Resilient and Secure Network Expansion:

Scaling MoRENet's International Bandwidth from 5 to 60 Gbps via AmLight-SACS and Cross-Regional Partnerships

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UbuntuNet CONNECT 2025

30 October 2025
Harare, Zimbabwe

Agenda

1. Introduction

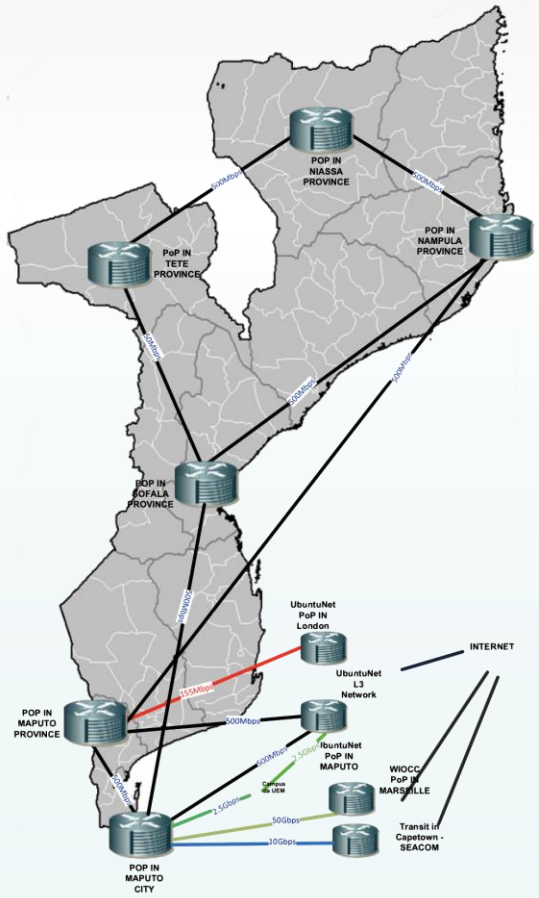
Following meetings in 2020 between MoRENet, RNP, SANReN, TENET, and the UbuntuNet Alliance, discussions focused on MoRENet's connection to ZAOXI at the Teraco Rondebosch Datacenter in Cape Town to access AmLight ExP capacity linking the U.S., Brazil, and South Africa. MoRENet expressed interest in connecting through SANReN's termination point in Cape Town to reach RNP's network in Fortaleza, enabling Mozambique's academic community to access RNP's services and connect to Brazil's Internet Exchange Point.

In 2024, a virtual consultation with RNP, SANReN, and TENET outlined plans for interconnection at NAPAfrica (Cape Town), access to AmLight-SACS capacity managed by SANReN, connection to the AMS-IX in Amsterdam, and establishing a direct link between MoRENet and RNP to strengthen international collaboration and network performance.

2. Key Message

Key Takeaways:

- From 5 Gbps → 60 Gbps: increase in capacity.
- Achieved through the AmLight-SACS South Atlantic link.
- Built on cross-regional cooperation (RNP, TENET, AmLight).
- A foundation for resilient, secure and sustainable research connectivity in Mozambique.



"This expansion is not just about higher bandwidth — it's about resilience, redundancy and regional collaboration."

3. Context and Motivation

Before the Project:

- Only 5 Gbps international bandwidth via a single route through South Africa.
- Limited support for e-learning, HPC and global data collaboration.
- Single-route dependency → risk of outages and security exposure.

Motivation:

