COMPANY OVERVIEW AND PROFILE

M&A Technology, Inc. - A Company Focused on the Education Market

M&A Technology is an ISO 9001-2008 Registered Technology Solutions Company focused on the education market. M&A Technology delivers total technology solutions, combined with installation, fulfillment, project management, maintenance and professional services to provide turnkey solutions and help clients gain control of their technology investments.

The M&A History

Magdy Elwany founded M&A Technology in 1984 and began the company as a solutions provider of procurement and network services with a focus on the education market. Since that time, M&A Technology has achieved steady growth while improving the capabilities to meet the technology service requirements of its more than 600 school districts, OEM, and government clients.

With corporate headquarters and manufacturing facilities in Carrollton, Texas, M&A Technology employs over 150 people. M&A Technology achieved steady growth despite numerous negative economic pressures.

The M&A Value Proposition

M&A Technology's focus is on providing complete solutions to our customers, from product selection to delivery, followed by excellent support. We work closely with our customers to understand their unique requirements and then build a support plan to provide complete customer satisfaction. To handle our customer's requirements we manufacture our own line of Desktop PC's, Servers, and other IT products in our 46,000 square foot manufacturing facility in Carrollton, Texas. This enables us to control the customer's configuration and product life cycle. We have refined this customer-centric approach over the past 20 years to offer customer load management, asset tagging, customer specific configurations, quick turn product development, and extended product life cycles. These services are designed to reduce the total cost of ownership for school districts and government entities, increase end-user satisfaction, and enable our customers to focus on their core business.

Our Valued Clients

M&A Technology is pleased to provide references from some of our valued clients within this proposal.

Our Products and Services

- Procurement and Provisioning Services
- Project Management Services
- Professional Services
- Technical Services
- Data Center Service Services
- Managed Data Center Services
- Network Security Services
- VDI and remote backup
- Break-Fix and Out-of-Warranty Services
- Installation Services
- Online Catalog

Our Certifications

- ISO 9001-2008 Registered
- Intel Platinum Provider
- Microsoft OEM Platinum
- Microsoft Authorized Education Reseller
- Lexmark Authorized Reseller
- HP Authorized Reseller
- Fujitsu Authorized Distributor
- Private Cloud Services
- Toshiba Platinum Authorized Reseller
- Intel Authorized Integrator

EXECUTIVE MANAGEMENT TEAM

M&A Technology's management team has over 200 years combined experience in the technology industry and over 80% of the current team has worked together for more than 20 years as a group. The team is highly skilled and understands the challenges and needs of the education market.

Magdy S. Elwany, Founder and CEO

Magdy has over 30 years experience in electrical engineering with special expertise in digital design. Prior to M&A Technology, Magdy's work experience included Flexible Computer, Inc., Unisystems International, Singer Enterprises and Texas Instruments.

Magdy has a Master of Science in Electrical Engineering (MSEE) from Southern Methodist University in Dallas and a Bachelor of Science in Electrical Engineering (BSEE) from Alexandria University in Alexandria, Egypt.

Val Overbey, Chief Technology Officer

Val has 30 years of experience in software from assembly language to C and 20 years of experience in the UNIX operating system and its variants. He has been a leader in the development of Web-based infrastructure for the education marketplace.

Having joined M&A Technology in 1993, Val is responsible for testing all systems and components for compatibility, interoperability and reliability.

Donna Shepard, Chief Operating Officer / Executive Vice President

Donna has 25 years of experience in computer sales and support with over 22 years dedicated to the K-12 and higher education markets. Donna currently sits on both the Partner Advisory Council for Microsoft and the prestigious Intel Board of Advisors where her expertise and experience in the K-12 market helps guide Microsoft and Intel to solutions that help further their education goals. Currently Donna is involved with the Microsoft initiative Shape the Future http://www.microsoft.com/publicsector/ww/programs/shape-the-future/Pages/index.aspx.
In 2012 Donna received the Technology Star Award from Richardson ISD for her dedication to technology in the classroom. After attending the University of North Texas in Denton, Texas, Donna joined M&A Technology where she has been instrumental in developing the K-12 Higher Education Project Management model. Donna is responsible for the Sales and Operations departments for M&A Technology, Inc.

Stewart Hair, VP Business Operations and Sales

Stewart is responsible for guiding the business operations and sales efforts at M&A Technology. Stewart is an IT Services industry executive with over 20 years of leadership experience at HP, EDS, MCI and Telestat. Prior to joining the IT Services industry, Stewart gained extensive business experience in the manufacturing and communications industries, overseeing day-to-day financial management while driving the exploitation of new technologies to improve corporate efficiency and profitability.
He spent the last 14 years at CompUSA where he developed and supported the Dallas/Fort Worth market. He has extensive experience in technology sales and support with strong customer focus.

EXECUTIVE SUMMARY

The Unique Benefits of a Relationship with M&A Technology

- A financially stable, private company with a proven track record of meeting and exceeding client requirements with a high level quality in PC systems and support for the past 29 years.
- M&A Technology's project management rollout model is legendary in the education and government markets and provides us with a distinct differentiation from our competitors and provides complete satisfaction to all of our clients.
- Aggressive pricing and outstanding value on all products and services provided.
- M&A Technology's Account Management team and support from Executive Management ensures that the proper resources are available at all times utilizing a "best practices" library of M&A Technology's largest clients.
- The comprehensive ISO 9001-2008 Registered for commitment to quality and continuous improvement.
- Texas based manufacturing facility with capacity to produce 500,000 desktops yearly. Current volume is 160,000 computers per year.
- Client references such as Plano (TX) ISD, Richardson ISD (TX), Austin ISD (TX), Edgewood ISD (TX) , Poteet ISD (TX), who have selected M&A Technology as their technology partner, continue to award projects to M&A Technology and more importantly, are continually satisfied with M&A Technology's exceptional performance. This brings a level of confidence to our clients.
- M&A Technology's standing and cooperative relationships and certifications from leading global technology companies.
- An executive management team with years of vast and diverse experience in the computer, networking and telecommunications fields.
- A company that listens to its valued clients and is extremely flexible with the ability to adapt for quick response to a customer's specific needs and expectations.
- M&A Technology will demonstrate its ability to provide the highest level of service by fulfilling the commitments in this proposal.
- By selecting M&A Technology as its technology provider, you will gain the benefits of a strong, financially stable, reliable technical resource with the highest levels of support in the marketplace.

