MTS Network Architecture

MTS network was based on that used for 2G, although major changes een to some terminology and to the radio access network .

includes:

MTS Network architecture Radio access Radio interface Frequency bands UMTS CDMA on Data channels UMTS TDD TD-SDCDMA Handover

change from 2G to 3G, the emphasis for the systems changed from a focus on mobile voice ications to mobile data and general connectivity.

dations for the UMTS network had been set in place when GSM was launched. This provided the basic ements as well as circuit switched voice.

6 JUNE 2023

Fact of the day: It was on 6th June 1683 that the Ashmolean Museum opened in Oxford, England. It was the world's first university museum. Then on this day in 1962, the Beatles auditioned with EMI records.

Quote: *Discovery consists of seeing what everyone else has seen and thinking what no-one else has thought.* Albert Szent-Gyorgyi (1893 - 1986) Hungarian scientist

tional of packet data with GPRS required additional network entities to be added. It was the ion of these two network elements that provided the basis for the 3G UMTS network architecture.

access network changed considerably as a completely new radio interface was used based around f CDMA. Also the handset name was changed to user equipment indicating a change in its use from ce phone to a data set which could have been a phone, PDA or laptop, with many laptops requiring a e to plug into a USB port.

MTS network constituents

for the 3G UMTS wireless communications system, there had been many changes when compared to ous generation, the same basic top level system overview was the same.

within the three top level constituents of this wireless communications system there were many

Point to ponder:

Before you start looking for something better, make sure you appreciate what you already have.

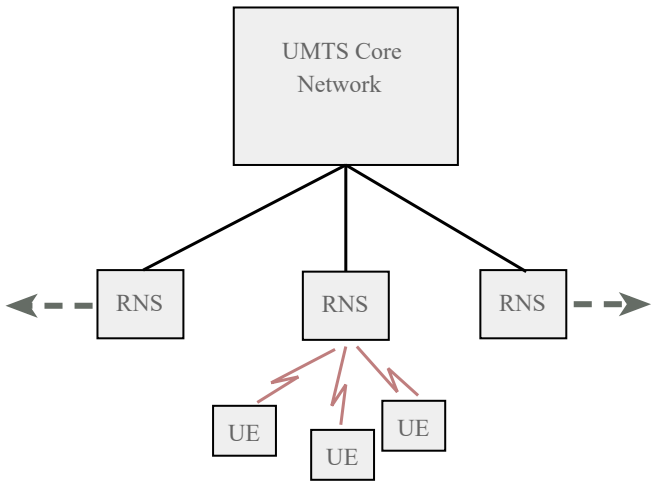
level network architecture for the 3G UMTS wireless communications system could be divided into in elements:

Equipment (UE): The User Equipment or UE is the name given to what was previous termed the e, or cellphone. The new name was chosen because the considerably greater functionality that the UE have. It could also be anything between a mobile phone used for talking to a data terminal attached to puter with no voice capability.

Network Subsystem (RNS): The RNS also known as the UMTS Radio Access Network, UTRAN, was the alent of the previous Base Station Subsystem or BSS in GSM. It provided and manages the air interface e overall network.

Network: The core network provided all the central processing and management for the system. It ıe equivalent of the GSM Network Switching Subsystem or NSS.

network was then the overall entity that interfaced to external networks including the public phone and other cellular telecommunications networks.



The main UMTS network blocks

topics:

▶ **Electronics Notes Bookshop**

EVENTS

▶ SubCon
▶ IMS, International Microwave Symposium
▶ HAM RADIO Friedrichshafen
▶ Hardware Pioneers Max
▶ AUTOTESTCON

More events

SELECTED VIDEO

Equipment, UE

R Equipment or UE was a major element of the overall 3G UMTS network architecture. It formed the rface with the user.

f the far greater number of applications and facilities that it could perform, the decision was made to ser equipment rather than a mobile.

it was essentially the handset (in the broadest terminology), although having access to much higher ta communications, it could be much more versatile, containing many more applications.

s of a variety of different elements including RF circuitry, processing, antenna, battery, etc.

re a number of elements within the UE that can be described separately:

circuitry: The RF areas handled all elements of the signal, both for the receiver and for the nitter. One of the major challenges for the RF power amplifier was to reduce the power consumption.

rm of modulation used for W-CDMA required the use of an RF linear amplifier. These inherently take current than non linear amplifiers which could be used for the form of modulation used on GSM.

dingly to maintain battery life, measures were introduced into many of the designs to ensure the um efficiency.

and processing: The base-band signal processing consisted mainly of digital circuitry. This was lerably more complicated than that used in phones for previous generations.

this had been optimised to reduce the current consumption as far as possible.

ry: While current consumption has been minimised as far as possible within the circuitry of the , there had been an increase in current drain on the battery.

users expecting the same lifetime between charging batteries as experienced on the previous ation phones, this had necessitated the use of new and improved battery technology. Lithium Ion (Li- atteries started to be more widely used to address this issue.

phones needed to remain small and relatively light while still retaining or even improving the overall tween charges.

rsal Subscriber Identity Module, USIM: The UE also contained a SIM card, although in the case of it was termed a USIM (Universal Subscriber Identity Module).

as a more advanced version of the SIM card used in GSM and other systems, but embodied the same of information. It contained the International Mobile Subscriber Identity number (IMSI) as well as the e Station International ISDN Number (MSISDN).

information that the USIM held included the preferred language to enable the correct language nation to be displayed, especially when roaming, and a list of preferred and prohibited Public Land e Networks (PLMN).

SIM also contained a short message storage area that allowed messages to stay with the user even the phone was changed. Similarly "phone book" numbers and call information of the numbers of ing and outgoing calls were stored.

ould take a variety of forms, although the most common format was still a version of a "mobile phone" having many data capabilities. Other broadband dongles started to be used as well - these could be n laptops or even desktop computers on occasions.

