

## A Deeper Level of Network Intelligence: Combating Cyber Warfare



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## People Rely on Internet

/// Business / Professional Use



/// Personal / Social Use



/// Financial Transactions



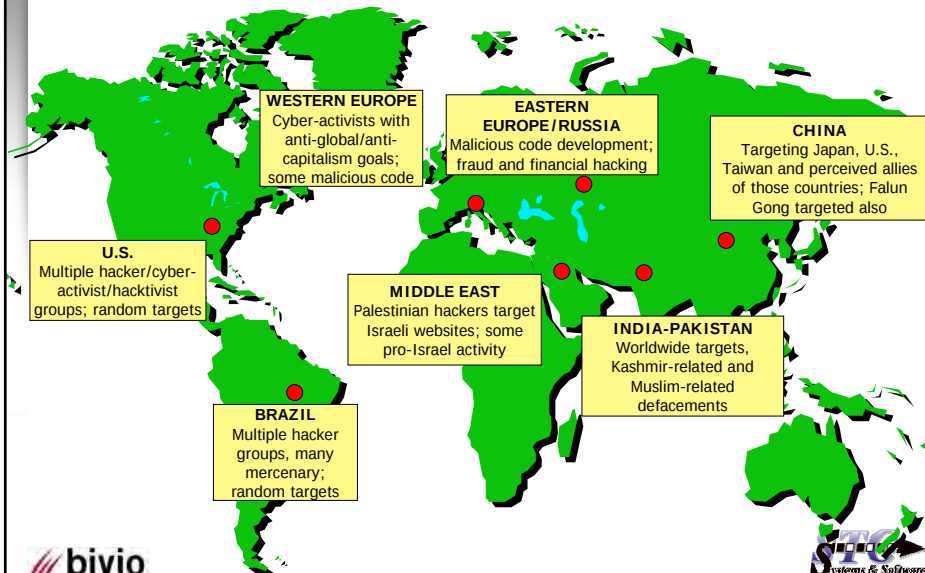
| Report Documentation Page                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                    |                                     |                                                                  | Form Approved<br>OMB No. 0704-0188                  |                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-------------------------------------|------------------------------------------------------------------|-----------------------------------------------------|------------------------------------|
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| 1. REPORT DATE<br><b>APR 2010</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                    | 2. REPORT TYPE                      |                                                                  | 3. DATES COVERED<br><b>00-00-2010 to 00-00-2010</b> |                                    |
| 4. TITLE AND SUBTITLE<br><b>A Deeper Level of Network Intelligence: Combating Cyber Warfare</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    |                                     |                                                                  | 5a. CONTRACT NUMBER                                 |                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    |                                     |                                                                  | 5b. GRANT NUMBER                                    |                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    |                                     |                                                                  | 5c. PROGRAM ELEMENT NUMBER                          |                                    |
| 6. AUTHOR(S)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                    |                                     |                                                                  | 5d. PROJECT NUMBER                                  |                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    |                                     |                                                                  | 5e. TASK NUMBER                                     |                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    |                                     |                                                                  | 5f. WORK UNIT NUMBER                                |                                    |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)<br><b>Bivio Networks Inc,4457 Willow Road, Suite 200,Pleasanton,CA,94588</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    |                                     |                                                                  | 8. PERFORMING ORGANIZATION<br>REPORT NUMBER         |                                    |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                    |                                     |                                                                  | 10. SPONSOR/MONITOR'S ACRONYM(S)                    |                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    |                                     |                                                                  | 11. SPONSOR/MONITOR'S REPORT<br>NUMBER(S)           |                                    |
| 12. DISTRIBUTION/AVAILABILITY STATEMENT<br><b>Approved for public release; distribution unlimited</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                    |                                     |                                                                  |                                                     |                                    |
| 13. SUPPLEMENTARY NOTES<br><b>Presented at the 22nd Systems and Software Technology Conference (SSTC), 26-29 April 2010, Salt Lake City, UT. Sponsored in part by the USAF. U.S. Government or Federal Rights License</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                    |                                     |                                                                  |                                                     |                                    |
| 14. ABSTRACT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                    |                                     |                                                                  |                                                     |                                    |
| 15. SUBJECT TERMS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                    |                                     |                                                                  |                                                     |                                    |
| 16. SECURITY CLASSIFICATION OF:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    |                                     | 17. LIMITATION OF<br>ABSTRACT<br><b>Same as<br/>Report (SAR)</b> | 18. NUMBER<br>OF PAGES<br><b>12</b>                 | 19a. NAME OF<br>RESPONSIBLE PERSON |
| a. REPORT<br><b>unclassified</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | b. ABSTRACT<br><b>unclassified</b> | c. THIS PAGE<br><b>unclassified</b> |                                                                  |                                                     |                                    |

