SERVICE AGREEMENT – ANNEXURE C

Connection Policy[1]
January 2015

1   About this connection policy

ZAMREN intends to provide research and education networking services ("REN services") to some all campuses of Zambian research institutions, universities and associated support institutions in the public sector. This is done in association with ZESCO, which is responsible for deploying the ZAMREN Backbone Network and other major components of the ZAMREN network, and other Optic fibre Infrastructure owners.

This connection policy is a public document. It reflects ZAMEN's enduring respect for the norms, rules and established good practices that characterise research and education networking worldwide. It is important for connecting institutions and their users to know and abide by the practices and rules of research and education networking. It is important for other RENs to be able to assess ZAMREN's bona fides as an REN operator and decide whether or not they want to enter into interconnection agreements with ZAMREN.

The connection policy provides answers to questions like:

- What kinds of organisations are entitled to connect to ZAMREN and use ZAMREN's REN services?

- What service contracts must connecting institutions enter into with ZAMREN?

- To what extent may an organisation that is connected to ZAMREN allow other organisations to connect to ZAMREN via that same connection? For example, may a university provide Internet access to schools in its area by allowing the schools to connect to the university's network?

- To what extent may an organisation that connects to ZAMREN provide REN services to users and locations that are not on the organisation's own premises? For example, may a university onward-provide REN services to its staff and students in their private lodgings?

- With what kinds of other networks will ZAMREN interconnect? What rules govern the route announcements and traffic flows at such interconnects?

The connection policy does not deal with questions of governance, operational responsibility, technology standards, service levels, acceptable use, cost-recovery or charges.

ZAMREN reserves the right to amend this Connection Policy. Notice of any significant amendments will be given to all Participating Institutions and by publication on ZAMREN's web site.

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[1] We acknowledge the Tertiary Education Network (TENET) of South Africa whose Connection Policy has formed the basis for the ZAMREN Connection Policy.

2. What is ZAMREN?

For purposes of this Connection Policy, "The ZAMREN network" refers to the network within Zambia that is under ZAMREN's routing administration and supports ZAMREN's provision of research and education networking services. At the infrastructure level, the ZAMREN network is comprised of several components, some of which are operated by ZAMREN itself and some of which are operated on ZAMREN's behalf by other operators. In all cases the rights and obligations of ZAMREN, the network owner and the network operator (if not ZAMREN) are set out in legally binding agreements.

ZAMREN is a legal entity registered on 19th September 2007, in the Republic of Zambia under Registrar of Societies Act Cap 119 of the Laws of Zambia. It is registered as a not-for-profit organization.

ZAMREN's MPLS network

Under contract to ZAMREN, CEC-Liquid Telecommunications Limited operates an IP Connect link between ZAMREN NOC and TENET's Reefhead Gateway in Johannesburg.

Gateways

Gateways are locations at which different networks interconnect with each other. The component networks of ZAMREN all interconnect with each other at gateways on ZAMREN.

Gateways at which ZAMREN interconnects with external networks, i.e. networks operated by other parties, are called External Gateways. Currently (as at the date of this document) ZAMREN operates three Gateways on ZAMREN, all of which are External Gateways: ZAMREN will establish further External Gateways as required.

ZAMREN's interconnections with external networks and policies applicable to such external connections.

3. Cost recovery and Participating Institutions

ZAMREN has no shareholders or other owners to whom surplus assets may be distributed, but ZAMREN may and does charge user member institutions at rates that recover the costs of providing services.

ZAMREN provides REN services in terms of a REN Service Agreement between ZAMREN and each institution. REN services that ZAMREN itself provides include connectivity to research and education institutions in Zambia via ZAMREN, the provision of connections to ZAMREN, international connectivity, Gateway Services including connectivity to other RENs of the World as well as general Internet connectivity in Zambia and world wide.

Some REN services are not provided by ZAMREN but by other service providers in terms of an agency structure in which ZAMREN acts as the appointed agent of the institution but not as the service provider. This requires the Institution to have entered into an Agency Agreement with ZAMREN. ZAMREN handles all ordering, billing, receipting and payments for such REN services, and charges a small agency fee to cover the associated administrative costs.

