Solutions To FTTH Challenges In Africa

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African Diversity
What Are The Outside Plant Challenges Specific To Africa?

1. Cost of Network Build And Operation
   - Requirement to build fast and monetize investment
   - Availability Of Skilled Splicing Resource

2. Range of Installation Environments
   - Product Flexibility

3. Network Security
   - Product Reliability
Optical Fibre Has Changed The World…
...But Splicing Fibre Takes Time and Skill
…And There’s Lots Of Fibre To Be Spliced In FTTH

- Costly equipment needed
- Non-productive time can be significant
- Residential customers demand minimum disturbance
Splice vs. Connectors

Replace This…

With This
Splice vs. Connectors

Difficult and time consuming splicing …

…becomes as simple as plug and play.
Pre-Connectorised FTTH solutions

The Benefits

• Faster
  – More customer connections per day with fewer installers
  – Faster Homes Passed Deployment
  – Shorter time to revenue

• Easier
  – Customer installs by unskilled technicians
  – Fibre that handles like copper and can be joined like copper
  – Avoidance of skilled labour shortages for mass rollout

• Reliable
  – All components assembled and tested in factory controlled conditions
  – Easy reconfiguration and access for testing
  – Modular upgrade path and flexibility in design
Typical Cost Per Home Comparison

- Based On 40% Take Rate
- Costs include outside plant materials and installation costs
- Costs exclude civils, duct and electronics
Financial Considerations

• Variation Of Installed Cost v Take Rate

![Graph showing Installed Cost v Take Rate]

- Day 1 costs are slightly higher for pre-connectorised
- But break even take rate is only 6%
Availability Of Skilled Labour

• For a spliced solution, each residential installer needs a fusion splicer … and the skills to use it

• Any large scale FTTH deployment means skilled splicing resource will become scarce – “Certain private FTTH providers noted a skills shortage developing in this area of the market – with the availability of technicians with appropriate qualifications a hindrance to last-mile connections.” UBS Global Research Paper on South African Telecoms Feb 17

• Skilled splice resource needed to pass 1000 homes and connect 40% could install 500 km of long haul 96f trunk route
Cost Deferment At Homes Passed - FlexNAP

- Hardened connectors also enable a pay as you go strategy
- FlexNAP is a custom designed solution with factory installed tap points installed where they are needed

- Only install the terminal when a customer requests service
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Range Of Civil Infrastructures

- Telecom Civils infrastructure may be less well developed in Africa compared to other regions
- Aerial, underground duct, direct buried, building facade, power infrastructure - wherever it will go!
Aerial + Low Premise Density Applications

• Aerial network is the lowest cost civils infrastructure
• Aerial deployment is more common outside cities
• All FTTH components must be suitable for aerial deployment
  – Network Access Points
  – Drop Cables
  – Closures
• Mounting Options
  – On steel lattice, concrete or wooden poles
  – On messenger wires
  – On building facades
Cables Designed For Simple Low Cost Aerial Fittings

- Ruggedised cable design enables the use of wedge clamp fittings
- Simple fittings originally used for copper drops
- Low cost, fast and easy to deploy, widely available

Figure 1
Aerial Deployment
Aerial Deployment
Aerial Deployment – Power Utility Network

Existing Aerial Plant

4 Port Terminal

8 Port Terminal

Stub Cable
Drop Cable Is Has The Most Demanding Application

A variety of solutions to fit any network configuration

- OptiTap on ROC Drop – Fast Access Technology
- OptiTap on 5mm round
- OptiTap on SST
- Hybrid OptiTap to SCAPC
- Multi-Fiber (up to 12F OptiTip) on SST
- Multifiber (2F OptiTip) on round FREEDm fanout
- DualDrop Indoor/Outdoor Fast Access cable

Drop Cable Portfolio

- ROC Drop with FastAccess Technology (250 µm)
- SST-Drop OSP or I/O LSZH+Riser
- CC SST-Drop I/O with 2.9mm
- CC Rugged Drop I/O, 4.8mm
- DualDrop
Product Implications

• Civil costs can be up to 80% of the overall network build
• The key to a successful FTTH business case lies in exploiting the existing civils infrastructure
• Products must meet universal application
  – Specified for harshest environment
  – IP68 across the product range
• Fitting kits to be included
  – Universal kits for many applications
  – Parts supplied with products
  – Mounting facilities are a design feature
• Cable properties are challenged in diverse applications
  – An aerial cable is different to a minicable
  – Hardware must be compatible with all cable designs
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Network Security

- The FTTH network has to operate in an uncontrolled and unprotected environment
  - Subject to disturbance from the outside world

- Rugged and reliable products are required

- Products which reduce external risk for installation staff
Aren’t Optical Connectors Too Fragile For Outside Plant?

