



IEEE Canada



**KITCHENER-WATERLOO
SECTION**

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The Kitchener-Waterloo Section of the Institute of Electrical and Electronics Engineers serves members whose mailing address is in Bruce, Grey, Perth, Waterloo or Wellington counties. It collects news relevant to local engineers and is published bi-monthly.

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Upcoming Events

Check <http://kw.ieee.ca/activities.html> for updated information.

Quantitative QoS and Efficient Resource Allocation in Differentiated Services Networks

IEEE Vehicular Technology Chapter Presentation, Nov 25, 11:00, EIT 3142

By Dr. Yu Cheng, University of Toronto

The differentiated services (DiffServ) architecture has been widely accepted as a scalable traffic management model to provision quality of service (QoS) in both wireless and wireline networks. DiffServ defines differentiated per-hop behaviors (PHBs) and service level agreement (SLA) based network management architecture, but it leaves open the specific techniques to provision quantitative QoS and achieve efficient resource allocation. In this talk, we first develop a quantitative assured service, which is an enhancement of the DiffServ assured PHB to provision quantitative QoS guarantee. For such a service, a partitioned-buffer scheme and associated admission control algorithms are studied to achieve intra-buffer loss differentiation with quantitative loss probability guarantee. Accurate loss analysis techniques are developed for both large buffer and finite-size buffer cases with general input processes. Effective bandwidth based admission control is also investigated. We then discuss how to improve resource utilization by connection level or service level QoS control in the SLA-based resource management architecture, assuming the packet-level QoS issues are encapsulated by the notion of effective bandwidth. At the present time, static SLAs are mainly used, where the network is dimensioned based on an estimation of the average traffic load. In reality, when the actual traffic load deviates from the estimation, resources will be utilized inefficiently. We develop a bandwidth borrowing technique for dynamic inter-SLA resource sharing. It improves resource utilization by exploiting the spare capacity of underloaded SLAs to admit traffic for overloaded SLAs, while SLA compliance is always guaranteed via a novel call-level service differentiation concept. Moreover, distribution of the spare capacity in the network can be dynamically adjusted according to

high-level policies and via a distributed algorithm to further improve the resource utilization.

The Drug Trial: You Be the Judge

Perimeter Institute Public Lecture, December 7, 2005, 7:00pm, Miriam Shuchman, M.D.

How do you advise a scientist who says she has information that could be vital to the public health but she's been told to keep it a secret? In this talk Dr. Shuchman will discuss the dramatic act of blowing the whistle in science. Drawing on the extensive information in her best-selling book including interviews with whistleblowers, surveys of scientists and public testimony - and adding new material that isn't in the book - Shuchman will outline the benefits of scientific whistleblowing over the past 40 years. Then she will describe its aftermath.

Recent Events

Senior Member Upgrades

The following local member has earned the professional recognition of peers for technical and professional excellence.

Reza Dizaji

See <http://www.ieee.org/ra/md/smpogram.html> for more information on this program.

Student Branches Active

M.Hulls

Local university students are making great strides to increase the interest in IEEE. University of Guelph is planning a Design & Fabrication lab to produce a simple infrared-to-serial converter that allows interfacing a PC with a standard 38kHz remote control. Conestoga College students have had a number of social events to increase membership. The UW Branch B students arranged an Artificial Intelligence competition involving ~170 participants expanding their knowledge in Java programming.

Prof. Will Asked "Was Einstein Right?"

Tom East

As part of the Perimeter Institute "Einsteinfest" celebration, on October 5th Professor Clifford Will of Washington University gave a fascinating lecture on the experimental confirmation of Albert Einstein's General Theory of Relativity.

Einstein was not an experimentalist, but his work predicted, among other things, that light is deflected towards a mass near its path. The first experiments involved photographing the positions of stars while and after the sun was between the stars and earth: these observations would only work when there was an eclipse to block out the sunlight. After some attempts foiled by cloudy weather, the predicted deflection was observed, correct within experimental error. Since then, measurements involving a massive star have been made, using either the Hubble telescope, or radio frequency interferometers. In every case, the predictions of the theory of relativity have been confirmed, in some cases to many significant figures.

