An Investigation Study WiMAX Network Monitoring and Analysis Industrial Quality Management

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Abstract: *The WiMaxclaims to provide mobile broadband coverage, full Strength signal with mobility, portability and tractability till the long distance end point. In this project I use various tools for testing the signal strength with point to point mobility within the WiMax cell. The purpose of this study is to check the reliability and prime functionality minimize the waste (Agile), reduce the defect (Sigma), portability with mobility with the help of KPI,SSR and to provide quality management in IT real world.The objective is to monitoring and analysis of IEEE and WiMax throughout the network in the targeted areas as sample for the test to detect user problem in real world. The Sample test area of Karachi Divide in to two rings with 9 Cluster in between Centrum Cluster is deployed they containing microwave link and the fiber optics. Clusters points are provided for testing 40 in Hyderabad and 30 in Sukkur less than 15 meters of diameter. Various applications are use in the test like Matlab, Real Time Alarm, DU Meter, Portal Element Management System etc. to discuss the Noise Carrier for Ratio of interface & RSSI, Data rate and modulation schemes.*

Keywords: Backhaul*= Replacement of wireless from wired,* ***Latency****= Delay in system Process by input to illustrate outcome,* ***RSSI****= Received Signal Strength Indicator,* ***Stera****= Cannot be definable in most of dictionaries ,****WiMAX****= WorldWide Interoperability for Microwave Access Or known as 4G network*

I. Introduction

In the mid 1990's, telecom affiliations built up the thought to utilize settled broadband remote systems for potential last mile answers for give a substitute. Their indicate was pass on a system with dependability of a hardwired structure, while remaining mindful of the adaptability, straightforwardness, and low expenses of a remote system. This headway would in like way go about a flexible framework in support of commercial or institutional backhaul dispersal engineers furthermore would effort in the direction of battle through the rule Internet bearers. Video calling is dreaming more. In the nineteen ninety nine ERICISSON demonstrate the first video call. Where number of services provider facilitate WiMAX, in all of them only four ISP have great fame Pakistan and in these the Wateen has secured top of the most over all in Pakistan's service provider for WiMAX. I do the research study in the direction of authenticate and corroborate WiMAX signals as per standards made by WiMAX forum and IEEE, all the way through region wide population sample with usual different apparatus, applications, antenna and drone with setup vehicle with different parameters as allowed by the standards for remarkable real world. Subscribers can used advanced telephony, surf the internet at super-fast speed, make video calls and watch IP-TV through the comfort and ease afforded by a single connection. The Wateen telecom is the first company in the world to roll-out the Wi-MAX network at a country wide scale. Wi-MAX is standards-based technology enabling the delivery of last mile wireless broadband access as an alternative to wired broadband like cable or DSL. With globally renowned partners such as Motorola, Cisco and Intel, the stage set to revolutionize the way you use technology! With Wateen'sWi-MAX network you get access to:Broadband internet with up to 2Mbps dedicated speed.Telephony with over 40 value added features, andfully secured high-speed data networks. Statement of Problem is as investigation study WiMAX network and analysis industrial quality management. What is the signal strength in real life and simulation based scenarios? Is signal are providing as per standard or the service provider claim? Is WiMAX given effective signals in cell till end mile access with mobility and portability? Are the antenna and other nodes are assembled properly or I not assembled proper then what's the effect on the result? Verify the cell shape as per standard or not? Is actual capability provided in real or not? I concentrate on the Wi MAX Network Monitoring investigation in the real world WiMAX systems. The subtle elements of the usage, Monitoring and investigation with Quality of Service in the Wi MAX system engineering will be introduced. It incorporates the meaning of different administration streams characterized by the IEEE 802.16 standard. The restrained elements of the system's usage, Monitoring and examination are exhibited. To investigate the parameters recreation in view of the prevalent system are utilized. Different parameters that decide Quality of Service of genuine use situations and movement streams of uses is broke down. The objective of the study is focused nationwide monitoring WiMAX signals as in real world also compared with standards of WiMAX forum and IEEE standards as well. I focused especially south region cover Sind and Baluchistan rural (country side areas) and urban areas. In this study I used different software and application use Google earth, drone, ping navigation management, MapInfo

and CPE also others. Use parameters like as jitter, delay, throughput and etc. Mostly researchers are worked on simulation based for real world scenarios and they claimed it's like a real. The uniqueness of my work is real work in real world with WiMax service provider tool and software with nodes of network. DU meter and a NET meter for compression the values as validation.

II. Methodology

1. Introduction

The era for continuous improvement through 5S, Agile, 6-Sigma to minimize losses enhance quality, mitigate risk, without delay communication till end mile using multiple service of internet and mobile telecom with bespoke application etc. It becomes ease to follow as per standards. The paper is based on study research project for M.Phil, An Investigative study WiMax Network Monitoring and Analysis Industrial Quality Management with improvement of QoS through various real tests and analysis rather than the simulation. Sampling is carried out from the southern region, where the box Karachi is divided into 2 rings (cover / contain complex 9 cluster areas), one connected via a radio link & eight are linked with optical fibers. One cluster used as interface / bridge between the two metropolitans. Fifty points were tested from original coordinates provided within fifteen meters in Hyderabad, 30 point in Sukkur. In this paper discuss obstacles, constraints, data rate, use of parameters, modulation schemes, SR sheets, KPI and RSSI with greater mobility, portability and accessibility till end mile of WiMAX cell. Many applications and software are used, some elements like portal management system, MATLAB, Real-time & ELTEK alarm and DU meter net meter etc.

1.1 Basic Goal of Network Management

There are generally three basic goals of network management.
- Fault monitoring.
- Account monitoring.
- Performance monitoring.

Fault monitoring refers to the measuring the faults in the network. Fault monitoring deals with the various layers of the network. When a problem occurs, it can be in different layers. Thus, it is important to know which layer is having problem.Account monitoring measures how the user uses the network. The network keeps a record of the devices used by the user. This type of information is used for billing user for network usage and for future network usage. Performance monitoring deals with measure the performance of the network. It measures the time duration in which network does the work. It also measures how slow or fast is the network.

1.2 Wateen Telecom Limited:

Wateen'sWi-MAX is standards-based technology enabling the delivery of last mile wireless broadband access as an alternative to wired broadband like cable or DSL. With globally renowned partners such as Motorola, Cisco and Intel, the stage set to revolutionize the way you use technology! With Wateen's Wi-MAX network you get access to:
- Broadband internet with up to 2Mbps dedicated speed.
- Telephony with over 40 value added features, and
- Fully secured high-speed data networks

Subscribers can used advanced telephony, surf the internet at super-fast speed, make video calls and watch IP-TV through the comfort and ease afforded by a single connection. Wateen Telecom offers a complete range of Telecom and Multimedia services like fixed wireless and mobile telephony, broadband for data, internet and TV/Multimedia along with other value-added services and applications to set the standards for a new era of communication in Pakistan.