How do you achieve this level of cleanliness…

In an environment like this?
One Operator Took the Risk…

…and it paid off!
“The drop is accomplished by employing a hardened connector to reduce maintenance issues. The cost per drop may be initially higher than a splice, though it can be done quicker and requires less skill and auxiliary equipment.”
– Verizon, FTTP: Lessons Learned, OFC 2005

After 2 years deployment …
“The outside plant troubles just go away to literally zero when we're doing this”
– Verizon CFO, Doreen Toben, Earnings Call, December 2006

Paving the way for millions of HP globally!
And Many Followed…
Test Specifications

- IP68 rating is typically applied to optical OSP for outdoor deployment.
  - 1st digit 6 = No dust ingress
  - 2nd digit 8 = Water immersion over 1m
- Telecom standards for Hardened Fibre Optic Connectors go a step further …
  - Telcordia GR-3120 (connector) and GR-771 (closures + terminals)
  - Environmental conditions wider than any individual African country
  - Mechanical conditions more severe than conventional optical OSP specifications
<table>
<thead>
<tr>
<th>GR3120 Connector Mechanical + Environmental Testing</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>GR-1221 6.2.4: Extended Heat Aging +85 °C</td>
<td>84 days</td>
</tr>
<tr>
<td>GR-1221 6.2.7: Extended Thermal Cycle: -40 °C +70 °C 100 Cycles</td>
<td>84 days</td>
</tr>
<tr>
<td>Proof Test: 740N Plug-Cap</td>
<td></td>
</tr>
<tr>
<td>Impact: 5m drop 3 axes onto rigid surface</td>
<td></td>
</tr>
<tr>
<td>Freeze / Thaw:</td>
<td></td>
</tr>
<tr>
<td>Mated connector pair in water frozen &amp; held at -5 °C; thawed &amp; held at +5 °C</td>
<td>10 cycles</td>
</tr>
<tr>
<td>GR-326 4.4.4.3: Airborne Contaminants Cl₂ H₂S NO₂ SO₂</td>
<td>20 days</td>
</tr>
<tr>
<td>GR-326 4.4.4.1: Dust Test  SAE Fine “Arizona Road Dust” 39% 0-5micron</td>
<td>7 days</td>
</tr>
<tr>
<td>GR-326 4.4.9: Ground Water Immersion (sect 5.3.8) Detergent, Chlorine, Fuel, Aqueous Ammonia</td>
<td>7 days</td>
</tr>
</tbody>
</table>
Non-Hardened Connector Solutions Exist

- Well established with SC or LC connectors inside conventional closures
- No demarcation between network build and customer connection
  - Each drop needs closure access and cable sealing
  - Customer connection teams not focused on fibre management

Increased risk of subscriber disruption
Non-Hardened Connector Deployment Challenges

- Reliability can be severely compromised with non-hardened connectors

- High attenuation and fibre breaks at terminals can be the highest cause of network faults
Security For Installation Staff

- Increasing frequency of fibre installation teams being targeted by criminals
  - Splicing equipment is recognised as a valuable asset
- FTTH Council Africa established equipment database

FTTH COUNCIL AFRICA
WHITE PAPER ON THEFT OF EQUIPMENT IN THE FIBRE INDUSTRY

- Connectorised solutions don’t need splicers!
Hardened Connectors Continue to Evolve

• New products to meet operators’ demands
  – Balance of added flexibility while maintaining toughness

• There are a range of hardened connector formats now available
  – Some formats have multi-vendor interconnect capability
  – Single-fibre versions mostly based on SC interface
  – Multi-fibre versions based on MT interface
Summary

- Pre-Connectorised FTTH solutions offer significant benefits for FTTH Deployment in Africa
  - Faster network rollout and customer installs
  - Low skill plug + play connections
  - Reliable proven solutions
  - Lower cost deployment
  - Reduced dependence on skilled splice labour
- Fibre install is like a CATV install
  - Simple redeployment of current resource
- Outside Plant products are flexible and versatile to meet the wide range of installation environments
- Reliability is proven through successful mass deployments throughout the world
CORNING