DataCentre - Fusionopolis

Level 17



NSCC Data Centre (Artist Impression)



NSCC Supercomputer



~1 PFlop System

- **1,288 nodes** (dual socket, 12 cores/CPU E5-2690v3)
- **128 GB DDR4** / node
- **10 Large memory nodes** (1x6TB, 4x2TB, 5x 1TB)

FUJITSU



~10PB Storage

- **HSM, Tiered, Tier 3 SSD disks**
- **I/O 500 Gbps flash burst buffer, 10x Infinite Memory Engine (IME)**



EDR Interconnect

- **Mellanox EDR Fat Tree**
- **InfiniBand connection to all end-points (login nodes) at three campuses**



GPU nodes



Accelerators nodes

- **128 nodes** with NVIDIA GPUs (identical to the compute nodes)
- **NVIDIA K40 (2880 cores)**
- **368,640 total GPU cores**

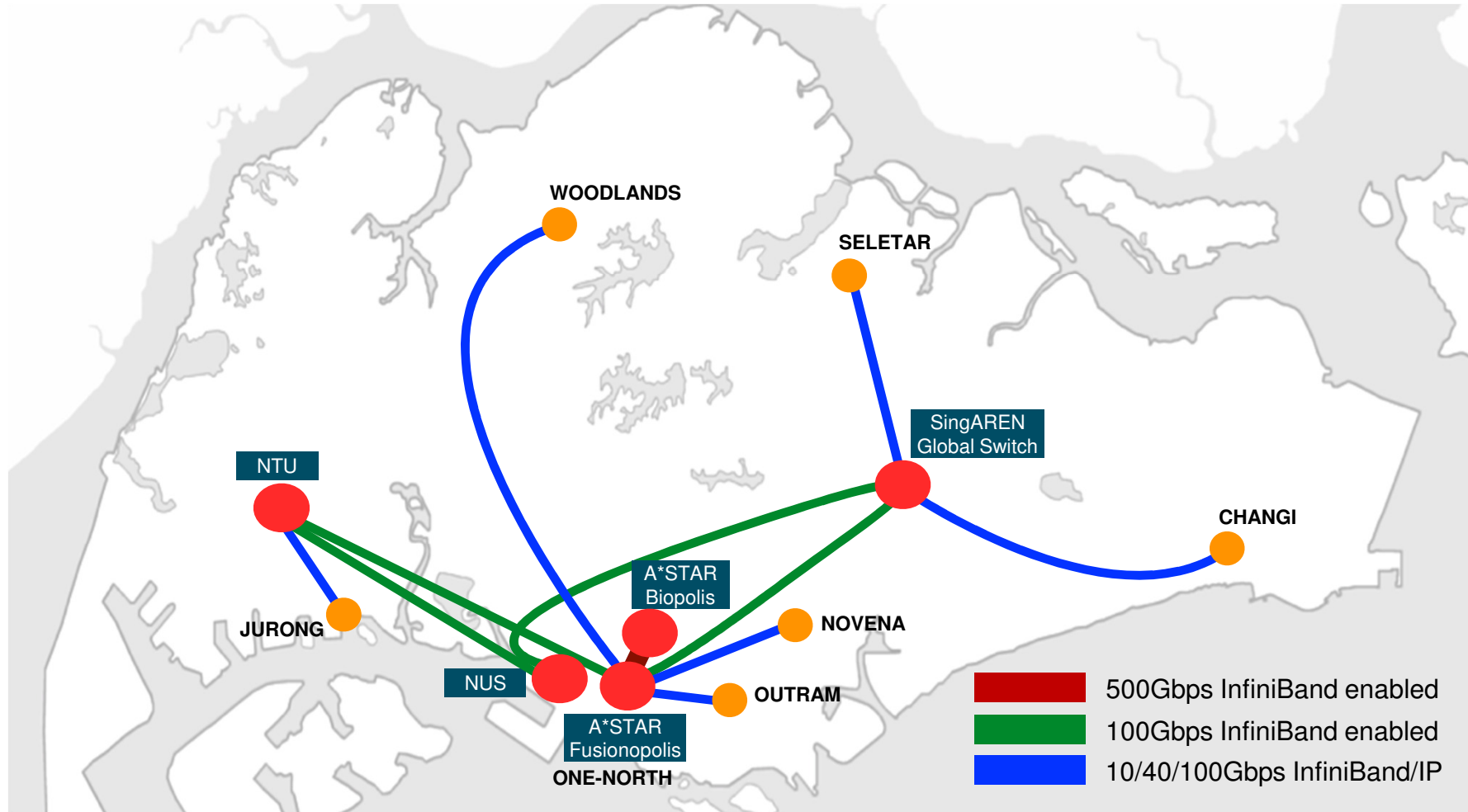


Visualization nodes

- **2 nodes** Fujitsu Celsius R940 graphic workstations
- Each with **3 x NVIDIA Quadro K4200**
- **NVIDIA Quadro Sync support**