2. Methodology

Network including wireless and wire line are converging towards mobile broadband allowing for greater mobility providing user experience similar to what a user will have in an office LAN environment. Wi-MAX the Worldwide Interoperability for Microwave Access, is an telecommunications technology aimed at providing wireless data over long distances in a variety of ways, from point-to-point links to full mobile cellular type access. It is based on the IEEE 802.16 standard which is also called Wireless MAN. Wi-MAX allows a user, for example, to browse the Internet on a laptop without physically connecting the laptop to a wall jack. The name Wi-MAX was created by the Wi-MAX Forum, which was formed in June 2001 to promote conformance and interoperability of the standard. The Forum describes Wi-MAX as a standard-base technology enabling the delivery of last mile wireless broadband access as an alternative to cable and DSL. The Network monitoring is the use of a system constantly to monitor a computer network for slow or failing components that notifies network Engineer about the current situation of the network via email, SMS or alarms. Network monitoring applications are created to collect data for the network management applications. Network monitoring is used to

monitor different threats from outside and inform the administrator about the threat. It is also monitors problems caused by overload or crashed servers, network connections or other devices. It also includes the monitoring of CPU usage, storage, virus and server proxies.

3. Instrument developing and construction

The service provider network is well structured over all in Pakistan and claimed the No. 1 in Pakistan. The biggest network monitored by several tools and documentations. The few of tools or software are also available on internet as web based applications as well as bespoke software available like metacafe, DU Meter and Net Meter for downloading and uploading speed monitoring. Tailored software utilized for signals strength name as MOTOWI[4] and CPE at customer end, the DAP analysis for nationwide. Perform for this research wondering the south region cluster points and base station or available sites around under fifteen (15) meters and take test for. Use drone with receiver and vehicle with WiMAX node connected to network through providing high speed for validate the mobility with portability till the last mile access.

3.1 Requirement List

There are many of things, I required for the purposes of the performing this research are as:
a. First of all the tools or software or application.
b. Transportation
c. Access id and password where needed
d. Customers complain report sheets.
e. Work force complains sheet.
f. Problem resolve sheet which have done job.
g. Laptop.
h. Indoor and outdoor antenna.
i. All network nodes.

3.2 Research Tools / Instruments

The sampling gather by the Network monitoring is the use of a system constantly to monitor a computer network for slow or failing components that notifies network Engineer about the current situation of the network via email, SMS or alarms. It is used for network management. The purpose of network monitoring is to collect information for the network management. During my study project work at Wateen Telecom the major responsibilities which I gone through with different tools are used for network monitoring sampling such as:

- Motorola Portal EMS Network Topology [Wateen]
- EMS
- Real time alarm viewer and management.
- Statistics storage.
- DU Meter
- Drones
- CPE
- MOTOWI4
- Metacafe
- Network management System
- KPI and SR Reporting Sheets
- Drive Testing.
- Nationwide network Monitoring.
- Call Testing etc.

4. Population

The targeted sampling populations are based on the areas or cluster points or base stations where I perform test for project work, which are consist of different cluster points of south region of Pakistan. The service provider for WiMAX, which take in hand on my project in Pakistan mainly have two of integral parts as region as cluster points and metropolitan rings for communication and WiMAX transmission management, integration, improvement and analysis. These are nationwide but important which is discuss in this research intended for network monitoring targeted sampling population are as follow:
a. Nationwide monitoring cover whole country service provider network (end to end).
b. Two (2) metropolitan ring containing nine (9) cluster points contain 84 sites or base stations were tested in Karachi in the region of ten (10) to fifteen (15) meters.

c. Fifty (50) cluster points provide in Hyderabad, where thirty one (31) were tested in the region of ten (10) to fifteen (15) meters.

d. Thirty (30) cluster points were provided in Sukkur, where seventeen (17) was tested in the region of ten (10) to fifteen (15) meters.

e. South region vise Service Request report cover all cluster points end to end. South region vise Key Performance Indicator report cover all cluster points end to end.

5. Drive Testing

Through the DRIVE TEST analysis user validate the real signals strength and comparison with standards as they follow for validation in WiMAX environment. The CPE tool is use or the validation of real world with standards of WiMAX as it is linked with internet access. The parameters are playing significant role to evaluate or observe the performance of it.

- Parameter.
- Frequency.
- RSSI
- CNIR
- Modulation Techniques.
- Preamble Index.
- Data Rates (With the help DU Meter)
- Data Rates (With the help Net Meter)

5.1 Drive Test Analysis:
For Hyderabad Field Points
During study project Field work, I analysis and observe coverage issue nodes tested for ATP at Hyderabad with various ends. My observation is also focuses to comparison at all points signal strength values with their standards values. The points or Base Stations were tested around less than 15 meters radius but in few cases may be more.
For Sukkur Field Points
Taken as a whole the 35 points were provided by authority to me for my project work for validation and observation. Observed received signals strength lees or equal fiteen meters diameter from original coordinate.
For Karachi Network
Karachi is a metropolitan area so it's handling as rings holding clusters through less than 100 sites are connected. Fewer cluster links with one to other through fiber and only DHA cluster connected through Microwave Link from Business Avenue cluster.

6. Network Monitoring

The monitoring of the network throughout countrywide DAP weather status check and the site up or down with the help of PEMS software.

7. SR Reporting Sheet

Under then monitoring of network if status downs of any of sites then automatically a request generated. In case request is not generate then admin or user call to service provider for generate the request which helping to maintain service request sheet daily.

8. KPI Reporting Sheet

KPI sheet maintain by service provider staff on daily basis also audited it and the KPI sheet based on the customers faces problem in WiMAX for static history for improvement and betterment.
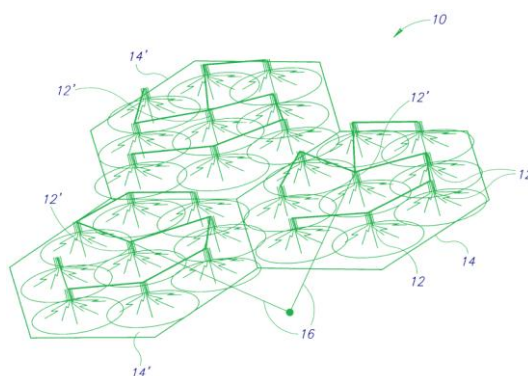
Reference: Standard Cell for WiMAX by WiMAX Forum and IEEE

III. Result and Analysis

1. FINDINGS

Karachi is covered by two rings and cluster points in the rings rather than hexagonal shaped cell domain as defined in standards for every BS and MS domain. Due to the road access issue in different areas or cities of south region are not reached able also unavailable of security is biggest issue, law and order situations and the location is not urbanize as counterpart of the metropolitan areas. In Korangi cluster point found weak signals or packet lost in almost throughout the cluster points. I can observe the poor signals over their as comparatively the other part of metropolitan area or Karachi. The distance from the base station may one of the fundamental reasons of it. Huge amount of variation found in CINR in modulation scheme in the same cluster points. Observed Received Signals Strength Indicators also validate the Korangi cluster points comparatively not equal or better than other cluster points especially the inherit micro wave access link cluster too. Due to fields and crops in Korangi cluster points are really effected on received signals, also the vanishing the multi path transmission of signals cause by the factual topography reason. In the south region most of the point was tested around 10 to 15 meters from the original coordinates. The received signals level is highly affected by flora and obstacles. Some of the cluster points were tested around 15 to 20 meters from the original coordinates in Sukkur area. The highly affected by Obstacles at received signals level in Sukkur cluster points.

