بسم الله الرحمن الرحيم

قال تعالي:

لَا الشَّمْسُ يَنبَغِي لَهَا أَن تُدْرِكَ الْقَمَرَ وَلَا اللَّيْلُ سَابِقُ النَّهَارِ وَكُلٌّ فِي فَلَكٍ يَسْبَحُونَ)

صدق الله العظيم

سورة يس الاية (40)

Dedication

This research is

Dedicated to those who patiently waited for me to finish:

My parents

My aunts & uncles

My grand mother

My brothers

Acknowledgments

I would like to take this opportunity to express my gratitude to my advisers, Dr.Salah for his supported and advised me through the master process, and for electronics department in Sudan University of Science and Technology. Also I would like to thank my friends and family without them the last few months would not have been as memorable. Khalid, Sami, Bahreldin, Mahmoud, Elshaigy, Ahmed, Mauwia. And for Fathia, Mosa and their sons thank you all. I certainly would not have completed my master studies without their support. Finally, I would like to thank my live Namarig for her constant encouragement and understanding.

Abstract

This dissertation proposes a contention media access control protocol for optical Code Division Multiple Access (CDMA) Local Area Networks (LANs) with Interference Avoidance. Optical CDMA is spread spectrum technology for multiplexing transmissions on an optical fiber. When OCDMA used as the physical layer in Local Area Networks, its throughput tends to zero at high offered load because of multiuser interference. Interference Avoidance prevents this throughput collapse of optical CDMA networks at high offered load. It extends the Carrier Sensing mechanism to high speed, shared medium, optical networks. Interference Avoidance consists of transmission scheduling. This work proposes algorithms for transmission scheduling using Fixed-rate perfect code and Variable-rate perfect code. The transmission scheduling algorithms stabilize the throughput at around 25% for fixed rate and 36% for variable rate of the maximum at high offered load. The work compares two algorithms with ALOHA CDMA where all transitions are admissible, in addition to that the throughput of aloha is around 18%. The strategy of this project is to get mathematical representation of transmission scheduling and solve its equation using MATLB program.

مستخلص

هذه الاطروحة تتناول تجنب التداخل في شبكات الالياف البصرية المحلية ذات الوصول الترميزي المتعدد. الليف البصري ذو الوصول الترميزي المتعدد هو عبارة عن تقنية انتشار طيفي لمزج الاشارات المرسلة في ليف بصري واحد. عند استخدام تقنية الليف البصري ذو الوصول الترميزي المتعدد في الشبكات المحلية تقل الكفاءة عند الحمل العالي (عند زيادة عدد المستخدمين) وذلك بسبب التداخل نسبة لتعدد المستخدمين. عملية تجنب التداخل تحافظ علي هذه الكفاءة عند زيادة عدد المستخدمين. وهي تحسين لتقنية تحسس الناقل في الاوساط المتشاركة ذات السرعات العالية,عملية تجنب التداخل هذه تحتوي عدة تقنيات, والمستخدمة هنا هي عملية جدولة الارسال باستخدام تقنيتين هما تقنية الكود المثالي الثابت وتقنية الكود المثالي المتغير. في الاولي تم الحصول علي كفاءة حوالي 25%, وفي الثانية حوالي 35%, وذلك عند أعلي عدد من المستخدمين مقارنة بألوهة الذي يعطي كفاءة حوالي 18%. استراتيجية هذا البحث هو ايجاد شرح رياضي لعملية جدولة الارسال المستخدمة لتجنب الارسال وحل المعادلات الرياضية للحصول علي الكفاءة أعلاه باستخدام لغة الماتلاب.

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List of Acronyms

Acronyms	Description
ASE	Amplifier Spontaneous Emission
AWGN	Additive White Gaussian Noise
BER	Bit Error Rate
BPF	Band Pass Filter
BPSK	Binary Phase Shift Keying
BS	Bandwidth Spread
BTMA	Busy Tone Multiple Access

CDMA	Code Division Multiple Access
CS	Carrier Sense
CSMA	Carrier Sensing Multiple Access
CSMA/CA	Carrier Sense Multiple Access/Collision Avoidance
CSMA/C	Carrier Sense Multiple Access/Collision Detection
C-T	Common-Transmitter
DS CDMA	Direct sequence CDMA.
DS/DO	Destroy Self/Destroy Other
DS/PO	Destroy Self/Preserve Other
DS/SS	Direct Sequence/Spread Spectrum
DS/SS/ON	Direct Sequence/Spread Spectrum/optical Network
DS-CDMA	Direct Sequence-CDMA
EGC	Error Generating Codeset
FDD	Frequency Division Duplex
FDMA	Frequency Division Multiple Acsses
FEC	Forward Error Correction
FH	Frequency hop
FH CDMA	Frequency-hopped CDMA.
Acronyms	**Description**
FH/SS	Frequency hop/Spread Spectrum
FM	Frequency Modulation
IM-DD	Intensity Modulation- Direct Detection systems
IS/ID	Interference Sense/Interference Detection
LAN	Local Area Network
MAC	Medium Access Control
MACA	Multiple Access Collision Avoidance
MAI	Multiple Access Interference
MAIA/C-T	Multiple Access Interference Avoidance/Common-Transmitter

MAIA/R-T	Multiple Access Interference Avoidance/Receiver-Transmitter
M-FSK	M-ary frequency shift keying
OCDMA	Optical Code Division Multiple Access
ONs	Optical Networks
OOC	Optical Orthogonal Codes
OOK	On-Of Keying
PL_R	Relative Path Loss
PON	Passive Optical Network
PS/DO	Preserve Self/Destroy Other
PS/PO	Preserve Self/Preserve Other
PSD	Power Spectral Density
RF	Radio Frequency
R-T	Receiver-Transmitter
RTS/CTS	Request-To-Send/Clear-To-Send)
SS/ONs	Spread Spectrum Optical Networks
SSMA	Spread Spectrum Multiple Access
TDD	Time Division Duplex
Acronyms	**Description**
TDM	Time Division Multiplex
TDMA	Time Division Multiple Access
TH	Time-hopped CDMA
WDM	Wave Division Multiplex
WDMA	Wave Division Multiple Access

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