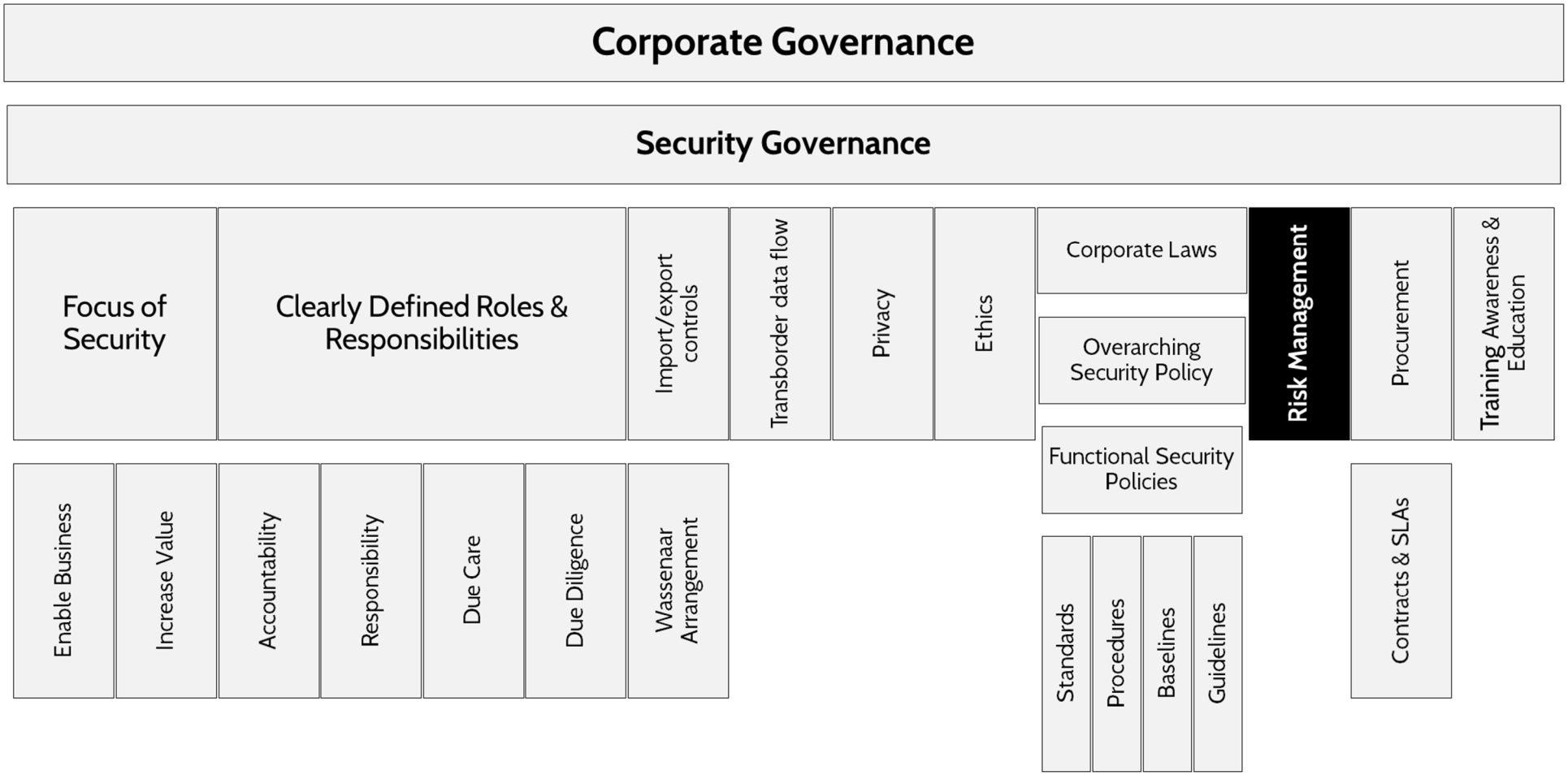
Alignment of Security Function to Business Strategy



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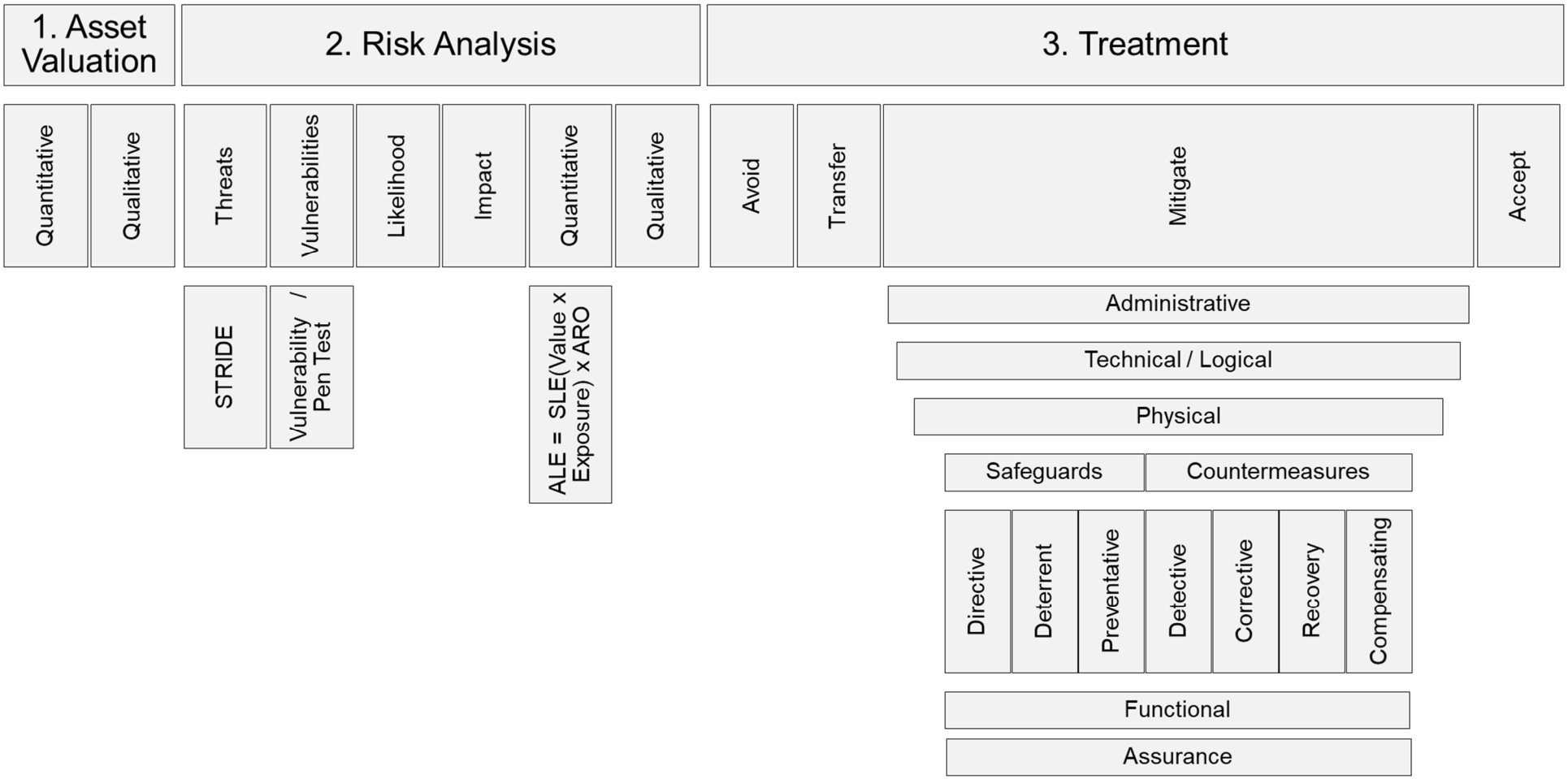
Risk Management