1.1 Key Points during ATP Field in Hyderabad:
Most of the pointy were tested around 10 to 15 meters from the original coordinates.
The received level is highly affected by Vegetation and Obstacles.

1.2 DRIVE TEST Analysis of Hyderabad Field Points:
During Field ATP at Hyderabad, I saw that in most points we get different signal strength values than the original values, but in most cases we get a much better coverage and much better data rates then the calculated values. Overall 50 points were provided. Where 31 points were tested on which the CPE was camped. 17 points were Inaccessible due to road access issue and only on 2 points the CPE was unable to Camped.

1.3 Key Points During Field ATP in Sukkur:
Few of the point were tested around 15 to 20 meters from the original coordinates. Most of the points were tested around 10 to 15 meters from original coordinates. The received level is highly affected by Obstacles.

1.4 DRIVE TEST Analysis of Sukkur Field Points:
Overall 30 points were provided.
17 points were tested on which the CPE was Camped.
13 points were Inaccessible due to road access issue.

1.5 Key Points During two Field ATP in Karachi:
Hence by comparing the two clusters of Karachi i.e. Korangi Router cluster and Business Avenue cluster through graphical representation we observe that Business Avenue Cluster have a good coverage and signal strength as most of the points are on open location. Some of the key factors from which you can differentiate the two clusters are as follows:
In Korangi cluster some of the points are not accessible due to road access issue as the location is not so much urbanized.
By observing modulation scheme parameter Business Avenue cluster got almost greater modulation and coding scheme as most of the points of Korangi cluster are at more distance from base station than Business Avenue cluster.
Carrier to interference noise ratio varies according to modulation scheme means greater the modulation scheme greater will be its CINR value. This can be clearly seen to the above chart.
Through RSSI (Received Signal Strength Indicator) value the coverage of any network can be evaluated hence by comparing the RSSI values of two different clusters we can observe that Business Avenue cluster has a good coverage.
Some of the factors from which the coverage of the network varies are fast fading. Due to terrain we get more reflected signal i.e. multi path propagation of signals.
Hence due to obstacle and vegetation the received signal is highly affected.

2. RECOMMENDATIONS / SUGGESTIONS
2.1 Integration:
Vertical integration in the technology of microwave are interconnects Multi level as hybrid topology. On the bases of this providing like new canvas to draw multiple or several region of flat grow response in local area of

network for potential effort. There are many of domains open as for future strategic work with per early planning & document work need with quality of service for 5G, 6G, and 7G off course LTE in metropolitan areas of Pakistan as well as country side areas. It requires as per standard or developing new standard as demographic bases of Pakistan or other country where these technology are away, far away or in pipelines.

2.2 Video Streaming:
Due to expansion of multiple TV channels, IP TVs, Social media & social media channels are demanding without delay end to end packet transferring through WiMAX without packet loss. It's hard to accurate but can mitigate. In this use appropriate integrated algorithm facilitate hybrid topology, No extra MAC enable for under the table solutions, MAC filter are use, no foreign user to prevent the hacker limited a few amount of guest allow with pre define time slot base on multiplexing. User datagram protocol with MAC filter for user who allow by the authority will given better result but it need more work on ground level. The nodes which use for UDP are must be QC passed with fault free electrical or mechanical overall engineering work. When assembled then they proper assembled no lacking in it for better result. Design must be prevent the draw effect of high windy or mitigate the risk of packet loss due to swiftness of wind as well as delay in packets or buffering. The end user has highly demanded one click result beyond the limitation with greater portability.

2.3 Antenna installation on high rise buildings:
If the deployment of antenna and other transmitting WiMAX nodes at heavy windy areas effect on signals, so in this regard give selecting strapping structures, mounting antennas in high or good quality with flexible proper fixed can alleviate or mitigate the risk.

2.4   Effect of pollution on WiMAX:
The gigantic problem or challenge for metropolitan areas is pollution, whenever Karachi is the five most polluted city of the world in the year 2016. Here number of contamination like noise, dust etc also face heat wave (high temperature), smog and smoke, where the garbage along streets green belts and grounds which generate toxic gasses. The deployment of nodes for WiMAX, The question is over the entire can affect on the signals of WiMA?
The answer is "Yes" and "No" both.
In condition of "Yes" do not designee proper antennas. The Engineering mistakes in it for the relevant frequency.Not proper mount. In the condition of "No"The antennas designee is proper for relevant frequencies. No engineering mistakes or malfunction in it and if it's proper mount as per standard.

### 2.5 Security concern for future and current implementation:
Whatever the technology is old or new the issue of the era is security as well as in software, applications, networks and transformation of data or data in bank. Every new sun rise technology meets newer susceptibility. I purposed to build up are for WiMAX additional efficient and secured network.Mode must integrate every after random period decided by experts of organization.Must be developed secure handshaking, especially for new neighbor found.Message management must be used with control like as other technologies available in market today or the message management need to integrate till more secure.The R&D department already in the way of continues improvement for

IV.   Figures and Tables
TABLE 1

Name	frequency	Preamble Index	RSSI	CINR	Speed UL	Mod DL	Mod UL
KHI1	3460.75	20	-88	9	190 Kbps	QPSK	QPSK
KHI2	3460.75	20	-64	26	1.38 Mbps	64 QAM	16 QAM
KHI3	3560.75	49	-58	28	1.38 Mbps	64 QAM	16 QAM
KHI4	3492.25	86	-78	16	1.98 Mbps	16 QAM	16 QAM
KHI5	3492.25	20	-61	28	369 Kbps	64 QAM	QPSK
KHI6	3592.25	27	-85	13	210 Kbps	QPSK	QPSK
KHI7	3592.25	23	-82	10	223 Kbps	QPSK	QPSK
KHI9	3560.75	49	-86	14	112 Kbps	QPSK	QPSK
KHI10	3592.25	27	-63	24	1.38 Mbps	64 QAM	16 QAM
KHI11	3560.75	57	-72	21	447 Kbps	64 QAM	16 QAM
KHI12	3460.75	28	-81	19	503 Kbps	64 QAM	16 QAM
KHI13	3460.75	24	-93	9	314 Kbps	QPSK	QPSK
KHI14	3492.25	82	-61	28	876 Kbps	64 QAM	QPSK
KHI15	3492.25	82	-80	18	787 Kbps	16 QAM	QPSK
KHI16	3592.25	19	-84	11	110 Kbps	QPSK	QPSK
KHI18	3560.75	61	-86	13	670 Kbps	16 QAM	QPSK
KHI19	3560.75	53	-79	18	1.21 Mbps	16 QAM	16 QAM
KHI20	3460.75	16	-96	8	189 Kbps	64 QAM	QPSK

