# Service Document

# WiMAX

**Release 1.0**

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# 1 Product Description

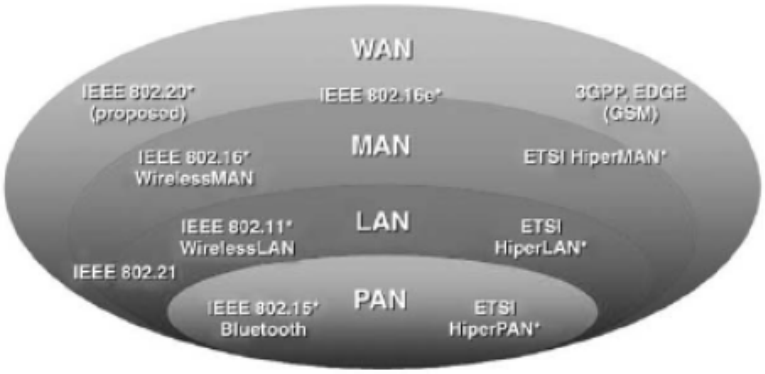
Last mile being a critical and essential element for delivery of any link to customer, TCL has decided to go ahead with WiMAX(Wireless Access) to penetrate into New Markets. Wireless access services would increase our reach, reduce time to delivery and increase scalability.

This document describes TATA Communication Ltd's WiMAX service from the perspective of the service features, billing, deliverables & processes involved in delivering the services over WiMAX. This document will be updated from time to time whenever there are some changes in the services & deliverables offered under TCL's WiMAX Service offerings.

# 2 WiMAX Overview

WiMAX is defined as Worldwide Interoperability for Microwave Access by the WiMAX Forum. It is based on IEEE 802.16 standard and is a Wireless MAN (Metropolitan Area Network) technology. WiMAX is designed to cover wide geographical areas serving large number of users at low cost and provides a wireless alternative to wired backhaul and last-mile deployments.

WiMAX provides LOS, Near Line of sight and Non line of sight coverage with the greatest range covered in case of Line of sight and least distance covered in case of Non Line of Sight conditions. The Forum describes WiMAX as "a standards-based technology enabling the delivery of last mile wireless broadband access as an alternative to cable and DSL."

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| WiMAX | Worldwide Interoperability for Microwave Access |
|---|---|
| IEEE standards | 802.16d -- Fixed WiMAX***<br>802.16e -- Mobile WiMAX<br>*** TCL deployment is on 802.16d(fixed) |
| Frequency Band allocated | 3.3 - 3.4 GHz |