MTS Radio Network Subsystem

the section of the 3G UMTS / WCDMA network that interfaced to both the UE and the core network - it he wireless communications elements of the network.

all radio access network, i.e. collectively all the Radio Network Subsystem was known as the UTRAN or dio Access Network.

MTS Core Network

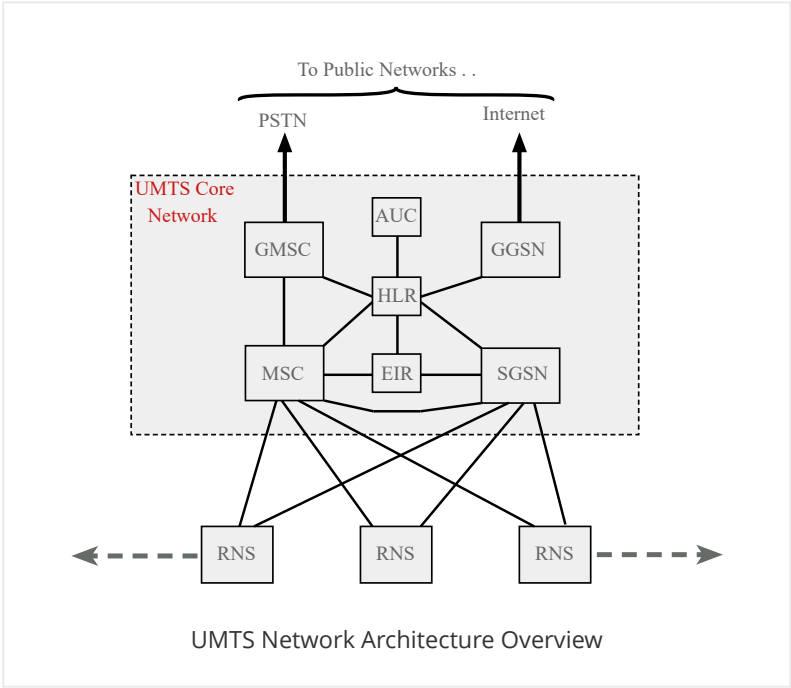
MTS core network architecture was a migration of that used for GSM with further elements overlaid to e additional functionality demanded by UMTS.

f the different ways in which data could be carried, the UMTS core network was split into two different

t switched elements: These elements were primarily based on the GSM network entities and carry
ı a circuit switched manner, i.e. a permanent channel for the duration of the call.

t switched elements: These network entities were designed to carry packet data. This enabled much
· network usage as the capacity could be shared and data was carried as packets which were routed
ding to their destination.

:work elements, particularly those that were associated with registration were shared by both domains
ated in the same way that they did with GSM.



UMTS Network Architecture Overview

vitched elements

it switched elements of the UMTS core network architecture included the following network entities:

e switching centre (MSC): This was essentially the same as that within GSM, and it managed the switched calls under way.

vay MSC (GMSC): This was effectively the interface to the external networks.

witched elements

:et switched elements of the 3G UMTS core network architecture included the following network

g GPRS Support Node (SGSN): As the name implies, this entity was first developed when GPRS was uced, and its use has been carried over into the UMTS network architecture. The SGSN provided a er of functions within the UMTS network architecture.

bility management When a UE attached to the Packet Switched domain of the UMTS Core Network, SGSN generates MM information based on the mobile's current location.

ssion management: The SGSN managed the data sessions providing the required quality of service d it also managed what were termed the PDP (Packet data Protocol) contexts, i.e. the pipes over which data was sent.

eraction with other areas of the network: The SGSN was able to manage its elements within the work only by communicating with other areas of the network, e.g. MSC and other circuit switched as.

ing: The SGSN was also responsible billing. It achieved this by monitoring the flow of user data across GPRS network. CDRs (Call Detail Records) were generated by the SGSN before being transferred to the arging entities (Charging Gateway Function, CGF).

vay GPRS Support Node (GGSN): Like the SGSN, this entity was also first introduced into the GPRS rk. The Gateway GPRS Support Node (GGSN) was the central element within the UMTS packet switched rk. It handled inter-working between the UMTS packet switched network and external packet switched rks, and could be considered as a very sophisticated router. In operation, when the GGSN received ddressed to a specific user, it checked if the user was active and then forwarded the data to the SGSN g the particular UE.

lements

ed elements of the 3G UMTS core network architecture included the following network entities:

e location register (HLR): This database contained all the administrative information about each ·iber along with their last known location. In this way, the UMTS network was able to route calls to the nt RNC / Node B. When a user switched on their UE, it registered with the network and from this it was ole to determine which Node B it communicated with so that incoming calls could be routed priately.

when the UE was not active (but switched on) it re-registered periodically to ensure that the network was aware of its latest position with their current or last known location on the network.

ment identity register (EIR): The EIR was the entity that decided whether a given UE equipment could owed onto the network. Each UE equipment had a number known as the International Mobile ment Identity. This number, as mentioned above, was installed in the equipment and was checked by twork during registration.

ntication centre (AuC) : The AuC was a protected database that contained the secret key also ned in the user's USIM card.

JMTS wireless communications system provided the first step in the transition from a mobile voice chatw as provided by the 1G and 2G services, and this meant that far more data capability was needed. reflected in the network architecture.

PREVIOUS PAGE NEXT PAGE

& Wired Connectivity Topics:
ommunications basics 2G GSM 3G UMTS 4G LTE 5G Wi-Fi Bluetooth IEEE 802.15.4
dless phones Networking fundamentals What is the Cloud Ethernet Serial data USB LoRa
SDN NFV SD-WAN
to Wireless & Wired Connectivity