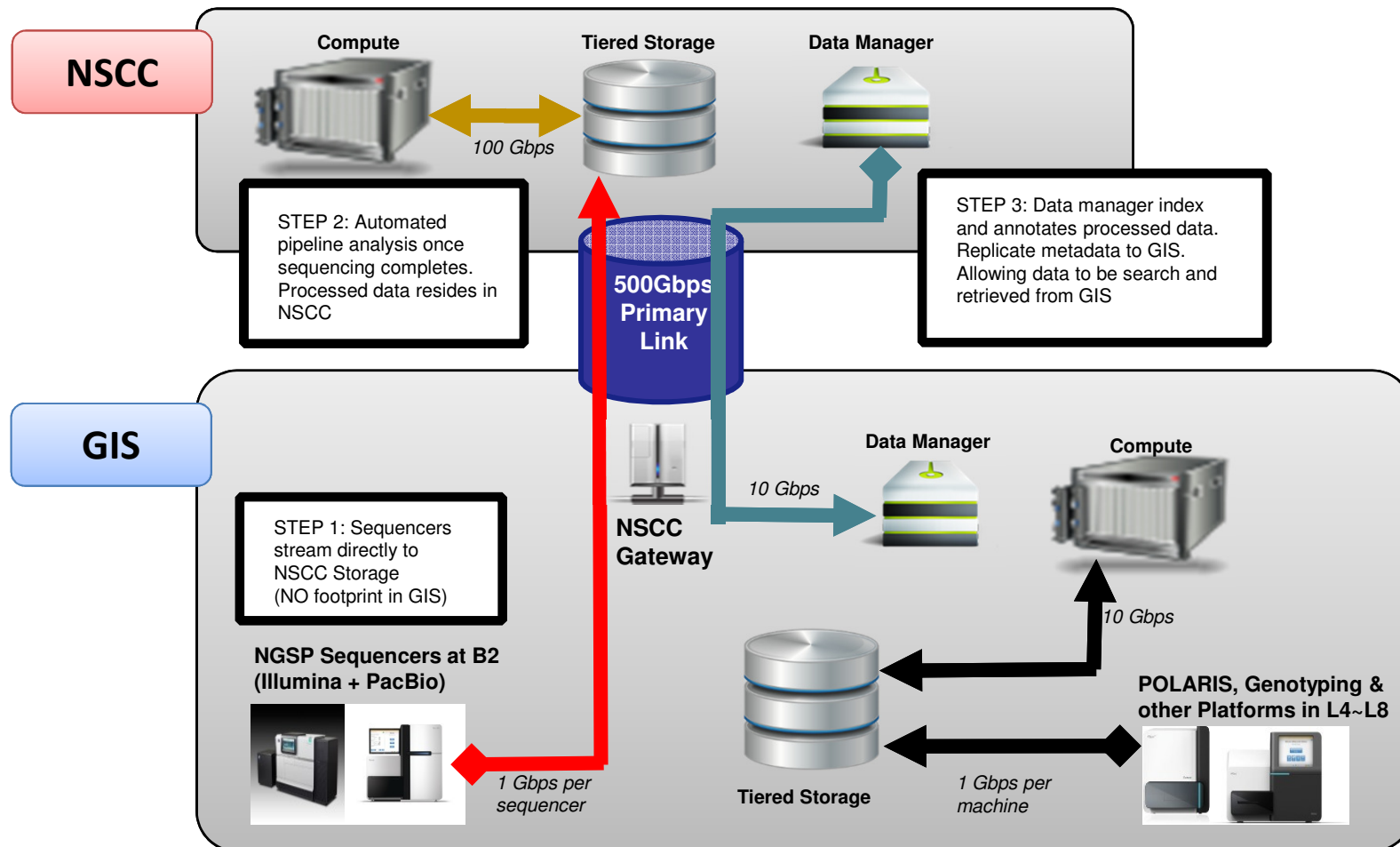
Singapore InfiniBand Connectivity (envisage)