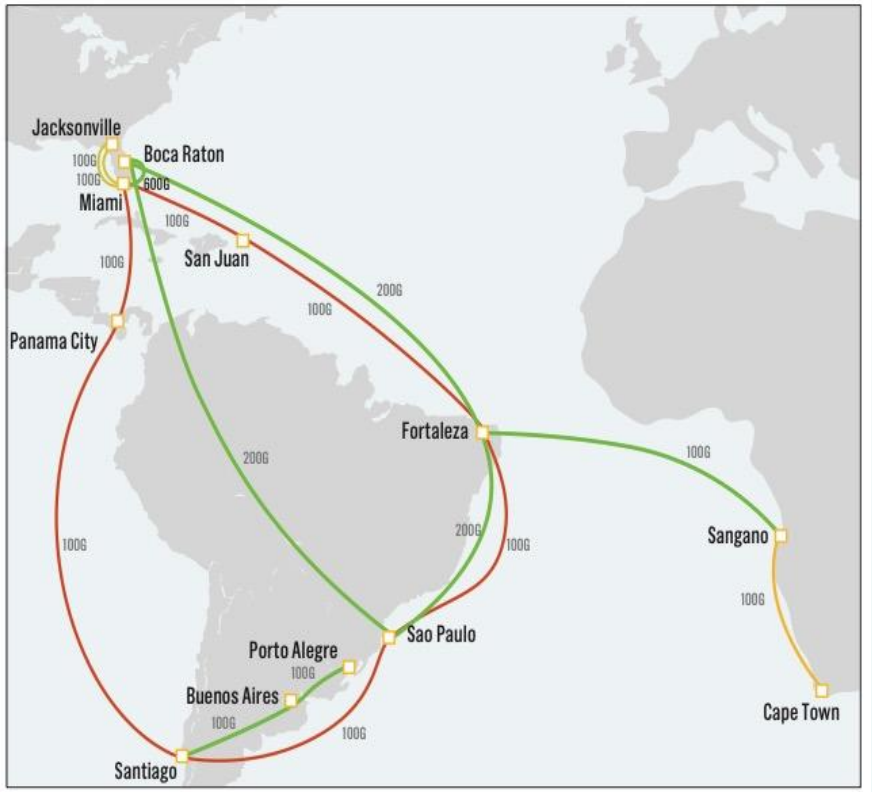
- Support the growing digital and scientific ecosystem.
- Improve resilience, reduce latency and enhance cybersecurity.
- Strengthen MoRENet's position as a regional academic network.

> "By 2023, demand had outpaced our available capacity, creating the need for a strategic upgrade and new international routes."

4. Strategic Approach: A Global South Collaboration

Key Actions:

- Formed partnerships with:
  - RNP (Brazil) – technical integration and engineering support.
  - TENET (South Africa) – Interconnection via Cape Town PoP.
  - AmLight – trans-Atlantic path via SACS to Fortaleza.
- Engaged operators SEACOM and WIOCC for capacity and redundancy.
- Coordinated design under UbuntuNet Alliance framework.



> "The approach was to combine engineering excellence and strategic partnerships, linking Africa and South America directly."

5. Network Architecture & Topology

Highlights:

- New MoRENet border PoP in Cape Town (South Africa).
- Connection to AmLight-SACS → Fortaleza → RNP → global R&E networks.
- Multi-domain integration (MoRENet | TENET | RNP | AmLight).
- Secure BGP sessions + MPLS compatibility across domains.
- Diverse routes ensure automatic failover in case of cable cuts.

6. MoRENet's Connectivity to RNP via SANReN and NAP Africa / IP Transit via WIOCC

TERTIARY EDUCATION AND RESEARCH NETWORK OF SOUTH AFRICA NPC

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Letter of Authorisation

I, Paul Sullivan, hereby authorise WIOCC to order a cross on behalf of MoRENet connecting to the below mentioned demark

Location – Teraco Rondebosch
Demark - C_DC1_CAB070_U43 TO C_MMR_MDF-E_U50 – F71-72

WIOCC
Africa's Hyperscale Infrastructure

Level 2, Alexander House
Silicon Avenue
Ebene, Cybercity 72201
Republic of Mauritius
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info@wiocc.net | www.wiocc.net

Letter of Authorisation/LOA

15Oct2024

RE: LETTER OF AUTHORISATION

Reference is made to the above.

West Indian Ocean Cable Company (WIOCC) has established itself as Africa's Hyperscale Infrastructure, providing international and African telcos and internet service providers with unraveled high-speed, resilient and diverse capacity into, within and out of Africa. Clients benefit from seamless end-to-end managed, international connectivity services, diverse via strategic investments in multiple submarine networks to connect Africa to the world, and the most extensive fibre-optic network service in sub-Saharan Africa with a 24x7x365 client support.