For purposes of this Connection Policy, a Participating Institution is an institution that has a current Service Agreement and/or a current Agency Agreement with ZAMREN.

4. ZAMREN Connections

For purposes of this Connection Policy, "a ZAMREN Connection" is an asset that is held by a person or organisation "the connecting party", and comprises:

(a) standing permission from ZAMREN to use some or all of the REN services, and

(b) agreed means by which the connecting party's network connects physically to ZAMREN and has access to some or all of the REN services.

A key attribute of a ZAMREN connection is the hand-off location – i.e. the location of the point at which operational responsibility changes between ZAMREN and the connecting party.

Types of ZAMREN connection are described below:

4.1 Direct On-Site ZAMREN Connections

A Direct On-Site ZAMREN Connection is a connection to ZAMREN in which the hand-off location is at the connecting site itself – i.e. in which the terminating equipment at the connecting site is directly on the ZAMREN network.

Any Direct On-Site Connection enables the connecting site network to use the REN Layer 3 services, including interconnections with other ZAMREN sites, and, depending upon the international bandwidth ordered for the site, with other RENs world wide and the Internet generally. In addition, a Direct On-Site Connection to ZAMREN will normally enable the connecting site to use ZAMREN's Layer 2 services, such as the setting up and use of private VLANs within the ZAMREN network.

ZAMREN has and is providing Direct On-Site ZAMREN Connections. New Direct On-Site ZAMREN Connections will be provided to on a campus-by-campus basis as agreed between the Participating Institution concerned and ZAMREN.

4.2 Direct PoP ZAMREN Connections

A Direct PoP Connection to ZAMREN is one in which the hand-off location is within a ZAMREN PoP and not at the connecting site itself, i.e. in which ZAMREN operates neither the terminating equipment at the connecting site nor the local access circuit between the connecting site and the NREN PoP.

Any Direct PoP Connection enables the connecting site to use the REN Layer 3 services, including interconnections with other ZAMREN sites and, depending upon the international bandwidth ordered for the site, with other RENs world wide and the Internet generally.

A complete list of existing and planned ZAMREN PoPs and their precise locations is available from ZAMREN.

4.3 Indirect ZAMREN Connections

An Indirect ZAMREN Connection is one provided to the connecting party by a Participating Institution that has itself one of the above types of Direct Connection and, subject always to the eligibility criteria in 5.0, is willing to allow the connecting party's network to connect to its network, either directly or indirectly via a proxy server or other device, and hence, via the Participating Institution's own Direct ZAMREN Connection, to use the REN services.

Thus an indirect connection comprises two components – the ("downstream") connection between the connecting party's network and that of the Participating Institution, and the ("upstream") connection, being the Participating Institution's own Direct Connection to ZAMREN.

The handoff location for an Indirect Connection is the same as that for its upstream Direct Connection.

The provision of Indirect Connections by Participating Institutions is subject to the policies set out 8.0.

The Indirect Connection mechanism allows Participating Institutions to extend the benefit of the REN services to other research and education organisations, and especially to smaller ones such as schools, museums, non-profit R&D start-ups and learned societies. It also allows Participating Institutions to permit individuals that have a direct association with the Institution and so have the Institution's permission to connect to the campus network from remote locations (e.g. staff from home or while traveling abroad, registered students from their digs, research associates from their places of work) to also utilize the REN services via such remote connections to the campus network.

5.   Policies applicable to ZAMREN Connections

Rules of the RENs

In general, commercial Internet Service Providers will accept any individual or organisation that is willing to enter into a service contract as a customer. By contrast, RENs provide services only to universities, research institutions and other organisations for which education or research, or the support thereof, is a prime purpose.

RENs in different countries differ from one another with regard to the precise eligibility criteria. While all RENs allow public universities and public research institutions to connect, some disallow profit-seeking private universities and research centres. Many RENs allow secondary and even primary schools to connect. Some RENs allow start-up firms located in local science parks and innovation hubs to connect.