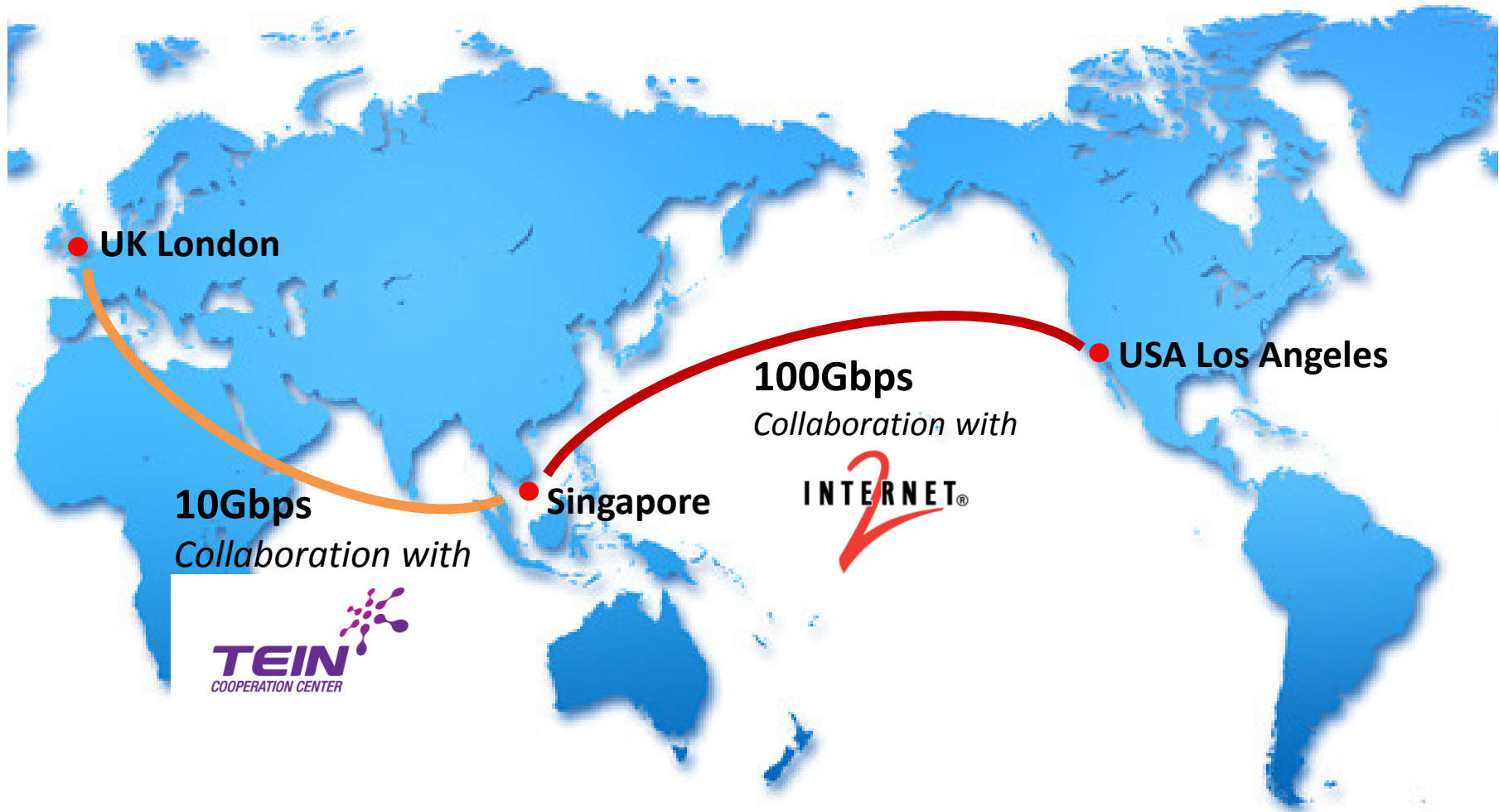
A network topology envisaging how all stakeholders of National Supercomputing Centre and other interested parties will be connected with InfiniBand links.

