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Editorial. Zegura, E.W. p. 461- 461

Tussle in Cyberspace: Defining Tomorrow's Internet. Clark, D.D.; Wroclawski, J.; Sollins, K.R.; Braden, R. p. 462- 475

The architecture of the Internet is based on a number of principles, including the self-describing datagram packet, the end-to-end arguments, diversity in technology and global addressing. As the Internet has moved from a research curiosity to a recognized component of mainstream society, new requirements have emerged that suggest new design principles, and perhaps suggest that we revisit some old ones. This paper explores one important reality that surrounds the Internet today: different stakeholders that are part of the Internet milieu have interests that may be adverse to each other, and these parties each vie to favor their particular interests. We call this process "the tussle." Our position is that accommodating this tussle is crucial to the evolution of the network's technical architecture. We discuss some examples of tussle, and offer some technical design principles that take it into account.

Distributed Self-Stabilizing Placement of Replicated Resources in Emerging Networks. Ko, B.-J.; Rubenstein, D. p. 476- 487

Emerging large scale distributed networking systems, such as P2P file sharing

systems, sensor networks, and ad hoc wireless networks, require replication of content, functionality, or configuration to enact or optimize communication tasks. The placement of these replicated resources can significantly impact performance. We present a novel self-stabilizing, fully distributed, asynchronous, scalable protocol that can be used to place replicated resources such that each node is “close” to some copy of any object. We describe our protocol in the context of a graph with colored nodes, where a node's color indicates the replica/task that it is assigned. Our combination of theoretical results and simulation prove stabilization of the protocol, and evaluate its performance in the context of convergence time, message transmissions, and color distance. Our results show that the protocol generates colorings that are close to the optimal under a set of metrics, making such a protocol ideal for emerging networking systems.

A Traffic Characterization of Popular On-Line Games. Feng, W.; Chang, F.; Walpole, J. p. 488- 500

This paper describes the results of the first comprehensive analysis of a range of popular on-line, multiplayer, game servers. The results show that the traffic behavior of these servers is highly predictable and can be attributed to the fact that current game designs target the saturation of the narrowest, last-mile link. Specifically, in order to maximize the interactivity of the game itself and to provide relatively uniform experiences between players playing over different network speeds, on-line games typically fix their usage requirements in such a way as to saturate the network link of their lowest speed players. While the traffic observed is highly predictable, the traces also indicate that these on-line games provide significant challenges to current network infrastructure. As a result of synchronous game logic requiring an extreme amount of interactivity, a close look at the trace reveals the presence of large, highly periodic, bursts of small packets. With such stringent demands on interactivity, routers must be designed with enough capacity to quickly route such bursts without delay.

Can Unstructured P2P Protocols Survive Flash Crowds?. Rubenstein, D.; Sahu, S. p. 501- 512

Today's Internet periodically suffers from hot spots, a.k.a., flash crowds. A hot spot is typically triggered by an unanticipated news event that triggers an unanticipated surge of users that request data objects from a particular site, temporarily overwhelming the site's delivery capabilities. During this time, the large majority of users that attempt to get these objects face the frustrating experience of not being able to retrieve the content they want while still being able to communicate effectively with all other parts of the network. In this paper, we examine whether simple, undirected peer-to-peer search protocols can be used as a backup to deliver content whose popularity suddenly spikes. We model a simple, representative, undirected peer-to-peer search protocol in which clients cache only those objects they have explicitly requested. Because the object that becomes hot initially has limited popularity, the number of cache points, were they to remain fixed, would be insufficient to handle the level of demand during the flash crowd. However, as searches complete, more copies of the object become available. We

analyze this natural scaling phenomenon and show that during the flash crowd, copies are distributed to requesting clients at a fast enough rate such that these simple protocols can indeed be used to scalably retrieve content that suddenly becomes “hot.”

Constructing Internet Coordinate System Based on Delay Measurement. Lim, H.; Hou, J.C.; Choi, C.-H. p. 513- 525

In this paper, we consider the problem of how to represent the locations of Internet hosts in a Cartesian coordinate system to facilitate estimation of network distances among arbitrary Internet hosts. We envision an infrastructure that consists of beacon nodes and provides the service of estimating network distance between pairs of hosts without direct delay measurement. We show that the principal component analysis (PCA) technique can effectively extract topological information from delay measurements between beacon hosts. Based on PCA, we devise a transformation method that projects the raw distance space into a new coordinate system of (much) smaller dimensions. The transformation retains as much topological information as possible and yet enables end hosts to determine their coordinates in the coordinate system. The resulting new coordinate system is termed as the Internet Coordinate System (ICS). As compared to existing work (e.g., IDMaps and GNP), ICS incurs smaller computation overhead in calculating the coordinates of hosts and smaller measurement overhead (required for end hosts to measure their distances to beacon hosts). Finally, we show via experiments with both real-life and synthetic data sets that ICS makes robust and accurate estimates of network distances, incurs little computational overhead, and its performance is not susceptible to the number of beacon nodes (as long as it exceeds a certain threshold) and the network topology.

Network Decomposition: Theory and Practice. Eun, D.Y.; Shroff, N.B. p. 526- 539

We show that significant simplicities can be obtained for the analysis of a network when link capacities are large enough to carry many flows. We develop a network decomposition approach in which network analysis can be greatly simplified. We prove that the queue length at the downstream queue converges to that of a single queue obtained by removing the upstream queue, as the capacity and the number of flows at the upstream queue increase. The precise modes of convergence vary depending on the type of input traffic, i.e., from regulated traffic arrivals to point process inputs. Our results thus help simplify network analysis by decomposing the original network into a simplified network in which all the nodes with large capacity have been eliminated. By means of extensive numerical investigation under various network scenarios, we demonstrate different aspects and implications of our network decomposition approach. Some of our findings are that our techniques perform well especially for the cases when: i) many flows are multiplexed as they enter the queue and/or ii) departing flows are routed to different downstream nodes, i.e., no single flow dominates at any node.

Layered Media Multicast Control (LMMC): Rate Allocation and Partitioning. Yousefi'zadeh, H.; Jafarkhani, H.; Habibi, A. p. 540- 553

The objective of layering techniques of distributing multimedia traffic over multicast IP networks is to effectively cope with the challenges in continuous media applications. The challenges include heterogeneity, fairness, real-time constraints, and quality of service. We study the problem of rate allocation and receiver partitioning in layered and replicated media systems. We formulate an optimization problem aimed at maximizing a close approximation of the so-called max-min fairness metric subject to loss and bandwidth constraints. Our optimal Layered Media Multicast Control (LMMC) solution to the problem analytically determines the layer rates and the corresponding partitioning of the receivers. Our simulation results show the effectiveness of our proposed solution in realistic

A Rate Control Scheme for Adaptive Real-Time Applications in IP Networks With Lossy Links and Long Round Trip Times. Akyildiz, I.F.; Akan, O.B.; Morabito, G. p. 554- 567

Currently there is no control for real-time traffic sources in IP networks. This is a serious problem because real-time traffic can not only congest the network but can also cause unfairness and starvation of TCP traffic. However, it is not possible to apply current solutions for Internet to the networks with high bandwidth-delay products and high bit error rates. The channel errors may result in inaccurate congestion control decisions and unnecessary rate throttles leading to severe performance degradation. This problem is amplified in the links with high bandwidth-delay products, since the link is inefficiently utilized for a very long time until the unnecessary rate throttle is recovered. In this paper, a new Rate Control Scheme, RCS, is introduced for real-time interactive applications in networks with high bandwidth-delay products and high bit error rates. RCS is based on the concept of using dummy packets to probe the availability of network resources. Dummy packets are treated as low priority packets and consequently they do not affect the throughput of actual data traffic. Therefore, RCS requires all the routers in the connection path to support some priority policy. A new algorithm is also proposed to improve the robustness of the RCS to temporal signal loss conditions. The delay-bound considerations for real-time traffic sources using RCS rate control scheme are also investigated. Simulation experiments show that in environments with high bandwidth-delay products and high bit error rates, RCS achieves high throughput performance without penalizing TCP connections.

