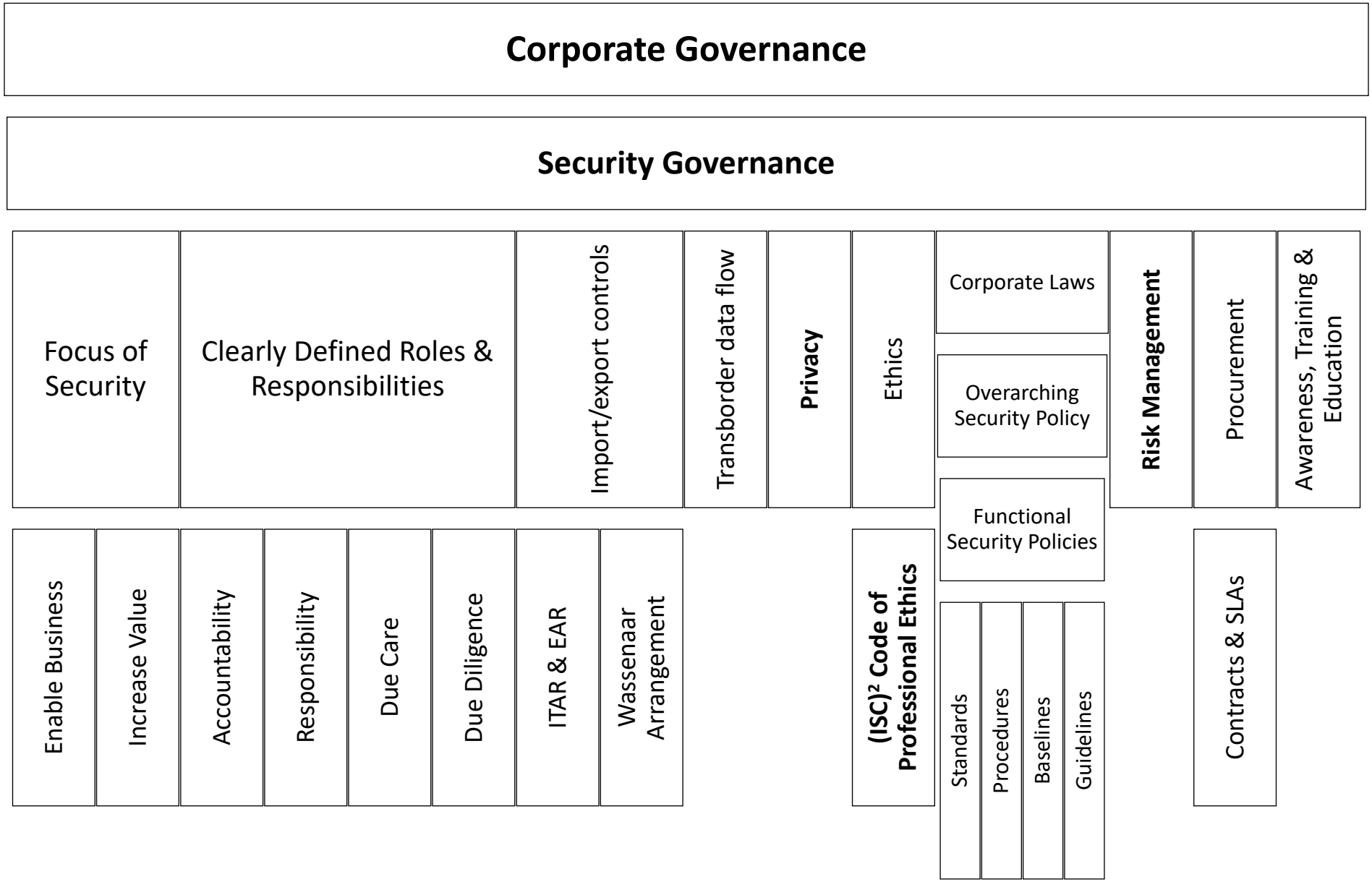
CISSP
MindMaps

Domain 1

Security and Risk Management

Alignment of Security Function to Business Strategy



Privacy

State or condition of being free from being observed or disturbed by other people

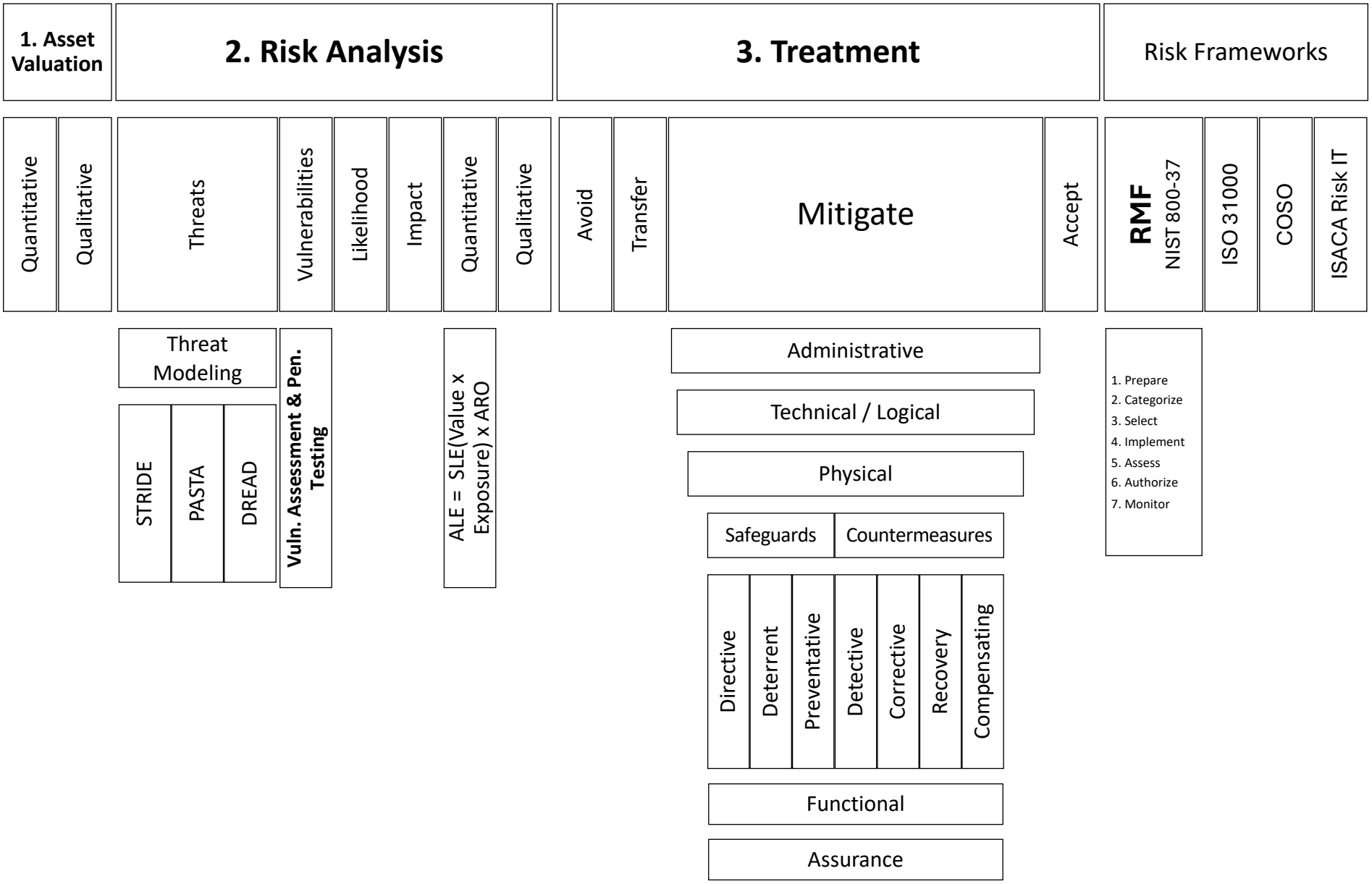
Privacy policy	Personal Data	Data Lifecycle	OECD Guidelines	GDPR	Cannot Achieve Privacy without Security

Standards Procedures Baselines Guidelines	PII SPI PHI PI	Direct Identifiers	Indirect Identifiers	Online Identifiers	Creation / Update	Store	Use	Share	Archive	Destroy	Collection Limitation	Data Quality	Purpose Specification	Use Limitation	Security Safeguards	Openness	Individual Participation	Accountability	Supervisory Authority (SA)	Breaches reported within 72 hours

Intellectual Property

Trade Secret	Patent	Copyright	Trademark

Risk Management



Domain 2

Asset Security

Asset Classification

Asset Inventory

Assign Ownership

Classify

based on **Value**

Protect

based on **Classification**

Assess & Review

- Data classification policy
  - Standards
  - Procedures
  - Baselines
  - Guidelines
- Classification
  - Security Label
  - Security Marking
- Categorization
  - System Readable
  - Human Readable
- Roles
  - Data Owner / Controller
  - Data Processor
  - Data Custodian
  - Data Steward
  - Data Subject
- Rest
  - Encryption
  - Access Control
  - Backups
- Motion
  - End-to-End
  - Link
  - Onion
- Use
- Archive
  - Retention Period
- Defensible Destruction
  - Destruction
    - Media Destruction
    - Shred / Disintegrate / Incinerate / Drill
    - Degauss
    - Crypto shredding
    - Overwrite / Wipe / Erasure
    - Format
  - Purging
  - Clearing
- DRM
- DLP

Domain 3

Security Architecture and Engineering

Models

Enterprise Security Architecture

- Zachman
- Sabsa
- TOGAF

Security Models

Lattice Based

Bell- LaPadula

- Confidentiality
- Simple Security Property
- Star Property
- Strong Star Property

Biba

- Integrity
- Simple Integrity Property
- Star Integrity Property

Lipner
Implementation

Rule Based

Clark-Wilson

- 3 goals of integrity
- 3 Clark-Wilson rules

Brewer-Nash

- Prevent conflicts of interest

Graham – Denning

Harrison –Ruzzo– Ullman

Secure Design Principles

- Threat Modeling
- Least Privilege
- Defense in Depth
- Secure Defaults
- Fail Securely
- Separation of Duties (SoD)
- Keep it Simple
- Zero Trust
- Trust But Verify
- Privacy by Design
- Shared Responsibility

Security Frameworks

- ISO 27001
- ISO 27002
- NIST 800-53
- COBIT
- ITIL
- HIPAA
- SOX
- FedRAMP
- FISMA
- Cyber Kill Chain

Evaluation Criteria

Certification

Accreditation

TCSEC (Orange Book)

Confidentiality only

Single Box only

Functional Levels

- **D1** – failed or not tested
- **C1** – Weak protection mechanisms
- **C2** – Strict login procedures
- **B1** - Security labels
- **B2** - Security labels and verification of no covert channels
- **B3** - Security labels, verification of no covert channels, and must stay secure during start-up
- **A1** – Verified design

ITSEC

Confidentiality + Integrity

Networked devices

Same Functional levels as TCSEC

Assurance Levels

- E0
- E1
- E2
- E3
- E4
- E5
- E6

Common Criteria

ISO 15408

Protection Profile

Target of Evaluation

Security Targets

Functional & Assurance Requirements

Assign EAL

- EAL1 – Functionally tested
- EAL2 – Structurally tested
- EAL3 – Methodically tested & checked
- EAL4 – Methodically designed, tested & reviewed
- EAL5 – Semi formally designed & tested
- EAL6 – Semi formally verified designed & tested
- EAL7 – Formally verified designed and tested

Trusted Computing Base (TCB)

- Reference Monitor Concept
  - Subject
  - Mediation
    - Rules
    - Logging & Monitoring
  - Object
- Hardware Components
  - Processor
  - Storage
    - Primary
    - Secondary
    - Virtual Memory
- Software Components
  - System Kernel
  - Firmware
  - Middleware
- Protection Mechanisms
  - Process Isolation
    - Memory Segmentation
    - Time Division Multiplexing
  - Processor States
    - Problem
    - Supervisor
  - Operating System Modes
    - User Mode
    - Kernel Mode
  - Ring Protection Model
    - Ring 3: User Programs
    - Ring 0: System Kernel
  - Secure Memory Management
  - Data Hiding
  - Defence in depth

- Security Kernel
  - Completeness
  - Isolation
  - Verifiability

Vulnerabilities in Systems

- Single Point of Failure
- Bypass Controls
- TOCTOU (Race Conditions)
- **Emanations**
- Covert Channels
- Aggregation & Inference

- Redundancy
- Mitigating Controls
- Increase frequency of Re-authentication
- Shielding (TEMPEST)
- White Noise
- Control Zones
- Analysis & Design
- Polyinstantiation

Mobile Devices

- Policy, training & procedures
- Remote access security
- End-point security

OWASP Mobile Top 10

- M1: Improper Platform Usage
- M2: Insecure Data Storage
- M3: Insecure Communication
- M4: Insecure Authentication
- M5: Insufficient Cryptography
- M6: Insecure Authorization
- M7: Client Code Quality
- M8: Code Tampering
- M9: Reverse Engineering
- M10: Extraneous Functionality

Web-based Vulnerabilities

Cross Site Scripting (XSS)

- **Stored** (Persistent)
- **Reflected** (Most common)
- DOM
- Target of Attack: **Client**

Cross Site Request Forgery (CSRF)

- Target of Attack: **Server**

SQL Injection

Input Validation

- Client Side vs. Server Side
- Allow Lists vs. Deny Lists

Cloud Computing

	On-Demand Self Service	Characteristics
	Broad Network Access	
	Resource Pooling	
	Rapid Elasticity	
	Measured Service	
	IaaS	Service Models
	PaaS	
	SaaS	
	Public	Deployment Models
	Private	
	Community	
	Hybrid	
Hypervisor	Virtual Machine	**Virtualized Compute**
Container Engine	Containers	
	Serverless	
	Local	**Identity Provider**
	Cloud	
	Cloud	Cloud identity
	Linked	
	Synced	
	Federated	
Cloud Consumer	Accountable	**Roles**
Owner / Controller		
Cloud Provider / Processor	Responsible	
Cloud Broker		
Cloud Auditor		
	SPML	**Protocols**
	SAML	
	OpenID	
	OAuth	
	Data Centric	Migration
	SLA	
	Snapshot, Virtual Disk, Image	Forensics
	Crypto Shredding / Crypto Erase	Data Destruction