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Intellectual Property

- Trade Secrets
- Patent
- Copyright
- Trademarks

Business Continuity Management (BCM)

- Business Impact Assessment
- Measurements of Time
  - RPO
  - RTO
  - WRT
  - MTD
- Types of Plans
  - Business Continuity Plan (BCP)
  - Disaster Recovery Plan (DRP)

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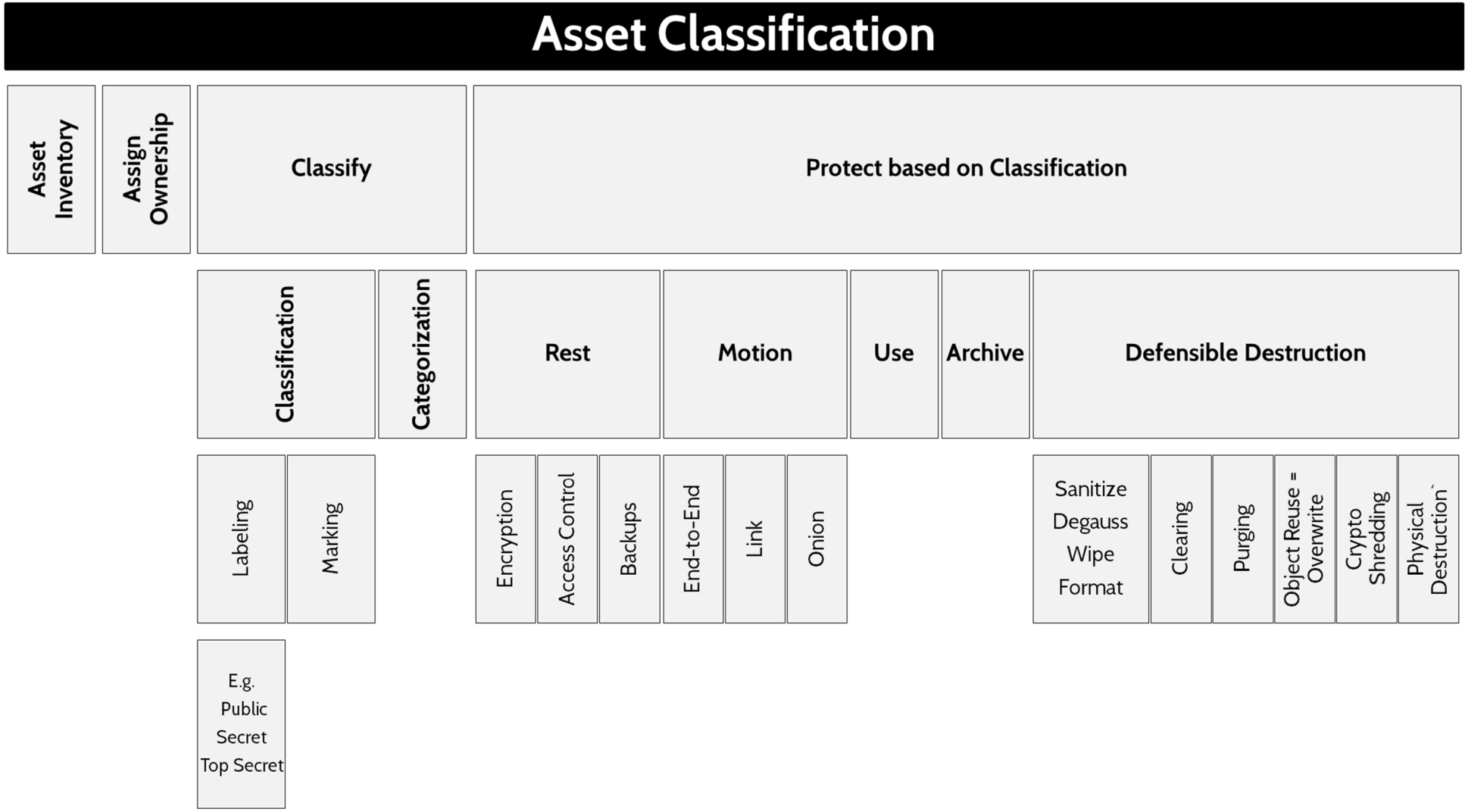

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Privacy

PII

- Direct Identifiers
- Indirect Identifiers

OECD Guidelines

- Collection Limitation
- Data Quality
- Purpose Specification
- Use Limitation
- Security Safeguards
- Openness
- Individual Participation
- Accountability

Roles

- Data Owner
- Data Custodian
- Data Steward
- Data Processor

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Frameworks

Security							Privacy	Risk			
ISO 27001	NIST	COBIT	COSO	ITIL	HIPPA	SOX	OECD Guidelines	NIST 800-37	ISO 31000	COSO	ISACA Risk IT

Models

Enterprise Security Architecture			Security Models						
Zachman	Sabsa	TOGAF	Lattice Based			Rule Based			
			Bell-LaPadula	**Biba**	Lipner Implementation	Clark-Wilson	Brewer-Nash	Graham–Denning & Harrison–Ruzzo–Ullman	