WHY CHOOSE M&A TECHNOLOGY

- **We're established**. When clients choose M&A Technology, they chose a financially stable, private company with a proven track record of 30 years in meeting and exceeding client expectations with business driven technology solutions

- **We believe in relationships**. Clients like the Austin ISD, Richardson ISD and Plano Independent School District chose M&A Technology based on its complete technology solution offerings, its legendary customer service, project management, and the trust in a long term relationship with a growing company

- **We're accountable**. Clients in the government, commercial, education and OEM segments appreciate the value of a single, accountable technology solution provider to deliver today's hottest technologies covering everything from desktops to wireless to remote management to e-services and beyond we don't point fingers we just provide solutions

- **We have important friends**. When clients choose M&A Technology, they gain the intellectual property of our most valued partners like Intel, Microsoft, Apple, Asus, HP and Dell

- **We're determined**. When clients choose M&A Technology, they are supported by a client support and executive management team with a laser focus on outstanding customer service and a "whatever it takes" attitude. Clients gain a team that is extremely entrepreneurial, listens, and is flexible to respond to the ever changing needs of our clients and our industry

- **We're certified**. When clients choose M&A Technology as their technology partner, they gain the reassurance and peace of mind that comes with an ISO 9001- 2008 Registered company committed to quality and continuous business process improvement

- **We believe in service.** We provide the highest level of service in Texas. We'll be your company's single point of accountability for all its technology needs and you can focus on ***your*** core business

THE CHOICE IS CLEAR:

CHOOSE M&A TECHNOLOGY

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ZTE

Technical Proposal for Town of Caroline, New York TD-LTE Project

Technical Proposal for Town of Caroline, New York TD-LTE Project

Version	Date	Author	Reviewer	Notes
V1.0	2016/08/03	Jason Ma, Andi Reinhard, Greg Piske	Mitchell Wu	

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1 Preface

This document aims to provide an end-to-end TD-LTE comprehensive technical proposal for TOWN OF CAROLINE including RAN and Core Network solutions. The contents of this proposal are organized as follows:

Chapter 1: Preface;

Chapter 2: Requirements Analysis;

Chapter 3: Proposed Network Solution;

Chapter 4: Solution Highlights and Benefits;

Chapter 5: Introduction of ZTE Proposed Products;

Chapter 6: ZTE Global TD LTE References;

Chapter 7: Abbreviations.

2 Requirement Overview

According to ZTE's understanding, the main requirements are listed as follows:

- Build-out TDD-LTE sites for 3.5Ghz network
- TD-LTE operating in 3.5GHz
- Initially one 20MHz carrier while allowing for additional carriers to be deployed as needed
- Base stations antennas and batteries, DC power supply, cabinet should be configured for 3 Sectors per site
- The LTE Core Network (MME/HSS/CG/EMS) will be hosted by M&A Technology
- A server-based, local gateway (SAE-GW) will be deployed in the town of Caroline to reduce backhaul requirements

3 Network Solution Proposal

3.1 Solution Design Principle

The proposed solution is designed based on following principles:

- Latest technology with suitable CAPEX and OPEX
- High Reliability
- Flexible Scalability
- Smooth Evolution
- Open Interface
- Convenient O&M

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3.2 Network Design Assumptions

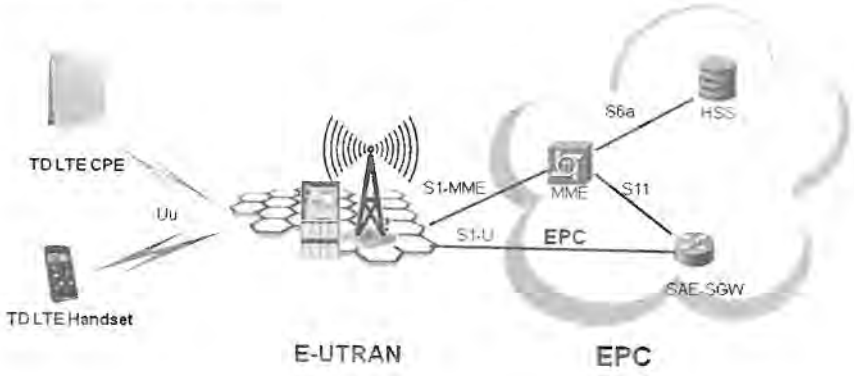
The following assumptions are used in the network design:

- 100% outdoor sites;
- Three (3) sectors per site;
- Initially 20MHz TD LTE carrier;
- 4T4R Remote Radio Unit (RRU)
- 4W TOC output per RRU channel;
- 100 RRC Connected users per site;
- Outdoor cabinet with 90A power module and Backup Battery as option.
- Assumes adequate backhaul in place for each site location.

