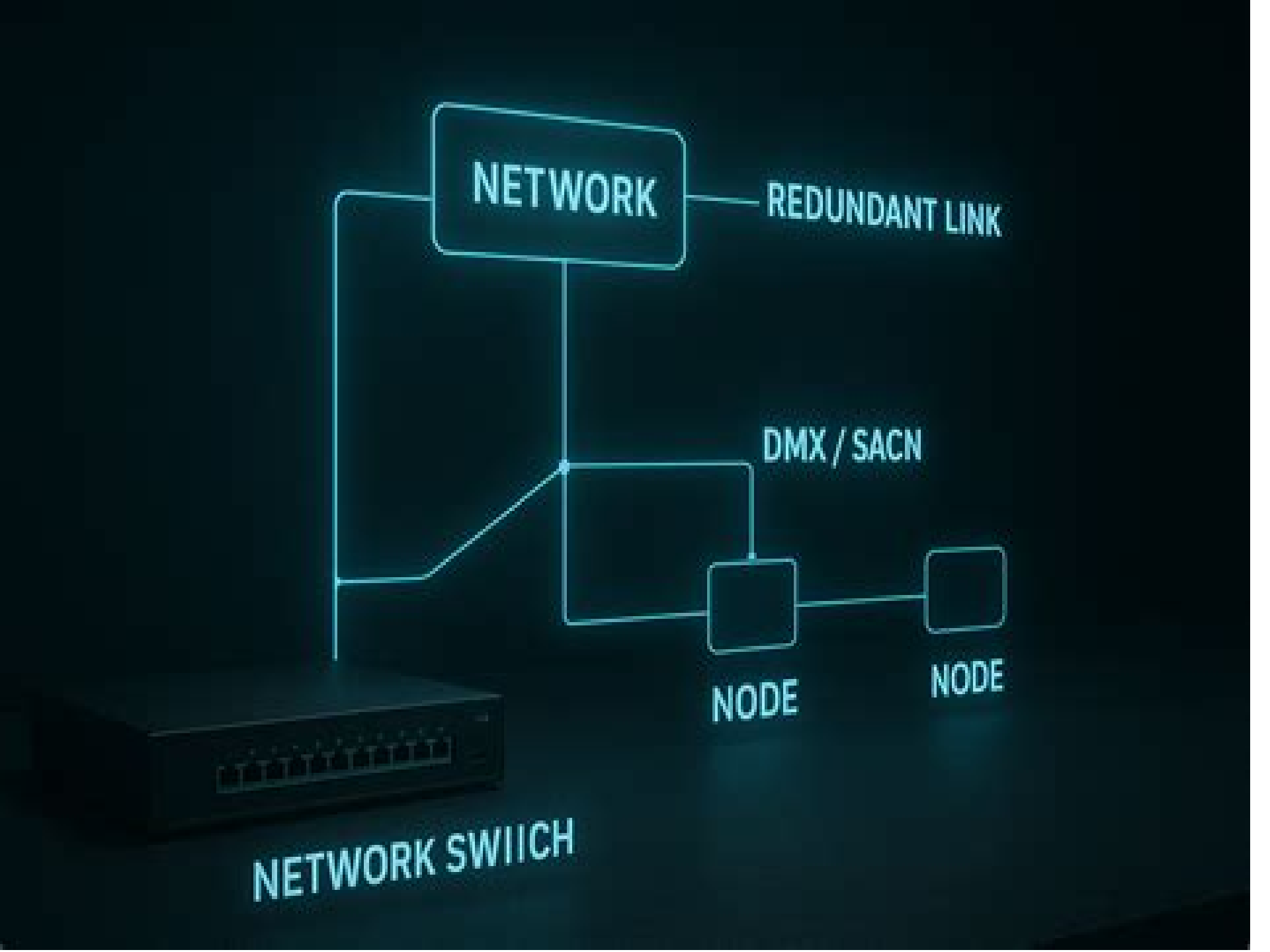
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Network Topology Optimization

Xiang Xie

Network Topology Optimization:

Network Topology Optimization Roshan Lal Sharma,1990 **NETWORK TOPOLOGY OPTIMIZATION, THE ART AND SCIENCE OF NETWORK DESIGN.** ROSHAN L. SHARMA,1990 Network Topology Optimization with Alternating Current Optimal Power Flow Tejaswi Potluri,2011 The electric transmission grid is conventionally treated as a fixed asset and is operated around a single topology Though several instances of switching transmission lines for corrective mechaism congestion management and minimization of losses can be found in literature the idea of co optimizing transmission with generation dispatch has not been widely investigated Network topology optimization exploits the redundancies that are an integral part of the network to allow for improvement in dispatch efficiency Although the concept of a dispatchable network initially appears counterintuitive questioning the wisdom of switching transmission lines on a more regu lar basis results obtained in the previous research on transmission switching with a Direct Current Optimal Power Flow DCOPF show significant cost reductions This thesis on network topology optimization with ACOPF emphasizes the need for additional research in this area It examines the performance of network topology optimization in an Alternating Current AC setting and its impact on various parameters like active power loss and voltages that are ignored in the DC setting An ACOPF model with binary variables representing the status of transmission lines incorporated into the formulation is written in AMPL a mathematical programming language and this optimization problem is solved using the solver KNITRO ACOPF is a non convex nonlinear optimization problem making it a very hard problem to solve The introduction of bi nary variables makes ACOPF a mixed integer nonlinear programming problem further increasing the complexity of the optimization problem An iterative method of opening each transmission line individually before choosing the best solution has been proposed as a purely investigative approach to studying the impact of transmission switching with ACOPF Economic savings of up to 6% achieved using this approach indicate the potential of this concept In addition a heuristic has been proposed to improve the computational efficiency of network topology optimization This research also makes a comparative analysis between transmission switching in a DC setting and switching in an AC setting Results presented in this thesis indicate significant economic savings achieved by controlled topology optimization thereby reconfirming the need for further examination of this idea **Topology Optimization in Spatially Distributed Cellular Neural Network** Varsha Bhambhani,2012 A new network topology optimization approach to cellular neural network design as a method for realizing associative memories using sparser networks is conceptualized This type of optimization allows recurrent neural networks to be implemented in a spatially distributed fashion that is with components of the network residing in different physical locations This could find application in addressing the problem of dynamic allocation of a team of robots to a collection of spatially distributed tasks which is relevant for large scale environmental monitoring and surveillance Spatially distributed sensing allows for greater coverage of the environment than a single large vehicle with multiple sensors would permit in many cases In this work we try

to answer the question of how could the design process be different if the network topology was also part of the design A sparser cellular neural network topology can be achieved without significantly degrading the performance of the network by selectively deleting those weights from the optimized network which contribute the least to ability of the network to recall the desired patterns This approach is particularly useful where neural links incur varying costs such as implementation of associative memories over wireless sensor networks The cellular neural networks interconnection topology is diluted without significantly degrading its performance where performance is quantified by the average recall probability of the patterns engraved into the networks associative memory The average recall probability is a measure of performance of the designed network in presence of noise and is defined as the ratio of number of recovered memory patterns perturbed initial condition vectors which result in same output as the stored memory vector to the total number of perturbed initial condition vectors Since the average recall probability cannot be assessed prior to testing the optimization algorithm uses the networks stability parameters as a measure of quality of memorization and optimization proceeds by selectively removing costly links that contribute the least to the magnitude of these parameters Two different approaches to implementing the optimization of the networks topology are implemented and compared The first one is a sequential process in which a single link is removed each time specifically the one the removal of which incurs the least performance cost compared to all other existing high cost links This method ignores the possibility that a non obvious combination of links may produce better results through the links simultaneous removal This phenomenon has been observed in simulation studies which validated the proposed method To validate further the optimization but more importantly to ensure that the overall approach does not depend on the particular method used for the combinatorial optimization we also implemented an alternative approach which is based on the randomized optimization In this approach a random sample of a sufficient number of i i d possible topology is generated In other words each random topology in the sample has the same probability distribution as the others and all are mutually independent An example is used to demonstrate that irrespectively of the combinatorial algorithm used the approach yields sparser associative memories that in general trade off performance for cost and in many cases the performance of the diluted network is on par with the original system In our numerical tests the two methods yield comparable results which do not differ significantly in terms of resulting network performance Performance is quantified in terms of the network recall probability and in the proposed optimization algorithm approach is captured by the neural networks stability parameters Further we apply the ideas developed so far to control network communication in actual robots to experimentally verify our simulation results Experimental testing has shown that spatially distributed implementations of cnn on CoroBots are indeed feasible and that for some cases the communication delays related to the communication between the different components of the network are not significant enough to affect the performance and stability properties of the dynamical system It is shown that the error between simulation of the discrete time dynamics and experimental results practically coincide with a

