Paul Hoffmann

CEO DATAKOM/GTEN

State of the Art Solutions for Interception

+ Clean Bandwidth = Clean Services

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NetworkQuality for customers.

www.datakom.de

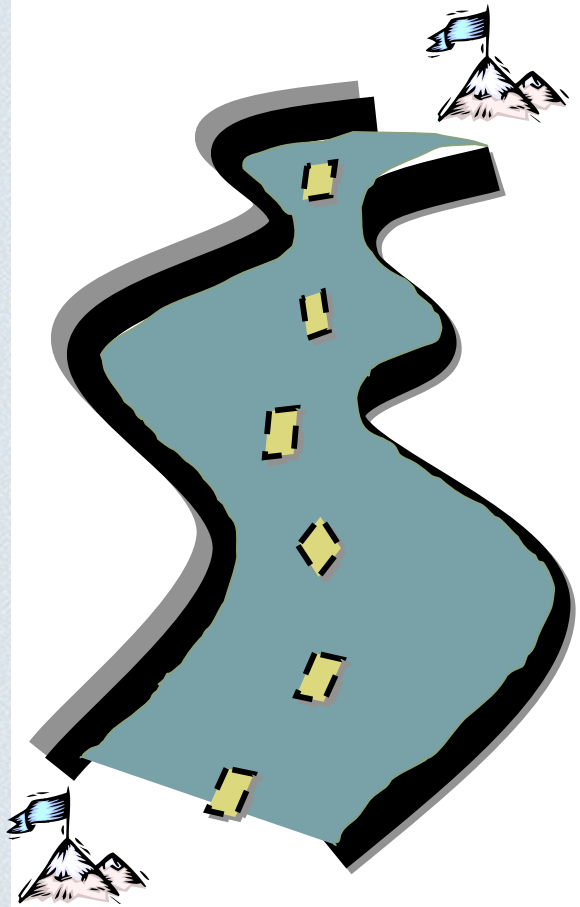
DATAKOM

(Mother Company of GTEN)

Innovative Test-, Analyzing and
Performance Management-Systems
for Voice – and Data Networks

+ Training and Consulting Services

History DATAKOM/ GTEN



1986 founding of DATAKOM

2000/2001 Founding of GTEN AG

- Take over of Technology, Patent, rights and obligation contracts
- Contract with large Carrier in Germany for LI Service

1999

Contract with Mannesmann ARCOR, Deutsche Telekom und o.tel.o

1997

Development of the G10-LI - Technology

Mediation between Carriers, Ministries, BNetzA and LEAs

20 years of experience in the Protocol- / Performance-Analysis of Data- / Voice-Networks

Life Cycle of Companies inside IT- Industry

- Usually, only some very large Companies do exist for very long Time
- Small and Medium Size Companies Appear and Disappear
- But there are some exceptions.

Why ?

Old Dutch Saying

- During „Stormy“ (Windy) Times
- (and over the last 20 years we had such times inside IT Market)

some are building:

Protection Houses

- And others:

- Like DATAKOM

Windmills

DATAKOM History

NetworkQuality for customers.

1986 Founding of DATAKOM GmbH
by Paul Hoffmann und Lydia Krowka

1988 Start of DATAKOM-Academy

2000 Start of GTEN AG with patented Technology for Lawful Interception

Until today

GTEN Intelligence for a better world

more than 10 000 Installation from DATAKOM and GTEN

GTEN - Division History

1986

- Foundation of DATAKOM GmbH
- Extensive experience in the protocol/ performance analysis of data/voice networks

1997

- Basic development of GTEN technology
- Mediation between carriers, ministries, BNetzA and LEAs

1999

- Contract with Mannesmann, ARCOR, Deutsche Telekom and o.tel.o
- Initial certification of LI solution by BMWi

2000

- ***Foundation of GTEN AG***
- Contract with Viag Interkom

  (later on BTIgnite)
- Investment backer was obtained in the form of Wellington Partners

2001

- Transfer of technology, patent rights and customer contracts
- Enhancement of existing GTEN solution towards IP applications

2002

- Contract with Telefonica
- GTEN becomes full voting member of ETSI
- GTEN New solution approved according to BNetzA and Dutch TIIT

2003

- Two large IP monitoring systems deployed in North Africa and Middle East
- VoIP LI solution certified by RegTP

2004

- Introduction of ATM Interceptor
- Start of development of email solution

2005/6

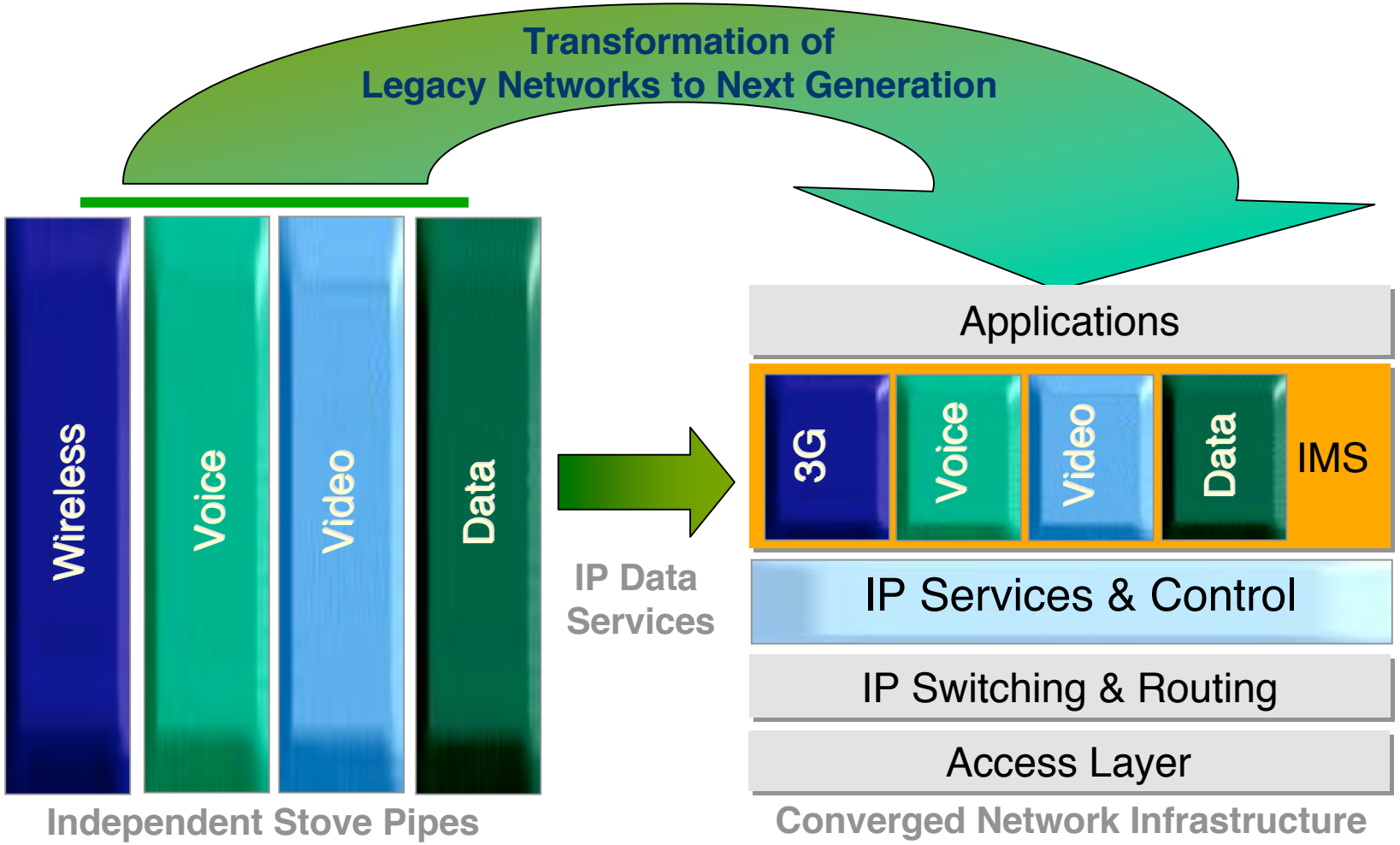
- Email solution certified by RegTP
- Contracts with Easynet, KEVAG and DIG
- Enhancements with existing

  Customer
- Development

  new Product Strategy
- Cleaning up Partner Selection
- Clean Bandwith Concept

What is happening in the market today?

The opportunity lies in the transformation of services.



Money is being spent to maintain the functionality, usability and security of the customer offerings.

Bandwidth Pressure from Next Generation Applications

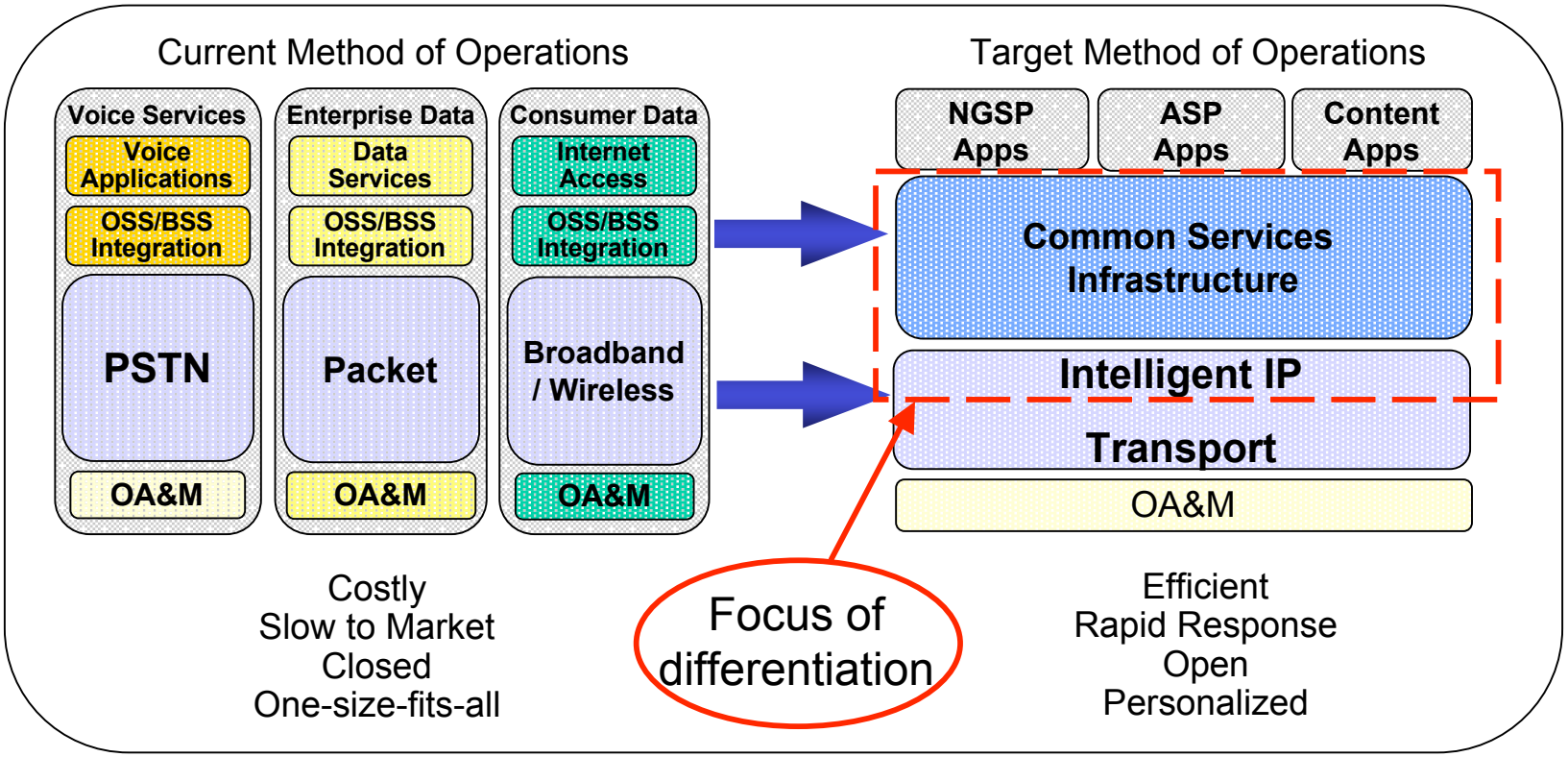
Application	Downstream	Upstream
Streaming Audio	128K - 384K	64K
Internet Access	256K - 1.5M	64K - 640K
Web Hosting	400K - 1.5M	400K - 1.5M
Video Conferencing	384K - 1.5M	384K - 1.5M
Distance Learning	384K - 1.5M	384K - 1.5M
Telecommuting	1.5M - 3M	1.5M - 3M
Interactive Video	1.5M - 6M	128K - 6M
VoD	1M - 18M	64K - 640K
Multiple Digital TV	2M - 8M	64K - 640K
Multiple VoD	6M	64K - 640K
HDTV	6-18M	64K
Gaming	2-20M	64K –20M

Source: Cisco 2005

Migration to IP is Critical for Participation in the IP Economy, but also Transparency

The pace of convergence to a common IP infrastructure is accelerating

- New-age IP service providers have distinct advantages over incumbents
  - ♣ e.g. personalized services
  - ♣ faster service development cycles
  - ♣ More granular, bounded service levels



Market Conditions

Networking Focused Increasingly on the Content

Switch

Router

Firewalls

PCs & Servers

Worms, Content (for LI)

User Conversations

MAC Header	IP Header	TCP	Payload
MAC Header	IP Header	TCP	Payload
MAC Header	IP Header	TCP	Payload
MAC Header	IP Header	TCP	Payload
14 Bytes	20 Bytes	20 Bytes	48 - 8,192 Bytes

Solution *Complete Visibility; Network Appliance Speeds; Configurable Logic*

MAC Header	IP Header	TCP	Payload

Market Conditions
Technology Challenges

- There is no good solution available to enable real-time network services & content control incl. Interception

  - ♣ Routers/switches are content-blind, closed systems
    - Header, not payload
    - Pass traffic, don't analyze
    - functionality is fixed
  - ♣ Appliances are point solutions, often ASIC-based and not extensible
  - ♣ Servers (Sun, Dell, …) are low speed and add latency

- The rate of increase for network transmission speeds and volumes is compounding the problem

Market Conditions Driving 10GbE Deployments

- Broadband data is exploding
  - ♣ "At the end of March 2006, 42 percent of Americans had high-speed at home, up from 30 percent in March 2005, or a 40 percent increase." *Pew Internet Survey, May 29, 2006*
    -
- Next generation of IP services are bandwidth hogs!
  - ♣ VoD estimated at 1-18Mbps downstream (HDTV 6-18Mbps)
  - ♣ Gaming: 2-20Mbps downstream (64Kbps-20Mbps upstream)
- 10GbE switch port pricing dropped to below $1,000 per port
- Dell'Oro predicts that over the next five years 23 million 10GbE ports will ship, worth $14bn

Situation regarding Lawful Interception

- Technology today based on old Network Design
- Handshake Interfaces between Network Provider and Law Enforcement Agencies are designed for old Telephone Networks where Content and Signaling where using different Routes
- Transport of Terrabytes Data towards LEAs very often useless and expensive
- New Generation Networks „Crying“ for new LI - Technology

Calea, ETSI, Sorm …….
Many (to many) standards don‘t make things better

- *
- TC LI (Technical Comitee LI)
- * DTR/LI-00014 Lawful Interception of WLAN Internet Access
- Beschreibt die Interception Domain und die Ausleitung von Wireless Internet. Wird voraussichtlich in 2006 herausgebracht.
- *
- DTR/LI-00020 Data Handover Architecture
- Beschreibt die Architektur für die Ausleitung von Daten (EU Data Retention Act). Wird voraussichtlich in 2006 herausgebraucht.
- *
- DTS/LI-00024 Lawful Interception;
- Service specific details for IP Multimedia Services Spezifikation für das Handover von Voice und sonstigen multimedialen Diensten in paketvermittelten Netzen (mit und ohne IMS). Wird voraussichtlich in 2006 herausgebraucht.
- *
- DTR/LI-00025 Lawful Interception;
- Architecture for IP Networks within a Communincation Service Provider's domain Beschreibt die Architektur für für LI in paketvermitteltеten Netzen. Wird voraussichtlich in 2006 herausgebraucht.
- *
- DTS/LI-00030 Lawful Interception;
- Service specific details for PSTN Emulation Services (PES) Spezifiziert die Ausleitung von Daten aus multimedialen Netzen, die PSTN Emulation System Eigenschaften besitzen (legacy TDM). Wird voraussichtlich in 2006 herausgebraucht.
- *
- TISPAN LI
- (Technical Committee - The harmonisation of IP Network Architectures)
- *
- DTS/07013
- Telecoms & Internet converged Services & Protocols
- for Advanced Networks (TISPAN);

- NGN Lawful Interception;
- Lawful Interception functional entities, information flow
- and reference points

- Spezifiziert wird der sog. Point of Interception für NGN Netze. Für das Handover wird auf die Dokumente TS 102 232 und 133.108 verwiesen. Wird voraussichtlich ende 2006 herausgebraucht.