On the Long-Run Behavior of Equation-Based Rate Control. Vojnovic, M.; LeBoudec, J.-Y. p. 568- 581

We consider unicast equation-based rate control, where, at some points in time, a source adjusts its rate to $f(p, r)$. Here p is an on-line estimate of the loss-event rate, r is the mean round-trip time, both as observed by this source, and f is a TCP throughput formula. It was generally believed that such a source would be TCP-friendly, that is, under the same operating conditions, its long-run time-average send rate (throughput) would not be larger than that of a TCP source. Our goal is to identify whether, and how far, this is true. First, we identify factors that play a role in TCP friendliness and find that it is important to study them separately. Then we analyze the importance of individual factors. A first factor is

conservativeness (= throughput not larger than $f(p,r)$). We show that conservativeness is influenced by some convexity properties of $f(p,r)$ with respect to p , and the covariance of the loss process. We show that in many real life cases these conditions result in conservativeness and, sometimes, excessive conservativeness. This explains the previously observed phenomena of throughput-drop when losses are high and f is the so-called PFTK formula. The second factor is that the source may experience considerably different loss-event rate than a TCP source. We identify and analyze two limit cases where this may lead to either TCP-friendliness or, in contrast, non-TCP-friendliness. Other factors such as round trip time and obedience of TCP to its own formula are found to be less significant. Our claims are obtained by analysis, and verified by numerical examples, simulations, laboratory and Internet experiments. Our results suggest that TCP-friendliness is difficult to verify in practice, whereas conservativeness is easier

Cross-Layer Optimization in TCP/IP Networks. Wang, J.; Li, L.; Low, S.H.; Doyle, J.C. p. 582- 595

TCP-AQM can be interpreted as distributed primal-dual algorithms to maximize aggregate utility over source rates. We show that an equilibrium of TCP/IP, if exists, maximizes aggregate utility over both source rates and routes, provided congestion prices are used as link costs. An equilibrium exists if and only if this utility maximization problem and its Lagrangian dual have no duality gap. In this case, TCP/IP incurs no penalty in not splitting traffic across multiple paths. Such an equilibrium, however, can be unstable. It can be stabilized by adding a static component to link cost, but at the expense of a reduced utility in equilibrium. If link capacities are optimally provisioned, however, pure static routing, which is necessarily stable, is sufficient to maximize utility. Moreover single-path routing again achieves the same utility as multipath routing at optimality

“De-Randomizing” Congestion Losses to Improve TCP Performance Over Wired-Wireless Networks. Biaz, S.; Vaidya, N.H. p. 596- 608

Currently, a TCP sender considers all losses as congestion signals and reacts to them by throttling its sending rate. With Internet becoming more heterogeneous with more and more wireless error-prone links, a TCP connection may unduly throttle its sending rate and experience poor performance over paths experiencing random losses unrelated to congestion. The problem of distinguishing congestion losses from random losses is particularly hard when congestion is light: congestion losses themselves appear to be random. The key idea is to “de-randomize” congestion losses. This paper proposes a simple biased queue management scheme that “de-randomizes” congestion losses and enables a TCP receiver to diagnose accurately the cause of a loss and inform the TCP sender to react appropriately. Bounds on the accuracy of distinguishing wireless losses and congestion losses are analytically established and validated through simulations. Congestion losses are identified with an accuracy higher than 95% while wireless losses are identified with an accuracy higher than 75%. A closed form is derived for the achievable improvement by TCP endowed with a discriminator with a given

accuracy. Simulations confirm this closed form. TCP-Casablanca, a TCP-Newreno endowed with the proposed discriminator at the receiver, yields through simulations an improvement of more than 100% on paths with low levels of congestion and about 1% random wireless packet loss rates. TCP-Ifrane, a sender-based TCP-Casablanca yields encouraging performance improvement

Novel Self-Configurable Positioning Technique for Multihop Wireless Networks. Wu, H.; Wang, C.; Tzeng, N.-F. p. 609- 621

Geographic location information can effectively improve the performance (e.g., in routing or intelligent coordination) of large wireless networks. In this paper, we propose a novel self-configurable positioning technique for multihop wireless networks, based on a Euclidean distance estimation model and a coordinates establishment scheme. A number of nodes serve as the landmarks to establish a coordinates system. Specifically, any pair of landmarks estimate their Euclidean distance according to the shortest path length between them and establish the coordinates system by minimizing an error objective function. Other nodes in the network can accordingly contact the landmarks and determine their own coordinates. The proposed technique is independent of the Global Navigation Satellite Systems (GNSSs), and the established coordinates can be easily tuned to GNSS if at least one node in the network is equipped with GNSS receiver. Our simulation results show that the proposed self-configurable positioning technique is highly fault-tolerable to measurement inaccuracy and can effectively establish the coordinates for multihop wireless networks. More landmarks yield more accurate results. With the rectification of our Euclidean distance estimation model, four to seven landmarks are usually sufficient to meet the accuracy requirement in a network with hundreds of nodes. The computing time for coordinates establishment is in the order of milliseconds for a GHz CPU, acceptable for most applications in the mobile ad hoc networks as well as the sensor networks

Ranking and Adaptive Ranking CDMA. Kabamba, P.T.; Meerkov, S.M.; Tang, C.Y. p. 622- 635

This paper develops an uplink transmission scheduling scheme, referred to as Ranking CDMA, which selects a subset of users for transmission at each time slot. We introduce long- and short-term metrics that characterize its performance, and devise analytical methods for evaluating these performance measures. It turns out that, although Ranking CDMA has excellent long-term power efficiency compared to traditional CDMA, it suffers from a lack of short-term fairness, which is quantified in our calculations. To alleviate this deficiency, we propose Adaptive Ranking CDMA and analytically show that it yields moderate power-efficiency improvement over traditional CDMA, while maintaining short-term fairness

User-Level Performance of Channel-Aware Scheduling Algorithms in Wireless Data Networks. Borst, S. p. 636- 647

Channel-aware scheduling strategies, such as the Proportional Fair algorithm for the CDMA 1xEV-DO system, provide an effective mechanism for improving throughput performance in wireless data networks by exploiting channel

fluctuations. The performance of channel-aware scheduling algorithms has mostly been explored at the packet level for a static user population, often assuming infinite backlogs. In the present paper, we focus on the performance at the flow level in a dynamic setting with random finite-size service demands. We show that in certain cases the user-level performance may be evaluated by means of a multiclass Processor-Sharing model where the total service rate varies with the total number of users. The latter model provides explicit formulas for the distribution of the number of active users of the various classes, the mean response times, the blocking probabilities, and the throughput. In addition we show that, in the presence of channel variations, greedy, myopic strategies which maximize throughput in a static scenario, may result in sub-optimal throughput performance for a dynamic user configuration and cause potential instability effects

Algorithms for Computing QoS Paths With Restoration. Bejerano, Y.; Breitbart, Y.; Orda, A.; Rastogi, R.; Sprintson, A. p. 648- 661