3.3 Network Architecture

Complete TD LTE network consists of TD LTE encode and EPC. The network architecture is shown in the figure below:

Figure 3-1 TD LTE Network Architecture



3.3.1 Proposed Network Solution for Town of Caroline

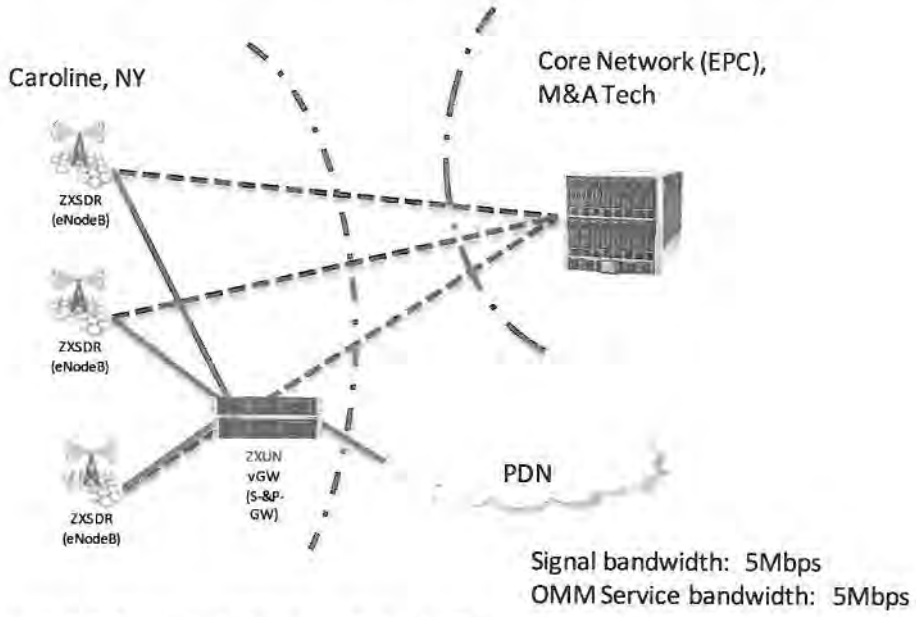


Figure 3.2 Proposed LTE Core Network Topology for Town of Caroline

3.4 TD LTE RAN Solution

For the Radio Access Network part, ZTE proposes a distributed BBU+RRU system: the BBU model named as ZXSDR B8200 is indoor equipment, which supports flexible installation such as independent installation in a standard 19-inch rack, wall-mounted installation and installation in outdoor power cabinet. The RRU is a complete outdoor radio unit, which supports pole, tower top, rooftop, wall-mounted installation, and connects to the B8200 with fiber.

The following TD LTE RRU model will be proposed:

ZXSDR R8984E (S3600), support 4*4 MIMO, and 4*4W TOC output

For outdoor applications, the BC8910A Cabinet will house the BBU and an up to 120A DC power module for easy installation. For battery backup, an optional battery cabinet PC8910A with up to 270Ah battery will be required. The RRU can be flexibly installed on tower top, rooftop, pole or wall according the site situation. With the cabinets and

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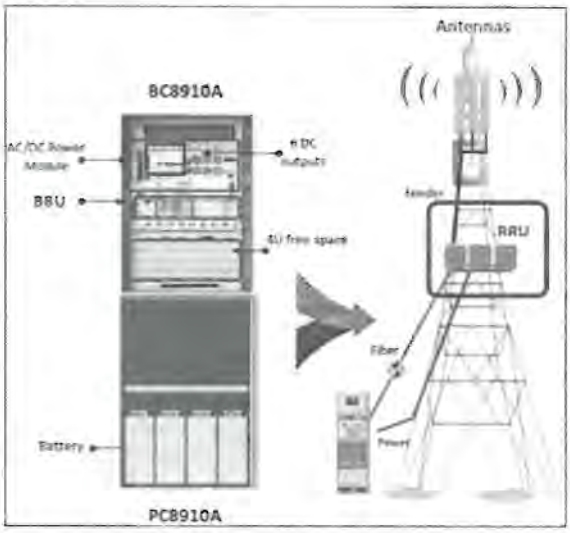
embedded power module, -48V DC power supplies and 2-phase 110VAC can both be supported with the same model.

A typical S111 outdoor site is shown in the figure below:

Figure 3-2 Typical Outdoor Deployment



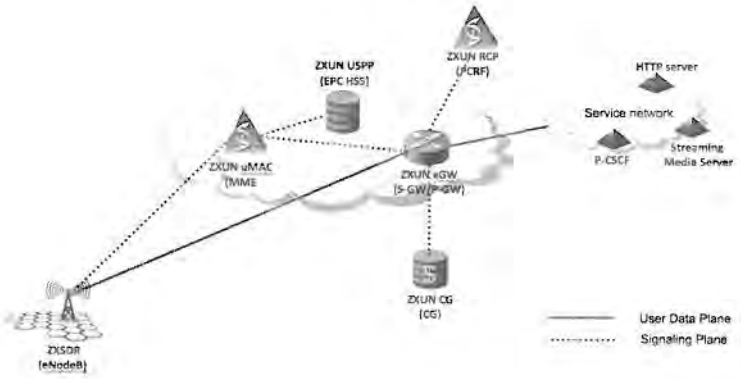
3.5 EPC Solution

The overall network topology is shown in the following figure. The main components of the EPC consist of the MME, HSS and S-GW/P-GW (SAE-GW). The MME and HSS will be hosted by M&A Technology using ZTE's latest NFV technology. The SAE-GW will be deployed locally. Also hosted at M&A, a Charging Gateway (CG) is used for offline charging and the Element Management System (EMS) provides configuration management, alarm management, performance reports, etc.

As additional options, ZTE can provide a PCRF can be deployed at M&A to provide dynamic policy control a usage monitoring and a LIG (Lawful Intercept Gateway) which can provide lawful intercept functions for CALEA compliance.