Cryptographic Services

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

Cryptographic terminology

- Plaintext
- Encrypt
- Key / Crypto variable
- Decrypt
- Key clustering
- Work factor
- Initialization vector/Nonce
- Confusion
- Diffusion
- Avalanche

Secret Writing

Hidden

- Steganography
- Null Cipher

Scrambled (Cryptography)

One-way

- **Hashing**
  - MD5
  - SHA-1
  - SHA-2
  - SHA-3

Two-way

Symmetric

- **Block**
  - **DES**
  - **3DES**
  - **AES** (Rijndael)
  - CAST-128
  - SAFER
  - Blowfish
  - Twofish
  - RC5/RC6
  - **Block Modes:**
    - **ECB**
    - CBC
    - CFB
    - OFB
    - **CTR**
- **Stream**
  - **RC4**

Asymmetric

- **Factoring**
  - **RSA**
- **Discrete Log**
  - Diffie-Hellmann (key exchange)
  - Elliptic Curve (ECC)
  - El Gamal
  - DSA
- **Digital Certificates**
- **Digital Signatures**

Substitution

- Caesar Cypher
- Monoalphabetic
- Polyalphabetic
- Running
- **One-time Pads**

Transposition

- Spartan Scytale
- Rail Fence (zigzag)

Digital Signatures

- Integrity
- Authenticity
- Non-repudiation
  - Origin
  - Delivery

Digital Certificates

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

PKI

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

Key Management

- Kerchhoff's Principle
- Generation
- Distribution
  - Diffie-Hellmann
  - Out-of-band
  - Hybrid
- Storage
  - TPM
  - HSM
- Rotation
- Disposition
  - Crypto-shredding
  - Key Destruction
- Recovery
  - Split Knowledge
  - Dual Control
  - Key Escrow

Cryptanalysis

Cryptanalytic Attacks

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

Cryptographic Attacks

- Man-in-the-middle
- Replay
- Pass the Hash
- Temporary Files
- Impleme-ntation
- Side Channel
  - Power
  - Timing
  - Radiation Emissions
- Dictionary Attack
- Rainbow Tables
- Birthday Attack
- Social Engineering
  - Purchase Key
  - Rubber Hose

Physical Security

Safety of people

Categories of Controls

Layered Defense

Deter
Delay
Detect
Assess
Respond

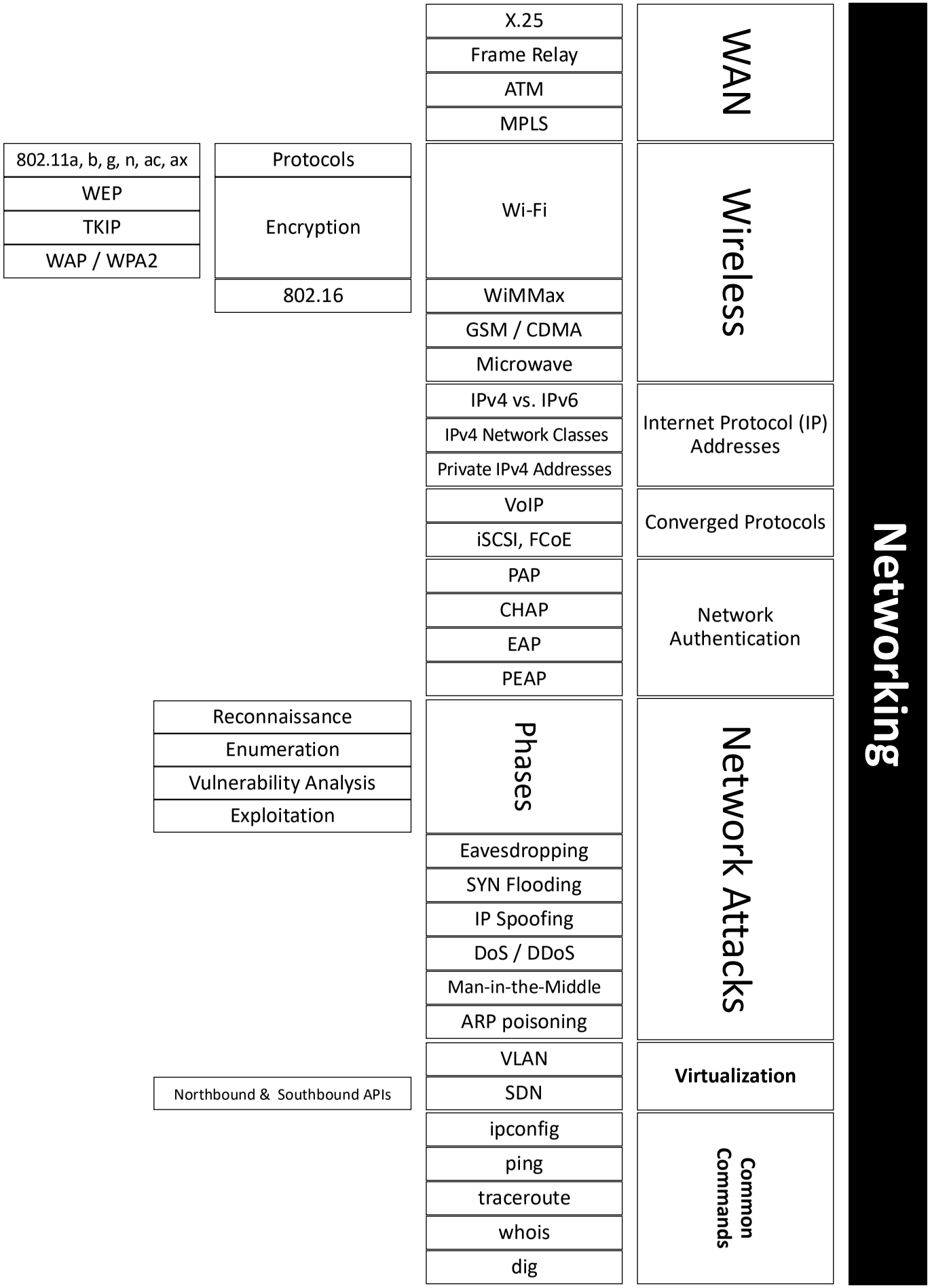
- Perimeter
  - Landscape
  - Grading
- Cameras
- Passive Infrared Devices
- Lighting
- Card Readers / Badges
- Doors / Mantraps
- Locks
  - Mechanical
  - Digital
- Windows
  - Shock
  - Glass break
- Walls
- Skimming
- Infrastructure
  - Network
  - Power
    - UPS
    - Generator
    - Power Outages
    - Power Degradation
  - HVAC
    - Temperature
    - Humidity
    - Air Quality
- Fire Detection
  - Flame (Infrared)
  - Smoke
    - Ionization
    - Photo-electric
    - Dual
  - Heat (Thermal)
- Fire Suppression
  - Water
    - Wet
    - Dry
    - Pre-action
    - Deluge
  - Gas
    - INERGEN
    - Argonite
    - FM-200
    - Aero-K
  - Extinguisher
  - CO_2

Domain 4

Communication and Network Security

Open Systems Interconnection (OSI) Model

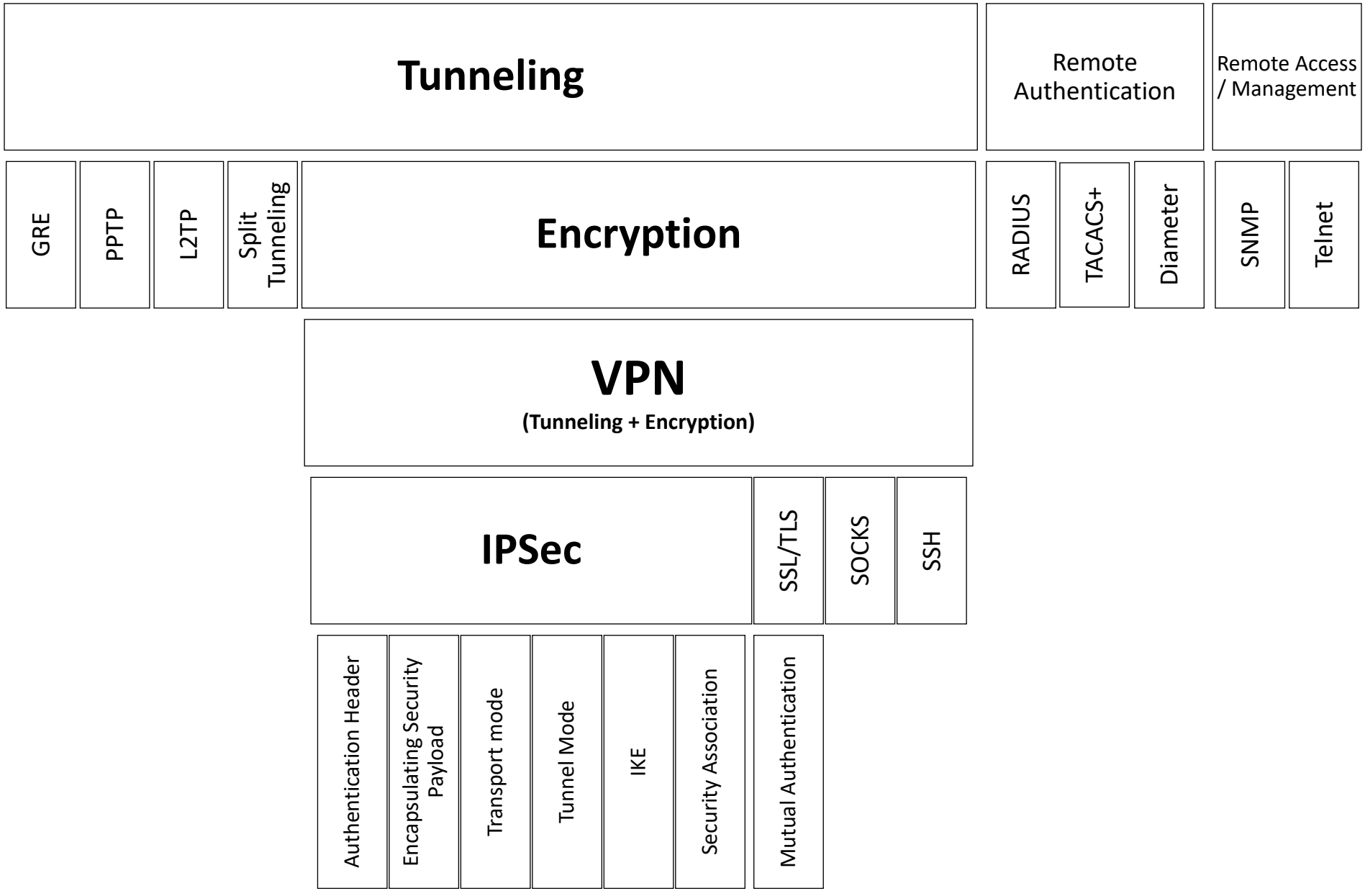
1. Physical	Media	Wired: Twisted Pair, Coaxial, Fiber Optic
		Wireless: Radio Frequency, Infrared, Microwave
	Topologies	Bus
		Tree
		Star
		Mesh
		Ring
	Collisions	CSMA/CA
		CSMA/CD
	Devices	Hubs, Repeaters, Concentrators
	Protocols	802.1x
2. Datalink	MAC Address	
	Devices	Switches & Bridges
	Protocols	ARP, PPTP, PPP, PAP, CHAP, EAP
3. Network	IP Address	
	Devices	Routers & Packet Filtering Firewalls
	Protocols	ICMP (Ping), IPSec, IGMP
4. Transport	Ports = Services	Common Ports
	Protocols	TCP/UDP, SSL/TLS & BGP
5. Session	Devices	Circuit Proxy Firewall
	Protocols	NetBIOS & RPC
6. Presentation		
7. Appl.	Devices	**Application** Firewalls
	Protocols	HTTP/S, DNS, SSH, SNMP, LDAP, DHCP


Networking
WAN
X.25
Frame Relay
ATM
MPLS
Wireless
Wi-Fi
Protocols
802.11a, b, g, n, ac, ax
WEP
TKIP
WAP / WPA2
Encryption
802.16
WiMMax
GSM / CDMA
Microwave
Internet Protocol (IP) Addresses
IPv4 vs. IPv6
IPv4 Network Classes
Private IPv4 Addresses
Converged Protocols
VoIP
iSCSI, FCoE
Network Authentication
PAP
CHAP
EAP
PEAP
Network Attacks
Phases
Reconnaissance
Enumeration
Vulnerability Analysis
Exploitation
Eavesdropping
SYN Flooding
IP Spoofing
DoS / DDoS
Man-in-the-Middle
ARP poisoning
Virtualization
VLAN
SDN
Northbound & Southbound APIs
Common Commands
ipconfig
ping
traceroute
whois
dig

Network Defense

- **Defense in Depth**
- Network Segmentation / Partitioning
  - Network Perimeter
  - DMZ
  - Bastion Host
  - Proxy
  - NAT / PAT
- Firewalls
  - Types
    - Packet Filtering
    - Stateful Packet Filtering
    - Circuit Proxy
    - Application
- Inspection
  - IDS
  - IPS
  - IDS/IPS Location
    - Host Based
    - Network Based
      - In-line
      - Mirror, Span, Promiscuous
  - IDS / IPS Detection Methods
    - Pattern
      - Signature analysis
      - Stateful matching
    - Anomaly
      - Statistical
      - Protocol
      - Traffic
    - White & Black Lists
    - Sandbox
  - Honeypots & honeynets
  - Ingress vs. Egress
- **Endpoint Security**