There is a growing interest among service providers to offer new services with Quality of Service (QoS) guarantees that are also resilient to failures. Supporting QoS connections requires the existence of a routing mechanism, that computes the QoS paths, i.e., paths that satisfy QoS constraints (e.g., delay or bandwidth). Resilience to failures, on the other hand, is achieved by providing, for each primary QoS path, a set of alternative QoS paths used upon a failure of either a link or a node. The above objectives, coupled with the need to minimize the global use of network resources, imply that the cost of both the primary path and the restoration topology should be a major consideration of the routing process. We undertake a comprehensive study of problems related to finding suitable restoration topologies for QoS paths. We consider both bottleneck QoS constraints, such as bandwidth, and additive QoS constraints, such as delay and jitter. This is the first study to provide a rigorous solution, with proven guarantees, to the combined problem of computing QoS paths with restoration. It turns out that the widely used approach of disjoint primary and restoration paths is not an optimal strategy. Hence, the proposed algorithms construct a restoration topology, i.e., a set of bridges, each bridge protecting a portion of the primary QoS path. This approach guarantees to find a restoration topology with low cost when one exists

Reliability Constrained Routing in QoS Networks. Chakrabarti, A.; Manimaran, G. p. 662- 675

The issue of handling network failures is becoming increasingly important. In this paper, we address the problem of constrained routing by treating reliability as one of the QoS requirements. The problem is to create a feasible path from a given node to the destination such that the bandwidth and reliability requirements of the path are satisfied and the cost of the path is minimized (Reliability Constrained Least Cost Routing Problem). To solve the problem, we propose an approach which employs a novel concept, called partial protection, wherein backup paths are created for a selected set of domains in the network so as to meet the reliability constraints. The Partial Protection Approach (PPA) has two steps: Primary Path

Creation and Backup Path Creation if necessary. To implement PPA, we propose three scalable two-pass resource reservation schemes, viz., Conservative, Optimistic, and Hybrid schemes. These schemes differ depending on whether the backup paths are created during the forward pass, reverse pass, or both. We evaluate the performance of the proposed schemes for dynamic multicast groups with different bandwidth and reliability requirements using average call acceptance rate and average tree cost as performance metrics. Our studies show that group dynamics and reliability requirements have significant impact on the performance of the schemes

Queueing Processes in GPS and PGPS With LRD Traffic Inputs. Yu, X.; Thng, I.L.-J.; Jiang, Y.; Qiao, C. p. 676- 689

Long range dependent (LRD) traffic whose single server queue process is Weibull Bounded (WB) is first analyzed. Two upper bounds on the individual session's queue length of LRD traffic under the generalized processor sharing (GPS) scheduling discipline are then contributed. It is shown that the index parameter in the upper bound of one LRD flow, (in addition to the decay rate and the asymptotic constant), may be affected by other LRD flows. A new concept, called LRD isolation, is subsequently contributed and accompanying it, a new technique is contributed to check whether a flow, with a given GPS weight assignment, can be guaranteed to be LRD isolated. This technique is also amenable for use in an online call admission control (CAC) scenario. When existing flows have already been assigned contract weights that cannot be changed, our technique can be used to determine minimum contract weights to be assigned to a new flow in order to guarantee the flow to be LRD isolated. The results are also extended to a PGPS (packet-based GPS) scheduler and relevant numerical results are provided to show the usefulness of our bounds and LRD isolation technique

Fast Incremental Updates for Pipelined Forwarding Engines. Basu, A.; Narlikar, G. p. 690- 703

Pipelined ASIC architectures are increasingly being used in forwarding engines for high-speed IP routers. We explore optimization issues in the design of memory-efficient data structures that support fast incremental updates in such forwarding engines. Our solution aims to balance the memory utilization across the multiple pipeline stages. We also propose a series of optimizations that minimize the disruption to the forwarding process caused by route updates. These optimizations reduce the update overheads by over a factor of two for a variety of different core routing tables and update traces

Dynamic Routing and Wavelength Assignment in the Presence of Wavelength Conversion for All-Optical Networks. Chu, X.; Li, B. p. 704- 715

Blocking probability has been one of the key performance indexes in the design of wavelength-routed all-optical WDM networks. Existing research has demonstrated that an effective Routing and Wavelength Assignment (RWA) algorithm and wavelength conversion are two primary vehicles for improving the blocking performance. However, these two issues have largely been investigated

separately; in particular the existing RWA algorithms have seldom considered the presence of wavelength conversion. In this paper, we firstly demonstrate that the existing dynamic RWA algorithms do not work well in the presence of wavelength conversion as they usually only take into account the current traffic, and do not explicitly consider the route lengths. We then propose a weighted least-congestion routing and first-fit wavelength assignment (WLCR-FF) algorithm that considers both the current traffic load and the route lengths jointly. We further introduce an analytical model that can evaluate the blocking performance for WLCR algorithm. We carry out extensive numerical studies over typical topologies including ring, mesh-torus, and the 14-node NSFNET; and compare the performance of WLCR-FF with a wide variety of existing routing algorithms including static routing, fixed-alternate routing and least-loaded routing. The results conclusively demonstrate that the proposed WLCR-FF algorithm can achieve much better blocking performance in the presence of sparse or/and full wavelength conversion.

IEEE ANTENNAS & PROPAGATION MAGAZINE

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An overview of ultra-wideband microwave imaging via space-time beamforming for early-stage breast-cancer detection. Xu Li; Bond, E.J.; Van Veen, B.D.; Hagness, S.C. p.19- 34

Ultra-wideband (UWB) microwave imaging has recently been proposed for detecting small malignant breast tumors. In this article, we review the current research status of this approach. First, we introduce the concept of microwave imaging via space-time (MIST) beamforming and related signal-processing algorithms. The objective of these signal-processing techniques is to form a spatial image of scattered microwave energy, and to identify the presence and location of malignant lesions from their scattering signatures. Next, we present numerical studies based on finite-difference time-domain simulations to demonstrate the efficacy of MIST beamforming for detecting small malignant breast lesions in both prone and supine configurations. Finally, the experimental feasibility of UWB microwave imaging is demonstrated using an initial imaging prototype and multilayered breast phantoms.

A novel approach to complex target recognition using RCS wavelet decomposition. Delisle, G.Y.; Zebbani, Z.; Charrier, C.; Cote, F. p. 35- 55

A novel approach to complex target recognition using wavelet decomposition of the radar cross section is introduced. The analysis technique is presented, and it is shown how it can be implemented using MATLAB software. Applications in the radar field are then investigated, both for simple and complex targets. The results obtained show that this technique is very promising and yields recognition levels difficult to achieve with any other available technique.

Matching of equivalent field regions. Appel-Hansen, J.; Rengarajan, S. p. 56- 61

In aperture problems, integral equations for equivalent currents are often found by enforcing matching of equivalent fields. The enforcement is made in the aperture surface region adjoining the two volumes on each side of the aperture. In the case of an aperture in a planar perfectly conducting screen, having the same homogeneous medium on both sides and an impressed current on one side, an alternative procedure is relevant. We make use of the fact that in the aperture the tangential component of the magnetic field due to the induced currents in the screen is zero. The use of such a procedure shows that equivalent currents can be found by a consideration of only one of the two volumes into which the aperture plane divides the space. Furthermore, from a consideration of an automatic matching at the aperture, additional information about tangential as well as normal field components is obtained. We compare the two procedures in this tutorial article.

Wave propagation in ray-chaotic enclosures: paradigms, oddities and examples. Galdi, V.; Pinto, I.M.; Felsen, L.B. p. 62- 81

Ray chaos, characterized by eventual exponential divergence of originally nearby multi-bounce ray trajectories, is an intriguing phenomenon. It can be observed in several electromagnetic wave propagation scenarios: both very complex (e.g., urban areas) and very simple (e.g., a stadium-shaped cavity) scenarios. This paper contains a compact review of known results on wave propagation in ray-chaotic scenarios. Attention is focused principally on two-dimensional simple paradigms of internal ray chaos ("ray-chaotic billiards"), with emphasis on possible implications for high-frequency wave dynamics ("ray-chaotic footprints"). General concepts, tools, and numerical examples are discussed, and their potential relevance to current challenges in electromagnetic engineering is noted.

