Mobile Backhaul Network in wireless Sensor

B. Saranya
M.Phil Full-Time Research Scholar,
Department of Computer Science,
Vivekanandha College of Arts and Sciences for Women,
Tamilnadu, India
E-mail: saransaranya100@gmail.com

S.Muruganandham
Assistant Professor,
Department Of Computer Science,
Vivekananda College of Arts and Science for women,
Tamilnadu, India
E-mail: smanand@gmail.com

I Abstract- The mobile backhaul networks have to catch up with all these changes and counterbalance the enhancements on the rest of the networks. Wireless service providers have very specific transport requirements and specifications for their services; understanding these requirements is key to choosing the right technology and type of network for the application. A large number of the existing backhaul networks are based on legacy technologies, incapable of supporting higherspeeds or service requirements. Explosion of packet data traffic over voice, unlimited data/voice services, faster download rates have demand for higher backhaul network capacity and intelligence.The technologies can be support quality of service (QoS) to separate traffic streams, timing synchronization, lower packet loss, and high availability (HA) along with maintaining low operational expenditure. A thorough understanding of these factors ensures operators choose the right technology,network and architecture to implement a successful wireless backhaul business strategy.
Keywords: Mobile Backhaul, Flat IP Network Architecture, Pure Packet Protocol Stack, Migration Methodologies

II Introduction

In recent years, broadband services over optical access networks have spread widely throughout the world, and they continue to be developed as various cloud services. Since optical access is anultimate broadband infrastructure with high capacity and good reliability, telecom operators have invested steadily in it by employing passive optical network (PON) technology such as G-PON/1G-EPON, and this has led to its deep penetration. The standardization of the second next-generation passive optical network (NG-PON2) has also been progressing , and it is expected to have additional values on the deployed optical access infrastructure and provide various attractivservices. At the same time, wireless broadband services are also of great interest, because attractive mobile handsets such as smart phones and tablet devices have recently been launched. Furthermore, machine to machine (M2M) communications designed for a big-data society will trigger further mobile traffic expansion. Therefore, to avoid the problem of a lack of bandwidth and diversity, the deployment of high-speed mobile networks such as the Long Term Evolution-Advanced (LTE-A) system has been scheduled for this decade, and Future RadioAccess (FRA) is now being discussed by the Third Generation Partnership Project (3GPP). The backhaul can be considered to be the portion ofthe network that connects the BTS

(and air interface) to the BSCs and mobile core network. The backhaul can consist of a group of cell sites that are aggregated at a series of hub sites. The generic model for the newer backhaul networks consists ofa cell, hub sites, or both connected to aggregation devices that inturn can either belong or be connected to a Metro network. A Transport type handling data from the different cell sites is carried over pseudo wires which supports circuit emulation, Timing Synchronization type which supports Clocking for the TDM data needs to be synchronized across the network. The framework includes also a reference architecture covering flat mobile networks with generic MPLS use cases that can be used for mobile backhauling.

Multiple wireless services based onsmall-cells over optical access platform:

A new information society we can handle big-data, variouswireless services will be co-existed. Figure 4 shows an image of an optical access platform providing multiple wireless services such as WiFi spot and M2M sensoservices, as well as broadband optical access services. These services shouldbe provided on the same network architecture, which is based ondeep-penetratedopticalaccess infrastructures, because of the need to suppress the huge investment on mobile entrance networks for small-cells from the operator's viewpoint. There is a need to provide various wireless services with different bit rates,required reach, and reliability, through the same optical access infrastructures. To this end, the software-defined OLT based on the DSP technology is an attractive approach [6]. It willalso accommodate RoF signals for realizing centralized signal processing. In such a case, simplification and unification of the hardware, especially on the ONU side, is definitely important if we are achieve significant CAPEX/OPEX reduction.