- * Bereits veröffentliche Standards, die erweitert werden (Work Items)
- Standards, die bereits herausgebracht und von europäischen Staaten adaptiert sind.
- * TS 101 671

List continued

- Handover interface for the lawful interception of telecommunications traffic Erweiterungen für PES und PSS sind in Arbeit. Wird verraussichtlich in 2006 fertig. Diese Spezifikation wird schon europaweit von Regulierungsbehörden adaptiert.
- * TS 102 232
- Lawful Interception; Handover specification for IP delivery
- Das Handover Interface für IP. Wird in Verbindung mit TS 102 233, 102 234, 102 815 und LI-00024 verwendet. Wegen der unterschiedlichen Einsatzgebiete gibt es noch Anpassungsbedarf. Diese Spezifikation wird schon europaweit von Regulierungsbehörden adaptiert.
- *
- TS 102 234 Lawful Interception;
- service specific details for internet access services
- * Wird u.a. für xDSL Layer 3 Ausleitung in Verbindung mit TS 102 232 verwendet. Erweiterungen und Verbesserungen sind geplant. Diese Spezifikation wird schon europaweit von Regulierungsbehörden adaptiert.
- *
- TS 101 909-20 Part I
- Digital Broadband Cable Access to the Public Telecommunications Network; IP Multimedia Time Critical Services; Part 20: Lawful Interception; Sub-part 1: CMS based Voice Telephony Services
- *
- TS 101 909-20 Part II
- Digital Broadband Cable Access to the Public Telecommunications Network; IP Multimedia Time Critical Services; Part 20: Lawful Interception; Sub-part 2: Streamed multimedia services
- LI in Breitband Kabelfernsehen Hybrid Fibre/Coaxial (HFC) Datennetzen. Die Spezifikationen beschreiben die Ausleitung von Telefonie und Daten. Diese Spezifikation wird schon europaweit von Regulierungsbehörden adaptiert.
- *
- TS 101 331 Telecommunications security;
- Lawful Interception; Requirements of Law Enforcement Agencies Die Anforderungen für die Behörden. Das Dokument wird regelmäßig an die zu berücksichtigenden Gegebenheiten angepaßt. Diese Spezifikation wird schon europaweit von Regulierungsbehörden adaptiert.
- * 3GPP
- * 133.108 UMTS 3G Security;
- Handover Interface for Lawful Interception
- Spezifiziert wird das Handover Interface für UMTS mit IP Multimedia Subsystemen. Diese Spezifikation wird schon europaweit von Regulierungsbehörden adaptiert.
- *
- 133.107 UMTS 3G Security;
- Architecture for Lawful Interception
- Spezifiziert wird das Intercept Domain.
- Diese Spezifikation wird schon europaweit von Regulierungsbehörden adaptiert.
- *

Old LI – Technical Design

- GTEN has, like other LI – Vendors, developed many LI- Solutions "dictated" by National Standards

- Result of many existing Standards for Network Provider:

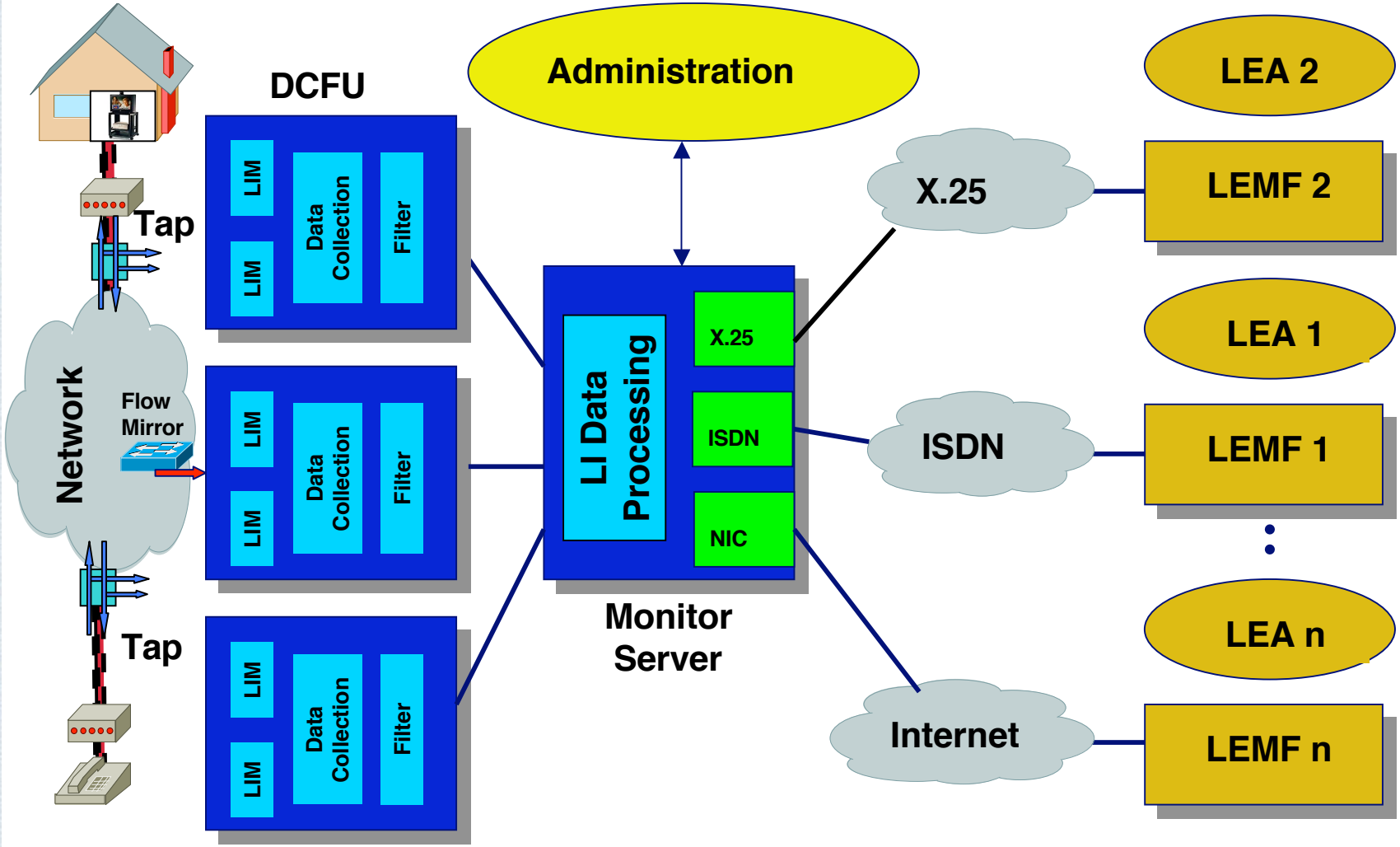
Buying LI- Only – Products very often means creating Cost only and no ROI (Return on Investment)

- Now we/you have the big chance to change this to:

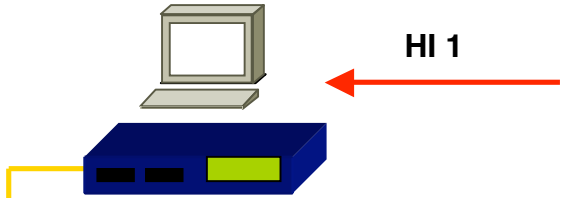
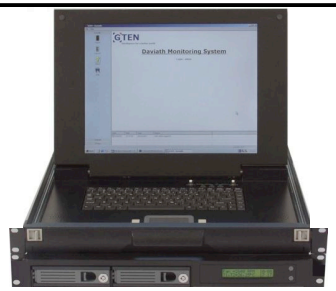
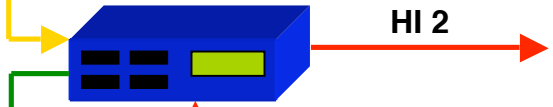
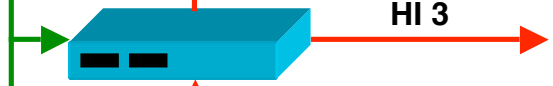
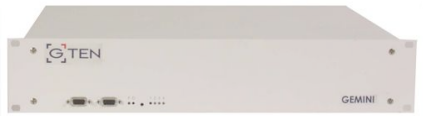
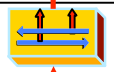
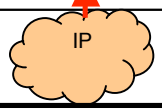
- Network Provider buying the right Technology will see better Performance plus good Portion of ROI and will get

Lawful Interception Solution for very low Cost or no Cost

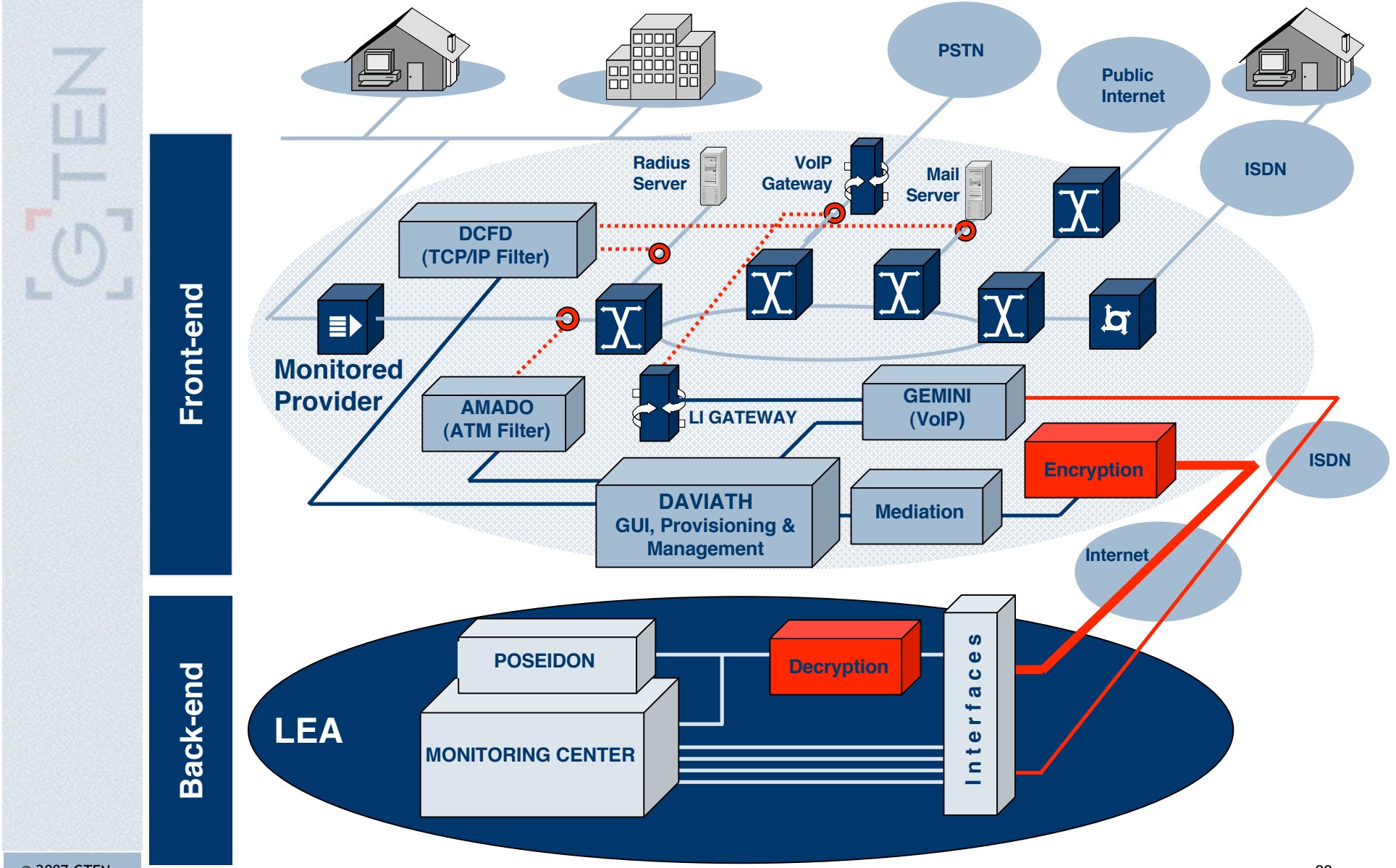
Modular Concept = Excellent Solution but based on old "Legacy Network" Design



Hand Shake Interfaces, designed many years ago for voice application

Level	Functional Units	GTEN Unit(s)
Operator Interface		
Management		
Provisioning		
Delivery		
Probe		
Tap		
Network		

LI - Product Environment as Result of Old “Standards”

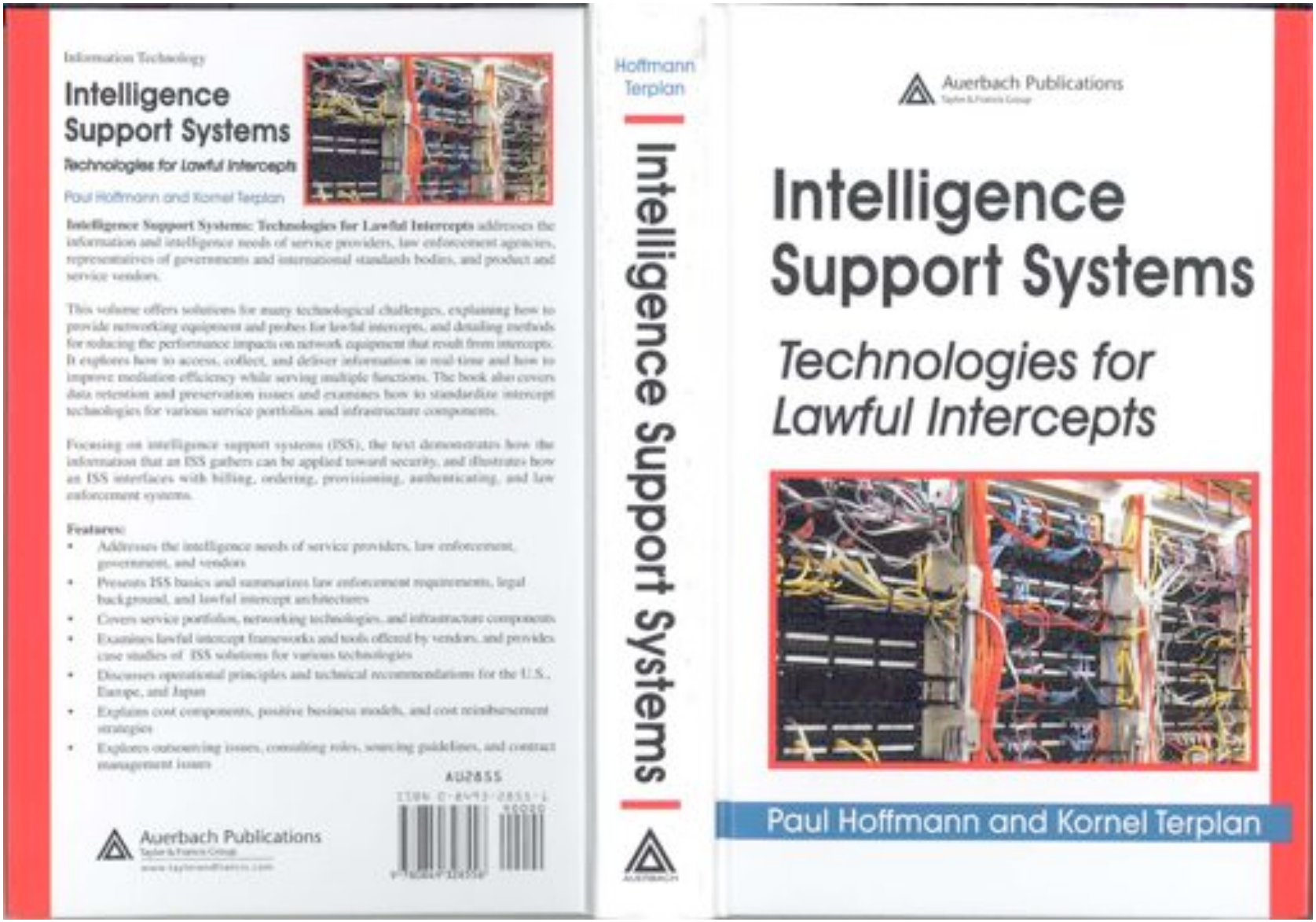


Reasons for taking a new direction:

- If you want to create a innovative solution,
  you have to study current solutions and theyr limits

- Together with a friend (Dr. Kornel Terplan) í have written a book last year describing LI – Technology and Methods plus Solutions from all over the world