The network elements with ZTE model names are shown in the figure below:

Figure 3-3 Network Structure with ZTE EPC Equipments



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3.6 Capacity Planning and Dimension

3.6.1 Product List and Dimensions

➢ **RAN**

The proposed equipments and facilities of the RAN part are listed in the table below:

Table 3-12 Product List of RAN

Item	Model	Quantity	Description
TD-LTE eNodeB	ZXSDR B8200	1 per site	BBU
	ZXSDR R8984E	1 per sector	3.5Ghz RRU support 4 channels
Netnumen U31	EMS	1	Network Management
Optional Items			
BBU & Power Cabinet	BC8910A	1 per site	Outdoor Cabinet
Battery Cabinet	PC8910A	1 per site	Outdoor Battery Cabinet
Battery		1-2 strings per site	135Amp hour battery
Antenna	MOBI	1 per sector	3.30-3.80GHz,16dBi X-Pol Antenna

3.6.2 Capacity Planning

➢ **Base Station (per site)**

Table 3-27 Site Configuration

Item	Licensed Capacity	Hardware Capacity
B8200	100/20Mbps in DL/UL and 100 RRC connections	600/300Mbps in DL/UL and 3600 RRC connections
R8984E	4*4W	4*4W

➢

- **CORE**

Centralized hosted Core Capacity:

Logic Function	Hardware Platform	Hardware Capacity
MME	HP C7000	500K subs
HSS		500K subs
CG		150 CDR/s
EMS		N/A

Local Gateway Capacity:

Logic Function	Hardware Platform	Hardware Capacity
PGW/SGW	HPE ProLiant DL380	12Gbps throughput (Active/Active deployment)

3.6.3 RF Planning

RF Link Budget:

Link Budget Parameter Configuration		
Channel Bandwidth	MHz	20
TDD Split Ratio (DL:UL)	#	3:1
Frequency	MHz	3660
RSRP	dbm	-115
eNodeB Antenna Configuration		4T4R
eNodeB Antenna Gain	dBi	17
eNodeB Noise Figure	dB	3
eUE Antenna Configuration		1T2R
eUE Tx Power	dBm	27
eUE Antenna Gain	dBi	12
eNodeB Antenna Height	m	36
eUE Antenna Height	m	2

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RF Link Budget Results:

Link Budget Result		
Frequency	MHz	3660
Propagation Model		COST-231 HATA
Radius	km	1.50
Caroline area	km2	142.9
Site required		31

Site Distribution for Town of Caroline coverage area

The current site count is based on initial assumptions for antenna height and throughput requirements for DL/UL in the coverage area. Adjustments can be made to RF link budget and site counts per specific market requirements. Example would be exiting tower locations, population distribution, etc.

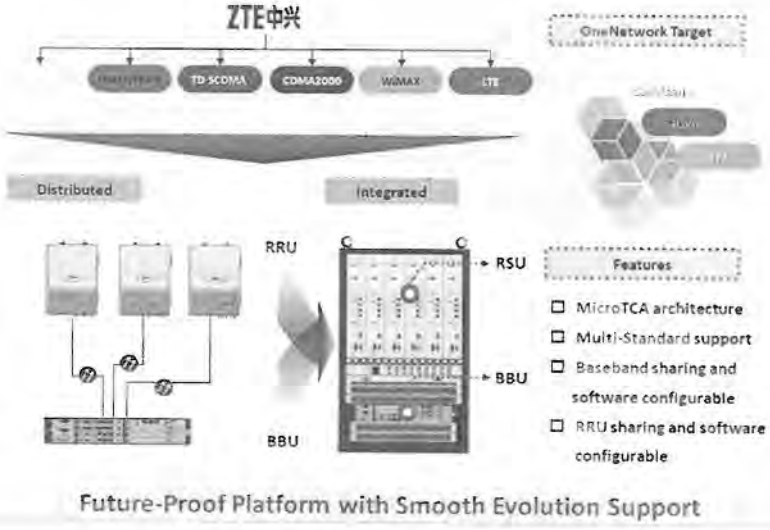
4 Typical DL throughputs that can be achieved are in the 25-50Mbps range for the primary coverage areas. Benefits of the ZTE Solution

The solution that ZTE proposes can bring the following benefits to TOWN OF CAROLINE.

4.1 SDR Platform based Uni-RAN Solution

ZTE Multi-Modal Base Station adopts the market leading SDR platform and micro TCA architecture. This new generation base station is named ZXSDR series which can fully satisfy user demands for multiple services. It features small size, large capacity, small weight, high power efficiency, multiple services and supports flexible backhaul transmission.

Figure 4-1 ZTE unified radio platform – SDR Platform



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The industry-leading SDR base station has the following advantages:

- Less space: With a compact design, it can be installed with virtually zero footprint.
- Diverse interfaces and flexible networking: System supports T1/FE/GE interfaces simultaneously. Single mode or hybrid connections are available for flexible deployment scenarios. RF units provide optical interface to base band unit. It can easily form a star and daisy-chain network.
- Flexible network deployment to meet the requirements of different installation scenarios: With this design, integrated cabinet in an equipment room, integrated cabinet at the bottom of tower, or RF unit being mounted on tower top can all be easily achieved.
- Indoor or outdoor support: for outdoor deployment, up to 270Ah per single battery cabinet can be provided.
- Easy expansion: capacity expansion can be easily achieved by adding new channel cards into the cabinet, as well as possible RF unit to guarantee enough TOC output power for each carrier.
- Multi-mode supported: multi-mode can be achieved at the same frequency band simultaneously. Therefore, giving the flexibility and ability for a hybrid network deployment and long term evolution with lowest cost possible.
- Wider bandwidth: it can support an operating bandwidth up to 160MHz (IBW).
- Higher efficiency, lower TCO: power amplifier adopts the most advanced Doherty PA, DPD linear technology and MCPA technology, and can support dynamic adaptive PA power supply due to the output power, which reduces power consumption. The power amplifier efficiency can reach up to 40%.
- Smooth evolution: migration to future-proof multi-mode technology can be realized by adding UMTS/FDD-LTE/TDD-LTE base band processing cards into the BBU, as well as adding possible RF unit if operating at different frequency bands.