Minutes of the AP-S adcom meeting. Shields, M.W. p. 82- 90

2004-2005 AP-S distinguished lecturers. Pathak, P.H. p. 102- 108

Modal impedances of planar, non-complementary, N-fold symmetric antenna structures. Huffman, J.A.; Cencich, T. p. 110- 116

Planar N-arm rotationally symmetric antennas are commonly used in applications that demand wideband, multiple-mode, dual-polarization, and conformal geometries. Antennas included in this category are spirals, log-periodic dipole arrays, bow-tie antennas, and sinuous structures. An analytic expression for the modal impedances of these complementary planar structures has been available for many years. This paper extends the theory to non-complementary planar N -fold symmetric antennas, and provides equations valid for any arm-to-gap width ratio, arm width, expansion rate, and low-loss electrically thin substrate materials. The equations are based on quasi-TEM coplanar stripline theory, and provide a band-averaged approximation of the input impedance of the antenna for each characteristic mode of operation. Predicted modal impedances are compared to spiral antenna measurements. In addition, a procedure for accurately measuring the dielectric constant of the substrate material is discussed.

Reviews and Abstracts
 Glisson, A. p. 118- 119

Computational cost estimations and comparisons for three methods of applied electromagnetics (MoM, MAS, MMAS). Avdikos, G.K.; Anastassiou, H.T. p. 121-129

The computational costs of three numerical techniques used in electromagnetics, namely the moment method (MoM), the method of auxiliary sources (MAS), and its modified version (MMAS), are estimated for various calculation schemes and configurations. Both surface and volumetric problems are considered. The number of multiplications required for the system-matrix fill is calculated and added to the algorithmic cost of the matrix inversion. The Green's function singularity extraction is also taken into account, particularly for the MoM. The original integrals are transformed into the local (area or volume) coordinate systems, and are subsequently evaluated on the basis of standard numerical quadrature schemes. For the surface integral equation (SIE), some calculations using either the well-known Duffy transformations or some analytical-numerical integration schemes are also presented (expressions are available only for the scalar potential integral case). For the MAS and MMAS, the matrix fill is shown to be much faster, since no time-consuming integrations are involved. The analysis is applied to various objects, such as a perfectly conducting (PEC) parallelepiped, a PEC sphere, and a microstrip patch antenna, and useful conclusions are drawn on the relative efficiency of the three methods.

USNC/URSI awards p. 129- 135

Random radio: an answer to the puzzle. Janaswamy, R. p. 138- 139

In the random radio puzzle, imagine an early "ham" trying to assemble an oscillatory RLC circuit by randomly grabbing a resistor, a capacitor, and an inductor out of separate boxes filled respectively with resistors, capacitors, and inductors of various values. The problem of providing a solution for the probability that the resulting circuit will oscillate is presented in the paper.

Teaching ethics in the engineering design process: a legal scholar's view. Brannigan, V.M. p. 146- 151

Engineering ethics are a critical "gap filler" in the regulation of technology. Engineers, as "professionals," are given professional autonomy in promoting risky activities, based on a promise that they will act in the public interest. The legal system, both in regulation and liability, puts constraints on the design process, but often leaves gaps that must be filled by ethical precepts. The conflict between the public interest and the private interest of the engineer is often most acute in the acceptance or rejection of relatively rare risks in the design of products. Rare risks normally involve the greatest uncertainty of injury. These rare risks of catastrophic injury can fall "under the radar" of regulatory systems, or technological advances may make regulatory systems obsolete. The other major risk category are "system risks," in which individual engineers assume that some other party will take care of

the risk. Teaching engineers to recognize and deal with these risks is critical. In particular, reliance on regulatory approval may be inadequate. Designing products that hold paramount the public safety must be the benchmark for engineering ethics.

Report of the Transactions Editor. Bird, T.S. p. 154- 155

A MATLAB-based visualization package for planar arrays of isotropic radiators. Sevgi, L.; Uluisik, C. p. 156- 163

This article introduces a simple MATLAB antenna package (ANTEN/spl I.bar/GUI) for the visualization of the radiation patterns, beamforming, and beam-steering capabilities of user-designed planar arrays of isotropic radiators. The package can be used as an educational aid, especially in antennas and propagation lectures.

Feeling guilty? Haupt, R.L. p. 166- 166

Intellectual Property and Patent Abstracts p. 168- 175

Sardinia radio telescope (SRT): instrumentation research and development p. 178-180

The risk of acoustic neuromas from using cell phones. Lin, J.C. p. 183- 185

In a recently reported study, an elevated risk of acoustic neuromas, a benign tumor of the auditory nerve, was found among persons in Sweden with 10 or more years of cell-phone use. There was no association with use less than 10 years, nor for other measures of use, such as cumulative hours of use or cumulative number of calls made. Tumors occurred more frequently on the side of the head on which the cell phone was typically used. Given the recent introduction and popularization of digital phones - this study used five years as the time since first regular use - these results provide only limited guidance with regard to the risk of short-term use of cell phones or exposure to wireless radiation, and do not indicate the relative risk from using an analog or digital phone alone.

Antoine roederer awarded doctorate honoris causa p. 185- 186

Inexpensive upgrade of base-station dumb antennas by two magnetic loops for "blind" adaptive downlink beamforming. Wong, K.T.; Lai, A.K.-Y. p. 189- 193

A simple scheme is herein proposed to upgrade an older base-station's "dumb" antennas for use in an adaptive space-division frequency-reuse downlink, with no expensive retrofitting of each "dumb" antenna with its own rake receiver. This scheme adds only two horizontally oriented loops (plus an optional vertically oriented dipole) to a base station's 120/spl deg/-azimuth sector, each with a temporal (not space-time) rake receiver. Such a pair (or triad) of diversely polarized but collocated antennas can estimate an incident mobile-source's uplink direction of arrival, based on which the existing "dumb" antennas can beam-form towards the mobile in downlink transmission.

Report on ultra-wideband and ultra-shot impulse signals Workshop 2004 p. 193-196

AMTA Corner
Kent, B. p. 203- 203

Testing of the MESSENGER spacecraft phased-array antenna. Wallis, R.E.; Bruzzi, J.R.; Malouf, P.M. p. 204- 209

The MESSENGER spacecraft, designed to orbit the planet Mercury, uses the first electronically scanned phased-array antenna for a deep-space telecommunication application. Two lightweight phased arrays, mounted on opposite sides of the spacecraft, provide the high-gain downlink coverage. Techniques for measurement of the phased-array antenna system include ambient temperature measurements in a compact antenna range, thermal vacuum testing, and spacecraft-level testing. There have been two novel developments in the characterization of the phased-array system. The first is a "gain envelope" response, which is a measurement of the gain of the array at the intended scan angle as the array is electrically scanned in 1/spl deg/ increments. This response was produced through a combination of hardware and test software to synchronize the gain measurement with the mechanical and electrical scanning. The second is a phase-steering verification test that utilizes couplers in each steered element in conjunction with previously measured element patterns to confirm that the antenna beam is steered properly. This method allows functional verification of the phased-array system while radiating into an RF-absorber-lined hat during spacecraft-level tests.

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Extreme outsourcing [Silver bullets]. p. 10- 10

Test throughput for mixed-signal devices. Kramer, R. p. 12- 15
People encounter mixed-signal system-on-a-chip (SOC) devices in our daily lives in a broad range of products. Consumer products like PDAs, automobiles, and appliances all contain microcontrollers, battery management, and power chips; these can be mixed-signal devices. They use broadband products such as set-top boxes, cable modems, DSL, and DVD players that contain mixed-signal devices.