This is to confirm that WIOCC has authorized Seacom order cross connect(s) to the below demarcation.

Address
Teraco Rondebosch,
240 Main Rd,
Rondebosch, Cape Town, 7701

CID	Demarcation	Connector Type	WIOCC Equipment	Port Details
CA-MU-C183-0003	DC3_CAB I36	LC/PC	CPT01AS01	

Seacom is required to comply with Teraco's access guidelines and indemnifies WIOCC and Teraco of any breach of the guidelines.

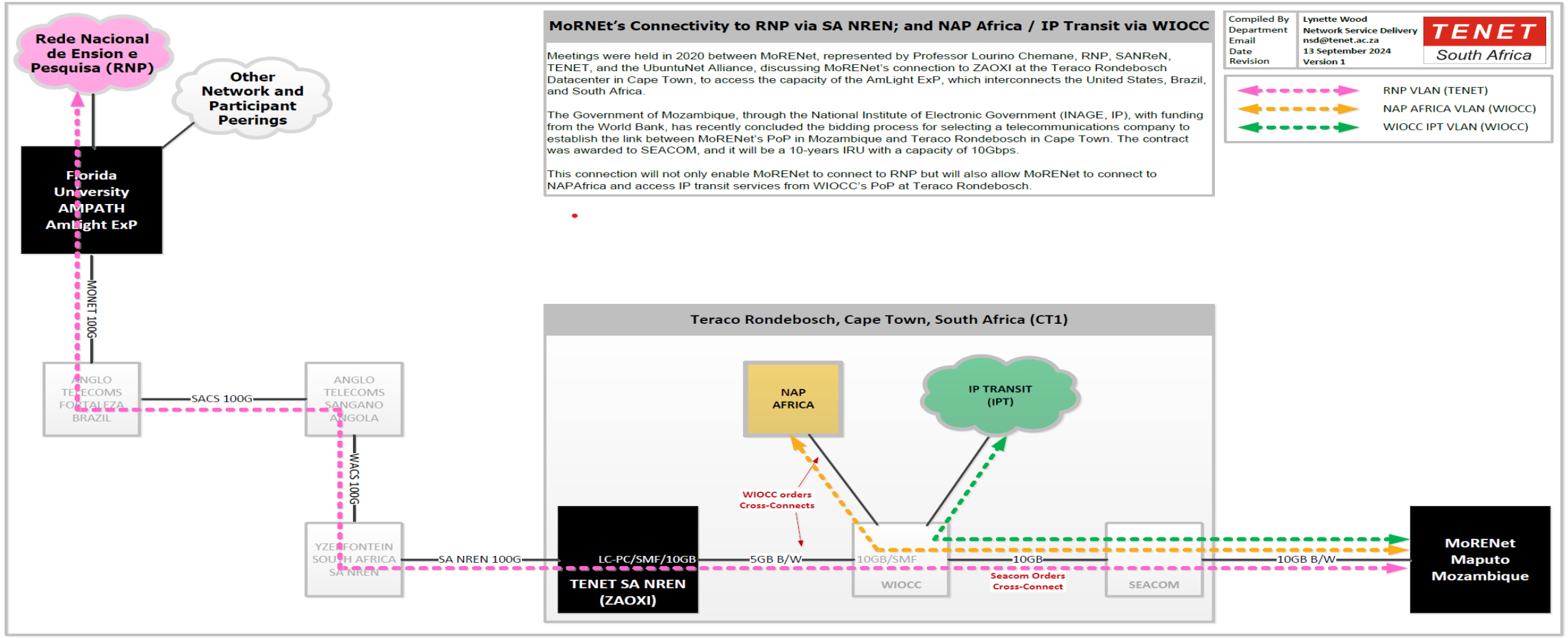
SEACOM

Demarcation Details_ Teraco Rondebosch

	SEACOM	Customer End
Demarcation	Cabinet C_DC1_CAB030 Rack-1 Great Westford Building, Rondebosch, Cape Town.	Customer MST to provide
ODF	CAB 030 ODF 4	Customer MST to provide
SFP		
Ports	ODF 4 Port 11-12	Customer MST to provide
Protection	NA	
Fiber Type	NA	
Connector	LC/PC	Customer MST to provide
Contact	Thanks & Regards, **Kaustubh Ovarikar** **Implementation Co-Ordinator | SEACOM** **NETWORK OPERATIONS CENTRE** T + 91 20 6614 1214 | CORP Ext. 091 609 | E kaustubh.ovarikar@seacom.com http://seacom.mu/disclaimers/	Customer MST to provide