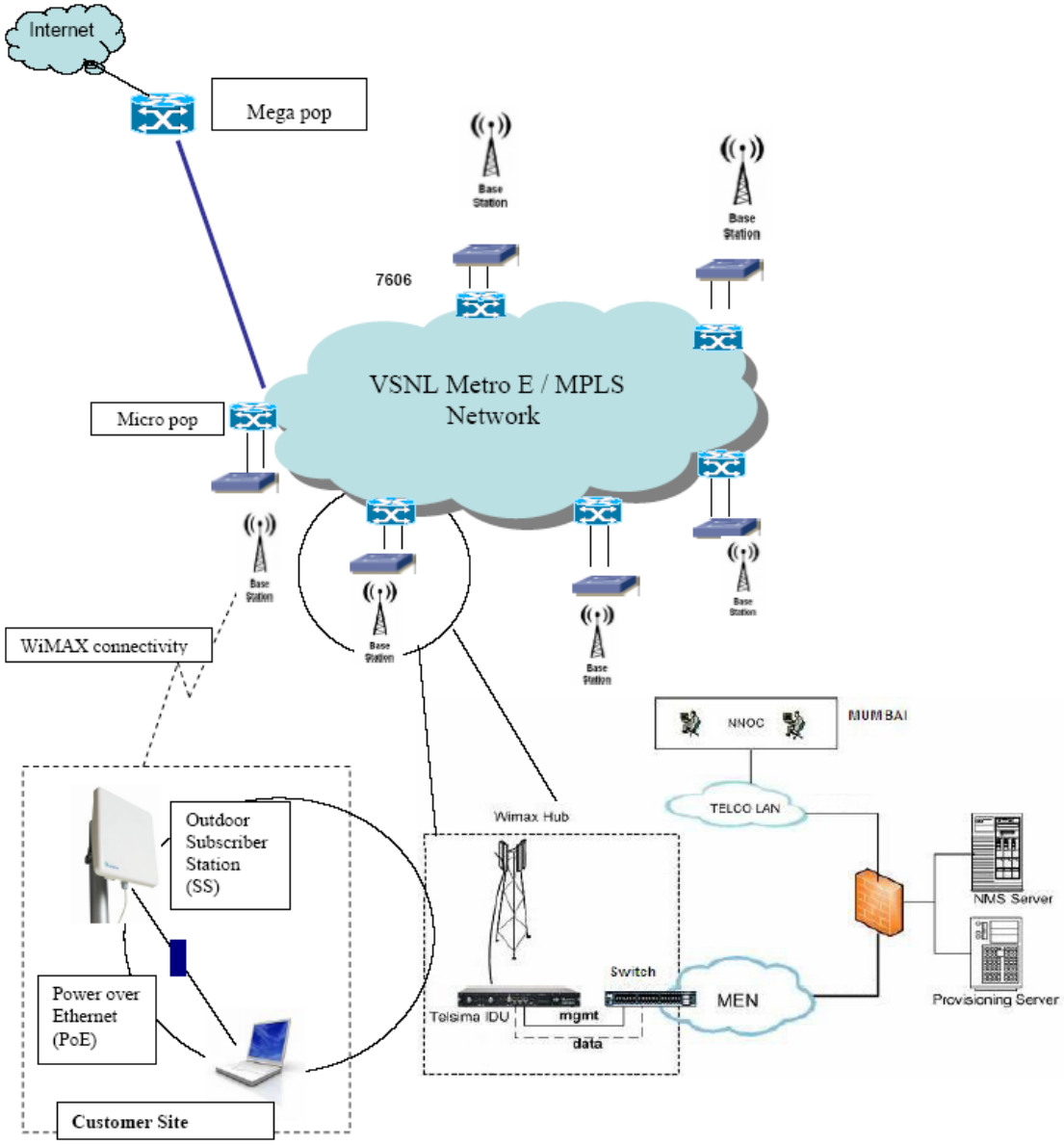
WiMAX based last mile access is a secured air link between the Tata Communications node and the customer premise with a committed bandwidth, utilizing licensed and protected frequency band(3.3 – 3.4 GHz) for operation.

The Data rates for WiMAX can reach upto 6 Mbps per sector. This air link has Ethernet (10/100 Base T) interface as a standard service delivery interface.

# 3 Architecture and Advantages

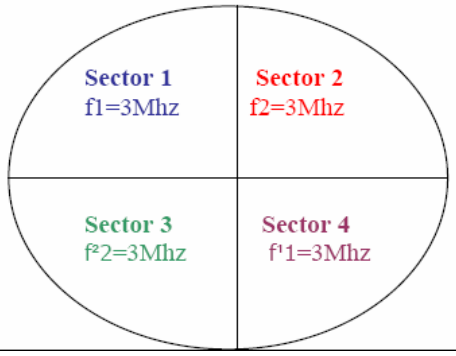
Tata Communications has been allocated the 3.3 – 3.4 GHz frequency bands for all the cities considered for launch of this service. The WiMAX network is designed for carrier-class operations. WIMAX offers “efficient multiple access” capability which allows users sharing aggregate bandwidth to have higher individual throughput. It can easily be scaled to cover larger areas and add more users and deliver faster data rates at longer distances as compared to other last mile implementations.