## A Hacker's Opportunity is Target Rich!

- /// Enterprise
  - Personal
  - Credit Card
- /// Government
  - Military secrets
  - Nuclear Information
  - Medical Records
  - Criminal Records
  - Classified Secrets and Information
  - Control of Physical Infrastructure
    - Power
    - Electrical
    - Water



## Hacking Hotspots and Trends



## Happening Now!

- Twitter DDOS
- DDOS attacks in Estonia
- Attacks on Booz Allen Hamilton
- Breach of defense contractor computers that let hackers get at information on the Joint Strike Fighter
- Power grid compromised
- Repeated attacks on .gov websites
- Real growing threat of cyber terrorism



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## Exploitation Evolution

- While we look at the evolution trend, it should be noted that the less severe exploits have not gone away. They still exist today and have even increased in numbers. The problem is that we also have to deal with exploits that now affect our national security.

Experimentation / Notoriety

Hactivism / Defacements

Criminal Enterprise

Espionage / Cyber Terrorism



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## Threats Today

- /// **Malware**
  - Worms
  - Trojans
  - Rootkits
  - Spyware
- /// **Botnets**
- /// **Remote & Local Exploitation**

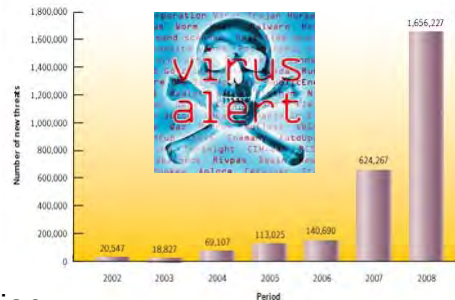


Figure 15. New malicious code signatures  
Source: Symantec

**Good News: New Government Initiatives Underway!**



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## CNCI Overview



### The Comprehensive National Cybersecurity Initiative

- /// Cybersecurity has been called “one of the most urgent national security problems facing the new administration.”<sup>1</sup>
- /// The CNCI “establishes the policy, strategy, and guidelines to secure federal systems.”<sup>2</sup>
- /// A program called to unify agencies’ fragmented approach to cyber security within the federal government.

(1) Center for Strategic and International Studies, Securing Cyberspace for the 44th Presidency: A Report of the CSIS Commission on Cybersecurity for the 44th Presidency (2008).

(2) Department of Homeland Security, Fact Sheet: DHS 2008 End of Year Accomplishments (Dec. 18, 2008), [http://www.dhs.gov/news/releases/pr\\_1229609413187.shtm](http://www.dhs.gov/news/releases/pr_1229609413187.shtm).



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## 12 Main Components of the CNCI

- ✦ Trusted Internet Connection
- ✦ Intrusion Detection
- ✦ Intrusion Prevention
- ✦ Research and Development
- ✦ Situational Awareness
- ✦ Cyber Counterintelligence
- ✦ Classified Network Security
- ✦ Cyber Education and Training
- ✦ Implementation of Info Security Technologies
- ✦ Deterrence Strategies
- ✦ Global Supply Chain National Security
- ✦ Public/Private Collaboration



## Two Initiatives of CNCI

- ✦ Einstein 2
  - *EINSTEIN 2 capability enables analysis of network flow information to identify potential malicious activity while conducting automatic full packet inspection of traffic entering or exiting U.S. Government networks for malicious activity using signature-based intrusion detection technology*
- ✦ Einstein 3
  - *The goal of EINSTEIN 3 is to identify and characterize malicious network traffic to enhance cybersecurity analysis, situational awareness and security response. It will have the ability to automatically detect and respond appropriately to cyber threats before harm is done, providing an intrusion prevention system supporting dynamic defense.*