Wireless products, cordless phones, cellular phones, WLAN, Bluetooth, GPS receivers, and cable tuners also contain mixed-signal SOC devices. The content of the mixed-signal SOC device is characterized by different types of cores. They may be analog cores or digital cores. Many applications include mixed analog and digital cores such as digital-to-analog converters (DACs) and analog-to-digital converters (ADCs). These devices can provide complete system functionality on a single chip. One of the important principles to improving test economics is to ensure that test times are as low as possible. When testing, it is important that the test system is not adding overhead time. Beyond fast test software, the device-limited test speed is approached when tester operations execute in parallel with device operation. The architecture of the test system is key when approaching test times that are device limited. This can be achieved with a test system architecture that controls instrumentation precisely in device clock time. Mixed-signal device testing has adopted the use of DSP techniques to obtain a set of test measurements from large data sets. Each core within the device can produce data simultaneously. In the case of the device described earlier, there may be three video converters and five audio converters, all producing large amounts of data.

Magnetic resonance force microscopy. Mounce, D. p. 20- 26

Dan Rugar at IBM used magnetic resonance force microscope (MRFM) technology in the summer of 2004 to detect the signal from a single electron spin (Rugar et al., 2004). This marked a turning point for microscopy since John Sidles invented the MRFM method in the early 1990s (Sidles, 1991). MRFM fills one of the most fundamental gaps in the tools we have for determining the structure of systems and materials with nuclear detection and mapping coordinates at the atomic scale. This article discusses some history of this microscopy, the unique features of the microscope, and the software and hardware necessary for its success.

Instruments for automatic tests. Truebenbach, E. p. 27- 34

Every engineer has used test instruments. From the humble handheld multimeter to the most complex protocol analyzer, test instruments are used by engineers in the field and the design lab, in repair shops and environmental chambers, in research, and in quality assurance (QA). Visit any electronics lab and you'll likely find arrays of instruments, stacked three high on lab benches, all of them familiar tools from familiar manufacturers. Walk down the hall from the lab to the test floor at a semiconductor manufacturer, a contract PC manufacturer, or even a military repair depot, and the familiarity falls away. Instead of multimeters, oscilloscopes, and precision voltage sources, you will find systems full of specialized instrumentation, often made by unfamiliar companies. The corridor between the design lab and the test floor seems to connect two different worlds. This discontinuity is not because the laws of electronics are different in the two worlds; it's caused by the constraints bounding the test engineer. These constraints have required the creation of a different breed of test instrument, called automatic test equipment (ATE). The line between lab equipment and ATE isn't a sharp one but it's sometimes sharp enough to necessitate entirely different instrument designs. This article explores some of the general themes driving production instrument

designs and gives some examples of the impact of production requirements on ATE design. The challenge for ATE designers is to cover all the boundary conditions while making sure that performance is always valued and cost effective.

Independent sensor networks. Mielke, A.M.; Brennan, S.M.; Smith, M.C.; Torney, D.C.; Maccabe, A.B.; KarlinM JF. p. 33- 37

The concept of networks of distributed sensors is a popular topic of research. Currently, many systems focus on environmental monitoring applications. Homeland security and the potential for nuclear weapons or dirty bombs has necessitated another type of environmental monitoring, that for radioisotopes. Select traffic points in the United States may be monitored for illicit isotopes by commercially available portal monitoring systems. This article discusses the research efforts at Los Alamos National Laboratory on the development of heterogeneous networks of small, low-power, easily concealed nodes and larger, more compute-capable nodes for in-situ data processing. These networks must be able to reconfigure themselves independently based on the data being collected across a number of sensor types in real time. An application pertinent to current national and global security issues to demonstrate the relevant concepts has been selected. The Los Alamos National Laboratory is developing methods of guarding against a potential terrorist attack using a simple radiological dispersal device (RDD).

Software testing for safety critical applications. Lingfeng Wang; Tan, K.C. p. 38- 47
Software quality indicates how well the software product complies with the user requirements. Safety-critical applications in industrial automation such as industrial measurement and instrument software pose unique concerns for software quality due to its demanding requirements on system performance. Effective software testing can ensure the software quality as well as help the developer garner customer kudos for high-quality software. In this article, various issues on industrial measurement and instrument software testing are discussed. (Code inspections and audits are complementary activities to software testing and are very effective. This article addresses only testing; it does not address code inspections and review).

Sensors and signal conditioning. Schmalzel, J.L.; Rauth, D.A. p. 48- 53

The challenge we take up in this fourth installment in a series of tutorials in instrumentation and measurement is to consider how to make a sensor work in a measurement system. Signal conditioning broadly includes the steps needed to make the sensor an active part of a measurement system by providing excitation, if required, and then performing the preliminary actions needed to obtain a signal that can be processed. What's done to and with that signal is the subject of future parts of this tutorial series. Luckily, we don't have to wait that long to get results, because the output of the signal conditioning stage can be used for something as simple as driving a display subsystem so that we see results. Signal conditioning is a critical step in a measurement system but so is each element as emphasized by the serial model we have been using so far to depict the basic elements of an

instrument. However, it is important to keep in mind that many overall performance limits of a measurement are strongly influenced by what happens in the signal conditioning stage. For example, linearity, accuracy, noise rejection, and long-term drift behaviors will be strongly affected by decisions made here.

Pseudorandom sequences and the measurement of the frequency response. Engelberg, S.; Benjamin, H. p. 54- 59

There are many ways to measure the magnitude of the frequency response of a system. The authors consider three methods and explain why they are not optimal. Then a method that uses pseudorandom sequences and explains why this method is optimal is considered. The authors discuss pseudorandom sequences and show how their properties make them nearly ideal for measuring the magnitude of the frequency response of a system. Several implementations of pseudorandom sequence generators is described. Finally, an example of a measurement made using a pseudorandom sequence is provided. Pseudorandom sequences are used in audio applications to measure the properties of loudspeakers and of rooms. Additionally pseudorandom sequences are made use of in direct sequence spread spectrum.

Pendulums and our spinning world. Witzel, J. p. 57- 69

This article features a development of a homemade pendulum with a closed loop circuitry and in the process, visually reproves that the earth actually does spin around the sun.

Education in instrumentation and measurement: the information and communication technology trends. Rak, R.J.; Michalski, A. p. 61- 69

This column gives a review of reasons for developing and adopting a new Web-based model of teaching in the field of instrumentation and measurement. There is included: a description of the Internet and a multimedia-based educational model; a description of the structure and tools of the electronic books and virtual laboratory and a description of the distance learning provided by Warsaw University of Technology (WUT), Warsaw, Poland.