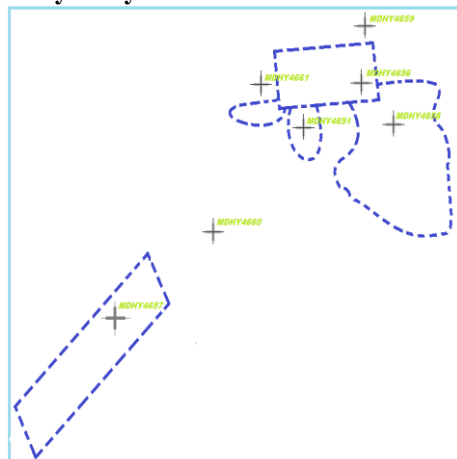**(Reference: Real Signals Coverage Sheet for Wateen Karachi Network)**
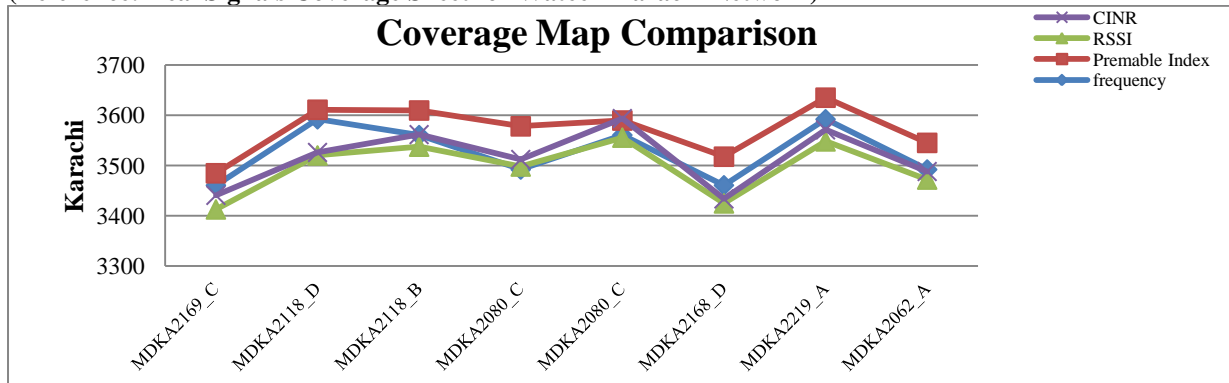
(Reference: Signals Coverage Comparison on the Bases of Sheet forWateen Telecom Karachi Network)
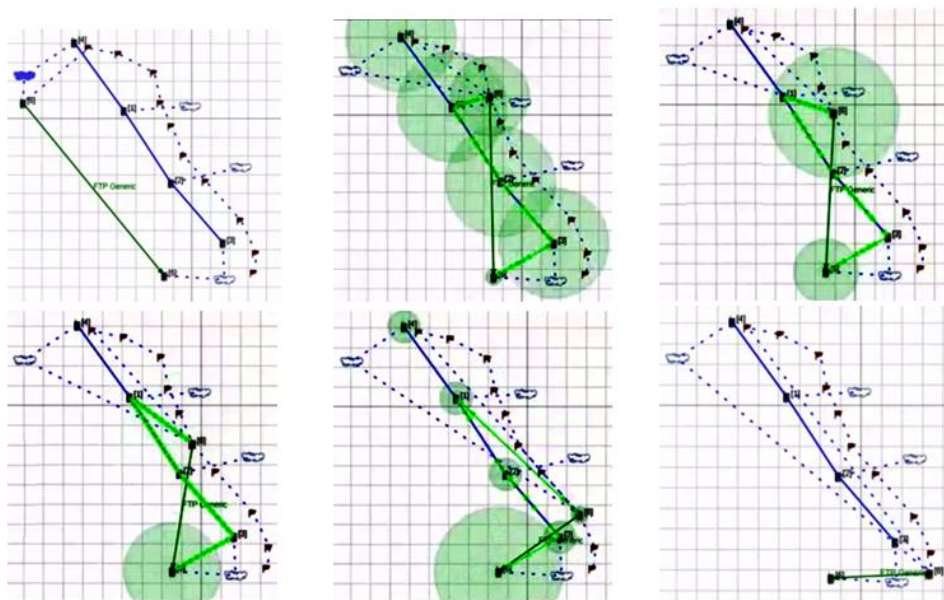
Reference: Real PING Navigation through NTM System South Field Cluster Points at Wateen Network

Coverage Map
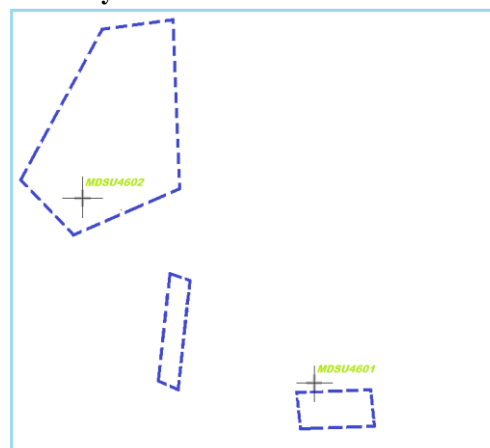
DT Analysis Hyderabad Field Cluster
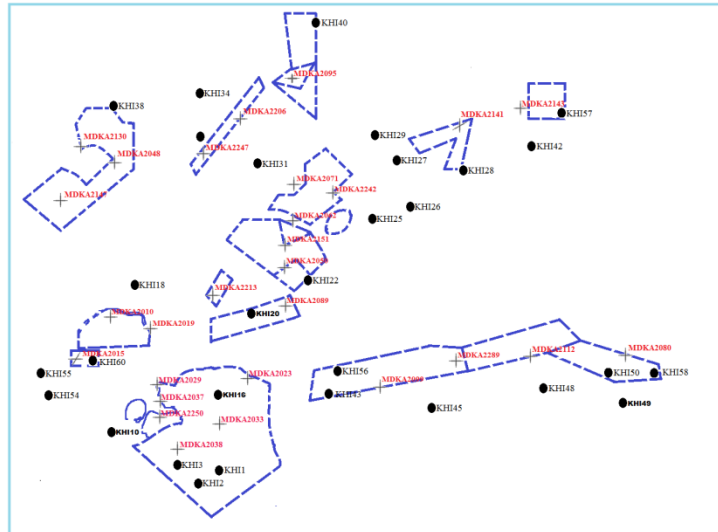
DT AnalysisSukkur Field Cluster Points

Reference: Real Coverage Map Based on Drive Testing Analysis of Hyderabad Field Cluster Points of Wateen Network Telecom for WiMAX Service Provider

Reference: Real Coverage Map Based on Drive Testing Analysis of Sukkur Field Cluster Points of Wateen Network Telecom for WiMAX Service Provider

Reference: Real Wateen Telecom Drive Testing snap shot for cluster point Korangi and cluster point Business Avenue Karachi Network from Drive Testing Application