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Evaluation Criteria

Certification			Accreditation
TCSEC (Orange Book)	**ITSEC**	**Common Criteria**	
Functional Levels: D1, C1, C2, B1, B2, B3, A1	Functional Level + Assurance Levels: E0 - E6	EAL1 – EAL7	

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Trusted Computing Base (TCB)

- Reference Monitor Concept
  - Subject
  - Mediation
    - Rules
    - Logging & Monitoring
  - Object
- Hardware Components
  - Processor
    - Multi-tasking
    - Multi-threading
  - Storage
    - Primary
    - Secondary
    - Virtual Memory
- Software Components
  - System Kernel
    - User Mode
    - Kernel Mode
  - Firmware
  - Middleware
- Protection Mechanisms
  - Process Isolation
    - Memory Segmentation
    - Time Division Multiplexing
  - Processor States
    - Problem
    - Supervisor
  - Secure Memory Management
  - Data Hiding
  - Virtualization / Abstraction
  - Defense in depth

- Security Kernel
  - Completeness
  - Isolation
  - Verifiability

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Vulnerabilities in Systems

Single Point of Failure	**Bypass Controls**	**TOCTOU** (Race Conditions)	**Emanations**		**Covert Channels**	**Inference Aggregation**
Redundancy	Mitigating Controls	Increase Frequency of Re-authentication	Shielding (TEMPEST)	White Noise	Control Zones	Polyinstantiation

Web-based Vulnerabilities

Cross Site Scripting (XSS)			**Cross Site Request Forgery (CSRF)**	**SQL Injection**
Stored (Persistent)	**Reflected**	**DOM**		
Input Validation				

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Cloud Computing

Characteristics					Service Models			Deployment Models			
On-Demand Self Service	Broad Network Access	Resource Pooling	Rapid Elasticity	Measured Service	IaaS	PaaS	SaaS	Public	Private	Community	Hybrid

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Cryptographic Services

Confidentiality	Integrity	Authenticity	Non-Repudiation		Access Control
	= Hashing		Origin	Delivery	

Secret Writing

Hidden		Scrambled (Cryptography)								
Steganography	Null Cipher	One-way	Two-way						Substitution	Transposition
		Hashing	Symmetric			Asymmetric				
		MD5 SHA-1 SHA-3	Block		Stream	Factoring	Discrete Log		Caesar Cypher Monoalphabetic Polyalphabetic Running **One-time Pads**	Spartan Skytale Rail Fence (zigzag)
			DES **3DES** **AES** CAST-128 SAFER Blowfish Twofish RC5/RC6	**Block Modes:** **ECB** **CBC** **CFB** **OFB** **CTR**	RC4	RSA	Diffie-Hellmann Elliptic Curve (ECC) El Gamal DSS			

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Digital Signatures

- Integrity
- Authenticity
- Non-repudiation

Digital Certificates

- Verify the owner of a Public Key
  - X.509
  - Replacement
  - Revocation

PKI

- Certificate Authority (Root of Trust)
- Registration Authority
- Intermediate CA
- Certificate DB (Revocation List)
- Certificate Store (Local)

Key Management

- Kirchhoff's Law
- Generation
- Distribution
  - Out-of-band
  - Hybrid
  - Key Wrapping
- Storage
  - TPM
  - HSM
- Rotation
- Disposition
  - Crypto-shredding
  - Key Destruction
- Recovery
  - Split Knowledge
  - Dual Control
  - Key Escrow

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Cryptanalysis

Cryptanalytic Attacks

- Brute Force
- Ciphertext Only
- Known Plaintext
- Chosen Plaintext
- Chosen Ciphertext
- Linear & Differential
- Factoring

Cryptographic Attacks

- Man-in-the-middle
- Replay
- Temporary Files
- Implement-ation
- Side Channel
  - Power
  - Timing
- Dictionary Attack
- Rainbow Tables
- Birthday Attack
- Social Engineering
  - Purchase Key
  - Rubber Hose

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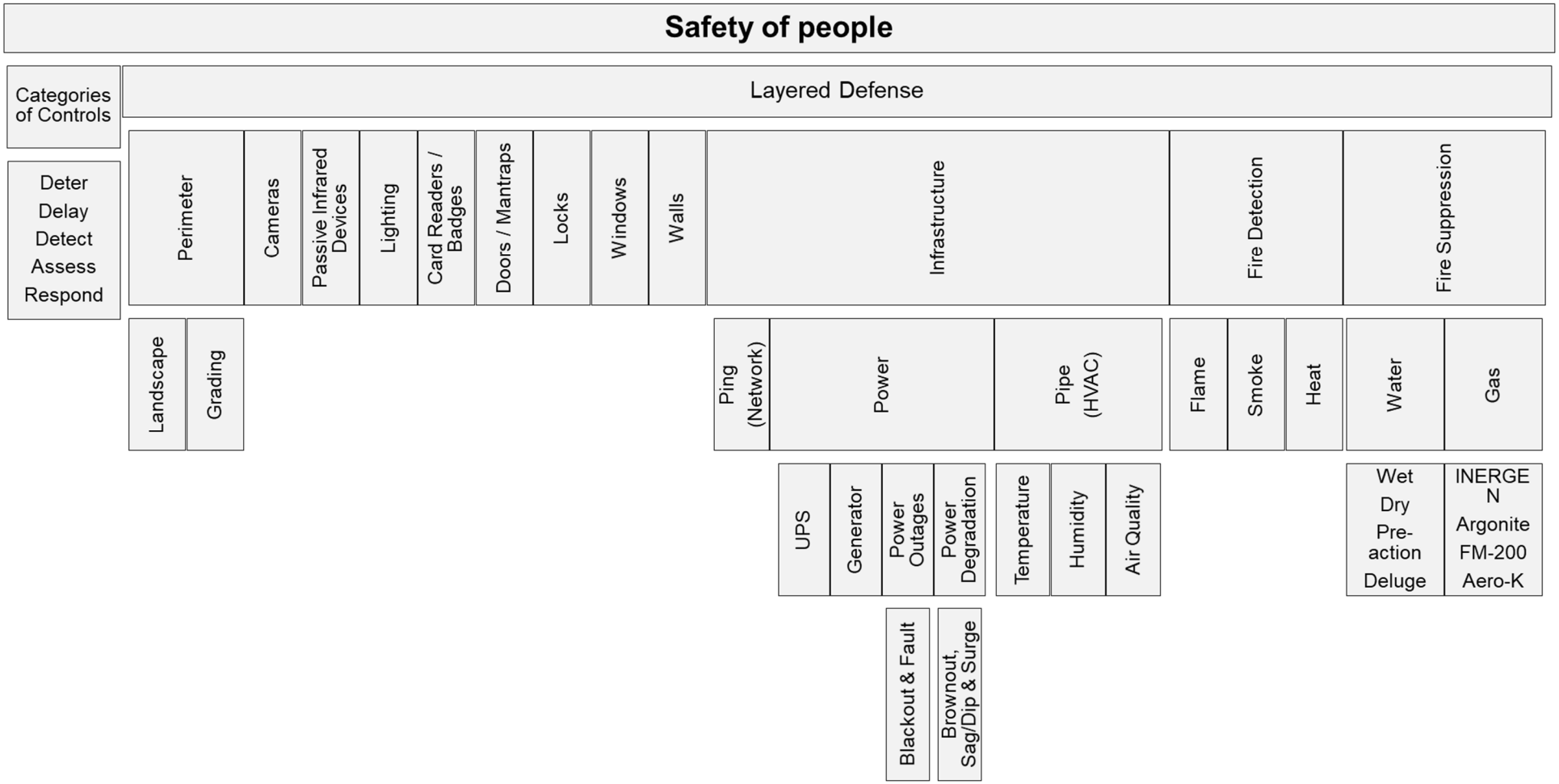
Physical Security