Another experimental confirmation came from observations of the orbit of Mercury. The orbit is elliptical: according to Newtonian physics, in the absence of other planets, the axes of the ellipse should stay fixed. They actually rotate about the sun very slowly (about one sixth of a degree per century): Leverrier calculated that most of this effect was caused by other planets, but it took Einstein's general theory to account for the rest.

Professor Will described the corrections that have to be made in the signals from the Global Positioning Satellite system (GPS) as a result of general relativity.

Dr. Hesjedal Described How to Manipulate Single Atoms

Tom East

On October 21st, Dr. Thorsten Hesjedal, Senior Scientist at the Paul-Druhe Institute for Solid State Electronics in Berlin, Germany, gave us a fascinating picture of individual atoms being assembled into molecules.

Researchers use Scanning Tunnelling Microscope (STM) not only to observe atoms, but to move them about. The substrate used is an octahedral face of a copper crystal (Cu111) in which the atoms are arranged in a hexagonal pattern. A few carbon atoms rest on this surface in the grooves. The tip of the probe of the STM is placed near one of these atoms, and by application of suitable voltage and current (a few volts, a fraction of a microamp), the atom is pulled or pushed along a groove.

This type of technology may lead to many more gates on a chip and postpone the end of Moore's Law for several more years.

Prof. Horowitz Covered Space-Time

Tom East

As part of the Einsteinfest celebrations at the Perimeter Institute, on 23rd October, Prof. Horowitz of the University of California discussed Einstein's view of the universe and subsequent developments before a standing room only crowd.

According to the Special Theory of Relativity, time is a dimension somewhat like the three space dimensions. However, no thing or signal can exceed the speed of electromagnetic waves in a vacuum, about 300,000 km/sec, (though the Fermilab accelerator pushes protons at 0.999999 times that speed). The elapsed time between two events depends on the velocity of the person measuring it, and so does the length of an object.

According to the General Theory of Relativity, a mass distorts space-time: the path of another object or of a beam of light is influenced by this curvature: the theory was first tested by observation during an eclipse of the sun - see "Was Einstein Right?". The speaker told us that Einstein's first calculation of this effect was in fact wrong, but fortunately the eclipse which would have shown him wrong was clouded out, and he came up with the right answer before a clear sky eclipse showed he was right.

A Black Hole consists of a dead star which distorts space-time so much that nothing can escape. It does not have to be very dense, just very massive. There is one in the Milky Way which has a million times the mass of our sun. A black hole eventually becomes a singularity of infinite density.

Time slows down near a massive object. Even the earth causes a clock in space to differ from one on the surface, and this is allowed for in the GPS system. Matter in motion produces gravitational waves: the Laser Interferometric Gravitational wave Observatory (LIGO) is intended to detect them, but the fact that binary neutron stars (which emit pulsars) are slowing down, already suggests that they are emitting gravitational waves.

The speaker stated that a time machine is not inherently impossible, but would be very difficult to make. It could only take you into the future.

As for cosmology, the distance between galaxies is increasing (“expanding universe”) but the galaxies are not increasing in size: working backwards, this implies that time started with a “big bang” 13 billion years ago. However, at such a singularity, general relativity would not apply, and one needs to invoke a quantum theory of gravity.

String Theory might unify all known forces. According to it, every fundamental particle is a string, and they differ in their properties because of different vibrations of the string. The theory predicts nine (or perhaps ten) dimensions, but we do not observe the extra dimensions because they are curled up into small circles, and it would require excessive energy to detect them.

The speaker concluded by saying that Einstein said there was a beginning of time and there will be an end – in a black hole. String Theory is not sure of either. Both agree that time slows down when you move quickly.

Target Tracking and Data Fusion

IEEE AESS, Dr. Bar-Shalom, University of Connecticut

How to Get the Most Out of Your Sensors. This talk describes the evolution of the technology of tracking objects of interest (targets) in a cluttered environment using remote sensors. Approaches for handling target maneuvers (unpredictable motion) and false measurements (clutter) are discussed. Advanced (“intelligent”) techniques with moderate complexity are described. The emphasis is on algorithms which model the environment and the scenarios of interest in a realistic manner and have the ability to track low observable (LO) targets. The various architectures of information processing for multi-sensor data fusion are discussed. Applications are presented from Air Traffic Control (data fusion from 5 FAA radars for 800 targets) and underwater surveillance for a LO target.