- As a result of the gained Knowledge our new LI – Technology Concept was born

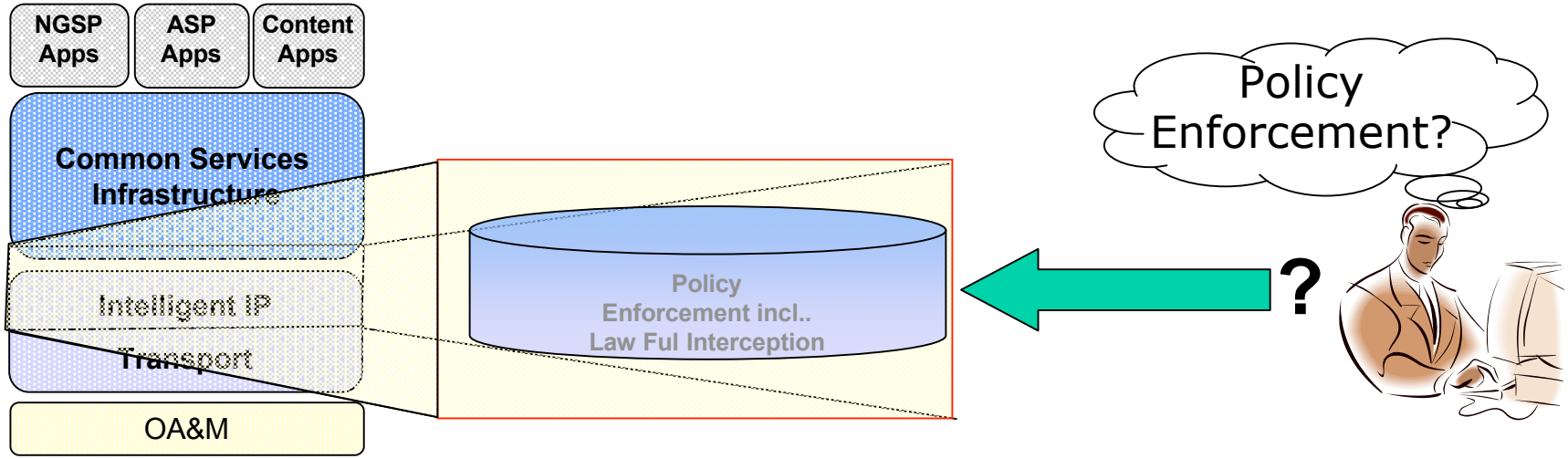

Information Technology
Intelligence Support Systems
Technologies for Lawful Intercepts
Paul Hoffmann and Kornel Terplan
Intelligence Support Systems: Technologies for Lawful Intercepts addresses the information and intelligence needs of service providers, law enforcement agencies, representatives of governments and international standards bodies, and product and service vendors.
This volume offers solutions for many technological challenges, explaining how to provide networking equipment and probes for lawful intercepts, and detailing methods for reducing the performance impacts on network equipment that result from intercepts. It explores how to access, collect, and deliver information in real time and how to improve mediation efficiency while serving multiple functions. The book also covers data retention and preservation issues and examines how to standardize intercept technologies for various service portfolios and infrastructure components.
Focusing on intelligence support systems (ISS), the text demonstrates how the information that an ISS gathers can be applied toward security, and illustrates how an ISS interfaces with billing, ordering, provisioning, authenticating, and law enforcement systems.
Features:
• Addresses the intelligence needs of service providers, law enforcement, government, and vendors
• Presents ISS basics and summarizes law enforcement requirements, legal background, and lawful intercept architectures
• Covers service portfolios, networking technologies, and infrastructure components
• Examines lawful intercept frameworks and tools offered by vendors, and provides case studies of ISS solutions for various technologies
• Discusses operational principles and technical recommendations for the U.S., Europe, and Japan
• Explains cost components, positive business models, and cost reimbursement strategies
• Explores outsourcing issues, consulting roles, sourcing guidelines, and contract management issues
AU2855
Auerbach Publications
Hoffmann
Terplan
Intelligence Support Systems
Auerbach Publications
Intelligence Support Systems
Technologies for Lawful Intercepts
Paul Hoffmann and Kornel Terplan

Advice for innovative IP Network Provider in Near - and – Middle East/Africa:

- Dont implement old Standards which are made for old Networks
- This is easy for those who dont have to implement standards like CALEA, ETSI etc.
- And even more easy for new IP – Network Provider

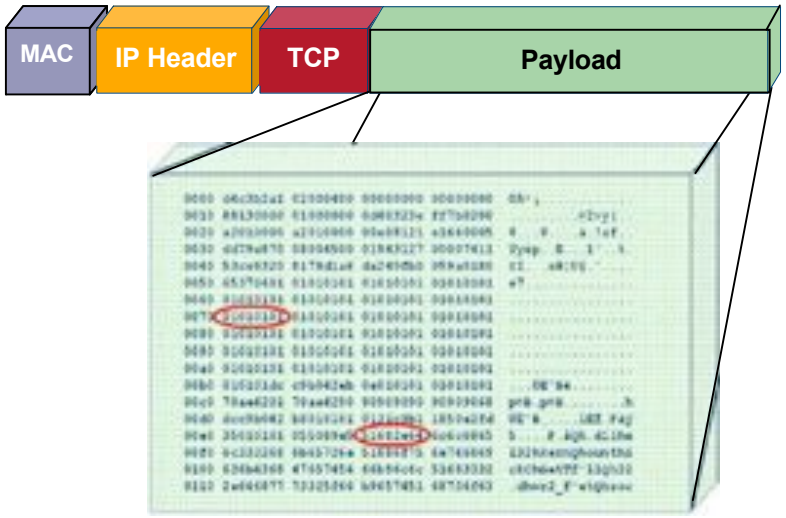
Today's Network Infrastructure inadequate for Service Control Needs

- **Devices optimized for OSI Layers 2-4 processing**
- **Router performance suffers as intelligence functionality is added & turned on**
- **Pace of feature enhancements too long to support needed roll-out and competitive response timetables**
- **Provisioning fixed-function appliances for required network intelligence is cost prohibitive and risky**



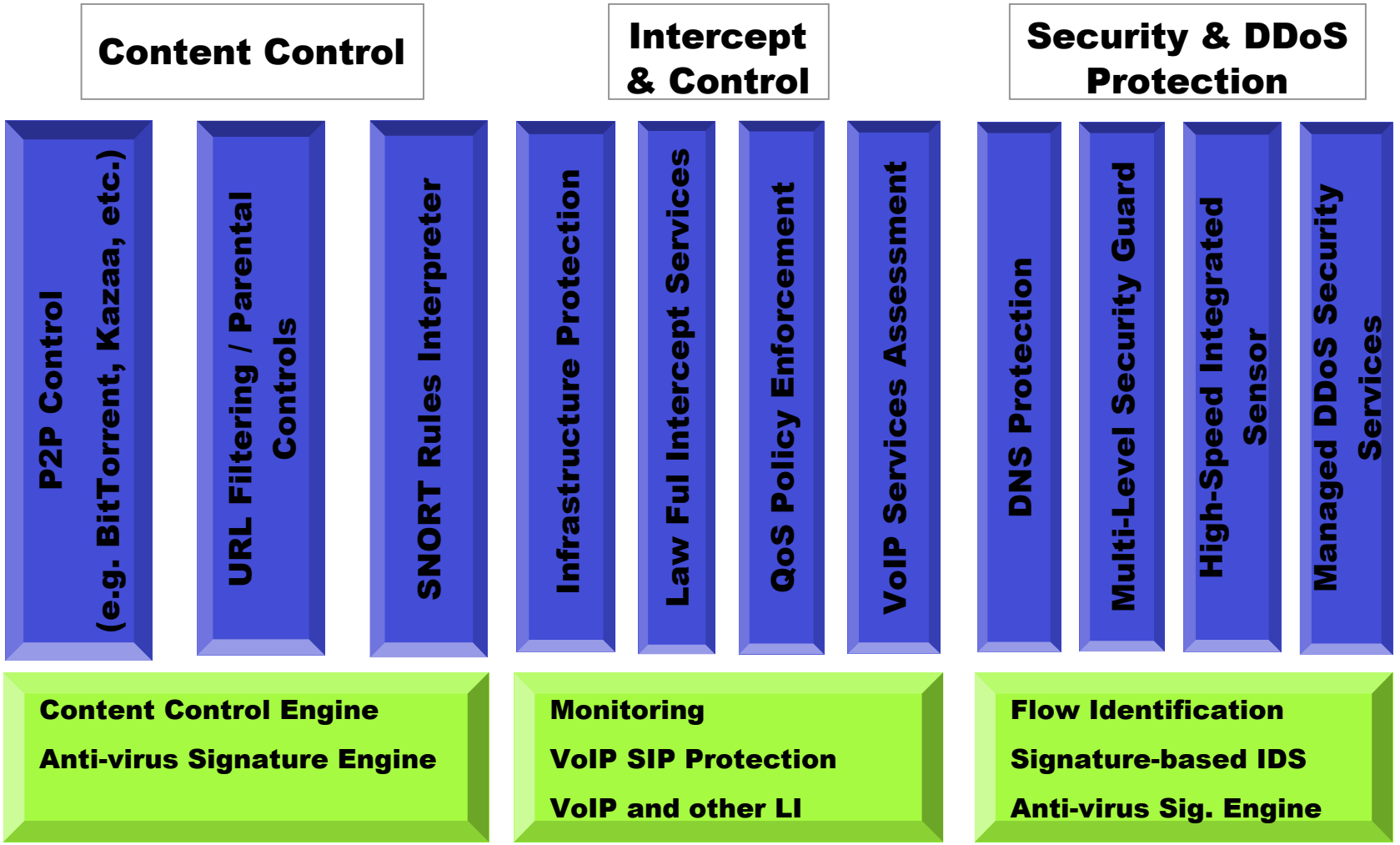
Market Conditions Summary:
Responding to End-User Expressed Issues

- Application layer attacks and service protocols demand deeper packet inspection & analysis & LI - Function
- General purpose computing solutions have hit a performance ceiling
- The fixed-function appliances model does not scale
- Network infrastructure equipment features are slow to evolve and limit customer's ability to build competitive advantages for their business



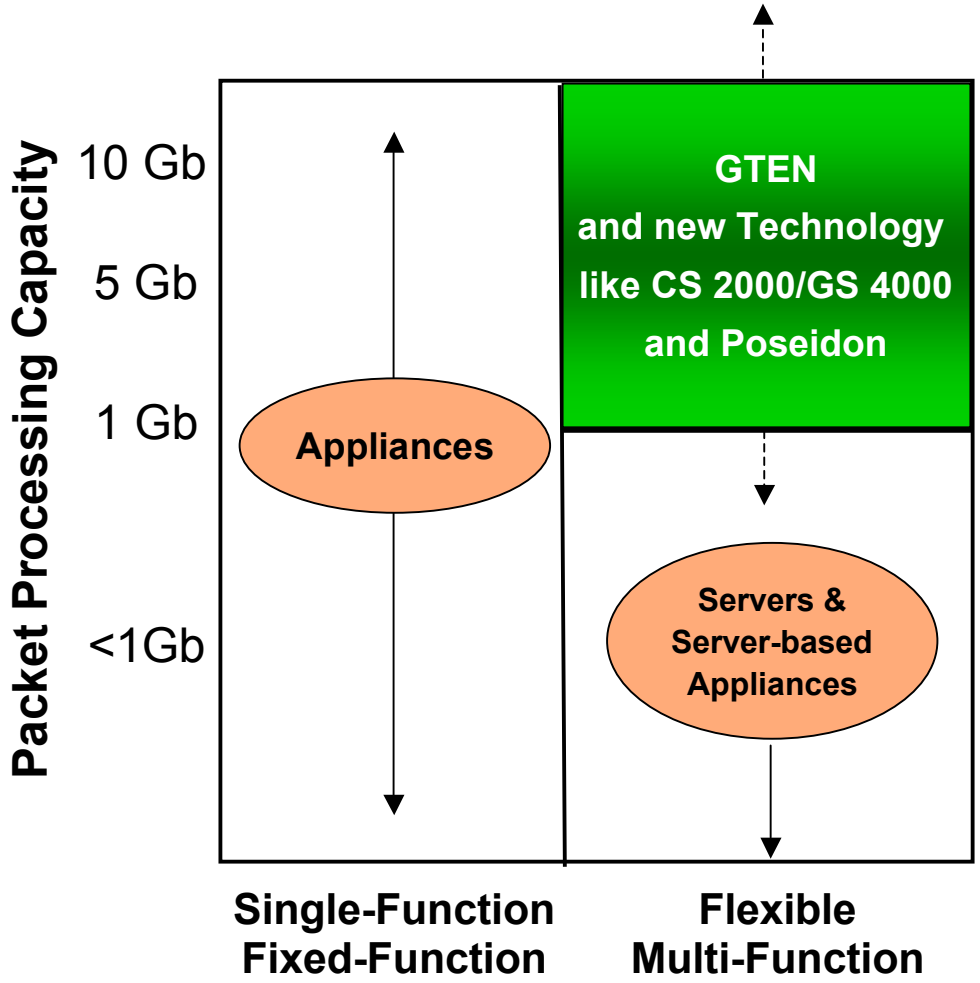
Partial SQL Slammer Worm Packet

IP Network - Solution Domains with LI as Part of the Job

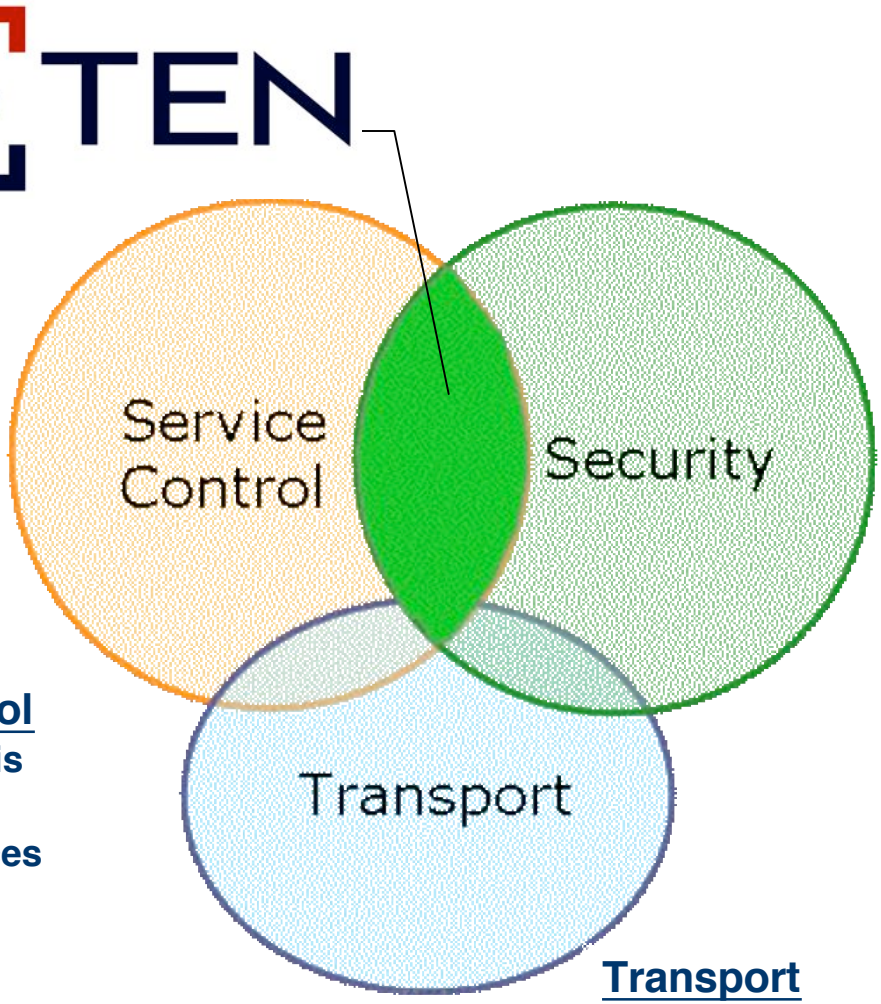


Market Conditions

An Underserved Market Segment Revealed



IP Services Control
GTEN taking care for old and new demands



Security
- State & flow tracking
- In-line filtering/blocking
- Signature detection
- Protocol anomaly detection
- Traffic anomaly
- Combined functions

Service Control
- L2-L7 analysis
- P2P Control
- Tiered Services

Transport
- Aggregation
- Routing
- Switching

Carrier/LEA Re-Thinking Appliance Strategies

Fixed-function Appliances

IP Services Delivery Requirements

- Interception as part of Service Delivery
- Peer-2-Peer Ctrl
- VoIP Control
- Content Filter
- Traffic Analysis
- Access Control
- Security Apps

Adaptable, Scalable Processing Resources

"Applying the development approach from IT software industry to telecoms"

The right LI – System partner helps Carrier to make money

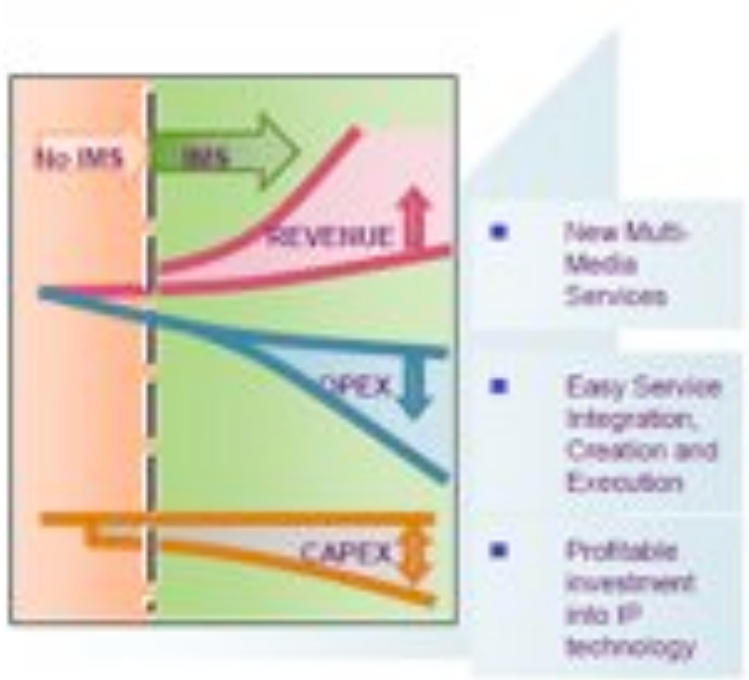
- LI – System not longer an „iland“ without Return on Investment

Value Proposition

Improve Average Revenue Per User
- Offer content based value added services
- Per user features, control and SLAs
- Security Services – DDoS, VoIP, AV
- VoIP/IMS Services – Peering, Personalized
- Traffic Management – QoS, Optimization

Reduced Capital Expenses
- Multiple Services Per Device
- Lower CAPEX Cost Per Megabit of Service
- Longer Deployment Life in Network
- Support More Users with Existing Network