TABLE 2

S.No	Name	Longitude	Latitude	Parent Sector	Frequency	Premable Index	RSSI	CINR	Modulation DL	Modulation UL	Speed UL	Speed DL	Latency	Jitter	Disconnection	Longitude (If Changed)	Latitude (If Changed)
KORANGI																	
95	KHI95	67.1992	24.8553	MDKA2118_D	3592.25	19	-91	6	QPSK	QPSK	222 Kbps	410 Kbps	450	230	0	No Chaged	No Chaged
96	KHI96	67.2067	24.8443	MDKA2118_B	2580.75	49	-72	24	64 QAM	16 QAM	336 Kbps	2.4 Mbps	68	76	0	No Chaged	No Chaged
100	KHI100	67.1519	24.8408	MDKA2230_B	3580.75	53	-96	4	-	-	-	-	-	-	-	Dumping Issue	No Chaged
98	KHI98	67.1491	24.8274	MDKA2104_B	3560.75	61	-	-	-	-	-	-	-	-	-	Camping Issue	No Chaged
102	KHI102	67.2248	24.8345	MDKA2369_A	3460.75	28	-61	22	64 QAM	16 QAM	1.03 Mbps	1.9 Mbps	69	72	0	No Chaged	No Chaged
174	KHI174	67.2441	24.8608	MDKA2371_A	3460.75	16	-75	24	64 QAM	16 QAM	1.12 Mbps	2.56 Mbps	366	110	0	No Chaged	No Chaged
98	KHI98	67.2351	24.8522	MDKA2080_A	3460.75	20	-73	8	QPSK	QPSK	334 Kbps	550 Kbps	58	76	0	No Chaged	No Chaged
90	KHI90	67.1881	24.8414	MDKA2112_B	3460.75	61	-85	13	16 QAM	QPSK	670 Kbps	1.3 Mbps	65	77	2	No Chaged	No Chaged
170	KHI170	67.127	24.8437	MDKA2219_D	3592.25	19	-85	5	QPSK	QPSK	78 Kbps	135 Kbps	98	109	1	No Chaged	No Chaged
92	KHI92	67.1407	24.844	MDKA2219_A	3460.75	18	-95	8	QPSK	QPSK	189 Kbps	332 Kbps	235	70	0	No Chaged	No Chaged
BUSINESS AVENUE																	
136	KHI136	67.036	24.8475	MDKA2019_B	3560.75	61	-76	21	64 QAM	16 QAM	1.34 Mbps	2.3 Mbps	55	62	0	No Chaged	No Chaged
137	KHI137	67.0275	24.8434	MDKA2019_C	3492.25	94	-88	7	QPSK	QPSK	109 Kbps	776 Kbps	74	71	0	No Chaged	No Chaged
138	KHI138	67.0207	24.8483	MDKA2019_D	3592.25	31	-59	23	64 QAM	16 QAM	1.45 Mbps	2.4 Mbps	67	71	0	No Chaged	No Chaged
18	KHI18	67.044	24.8143	MDKA2033_D	3592.25	23	-90	16	16 QAM	16 QAM	230 Kbps	949 Kbps	200	64	0	No Chaged	No Chaged
27	KHI27	67.057	24.8129	MDKA2033_B	3560.75	53	-45	28	64 QAM	16 QAM	1.04 Mbps	2.20 Mbps	64	68	0	No Chaged	No Chaged
20	KHI20	67.0327	24.8038	MDKA2038_D	3592.25	19	-55	21	64 QAM	16 QAM	1.2 Mbps	2.2 Mbps	223	100	0	No Chaged	No Chaged
72	KHI72	67.0859	24.8803	MDKA2169_A	3460.75	16	-83	13	QPSK	QPSK	211 Kbps	762 Kbps	64	75	0	No Chaged	No Chaged
88	KHI88	67.0836	24.872	MDKA2169_C	3492.25	82	-81	28	64 QAM	QPSK	876 Kbps	2.23 Mbps	61	58	0	No Chaged	No Chaged
87	KHI87	67.0899	24.8703	MDKA2169_C	3492.25	82	-80	18	16 QAM	QPSK	787 Kbps	1.12 Mbps	60	62	0	No Chaged	No Chaged

Reference: Real Wateen Telecom Drive Test comparison sheet snap shot for cluster point Korangi and cluster point Business Avenue Karachi Network from Drive Testing Application

TABLE 3

Combinations	Alarm Detail	Relay I	Relay II	Relay III	Relay IV	AVR
1	Normal Operation	No	No	No	No	No
2	Battery Fuse	Yes	No	No	No	No
	Load Fuse	Yes	No	No	No	No
	Critical Rectifier Fail	Yes	No	No	No	No
3	HIGH Battery Voltage	No	Yes	No	No	No
	LOW Battery Voltage	No	Yes	No	No	No
4	1 Rectifier Fall Alarm	No	No	Yes	No	No
	Battery Symmetry Alarm	No	No	Yes	No	No
	High Temperature	No	No	Yes	No	No
5	Air Con	No	No	No	Yes	No
6	AVR	No	No	No	Yes	Yes
7	Status Pal	Yes	Yes	Yes	Yes	Yes

RELAY I	Critical
RELAY II	Major
RELAY III	Minor
RELAY IV	Air Con
AVR	AVR

Reference: Real world ELTEK alarms from Wateen network portal

TABLE 4

SR No.	Priority	Case Title	Open Time	Current Status	RCA / Comment
2203951	P4	KAR HYD 01 X SITE NVIP MNHY4653 - Site is Down	Aug, 04 - 2015 12:28:23	Resolved	Due to power fluctuations,BCU power cable was short circuited Cable was rep
2203975	P3	KHI NSA Packet-Korangi router has environeental Alarm	Sep, 17 - 2015 16:30:43	Awaiting LOAcot Team	
2203985	P3	KHI NSA Packet-7613 touter has environeental Alarm	Sep, 28 - 2015 17:30:43	Awaiting LOAcct Team	
2203975	P3	KHI NSA Packet-Korangi router has environemental Alarm	Oct, 20 - 2015 23:02:51	Awaiting Customer	
2204073	P4	KAR HYD NVIP 01X Sector MNHY4167-Sector D is in Dormant State	Oct, 22 - 2015 17:08:23	Resolved	RCA Site controlled card has been replaced Sector is now up
2193856	P4	KHI P4 MDKA2147 Not accessible from NOC	Nov, 20 -2015 19:08:23	Case Closed	Closing case after customer confirmation
2195573	P2	KHI P2 SA MDKA 2255-Sector D is not accessible	Dec, 13 - 2015 18:09:03	Case Closed	Sector was UP Services were ok Only loss of visibility
2197159	P3	KHI P3-Data rate issue in Karachi-Lahore & Karachi-Islamabad VPN	Dec, 27 - 2015 20:30:43	Case Closed	Frequency was changed from Lahore end. End to End conectivity was checked
2201925	P4	KAR HYD 02 X SITES NVIP MDHY4651 MDHY 4658-Sites are not accessible from	Jan, 19 - 2016 18:08:23	Resolved	No repetitive Alarm Reported at the sites
2202550	P4	KAR SKR 01 X SECTOR NVIP MNSU 4601 Down-Sector D is fluctuating	Jan, 19 - 2016 20:02:51	Resolved	No repetitive Alarm Reported at the sites
2203704	P4	KAR KAR 01 X SECTOR NVIP MDKA2155-Sector C is Down	Feb, 14 - 2016 16:08:23	Resolved	APDiag was run and sectors were reconfigured
2199304	P4	KAR P4 Down-MDKA2128 Sector B is not accessible from NOC	Apr, 18 - 2016 13:45:43	Case Closed	Modem was in rolling After swapping the modem the sector is UP
2200743	P4	KAR KAR 01 X SECTOR NVIP MDKA2168 DOWN-Sector A is down	May, 18 - 2016 20:09:03	Case Closed	Dupliucate SR, SR2200920 is addressing this issue
2200920	P4	KAR KAR 01 X SECTOR NVIP MDKA2168 DOWN-Sector A is down	May, 18 - 2016 17:38:13	Case Closed	Sector is UP after replacing the RF head
2200953	P4	KAR KAR 01 X SECTOR NVIP HUB10 DOWN-Sector D is down	Jun, 07 - 2016 09:12:52	Case Closed	Sector is UP after replacing the RF head
2201205	P4	KAR KAR 02 X SECTORS NVIP MDKA2023 DOWN-Sector A.B is down	Jun, 22 - 2016 14:38:13	Case Closed	Sectors were down due to fiber breakage.
220703	P4	KAR KAR 01 X Site NVIP MDKA2033 DOWN-MDKA2033 is not accessible	Aug, 11 -2016 16:45:22	Case Closed	Site went down due to Activity going on by SI. It came UP after reloading
220565	P4	KHI P4 Down-MDKA2196_A is inaccessible from NOC	Aug, 17 -2016 16:38:13	Case Closed	RF head was replaced during the activity Sector is now UP.
2204292	P3	KHI KHI COMPLT VOL VO INT MDKA2219-CPE hang issue	Oct, 10 - 2016 12:12:52	Awaiting LOAcct Team	
2204296	P3	KAR NSA PACKET-Karachi Ring 1 is in protection state	Oct, 14 - 2016 10:12:52	Case Closed	RCA Fiber Cut
2204285	P3	KHI KHI COMPLT Bank AlFalah Ltd VPN MDKA2245-CAMP DECAMP Issue	Oct, 24 - 2016 22:30:43	Awaiting Customer	

