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AN INVESTIGATION INTO ADVANCE TIME DIVISION MULTIPLE ACCESS BASED PERSONAL COMMUNICATION NETWORKS

This Thesis is Presented in Partial Fulfilment of the Requirements for the Degree of Master of Technology in Production Technology at Massey University

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ABSTRACT

This thesis examines and simulates a statistically multiplexed multiple access technique known as Advanced Time Division Multiple Access (ATDMA). The simulations were carried out in a multimedia traffic environment. Parameters that could optimise the network performance in terms of quality, reliability and capacity have been examined using a simulation model. This thesis also examines network architecture and signalling related issues.

The simulation results were analysed to propose a suitable ATDMA frame structure in terms of the frame length and the organisation of traffic and reservation slots. The simulation results indicated that the performance of the ATDMA based system can be enhanced when delay insensitive data is transmitted as blocks of packets of a specific size. The simulation results also indicated that the performance of the ATDMA based system can be further enhanced when a video terminal is allocated a single traffic slot as opposed to multiple traffic slots. Further simulations have been carried out to determine the up-link traffic channel capacities and control channel capacities. This thesis also examined aspects that could further enhance the performance of an ATDMA based system.

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LIST OF ABBREVIATIONS

ACCH	Associated Control Channel
AGCH	Access Grant Channel
AMPS	Adavanced Mobile Phone System
APC	Automatic power Control
A-TDMA	Advanced-Time Division Multiple Access
ATDMA-PL	Advanced-Time Division Multiple Access-Physical Layer
ATM	Asynchronous Transfer Unit
ATM-NTU	ATM Network Transfer Unit
BC	Bearer Controller
BCCH	Broadcast Control Channel
B-ISDN	Broadband ISDN
BLC	Base Link Controller
BLM	Base Location Manager
BRA	Base Resource Allocator
BS	Base Station
BSS	Base Station System
BSC	Base Station Controller
BTP	Base Transport
BTS	Base Transceiver Station
CC	Common Controller
CCCH	Common Control Channel
CDMA	Code Division Multiple Access
CCSS7	Common Channel Signaling System Number 7
CL	Connectionless
CO	Connection-Oriented
CS	Convergence Sublayer
CT-2	Second Generation Cordless Telephones
DCCH	Dedicated Control Channel
DECT	Digital European Cordless Telephone
ETSI	European Telecommunications Standards Institute

FBR	Fixed Bit Rate
FIFO	First Come First Out
FPLMTS	Future Public Land Mobile Telecommunication System
HB	Header Bits
GEOS	Geostationary Satellite
ID	Identification Number
IN	Intelligent Network
ISDN	Integrated Services Digital Network
ISDN-UP	Integrated Services Digital Network User Part
LA	Link adaptation
LC	Link Controller
LE	Local Exchange
LEOS	Low Earth Orbit Satellite
LCCH	Leash Control Channel
LM	Location Manager
LSD	Least Significant Digit
MAC	Medium Access Control
MAP	Mobile Application Part
ME	Measurement Entity
MEOS	Medium Earth Orbit Satellite
MLC	Mobile Link Controller
MLM	Mobile Location Manager
MRA	Mobile Resource Allocator
MRC	Mobile Routing Controller
MS	Mobile Station
MSC	Mobile Switching Center
MSD	Most Significant Digit
MSCP	Mobility and Service Control Point
MSDP	Mobility and Service Data Point
MSS	Mobile Satellite Services
MT	Mobile Terminal
MTC	Mobile Traffic Controller

MTP	Message Transfer Part
MTP	Mobile Transport
MSU	Mobile Switching Unit
NADC	North American Digital Cellular
NCS	Network Combiner & Switching
NLC	Network Link Controller
NLM	Network Location Manager
NLP	Network Layer Protocol
NNI	Network to Network Interface
NRA	Network Resource Allocator
NRC	Network Routing Controller
NTC	Network Traffic Controller
OSI	Open System Interconnection
PCN	Personal Communication Network
PRMA	Packet Reservation Multiple Access
PSTN	Public Switched Telephone Network
RA	Resource Allocator
RACH	Random Access Channel
RAMA	Resource Auction Multiple Access
RC	Routing Controller
RF	Radio Frequency
RF-NTU	RF Network Transfer Unit
RGCH	Access Grant Channel
RLL	Radio Link Layer
RLP	Radio Physical Layer
RSS	Radio Support System
SAAL	Signaling ATM Adaptation Layer
SAR	Segmentation and Reassembly
SC	Slot Controller
SCCP	Signaling Connection Control Part
SCP	Service Control Point
SNL	Signaling Network Layer

SS 7	Signaling System Number 7
STP	Signaling Transfer Points
TB	Tail Bits
TC	Transmission Controller
TCH	Traffic Channel
TX	Transient Exchange
TDM	Time Division Multiplexed
TDMA	Time Division Multiple Access
QoS	Quality of Service
UMTS	Universal Mobile Telecommunication System
VCI	Virtual Channel Identifier
VPI	Virtual Parth Identifier
WARC'92	World Administrative Radio Conference 1992