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Open Systems Interconnection (OSI) Model

7. Appl.	6. Presentation	5. Session	4. Transport	3. Network	2. Datalink	1. Physical
Devices		Devices	**Ports** = Services	**IP Address**	**MAC Address**	Media
Protocols		Protocols	Protocols	Devices	Circuit vs. Packet Switched Networks	Topologies
Application Firewalls		Circuit Proxy Firewall	**TCP/UDP & SSL/TLS**	**IPv4 & IPv6**	Devices	Collisions
HTTP/S, DNS, SSH, SNMP		PAP, CHAP, EAP		**Routers & Packet Filtering Firewalls**	Protocols	Devices
				ICMP (Ping), **IPSec,** IGMP	**Switches** & Bridges	**Wired:** Twisted Pair, Coaxial, Fiber Optic
					ARP, PPTP, SLIP, PPP, PAP, CHAP, EAP, PEAP	**Wireless:** Radio Frequency, Infrared, Microwave
						Bus
						Tree
						Star
						Mesh
						Ring
						CSMA/**CA**
						CSMA/**CD**
						Hubs, Repeaters, Concentrators

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Networking

Converged Protocols	Network Attacks	Virtualization	WAN	Common Commands
iSCSI, FCoE, VOIP	Phases	VLAN	X.25	ipconfig
	Eavesdropping	SDN	Frame Relay	ping
	SYN Flooding		ATM	traceroute
	IP Spoofing		MPLS	whois
	Smurf / Fraggle			dig
	DoS / DDoS			
	Man-in-the-Middle			
	Spoofing			
	ARP poisoning			

Reconnaissance
Enumeration
Vulnerability Analysis
Exploitation

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Network Defense

- **Defense in Depth**
- Network Segmentation / Partitioning
  - Network Perimeter
  - Choke Point
  - DMZ
  - Bastion Host
  - Proxy
  - NAT / PAT
- Firewalls
  - Types
    - Packet Filtering
    - Stateful Packet Filtering
    - Circuit Proxy
    - Application
  - Architectures
    - Packet Filtering
    - Dual-homed Host
    - Screened Host
    - Screened Subnet
    - 3-Legged Firewall
- Inspection
  - IDS
  - IPS
  - IDS/IPS Location
    - Host Based
    - Network Based
      - In-line
      - Mirror, Span, Promiscuous
  - IDS / IPS Detection Methods
    - Pattern
      - Signature analysis
    - Anomaly
      - Stateful matching
      - Statistical
      - Protocol
      - Traffic
    - White & Black lists
    - Sandbox
  - Honeypots & honeynets
    - Enticement vs. Entrapment
  - Ingress vs. Egress

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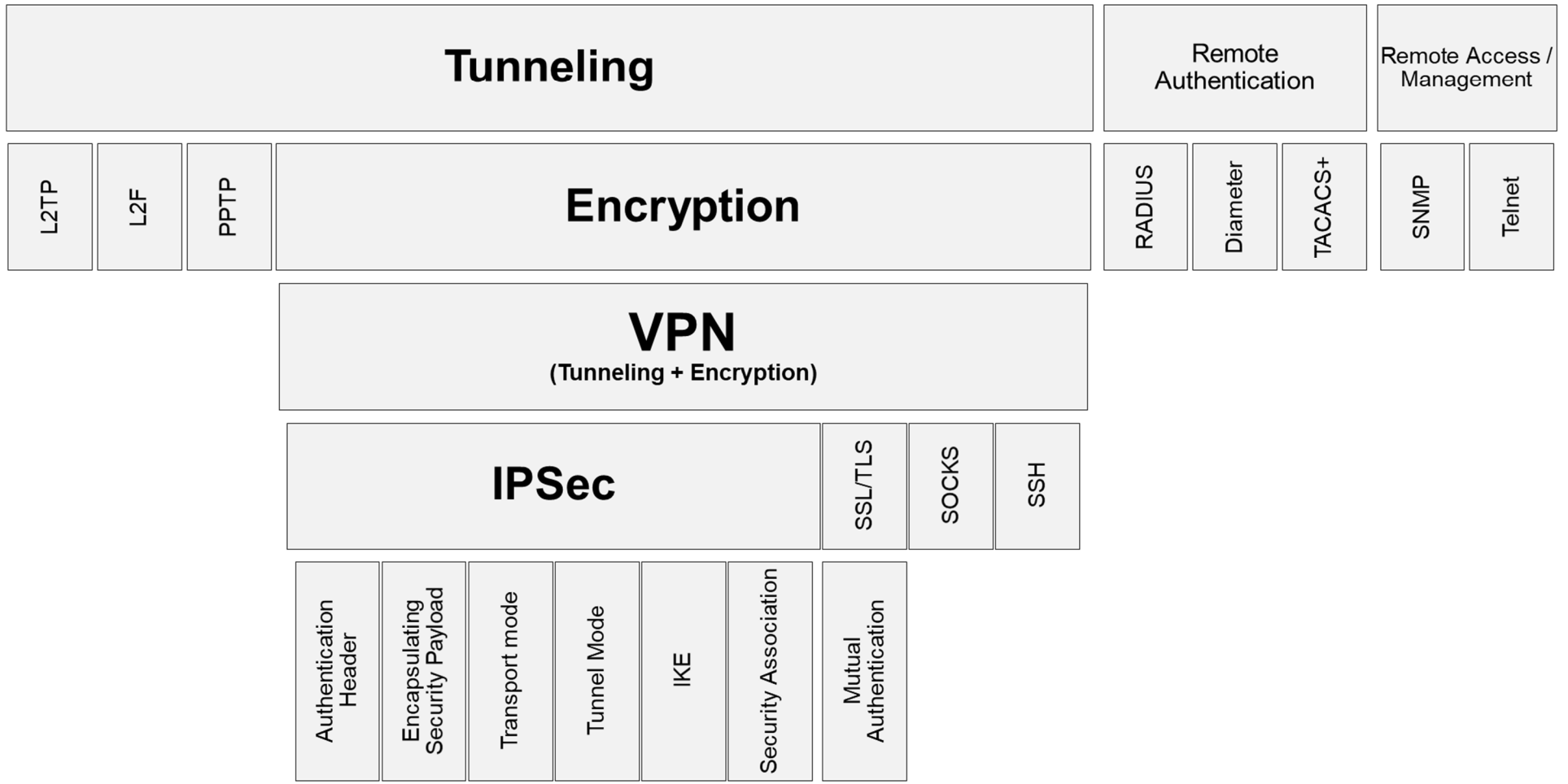
Remote Access



