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MOBILE COMPUTING FOR 5G TECHNOLOGY

IT4080

ASSIGNMENT - 2

1. List all the multiple access techniques used for wireless communication. Do a neat comparision between TDMA, FDMA & CDMA.

Multiple access techniques used in wireless communication.

1. FDMA:

Frequency division Multiple Access.

Each user is assigned a unique frequency band.

2. TDMA:

Time Division Multiple Access.

Time is divided into slots; each user transmits in assigned time slots.

3. CDMA

Code Division multiple Access.

All users transmit over the same frequency band simultaneously.

4. OFDMA:

Orthogonal Frequency division Multiple Access.

sub-divided the bandwidth into multiple orthogonal subcarriers.

5. SC-FDMA:

Single carrier FDMA. Similar to OFDMA but with lower Peak-to Average Power Ratio [PAPR].

6. SDMA:

Space Division Multiple Access.

Uses spatial seperation with smart antennas & beamforming.

7. NOMA:

Non-Orthogonal Multiple Access.

Multiple users share the same time and frequency resources.

8. PDMA:

Pattern Division Multiple Access.

combines power and pattern mapping for user seperation.

COMPARISION BETWEEN TDMA, FDMA & CDMA.

1. TDMA:

Each user is assigned a specific time slot for transmission.

Efficient use of bandwidth compared to FDMA.

Requires strict time synchronization to avoid overlapping.

Better suited for digital communication.

Lower implementation complexity than CDMA.

Delay-sensitive due to time slot allocation.

Common in 2G mobile systems.

2. FDMA:

Total bandwidth is divided into non-overlapping frequency bands.

Each user has exclusive use of one frequency band during a call.

Minimal synchronization required.

Less efficient due to guard bands between frequencies.

Continuous transmission increases power consumption.

Simpler hardware requirements.

Used in early 1G analog systems like AMPS.

3. CDMA:

All users share the same frequency and time, differentiated by unique spreading codes.

Higher capacity and resistance to interference.

No need for guard bands or time slots.

Ideal for dense environments with high user counts.

offers high spectral efficiency - efficient use of bandwidth.

2. The new use of the new modulation and the protocol enhancements, result in dramatically increased throughput and capacity gains enabling 3G services in the existing GSM/GPRS networks. No changes are needed to the existing core network infrastructure to support EDGE. Examine on the fact that EDGE is only an "add-on" for BSS.

INTRODUCTION:

EDGE stands for Enhanced Data rates for GSM Evolution.

It is a 3G technology based on the enhancement

of existing 2G GSM & GPRS networks.

KEY CHARACTERISTICS OF EDGE:

Uses 8PSK modulation in addition to GMSK used in GSM.

Offers theoretical data rates up to 384 kbps.

Requires no changes to the existing core network.

Only upgrades to BSS (Base Station subSystem) are needed.

Compatible with existing GSM/GPRS spectrum and equipment.

EDGE as an ADD-ON FOR BSS:

(i) Software Upgrade to BTS

Edge support can be added via software modifications.

No major hardware overhauls are required.

(ii) Hardware Upgrade.

Some BTS models may need hardware upgrades for optimal EDGE support.

Transceivers may require EDGE-capable modems or signal processors.

iii. No change to core Network.

The MSC and SGSN / GGSN components remain unchanged.

makes EDGE cost-effective and easy to deploy.

iv. Reuses GSM Radio channels.

EDGE uses the same 200 KHz channels as GSM.

Operators can switch dynamically between GSM, GPRS and EDGE.

v. Protocol Enhancements.

Introduction of new coding schemes for improved error correction & throughput.

More efficient radio link protocols & dynamic link adaption.

ADVANTAGES OF EDGE AS A BSS ADD-ON:

Provides 3G - like speeds with minimal investment.

Easier & faster to roll out compared to full 3G infrastructure.

Fully backward compatible with GSM & GPRS devices.

CONCLUSION:

EDGE is rightly teamed an "add-on" to the GSM / GPRS BSS

It delivers significant performance improvements through modulation upgrades and efficient protocols, without requiring changes to the core network.

This makes the EDGE a bridge between 2G & 3G, offering enhanced services while maintaining infrastructure compatibility.