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March 2006



AIR FORCE ENTERPRISE DEFENSE (AFED)

Northrop Grumman

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AIR FORCE RESEARCH LABORATORY
INFORMATION DIRECTORATE
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STINFO FINAL REPORT

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AFRL-IF-RS-TM-2006-2 has been reviewed and is approved for publication.

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13. ABSTRACT (Maximum 200 Words) Provided technical Information Assurance (IA) support to the Air Force Research Laboratory (AFRL) Defensive Information Warfare (DIW) Branch in the design, development, integration, installation and demonstration of the Air Force Enterprise Defense (AFED) and Automated Intrusion Detection Environment (AIDE) systems.				
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1.0 What is AFED?

AFED is a security management system combining data from multiple types of sensors including IDS, vulnerability assessment, change management, correlators, etc.

1.1 Allows analyst to view data from a single console.

1.2 Aggregation capabilities significantly reduce data that must be viewed by analysts.

1.3 AFED components are configurable and flexible to allow them to be quickly modified to accept, aggregate and display information from new data sources.

2.0 Background:

2.1 Development – 2000 to 2004

2.2 Built on EPIC, AIDE, EPIC2 systems

2.3 Started as AC2ISRC funded program, then supported by In-House funding

Initiated to address Warfighter needs for better network security tools

2.4 Installations at ACC NOSC (2000), AFIWC (2002) and AFRL/RRS NOC 2002

2.5 Core system completed Jan 2004

3.0 Before AFED:

3.1 EPIC (Extensible Prototype for Intrusion Control)

- 1997-1998
- Designed to collect information from Multiple Data Sources
- Based upon G2 Expert System
- Demonstrated at EFX 98, JBC 98

4.0 AIDE (Automated Intrusion Detection System)

4.1 1998 to 2002

4.2 DISA ATD built on EPIC focused on Intrusion Detection and Hierarchical Reporting.

4.2.1 Deployed to 15+ DISA sites

5.0 EPIC (Extensible Prototype for Intrusion Command and Control)

- 1999 to 2000
- Enhanced version of EPIC
- New features included
 - additional database support
 - Policy enforcement capability
 - Host information
 - Network Management

6.0 AFED Database

6.1 Application – Oracle 9i Database

6.2 Types of Data Stored

- Host/Network based intrusion detection events (including syslog events)
 - . OS
 - . Location
 - . Services/service approval status
 - . POC data
 - . Vulnerability data
 - . Mission data
- Signature References, Analyst defined Notes/COA's
- Signature Normalization data
- IP domain to Organization mappings and metadata

7.0 DATA Extraction Utility

7.1 Application – Java based client/server

7.2 Capabilities

- Robust communication of data from files/databases to another database
- Supports Oracle, MySQL, Postgres, and Access
- Extreme configurability (configuration file specifies parsing, filtering, connections, etc.)
- Bookmarking
 - . Tracks what data was read and transferred
 - . Prevents loss of data in the event of a shutdown or network failure
 - . Source quenching
 - . Throttling mechanism that buffers data at server side to prevent overrun of database
- Health status reporting
- Can be used independently of AFED database and FlexViewer

8.0 SQL Correlator

8.1 Application

- Java based application based on FlexViewer
- Writes results to database

8.2. Capabilities

- Generate new “Cyber Alerts” regarding conditions that can be determined from SQL queries and insert them into database.
 - Extreme configurability
 - Read/write to any database schema
 - Supports Oracle, MySQL, Postgres, and Access
 - Can be used independently of AFED database and Data Extraction Utility and FlexViewer

9.0 *FlexViewer*

9.1 Application

- Java Based Graphical User Interface
- Provides a spreadsheet view of data
- Graphical capability to be added

9.2 Capabilities:

- Displays Data from Oracle, MySQL, Postgres, and Access
- Drive third party apps using data from spreadsheet cells
- Fully configurable menus
- User definable/sharable
- Built-in scripting engine allowing extreme extensibility
- Can be used independently of AFED database and Data Extraction Utility