maximum error difference of the order of 10 4 Thus the proposed combinatorial optimization methods performed almost equally well in practice as in simulations **Information Processing and Network Provisioning** Michel Kadoch,Mohamed Cheriet,Xuesong Qiu,2025-08-19 The proceedings set CCIS 2593 until CCIS 2596 constitutes the proceedings of the Third International Conference on Information Processing and Network Provisioning ICIPNP 2024 which took place in Qingdao China during November 8 10 2024 The 153 full papers presented in the proceedings were carefully reviewed and selected from 277 submissions They deal with up to date research ranging from information and signal processing and network provisioning to computer communications and network applications **Robustness Optimization for IoT Topology** Tie Qiu,Ning Chen,Songwei Zhang,2022-06-11 The IoT topology defines the way various components communicate with each other within a network Topologies can vary greatly in terms of security power consumption cost and complexity Optimizing the IoT topology for different applications and requirements can help to boost the network s performance and save costs More importantly optimizing the topology robustness can ensure security and prevent network failure at the foundation level In this context this book examines the optimization schemes for topology robustness in the IoT helping readers to construct a robustness optimization framework from self organizing to intelligent networking The book provides the relevant theoretical framework and the latest empirical research on robustness optimization of IoT topology Starting with the self organization of networks it gradually moves to genetic evolution It also discusses the application of neural networks and reinforcement learning to endow the node with self learning ability to allow intelligent networking This book is intended for students practitioners industry professionals and researchers who are eager to comprehend the vulnerabilities of IoT topology It helps them to master the research framework for IoT topology robustness optimization and to build more efficient and reliable IoT topologies in their industry Advanced Technologies in Ad Hoc and Sensor Networks Xue Wang,Li Cui,Zhongwen Guo,2014-07-08 Advanced Technologies in Ad Hoc and Sensor Networks collects selected papers from the 7th China Conference on Wireless Sensor Networks CWSN2013 held in Qingdao October 17 19 2013 The book features state of the art studies on Sensor Networks in China with the theme of Advances in wireless sensor networks of China The selected works can help promote development of sensor network technology towards interconnectivity resource sharing flexibility and high efficiency Researchers and engineers in the field of sensor networks can benefit from the book Xue Wang is a professor at Tsinghua University Li Cui is a professor at Institute of Computing Technology Chinese Academy of Sciences Zhongwen Guo is a professor at Ocean University of China **Graphical User Interface in Computer Network Topology Optimization** Hua-Ming Jin,1993 Artificial Neural Networks: Formal Models and Their Applications – ICANN 2005 Wlodzislaw Duch,Erkki Oja,Slawomir Zadrozny,2005-08-25 This volume is the first part of the two volume proceedings of the International C ference on Artificial Neural Networks ICANN 2005 held on September 11 15 2005 in Warsaw Poland with several accompanying workshops held on September 15 2005 at the Nicolaus Copernicus University