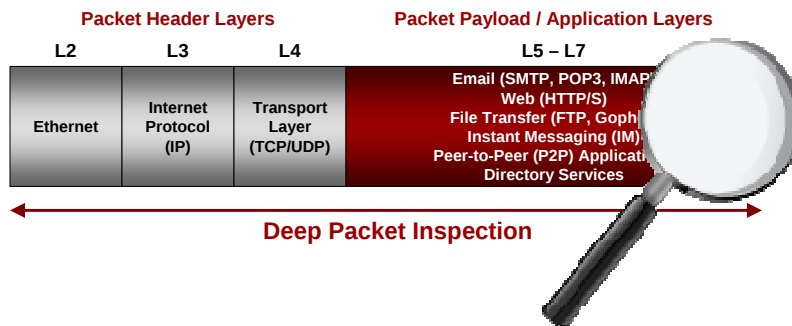
## A Transforming Network

- ✦ Explosion in usage, applications, devices, protocols
- ✦ Basic networking problems remain
  - Security
  - Information assurance
  - Cyber defense
  - Awareness
  - Control
- ✦ Network role transition from connectivity to policy
- ✦ Key Enabling Technology: **Deep Packet Inspection**

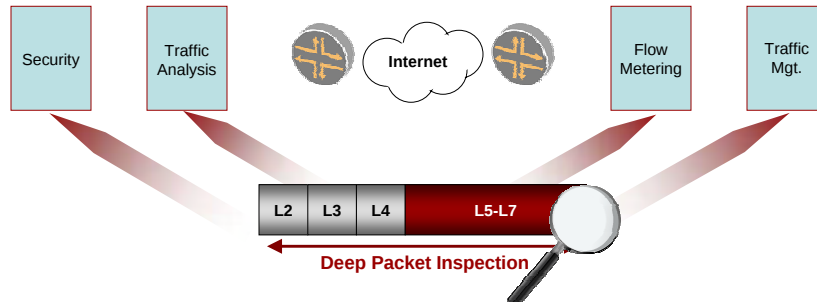


## What is Deep Packet Inspection (DPI)?

- ✦ Set of technologies enabling fine-grained in-depth processing of network traffic
- ✦ Not a solution or an application!



## How is DPI used?



Deep packet inspection is used for a variety of protocol-aware networking functions including:

- Prevention of security violations
- Statistical traffic analysis
- Flow metering
- Content-based billing

## Cyber Security: Why DPI?

- ⚡ L3/4 analysis clearly not granular enough
  - Source/Destination often insufficient or totally irrelevant
- ⚡ Most information including viruses, worms, and bots is in the payload
  - Deeply embedded
  - Context dependent
  - Dynamic
- ⚡ Tunneling makes outer protocols/headers insufficient
- ⚡ Correlation between flows and payload often crucial
- ⚡ Threats are real-time & dynamic; response must be as well
  - DPI is real-time networking analog to off-line analysis
  - Dramatically shortens threat identification and response

## Example DPI-enabled Applications

AMP



SNORT®

- ❑ Intrusion Detection and Prevention
- ❑ Network Flow Analysis
- ❑ Data Leak Prevention
- ❑ Network Monitoring
- ❑ Data Retention
- ❑ Web Content Control
- ❑ Network Forensics



YAF



BarnYard



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## DPI Applications Requirements

### Development

- Prefer Linux for networking applications 
- Limited only by developer's imagination and ability to code
- Evolve and change applications with new requirements
- Develop independent of underlying platforms

### Deployment

- Provide same operational environment – Linux 
- Insulate the applications from networking delivery infrastructure
- Offer appropriate amount of compute power for application to handle the offered "speeds and feeds" (10Gbit, OC-192, beyond)
- Run multiple applications on the same "speeds and feeds" pipe



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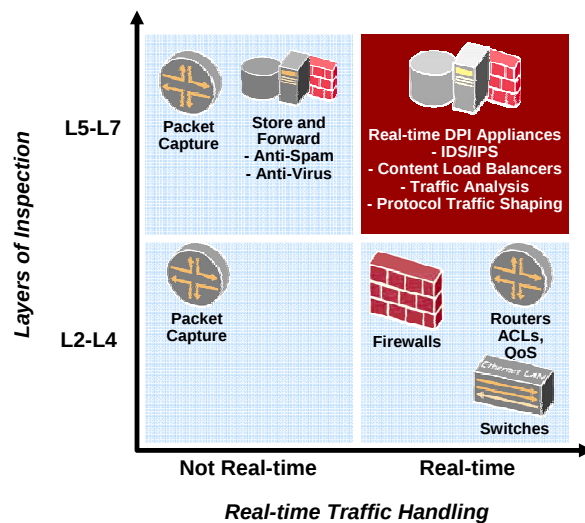
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## DPI-introduced Challenges