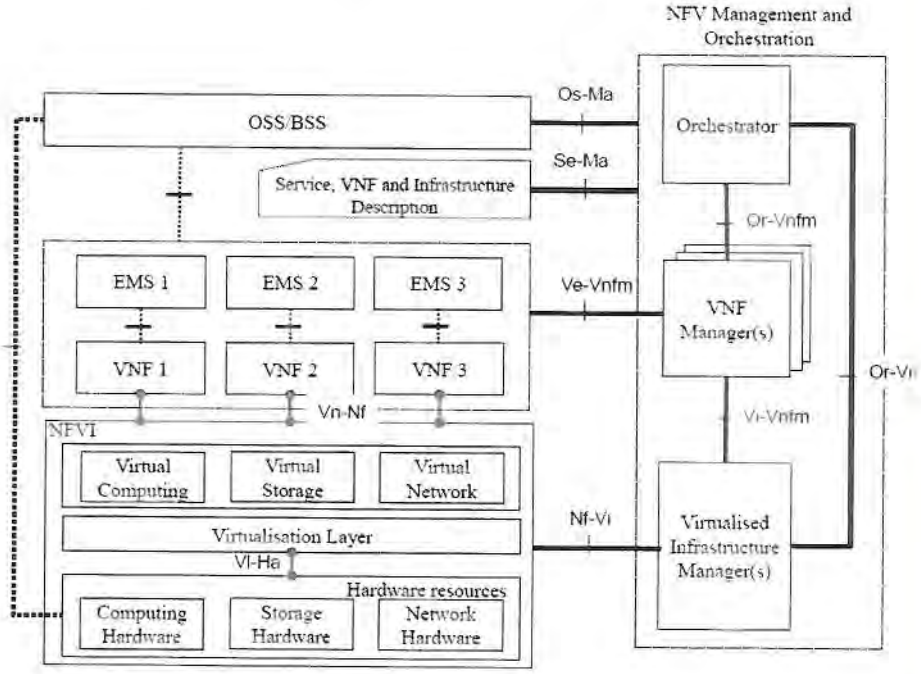
4.2 ZTE Virtualized Core Network Solution

4.2.1 Architecture

ZTE's virtualized core network solution is an open and standards compliant solution that focuses on performance optimization and total cost reduction. The following section will illustrate the vEPC architecture.

The following figure illustrates the overall vEPC architecture. The ZTE NFV solution follows the ETSI NFV architecture.

Figure 4-24 ETSI NFV Architecture



In ZTE's vEPC architecture, the VNF (Virtual Network Function) is based on a Virtual machine. It decouples the hardware and the applications. Each VNF is composed of multiple types of VNFCs. Each type of VNFC has multiple instances. Each instance corresponds to a VDU, which is mapped to a VM. All of the EPC Core Network Elements including MME, HSS and SAE-GW are virtualized.

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4.2.2 Hardware Platform

The centralized Signaling Core, based on the HP BladeServer C7000 will be hosted by M&A Technology.

The HP C7000 BladeSystem was designed for scalable virtualization, making it an ideal platform for ZTE's NFV solution.

The HP C7000 BladeSystem is an enterprise/datacenter blade server system. The 10U high shelf can support up to 16 server blades and up to 8 compute, storage or workstation blades plus redundant network and storage interconnects.

The Blade Server used in the C7000 feature dual Intel Xeon processors and offer flexible networking capabilities.

The C7000 will be deployed in M&A's data center and implement the vHSS, vMME and vEMS on the C7000.

Distributed GW – HPE ProLiant DL380

The HPE ProLiant DL380 is a highly versatile, future proof rack server that delivers world-class Performance and Industry-Leading Energy Efficiency in 2U of rack space.

The ProLiant server provides a flexible chassis with an abundance of networking options and expandability for investment protection.

It features the latest Intel Xeon processors and high efficiency redundant HPE Flexible Slot Power Supplies.

The DL380 will be used to implement the virtual S-GW and P-GW, allowing for a cost effective solution to keep the traffic in the town of Caroline.

4.2.3 Distributed GW solution

To save transmission cost and allow for more flexible deployment for the town of Caroline, ZTE proposes a distributed GW solution. The local gateway will allow for local breakout of the user data traffic and keep the traffic in the market while centralizing the authentication and management functions. A server will be deployed as the local GW and connected to centralized MME/HSS.

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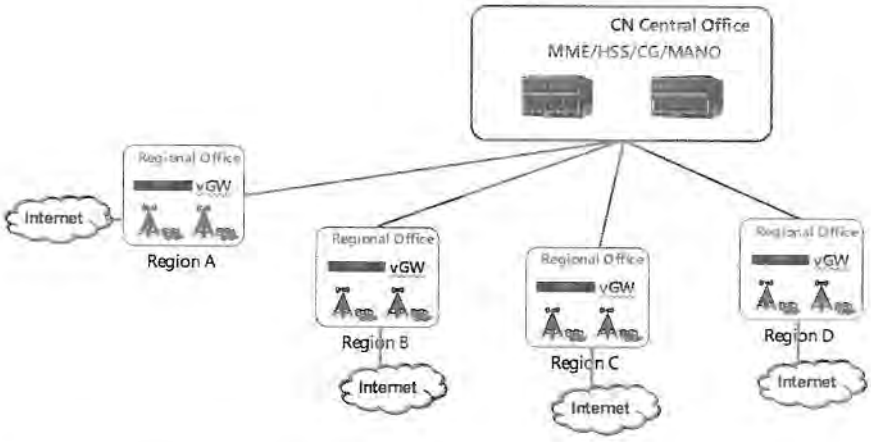

The typical signaling requirements between the market and the centralized Core Network are 5Mbps for signaling and 5Mbps for O&M traffic.

4.2.4 Unified Network management

The ZTE NetNumen U31 system manages all Uni-RAN and Uni-Core Network elements, including MME, SAE-GW and HSS and supports the centralized management of the EPC core network. Configuration management, alarm management, performance management and Inventory management are transferred to the NMS through the north-bound interface.