Toru Poland The ICANN conference is an annual meeting organized by the European Neural Network Society in cooperation with the International Neural Network Society the Japanese Neural Network Society and the IEEE Computational Intelligence Society It is the premier European event covering all topics concerned with neural networks and related areas The ICANN series of conferences was initiated in 1991 and soon became the major European gathering for experts in those fields In 2005 the ICANN conference was organized by the Systems Research Institute Polish Academy of Sciences Warsaw Poland and the Nicolaus Copernicus Univ sity Toru Poland From over 600 papers submitted to the regular sessions and some 10 special c ference sessions the International Program Committee selected after a thorough peer review process about 270 papers for publication The large number of papers accepted is certainly a proof of the vitality and attractiveness of the field of artificial neural networks but it also shows a strong interest in the ICANN conferences **Capacity Planning and Topology Optimization of Corporate Communication Networks** Ning Xiao,1993 Proceedings of the 2nd International Conference on Networks, Communications and Intelligent Computing (NCIC 2024) Zhaohui Yang,Gang Sun,2025-11-12 This book gathers selected high quality papers presented at the 2nd International Conference on Networks Communications and Intelligent Computing NCIC 2024 held during November 22 25 2024 in Beijing The proceeding of NCIC 2024 targets a mixed audience of academicians and industry practitioners who are deeply involved in their respective technical fields This book offers a platform for scholars and researchers to present their findings methodologies and applications in the fields Readers will find a diverse range of topics including advancements in 6G IoT implementations green networking practices and the role of artificial intelligence in enhancing networking efficiency The primary beneficiaries of this book are professionals researchers and academics in the fields of networks communications and intelligent computing as well as students pursuing advanced studies in these areas The contents are curated to enhance knowledge foster innovation and encourage the practical application of emerging technologies in the industry Additionally the proceedings are not only a record of the conference s scholarly papers but also serve as a valuable resource for ongoing research and development activities within these cutting edge technological domains *Collaborative Computing: Networking, Applications and Worksharing* Honghao Gao,Xinheng Wang,2022-01-01 This two volume set constitutes the refereed proceedings of the 17th International Conference on Collaborative Computing Networking Applications and Worksharing CollaborateCom 2021 held in October 2021 Due to COVID 19 pandemic the conference was held virtually The 62 full papers and 7 short papers presented were carefully reviewed and selected from 206 submissions The papers reflect the conference sessions as follows Optimization for Collaborate System Optimization based on Collaborative Computing UVA and Traffic system Recommendation System Recommendation System Network and Security Network and Security IoT and Social Networks Images handling and human recognition Edge Computing Edge Computing Collaborative working Deep Learning and application Deep Learning and application Deep Learning and application UVA Computational Science and Its

Applications – ICCSA 2016 Osvaldo Gervasi,Beniamino Murgante,Sanjay Misra,Ana Maria A. C. Rocha,Carmelo M. Torre,David Taniar,Bernady O. Apduhan,Elena Stankova,Shangguang Wang,2016-07-01 The five volume set LNCS 9786 9790 constitutes the refereed proceedingsof the 16th International Conference on Computational Science and ItsApplications ICCSA 2016 held in Beijing China in July 2016 The 239 revised full papers and 14 short papers presented at 33 workshops were carefully reviewed and selected from 849 submissions They are organized in five thematical tracks computational methods algorithms and scientific applications high performance computing and networks geometric modeling graphics and visualization advanced and emerging applications and information systems and technologies Topology Optimization Using Neural Network Aaditya Chandrasekhar,2023 Topology optimization TO is a well established field that seeks to compute optimized designs for a desired objective under imposed constraints Density based methods in particular Solid Isotropic Material with Penalization SIMP is arguably the most popular TO method distinguished by their theoretical simplicity and generality In SIMP typically a pseudo density field represented over a finite element mesh is optimized to capture the design However in mesh based SIMP certain challenges arise these include a extracting boundaries of thin geometries from the mesh b the number of design variables increases linearly with the number of elements c challenges associated with adaptive meshes and d error prone gradient computation The focus of this thesis is to exploit the representational capacity of neural networks NNs for mesh independent TO In particular combining the simplicity and generality of the popular SIMP method with the flexibility and capability of NNs allows one to address the challenges that stem from and are not restricted to discrete mesh based representation The objective of this thesis is to showcase and explore the benefits of the proposed Topology Optimization using Neural Networks TOuNN framework In particular while relying on SIMP s density formulation we exploit unique features of NNs such as its representational capacity to capture the global density field back propagation for automated sensitivity boundary extraction etc The thesis is organized under the following topics 1 Foundation The fundamentals of TOuNN are established through comparative studies against existing methods in 2D and 3D 2 Manufacturing constraints The inclusion of manufacturing constraints is central to TO to obtain practical and realizable geometries Manufacturing constraints through projection schemes including casting extrusion and 3D printing are illustrated Further we emphasize augmenting the simple feedforward network with a layer containing Fourier terms whose chosen frequencies This allows for length scale control in the intended topology Designs with repeated interior patterns catering to Additive Manufacturing AM may also be obtained While offering faster convergence compared to an unaugmented network the work highlights the importance of conditioning NNs that are often used as black boxes 3 Multi Material The framework is expanded to handle multiple materials during TO Apart from highlighting the generality of the framework we observe the ability to extract smooth material interfaces with no considerable increase in computational cost 4 Fiber composites The framework is also expanded for the design of continuous fiber reinforced composites The ability to