Reduce Operational Expenses
- Manage peering & transit costs
- Reduce cost per service per megabit
- Reduce cost to deploy new services
- Improve efficiency of network resources



Market IMS Value Proposition

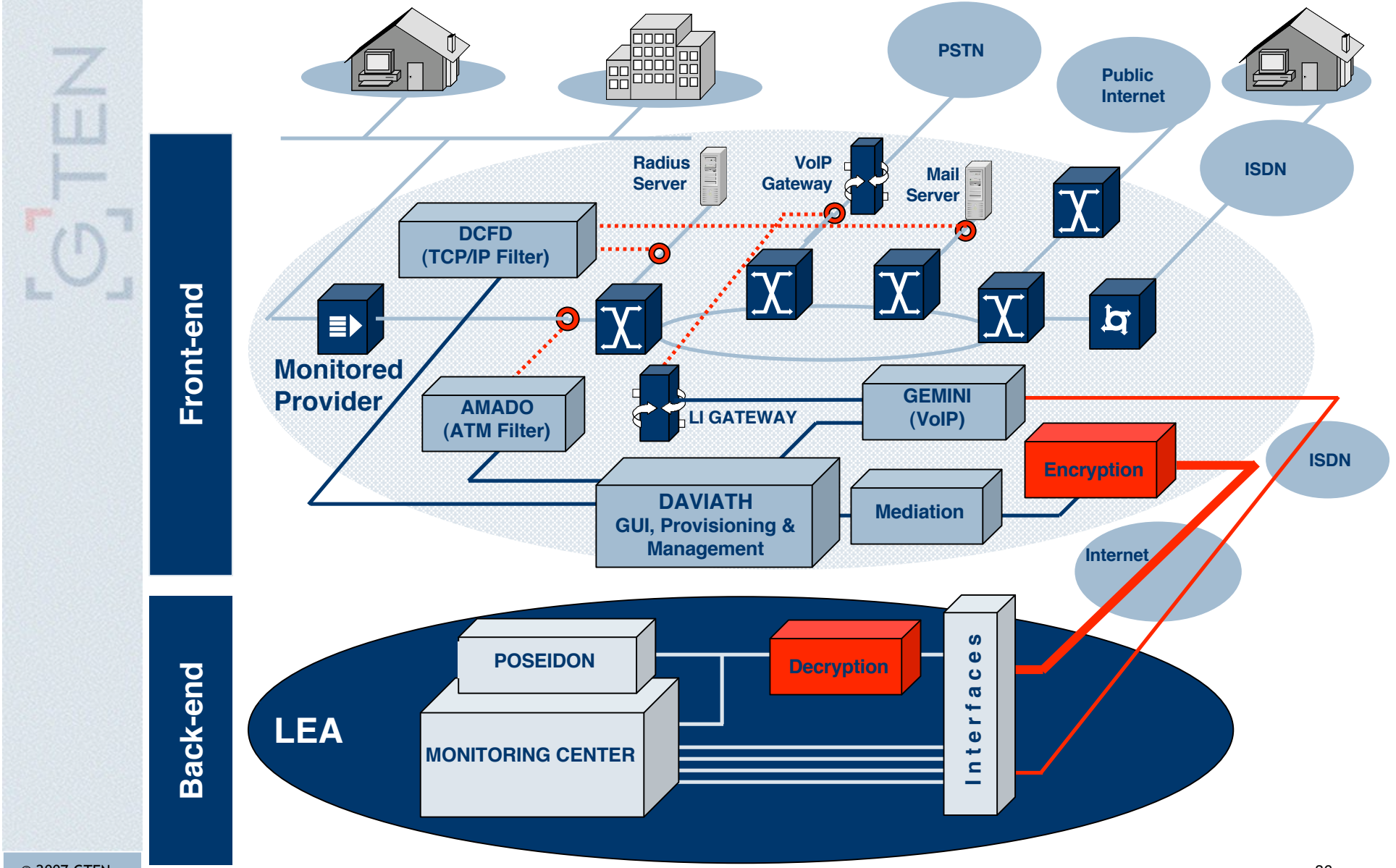
Managed Services Infrastructure: Value Added Services Scenario

Network Provider may offer Clean Bandwidth Service for Customer. Example:

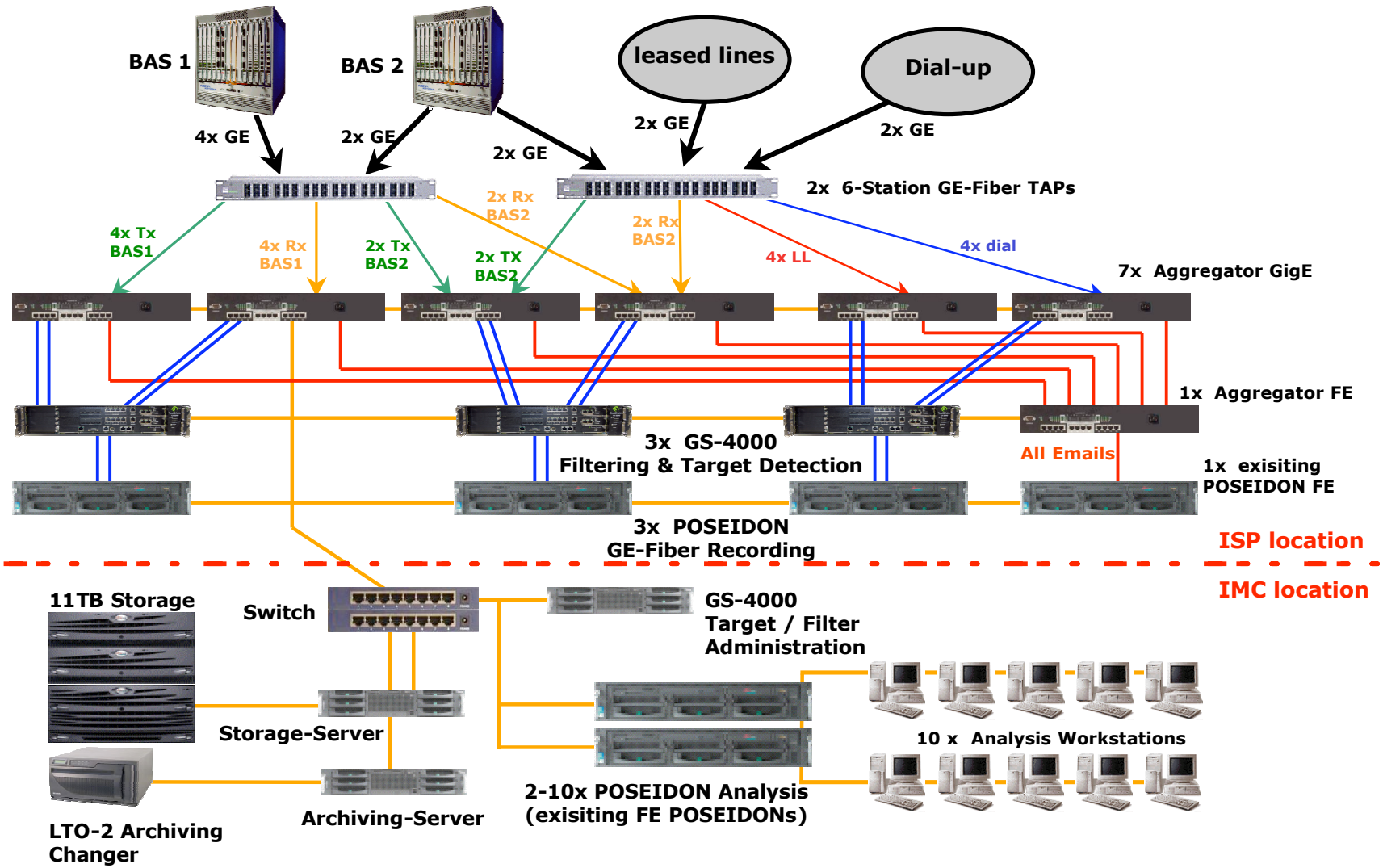
- Revenue opportunity directly linked with pace and number of services rolled-out
- Capex breakeven in under 12 months for each service
- Differentiate your business via:
  - Services mix
  - Ease of deployment

Penetration Rates	75%	75%	100%	100%	90%
Traffic Reporting	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Hardware Expense	$ 430,000	$ -	$ -	$ -	$ -
Support Expense	$ 64,500	$ 64,500	$ 64,500	$ 64,500	$ 64,500
Operational Expense	$ 361,440	$ 361,440	$ 361,440	$ 361,440	$ 361,440
Total Expense	$ 855,940	$ 425,940	$ 425,940	$ 425,940	$ 425,940
Revenue	$ 903,600	$ 903,600	$ 903,600	$ 903,600	$ 903,600
Net Income	$ 47,660	$ 477,660	$ 477,660	$ 477,660	$ 477,660
DDoS Mitigation	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Hardware Expense	$ 918,000	$ -	$ -	$ -	$ -
Support Expense	$ 91,800	$ 91,800	$ 91,800	$ 91,800	$ 91,800
Operational Expense	$ 1,084,320	$ 1,084,320	$ 1,084,320	$ 1,084,320	$ 1,084,320
Total Expense	$ 2,094,120	$ 1,176,120	$ 1,176,120	$ 1,176,120	$ 1,176,120
Revenue	$ 2,710,800	$ 2,710,800	$ 2,710,800	$ 2,710,800	$ 2,710,800
Net Income	$ 616,680	$ 1,534,680	$ 1,534,680	$ 1,534,680	$ 1,534,680
P2P Traffic Control	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Hardware Expense	$ -	$ 760,000	$ -	$ -	$ -
Support Expense	$ -	$ 38,000	$ 38,000	$ 38,000	$ 38,000
Operational Expense	$ -	$ 722,880	$ 722,880	$ 722,880	$ 722,880
Total Expense	$ -	$ 1,520,880	$ 760,880	$ 760,880	$ 760,880
Revenue	$ -	$ 2,710,800	$ 2,710,800	$ 2,710,800	$ 2,710,800
Net Income	$ -	$ 1,189,920	$ 1,949,920	$ 1,949,920	$ 1,949,920
VoIP Traffic Control	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Hardware Expense	$ -	$ -	$ 380,000	$ -	$ -
Support Expense	$ -	$ -	$ 38,000	$ 38,000	$ 38,000
Operational Expense	$ -	$ -	$ 481,920	$ 481,920	$ 481,920
Total Expense	$ -	$ -	$ 899,920	$ 519,920	$ 519,920
Revenue	$ -	$ -	$ 1,807,200	$ 1,807,200	$ 1,807,200
Net Income	$ -	$ -	$ 907,280	$ 1,287,280	$ 1,287,280
	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Net Income Projections	**$ 664,340**	**$ 3,202,260**	**$ 4,869,540**	**$ 5,249,540**	**$ 5,249,540**

LI - Product Environment from yesterday



LI - Monitoring of a complete Country based on modern IP – Network Requirements

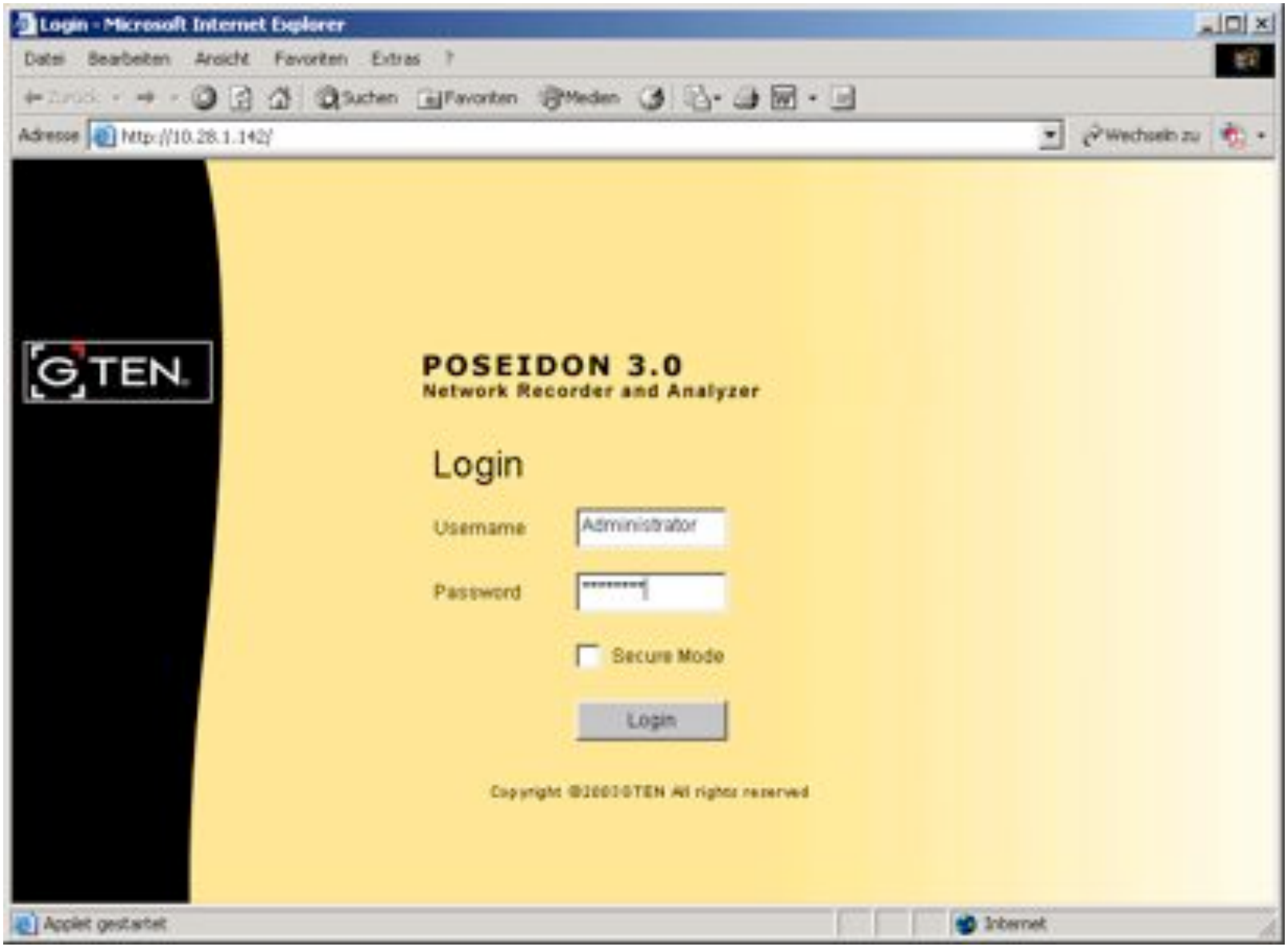


Part of the Solution: Reconstruction of Intercepted Data
(only available for LEA,s)