SR Reporting Sheet

TABLE 5

Case ID	Priority	Site ID	Opening Date	Status	RCA/ Comments	Restoration Time
2197213	P4	MDKA2087	Aug, 03 - 2015 10:28:23	Closed	Modems were in rolling and site was re-commissioned	Aug-03-2015 11:45:43
2197466	P4	MNHY4651	Aug, 06 - 2015 11:28:23	Closed	IDC cards were burnt at site MNHY4657 an	Aug-06-2015 12:45:43

					aggregate	
2193856	P4	MDKA2147	Aug, 24 - 2015 13:28:23	Closed	Closing case after customer confirmation	Aug-24-2015 14:45:43
2195072	P4	MDKA2011	Sep, 16 - 2015 14:28:23	Closed	ODU was faulty and hence replaced	Sep-16-2015 15:45:43
2195013	P4	MDKA2066	Sep, 29 - 2015 22:09:03	Closed	There was an issue with the backhaul IDM got stuck	Sep-29-2015 00:02:51
2195013	P4	MDKA2228	Oct, 05 - 2015 23:09:03	Closed	There was an issue with the backhaul IDM got stuck	Oct-05-2015 01:02:51
2195013	P4	MDKA2246	Oct, 19 - 2015 10:08:23	Closed	There was an issue with the backhaul IDM got stuck	Oct-19-2015 11:30:43
2195573	P2	MDKA2255	Oct, 23 - 2015 11:08:23	Closed	Sector was up services were ok Only loss of visibility	Oct-23-2015 12:30:43
2197159	P3	Dawn VPN	Nov, 17 - 2015 12:08:23	Closed	Frequency was changed from Lahore end.End to E ND	Nov-17-2015 13:30:43
2197696	P4	MDKA2050	Nov, 19 - 2015 13:08:23	Closed	GPS was faulty and it was replaced	Nov-19-2015 14:30:43
2199065	P3	Nazimabad router	Nov, 14 - 2015 14:08:23	Closed	AC is issue	Nov-14-2015 15:30:43
2199173	P4	MDKA2196	Dec, 13 - 2015 10:08:23	Closed	Site Controller Card was Replaced	Dec-13-2015 11:30:43
2199180	P3	Karachi Router Environemental Alarm	Dec, 27 - 2015 11:08:23	Closed	KHI P3 Karachi Router Environmental Alarm	Dec-27-2015 12:30:43
2199201	P4	MDKA2045	Jan, 18 - 2016 12:08:23	Awaiting Customer	ATS Panel issue.Sitedoesnot shift to Genset	Jan-18-2016 13:30:43
2199301	P4	MDKA2196	Feb, 17 - 2016 14:08:23	Closed	ODU was replaced	Feb-17-2016 15:30:43
2199318	P4	MDKA2245	Mar, 03 - 2016 15:08:23	Resolved	Issue is under observation	Mar-03-2016 16:30:43
2199919	P4	MDKA2236	Mar, 16 - 2016 16:08:23	Closed	ATS Panel issue	Mar-16-2016 17:30:43
2199939	P4	Ufone DHA MDKA2042	Apr, 18 - 2016 17:08:23	Closed	MTU size changes to 1400 (RCA was given again	Apr-18-2016 18:30:43
2199985	P4	CMPAK	Jul, 21 - 2016 21:08:23	Awaiting Customer	Site is intentronally down.SR is awaiting to track it	Jul-21-2016 22:30:43
2200004	P4	MDKA2165	Aug, 17 - 2016 22:08:23	Closed	ATS Panel issue.Sitedoesnot shift to Genset	Aug-17-2016 23:30:43
2200004	P4	MDKA2236	Aug, 29 - 2016 09:12:52	Closed	ATS Panel issue.Sitedoesnot shift to Genset	Aug-29-2016 10:11:13
2200062	P2	Karachi Nazimabad Router	Sep, 14 - 2016 10:12:52	Closed	ATS Panel issue	Sep-14-2016 11:11:13
2200137	P4	MDKA2151	Sep, 18 - 2016 11:12:52	Closed	Site was rebooted at due to DHCP script running	Sep-18-2016 12:11:13
2200284	P4	MDKA2430	Oct, 03 - 2016 13:45:22	Resolved	MTU size changes to 1400 (RCA was given again	Oct-03-2016 14:38:13
2200312	P4	Arwentech VPN	Oct, 04 - 2016 14:45:22	Awaiting Customer	Issue is under observation	Oct-04-2016 15:38:13
2200579	P3	Air Port Router	Oct, 07 - 2016 15:45:22	Closed	Temperature is normal	Oct-07-2016 16:38:13

**KPI Reporting Sheet**
Nationwide Monitoring:

Reference: Real world MOTOROLA Portal EMS Network Topology [Wateen] snap shot from wateen nationwide network portal

WiMAX signals through MOTOWI⁴:

Reference: Real Testing and Analysis Snap Short For Diagnostic of WiMAX signals through MOTOWI⁴ Nationwide Field Cluster Points at Wateen Network

Wateen Karachi Network:

Reference: Phase 1 & 2 CMSN Real Wateen Karachi Network Diagram from Manual

Karachi Central Cluster

S. No.	Name	Long.	Lat.	Parent Sector	Frequency	Preamble Index	RSSI	CINR	Mod DL	Mod UL	Speed DL	Speed UL	Latency	Jitter
3	KHI3	66.9985	24.9151	MDKA2199_A	3460.75	16	-85	4	QPSK	QPSK	788 Kbps	98 Kbps	63	61
14	KHI14	66.9974	24.9017	MDKA2199_C	3492.25	82	-94	5	QPSK	QPSK	769 Kbps	98 Kbps	75	70
11	KHI11	66.9883	24.9546	MDKA2320_A	3460.75	16	-99	2	QPSK	QPSK	550 Kbps	110 Kbps	192	96
2	KHI2	66.9786	24.9097	MDKA2351_B	3560.75	49	-90	4	QPSK	QPSK	998 Kbps	134 Kbps	65	70
117	KHI117	66.967	24.9094	MDKA2351_D	3592.25	-	-83	13	16 QAM	QPSK	1.90 Mbps	1.17 Mbps	67	11
8	KHI8	66.9907	24.9106	MDKA2147_B	3560.75	53	-80	13	16 QAM	16 QAM	1.32 Mbps	0.43 Mbps	67	60
9	KHI9	66.9759	24.9155	MDKA2147_D	3592.25	23	-87	8	QPSK	QPSK	615 Kbps	114 Kbps	82	69
6	KHI6	66.9972	24.9367	MDKA2130_A	3460.75	24	-78	17	64 QAM	QPSK	1.56 Mbps	998 Kbps	65	70
10	KHI10	66.9916	24.9275	MDKA2130_C	3492.25	90	-84	15	QPSK	QPSK	540 Kbps	160 Kbps	58	67
148	KHI48	66.9843	24.9359	MDKA2130_D	3592.25	27	-79	14	16 QAM	QPSK	845 Kbps	200 Kbps	80	67
13	KHI13	67.0138	24.9135	MDKA2353_C	3492.25	90	-89	4	QPSK	QPSK	205 Kbps	112 Kbps	64	123

Gulshan-e-Iqbal Cluster

S. No.	Name	Long.	Lat.	Parent Sector	Frequency	Preamble Index	RSSI	CINR	Mod DL	Mod UL	Speed DL	Speed UL	Latency	Jitter
91	KHI91	67.1589	24.9423	MDKA2141_B	3560.75	53	-79	18	16 QAM	16 QAM	2.14 Mbps	1.21 Mbps	63	61
107	KHI107	67.1567	24.9332	MDKA2141_C	3492.25	86	-70	22	64 QAM	16 QAM	4.4 Mbps	2.43 Mbps	77	61
149	KHI149	67.144	24.924	MDKA2141_C	3492.25	86	-73	24	64 QAM	16 QAM	3.97 Mbps	1.81 Mbps	63	61
82	KHI82	67.0921	24.8951	MDKA2168_D	3592.25	27	-63	24	64 QAM	16 QAM	3.68 Mbps	1.38 Mbps	63	61
83	KHI83	67.0988	24.8995	MDKA2168_B	3560.75	57	-72	21	64 QAM	16 QAM	2.56 Mbps	447 Kbps	52	63
78	KHI78	67.0739	24.8862	MDKA2059_D	3592.35	27	-85	13	QPSK	QPSK	660 Kbps	210 Kbps	60	63
79	KHI79	67.1075	24.8422	MDKA2259_D	3592.35	23	-82	10	QPSK	QPSK	778 Kbps	223 Kbps	57	87
77	KHI77	67.0609	24.8982	MDKA2252_A	3492.25	20	-61	28	64 QAM	QPSK	1.10 Mbps	359 Kbps	101	149
74	KHI74	67.0816	24.907	MDKA2062_A	3460.75	20	-64	26	64 QAM	16 QAM	3.02 Mbps	1.38 Mbps	59	62
76	KHI76	67.0831	24.8989	MDKA2062_C	3492.25	86	-78	16	16 QAM	16 QAM	3.31 Mbps	1.98 Mbps	61	60
106	KHI106	67.1404	24.935	MDKA2141_D	3592.25	23	-80	19	64 QAM	16 QAM	4 Mbps	2.07 Mbps	60	62
150	KHI150	67.1486	24.9283	MDKA2141_C	3492.25	86	-90	10	QPSK	QPSK	1.02 Mbps	271 Kbps	68	60
152	KHI152	67.1204	24.9533	MDKA2141_A	3460.75	20	-83	11	QPSK	QPSK	415 Kbps	286 Kbps	78	5
153	KHI153	67.1764	24.9416	MDKA2141_B	3560.75	53	-74	26	64 QAM	16 QAM	2.66 Mbps	1.64 Mbps	119	4