10.0 *AIDE (Automated Intrusion Detection System)*

10.1 1999 TO 2000

10.2 Enhanced version of EPIC

10.3 New features included:

10.1.1 Additional database support

10.1.2 Policy enforcement capability

10.1.3 Host information

10.1.4 Network Management

AFED Conceptual Architecture

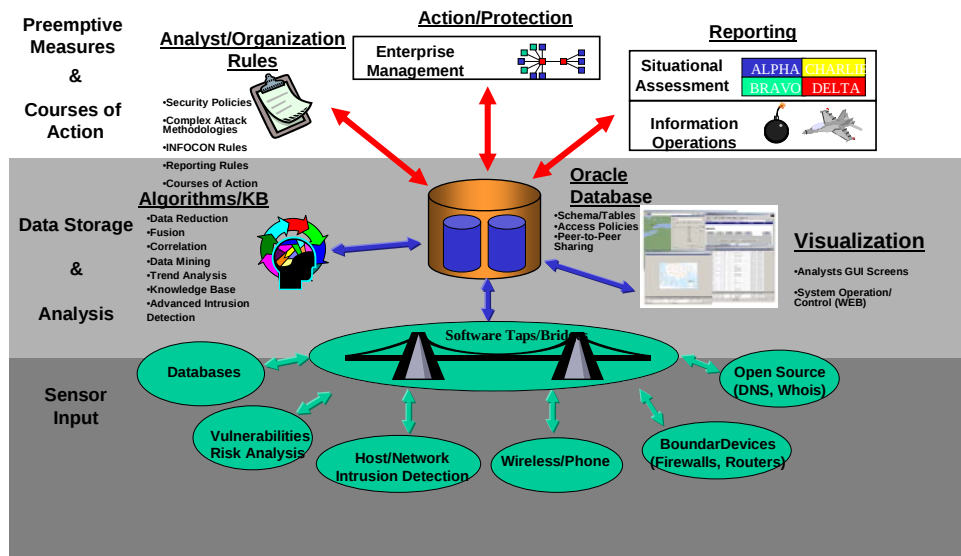


Figure 1: AFED Conceptual Architecture

AFED Components

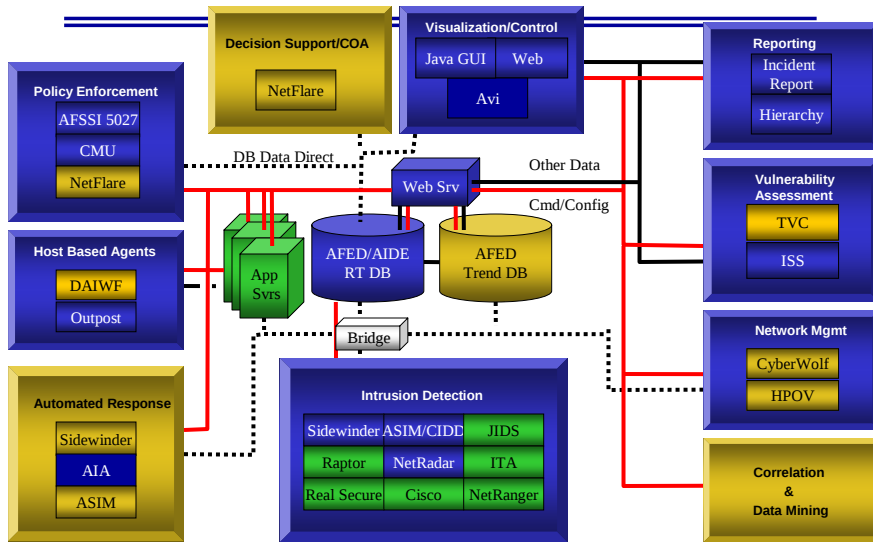


Figure 2: AFED Components

AFED FlexViewer

[illegible]