Example of Accessibility

NSCC-GIS Integration - Big Data with HPC



ACA100 & ACE10 Connectivity



10Gbps
Collaboration with



100Gbps
Collaboration with

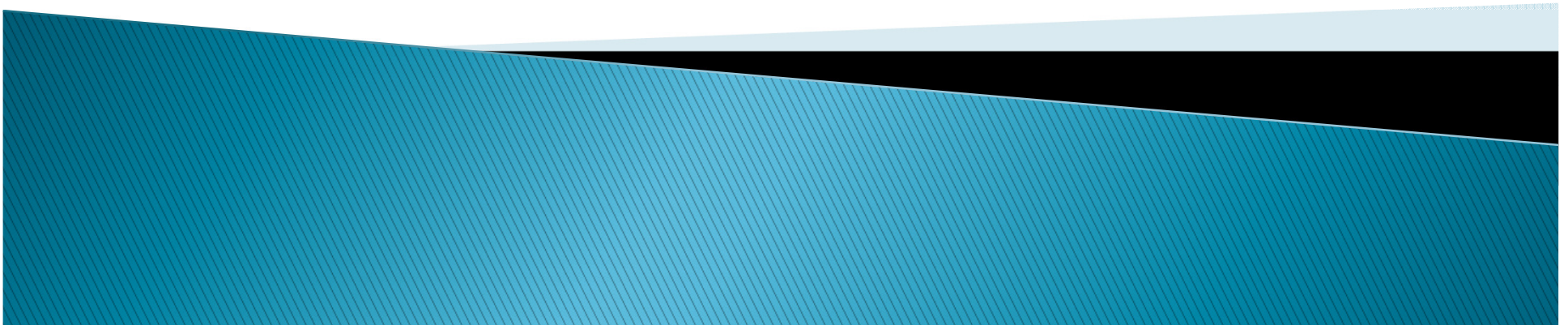


**National
Supercomputing
Centre**
Singapore

Global Connectivity as Anchor Participant of InfiniCortex Project



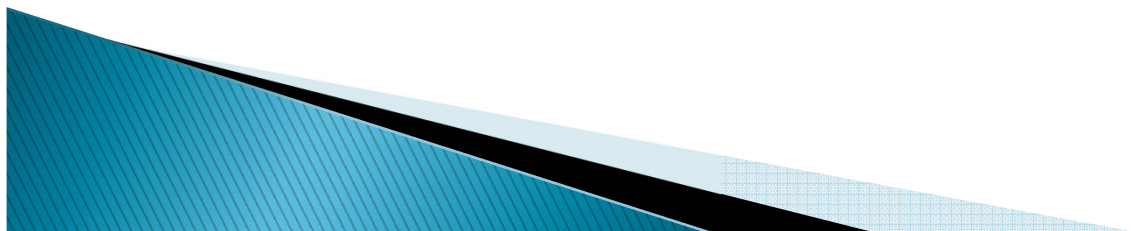
SuperASTRENA/ ASTRENA-2



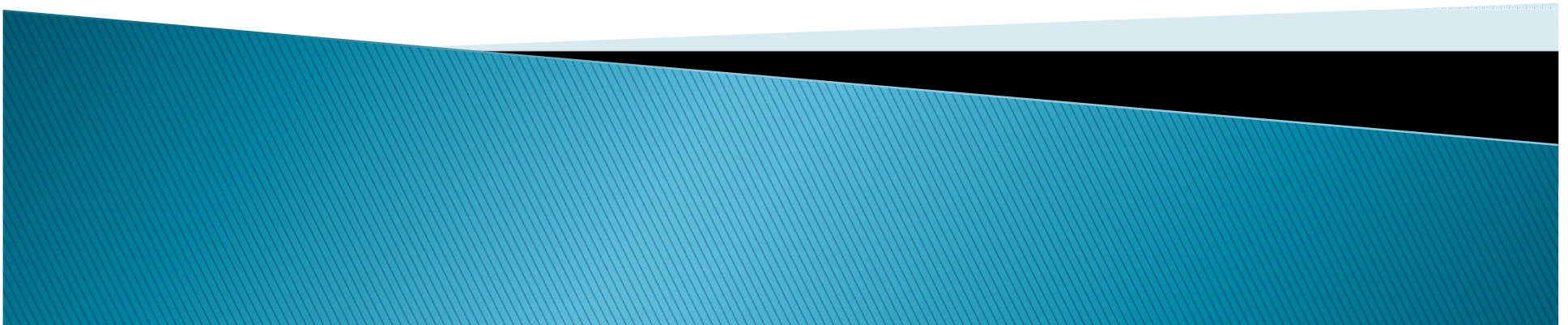
SuperASTRENA Workshop



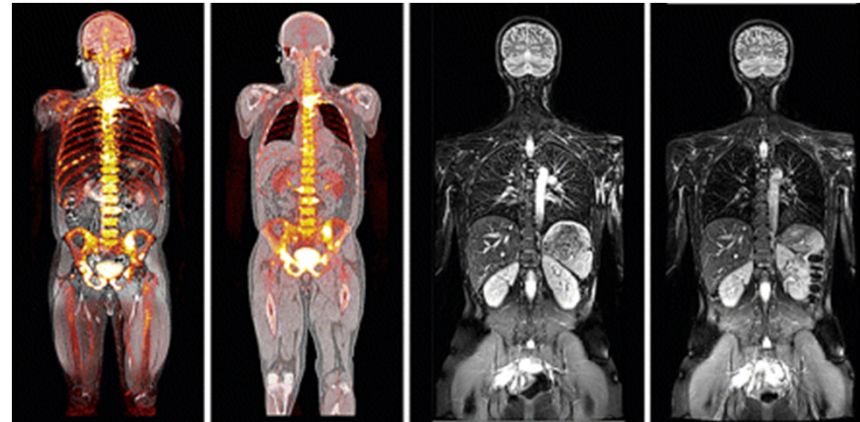
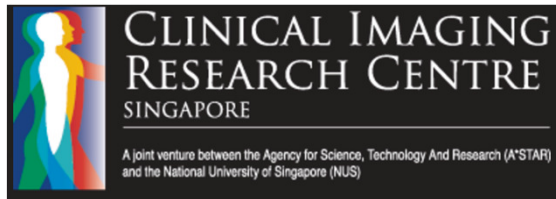
- ▶ Proposing (up to) a week of workshops and discussions in Singapore
 - Workshops focused on Supercomputing/HPC with hands-on sessions
 - Discussion sessions on potential/proposed Collaboration projects
 - Open to ASTRENA members (with proposed HPC collaboration projects)
 - To provide travel fellowships (air travel & accommodation)



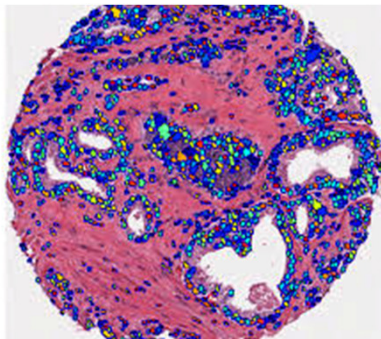
Examples of Areas for Collaboration



Collaboration Opportunities for Medical Imaging



DIGITAL PATHOLOGY



- **3D Reconstruction** for Multimodal Images
- Analysis of **Time-Series** Volumetric Data
- **Deep Learning** for Identification of Pathologies

Opportunities for Bioinformatics

GARUDA from SBI



Garuda – The way biology connects

- open, community-driven, common platform that provides a framework to interface, discover, & navigate through different applications, databases and services in bio-medical research
- provides language independent API to connect software as gadgets
- Gadget = software integrated as a node in a more complex workflow
- explore gadgets through the gateway and operate them through the dashboard
- supported by a global alliance of leaders in computational biology and informatics