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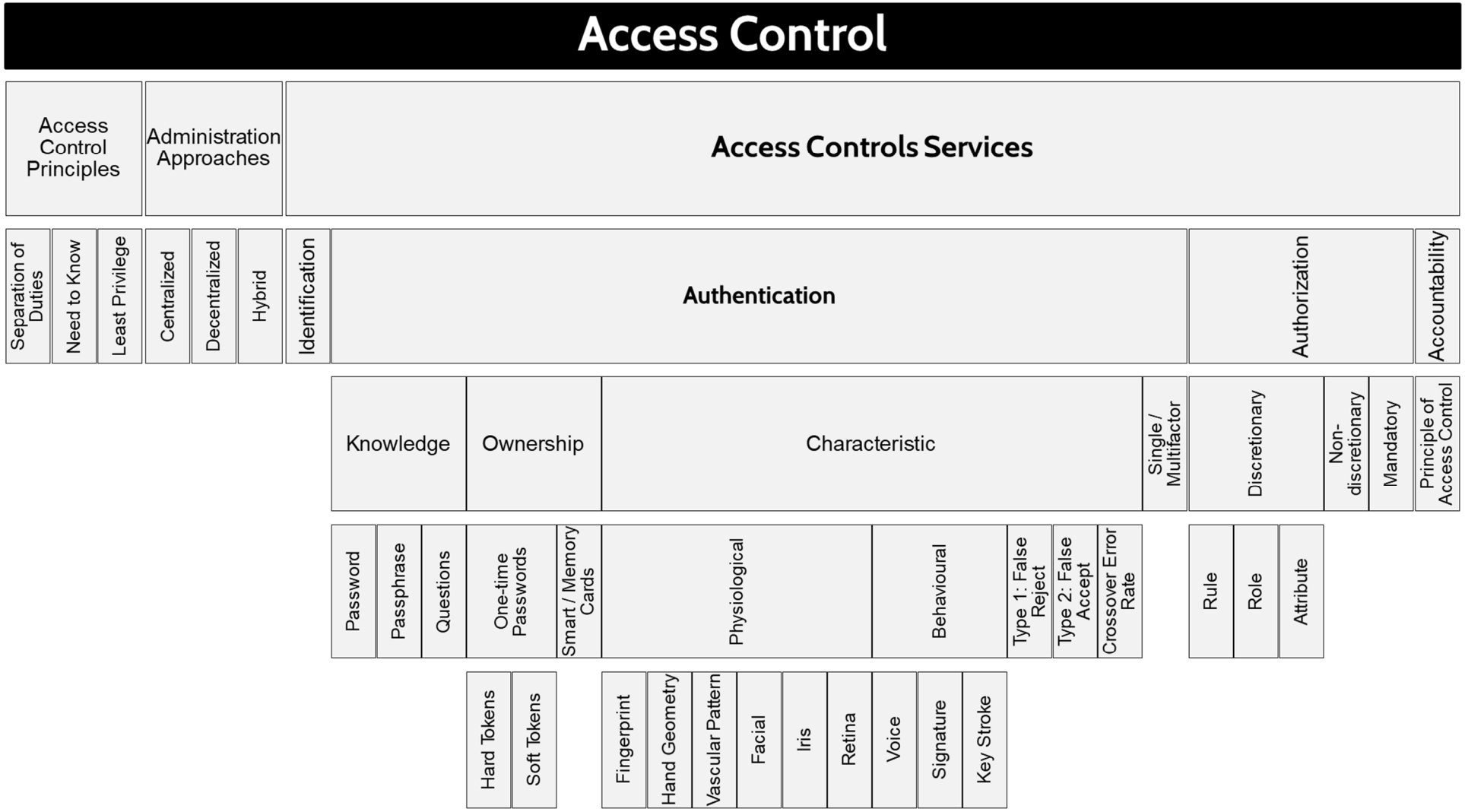

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Single Sign-on / Federated Access

Allows users to access multiple systems with a single set of credentials

Single Sign-on		Federated Access					IDaaS
Access systems **only within the same organization**		Access systems across **multiple entities**					
Kerberos	Sesame	Trust Relationship			SAML		WS-Federation OpenID OAuth
One ticket	Symmetric encryption only	Multiple Tickets	Symmetric & Asymmetric encryption	Principal / User	Identity Provider	Relying Party / Service Provider	Tokens	Assertions written in XML