**Schematic of implementation of WiMAX at TCL**

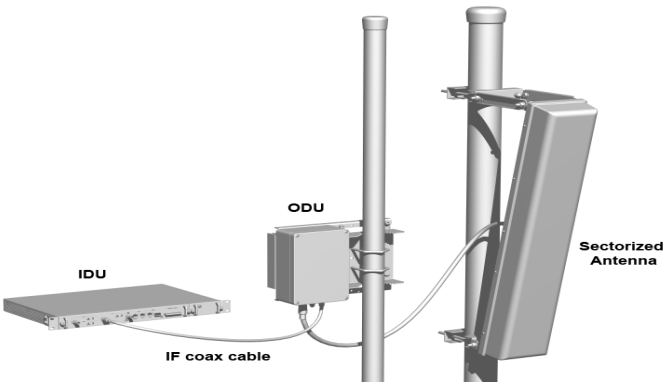


## Base Station Deployment Models

| | |
|---|---|
| **WiMAX Band** | **3.3-3.4 GHz** |
| **Total Frequency Spots per base station** | **2 frequency spots,<br>f1 = f2 = 6 MHz each** |
| **Base Station (BTS) deployment mode** | **FR4 Mode** |

| FR4- 4 Freq Spots of 3MHz each / BTS | Bandwidth Throughput under FR4 Mode |
|---|---|
|  | ➢ f1=f2= f'1=f'2= 3 Mhz<br>➢ f1+f2+f'1+f'2= 12 Mhz<br>➢ 12 Mhz * 2 (spectral efficiency)= 24 Mbps<br>➢ Per Sector Throughput= 6Mbps (24/4)<br>➢ **With 60:40 TDD spilt (in cities with Retail Deployment)**<br>**4 Mbps downlink & 2 Mbps uplink**<br>**With 50:50 TDD spilt (In cities with no Retail) 3 Mbps downlink & 3 Mbps uplink** |

## Base Station Set-up




The Telsima Base Station (Star MAXTM 4100) consists of –

- **Indoor Unit (IDU)**
- **Outdoor Units (ODU)**
- **Antennas**

Each base station would have a single IDU and can support a maximum number of 4 sectors, for which there will be a need for 4 numbers of ODU as well as Antenna's. Each sector would have a 90 Degree coverage zone

**Subscriber Station**

The Telsima Unit being deployed at client site is Star MAX 2150. Designed for full outdoor operation, Integrated antenna, PoE to subscriber (CPE)

**Typical Installation Examples**

This is most Common Deployment Scenario

- LMR (Lift Maintenance Room) or Water Tank is used for fixing the Mast
- Building Parapet wall is also used for clamping the Mast
- Up to 5 meters pole is allowed to be put up from the highest point of the authorized structure without any SACFA approvals
- Above 5 mtrs, we would need to deploy a mast/tower with SACFA approvals

The railing on Roof top / Balcony / Terrace can also be used for fixing the Antenna.

**Advantages**

- More Secure – Due to the incorporation of the Two – Stage Security processes. ( X.509 in the authentication process and 56-bit DES for the service flow)
- It is a based on the standardization specified under IEEE 802.16, thereby ensuring compatibility and Interoperability with other WiMAX equipment.
- Ability to provide connectivity where it would be difficult for wired infrastructure to reach
- Faster Built Up of network and also can be deployed in all cities with less capital when compared with wire-line services
- Provides Non- Line of Sight based connectivity-
- WiMAX is relatively unaffected by weather and foliage
- Scalability – Additional base stations can be added incrementally as demand for bandwidth grows
- Sub E1 Bandwidth requirements can be served
- Faster Feasibility & Implementation –
  - *By eliminating the Pre Installation on-site feasibility surveys.*
  - *No ROW Issues*
- Better Quality of Service – compared to other wire-less technologies
  - *For Real Time Applications – Voice & Video*
  - *Not Just Best Effort*.

# 4 Security in WiMAX

WiMAX_Security.pdf

# 5 Applications Supported

- Data
- Video (Buffered & Live streaming)
- VoIP & MVoIP
- Multi Cast Service.