Figure 3: AFED FlexViewer

FlexViewer - Editor Window

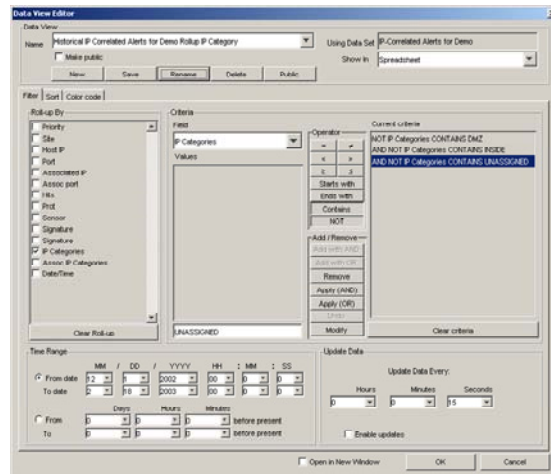


Figure 4: FlexViewer – Editor Window

FlexViewer - Sort Editor

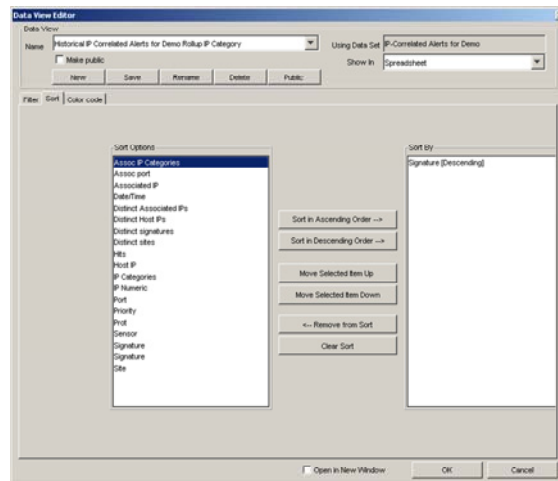


Figure 5: FlexViewer – Sort Finder

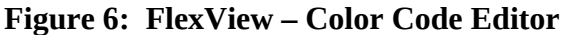


Figure 7: FlexViewer – Color Codes Applied

Host POC Drilldown

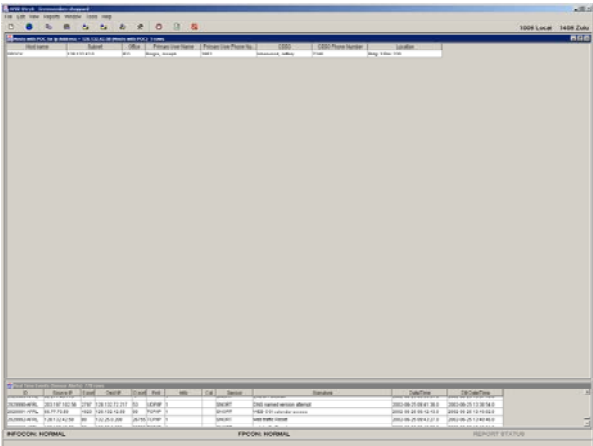


Figure 8: Hose POC - Drilldown

Host Services Drilldown

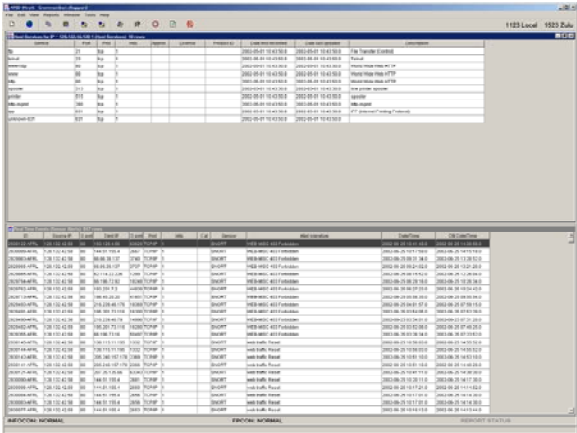


Figure 9: Hose Services - Drilldown

Data View

Sorted by Hits

FullDataset Rollup Sig (Sensor Alerts) 474 rows from 77557 records										
Site	Source IP	S port	Dest IP	D port	Hits	Prot	Signature	Source IP Cat	Source Org	
2*	31*	-1	6408*	-1	171,451	OMP	OMP PING Sun Solars	3*	23*	
3*	4576*	15909*	222*	80	49,641	TCP	WEBFRONTPAGE_v8_bfaccess	5*	1110*	
3*	4507*	219*	90*	22125*	36,420	3*	SHELLCODE_v88_inc_v88_NOOP	4*	1361*	
3*	2905*	15043*	108*	80	33,763	TCP	WEB-MDC http directory traversal	5*	1063*	
3*	1543*	48*	28*	20432	30,490	TCP	DDOS shell client to handler	6*	401*	
3*	2815*	945*	69*	12832*	30,230	3*	SHELLCODE_v88_NOOP	5*	946*	
3*	9901*	12790*	217*	80	26,327	TCP	WEB-IS scripts access	5*	2250*	
3*	1063*	5915*	1717*	80	21,219	TCP	WEB-IS cmd exe access	3*	159*	
3*	201*	18704*	37*	80	20,363	TCP	WEB-MSC whistler HEAD with large diagram	4*	107*	
JAWA	76*	193*	211*	19,317	UDP	MSC Large UDP Packet	2*	29*		
3*	6203*	823*	70*	80	16,615	TCP	WEBFRONTPAGE_v8_rpc access	5*	1483*	
3*	127*	80	3497*	10192*	15,341	TCP	ATTACK RESPONSES 403 Forbidden	INSIDE	3*	
3*	849*	16*	26*	2*	13,979	TCP	DDOS mstream client to handler	5*	303*	
3*	3*	9258*	204*	80	13,887	TCP	WEB-IS multiple decode attempt	2*	2*	
2*	17*	25	1620*	5001*	13,602	TCP	POLICY SMTP relaying denied	5*	2*	
3*	3950*	7430*	01*	80	13,499	TCP	WEB-IS_v88_access	5*	1449*	
3*	305*	18*	546*	1742*	12,298	TCP	SCAN mmap TCP	3*	153*	
3*	197*	-1	212*	-1	11,016		BAD TRAFFIC bad frag bits	2*	62*	
JANC	76*	19*	151	10,027	UDP	SNMP request udp	UNKNOWN	U.S. DEPARTMENT OF TRANSPORTATION		US
3*	563*	5343*	75*	80	9,500	TCP	WEB-CGI format access	3*	221*	