The eligibility criteria for ZAMREN connections appear in the following sections.

5.1   Eligibility for a Direct Connection

Categories of eligible entities

- Higher Education Institutions;
- Public Science and Technology Entities;
- Associated Support Institutions;
- Further Education and Training Networks; and
- Schools Networks.

For purposes of this Connection Policy, these categories of institution are defined as follows:

"Higher Education Institutions" means all such institutions as are from time to time, established, deemed to be established, declared or registered as Higher Education Institutions in terms of the Higher Education Act;

"Public Science and Technology Entities" means all Public Research Councils and such other National Public Entities that are not National Government Business Enterprises (as so defined in the Public Finance Management Act) and that have one or more of the following functions as a core purpose:

- conducting and/or promoting scholarly research, a reasonable proportion of the results of which are published;
- conducting and/or promoting technological innovation;

- the gathering and curation of scientific data, a reasonable proportion of which is made available to institutions and individuals for educational and/or research purposes.

"Associated Support Institutions" means such bodies as exist for the primary purpose of supporting the educational, research, technological innovation and/or data management activities of the Higher Education Institutions and/or the Public Science and Technology Entities.

"Further Education and Training Networks" means such entities that exist to provide connectivity and associated support, on a non-profit basis, to Further Education and Training institutions as defined in the Further Education and Training institutions Act.

"Schools Networks" means such entities that exist to provide connectivity and associated support, on a non-profit basis, to schools as defined in the Schools Act.

No other organisation is eligible to have a Direct Connection to ZAMREN, except with ZAMREN's express written permission. This applies to both Direct On-Site and Direct PoP Connections.

6.   Requirement to be a Participating Institution

Direct Connections to ZAMREN will not be provided to any entity that is not a Participating Institution i.e. that has not entered into a REN Service Agreement and/or an Agency Agreement, as may be required, with ZAMREN. This applies to both Direct On-Site and Direct PoP Connections.

7.   Eligibility for Indirect Connections:-

Apart from entities that meet the eligibility criteria for Direct Connections, Participating Institutions may provide Indirect Connections to the following types of organisations and persons:

- All schools that are recognized as such by the National and/or Provincial Departments of Education;
- Further Education and Training Colleges;
- Public museums and art galleries;
- Non-profit R&D start-up entities;
- Learned societies;
- Non-profit entities (Section 21's, trusts, associations not-for-gain) to which the Participating Institution provides logistical support services such as telephone, accommodation, salary administration or other but which are distinct as legal entities from the Institution itself;

- Individuals, such as staff, registered students, research associates that have an enduring contractual association with the Participating Institution, in terms of which they have the Institution's permission to connect to the campus network and use its services from remote locations, such as from home, while travelling abroad, normal places of work.

8.   Provision of Indirect Connections

A Participating Institution may provide Indirect Connections to eligible organisations or persons via any campus or site of the Participating Institution that has a Direct Connection to ZAMREN; subject to the conditions set out in this Connection Policy.

An Indirect Connection is provided to a single organisation or person ("the indirectly connecting party") for its/his/her own use, which use shall comply with ZAMREN's Acceptable Use Policy.

An Indirect Connection shall not be provided to any person or entity that provides connectivity to other parties.

No organisation or person with an Indirect Connection may use that Indirect Connection to provide any other organisation or person with connectivity to ZAMREN.

A Participating Institution that provides an Indirect Connection shall contract with the indirectly connecting party on terms which:-

(a) specify the applicability of the ZAMREN AUP and provides a link to it,

(b) prohibit any further distribution or resale of the connectivity provided and

(c) provide the right to suspend and/or terminate the provision of the indirect connection where there is a breach of (a) or (b).

The circuit via which the downstream connection of an Indirect Connection is realised may be provided by or on behalf of the Participating Institution or by or on behalf of the indirectly connecting party.

Neither ZAMREN nor any of its upstream service providers has any contractual relationship with or obligations towards organisations or persons with Indirect Connections.

ZAMREN deems networks that have Indirect Connections via a Participating Institution to be integral parts of the institutional network of the Participating Institution, and holds the participating Institution responsible for all aspects of such Indirect Connections and the use that is made of them.