Remote Access



Domain 5

Identity and Access Management

Access Control

- Access Control Principles
  - Separation of Duties
  - Need to Know
  - Least Privilege
- Administration Approaches
  - Centralized
  - Decentralized
  - Hybrid
- **Access Controls Services**
  - Identification
  - **Authentication**
    - Knowledge
      - Password
      - Passphrase
      - Questions
    - Ownership
      - One-time Passwords
        - Synchronous
        - Asynchronous
      - Smart / Memory Cards
        - Hard Tokens
        - Soft Tokens
    - Characteristic
      - Physiological
        - Fingerprint
        - Hand Geometry
        - Vascular Pattern
        - Facial
        - Iris
        - Retina
      - Behavioural
        - Voice
        - Signature
        - Key Stroke
        - Gait
      - Templates
      - Type 1: False Reject
      - Type 2: False Accept
      - Crossover Error Rate
    - Single / Multifactor
    - Authenticator Assurance Levels (AAL)
    - Just-in-time Access
  - Authorization
    - Discretionary
      - Rule
      - Role
        - Types of RBAC
      - Attribute / Content
    - Non-discretionary
    - Mandatory
    - Principle of Access Control
  - Accountability
  - Session Hijacking
- Session Management

Single Sign-on / Federated Access

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

Single Sign-on

Access systems **within the same organization**

Federated Identity Management (FIM)

Access systems across **multiple entities**

Kerberos

- Components
  - User / Client
  - Key Distribution Center
  - Authentication Service
  - Ticket Granting Ticket (TGT)
  - Ticket Granting Service
  - Service Tickets
  - Service
- Symmetric encryption only

Sesame

- Symmetric & Asymmetric encryption

Trust Relationship

- Principal / User
- Identity Provider
- Relying Party / Service Provider

SAML

- Tokens
- Assertions written in XML
- Components
  - Profiles
  - Bindings
  - Protocol
  - Assertion

WS-Federation

OpenID

OAuth

Domain 6

Security Assessment and Testing

Security Assessment and Testing

- Validation
- Verification
- Rigour
- **Testing a System**
  - Unit
  - Interface
  - Integration
  - System
- **Testing Techniques**
  - Methods & Tools
    - Manual
    - Automated
  - Runtime
    - Static
    - Dynamic
    - Fuzz
      - Mutation
      - Generation
  - Access to Code
    - White
    - Black
  - Techniques
    - Positive
    - Negative
    - Misuse
    - Decision table analysis
    - State-based analysis
    - Boundary Value Analysis
    - Equivalence Partitioning
  - Efficiency
    - Real User Monitoring
    - Synthetic Performance Monitoring
  - Operational
    - Regression Testing
- Testers / Assessors
  - Internal
  - External
  - Third-Party
    - Type 1
      - SOC 1
      - SOC 2
    - Type 2
      - SOC 3
  - Roles
    - Executive Management
    - Audit Committee
    - Security Officer
    - Compliance Manager
    - Internal Auditors
    - External Auditors
- Metrics
  - Focus
  - KPIs
  - KRIs

Identifying Vulnerabilities

Vulnerability Assessment

Penetration Testing

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

Banner grabbing & Fingerprinting

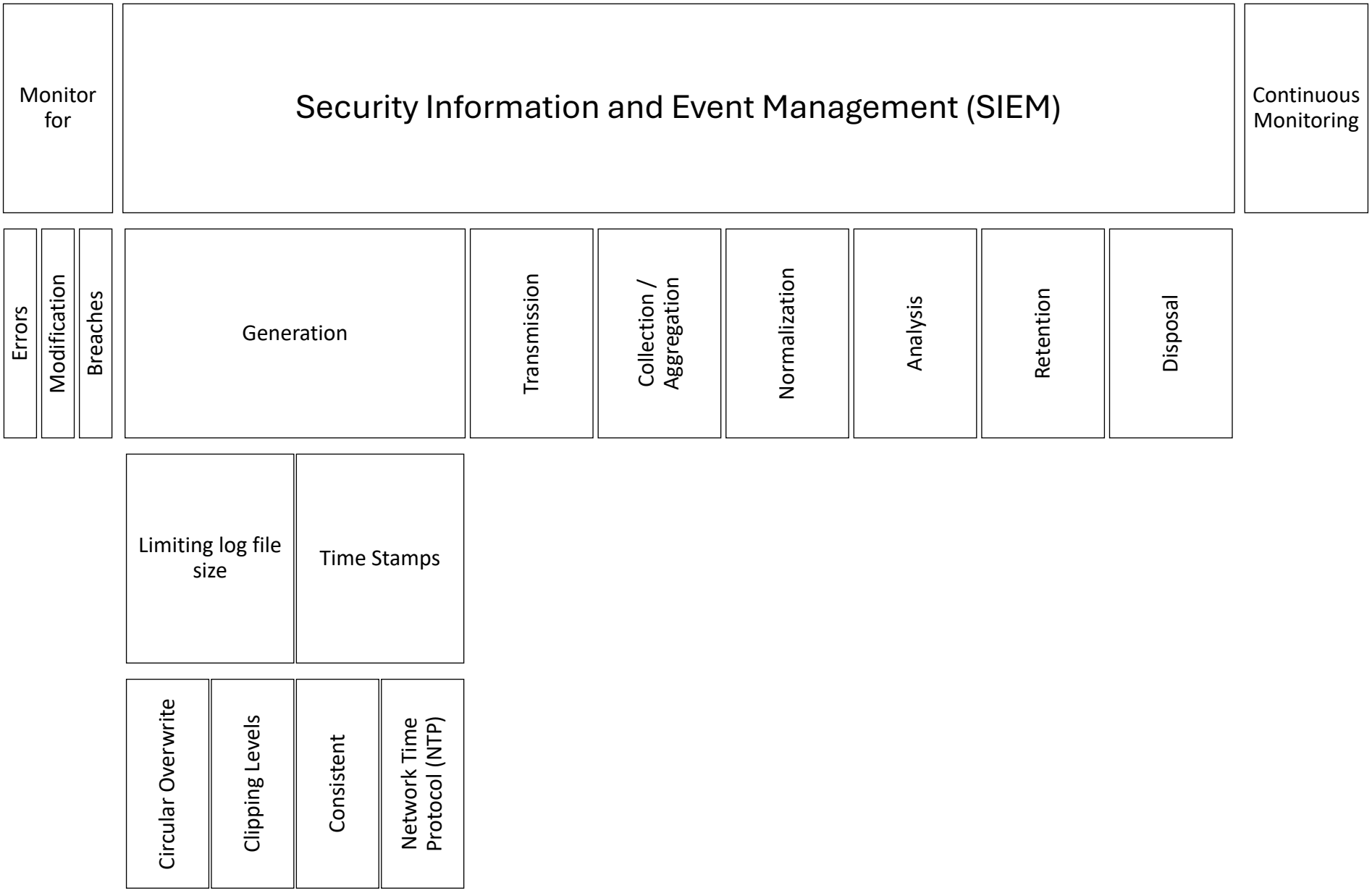
Interpreting & understanding results

- **CVE**
- **CVSS**

SCAP

False positive vs. False negative

Log Review & Analysis



Domain 7

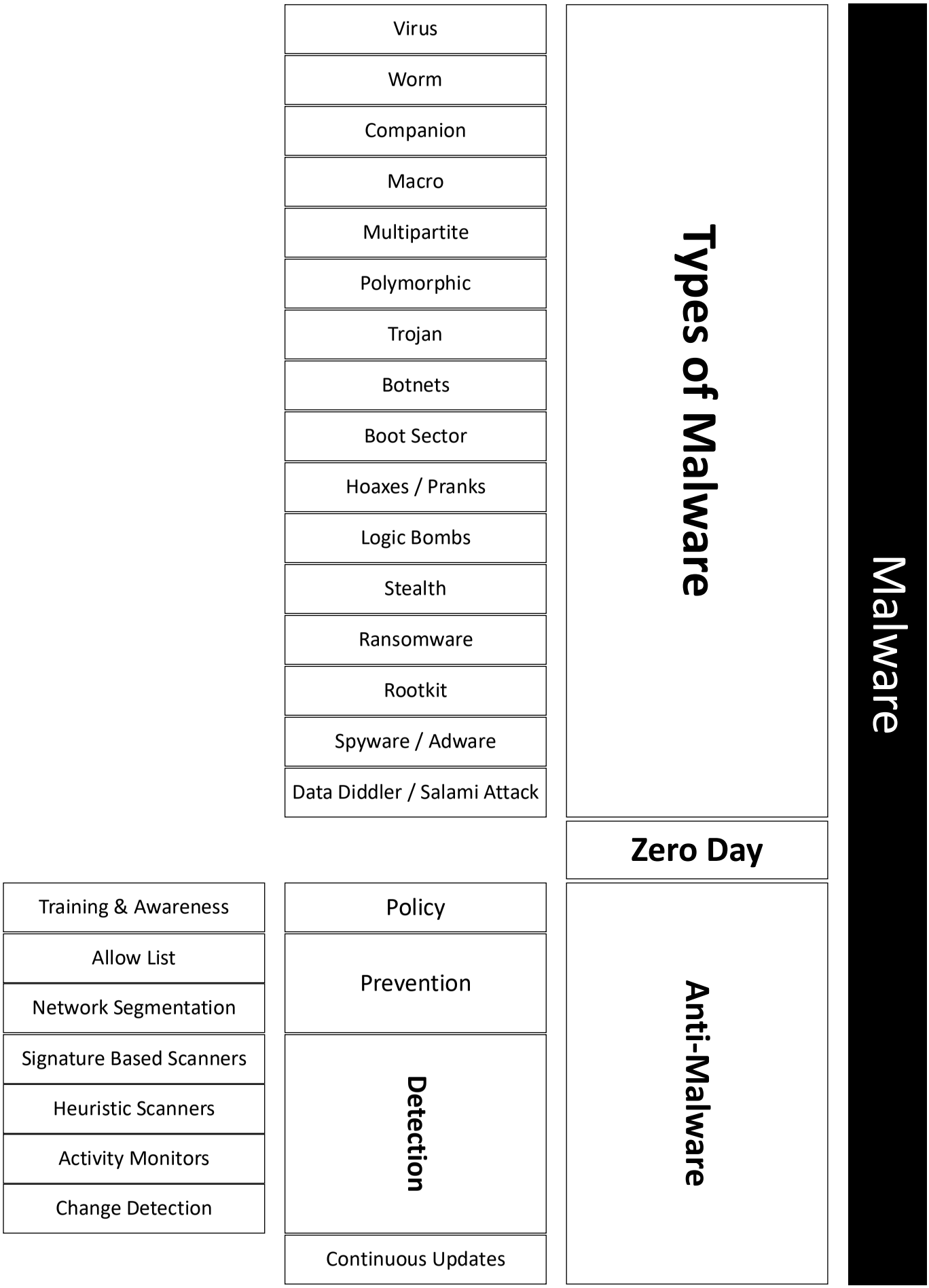
Security Operations

Investigations

- **Secure the Scene**
- **Collect & Control Evidence**
  - **Locard's Principle**
  - **MOM**
  - Sources
    - Oral / Written statements
    - Documents
    - Digital Forensics
      - Live Evidence (Volatile)
      - Secondary Storage (HD)
      - VM Instance / Virtual Disk
    - E Discovery
  - **Chain of Custody**
- **Types of Evidence**
  - Real Evidence
  - Direct Evidence
  - Secondary Evidence
  - Best Evidence Rule
- 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

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				


Malware
Types of Malware
Virus
Worm
Companion
Macro
Multipartite
Polymorphic
Trojan
Botnets
Boot Sector
Hoaxes / Pranks
Logic Bombs
Stealth
Ransomware
Rootkit
Spyware / Adware
Data Diddler / Salami Attack
Zero Day
Anti-Malware
Policy
Prevention
Detection
Continuous Updates
Training & Awareness
Allow List
Network Segmentation
Signature Based Scanners
Heuristic Scanners
Activity Monitors
Change Detection

Patching

Determine if Patch is available					**Implement through Change Management**		
Threat Intelligence	Vendor Notification	Pro-actively checking			Timing	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.	CCB CAB ECAB				Test New Functionality	Regression Testing	

Recovery Strategies

- Failure Modes
  - Fail-Soft
  - Fail-Secure
  - Fail-Safe
- **Backup Storage**
  - Archive Bit
  - Types of Backups
    - Mirror
    - Full
    - Incremental
    - Differential
  - Validation
    - Checksums / CRC
  - Data Storage
    - Offsite
    - Tape Rotation
  - RPO
- Spare Parts
  - Cold
  - Warm
  - Hot
- **RAID**
  Redundant Array of Independent Disks
  - **RAID 0** - Striping
  - **RAID 1** - Mirroring
  - **RAID 5** - Parity
  - **RAID 6** - Double Parity
- High Availability System
  - Clustering
  - Redundancy
- Recovery Sites
  - Types of Sites
    - Cold
    - Warm
    - Hot
    - Mobile
    - Mirror / Redundant
  - Geographically remote

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

Restoration order

- Most critical first
- Dependency charts

Domain 8

Software Development Security

Secure Software Development

- Bake In Security
- **System Life Cycle (SLC)**
  - **Software Development Life Cycle (SDLC)**
    - Plan + Mgmt. Approval
    - Requirements
    - Architecture & Design
    - **Development**
    - Testing
    - Deployment
    - Operation
    - Disposal
  - Waterfall
  - Agile
  - DevOps
  - Canary
  - Certification
  - Accreditation
  - Cannot go back
  - Sprints
  - Scrum Master
  - Combine Dev, QA & Ops
  - SecDevOps
- Maturity Models
- APIs
  - REST
  - SOAP
- Obfuscation
  - Lexical, Data, Control flow
- Acquire Software
  - Assess vendors
  - Contracts, / SLAs
- **Software Security Weaknesses & Vulnerabilities**
  - Buffer Overflows
  - SQL Injection
  - XSS / CSRF
  - Covert Channels
  - Backdoors / Trapdoors
  - Memory / Object Reuse
  - TOCTOU
  - Citizen Developers
- Secure Programming
  - Input Validation
  - Session Management
  - Polyinstantation
- Maintain Software
  - SCM
  - SOAR