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MUNDO ELECTRÓNICO

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Con acento

El lento despliegue de la TDT pone en dificultades a la electrónica de consumo
Las tarjetas de adquisición como elemento clave de la instrumentación virtual

Información de Empresa

Cetisa se integra en Grupo Tecnipublicaciones

Agenda

SIMO TCI trata de fomentar la utilización de las TI como elemento estratégico para las empresas
Los organizadores del 3GSM World Congress se plantean el cambio de sede

Panorámica

Empresas

Freescall Semiconductor establece una filial en España ya como compañía independiente

Electronica se esforzó en ofrecer optimismo y en marcar los segmentos en expansión

Un seminario de Rutronik detalla los retos que supone la entrada en vigor de la directiva RoHS

Mercado

Llega la TV a la carta a través de accesos DSL

La demanda mundial de circuitos analógicos superará pronto a la de procesadores

Tecnología

Artesyn entrega los primeros convertidores CC/CC en cuarto de brick de 200 W

Analog Devices desarrolla un proceso CMOS analógico de 30 V

Se establece una red europea para investigar sobre sistemas embarcados

Generador DDS de TTI con arquitectura de generador de señal

Rohde&Schwarz propone una plataforma de medida multiestándar y multifunción

Agilent se adelanta en la generación y análisis de WiMAX

Informe: Electrónica de consumo

Televisores de pantalla plana y fotografía digital impulsan la electrónica de consumo

La evolución que ha seguido el segmento de la electrónica de consumo está siendo mejor que para el mercado electrónico en su conjunto gracias a la irrupción de una serie de productos cuya demanda está creciendo con fuerza. En concreto son los televisores de pantalla plana (LCD y de plasma), los sistemas de cine en casa (home cinema), los equipos grabadores de DVD y las cámaras fotográficas digitales los que están consiguiendo una rápida penetración en los hogares españoles y unas mejores perspectivas de negocio para una industria necesitada de revulsivos. La lenta pero segura implantación de la TV digital terrestre (TDT) habría de jugar asimismo un importante papel.

Entrevista

Jesús Casado, Director de Negocio de TV Digital y Medio Ambiente de Philips Ibérica: "La TDT tiene que ser más, mejor y más fácil"

Perspectiva

COMPONENTES

Amplificadores operacionales. Estabilidad y capacidad de entrada

Ron Mancini

Los amplificadores operacionales no compensados requieren siempre componentes de estabilización externos para lograr la estabilidad, mientras que los dispositivos con compensación interna son estables, bajo condiciones limitadas, sin necesidad de componentes externos adicionales. La capacidad de salida puede estar constituida por diferentes términos, por ejemplo: la capacidad del cable, la capacidad de entrada del convertidor o la capacidad del filtro de salida, y reduce la estabilidad en las configuraciones de seguidores de tensión (buffer).

ELECTRÓNICA DE POTENCIA

Fuente de alimentación para PC con SAI interno incorporado

A. Fernández, J. Sebastián, P. Villegas, M.M. Hernando y J. Corral

El sistema más habitual para evitar la pérdida de información de un PC en caso de un fallo de red es la conexión de un SAI externo. Estos sistemas proporcionan una tensión alterna de características similares a las de la red durante unos minutos hasta que se agota la batería que incorporan. Otra posible solución al problema consiste en utilizar un SAI incorporado a la propia fuente de alimentación de forma que la energía de la batería se transforme directamente en una tensión continua en vez de alterna. Esto tiene la ventaja de que se ahorra una etapa de conversión y por tanto mejora el rendimiento. Por el contrario, el sistema es más complejo de diseñar, sobre todo si se pretende incorporar el SAI dentro de la propia fuente de alimentación del PC sin incrementar el volumen. En este

artículo se propone un diseño para una fuente de alimentación de PC con especificaciones ATX y con un SAI de continua incorporado.

TELECOMUNICACIONES

ZigBee. Nuevo estándar de tecnología inalámbrica

María Navarro, Joan Vila, Jordi Muñoz y Javier Calpe

Cuando todavía falta un cierto grado de adaptación al uso de la tecnología Bluetooth, aparece en escena un nuevo competidor: el ZigBee. Esta nueva tecnología es un estándar de comunicación inalámbrica de corto alcance, destinada a la electrónica de consumo y al control industrial. Está concebida para aplicación en redes de sensores de bajo consumo y coste, juguetes, periféricos de PC, etc. y viene respaldada por firmas como Motorola y Philips entre otras.

Nuevos productos

Componentes, Instrumentación, Equipamiento y Telemática

Dossier

Tarjetas de adquisición de datos para PC

Juan J. Salgado

Un buen desarrollo depende fuertemente de los datos obtenidos a partir de los experimentos reales. Estos datos permitirán variar el diseño o adaptarlo a las nuevas necesidades o, en todo caso, descartar o conocer que se está en el camino equivocado. Existen diversos tipos de equipos o sistemas destinados a adquirir datos, y entre ellos quizás los más conocidos sean los registradores de datos, que proceden de aquellos viejos registradores de datos en papel. Sin embargo, la evolución de las necesidades y la tecnología ha dotado a los registradores de soportes más adecuados y, sobre todo, más transportables: los soportes lógicos. Llegados a este punto un sistema de adquisición de datos puede reducirse a la mínima expresión puesto que todo el tema de soporte y representación o manejo de datos lo puede proporcionar la informática. En concreto las tarjetas de adquisición de datos proporcionan la circuitería mínima necesaria para convertir un ordenador en un sistema completo de adquisición y registro de datos.

Bibliografía / Catálogos

INFORME

Iván G. Losada. El mercado de armarios y envolventes consolida una etapa de crecimiento

De forma genérica, puede afirmarse que el subsector de armarios y envolventes ha mejorado ligeramente sus resultados económicos obtenidos a lo largo de 2004 respecto al año anterior. Se trata además de un mercado prometedor para el que los actores demandan, entre otras iniciativas, el cumplimiento real de la normativa de la ICT (Infraestructura Común de Telecomunicaciones), y una mayor y más activa implicación por parte de las Administraciones Públicas, ya que en opinión de la práctica totalidad de profesionales consultados "aún queda mucho camino por recorrer".

OPINIÓN

Los componentes de potencia para aplicaciones industriales en Europa / Ole-Petter Brusdal

PERSPECTIVA

Pedro Reviriego Vasallo. Modelos de negocio en la industria microelectrónica IDMs versus "fabless-foundries"

En la industria microelectrónica conviven en la actualidad dos modelos de negocio dominantes con diferentes niveles de integración vertical. Por una parte, los Integrated Device Manufacturers (IDM) que realizan todo el proceso desde el diseño hasta la fabricación de circuitos integrados, y por otra la combinación "Fabless-Foundries" en la que los primeros realizan el diseño y los segundos se ocupan de la fabricación. En este artículo se analizan ambos modelos de negocio pasando revista a las ventajas e inconvenientes de cada uno de ellos, para a continuación presentar el estado actual de los mismos en la industria, así como su previsible evolución futura.

Convertidores CC/CC: topologías y criterios de aplicación / Mikael Appelberg, Anders Petersson

José Torres, T. García, Jesús Soret, J.A. Gómez. Compresión de imágenes estáticas en FPGA

Este artículo presenta el diseño y la realización de un prototipo capaz de comprimir imágenes capturadas de una señal de vídeo con el fin de reducir su tamaño y poder almacenarlas para su posterior descompresión y representación. Se trata de un prototipo que complementa los actuales sistemas de circuito cerrado, de control de accesos o de videoperteros. Las imágenes se obtienen de una cámara de vídeo con estándar CCIR, y es el núcleo una FPGA que implementa el algoritmo de compresión basado en la DCT.

Mejora de calidad de la señal en alta velocidad: aplicación en cable y backplanes
/ Kai Peters

Microfotónica de las comunicaciones: óptica integrada y MOEMS / Marko
Galarza, Jokin Moreno, Manuel López-Amo

MUNDO ELECTRÓNICO

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INFORME

Subcontratación : los subcontratistas apuestan por el valor añadido
El negocio de la subcontratación viene experimentando un notable crecimiento en los últimos años ya que la industria ha adoptado esta fórmula de manera generalizada para todos los sectores. Ligada a la deslocalización, es decir, al traslado de activos industriales a zonas geográficas de bajo coste, la subcontratación sobrevive en España con una oferta centrada en pequeños suministradores situados en su mayor parte en Aragón, Cataluña y la Comunidad Valenciana. En líneas generales estas empresas están recuperando facturación y tienen a sus clientes en el ámbito de las telecomunicaciones, la industria y la electrónica de consumo.