"By 2023, demand had outpaced our available capacity, creating the need for a strategic upgrade and new international routes."

6. MoRENet's Connectivity to RNP via SANReN and NAP Africa / IP Transit via WIOCC

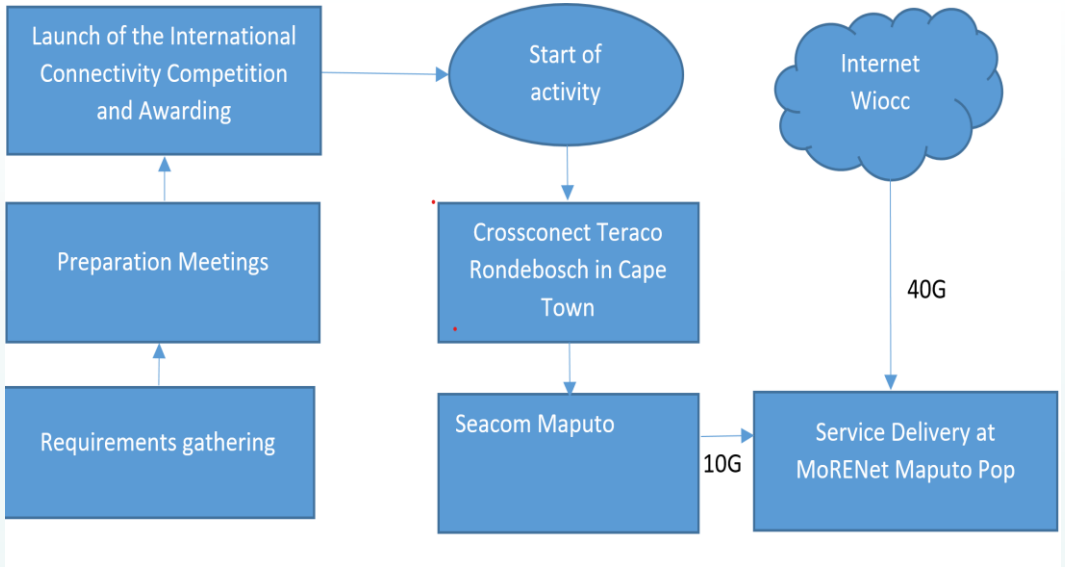


"This expansion is not just about higher bandwidth — it's about resilience, redundancy and regional collaboration."

7. Implementation Process

Phases:

1. Feasibility & Partnership Negotiation.
2. Engineering Design & Configuration (across ASNs).
3. Testing and Validation of secure BGP sessions.
4. Traffic cut-over and monitoring through NOC/SOC.



Challenges:

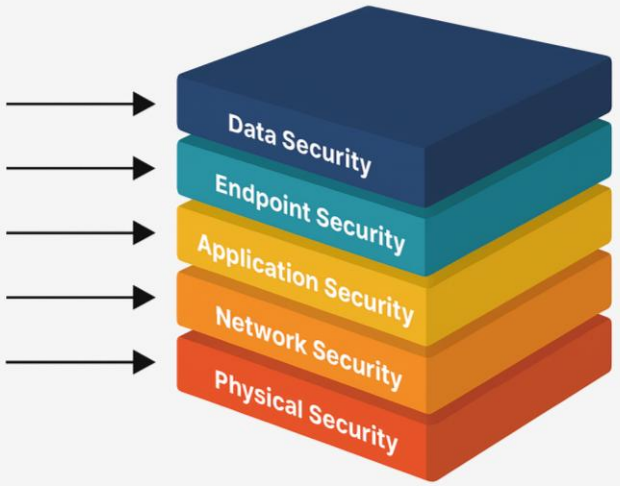
- Aligning technical policies across four domains.
- VLAN and MPLS provisioning for end-to-end connectivity.
- Harmonizing SLA and incident response procedures.