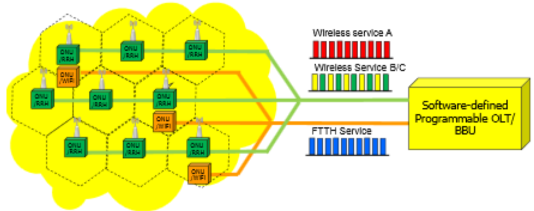

Fig1: Multiple wireless services platform over optical access network

Typical2G/2.5GGSMNetworkOverview:
In a typical wieless network Base station transceivers(BTS)arelocated.Thcontrandradioairinterfaceforeacell.Basestationcontrollers(BSC)providecontrolovermultiplecellsitesand multiple base station transceivers.The base station controllers can be located in a separate office or co-located at the mobile switching center(MSC)

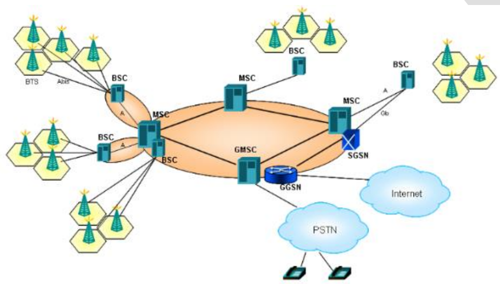

Fig2: Multiple wireless services platform

Flat IP Network Architecture :

To support multi-service traffic with cost effectively,toincreasingtransportbandwidthcapacity for data services by widening frequency band of carriers, maximizing efficiency forbandwidth utilisation, providing carrier grade manageability and survivability and architectures like Flat IP network architectures are the main requirements in mobile backhaul network. The term flat IP architecture can be applied to a network where all the nodes can reach each other via IP connectivity. A flat IP architecture can be applied toa network where the radio and routing functionality is pushed to the edge of the network.The end-to-end connectivity is achieved through a packet-based core network. Technologies such as LTE are based on a flat IParchitecture. One of the main advantages of using IP-based networks is the capability to transport different traffic types over a common IP/MPLS-based infrastructure in addition to providing QoS guarantees and security requirements, low latency and low cost.

Synchronized Access Network:
One of the fundamental requirements for a converged network is the synchronization of the access network This is because it is necessary to consider the migration path fromthe legacy frequency synchronized (i.e. ATM-based) mobile system. Furthermore, future mobile systems will need cooperative operation between cells using coordinated multi-point transmission/reception (CoMP) and heterogeneous network (HetNet) techniques to improve their throughput and coverage. Of course, a cost-effective method is preferable to the currently used global positioning system (GPS). A typical way of achieving synchronization is to employ Synchronization Ethernet (Sync-E) and the Precision Time Protocol (PTP). Sync-E enables us to realize highly precise frequency synchronization with a physical layer based technique. However, this function should be implemented in all interfaces and intermediate nodes. Therefore, it is not easy to apply it smoothly to existing optical systems. On the other hand, the PTP enables us to provide both phase and frequency synchronization with a packet-based technique. Of practical concern is the fact that the PTP is easily affected by traffic conditions. A hybrid configuration based onSync-E has been investigated taking these features into consideration, and only the timing offset is realized by the PTP

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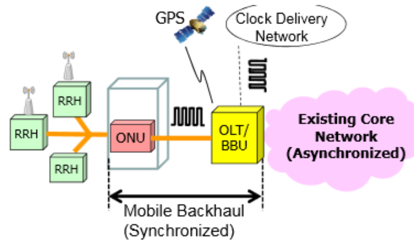

Fig3:Synchronized Network

III Design Considerations for IP Based Mobile Backhaul Network

3.1. VLAN Models

The traffic in the backhaul can be separated either based on services or location into tagged frames and untagged frames. Tagged frames can be location and service tags (Q- in- Q) or only location based tags. Considering untagged frames, the BTS is not capable oftagging the frames with the appropriate location or service information. The appropriate location and ser
vice VLAN tags are added on the cell site device.