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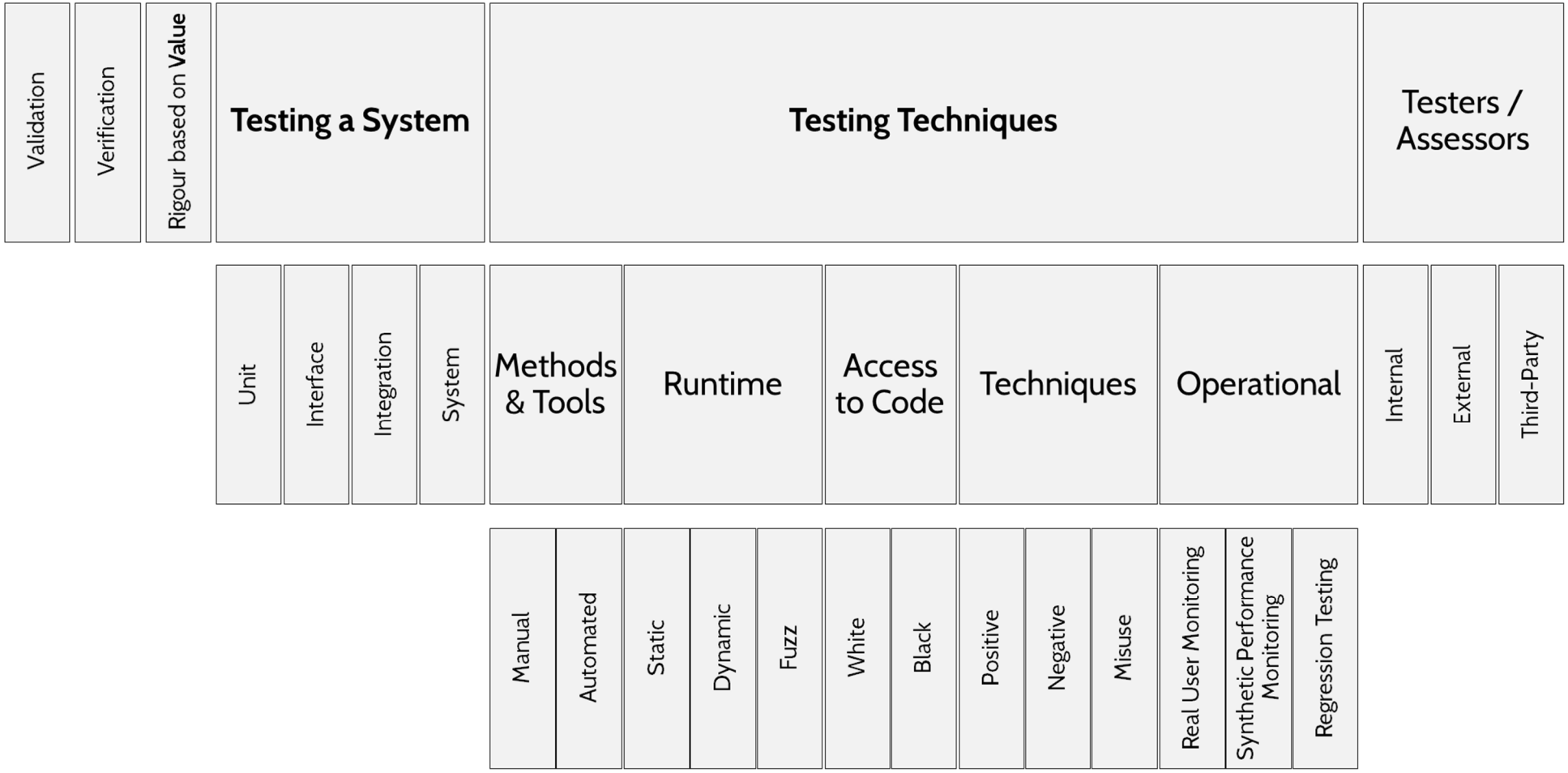
Security Assessment and Testing



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Identifying Vulnerabilities

- Vulnerability Assessment
- Penetration Test
- **Process**
  - Reconnaissance
  - Enumeration
  - Vulnerability Analysis
  - Execution
  - Document Findings
- **Testing Techniques**
  - Perspective
    - Internal
    - External
  - Approach
    - Blind
    - Double-blind
  - Knowledge
    - Zero (black)
    - Partial (gray)
    - Full (white)
- Types of Scans
  - Credentialed / Authenticated
  - Uncredentialed / Unauthenticated
- War dialing / War driving
- Banner grabbing & Fingerprinting
- Interpreting & understanding results
  - **CVE** Common Vulnerability & Exposures Dictionary
  - **CVSS** Common Vulnerability Scoring System
- False positive vs. False negative

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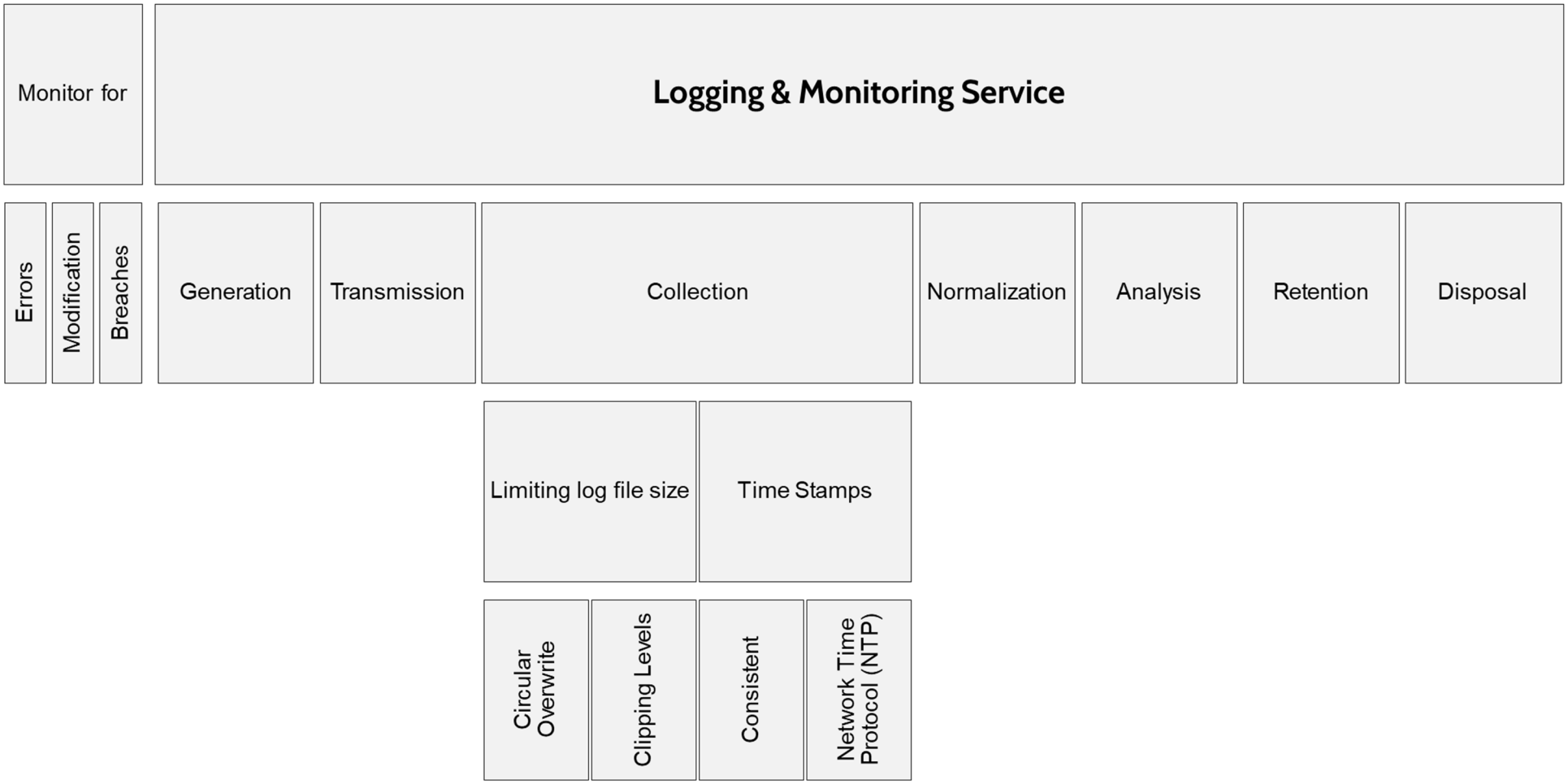
Log Review & Analysis