REPORTAJE

El centro español de Lucent alcanza los objetivos iniciales tras su primer año

OPINIÓN

Luis Mayayo . Combinación de red inalámbrica y control industrial

PERSPECTIVA

Jaques Chautemps; Louis Brissot (fot.). Sensores de imagen CMOS y CCD: comparación

Al plantearse la cuestión sobre cuál es el mejor generador de imágenes -¿CCD o CMOS?-, realmente debería preguntarse cuál se ajusta mejor a una aplicación determinada, dependiendo de si el procesamiento se realiza mediante un ordenador o mediante el ojo y la mente humanos, si se usan imágenes fijas o en movimiento, si el escenario cambia rápidamente o no, etc. Entre los criterios susceptibles de influir sobre la decisión, cabe destacar que el fácil uso, el consumo de energía y los costes son a menudo tanto o más importantes que el rendimiento electroóptico. Este artículo describe los aspectos de rendimiento de ambos tipos de sensores y su posible desarrollo.

Louis Brissot, Jaques Chautemps. CMOS or CCD Imaging?: A comparison of two continually evolving technologies

Markus Hermwille, Jens Li; Martin Freyberg (fot.). Módulo de IGBT inteligente con driver adaptable

Los diseños modernos de los convertidores de potencia requieren módulos IGBT compactos provistos de interfaces sencillos que ofrezcan soluciones rentables. El mercado exige de los módulos de potencia modernos una baja altura general, terminales separados de CA y CC en cada lado y acceso al driver en la parte superior. SEMiX - una nueva plataforma modular - es la respuesta a estas exigencias. Además, se ha desarrollado un nuevo driver para módulos denominado SKYPER

Frederik Dostal. Convertidor elevador: tensión de entrada alta

Este artículo describe un principio sencillo que permite a muchos elevadores CC/CC su uso con tensiones de entrada más elevadas que aquellas para las cuales fueron diseñados inicialmente

Jan Gripsborn. Control de LED blancos en equipos portátiles

Debido al ahorro de energía, numerosos equipos portátiles utilizan LED blancos como medio de iluminación del visualizador. Este artículo describe cómo un CI controlador de alto rendimiento simplifica el diseño de la circuitería de control del LED

J.F. Gisbert, Eduardo Mateo, J. Gómez, J. Torres, J. Martos, E. Sanchis, G. Boizuela. Sistema medidor de fuerza prensil: transmisión de datos a PC

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REPORTAJE

Aries Ingeniería y Sistemas cumple 20 años diversificando su oferta

INFORME

La expansión del mercado compensa la presión sobre los precios de los componentes

PERSPECTIVA

Reducción de EMI en fuentes conmutadas : variación de frecuencia / Juan Mon, Javier Gago Barrio, Josep Balcells, D. González, A. Santolaria

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REVISTA COLOMBIANA DE COMPUTACIÓN

Vol. 5, no. 1 Junio 2004

Editorial

La evolución provocada en los últimos años por tecnologías como los componentes y los servicios Web está motivando el desarrollo de nuevos procesos productivos. El tejido empresarial debe adaptar los negocios a esta nueva era de globalidad, requiriendo nuevos servicios que cubran las necesidades

que los clientes exigen. Estos servicios y los sistemas software que manejan los procesos productivos de las empresas deben ser desarrollados y adaptados en un corto espacio de tiempo para cubrir las necesidades del mercado. La sociedad del conocimiento a la cual nos acercamos requiere, por lo tanto, cada vez más de un aprovechamiento exhaustivo de todos los recursos disponibles.

En este sentido, las utilización, generación y explotación de nuevas tecnologías se convierten en aspectos fundamentales del desarrollo económico y social en la actualidad. Sin embargo, conseguir unos estándares de utilización de nuevas tecnologías, y concretamente en tecnologías de la información, resulta una tarea idealista y casi utópica. Prueba de ello la encontramos actualmente en dos de estas nuevas tecnologías, componentes software y servicios Web, que se están convirtiendo en la punta de lanza. En este número especial de RCC presentamos los trabajos del taller Nuevas Tecnologías de la Información: Componentes y Servicios Web, que fue celebrado en Alicante, España, del 12 al 14 de Noviembre de 2003 en el marco de las VIII Jornadas de Ingeniería del Software y Bases de Datos. Este taller pretende ser un marco de encuentro donde analizar las diferentes tecnologías de desarrollo basado en componentes presentes en el mercado centrandó nuestra atención en aquellos aspectos comparativos entre las diferentes plataformas, limitaciones y posibles extensiones en el campo de la calidad de servicio, la certificación o la semántica, por citar unos ejemplos. En las páginas siguientes presentamos un resumen de las principales charlas y conclusiones a las que se llegaron durante el desarrollo del taller y algunos artículos seleccionados por el comité de programa, a saber:

El primer artículo ha sido preparado por Pérez, Navasa y Murillo, de la Universidad de Extremadura. En él abordan el problema de cómo documentar componentes utilizando diagramas de secuencia que permitan mejorar las capacidades de búsqueda de las herramientas de repositorio actuales.

El segundo trabajo aborda la problemática de unir el mundo de los componentes y el de los aspectos desde un punto de vista crítico y exhaustivo. Fue presentado por Reina y Torres, de la Universidad de Sevilla.

El tercer trabajo, desarrollado por Iribarne, de la Universidad de Almería, intenta presentar una comparación detallada entre el mundo de los servicios Web y los componentes software.

El cuarto trabajo fue desarrollado por Granell, Poveda y Gould, de la Universidad Jaime I. En él presentan una propuesta para la composición de servicios Web en el contexto de un proyecto de investigación denominado ACE-GID.

El quinto trabajo presenta los resultados de aplicar la tecnología J2EE en el contexto de la minería de uso de la Web. Fue desarrollado por Hernansaenz, Botía y Skarmeta, de la Universidad de Murcia.

El sexto trabajo, presentado por Castro, Marcos y Vela, de la Universidad Rey Juan Carlos, trata acerca de cómo modelar con UML la interfaz de los servicios Web. En conjunto, creemos que estos trabajos dan un repaso a grandes rasgos a algunos de los temas de investigación más actuales en el campo de los componentes y los servicios Web, por lo que pueden servir de base a otros investigadores interesados en estos temas.

Los editores invitados: Rafael Corchuelo, Pedro J. Clemente y Diego Sevilla.

Representing WSDL with Extended UML

V. de Castro / E. Marcos / B. Vela

Resumen: Los servicios Web proveen un marco sistemático y extensible para la interacción de aplicaciones a través de la Web, basado en XML y construido sobre protocolos Web existentes. Aunque existen varias tecnologías que facilitan el desarrollo, la carencia de una metodología sólida para el desarrollo tanto de servicios Web, como de aplicaciones orientadas a servicios, plantea la necesidad de nuevos métodos o técnicas de modelado que puedan garantizar la calidad en el desarrollo de este tipo de aplicaciones. MIDAS es un marco metodológico orientado a modelos para el desarrollo de Sistemas de Información Web. MIDAS está basado en MDA (Model Driven Architecture) y propone modelos PIM (Platform Independent Models) y PSM (Platform Specific Models) acorde a tres aspectos: Contenido, Hipertexto y Comportamiento; además define guías para la generación de modelos y para la transformación de los mismos. En MIDAS proponemos modelar el comportamiento del SIW desde una perspectiva orientada a servicios y en este trabajo presentamos uno de los PSM propuestos para ello, llamado WSDL Model. Dicho modelo es una extensión de UML para el modelado de servicios Web, basada en el estándar Web Service Description Language (WSDL). La extensión propuesta aporta una notación en UML que, por un lado, permite obtener una representación gráfica de un servicio Web y por otro, facilitará la generación automática de código WSDL a partir de un diagrama UML. Palabras clave: extensión de UML, WSDL, modelado de servicios Web, sistemas de información basados en la web.