Difference between Karachi Central Cluster and Gulshan-e-Iqbal Cluster
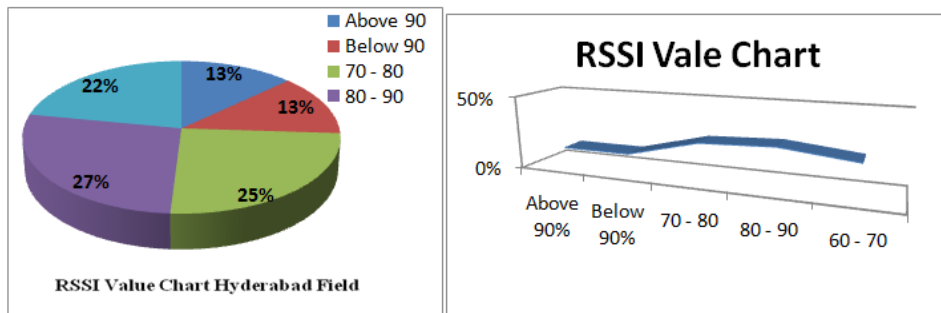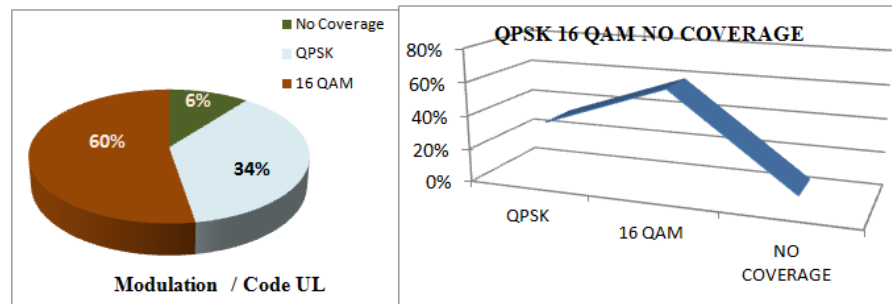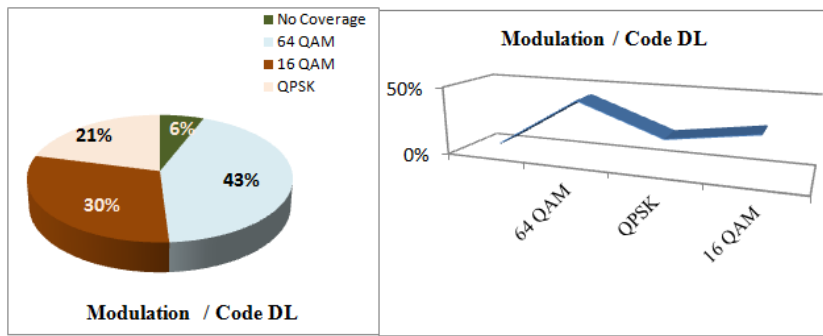
Modulation Scheme for Karachi Central Cluster
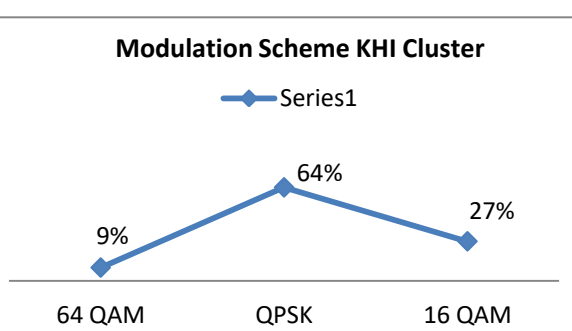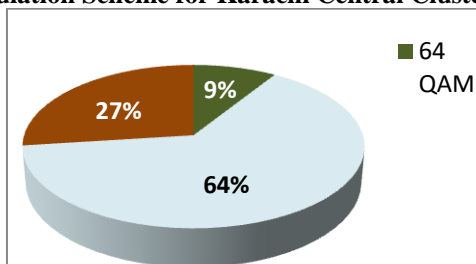
Modulation Scheme KHI Cluster
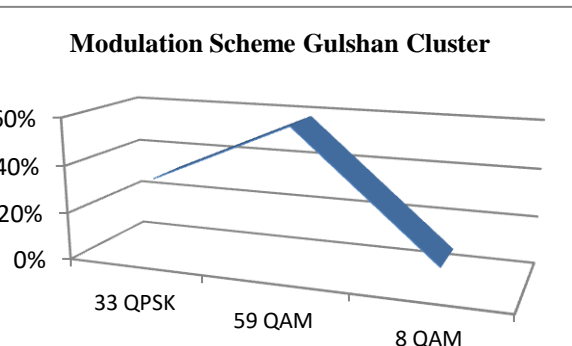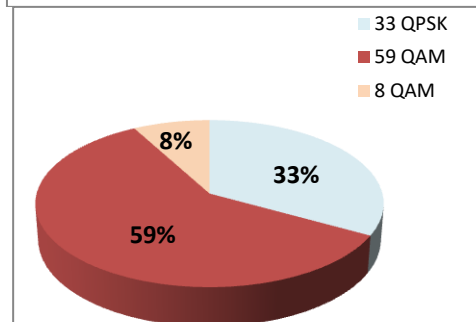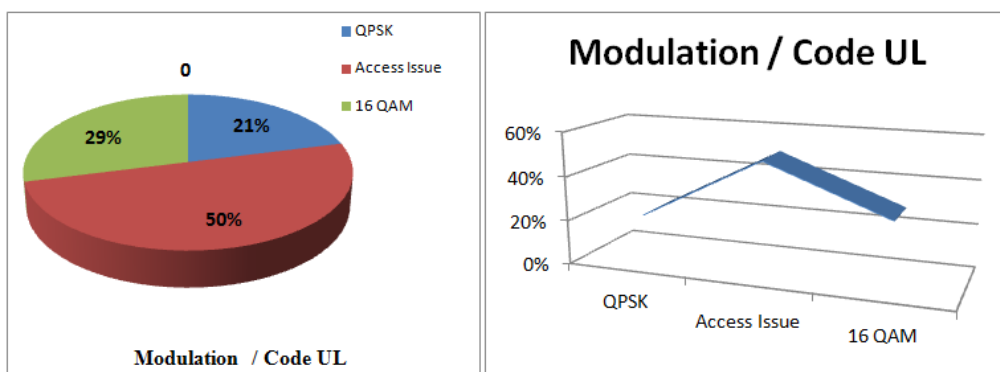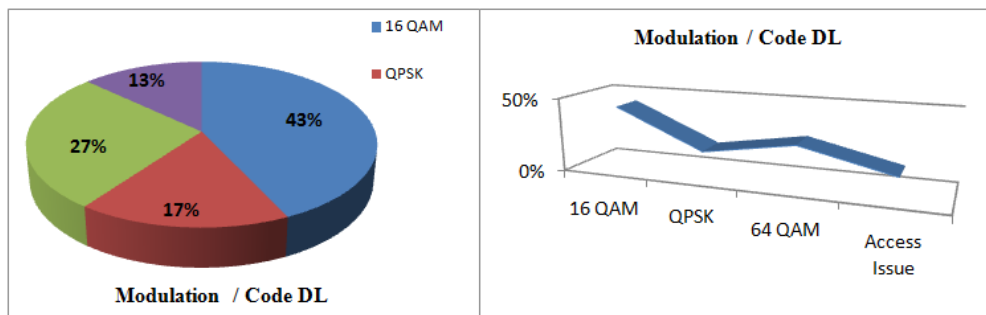

Modulation Scheme for Gulshan Cluster

Modulation Scheme Gulshan Cluster

Modulation Scheme Chart Hyderabad Field

Modulation Scheme Chart Sukkur Field

V. Conclusion

Most of the pointy in nationwide network monitoring we have to check the status of the DAP whether the site is up and down with the help of PEMS (Portal Element Management System) software. Mount or assembled all the nodes properly for given quality of service and mount right antenna on right places for the result as per 802.16 standard. Not everything aligns as good as per standard as well as bookish type of definition the ground situation is quite differing in some of cluster point's areas in south region. Somewhere vegetation may become one of the causes for affected on received signals, topography of the areas, loss connection or loosely assembled antennas (not fixed properly) and humidity. Obstacles of vegetation are become big challenge when heavy equipments transportation, the grower become hard face when the team go over there. Even I went some cluster point and want to tested for validation per standard or the service provider claim, I faces the same. The government and the service provider company have great responsibility to resolve this matter on the bases of high priority for monitoring or given strength signals as per standard. In this regard relation departments are working but it slower as per need for the progress of our country.

The majority of the point where tested around nationwide network monitoring diagnostic the weather is affected on the WiMAX signals also if the antenna is not properly mount or assembled then it also week signals or packet loss. If there are any engineering faults in it then it's not proper work as per need. The pollution is not effected on it but rain and oxygen when increase the MHz. Actually heat is not effect on microwave but due to high temperature the moisture and the humidity can effect on it.

The signals strength was tested 10 to 15 meters coordinate in mostly cluster points in south region of Pakistan. The best result found in Gulshan-e-Iqbal Cluster which also known as Sunny Hieght Cluster but it will given more better results if counter part of antenna or booster will assembled on high rise buildings in south region. The moisture will effect on the received signals strength also the oxygen absorbed the signals too.

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