Databases

- **Components**
  - Hardware
  - **Software**
  - Language (SQL)
  - Users
  - Data
- **Maintaining Integrity of Data**
  - Concurrency
  - Locks
  - A Atomicity
  - C Consistency
  - I Isolation
  - D Durability
- SQL Injection

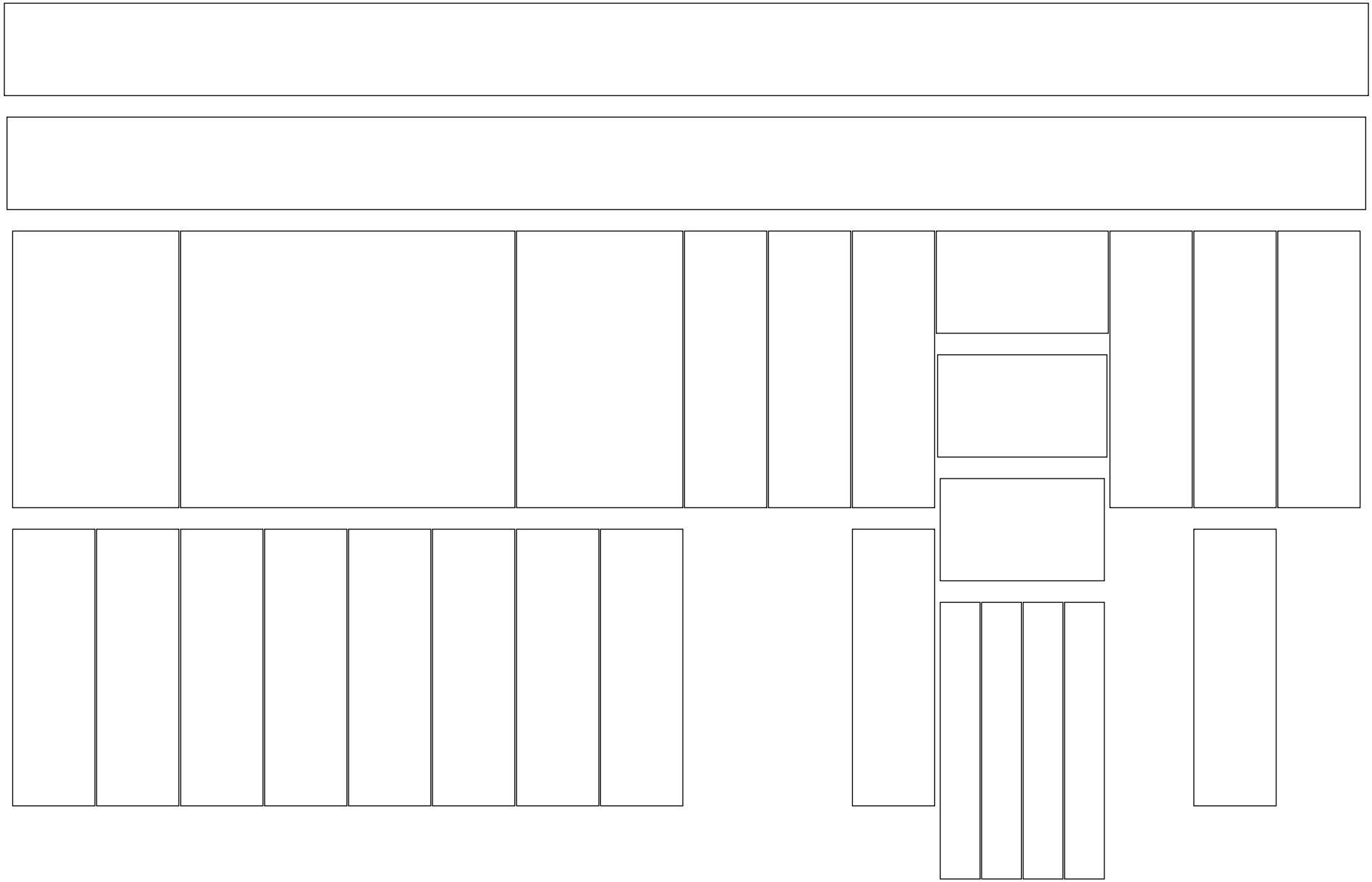
- **Database**
- **Tables**
  - Rows = Tuples / Records
  - Columns = Attributes
  - Fields
  - Primary & Foreign Keys

Printable Blank MindMaps

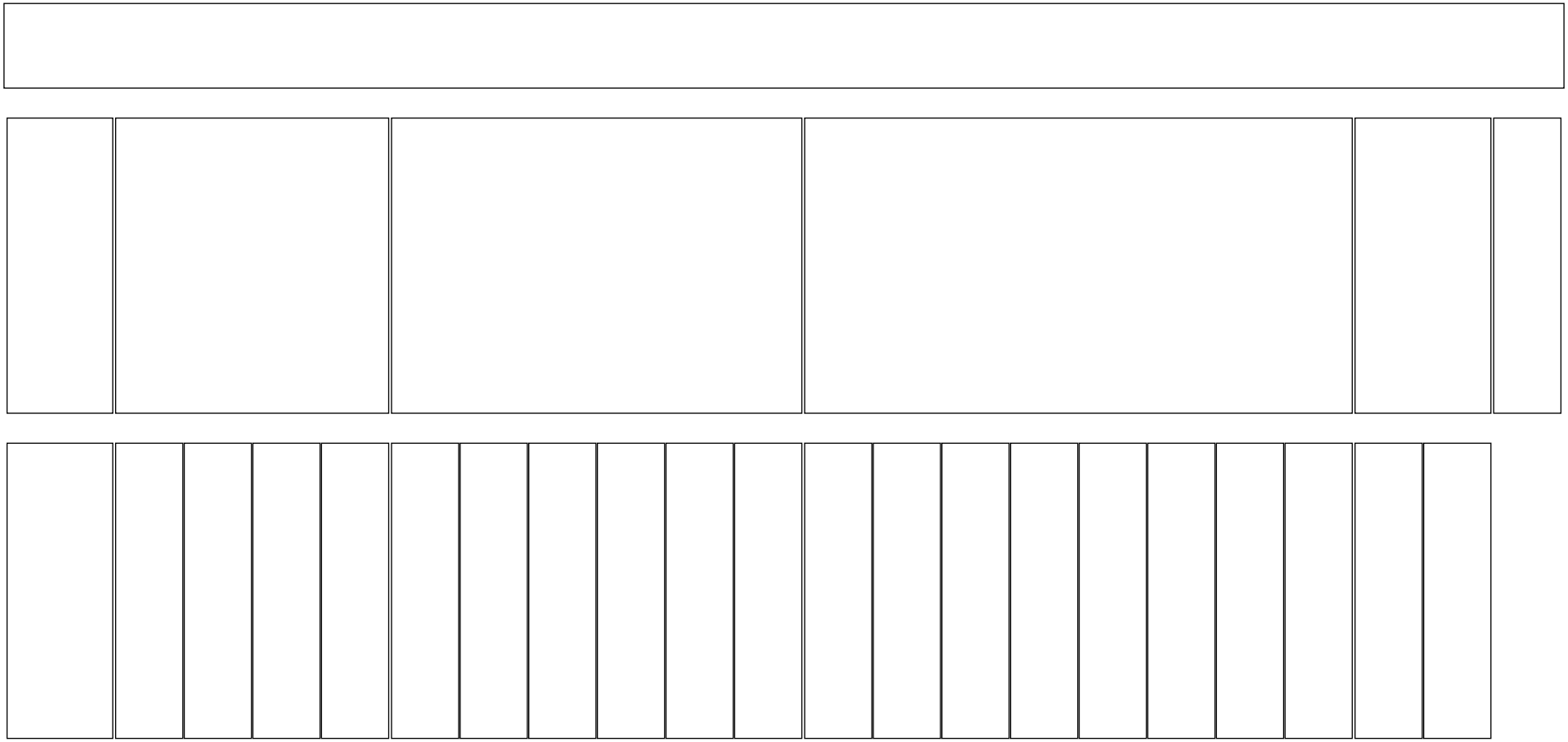
Print out the following blank MindMaps and fill them in as your watch our MindMap videos!