The NetNumen U31 supports flexible North-bound interface configurations, supporting various different protocols such as CORBA, FTP, DB, SNMP and CLI interface for easier integration and to realize the flawless integration with the high level OSS system.

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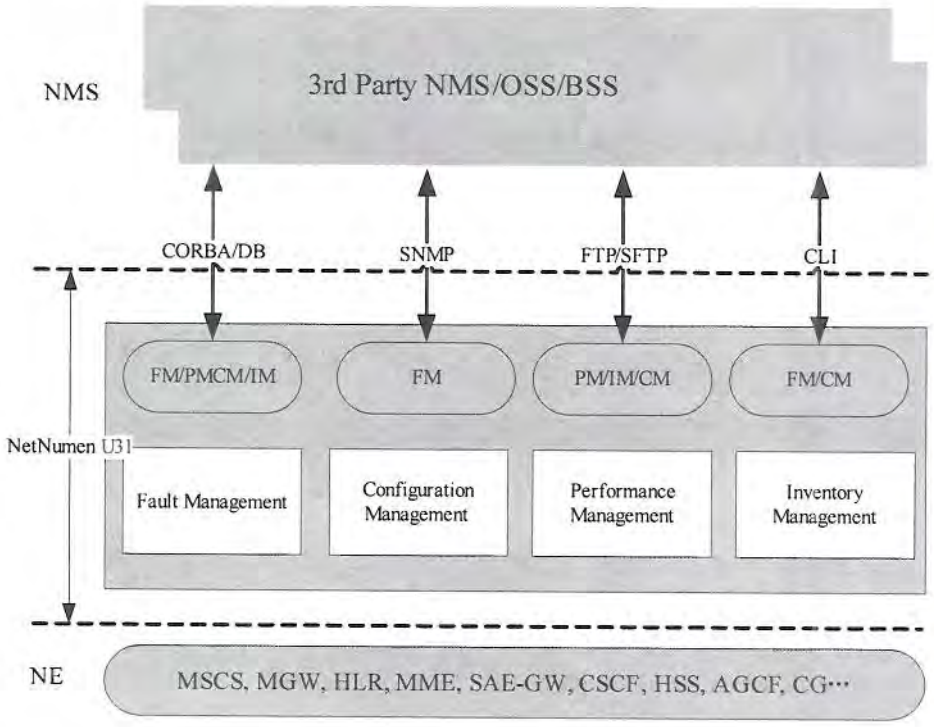
Figure 4-34 Network OSS Architecture



- The above figure shows ZTE integration point and the protocols between ZTE EMS and third party OSS. This interface can be customized to match the requirements of the NMS.

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5 RAN Product Introduction

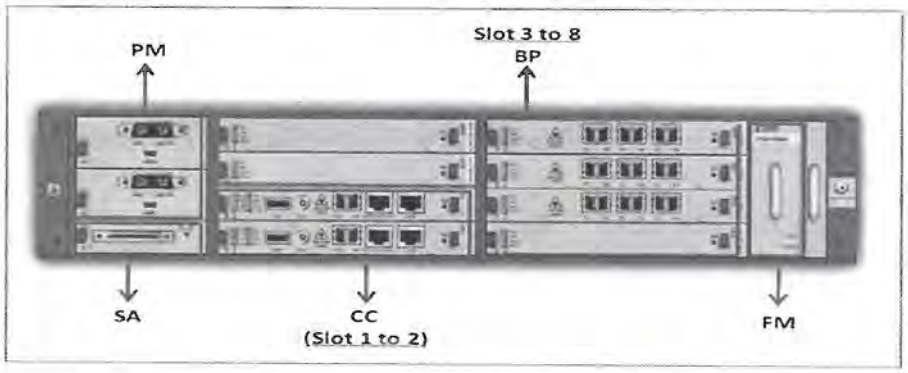
5.1 Large-capacity BBU -- ZXSDR B8200

ZTE is a pioneer to adopt the MicroTCA platform for BBU in the industry. Base stations developed on this platform possess powerful functions with strong flexibility and high reliability, which can meet upgrading and evolutionary demands of the wireless network for a long time.

B8200 is base band processing unit, which is the common part of each type of macro and compact BTS.

The exterior appearance and physical indices of B8200 are shown and listed below:

Figure 5-14 Appearance and Structure of B8200



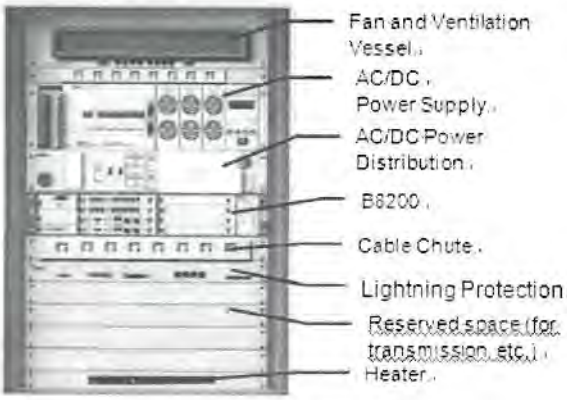
The specifications of B8200 are listed in the table below:

Table 5-1 Specifications of B8200

Feature	Description
Dimensions	88.4×482.6×197 mm （H×W×D）
Weight	5.25Kg
BP Capacity	3 cells
Power Consumption	180W
Color	Dark Blue

For outdoor use, BBU part will be put into a cabinet called BC8900A, in which power module and lightning protection module are also included to make it capable of being deployed in an outdoor environment. The structure of BC8910A is shown in the figure below:

Figure 5-25 Physical Structure of BC8910A



Optionally, for newly built sites, or for existing sites without enough battery for the new equipments, a cabinet called PC8910A, with the same dimensions as that of BC8910A, can be adopted:

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Figure 5-36 Physical Structure of PC8910A

With this cabinet, up to 270Ah battery can be provided, which will be enough for 8-hour power backup for the main equipment.