3.2. CoS

In general, services signalling, user plane transport, and management traffic can be classified, prioritized, and scheduled using CoS. The mobile backhaul network needs to be capable of recognizing the CoS settings, doing any re-marking of packets if required, prioritizing between the packets, and applying CoS rules to the different traffic streams. Backhaul networks need to be able to support the main traffic type voice,video,networksignalling/management , and best-effort data and also be able to providing low packet loss.

3.3. Transport and Services

MPLS and pseudo wires are used as the transport mechanism in both the IP/Ethernet and hybrid types of mobile backhaul networks. The advantage of using MPLS for transporting pseudo wires is that it is agnostic to the transport media and more scalable than pure Layer networks. Loops and flooding can be avoided. A Layer 3 network can solve such an
issue since the routing information is obtained from the control plane, thus making it more deterministic. Layer 3 networks offer reliability, convergence of services (2G/3G traffic),
QoS, OAM, inherent security and synchronization. MPLS (and pseudo wires) can support transport of multiple technologies such as ATM, TDM, and Ethernet over the same physical links. MPLS protection schemes ensure faster convergence and failure detection times.

3.4. Synchronization

Clock synchronization in a mobile backhaul network is an essential requirement for handoff support, voice quality, and low interference. Loss of timing synchronization can result in poor user experience, service disruptions, and wastage of frequency spectrum. Hence, timing in a mobile network can be distributed by using GPS or a legacy TDM network that is external to the IP-packet based network, Packetbased dedicated streams (IEEE1588- or NTP-based), using Synchronous Ethernet over the physical layer, adaptive clocking, DSLclocking. Thus clock synchronization is obtained.

3.5. Reliability and Fault Detection

Fault detection mechanisms need to be in place at different levels of the network. OAM can be used to detect failures at both Ethernet physical and link layers. MPLS protection schemes offer options such as make-before-break, and link- and node-level failure detection with better convergence times. All these schemes enable faster detection, notification, and recovery from failures; thus increasing the reliability .

3.6. Network Configuration and Monitoring

It is essential to use software tools that provide ease of network provisioning, management, and monitoring. The tools need to be able to maintain a
database of the network nodeinformation in order to
support configuration and monitoring.

IV Methodology

It is nothing but the migration steps from legacy backhaul networks towards carrier Ethernet technology along with maintaining backward compatibility. There are scenarios considered under two cases when migrating from existing legacy networks to Carrier Ethernet. The initial scenario mainly depends upon the extent of Ethernet support available on the BTS. Irrespective of the level of Ethernet support, the migration path involves an intermediate step of a TDM/ATM/Packet hybrid backhaul. Thehybrid nature of the backhaul will depend upon eitherusing an interworking function between the BTS and BSC or running a dual TDM/Ethernet stack on the BTS and BSC .

V Next Generation Backhaul Network

High-speed packet access (HSPA) subscribe growth and increased usage ofmobile multimedia services are driving the success of mobile broadband This serious complement tofixed broadband has become a source of new revenue streams for mobile network operators. Indeed, the increasein data traffic in mobile networks has been dramatic – a study of Ericsson enabled networks mobile data traffic surpassed voice traffic in most operators' HSPA-enabled networks. Many operators are seeing exponential increases in traffic, to attractive offerings and to consumer trends toward high-bandwidth applications,Such as video sharing, peerto-peerand enterprise use of mobile internet and remote office connectivity.These developments are driving the need for next- generation backhaul.

VI Conclusion

Furthermore, with the coming deployment of LTE and 4G mobile systems, it is expected to increase even more. To cope with the changed traffic composition operators need to migrate their legacy TDM networks to packet-switched backhaul networks capable of supporting high volumes of packet traffic while maintaining low OPEX. LTE systems are based on a flatter, all-packet (IP/Ethernet)architecture with significantly higher bandwidths than existing GSM 2G and UMTS 3G networks. Reliance on Ethernet to provide physical layer connectivity is driving the need for Ethernet services. Finally, while the industry has focused on the backhaul of mobile services from cell sites, a far more interesting, lucrative and-near term opportunity exists for transport providers in the core metro networks.

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