Print pages **41** to **70**

Alignment of Security Function to Business Strategy

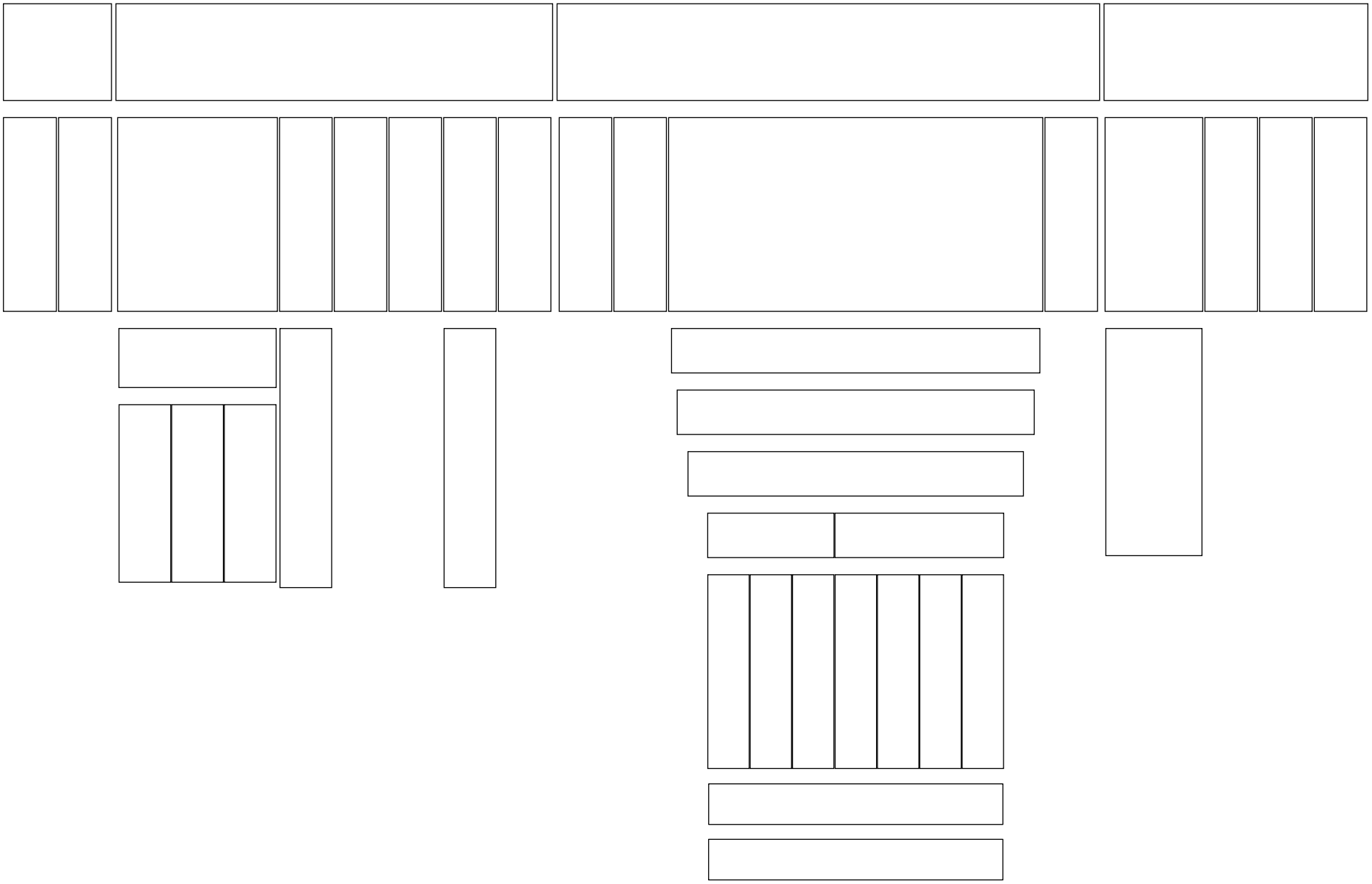


Privacy

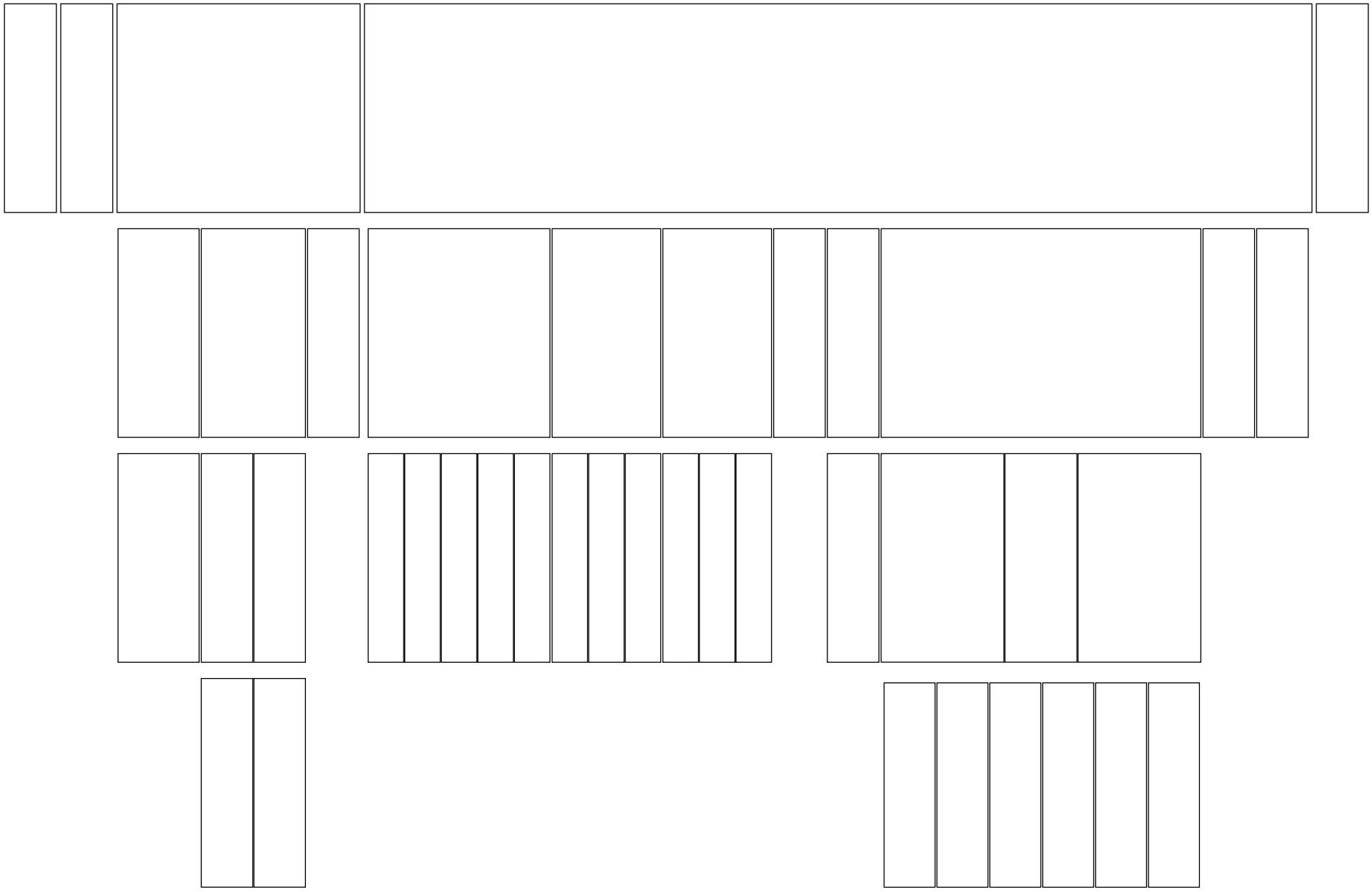


Intellectual Property

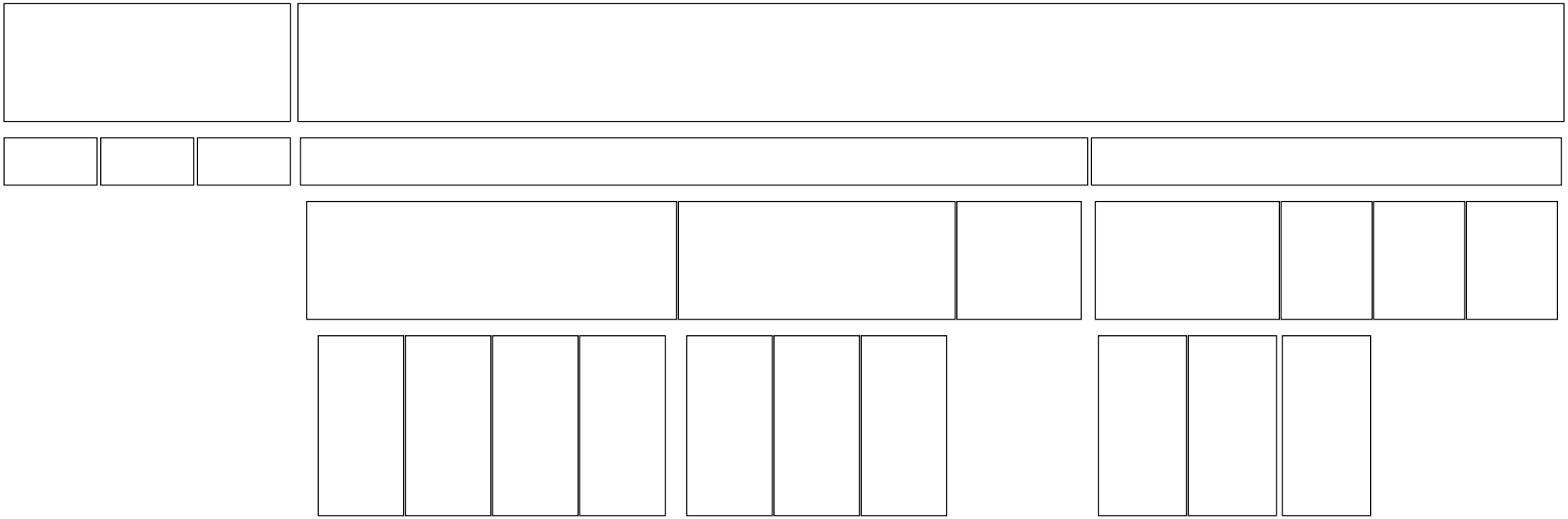
Risk Management



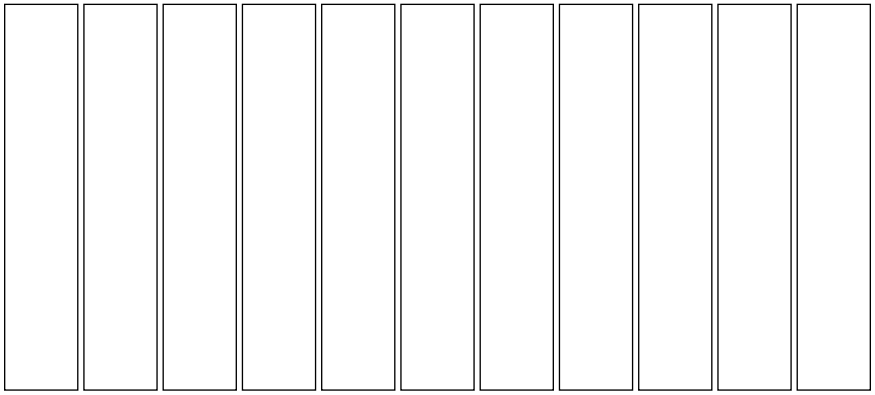
Asset Classification