GARUDA on GPUs



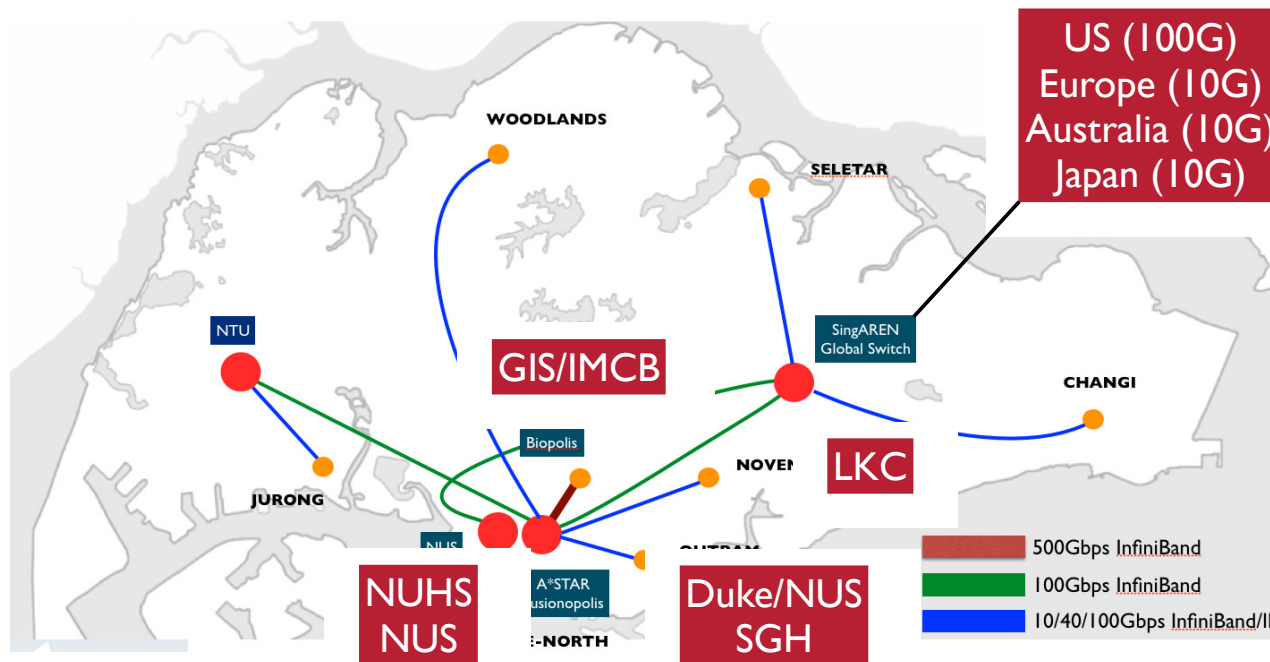
- Provide Garuda users with access to workflows that include GPU-enabled applications



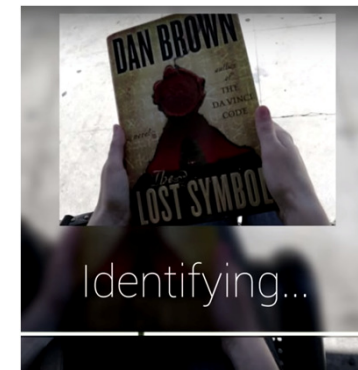
- Extend the gadget portfolio to Deep Learning applications
- Install the entire framework on the NSCC supercomputer and others to allow for a low entry point into HPC for researchers

Opportunities for non-HPC Visualisation

- Leveraging on **high speed** networking over Infiniband transport



Augmented Reality
Real-time Image
Recognition



Hi-definition/3D
Conferencing



Opportunities for Digital Media

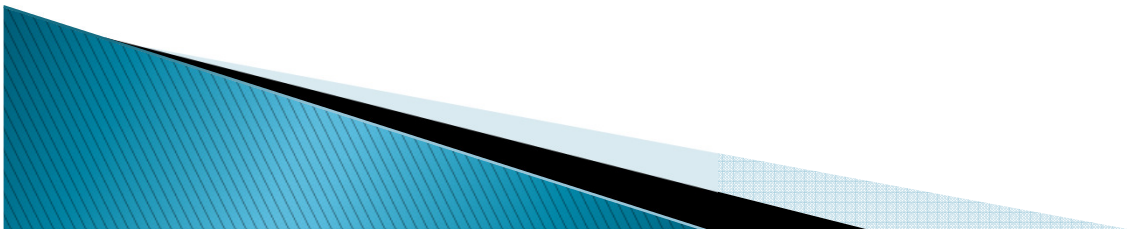
- Collaboration with digital media SME to fit open source Blender into animation pipeline
- Leveraging on Blender optimized on NVIDIA GPUs
- Benchmarking of Blender with and without GPUs
- POC one of the largest Blender rendering farms



<http://www.blender.org/wp-content/uploads/2012/11/Modelling1.png>

Conclusion

- ▶ Looking forward to more ASTRENA activities especially with SuperASTRENA and ASTRENA2 opportunities for collaborations





Thank You
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