An Incremental Approach to Web Service Composition

C. Granell / J. Poveda / M. Gould

Resumen: Los servicios web geográficos se incorporarán en un futuro próximo al mundo del comercio electrónico, donde la composición de servicios compuestos a partir de servicios simples o atómicos se convertirá en un instrumento esencial. Actualmente, no existe un modelo concreto para la composición de servicios web geográficos, y dentro del marco de trabajo de un proyecto europeo, definimos las bases de esta composición como parte de las pruebas de interoperabilidad de servicios web geográficos. En lugar de adoptar los métodos estáticos disponibles, hemos definido el concepto de composición incremental y un modelo para definir, componer e invocar composiciones de una manera flexible. Para dar forma a este modelo, hemos desarrollado un prototipo que demuestra su capacidad con un sencillo escenario para la composición de funciones aritméticas, en el cual

expresiones aritméticas complejas pueden ser evaluadas con facilidad mediante la composición de servicios atómicos. Además, mencionamos las ventajas de la composición incremental frente a otras aproximaciones orientadas al proceso así como la necesidad de incorporar al modelo otras extensiones adicionales como puede ser la semántica.

Palabras clave: Composición de servicios web, composición incremental, interoperabilidad semántica, pruebas de interoperabilidad.

METALA: a J2EE Technology Based Framework for Web Mining

J.M. Hernansaez / J.A. Botía / A.F. Skarmeta

Resumen: En este artículo, comentamos los aspectos más importantes de METALA, una herramienta software para meta-aprendizaje, que hemos desarrollado para realizar aprendizaje inductivo de manera distribuida y basada en componentes. La distribución viene por el uso de un estándar de desarrollo de aplicaciones distribuidas bien definido como es J2EE, y la base de componentes de la metodología que hemos desarrollado para integrar nuevos algoritmos y otras utilidades software dentro del sistema. Nuestro objetivo es usar esta nueva arquitectura para evaluar algoritmos de Minería de Uso Web, un problema de aprendizaje concreto del área de la Minería del Web, y aprovechar estos algoritmos para construir nuevos modelos de conocimiento. Estos modelos pueden usarse después para crear e incorporar en la arquitectura nuevas aplicaciones y herramientas. Comentaremos las ventajas y defectos de usar J2EE como base tecnológica. Además compararemos nuestra arquitectura con otras plataformas software propuestas para resolver problemas de Minería del Web similares a los que METALA puede resolver. Para ilustrar el uso de METALA, presentamos la explicación del proceso de un ciclo de vida completo de Minería de Uso Web.

Palabras clave: Arquitectura del software, minería de uso de la web, aprendizaje inductivo, modelos de conocimiento, J2EE, XML.

Web Components: A Comparison between Web Services and Software Components

Luis Iribarne

Resumen: La disciplina de la ingeniería del software está experimentando una rápida consolidación de las actividades de desarrollo de aplicaciones software y del uso de tecnologías y metodologías de programación basadas en web. En el campo de los servicios web además están apareciendo prácticas (orientadas y basadas) para la construcción de aplicaciones software a gran escala (como por ejemplo los sistemas de información distribuidos). Las prácticas para el desarrollo de software basadas en la composición de servicios web (muchos de estos desarrollados por terceras partes) conllevan problemas similares a los que aparecen en el campo del desarrollo de software basado en componentes (más extendido en el campo de los componentes COTS), como la interoperabilidad o la compatibilidad de componentes. El presente trabajo lleva a cabo un estudio comparativo entre la descripción tradicional de los componentes software y el lenguaje para la descripción de servicio web (WSDL). El trabajo también identifica

algunas de las limitaciones que presenta la actual especificación del servicio de directorio (UDDI) para desarrollar aplicaciones software distribuidas mediante la composición de servicios webs.

Palabras clave: Servicios web, componentes software, WSDL, UDDI, especificación semántica, especificación de protocolos.

Documentación de Componentes: Una Aproximación Basada en Diagramas de Secuencia

M.A. Pérez / A. Navasa / J.M. Murillo

Resumen: Los rápidos cambios que experimentan las reglas de negocio asociadas a las empresas, hacen que por una parte se incremente el número de nuevas soluciones software a construir, mientras que por otro lado aumente el tiempo y dinero destinado a la evolución de los sistemas existentes. La falta de información sobre el comportamiento preciso de los componentes utilizados dificulta la evolución de los sistemas desarrollados. De esta manera, añadir un nuevo componente o sustituir uno existente plantea problemas derivados por las nuevas interacciones que se dan para integrarlo en un sistema en funcionamiento. Este artículo presenta una herramienta que partiendo de los diagramas de secuencia y demás información obtenida en la fase de Análisis y Diseño, permite mejorar el conocimiento de los servicios de los componentes utilizados y de sus interacciones con el entorno en donde se utiliza. Así mismo, se estudia la posibilidad de agregación o sustitución, individual o mediante la utilización de conjuntos de componentes que cooperen para adaptarse a los nuevos requisitos del sistema. Con todo ello, se pretende minimizar los posibles problemas de integración de nuevos componentes en un sistema software.

Palabras clave: componentes software, escenarios, reutilización, mantenimiento de sistemas, diagramas de paso de mensajes, autómatas.

Components + Aspects: A General Overview

A.M. Reina / J. Torres

Resumen: En los últimos años se han propuesto nuevas formas de descomponer sistemas. En primer lugar, el desarrollo orientado a componentes se ha reconocido ampliamente como un paradigma para construir sistemas utilizando piezas llamadas componentes. Pero, más recientemente, ha surgido con fuerza una nueva filosofía conocida como separación avanzada de conceptos o programación orientada a aspectos. Este paradigma tiene como uno de sus principales objetivos el mejorar la descomposición de sistemas. Aunque a primera vista parezca que ambos enfoques entran en conflicto, éstos no son incompatibles. Por lo tanto, el principal objetivo de este trabajo es analizar las distintas propuestas que hay para acercar el mundo de los componentes al mundo de los aspectos. Tras un análisis de las mismas, se tiene que la mayoría de ellas aún se mueven en la fase de implementación, y que queda mucho por hacer en las fases previas. Además, otro punto a destacar es la necesidad de métricas para medir y comparar resultados de forma objetiva.

Palabras clave: Programación orientada a aspectos, separación avanzada de conceptos, tecnología de componentes.

Resumen de Conclusiones

P.J. Clemente / D. Sevilla / R. Corchuelo

El taller sobre Nuevas Tecnologías de la Información: Componentes y Servicios Web, es un referente científico de primer orden en cuanto al estudio, implantación y perspectivas de las nuevas tecnologías de la información. En la edición de 2003 se debatieron temas tan interesantes actualmente para el mundo de la Ingeniería del Software como los siguientes:

- Componentes y tecnología grid, nuevas plataformas como OGSA;
- Interoperabilidad de componentes entre distintas plataformas;
- Calidad de servicio en componentes software;
- Búsqueda y recuperación de componentes en repositorios, búsquedas semánticas;
- Configuración de componentes;
- Adaptabilidad de sistemas software basados en componentes;
- Comparativa entre plataformas de componentes;
- Servicios web y su aplicabilidad en sistemas empresariales.

Con el objetivo de dar mayor dinamismo al debate, éste fue dirigido hacia un conjunto de preguntas sobre los temas de interés previamente identificados. A continuación presentamos las reflexiones obtenidas agrupadas por sesiones temáticas.

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