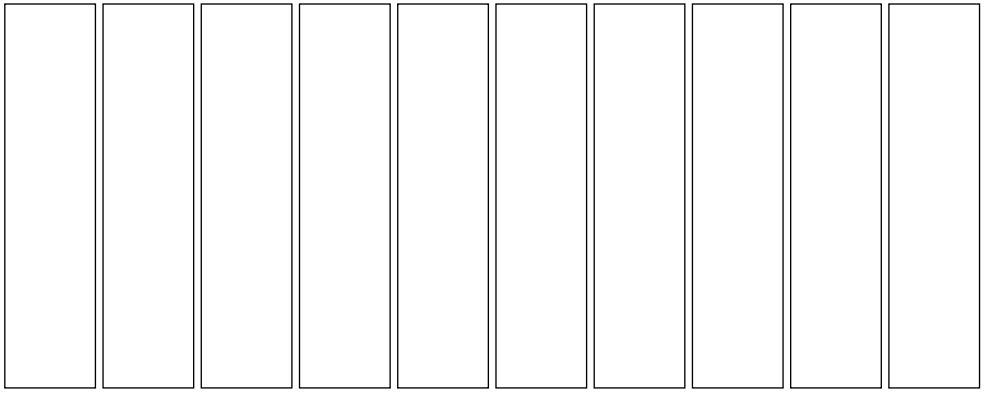
Models



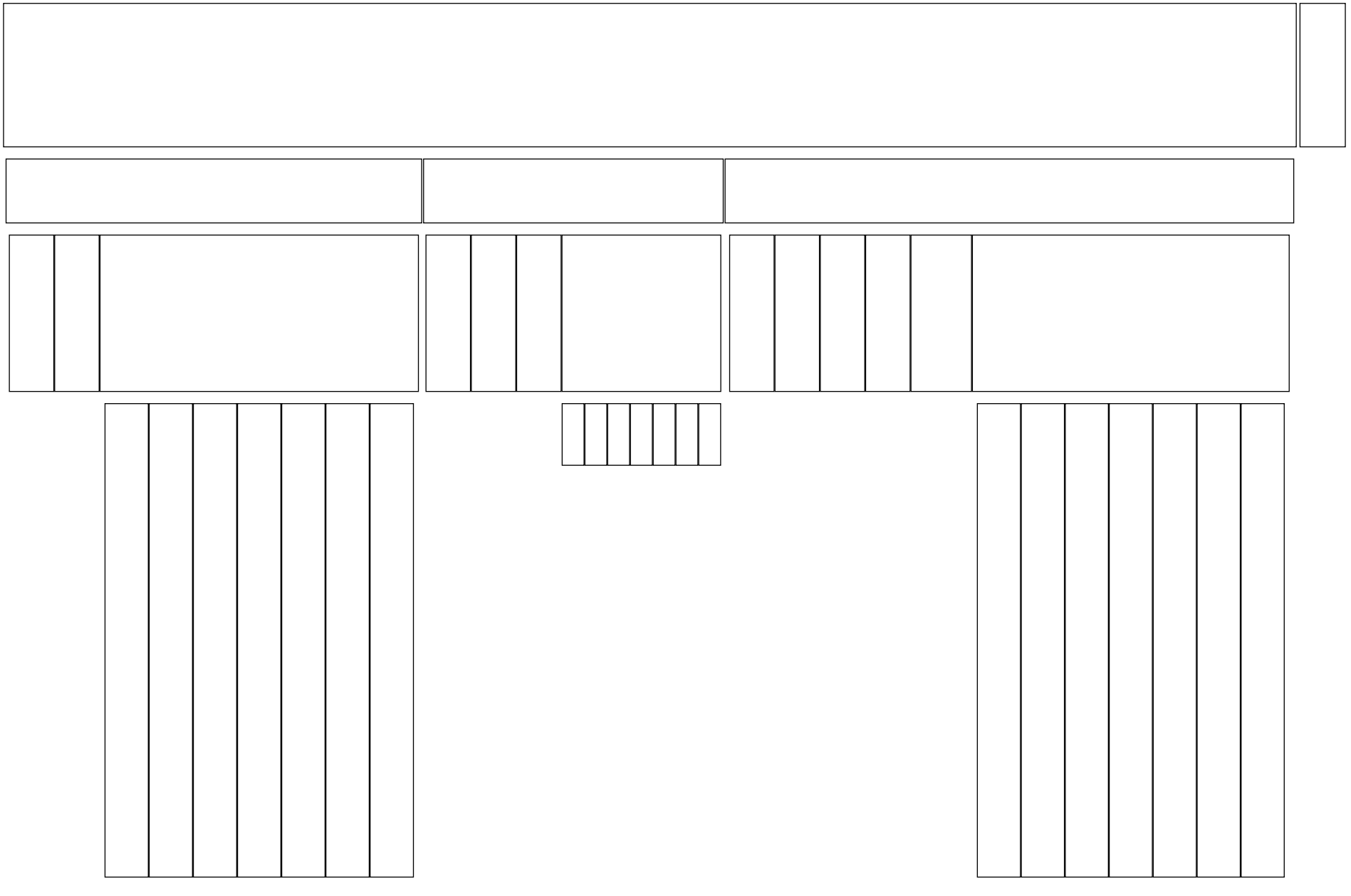
Secure Design Principles



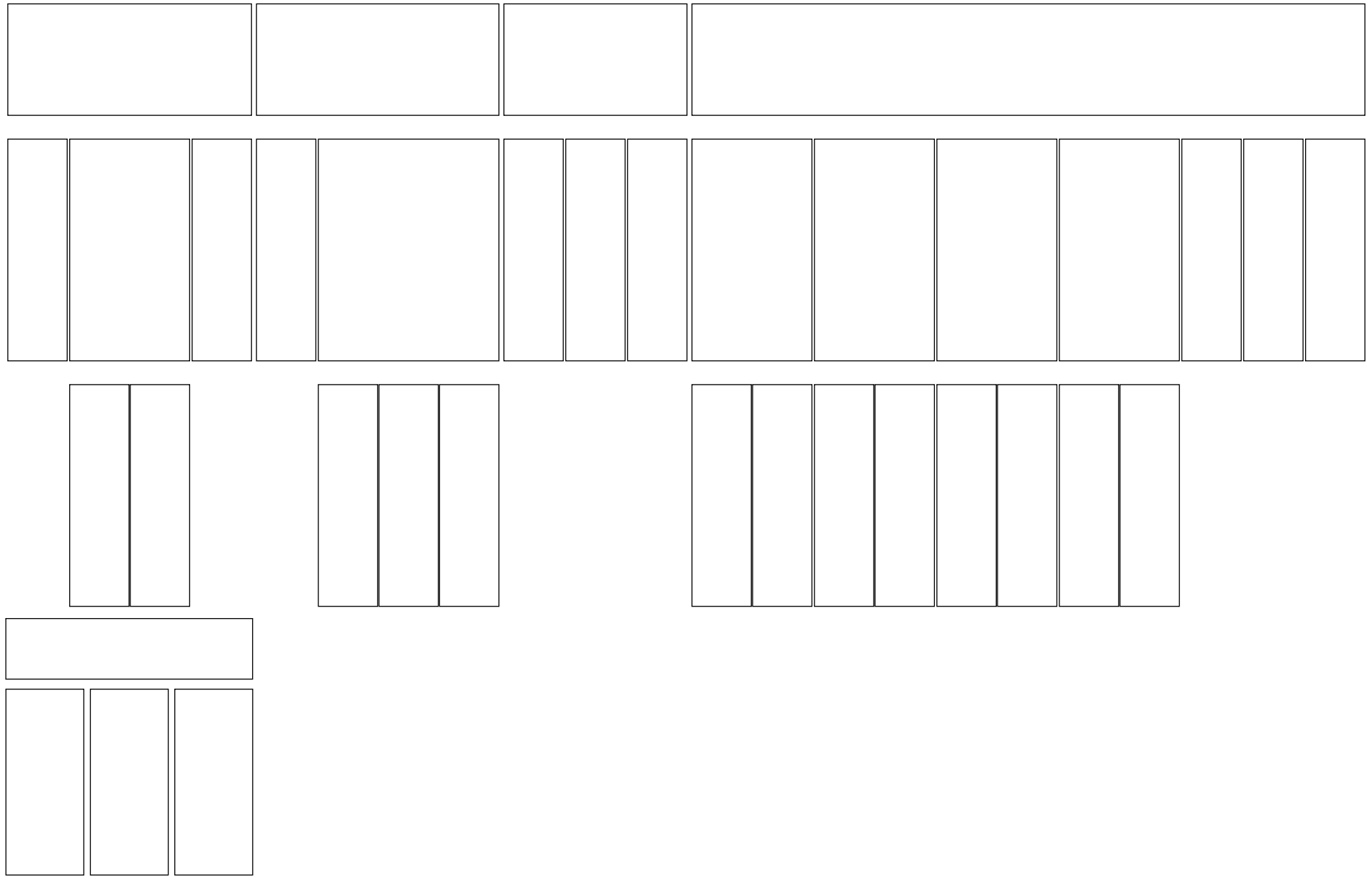
Security Frameworks



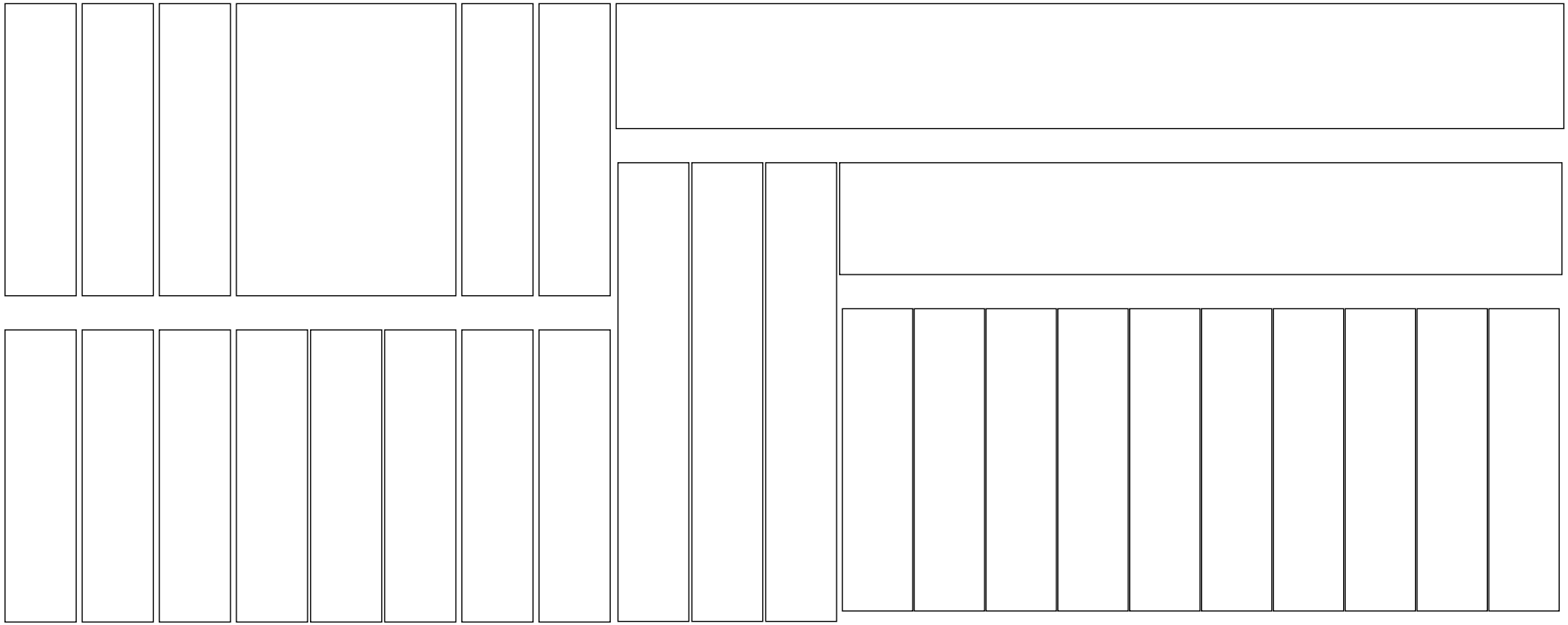
Evaluation Criteria



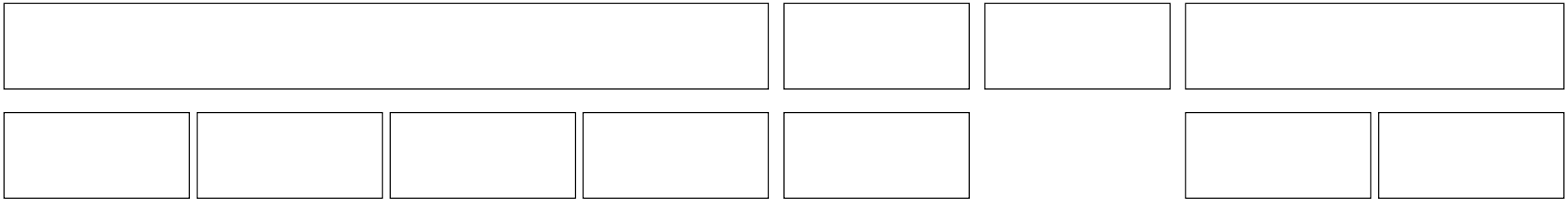
Trusted Computing Base (TCB)