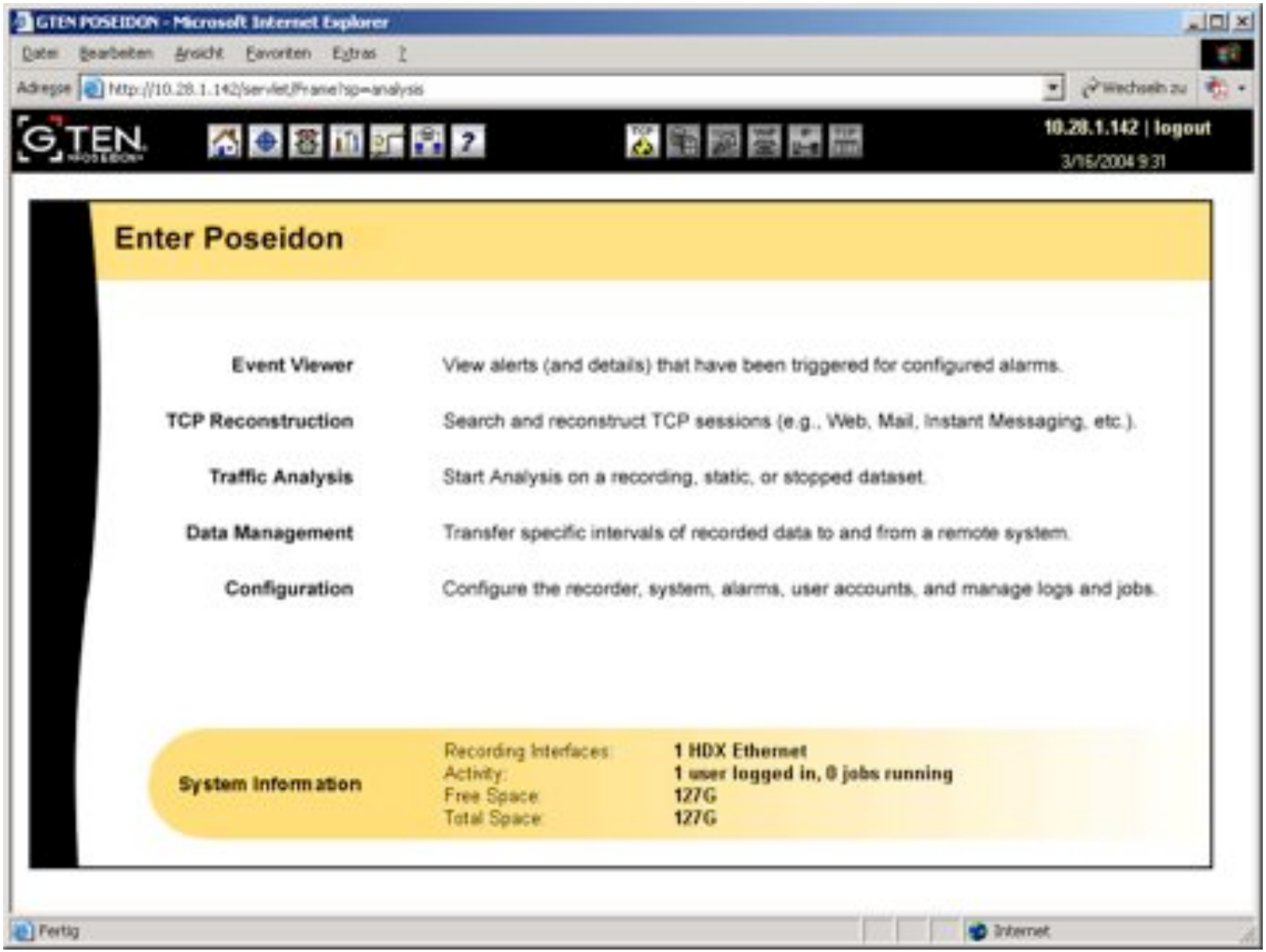
- **Philosophy:**

- **Transport of data only when necessary**

Login Screen



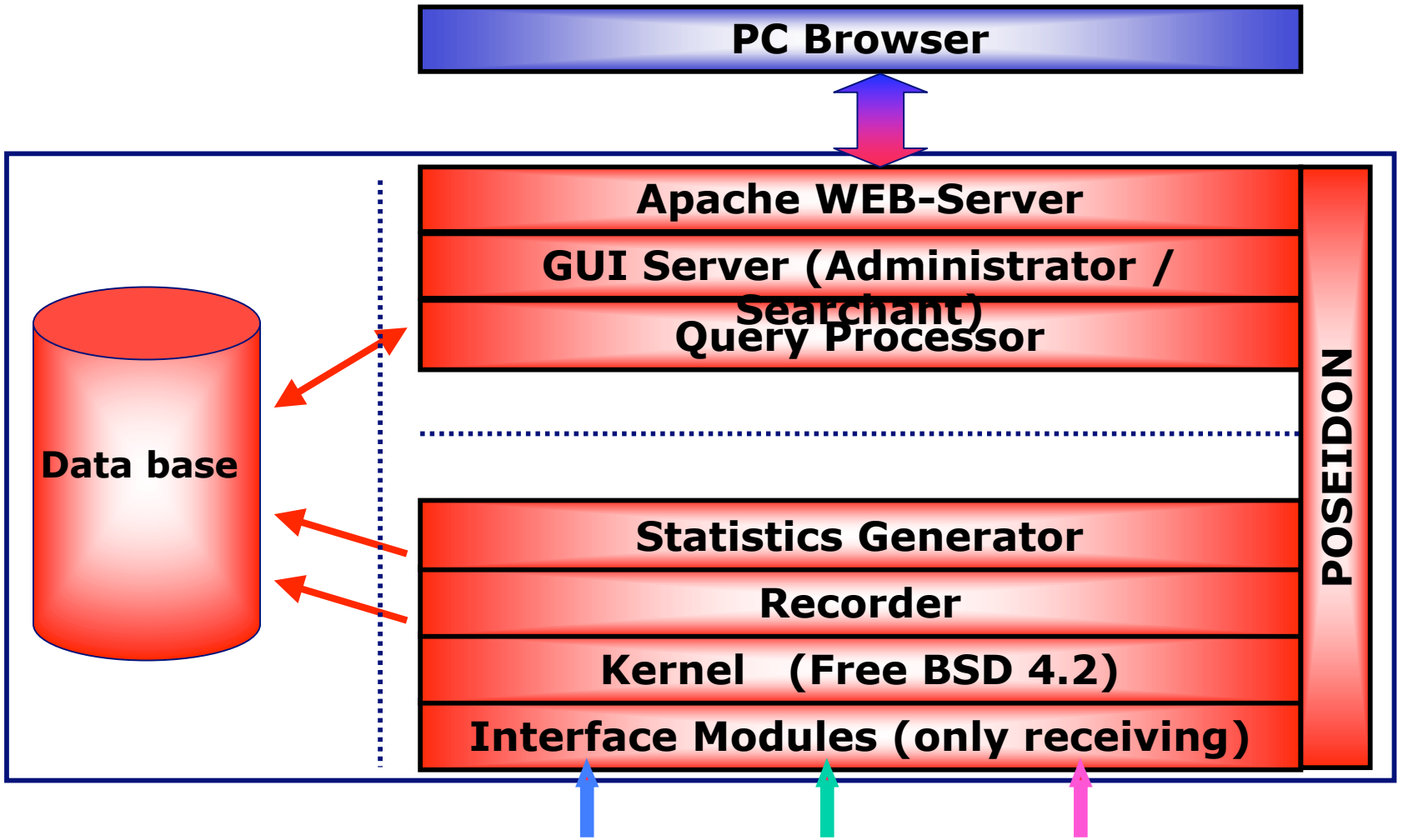
Start page - Administrator



POSEIDON Applications

- Non-intrusive network security monitoring system
  - ♣ With alerting functions on user-defined events
  - ♣ With WEB-GUI (Administrator and User View)
- Collects, records and analyses IP-traffic transported through different networks like
  - ♣ Ethernet (as well Fast and Gigabit Ethernet)
  - ♣ ATM
  - ♣ POS
  - ♣ E1/T1, E3/T3
- Collects, records and analyzes **VoIP** calls

POSEIDON Architecture



Reconstruction of IP-data

- **Protocols**

  Frame Relay, HDLC, Cisco HDLC, PPP, BayPPP, MLPPP, VLAN (ISL & IEEE 802.1q), Ethernet (IEEE 802.3), IP, ATM & IP, PoS & IP, WCP and STAC Compression (MPLS & IPv6 optional)

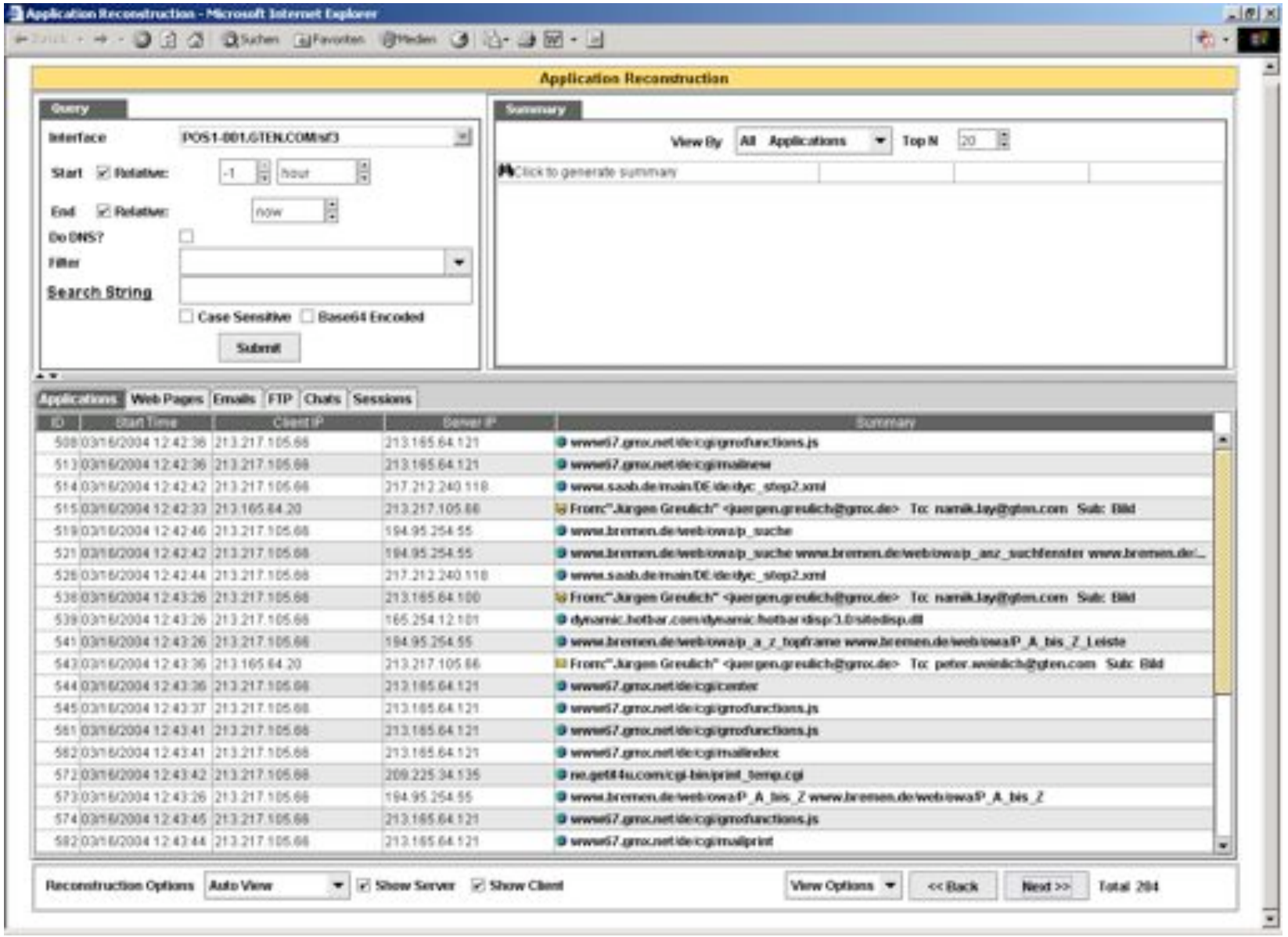
- **Complete Analysis on all protocol layers**

  - **PPP** (PAP, IPCP, LCP)
  - **Ethernet**
    - IP
    - UDP
    - ICMP
    - TCP
      - **FTP**
      - **HTTP**
      - **SMTP**
      - **POP3**
      - **IMAP4**
      - **TELNET**
      - **CHAT / IRC**
      - **VoIP (optional)**

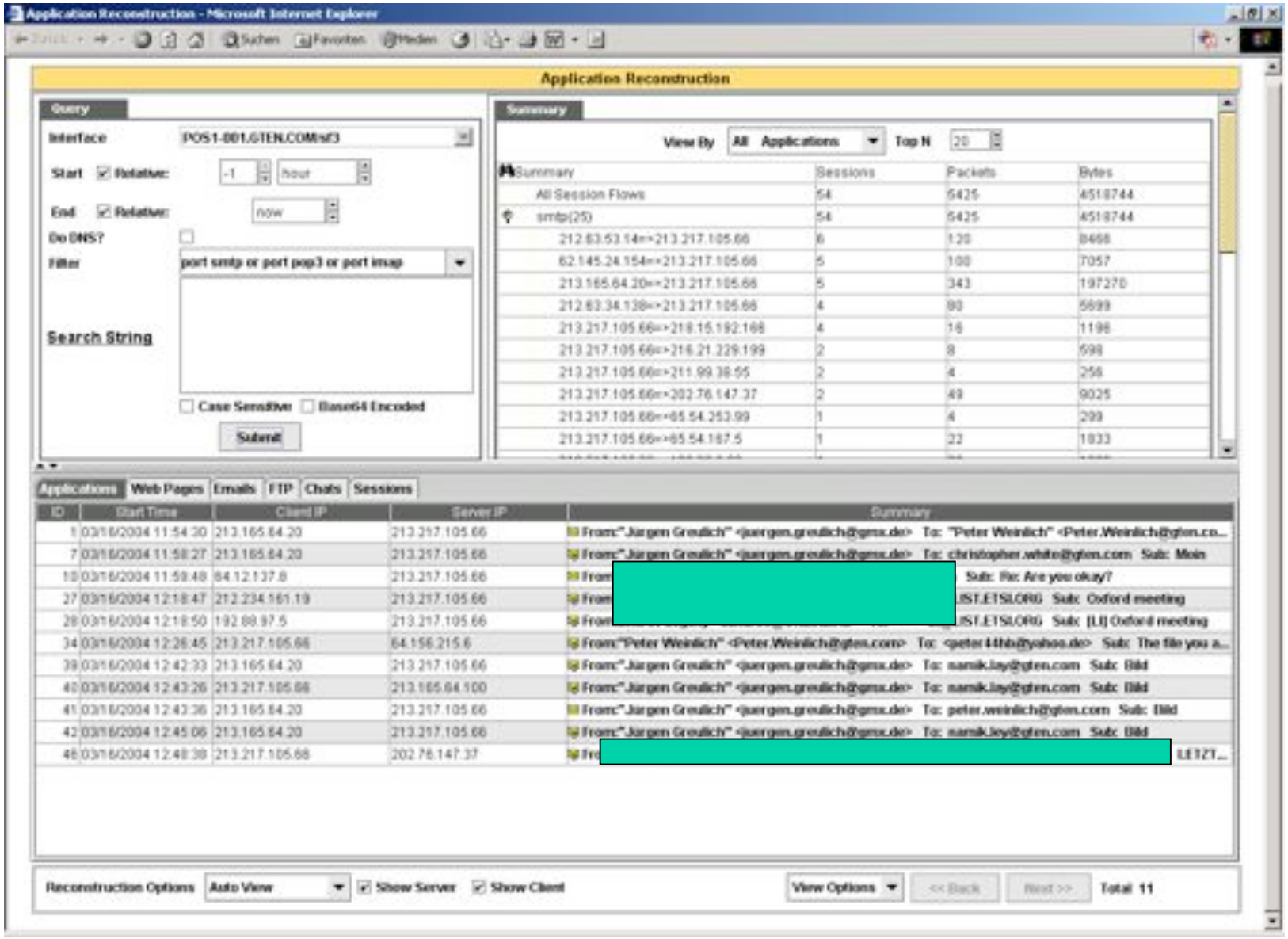
- **Email reconstruction incl. all attachments**

- **VoIP reconstruction** [H.323v4 – H.225, H.245,Q.931, RTP, RTCP, SCCP, SIP, MGCP(IPDC, SGCP)]