represent fiber parameters through NN allows for the extraction of smooth continuous fibers The method is illustrated through various examples and validated through 3D prints 5 Multi Scale The framework is expanded to represent and optimize for multi scale designs This once again highlights the generality of the framework and the ability to represent fine scale geometry compactly Topology Control in Wireless Ad Hoc and Sensor Networks Paolo Santi,2005-08-05 Topology control is fundamental to solving scalability and capacity problems in large scale wireless ad hoc and sensor networks Forthcoming wireless multi hop networks such as ad hoc and sensor networks will allow network nodes to control the communication topology by choosing their transmitting ranges Briefly topology control TC is the art of co ordinating nodes decisions regarding their transmitting ranges to generate a network with the desired features Building an optimized network topology helps surpass the prevalent scalability and capacity problems Topology Control in Wireless Ad Hoc and Sensor Networks makes the case for topology control and provides an exhaustive coverage of TC techniques in wireless ad hoc and sensor networks considering both stationary networks to which most of the existing solutions are tailored and mobile networks The author introduces a new taxonomy of topology control and gives a full explication of the applications and challenges of this important topic Topology Control in Wireless Ad Hoc and Sensor Networks Defines topology control and explains its necessity considering both stationary and mobile networks Describes the most representative TC protocols and their performance Covers the critical transmitting range for stationary and mobile networks topology optimization problems such as energy efficiency and distributed topology control Discusses implementation and open issues including realistic models and the effect of multi hop data traffic Presents a case study on routing protocol design to demonstrate how TC can ease the design of cooperative routing protocols This invaluable text will provide graduate students in Computer Science Electrical and Computer Engineering Applied Mathematics and Physics researchers in the field of ad hoc networking and professionals in wireless telecoms as well as networking system developers with a single reference resource on topology control *Simulation of Computer Networks* ,1987 *Topology Optimization in Detailed Node-breaker Representations of Electric Power Networks* Sogol Babaeinejadsarookolaee,2022 In power system operation the topology of the grid is often assumed fixed over short time horizons If feasible changing the topology via network switching yields a new operating point Optimal choice of such switching may produce an operating point with lower cost or fewer elements operating at limits or greater stability margins Work on this topic may be broadly divided into two categories More recent research has used formal optimization methods and advances in the optimal power flow problem However such work typically restricts the class of decisions to consider only transmission line switching and correspondingly restricts network models to bus branch Ybus based representations In contrast older work tended to focus on improving the security of grid operation using more detailed network models and considering a wider range of possible switching actions including substation bus bar reconfiguration However these works are limited in that they often used the DC power flow or an approximation of AC power flow equations

or very limited search techniques to choose the binary decision variables of breaker positions or simple bus bar switching representations Research in this thesis seeks to join and extend these two categories of prior work We first extend techniques of transmission line switching in optimal power flow to allow bus switching and substation reconfiguration The approach uses a regularized model of bus circuit breaker behavior and focuses on the standard optimal power flow objective of minimizing production cost Next we look at the use of network switching including substation reconfiguration to improve the grid performance with respect to an effective objective function We propose the objective of minimizing a weighted L2 norm on the vector of transmission line flows From this geometric perspective we argue that reducing the weighted L2 norm of the line flows tends to move the operating point toward the interior of the OPF s feasible operating region improving the security of grid operation Based on this form of objective several efficient full AC heuristic algorithms are presented allowing tractable computation of breaker decision variables and enhancing OPF feasibility **Teletraffic Engineering in the Internet Era** J.M. de Souza,N.L.S. da Fonseca,E. de Souza e Silva,2001-08-29 This book presents recent developments on teletraffic science and engineering specially on traffic modelling and control of the Internet TCP IP Wireless and Multimedia Networks Moreover it presents new queueing and optimisation methods applied to the planning and control of the telecommunications networks The Network Manager's Handbook ,1998 **Topological Network Design in Telecommunication Systems** Peter Kubat,J. MacGregor Smith,2002

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