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Investigations

- **Secure the Scene**
- **Collect & Control Evidence**
  - **Locard's Principle**
  - **MOM**
  - Sources
    - Oral / Written statements
    - Documents
    - Digital Forensics
      - **Live Evidence (Volatile)**
      - Secondary Storage (HD)
    - E Discovery
  - **Chain of Custody**
- **Rules of Evidence**
  - Authentic
  - Accurate
  - Complete
  - Convincing
  - Admissible
- Investigative Techniques
  - Media Analysis
  - Software Analysis
  - Network Analysis
- Types of Investigations
  - Criminal
  - Civil
  - Regulatory
  - Administrative
- Document & Report

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Security Information and Event Management (SIEM)

Capabilities						Continuously Update
Aggregation	Normalization	Correlation	Secure Storage	Analysis	Reporting	

Incident Response

Prep.	Triage		Action / Investigation		Recovery		
	Detection	Response IR Team Deployed	Mitigation Containment	Reporting Relevant Stakeholders	Recovery Return to normal	Remediation Prevention	Lessons Learned Improve Process

Sources: SIEM, IDS/IPS DLP, Fire detectors Etc.	Event	Incident

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Incident Response

Preparation	Triage		Action / Investigation		Recovery		
	Detection	**Response** IR Team Deployed	**Mitigation** Containment	**Reporting** Relevant Stakeholders	**Recovery** Return to normal	**Remediation** Prevention	**Lessons Learned** Improve Process
	Sources: SIEM IDS/IPS DLP Anti-malware Cameras Fire detectors Etc.	Event	Incident				

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Malware

Types

- Virus
- Worm
- Companion
- Macro
- Multipartite
- Polymorphic
- Trojan
- Botnets
- Hoaxes / Pranks
- Spyware / Adware
- Boot Sector Infector
- Logic Bombs
- Data Diddler / Salami Attack

Zero Day

Anti-Malware

- Policy
  - Training & Awareness
- Detection
  - Signature Based Scanners
  - Heuristic Scanners
  - Activity Monitors
  - Change Detection
- Continuous Updates

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Patching

Determine if Patch is available				Implement through Change Management	
Threat Intelligence	Vendor Notification	Pro-actively checking		Deploy	
		Agent	Agentless	Passive	Automated	Manual

Change Management

Change Request	Assess Impact	Approval	Build & Test	Notification	Implement	Validation		Version & Baseline
	Emergency Change vs. Standard process	Based on impact, severity, etc.				Test New Functionality	Regression Testing	

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Recovery Strategies

Backup Storage

- Archive Bit
- Types of Backups
  - Mirror
  - Full
  - Incremental
  - Differential
- Data Storage
  - Offsite
  - Tape Rotation

Spare Parts

- Cold
- Warm
- Hot

RAID

Redundant Array of Independent Disks

- **RAID 0** Striping
- **RAID 1** Mirroring
- **RAID 5** Parity

High Availability System

- Clustering
- Redundancy

Recovery Sites

- Types of Sites
  - Cold
  - Warm
  - Hot
  - Mobile
  - Redundant
- Geographically remote
- Reciprocal Agreements

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Business Continuity Management (BCM)

Focuses on **critical and essential functions** of business

Goals of BCM

1. Safety of people
2. Minimize damage
3. Survival of business

Business Impact Assessment

- Identify Critical Processes & Systems
- Measurements of Time
  - **RPO**
  - **RTO**
  - **WRT**
  - **MTD**
- Owner approval of #s and associated costs

Types of Plans

- Business Continuity Plan (**BCP**)
- Disaster Recovery Plan (**DRP**)

Testing Plans

- Read-through / Checklist
- Walkthrough
- Simulation
- Parallel
- Full-interruption / Full-scale

