Bro: An Open Source Network Intrusion Detection System

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Abstract: Bro is a powerful, but largely unknown open source network intrusion detection system. Based on a sound design, Bro achieves its main goals – separating policy from mechanisms, efficient operation in high-volume networks, and withstanding attacks against itself – by using an event-driven approach. Bro contains several analyzers (e.g. protocol decoders for a variety of network protocols and a signature matching engine), which are by themselves policy-neutral but raise events as an abstraction of the underlying network activity. Based on scripts written in Bro's own powerful scripting language, the user defines event handlers to specify his environment-specific policy.

We give an overview about the design and implementation of Bro, describe our experiences with deploying it in a large-scale research environment, and present some of our extensions.

1 Introduction

Due to the enormous increase in the number of attacks seen on the Internet, *network intrusion detection systems* (NIDSs) are an important part of many security policies. In contrast to a *host-based* intrusion detection system, a NIDS usually taps the network at some central point, monitoring all traffic to detect malicious activity. Traditionally, two approaches to network intrusion detection are differentiated: a system using *anomaly-detection* relies on a definition of *normal* network activity and alerts if traffic deviates from this profile. Deviation is typically measured using statistics. On the other hand, *misuse-detection* systems use a library of specific attack characteristics and generate an alert whenever they locate one of them in the monitored traffic. The draw-back of misuse-detection is the difficulty of recognizing previously unknown attacks. While anomaly-based NIDSs have the potential for this, they often suffer from a high number of false–alarms. The most common form of misuse detection is signature matching: the NIDS identifies an attack by recognizing a specific byte sequence within the network packets. Most commercial systems follow this approach [Jac99] as does the well-known open source software Snort [Roe99].

Taking a closer look at open source NIDSs, we notice that Snort is the only one widely deployed in real networks. It appears that most people are not aware of alternatives. This is interesting for three reasons. First, in other areas of security there usually is a variety of open source software available. Second, Snort shows some technical limitations that

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UNIX and Linux System Administration Handbook Evi Nemeth,2011 This fourth edition covers Red Hat Enterprise Linux openSUSE Ubuntu Solaris Opensolaris 11 and AIX 6 1 **International Conference on Intelligent Data Communication Technologies and Internet of Things (ICICI) 2018** Jude Hemanth,Xavier Fernando,Pavel Lafata,Zubair Baig,2018-12-20 This book discusses data communication and computer networking communication technologies and the applications of IoT Internet of Things big data cloud computing and healthcare informatics It explores examines and critiques intelligent data communications and presents inventive methodologies in communication technologies and IoT Aimed at researchers and academicians who need to understand the importance of data communication and advanced technologies in IoT it offers different perspectives to help readers increase their knowledge and motivates them to conduct research in the area highlighting various innovative ideas for future research **Big Data Analytics in Cybersecurity** Onur Savas,Julia Deng,2017-09-18 Big data is presenting challenges to cybersecurity For an example the Internet of Things IoT will reportedly soon generate a staggering 400 zettabytes ZB of data a year Self driving cars are predicted to churn out 4000 GB of data per hour of driving Big data analytics as an emerging analytical technology offers the capability to collect store process and visualize these vast amounts of data Big Data Analytics in Cybersecurity examines security challenges surrounding big data and provides actionable insights that can be used to improve the current practices of network operators and administrators Applying big data analytics in cybersecurity is critical By exploiting data from the networks and computers analysts can discover useful network information from data Decision makers can make more informative decisions by using this analysis including what actions need to be performed and improvement recommendations to policies guidelines procedures tools and other aspects of the network processes Bringing together experts from academia government laboratories and industry the book provides insight to both new and more experienced security professionals as well as data analytics professionals who have varying levels of cybersecurity expertise It covers a wide range of topics in cybersecurity which include Network forensics Threat analysis Vulnerability assessment Visualization Cyber training In addition emerging security domains such as the IoT cloud computing fog computing mobile computing and cyber social networks are examined The book first focuses on how big data analytics can be used in different aspects of cybersecurity including network forensics root cause analysis and security training Next it discusses big data challenges and solutions in such emerging cybersecurity domains as fog computing IoT and mobile app security The book concludes by presenting the tools and datasets for future cybersecurity research **Securing the Connected World** Sabu M Thampi,Tony Thomas,Preetam Mukherjee,2025-04-12 Securing the Connected World Exploring Emerging Threats and Innovative Solutions offers a detailed examination of the growing challenges and cutting edge solutions in the realms of IoT Internet of Things and IoD Internet of Drones The book is structured to provide a balanced blend of foundational knowledge and advanced research insights making it an essential

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Conference on Computer and Communications Security ,2006   Network Forensics Sherri Davidoff,Jonathan Ham,2012-06-18 This is a must have work for anybody in information security digital forensics or involved with incident handling As we move away from traditional disk based analysis into the interconnectivity of the cloud Sherri and Jonathan have created a framework and roadmap that will act as a seminal work in this developing field Dr Craig S Wright GSE Asia Pacific Director at Global Institute for Cyber Security Research It s like a symphony meeting an encyclopedia meeting a spy novel Michael Ford Corero Network Security On the Internet every action leaves a mark in routers firewalls web proxies and within network traffic itself When a hacker breaks into a bank or an insider smuggles secrets to a competitor evidence of the crime is always left behind Learn to recognize hackers tracks and uncover network based evidence in Network Forensics Tracking Hackers through Cyberspace Carve suspicious email attachments from packet captures Use flow records to track an intruder as he pivots through the network Analyze a real world wireless encryption cracking attack and then crack the key yourself Reconstruct a suspect s web surfing history and cached web pages too from a web proxy Uncover DNS tunneled traffic Dissect the Operation Aurora exploit caught on the wire Throughout the text step by step case studies guide you through the analysis of network based evidence You can download the evidence files from the authors web site lmgsecurity com and follow along to gain hands on experience Hackers leave footprints all across the Internet Can you find their tracks and solve the case Pick up Network Forensicsand find out   **Proceedings of the ... USENIX Security Symposium** ,2006   **IEEE/ACM Transactions on Networking** ,2009   **The Handbook of Computer Networks, Distributed Networks, Network Planning, Control, Management, and New Trends and Applications** Hossein Bidgoli,2008 The Handbook of Computer Networks is the third set of reference books from leading author and Professor of Management Information Systems at California State University Bakersfield Hossein Bidgoli The Handbook of Computer Networks is designed to arm researchers practitioners students and managers with in depth understanding of this important and fast growing field in its broadest scope and in an applied and functional framework Each volume incorporates state of the art core information and networking topics practical applications and coverage of the emerging issues in the computer networking and data communications fields   *High Speed Deep Packet Inspection with Hardware Support* Fang Yu,2006   D-trigger Ling Huang,2007   Extrusion Detection Richard Bejtlich,2006 Overcome Your Fastest Growing Security Problem Internal Client Based Attacks Today s most devastating security attacks are launched from within the company by intruders who have compromised your users Web browsers e mail and chat clients and other Internet connected software Hardening your network perimeter won t solve this problem You must systematically protect client software and monitor the traffic it generates Extrusion Detection is a comprehensive guide to preventing detecting and mitigating security breaches from the inside out Top security consultant Richard Bejtlich offers clear easy to understand explanations of today s client based threats and effective step by step solutions demonstrated against real traffic and data You will learn how to assess threats

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