9. **Charges for Indirect Connections**

Participating Institutions that provide Indirect Connections may charge the beneficiary institution or person at a rate that recovers the *marginal direct cost* to the Participating Institution of providing the Indirect Connections.

Within 14 days of being so requested by ZAMREN, the Participating Institution shall provide details of the Indirect Connections that it is providing, including the identities of the beneficiaries and bandwidths, and the charges that it is imposing in respect of these Indirect Connections

10. **Independent IP address space**

All IP address prefixes that are routed across ZAMREN to and from connecting sites must be held by the connecting site either as a direct end-user allocation from AfriNIC to the Institution or as an assignment from ZAMREN in its role as a Local Internet Registry. ZAMREN will not accept a connection from a site if the site's network uses IP address prefixes that originate with the networks (ASNs) of commercial operators or other third parties.

This applies equally to Direct and Indirect Connections.

Except in the circumstances considered in below, ZAMREN will announce sites' address prefixes on behalf of the site as originating within ZAMREN's ASN.

11. **BGP connections**

ZAMREN will exchange BGP route announcements with Participating Institutions that require this, in accordance with established Internet practice.

In such cases, sites may announce their prefixes to ZAMREN as originating within the connecting Participating Institution's ASN. The restrictions specified below apply to all routes announced in this way to ZAMREN.

No announcement to third parties of routes learned from ZAMREN

Where a Participating Institution provides Indirect Connections to one or more entities in terms of this Connection Policy, the Participating Institution may exchange route announcements with such entities and may announce to such entities the routes that it has learned from ZAMREN.

Apart from the circumstances contemplated in the previous paragraph, no Participating Institution that exchanges route announcements with ZAMREN may announce to any third party network routes that it has learned from ZAMREN.

No entity that has an Indirect Connection to ZAMREN may announce to any other network routes that it has learned from ZAMREN.External Interconnections

12. **Interconnection obligations specific to RENs**

In general, when RENs interconnect and exchange route announcements with other RENs, the routes that they announce to each other are "REN routes" –i.e. routes that have both source and destination within RENs and which lie entirely within RENs. Consequently, ZAMREN must be in a position to ensure that when it announces routes to other RENs including other African NRENs as well as regional RENs such as UbuntuNet, Géant and Internet2, it announces routes only to ZAMREN itself.

13. **Connectivity to other Zambian networks**

Settlement-free peering interconnections

ZAMREN's connectivity to other networks in Zambia is realised in the first instance, through a number of settlement-free peering interconnections with a number of individual operators at the local Internet Exchanges Points.

14. **Contracted transit service**

Connectivity to the entire Zambian Internet is ensured through a contract with a major operator.

15. **Private peering interconnections**

Where a Participating Institution that has a Direct ZAMREN Connection has a substantial and sustained connectivity requirement between its own network and that of some external entity, the Participating Institution may request ZAMREN to allow that external entity to establish a private peering interconnection with ZAMREN.

16. **Connectivity to UbuntuNet, to Géant and other RENs, and to the Internet world wide**

ZAMREN's connectivity to Géant and other RENs worldwide, as well as to the Internet generally, is realised through the UbuntuNet Hub at Telecity, London. At Telecity, ZAMREN exchanges route announcements with UbuntuNet, which in turn exchanges routes announcements with Géant and with one or more major commercial ISPs. In addition, UbuntuNet has settlement-free peering agreements with a large number of networks at the London Internet Exchange.

Géant provides REN-transit to UbuntuNet – i.e. connectivity not only to Géant itself but to all RENs across the World with which Géant interconnects. The commercial ISPs provide settlement-free peering and transit to the general Internet worldwide.

Thus in terms of AS paths, UbuntuNet is ZAMREN's upstream provider of both REN connectivity and general Internet access.

17. **Future developments**

As UbuntuNet develops its infrastructure within Africa, ZAMREN will be able to connect via UbuntuNet to other African NRENs directly – i.e. via routes that remain within Africa rather than routing via London