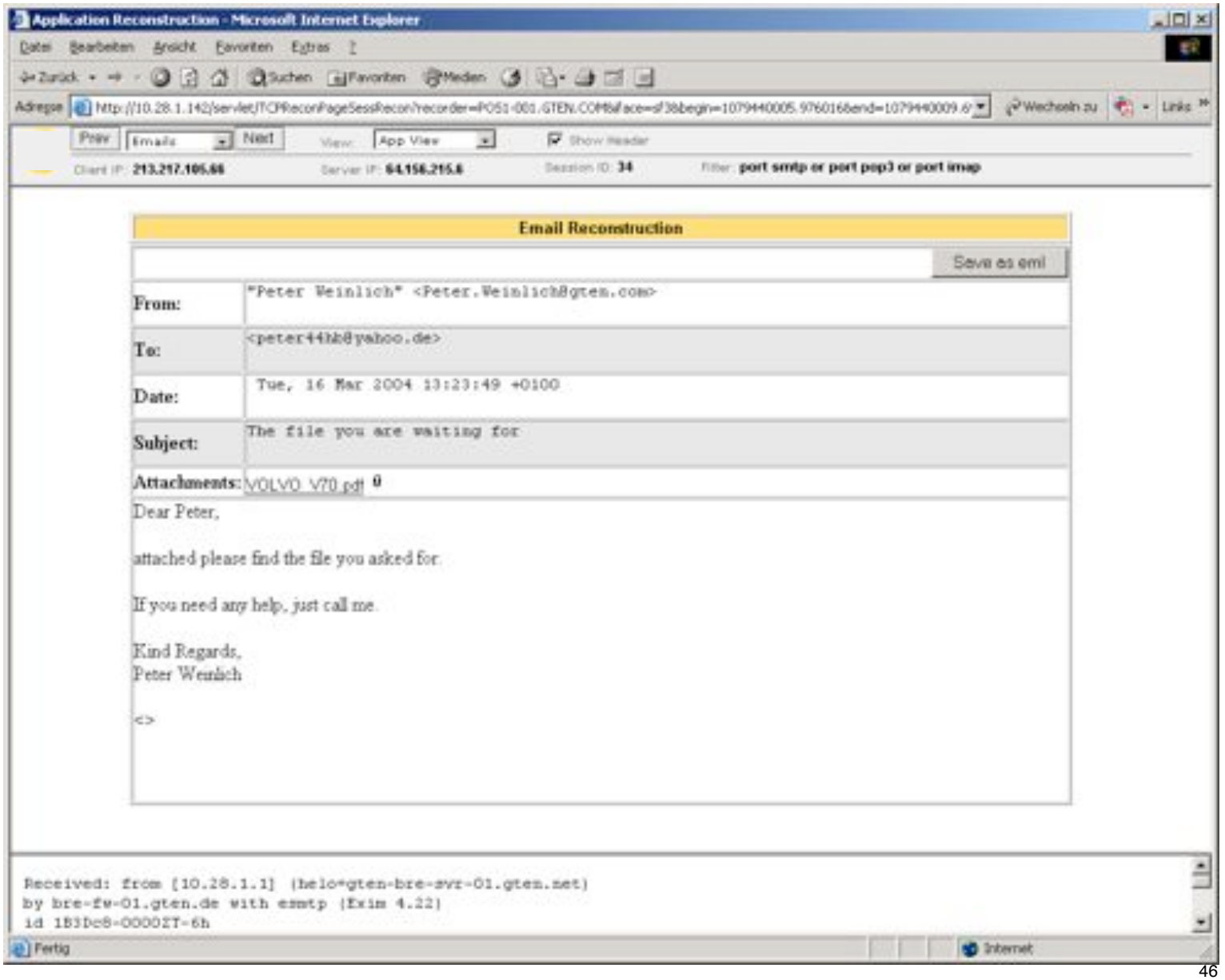
List of all sessions – Applications



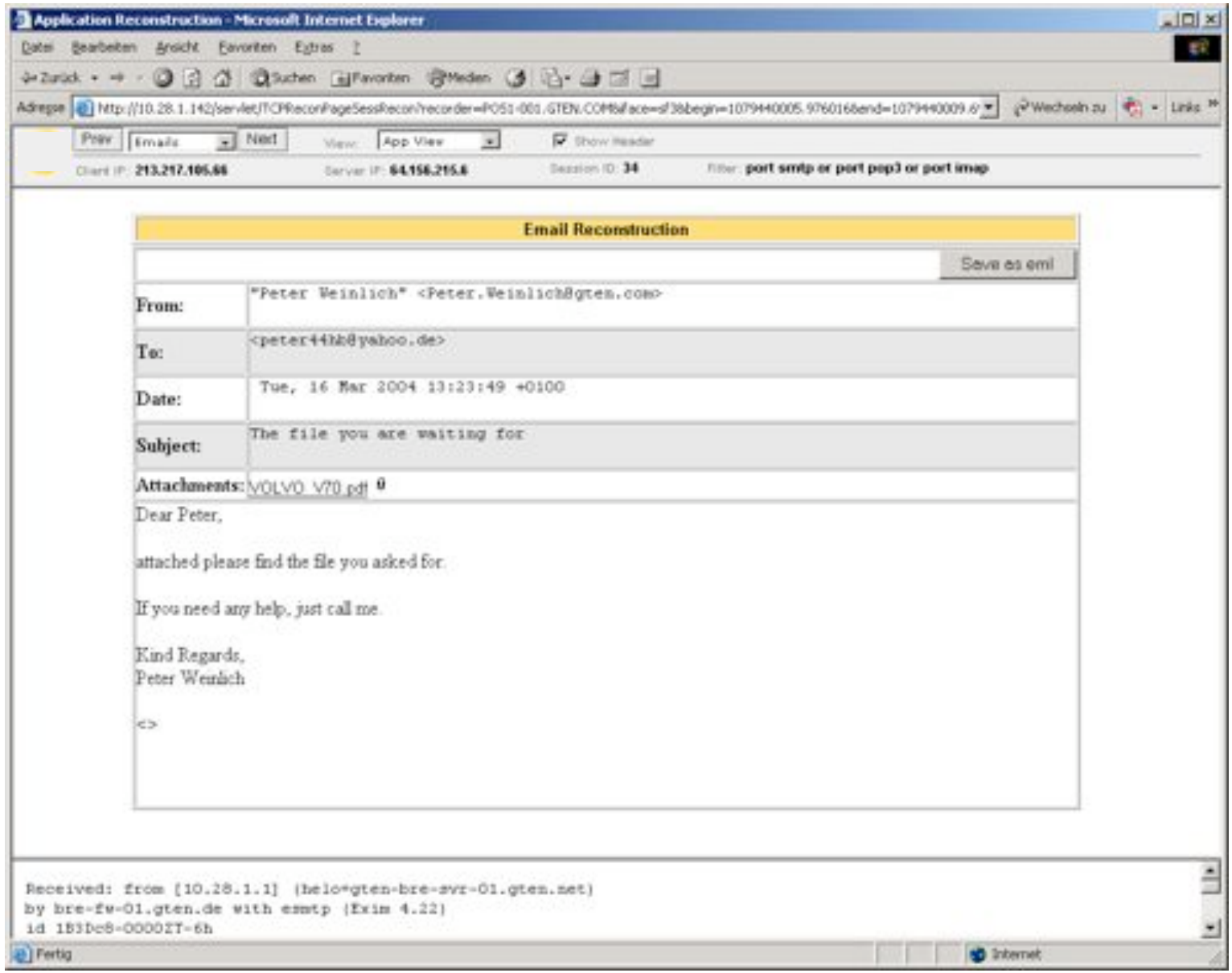
List of emails – Application view



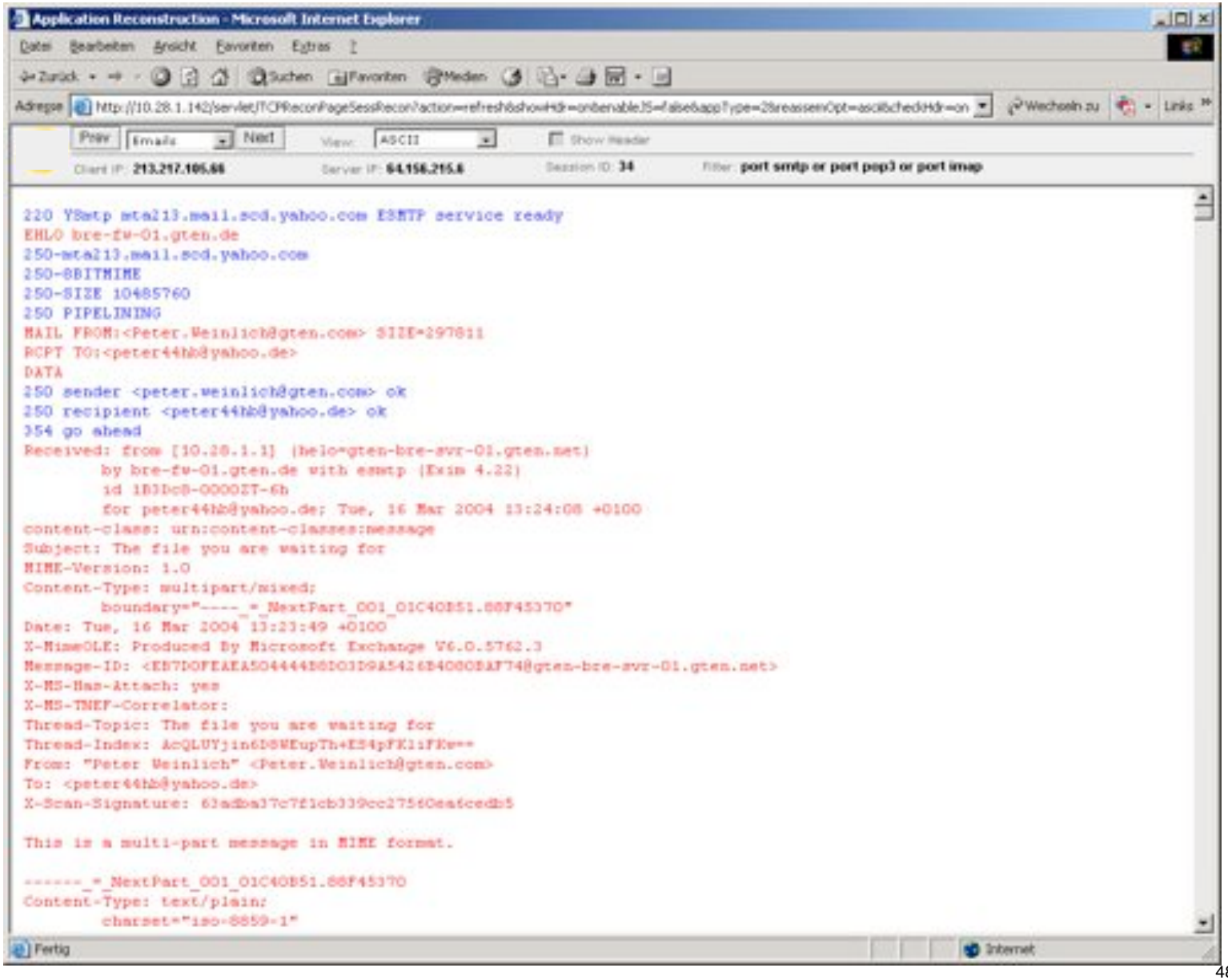
Reconstructed email – Application



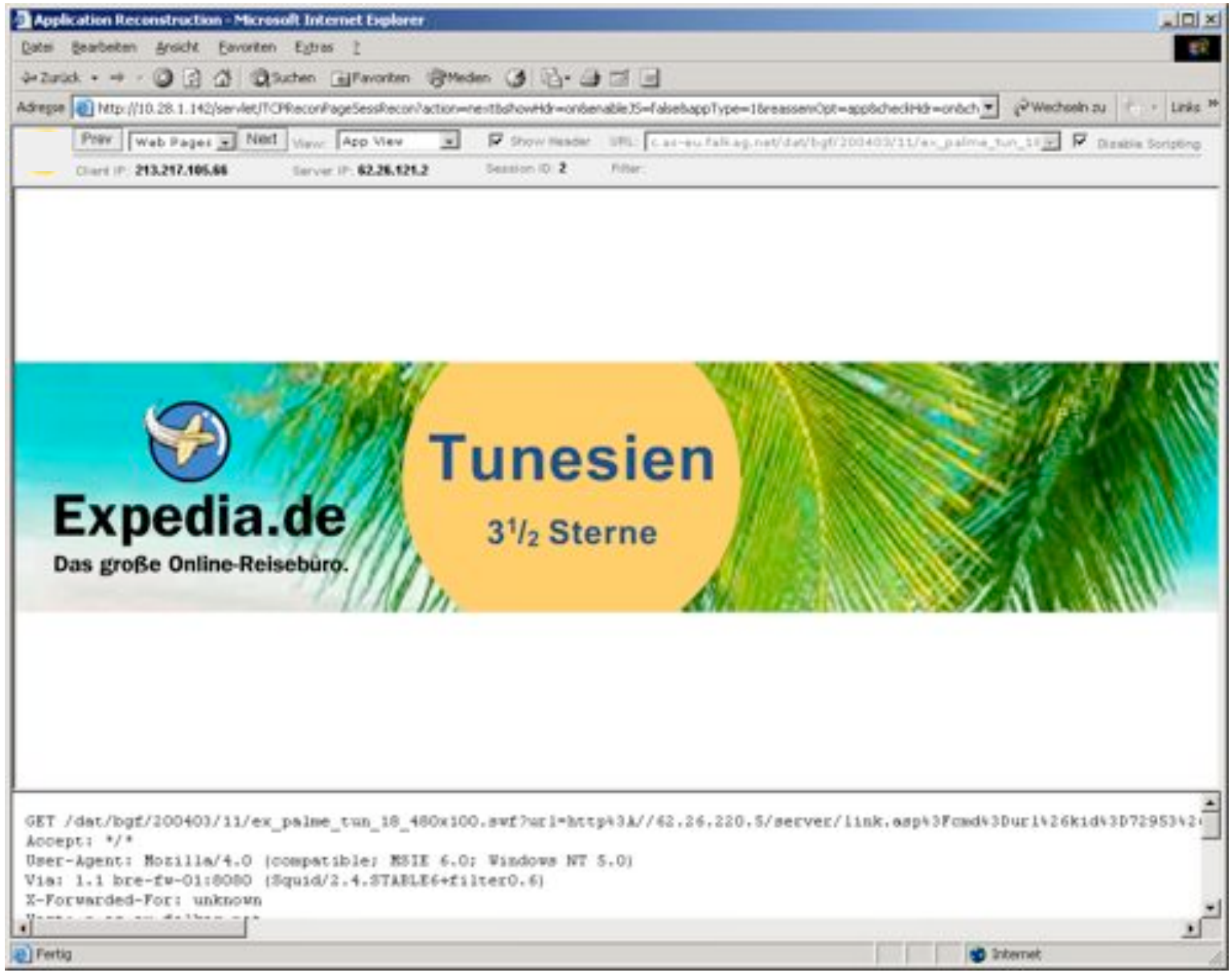
Reconstructed email – Application



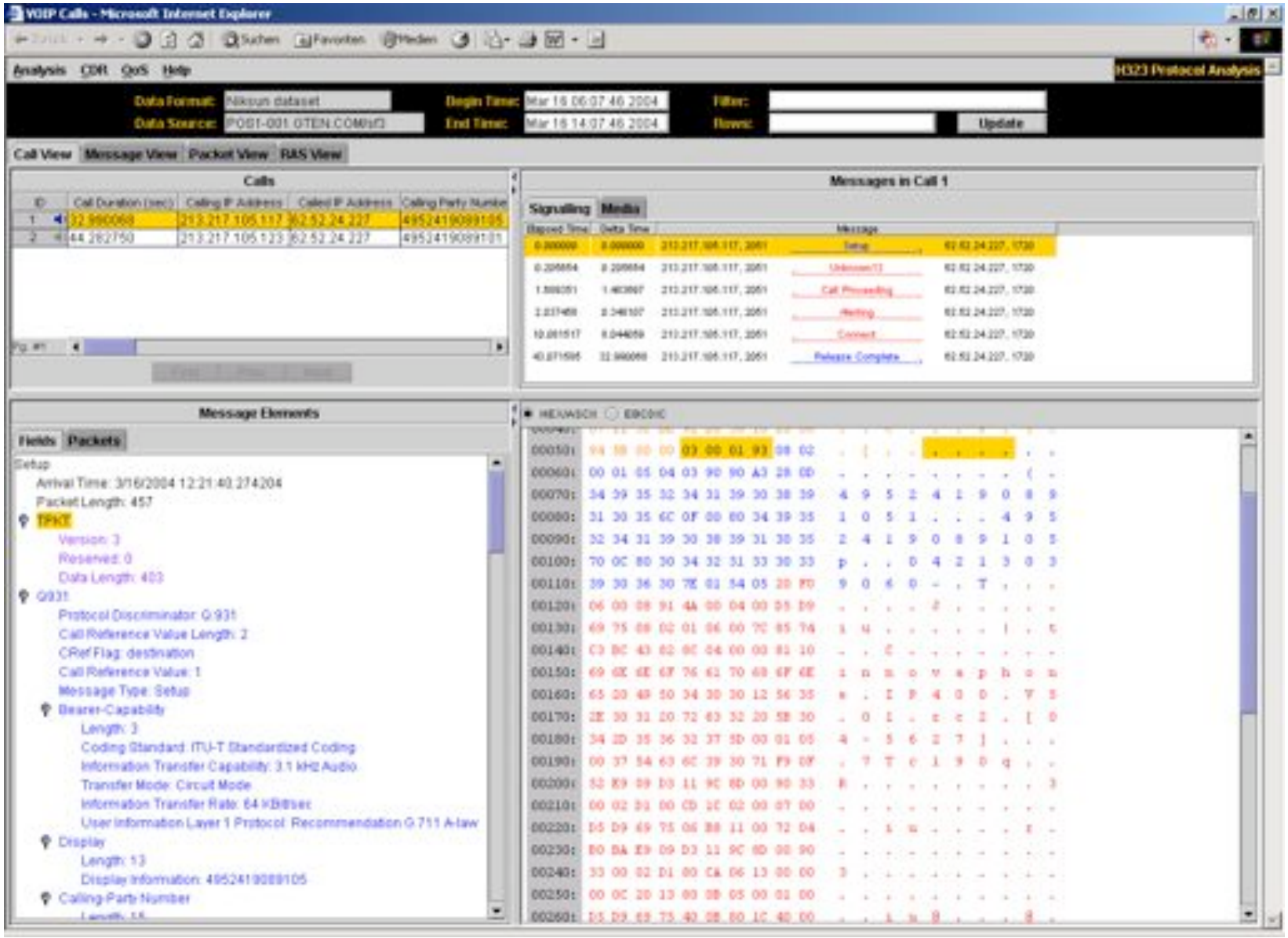
Reconstructed email – ASCII



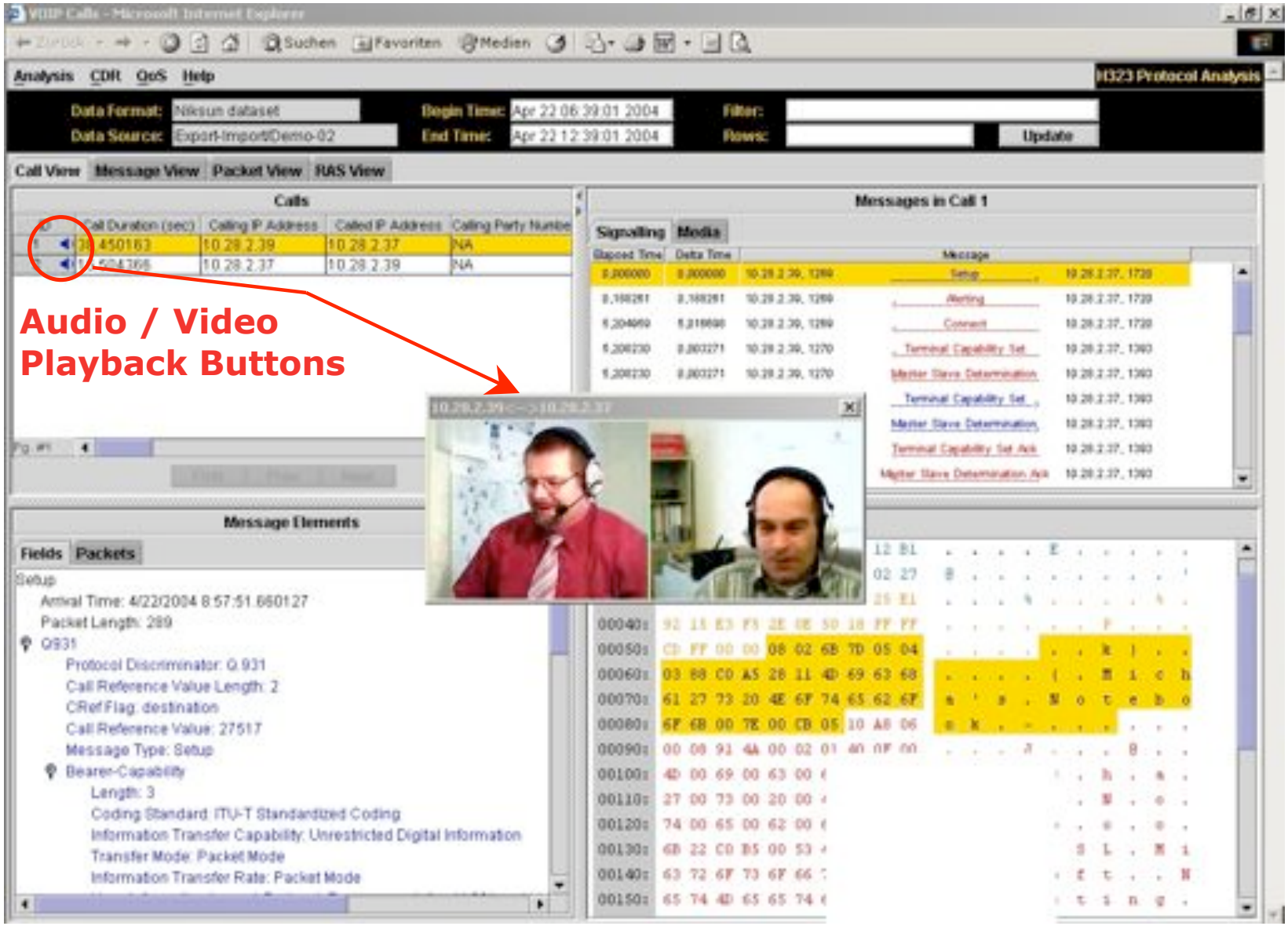
Reconstructed WEB-site – Application



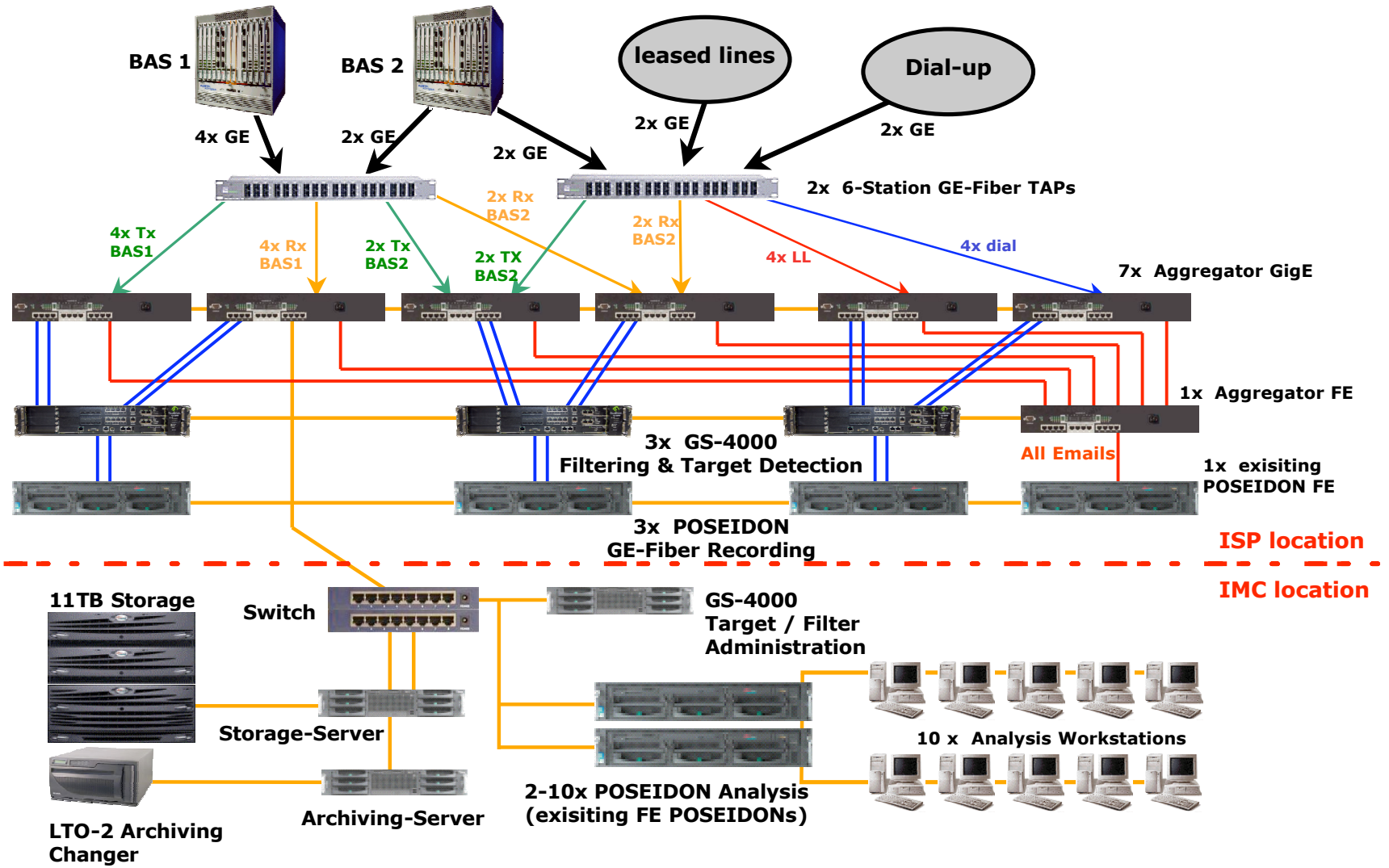
Voice over IP session list



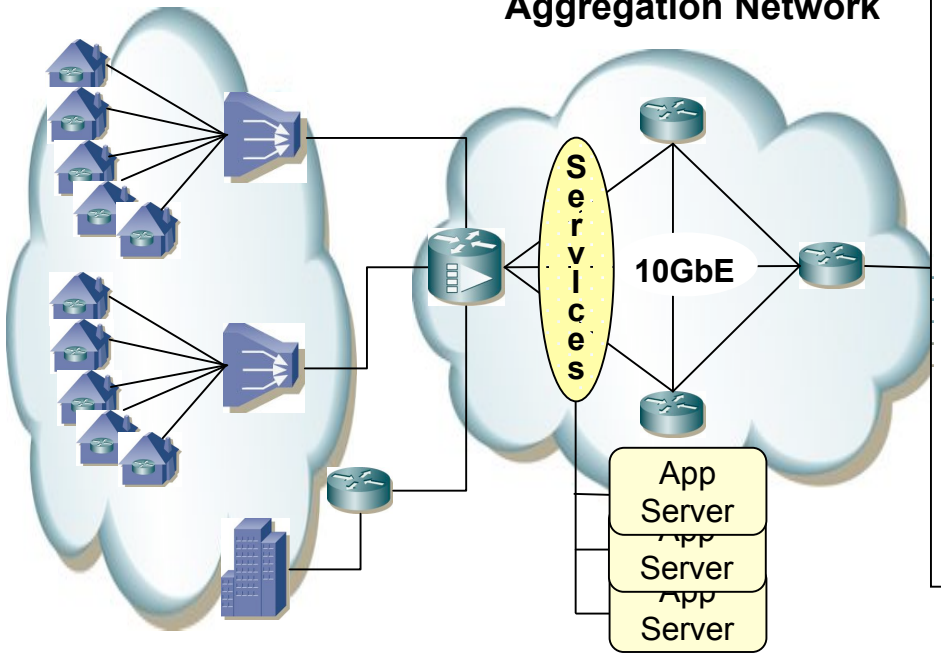
VoIP Playback of Voice & Video



LI - Monitoring of a complete Country Based on modern IP – Network Requirements



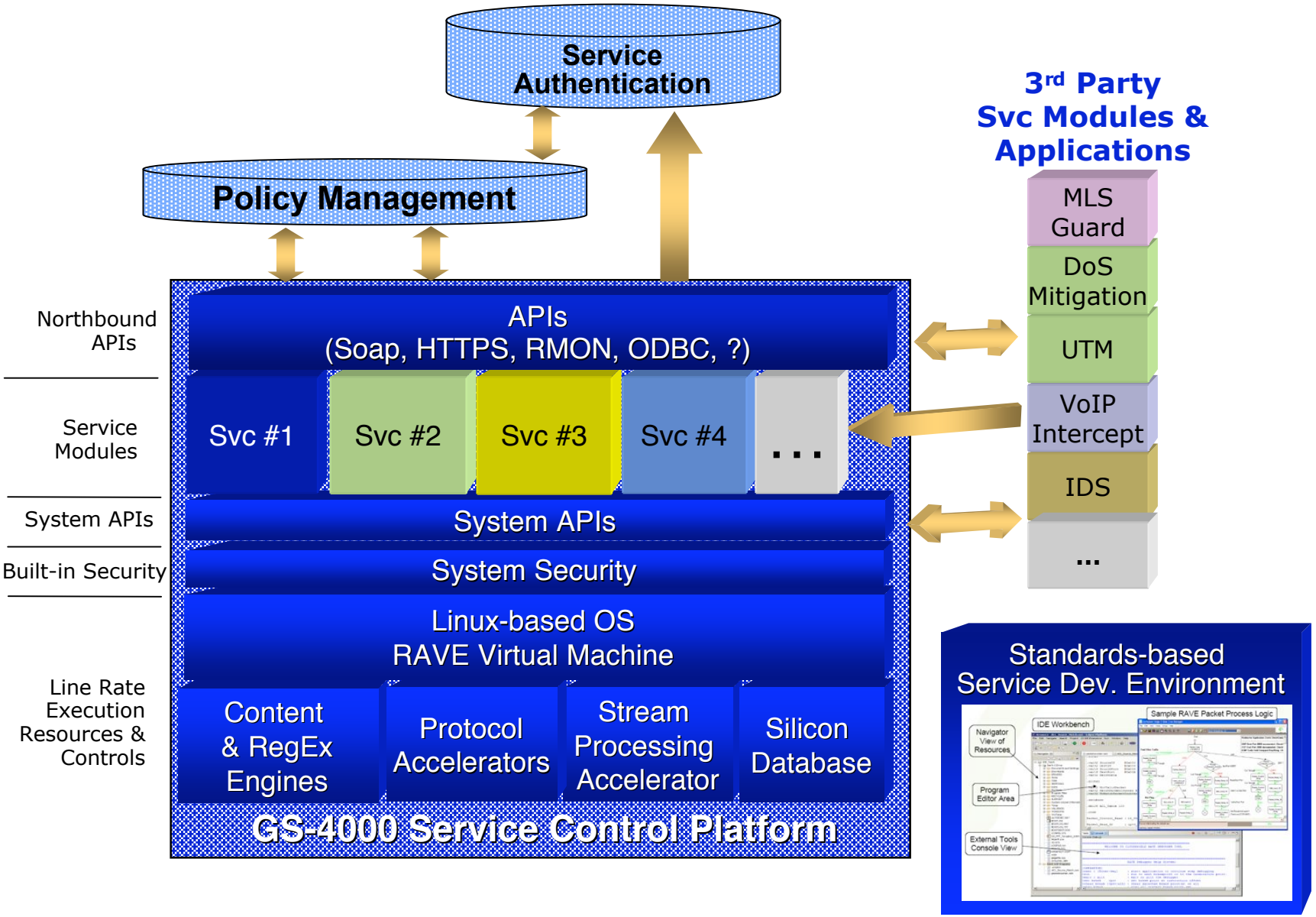
New Services Offerings Requiring up to 10GbE Deployment in Aggregation Points. LI can be build inside same "Service Points"



- 10GbE rolling out in the aggregation network
- Optimal location for Service Control & Policy Enforcement + Interception
- Requiring 10Gbps of:
  - ♣ Inspection;
  - ♣ Classification; and
  - ♣ Control

CIR is forecasting the market for 10-Gbps ports on telecommunications and data communications equipment will grow from 221,000 ports in 2006 to 1.2 million by 2010; *Light Reading, Nov 2005.*

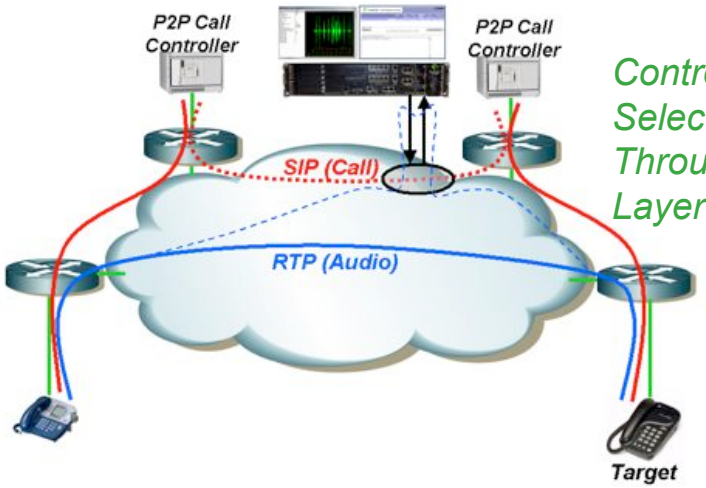