The battery cabinet can be put right under BC8910A, thus no extra footprint is required. See the figure below:

Figure 5-47 Combination of BC8910A and PC8910A

There are built-in power conversion modules which can convert 110V/220V AC to -48V DC, and/or distribute -48V DC to all of the modules, including BBU, RRU and battery.

In the normal case, battery keeps in charging state, acting as one of the loads similar to BBU and RRU. When the main power supply fails, battery will take over to function as the power supply of all the other equipments.

The specifications of BC8910A and PC8910A are listed in the table below:

Table 5-2 Proposed Configuration of Outdoor Cabinets

Item	BC8910A	PC8910A
Dimension (H*W*D) (mm)	800*600*600	800*600*600
Weight of full configuration (kg)	112Kg	Without battery: 52Kg With battery: 452Kg
Power Capacity	120A DC	Up to 2*135Ah
Notes	Reserved 6U space for transmission etc.	

5.2 Four-Carrier Remote Radio Unit - ZXSDR R8984E

ZXSDR R8984E processes 4 received signals and 4 transmitted signals, convenient to be upgraded to 4*4 MIMO LTE mode without any hardware changes.

By applying the distributed system, the feeder loss will be eliminated when the radio unit is positioned close to the antenna, thus the coverage is enlarged.

The exterior appearance and physical indices of R8984E are shown and listed below:

Figure 5-58 Physical Appearance of R8984E

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The specifications of R8984E are listed in the table below:

Table 5-3 Specifications of R8984E

Feature	Description
External Dimensions	425 x 300 x 150 (mm)
Volume	19L
Weight	<19Kg
RF Power	4W/path *4
Antenna Port	4T4R
Instantaneous Bandwidth	160MHz
Occupied Bandwidth	80Mhz (4 Carriers)
Power Consumption	200W（DL:UL 2:2，typical） 260W（DL:UL 3:1，typical）
Operational Power Supply	-48 VDC (-37 VDC to -60 VDC)
Temperature	-40°C - +55°C

6 Global TD-LTE Reference

TD-LTE has long passed the stage of trials and stepped into the stage of large-scale commercialization.

In June, 2016, ZTE cloud-based core network(vCN)won The Best Core Network Product award in the 5G world Summit 2016 in London.

In 2016 June, ZTE jointly announced with Telefónica del Perú the commercial operation

of the first IP Multimedia Subsystem Voice over Long-Term Evolution (IMS VoLTE) network in Perú and in Telefónica LATAM. Telefónica del Perú continues its leadership in the telecommunications technology industry in the region, as it overcomes its users' highest requirements in Perú and greatly enhances its market competitiveness in Latin America. ZTE helped Telefónica del Peru build a unified fixed-mobile convergence (FMC) IMS platform to provide VoLTE and services for both mobile and landline users, which became the first commercial VoLTE and FMC network in Latin America.

2015 Q4, ZTE accomplished the commercial virtualized EPC rolled out for North American Operator Beamspeed and Rise Broadband.

2015 Q4, ZTE signed a contract with Telefonica Group to provide VoLTE service for Telefonica Peru branch (TDP). ZTE IMS can support rich services for TDP such as fixed migration, VoLTE, FMC etc.

Dec 2015, ZTE who is the exclusive core network supplier of Luxemburg JOIN Experience has newly signed a vIMS contact with JOIN, Based on the contract ZTE will deploy vIMS based VoWIFI and VoLTE for JOIN in Luxemburg and Belgium market.

Oct. 2015, ZTE was selected by Masmovil for implementing IMS to provide high quality voice solution in Spain.

2015 Q2, ZTE has won the second phase TD-LTE and MW contract from Peru DTV, and continued maintaining its exclusive supplier status.

As of July, 2013, ZTE had successfully won 22 TD-LTE commercial contracts and deployed TD-LTE networks in 37 countries serving over 55 operators.

At least four of them defined large-scale commercial networks.

Softbank has the world's largest commercial TD-LTE network.

ZTE provided its industry leading, large capacity BBU as the centralized baseband unit. Every group center (GC) room includes several BBU cabinets which can contain multiple BBUs and each BBU can provide capacity for 18 cells. GPS utilizes a fiber remote method, for central rooms which cannot be drilled for feeder cable.

On Feb 24, 2012, Softbank launched 4G high-speed mobile broadband services, the

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download speed of 4G network is up to 76Mbps.

CMCC is the most powerful driving force of TD-LTE. Early on Sep 28, 2011, ZTE has completed pre-commercial test.

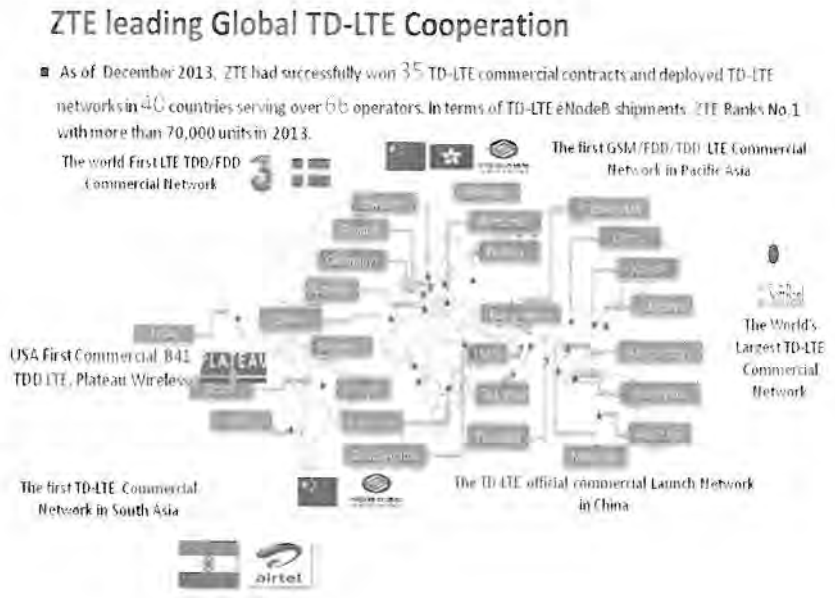
ZTE deployed India's first TD-LTE commercial network on 2.3GHz serving a showcase for the evolution of GSM to TD-LTE. The coverage introduced 2T2R+4T4R solution. With 4T4R, the coverage and capacity have been greatly enhanced. Site and antenna sharing reuses old GSM legacy network as far as possible.