Alerts Aggregated
by Signature

Figure 10: Data View

Data View - Tuning Applied

Sorted by Hits

Site	Host IP	Port	Associated IP	Assoc Port	Hits	Prot	Signature	IP Category	Organization	Co
3*	412*	16405*	550*	47*	144,879	3*		343*	UNKNOWN	U.S. DEPARTMENT OF TRANSPORTATION
3*	2543*	9945*	950*	3713*	30,309	3*		328*		
3*	0*	0*	27*	777*	20,359	TCP		13*	UNKNOWN	THE NATIONAL OCEANIC AND ATMOSPHERIC ADMIN
3*	1017*	17352*	90*	270*	18,943	2*		69*		US
3*	3111*	7189*	1497*	109*	15,096	3*		74*	2*	AFRIC
3*	309*	3160*	100*	56*	12,130	TCP		43*	UNKNOWN	PAC BELL INTERNET SERVICES
3*	1233*	2672*	344*	16*	11,963	3*		60*	SUSPICIOUS	AOL
3*	2676*	4190*	147*	1094*	11,214	3*		94*	SUSPICIOUS	ATT NPT (REAL TIME MONITORING)
3*	1880*	4002*	476*	783*	10,059	3*		83*	SUSPICIOUS	RRE
3*	180*	864*	73*	700*	9,611	2*		56*		CERNET
2*	3*	3522*	12*	4*	9,482	TCP		29*	UNKNOWN	BOM INTERNATIONAL, INC.
3*	1209*	1417*	110*	821*	8,848	3*		72*	SUSPICIOUS	LEVEL 3 COMMUNICATIONS, INC.
3*	1214*	3231*	105*	229*	8,865	3*		68*	UNKNOWN	COMCAST CABLE COMMUNICATIONS, INC.
3*	160*	424*	56*	4324*	8,007	3*		42*	UNKNOWN	ABOVENET COMMUNICATIONS, INC.
3*	1145*	3190*	100*	56*	7,874	2*		71*	SUSPICIOUS	COX COMMUNICATIONS INC.
3*	88*	81*	35*	3755*	6,290	2*		21*	UNKNOWN	COSENT COMMUNICATIONS
3*	426*	431*	103*	1268*	6,076	2*		52*	UNKNOWN	CABLE 81 WIRELESS
3*	3*	2*	14*	20*	5,529	TCP		7*	UNKNOWN	SHOCKWAVE.COM
3*	674*	1241*	683*	149*	4,953	TCP		64*	UNKNOWN	QWEST COMMUNICATIONS
3*	326*	1032*	80*	270*	4,921	2*		54*	SUSPICIOUS	XO COMMUNICATIONS
3*	292*	4102*	4100*	4100*	4,815	3*		66*	UNKNOWN	VERIZON INC.

Alerts Aggregated by Organization

Figure 11: Data View – Tuning Applied

Data View - Organization Drilldown

Organization=U.S. DEPARTMENT OF TRANSPORTATION (IP Correlated Alerts) 412 rows from 144679 records

Site	Host IP	Port	Associated IP	Assoc port	Hits	Prot	Signature
3 *	192.168.254.240	15566 *	512 *	15 *	111,591	3 *	69 *
2 *	192.168.254.240	3893 *	41 *	7 *	18,170	2 *	69 *
IAMC	192.168.254.240	505 *	2 *	80	4,162	TCP	238 *
IAYVA	192.168.254.240	524	208.100.0.0	6 *	3,453	TCP	2 *
2 *	192.168.254.240	1993 *	2 *	80	2,851	TCP	8 *
2 *	192.168.254.240	2 *	2 *	9 *	980	TCP	8 *
IAMC	192.168.254.240	552 *	3 *	139	584	TCP	NETBIOS NT NULL session
2 *	192.168.254.240	523 *	17 *	3 *	538	2 *	21 *

Figure12: Data View – Organization Drilldown