Medieval texts hit information highway

UW Daily Bulletin

UW profs are uploading the texts of an early scientist (Albertus Magnus 1193?-1280) as part of a world wide project to make the works of early scholarly works available online.

Hard Open Problems in Network Computing, and Hints on How to Solve Them

ICR Seminar Oct 13 by Tim Bray, Sun Microsystems

Trends in modern Network Computing include:

- Changes in the trade-offs between data storage media, in particular disk and main memory, in terms of cost, performance, and scale.
- Moore's law is now chiefly increasing parallelism rather than clock rates in processors.
- Software architectures in the era of "Web Services" are tending away from RPC and toward loose coupling, message exchange, asynchrony, and contract-based services.
- Increasing interest in "dynamic languages" which do not offer compile-time type-checking; for example, Python as opposed to Java.

This talk will outline problems arising out of these trends, with particular focus on current industrial pain points, and offer some general thoughts on which directions might prove fruitful to investigators interested in addressing them.

Award from Strategic Microelectronics Council

UW Daily Bulletin

Mohammad Maymandi-Nejad, a graduate student in electrical and computer engineering, is this year's winner of an award from the Strategic Microelectronics Council. The award recognizes "industrial collaboration", and Maymandi-Nejad was cited for his project entitled "A Wireless Bio-Implantable Device for Monitoring Blood Pressure of Transgenic Mice".

http://www.cmc.ca/news/awards/smc_award.html

Nortel Networks Institute Research Excellence Awards

UW Daily Bulletin

Four graduate students in electrical and computer engineering had their excellence in research recognized by the Nortel Networks Institute for Advanced Information Technology at the University of Waterloo." Winners: Mohammad Ali Maddah-Ali and Mahmoud Taherzadeh for "Standard Contribution in Sub-Channel Reuse for CQICH Fast Feedback Channels"; Mehdi Ansari and Hadi Baligh for "Standard Contribution in Unified MIMO Pre-coding Based on Givens Rotation".

Engineers and the World

Uptown Waterloo Wi-Fi Enabled

Waterloo Tech Digest

Atria Networks has converted all of downtown Waterloo into a Wi-Fi hotspot, called the Uptown Waterloo Wi-Fi Zone. Businesses through the area can subscribe to the service, and can provide access to their customers if they choose to. Fees start at \$4.95 for an hour, and there are daily, weekly, and monthly rates. Wi-Fi service at the Waterloo Public Library remains free for users. Pay-per-use access is also available at the Rec Complex and RIM Park.

Local Business Leaders Create Global Change Portal

KW Record

A new portal will allow politicians, non-government organizations, academics, aid workers, anyone with Internet connectivity, to find detailed information about countries, their governments and the issues that challenge them.

It will be available to help countries hit by disasters, aid understanding of problems faced by others and help organize responses.

The system was created by combining leaders and technology from Waterloo county including RIM, Open Text and University of Waterloo.

See <http://www.theigloo.org> for more information

Professor Honoured With Street Name

KW Record

Frank Tompa Drive is now the official name of the road to Open Text in the UW business park. Frank Tompa is a UW Professor and was co-founder of the Open Text technology.

Geothermal Company Launched

KW Record

Local businessmen Jim Bolger and Paul Dietrich have launched Earth FX Energy Inc to install geothermal heating and cooling systems. These systems are expensive to install but can reduce energy costs by up to two-thirds of current systems.

<http://www.earthfxenergy.com>

Scooters Park for Free in Toronto

Globe and Mail

A recent motion passed by the City of Toronto allows scooters and motorcycles to park for free on city streets. The city hopes to encourage alternatives to driving a car.

Research Accelerator Centre Looking for Clients

KW Record

The Waterloo Research and Technology centre is already considering proposals from small businesses looking for help to grow big. The center provides low rent space initially and will partner with the clients to get them to the next stage. This help includes access to local business and technical expertise, shared resources and planning.

Electromagnetic Humour

Selected by Tom East

Two antennas met on a roof, fell in love and were married. The wedding was not up to much, but the reception was excellent.