For Hi3G Sweden, ZTE deployed the world's first multi-mode (FDD & TDD) LTE network. Northern Europe is a pioneer in mobile communication. The first LTE network was built there. The requirement for bandwidth is very high. To provide even wider bandwidth, our customer bought various spectrum licenses, including UMTS 900MHz, LTE FDD 800MHz, LTE FDD 2.5GHz and LTE TDD 2.5GHz, especially at TDD 2.5GHz, where they acquired 50MHz spectrum.

To effectively utilize all spectrums, we defined three scenarios. We use 2.5GHz LTE FDD/TDD spectrum to cover dense urban area. We use UMTS 900MHz, LTE FDD 800 MHz and LTE TDD 2.5G to cover suburban and countryside. At last we use LTE TDD 2.5GHz to cover hotspot and blind areas.

Now, commercial launch has been finished in Stockholm, Malmo and Goteborg.

Figure 6-1 Worldwide presence of ZTE TD-LTE system



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7 Glossary

Abbreviation	Full Characteristics
3GPP	3rd Generation Partnership Project
BBU	Base band Unit
CN	Core Network
DL	Downlink
eNodeB	Evolved NodeB
EPC	Evolved Packet Core
EPS	Evolved Packet System
E-UTRAN	Evolved Universal Terrestrial Radio Access Network
FTP	File Transfer Protocol
GPS	Global Positioning System
GW	Gateway
HSS	Home Subscriber Server
LTE	Long Term Evolution
MIMO	Multiple In Multiple Out
MME	Mobility Manage Entity
NM	Network Management
OFDMA	Orthogonal Frequency Division Multiple Access
OMC	Operation and Maintenance Centre
OAM	Operation Administration Maintenance
OPEX	Operating Expense
PDN	Packet Data Network
QoS	Quality of Service
RRU	Remote Radio Unit
SAE	System Architecture Evolution
UE	User Equipment
UL	Uplink

Town of Caroline, New York
TD-LTE Proposal
08/08/2016

Town of Caroline, New York TD-LTE Solution Proposed by M&A Technology

Equipment:

1. 60 Antennas
2. 60 Radios (RRU)
3. 20 Base Station (BBU)
4. 20 Outdoor Cabinet
5. 1 RAN (Radio Area Network) HA Appliance with RAN Management Software
6. 20 150' Mono Pole Tower
7. 20 12' x 12' Concrete Pad enclosed with Chain Link Fencing
8. 20 48V DC Power Rectifier
9. 20 Fiber Cable Multi Mode
10. 20 Coax Power Cables
11. 20 Conduit for Tower
12. Customer Premise Equipment (CPE) 3,100 devices (additional CPE devices available for purchase by the Town of Caroline at $185.00 each).

Warranty:

13. 1 year equipment warranty - from beginning date of installation
14. 1 year warranty on installation services

Maintenance:

15. 1st year maintenance included
16. Additional annual maintenance contracts available @ 10% of the Purchase Price.

M&A Technology Provided Engineering and Installation Services:

1. Site inspection and survey
2. Spectrum analysis
3. RF Simulation, wireless parameter planning
4. Transmission parameter design
5. Background interference test
6. RF Engineering
7. Permits FCC
8. Permits FAA

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9. Antenna Mono Pole installation
    a. Furnish monopole and antenna mounts (monopole to be designed for one ring only)
    b. Soils test
    c. Permit cost
    d. Foundation install, includes, labor and all materials
    e. Erect monopole, includes, labor, crane , install antennas/radios, install standard grounding and clean site
    f. Install 6'x5' equipment pad at base of tower
    g. Furnish and install 12'x12' compound fence
    h. Freight to deliver monopole to site
    i. Electrical and Fiber service from pad to monopole
10. Network detail design
11. Network optimization
    a. Coverage optimization
    b. KPI optimization
12. Engineering design
13. Hardware delivery and installation
14. Software commissioning
15. Interoperability testing
16. Acceptance test
17. System verification

Initial M&A Technology Provided Data Center Services:

1. Core Switch client partition provisioning and configuration
2. Network configuration
3. Initial User set-up and verification
4. Ongoing Core Switch monitoring and management

Project Fees:

1. **Onetime Project Fees:**

a. Equipment and Installation per site: 20 sites	$ 4,410,000.00
b. Mono Tower and Installation per site: 20 sites	$ 465,000.00
c. Total One-time Project Fees:	$ 4,875,000.00

2. **Monthly Recurring Fees:**

a. Network Management Fee (3,100 user; 20 sites)	$ 62,000.00
b. 1 Gbps Circuit Caroline NY to Carrollton Tx	$ 6,000.00
c. Total Monthly Recurring Fees	$ 68,000.00

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Town of Caroline, New York
TD-LTE Proposal
08/08/2016

Town of Caroline, New York Responsibilities:

1. Provide bandwidth to routers and Base Stations from the town's network.
2. Provide connectivity from the tower sites to the town's network.
3. Provide power to each tower site
4. Provide the appropriate site or sites to house the eLTE radio transmission equipment and the radio equipment tower.
5. Future sites: typically 95 to 150 foot mono towers are installed at each radio site, Town of Caroline, New York will provide the land right of ways to install the towers, concreate pads and security fencing.
6. Town of Caroline, New York will provide A/C Power and Fiber connections to the Mono Pole tower.

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