- /// Finer granularity → vast increase in compute power
- /// Increased options for data manipulation → flexibility
- /// Changing networking environment → extensibility
- /// Application and protocol diversity → customizability

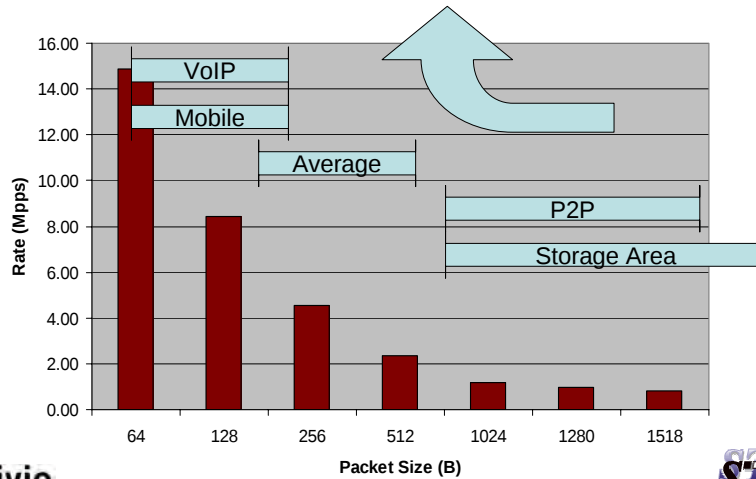
**High compute/high throughput networking:**  
*collision of computing and networking is the key dynamic for next generation networking*

## DPI Hardware Implementations



## 10 Gbps Considerations

- ⚡ DPI performance significantly harder to maintain at 10 Gbps speeds
- ⚡ Network applications drive overall network impact



## Real-time DPI Devices

- ⚡ Enable real-time, inline inspection, analysis and control
- ⚡ Requires significant processing capacity/density to perform L7 analysis at 10 Gbps speeds
- ⚡ Can be based on general-purpose CPUs
- ⚡ Can be based on custom hardware

## Real-time DPI Devices

### Advantages

- Capable of providing transparent real time L7 enforcement
- Purpose built architectures can provide high speed L7 capabilities

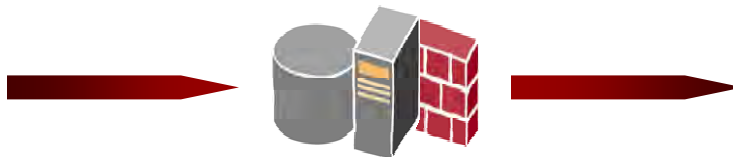
### Disadvantages

- Hardware requirements greater than those of simple forwarding devices,
- Therefore, true 10G capable DPI platforms cost more than L3/L4 capable platforms

## Achieving 10Gbps (Real-time)

### Real-time DPI - Standalone form factor solutions

- Custom built appliances
- Servers with accelerator cards



## Bivio Product Highlights

- ✦ **Unique system architecture optimized for wire-speed packet processing**
  - Powerful computation platform
  - De-coupling of network from CPU
  - Programmable data path
  - Hardware acceleration
- ✦ **Comprehensive software environment**
  - Standard Linux development environment
  - Multi-application support
  - Integrated management
  - High Availability & Redundancy
  - Clustering support
  - Advanced load distribution
- ✦ **Unique scaling capabilities enable true wire-speed for any service at 10 Gbps and beyond**
- ✦ **Fully Integrated Multi-Service/Multi-Application DPI Solutions**
  - Self-consistent, i.e., does not need any external system interaction to work
  - Extensive unified Logging and Data Correlation
  - Software-based: extensible and customizable



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## Summary & Key Takeaways

- ✦ Internet is used daily for many business, personal & private aspects
- ✦ Threats are continuing to grow & evolve
- ✦ CNCI has allocated a plan & a budget to implement solutions throughout government agencies
- ✦ DPI platforms can be leveraged to solve challenging cyber security problems
- ✦ Bivio Networks is the leading supplier of open DPI platforms and cyber security solutions!



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