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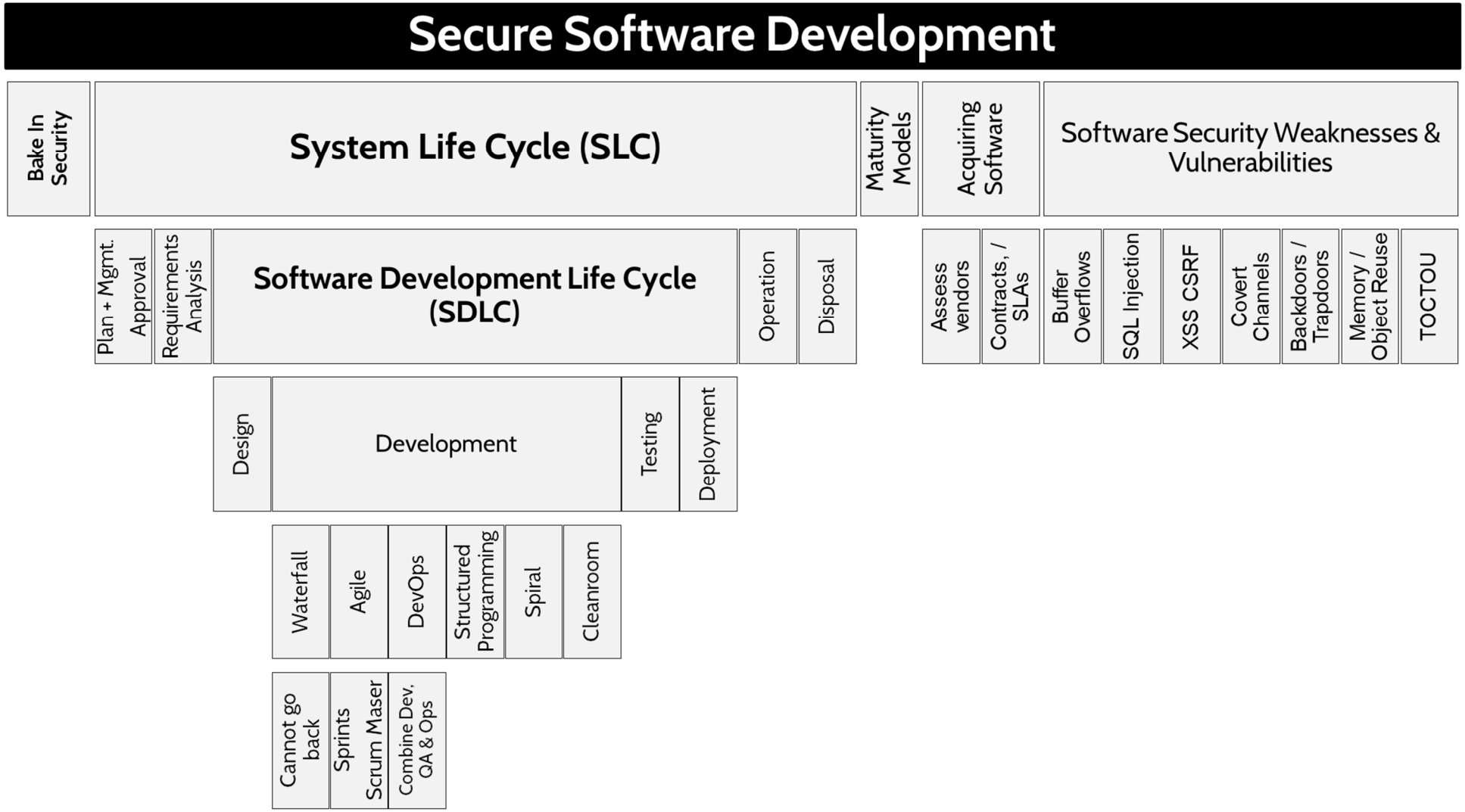

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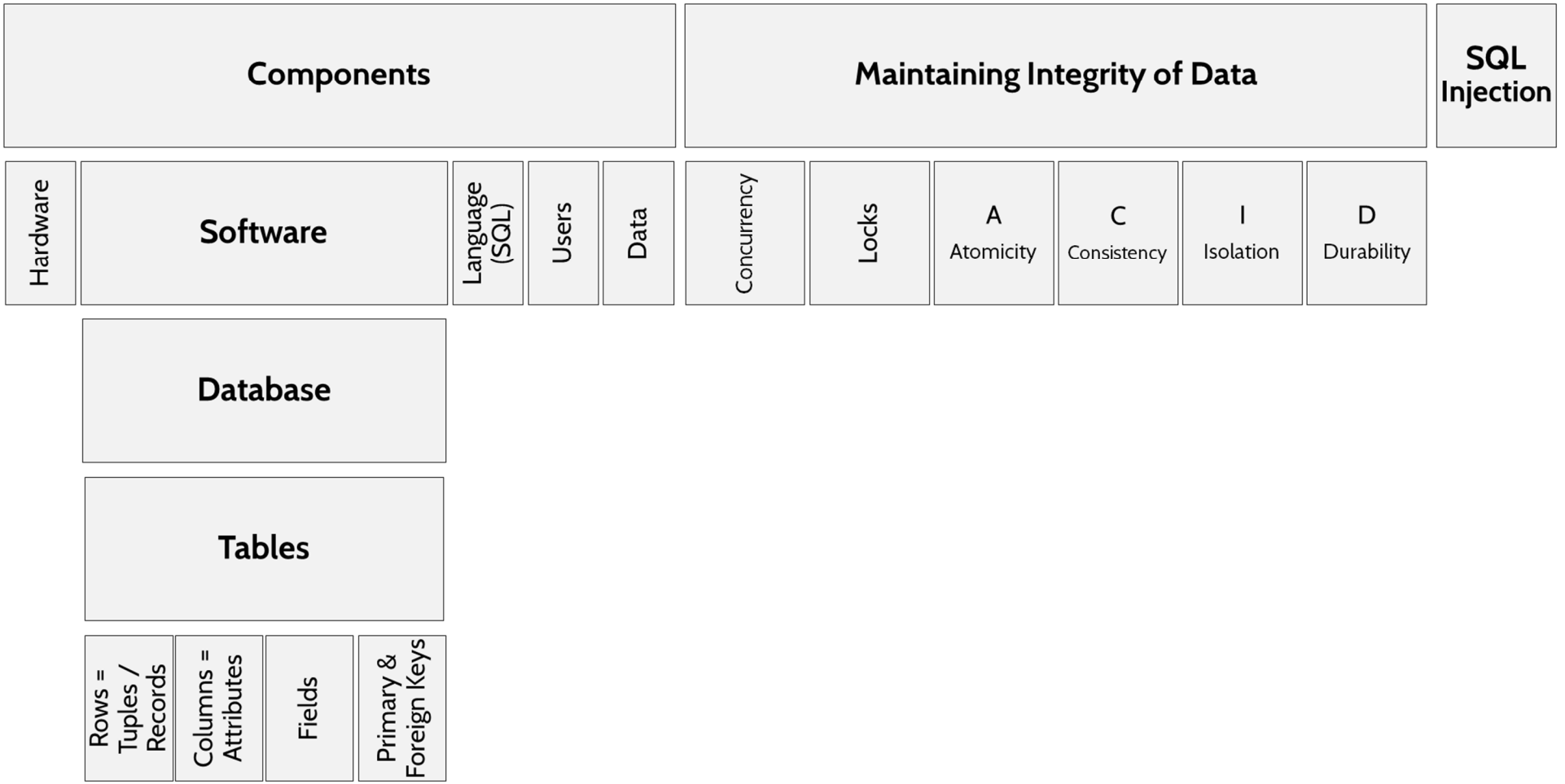
Databases



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