

Liquid Telecom IPv6 Deployment

Building Africa's digital future

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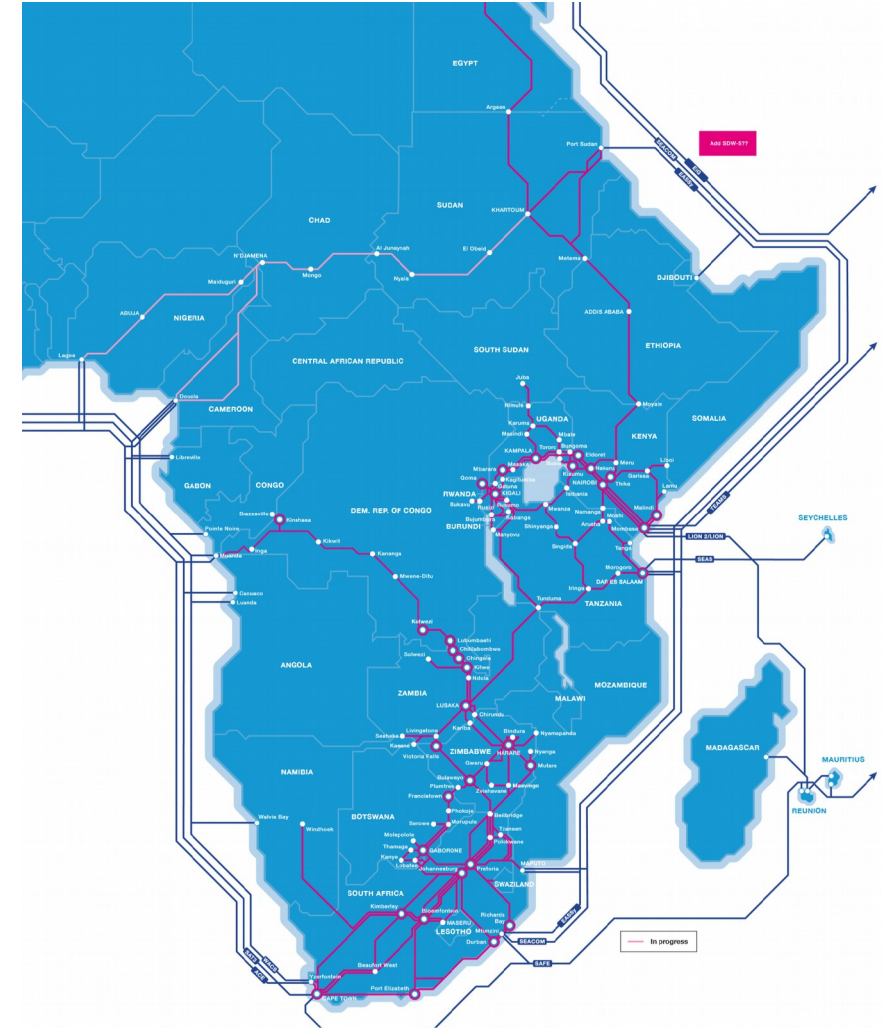
Who is Liquid?



Africa's largest fiber network, stretching from Cape To Cairo, and approaching 70 thousand kilometers of fiber in the ground.

The Mission Statement of the CTO's office:

To continuously employ cutting edge Global technology and standards combined with African innovation, building skills and capacity to deliver high quality connectivity and ICT solutions to our customers at a price they can afford, over a robust, resilient and trusted network



Current IPv6 Deployment Highlights



Our IPv6 road began many years ago – with one customer in Zambia. IPv6 was deployed across the backbone – and for that one customer

- We switched our backbone to single topology roughly 6 years ago – enforced single topology ensures engineers deploy IPv6
- We rolled out IPv6 in Zimbabwe on our GPON network – which to our knowledge is still the only major IPv6 deployment in the country, and puts the country at 5.93% adoption
- Our new GPON network in Tanzania is now also rolled out with V6 on the same Zimbabwean model – so as that grows – we'll see more V6 there

The challenges...



So why did things stall? What about the rest of the countries?



- Our customer base is heavily enterprise and wholesale – in an environment that is heavily NAT centric. Convincing companies to move from what they know and trust is problematic.
- NAT is actively sold by the security fraternity as a security mechanism – and that leaves V6 adoption at a disadvantage – you are fighting disinformation
- Until recently – there was almost no movement on the mobile networks in the V6 space – we're starting to see movement with Safaricom in Kenya and the mobile network in Lesotho – so hoping to see some impact there
- Vendor challenges (particularly in the CPE side), and lack of feature parity is damaging the deployment – more on this coming up.