# 6 Service Area Matrix

| Wi-Max RFS Cities – 125 | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Agra | 35 | Karnal | 69 | Mehsana | 103 | Pathankot |
| 2 | Ahmedabad | 36 | Kharagpur | 70 | Bhilwara | 104 | Panipat |
| 3 | Ajmer | 37 | Kolhapur | 71 | Bhatinda | 105 | Phagwara |
| 4 | Allahabad | 38 | Kottayam | 72 | Sambalpur | 106 | Uran |
| 5 | Allepey | 39 | Lucknow | 73 | Cuddalore | 107 | Panvel |
| 6 | Alwar | 40 | Ludhiana | 74 | Jamnagar | 108 | Karimnagar |
| 7 | Ambala | 41 | Madurai | 75 | Silvassa | 109 | Nizamabad |
| 8 | Amritsar | 42 | Meerut | 76 | Valsad | 110 | Kalyan |
| 9 | Anand | 43 | Mohali | 77 | Adoni | 111 | Dombivali |
| 10 | Asansol | 44 | Mysore | 78 | Guntur | 112 | Guwahati |
| 11 | Bangalore | 45 | Nagpur | 79 | Medak | 113 | Nagarcoil |
| 12 | Bareilly | 46 | Nellore | 80 | Rajahmundry | 114 | Tanjavur |
| 13 | Baroda | 47 | Noida | 81 | Chengalpatpu | 115 | Aligarh |
| 14 | Bharuch | 48 | Palakkad | 82 | Sriperumpudur | 116 | Bhavnagar |
| 15 | Chandigarh | 49 | Patiala | 83 | Tiruvallur | 117 | Gandhidham |
| 16 | Chennai | 50 | Pune | 84 | Jalgaon | 118 | Junagad |
| 17 | Coimbator | 51 | Ranchi | 85 | Solapur | 119 | Khamman |
| 18 | Cochin | 52 | Rourkela | 86 | Kota | 120 | Chitoor |
| 19 | Cuttack | 53 | Salem | 87 | Sonepat | 121 | Bellary |
| 20 | Delhi | 54 | Satara | 88 | Hassan | 122 | Surendranagar |
| 21 | Eluru | 55 | Shimla | 89 | Kolar | 123 | Navsari |
| 22 | Ernakulam | 56 | Surat | 90 | Tumkur | 124 | Dhule |
| 23 | Faridabad | 57 | Thiruvalla | 91 | Dhanbad | 125 | Latur |
| 24 | Gandhi Nagar | 58 | Thrissur | 92 | Bhillai | | |
| 25 | Ghaziabad | 59 | Trivendrum | 93 | Korba | | |
| 26 | Gurgaon | 60 | Tuticorin | 94 | Kakinada | | |
| 27 | Hissar | 61 | Vijayawada | 95 | Tirupati | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 28 | Hosur | 62 | Vizag | 96 | Warangal | | |
| 29 | Hyderabad | 63 | Mumbai | 97 | Dharwad | | |
| 30 | Jabalpur | 64 | Kolkata | 98 | Kancheepuram | | |
| 31 | Jaipur | 65 | Ankleshwar | 99 | Mangalore | | |
| 32 | Jamshedpur | 66 | Gorakhpur | 100 | Vellore | | |
| 33 | Jhansi | 67 | Rohtak | 101 | Belgaum | | |
| 34 | Jodhpur | 68 | Himmatnagar | 102 | Rudrapur | | |

# 7 Service Delivery Process

Expectations from Customer:

| Requirement | Description |
|---|---|
| **RoW** | Right of Way (RoW) permission for cables, existing cable trays, conduits routing at customer premises, at no cost to Tata Communications |
| **Site Access and Permissions** | Site access and permissions for fixing the ODU, IDU at customer premises; site access to Tata Communications' designated vendor for installation of the radio units at no cost to TataComm |
| **Site Requirements** | _ Regulated / un-interrupted AC power supply at IDU location<br>_ Earthing point near ODU and IDU locations<br>_ Mast arrangement of required height<br>_ Electricity bill / property bill receipts for the customer premises<br>_ Protection for the IDU and ODU from physical damages<br>_ Authorization for Tata Communications to install radio equipment at customers' premise without liability |