Functional Architecture of modern Aggregation Units



- A Few Application Example out of many possible ones for the new -All in One Plattform-:

Traffic Mirroring / Intercept

Selective Interception, Replication, Session Hijacking



Controlled IP Network Selective Monitoring Through Application Layer Route Manipulation

GS-4000 Traffic Monitoring:

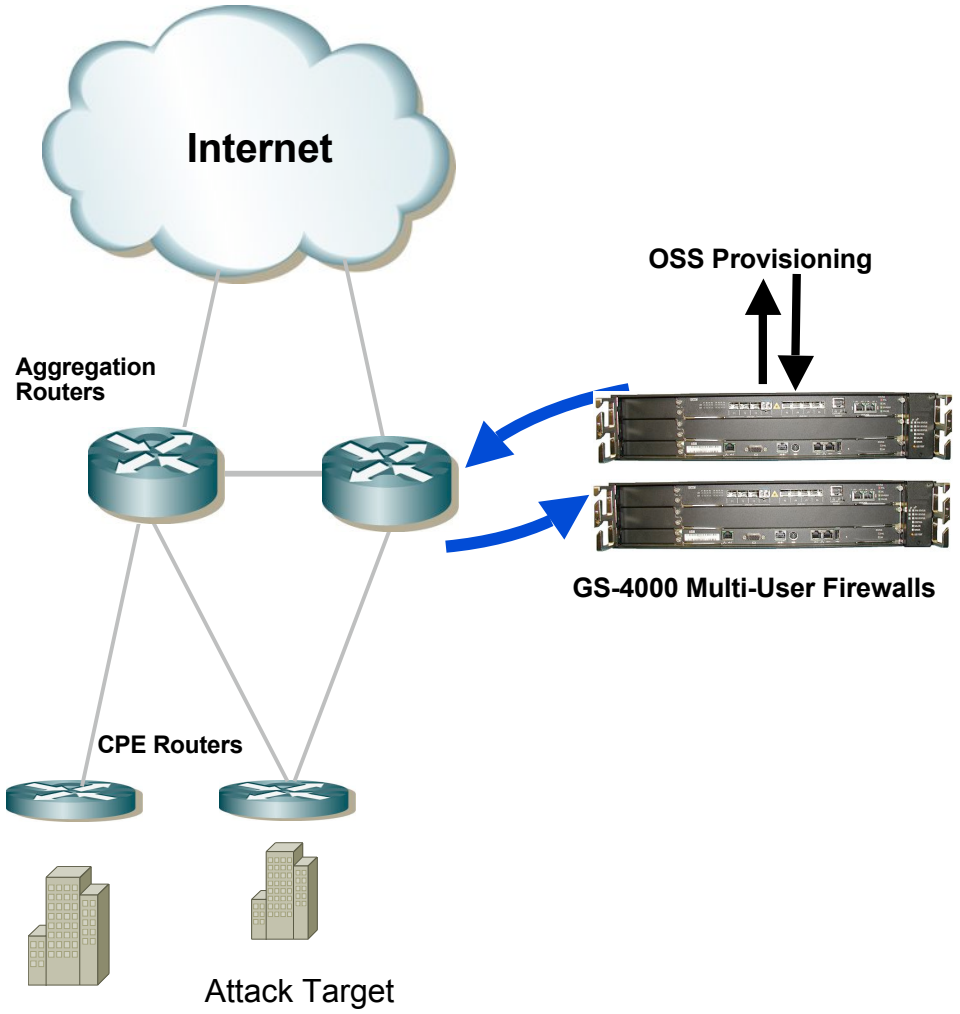
- Multiple Deployment Methods
  - Passive Tap Deployment with Intercept & Arrival Rate
  - Span Port with Inject Path for Session Controls
  - Active In-line for Selective Session Controls
  - HW Raw, MAC or GRE Distribution
  - SW Custom Delivery (iSCSI, FC/IP)
- Multiple Targeting Mechanisms
  - Flow Targeting (Webmail Sessions)
  - Content (Any Packets w/BOMB)
  - Content Flow (Bad Conversations)
  - Non-Port Protocol (SIP, Skype)
  - Circuit / 5-Tuple (MPLS, VLAN, etc.)
- Algorithm Based Reporting
  - Packet Accurate Netflow, IPFix
  - Host Fingerprinting
  - Custom Traffic Profiling

Traditional IP Traffic Mirroring and Monitoring

GTEN has significant Government & Carrier Experience with numerous GTEN & Partner Solutions in "Traffic Mirroring"

Solution Example: Managed Multi-User Firewalls

Carrier Network Deployment & Provisioning



Service Provider Firewall Hallmarks:

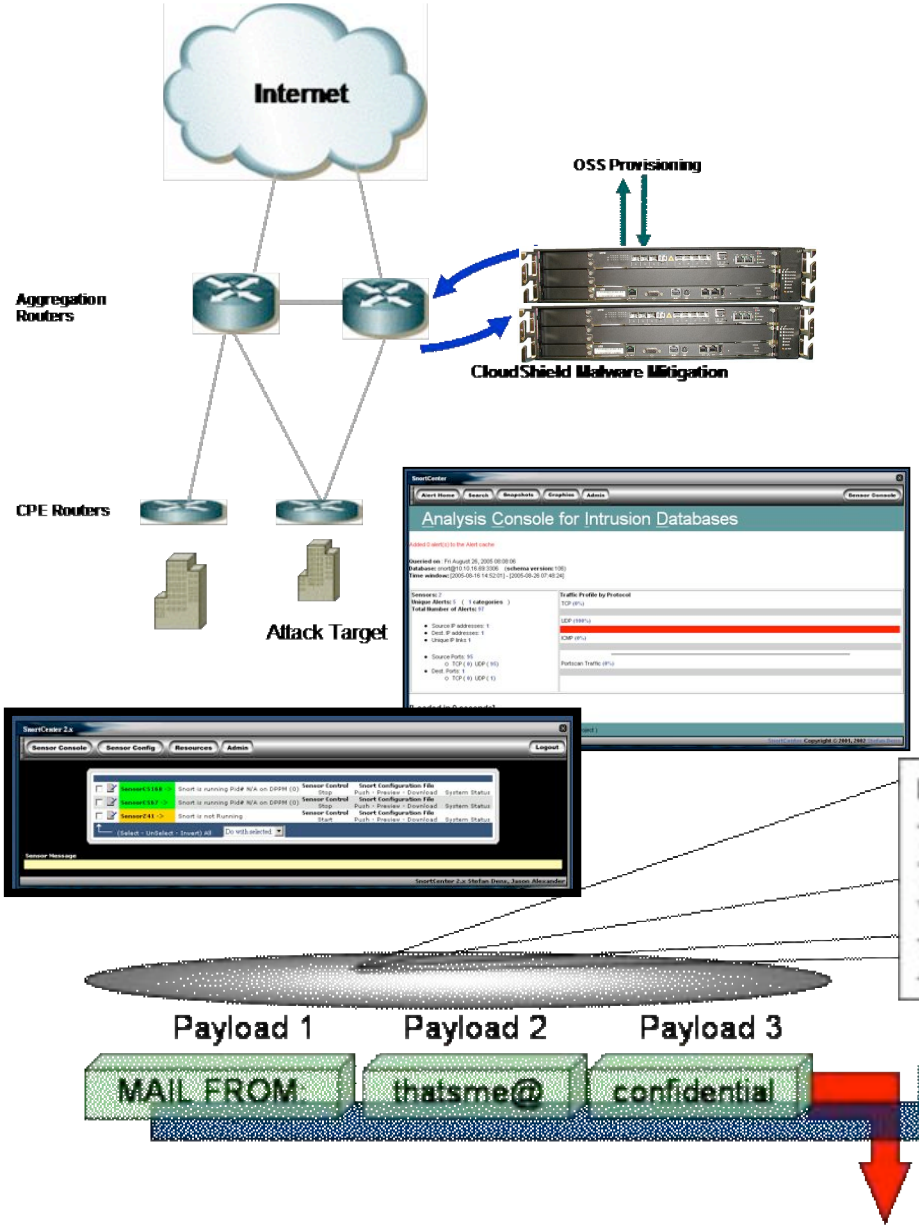
- Multiple Independent Rule Sets
  - Per Subscriber Rule Sets
  - Mobility (Rule Sets Move As Needed)
  - Secure Separation of Rule Space
- Service Provider Subscriber Definition
  - IP Blocks
  - MPLS
  - VLAN (Virtual WAN/LAN Interfaces)
- Scalability & Capacity Planning
  - Multi-Gigabit Performance
  - Customer Flow Capacity Control
  - Customer Policy Capacity Controls
  - No Flow/Policy Degradation

Multi-User Firewalls Are Different:

- 7-Tuple Customer Policy Definitions
  - SIP, DIP, SP, DP, Proto, VLAN, MPLS
- Policies Provisioned Per Customer
- OSS Policy Provisioning (SOAP)
- Dynamic Policy Migration
- Dynamic Customer Detection (DHCP)
- Transparent & Transparent NAT/PAT
- Asymmetric State Synchronization
- IPv6, Encapsulation, Multi-L2/2.5

Solution Example: Malware Mitigation

In the network content inspection & control

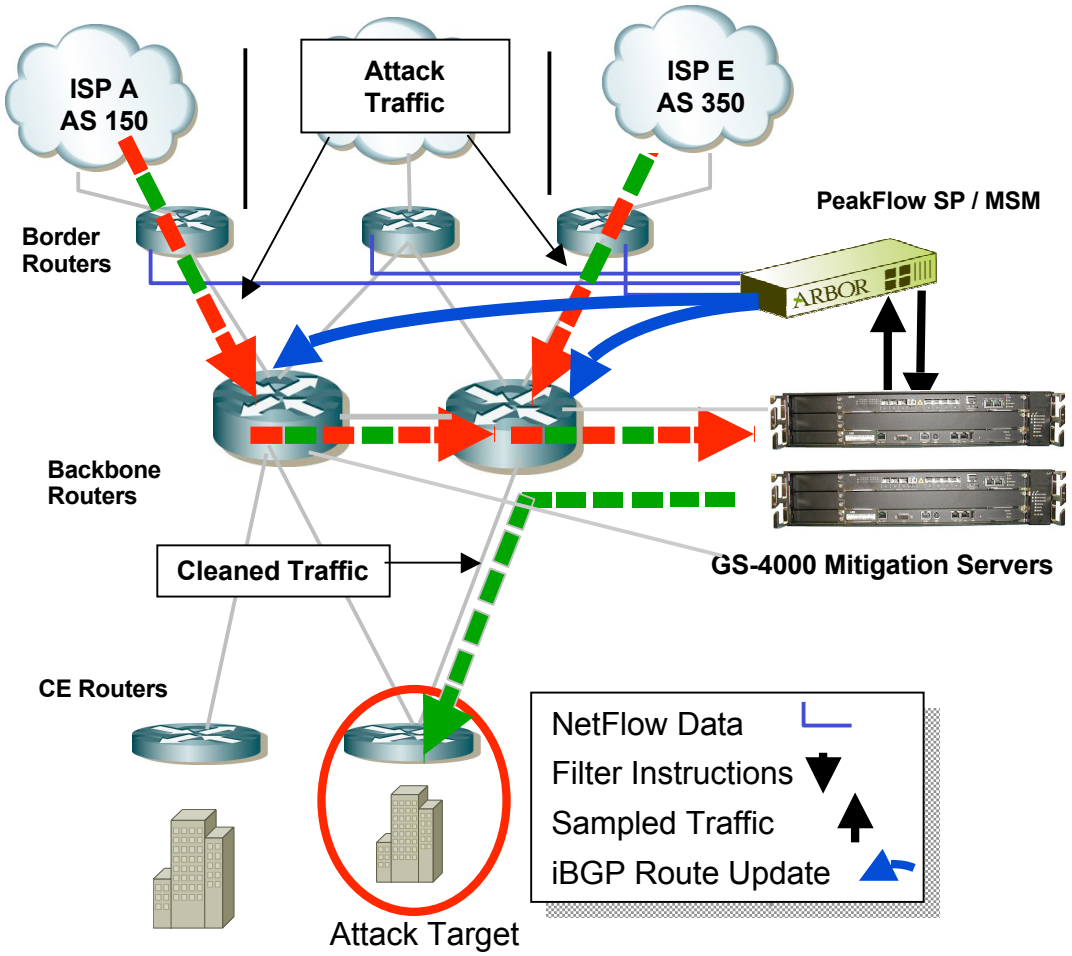


Content Control Characteristics:

- Malware Mitigation
  - Web Anti-Virus (Kaspersky, etc.)
  - Web Protection and IPS
  - Adware, Spyware, Bots
  - Email, Webmail, FTP
- Service Provider Characteristics
  - Stealth Network Deployment
  - Fault Tolerant Deployments
  - Multiple Gigabit, Any Rule Quantity
  - Hitless Active Rule Provisioning
- Other GS-4000 Differentiators
  - Stream Re-Assembly with Asymmetric Route Recovery
  - Selective Subscriber Deployment

Solution Example: DDoS Mitigation

Multi-Function, Multi-Customer DDoS Mitigation Solution



Market Leading Mitigation:

- Supports Multiple Analysis Vendors
  - Arbor Networks plus Open API
- Scalable Deployments
  - BGP Peered & Clusters
  - Multiple Gigabits Per Blade
  - Shared Mitigator Deployment
- Flexibility
  - Extensible Mitigation Techniques
  - Netflow Generation
  - Content Based Scrubbing
  - Additional Services Capabilities

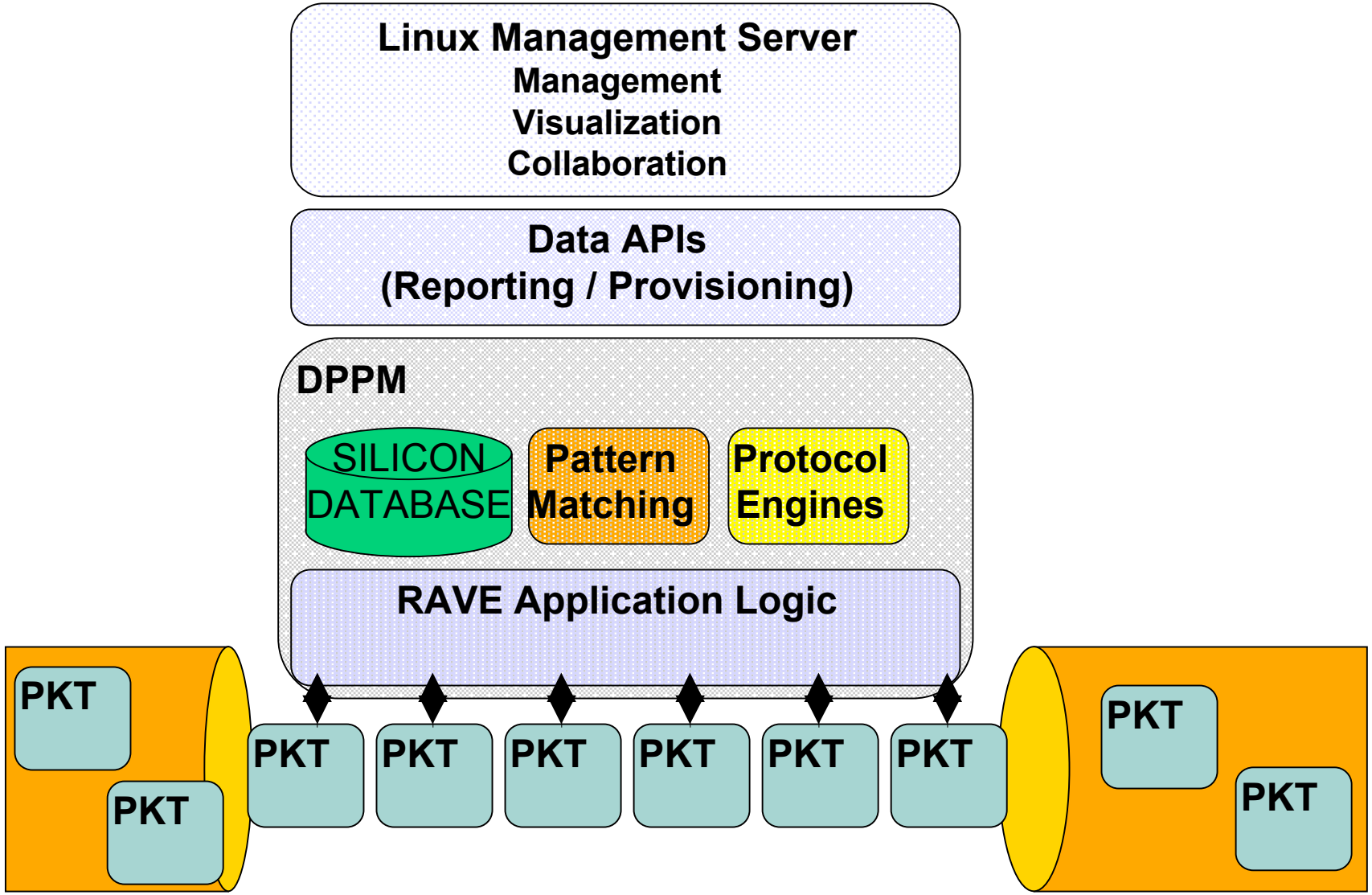
Broadest Built-in Attack Filters:

- SYN & ACK Floods ***(Fastest Proxies)***
- Invalid TCP (SYN-FIN, FIN, SYN-RST and TCP-Null)
- DNS Floods ***(Patented)***
- Fragmentations (UDP, TCP, ICMP)
- ICMP Floods
- Zombie Attacks
- Worms
- Bogon/ Private IP Space
- Block Large Frames (>1500, >9000)
- TCP with Empty Payload
- Layer 7 Attacks ***(Patented)***

Benefits:

- Plattform allows to run many standard jobs beside LI simultan
- Plattform allows to implement individual customer solutions
- Plattform will not loose a single „bit“
- Plattform internal delay very small

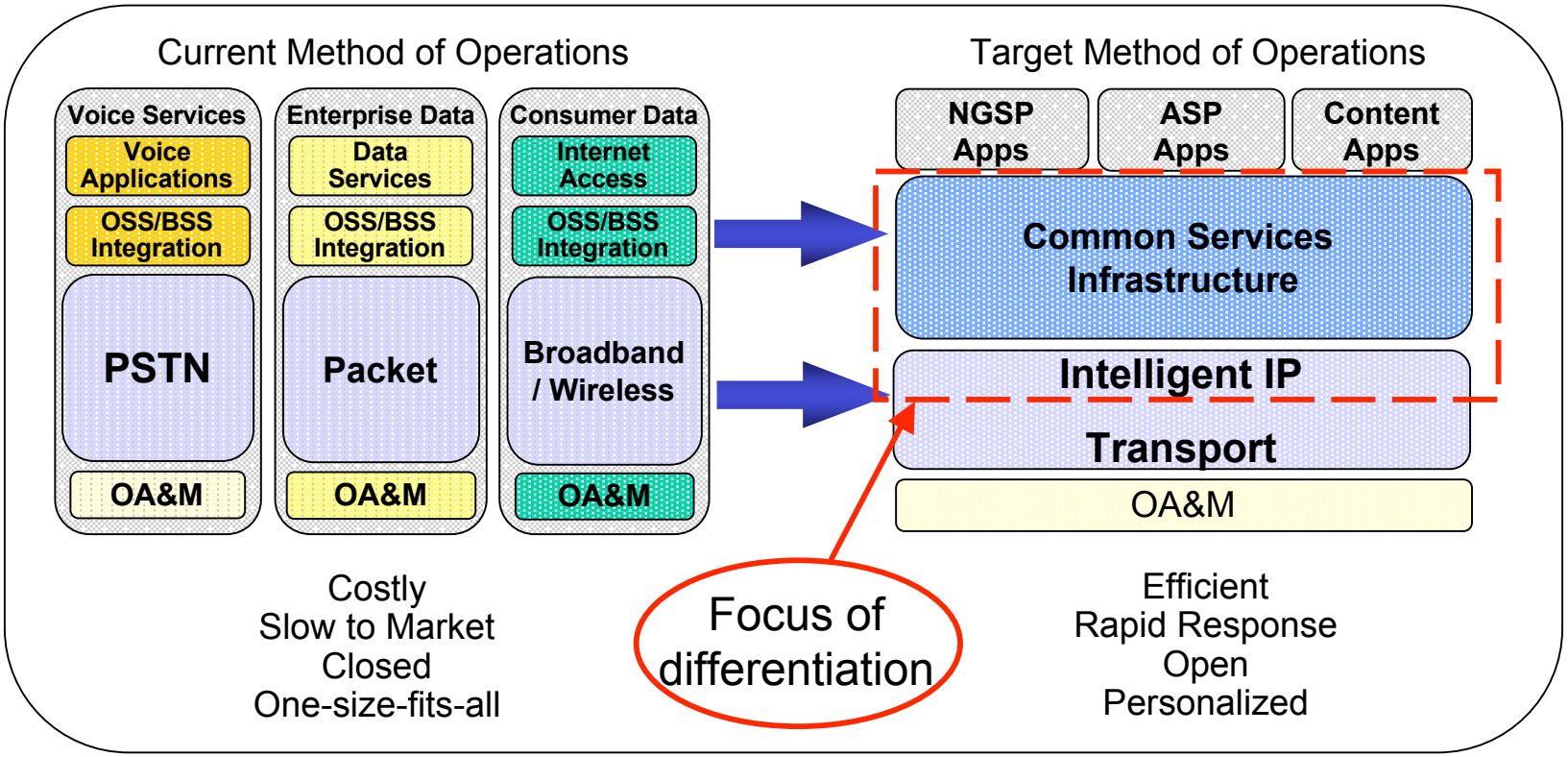
CS-2000/GS-4000 Processing Pipeline



Migration to IP is Critical for Participation in the IP Economy, but also Transparency

The pace of convergence to a common IP infrastructure is accelerating

- New-age IP service providers have distinct advantages over incumbents
  - ♣ e.g. personalized services
  - ♣ faster service development cycles
  - ♣ More granular, bounded service levels



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