I'll talk briefly about each off the following – and why they create significant challenges – and how we see them being addressed

- Lack of MPLS feature parity – and we see similar in other protocols
- Inconsistent vendor implementations – and in some cases – license fees
- Lack of consistent CPE implementations
- A vast array of translation mechanisms has everyone wondering which way to turn.

- **We rely on the ability to steer and engineer traffic – for technical reasons – and sometimes political reasons.**
 - Traffic steering is traditionally done with MPLS and with shutdowns becoming more common place – with content providers arriving on the continent – and with countries where getting really high capacity circuits being problematic – being able to dynamically steer traffic is becoming more critical
- SR-MPLS has allowed us to let customers steer their own traffic – based on their needs at a particular time. SR-MPLS sadly does not work on certain vendors when applied to IPv6 (In two vendors, the TLV's in ISIS are simply not there when it comes to IPv6 – and in one case – they refuse to even discuss this)

IPv6 Challenges – MPLS (2)



- In order to do end to end traffic control and steering – having islands of hardware where V6 support isn't there in SR-MPLS – leaves us with a major problem with certain inland countries – however – we think we have a solution (more on this to come)
- BGP-LU – which is critical to our network segmentation – still has some pretty strange behavior in an SR environment without LDP – this is a problem in the absence of LDPv6 (which is a non-starter)

IPv6 Challenges – Vendor implementations



- We utilize BGP Link-State heavily for communication with our traffic controllers – and it forms a critical link in our engineering train.
 - While the LS RFC's are well defined, and the TLV's are allocated by IANA – we've found support in vendors to be extremely inconsistent on the IPv6 side.
- Support for V6 on low end CPE's is extremely inconsistent - in most cases – it exists – but its often very broken.
- Support for DPI when running V6 is patchy – but improving

Translation Mechanisms....



- We are still exploring our options here – there are many – but finding consistent support for a particular mechanism hasn't proved easy.
- Right now - DS-LITE seems to be the most likely option – purely because the ONT's we use support the mechanism – but dual stack while we still have address space is still the preferred option.

Our Solutions....



- SR-MPLS gives us the functionality we need to steer traffic
- We're still missing the ability to deploy certain functionality with regards to circuit extensions, however we see hope as EVPN and in particular EVPN-VPWS becomes more prevalent.
- Through the use of binding SID's and using them to guide packet encapsulation and decapsulation, we can take an SR-MPLS packet, push a V6 header and a CRH extension, route the traffic over islands that do not support SR-MPLS – and de-encapsulate – leaving our label stack intact – not an ideal solution – but it gives us the traffic steering end to end (we're testing this right now)

- SRv6 we believe will give us a lot of what we need – however – not in its original form – the overhead is too high, and we have a myriad of other concerns around “address overloading” and other problems. Hence – we’re firmly supporting SRv6+ and the compressed routing header approach – though in reality – SR-MPLS will always be our preferred choice.

Other challenges and their solutions



- On the link-state problems – we're working with our vendors to try and get more consistent implementation – until then we're having to augment data through a variety of other sources. It's not ideal – but it's functional.
- On the DPI side – it's a matter of knocking on the vendors doors and pushing like hell – but we're starting to see a lot better support for this and the initial issues are slowly getting resolved.
- Our procurement models have had to change – we now ask for support for RFC's in RFP's that are issued – and demand the vendors specify where they deviate from the specified RFP's. That lets us evaluate and gives us recourse when things don't work

Moving down the track....



On going projects and things for the near future



- We are V6 enabling consumer networks in Uganda, Rwanda, Zambia and Kenya as we speak.
- Our new network in South Sudan will be V6 enabled from day one to the consumer – as will any future networks
- Our investigation of the translation mechanisms continues – we have some room to move here, because of V4 availability – but in no way is it taking a back seat.
- We'll continue working with the SPRING working group and hopefully contributing to a future where parity to V4 from the operators perspective can finally be realized.

On going projects and things for the near future



- By policy we are now deploying V6 towards any client – enterprise or otherwise – and as such, it then becomes a matter of convincing them to take it beyond the edge and into their networks.

- We're launching some fairly major V6 awareness campaigns and training material aimed at the corporate consumer. This will be done through our 21C skills training initiatives.
- These initiatives will consist of training videos, white papers and promotional material aimed heavily at the enterprise.
- We will continue in our fight to dispel the myth of security by NAT – and through the use of affordable cloud hosted firewalling solutions, hopefully provide a more secure environment while we do this!



Africa's Cloud is Liquid.™

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