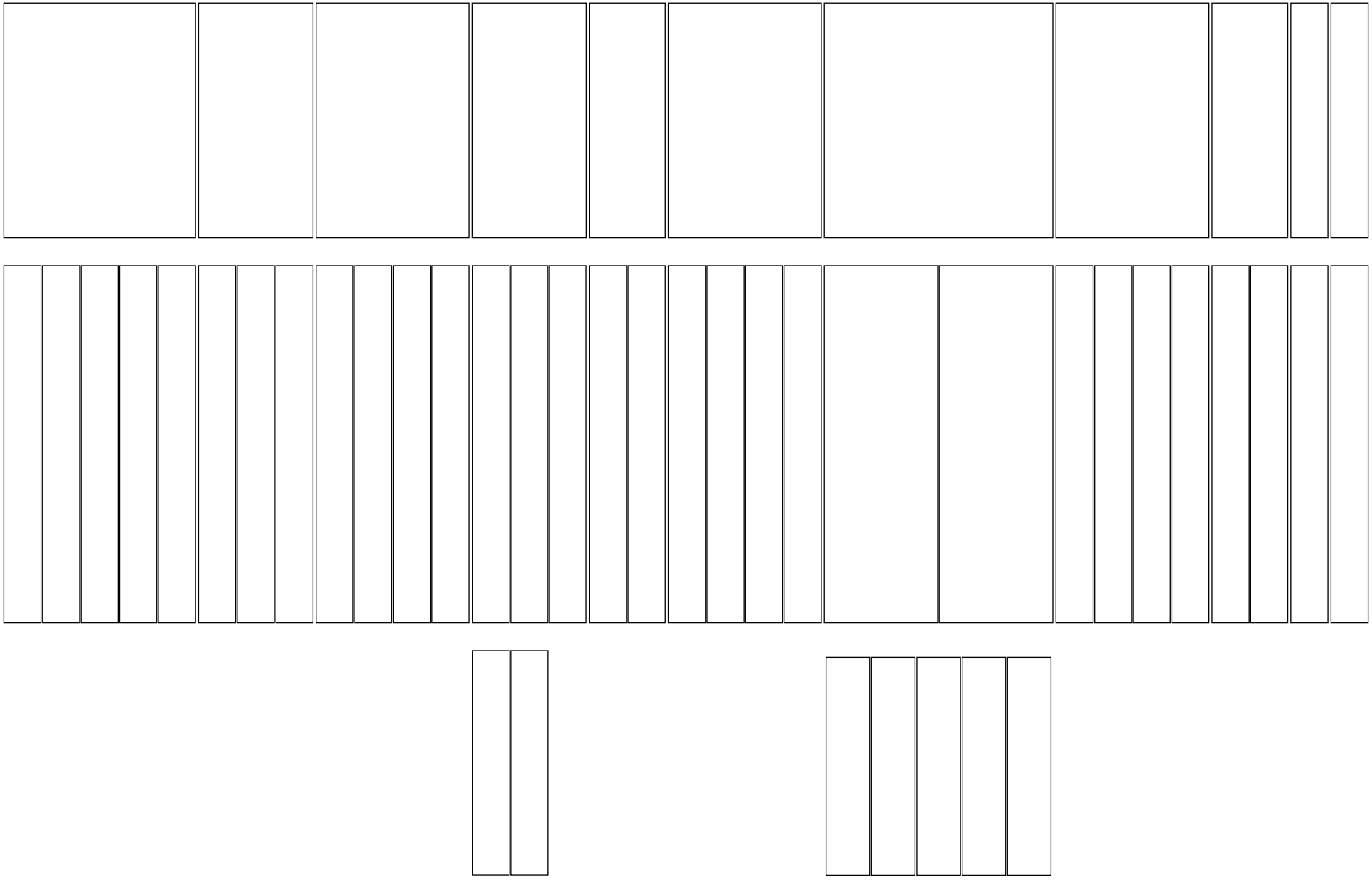
Vulnerabilities in Systems



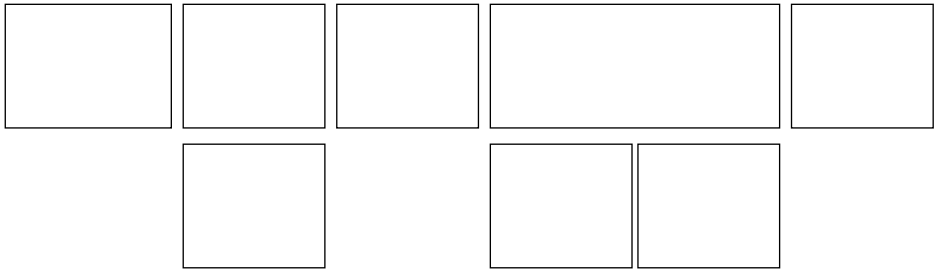
Web-based Vulnerabilities



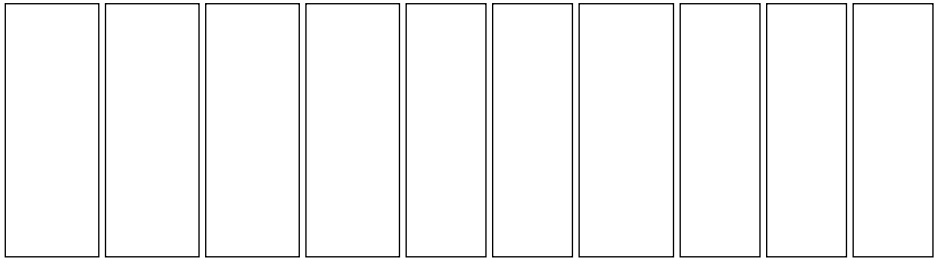
Cloud Computing



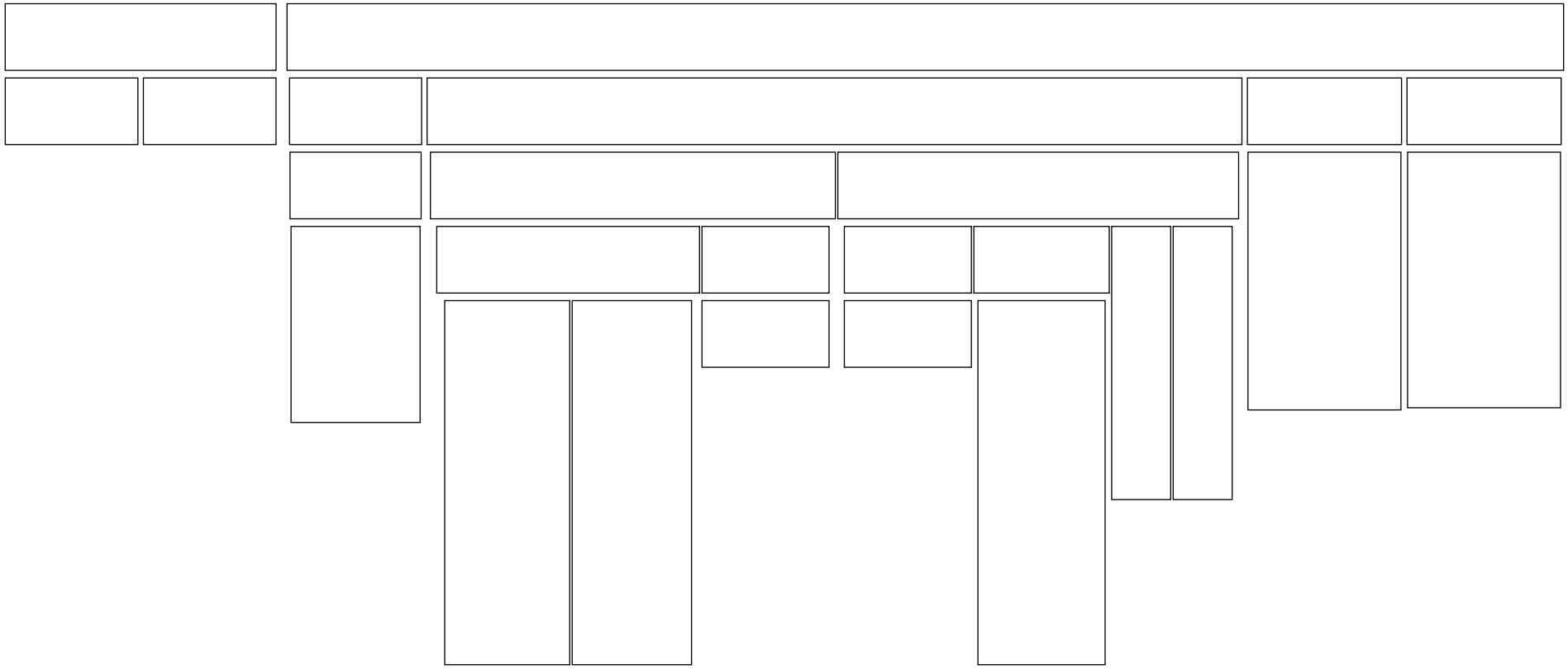
Cryptographic Services



Cryptographic terminology



Secret Writing



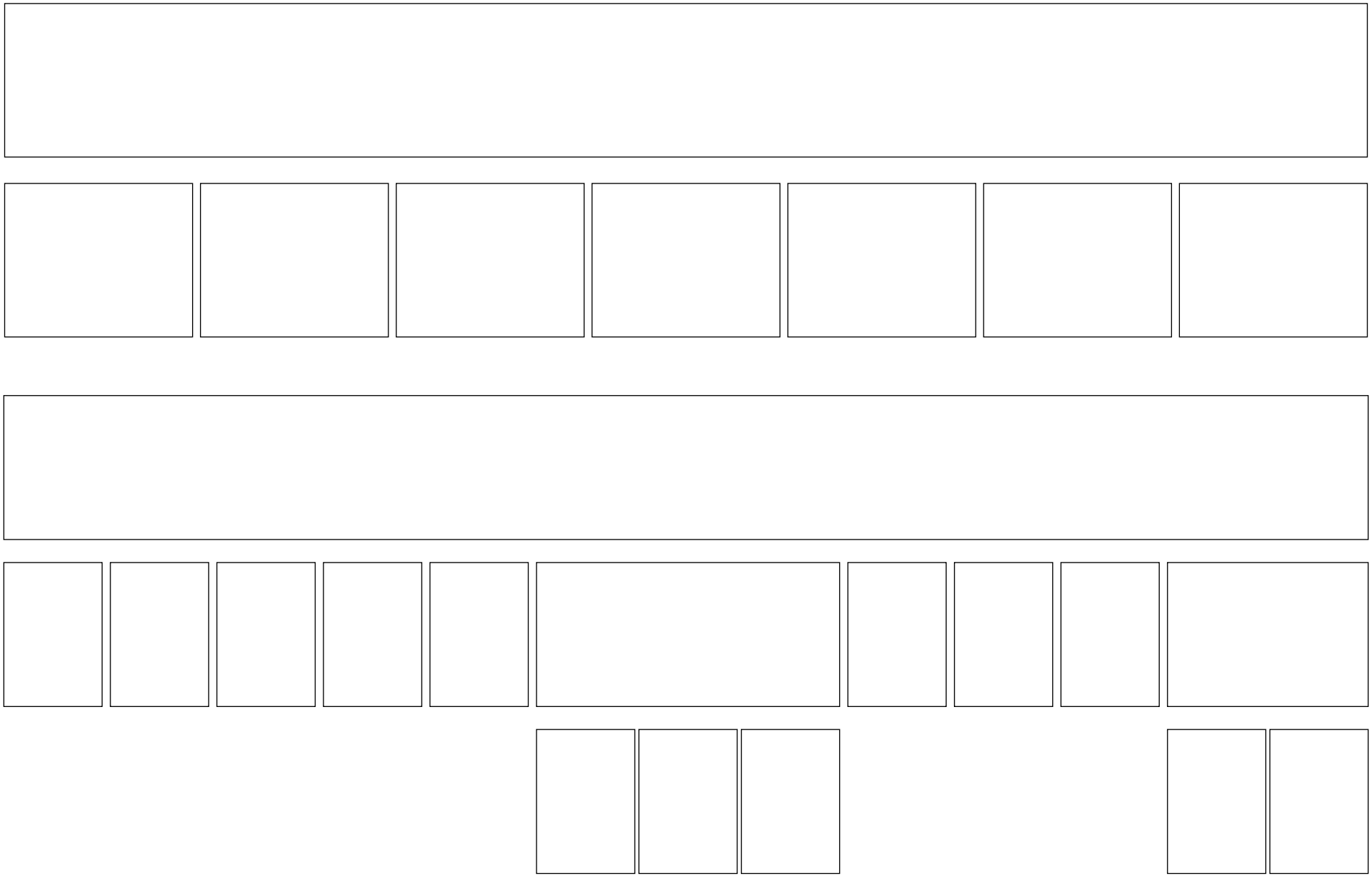
Digital Signatures

Digital Certificates