"The implementation was a multi-country effort requiring close coordination between network teams in Mozambique, South Africa and Brazil"

8. Security and Resilience Features

Measures Implemented:

- RPKI-based route validation.
- DDoS mitigation with upstream providers.
- BGP session authentication and filtering policies.
- Real-time traffic monitoring (NOC/SOC).
- Redundant paths across Atlantic and East African routes.



> ” We focused on a ‘secure-by-design’ approach – resilience comes not only from hardware redundancy but also from robust security policies.”

9. Technical Outcomes

Current Status:

- International capacity expanded to 60 Gbps.
- Active redundancy via two continental routes.
- Initial tests show:
  - Latency reduction (≈ 25–30%) to global destinations.
  - Improved stability under failover conditions.
- Full utilization pending completion of MoRENet backbone expansion to reach universities.

> ”The international capacity is ready and operational, but its benefits will reach full scale once our national backbone upgrade is complete”

10. Impact for Research and Education

Benefits Expected

- Large datasets can be moved between research centers in minutes instead of hours.
- Enhances overall efficiency of distributed computing.
- Foster cross-institutional collaboration and resource sharing through interconnected HPC infrastructures.
- Unlocks new possibilities in data-heavy research like genomics, climate modeling, and astrophysics.
- Delivers the capacity required for next-generation AI, ML, and big data applications.

> ”This infrastructure forms the foundation for advanced services — from remote experiments to open science initiatives”

11. Lessons Learned

Key Insights:

- 🤝 Cross-regional partnerships are essential for affordable bandwidth.
- 🛡 Early integration of security and resilience principles pays off.
- 🔗 Inter-NREN coordination requires technical alignment + trust.
- 📚 Capacity building and knowledge transfer must continue.

> ” Beyond technology, success depends on human factors — teamwork, shared vision and trust among NRENs”

12. Next Steps and Outlook

Planned Actions:

- Finalize national backbone expansion to distribute 60 Gbps capacity.
- Increase traffic utilization and measure performance metrics.
- Deploy advanced services (eduroam, cloud federation, cybersecurity training).
- Strengthen collaboration with AmLight, RNP, TENET and UbuntuNet Alliance.

2025	2027
Capacity Country	Capacity Country
INTERNACIONAL CONECTIVITY 60GB → NATIONAL BACKBONE 5G per Link	NATIONAL BACKBONE 10G per Link
Services	Services
➢ HPC ➢ Email services ➢ Application Hosting ➢ Cybersecurity Services ➢ Internet Connectivity and Access ➢ DNS Services ➢ Eduroam ➢ Web conferencing ➢ Moodle ➢ Training services	➢ File sender ➢ Cloud service ➢ RECIMO ➢ CAFMOZ ➢ Digital certification ➢ And others…

> ” The next phase is to extend this international capacity to our universities and research centres – turning infrastructure into impact”

13. Conclusion and Acknowledgements

Conclusion:

- The MoRENet expansion marks a milestone for digital sovereignty and network resilience in Mozambique.
- Demonstrates the power of cross-continental cooperation in advancing research and education.
- A scalable model for other African NRENs seeking resilient and secure connectivity.

Acknowledgements

- Partners: RNP (Brazil), TENET (South Africa), AmLight (FIU), SEACOM, WIOCC;
- Support: Ministry of Communication and Digital Transformation (Mozambique);
- UbuntuNet Alliance for the regional coordination;
- UbuntuNet Connect 2025 – for the platform to share this journey.

Thank You

(Obrigado)

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