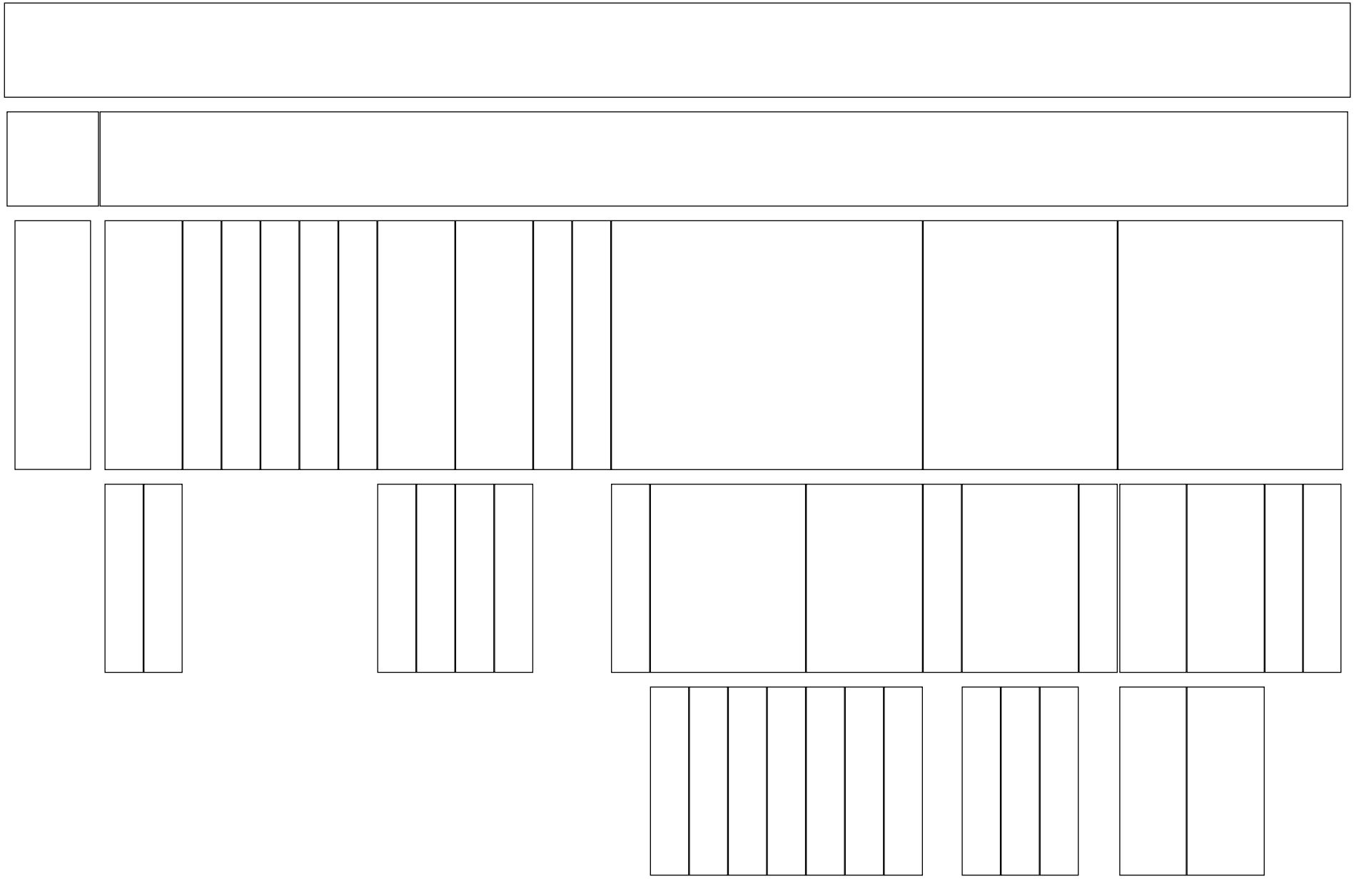
PKI

Key Management

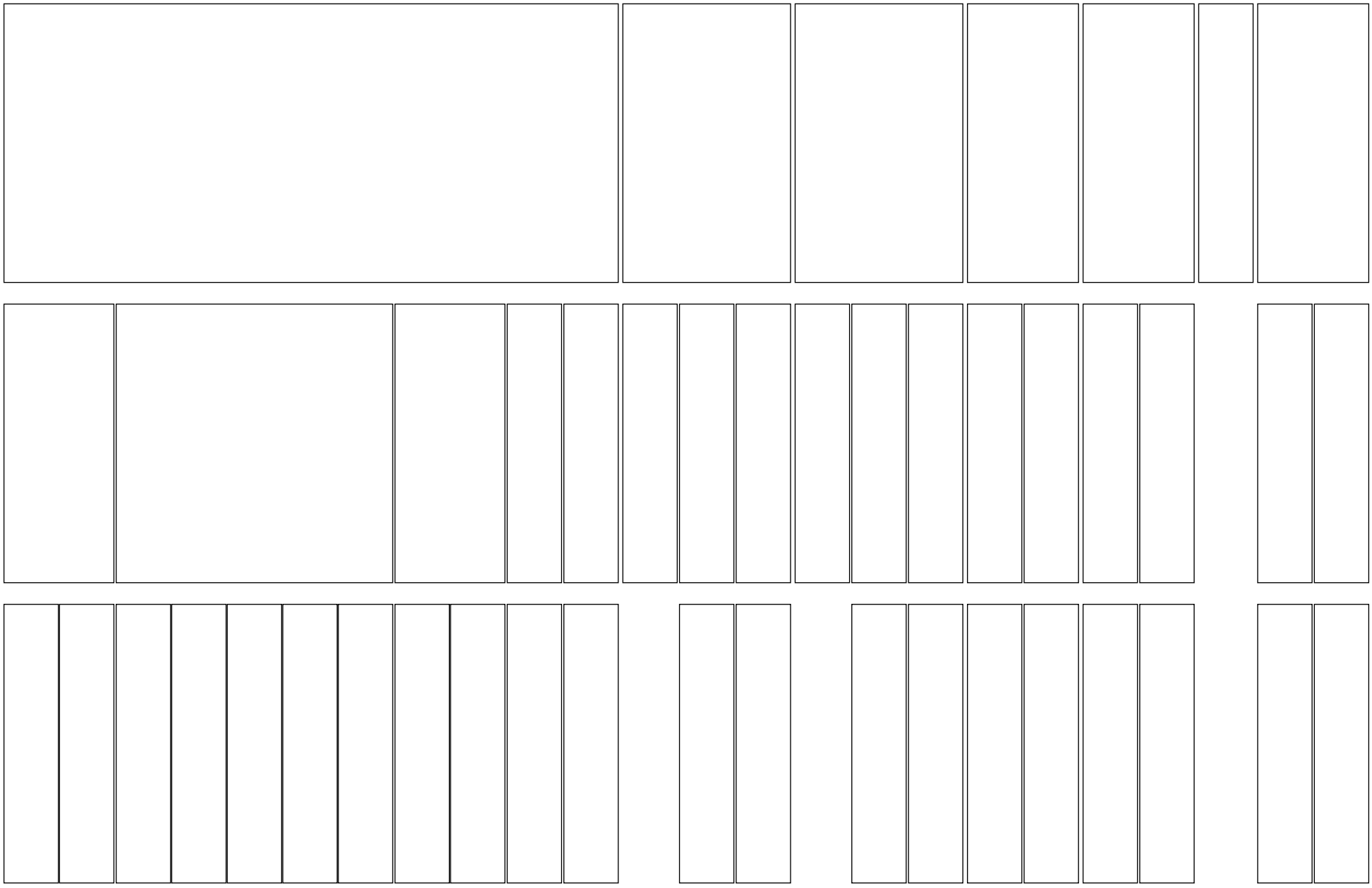
Cryptanalysis



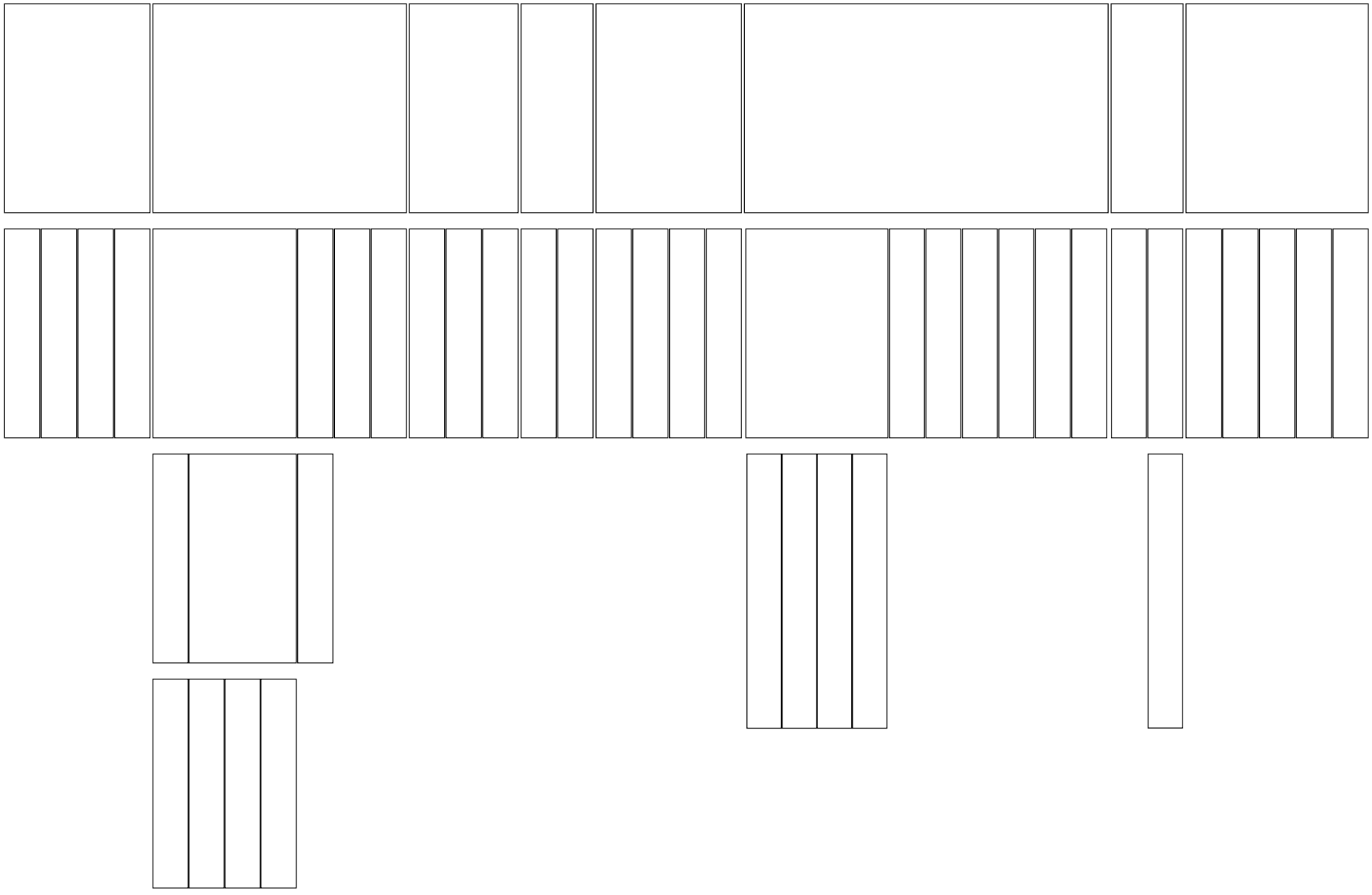
Physical Security



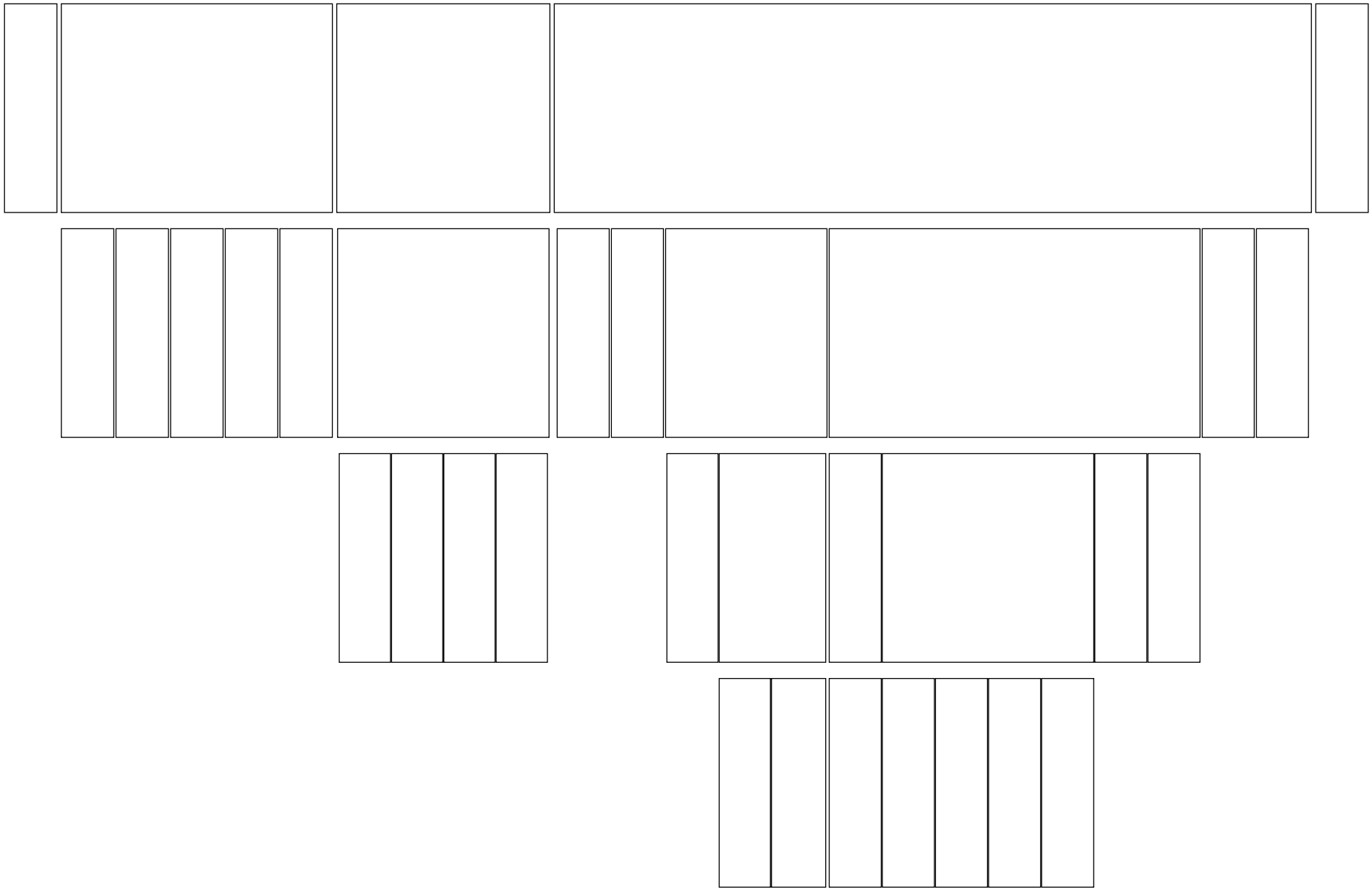
Open Systems Interconnection (OSI) Model



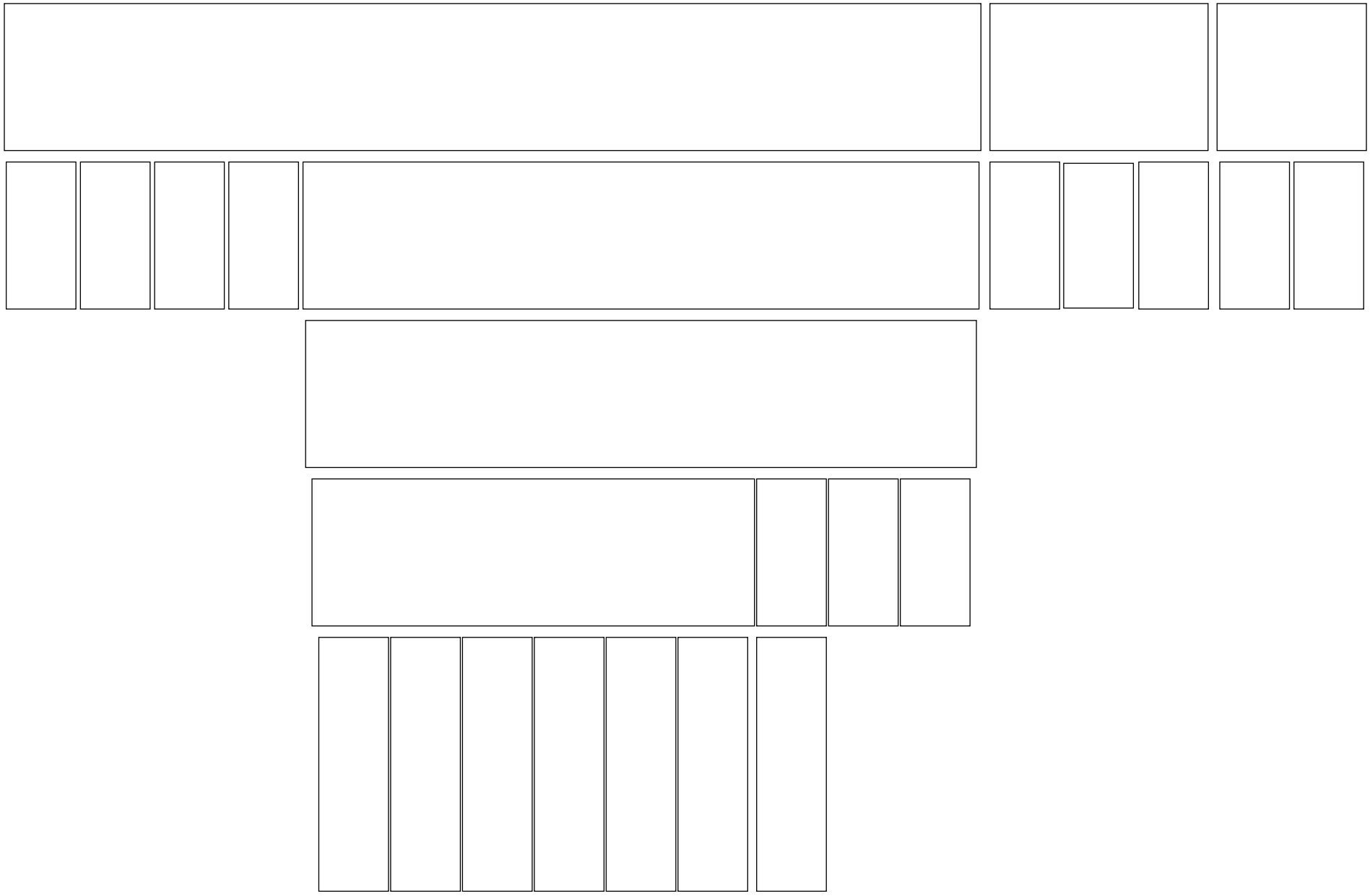
Networking



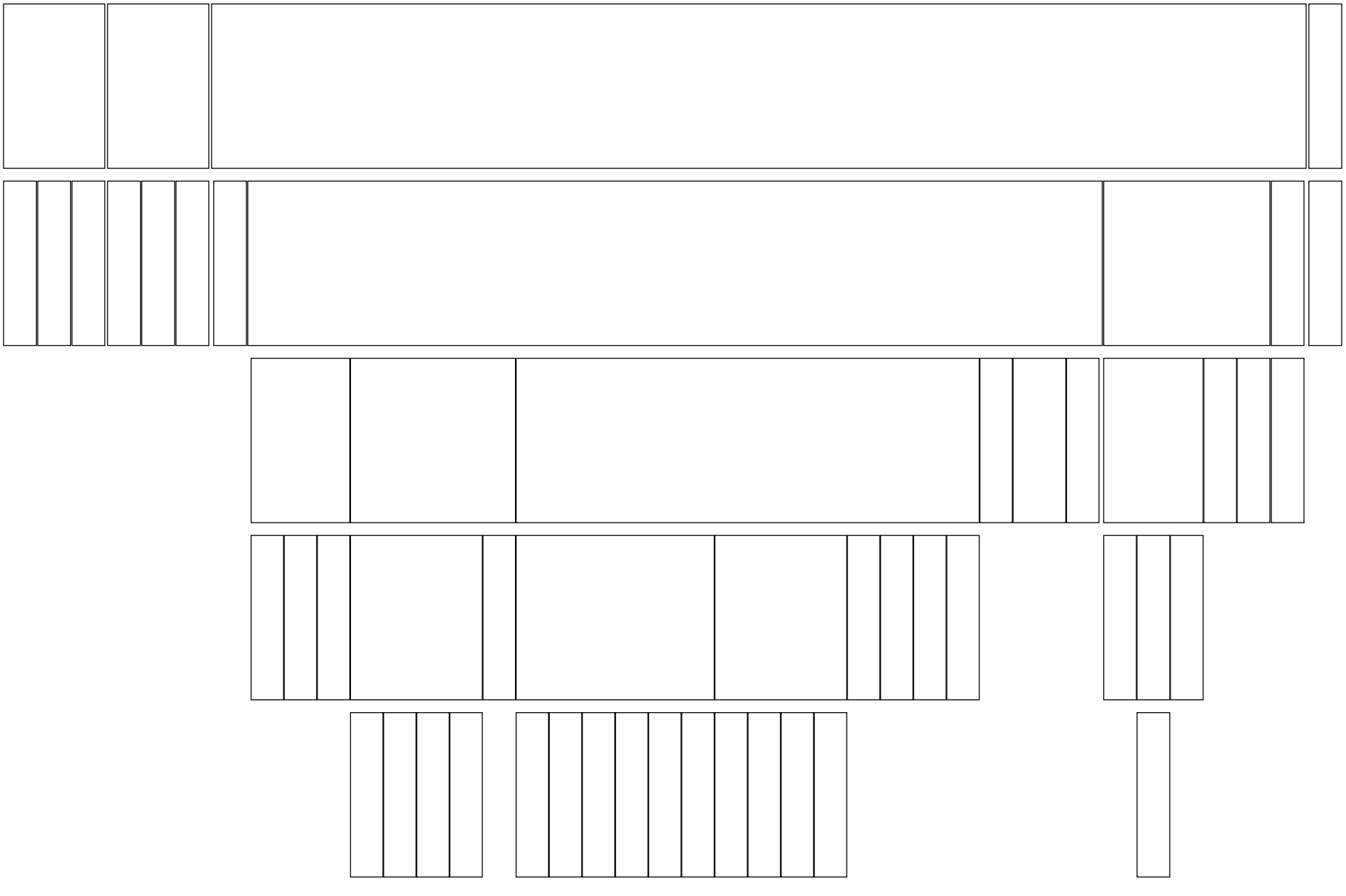
Network Defense



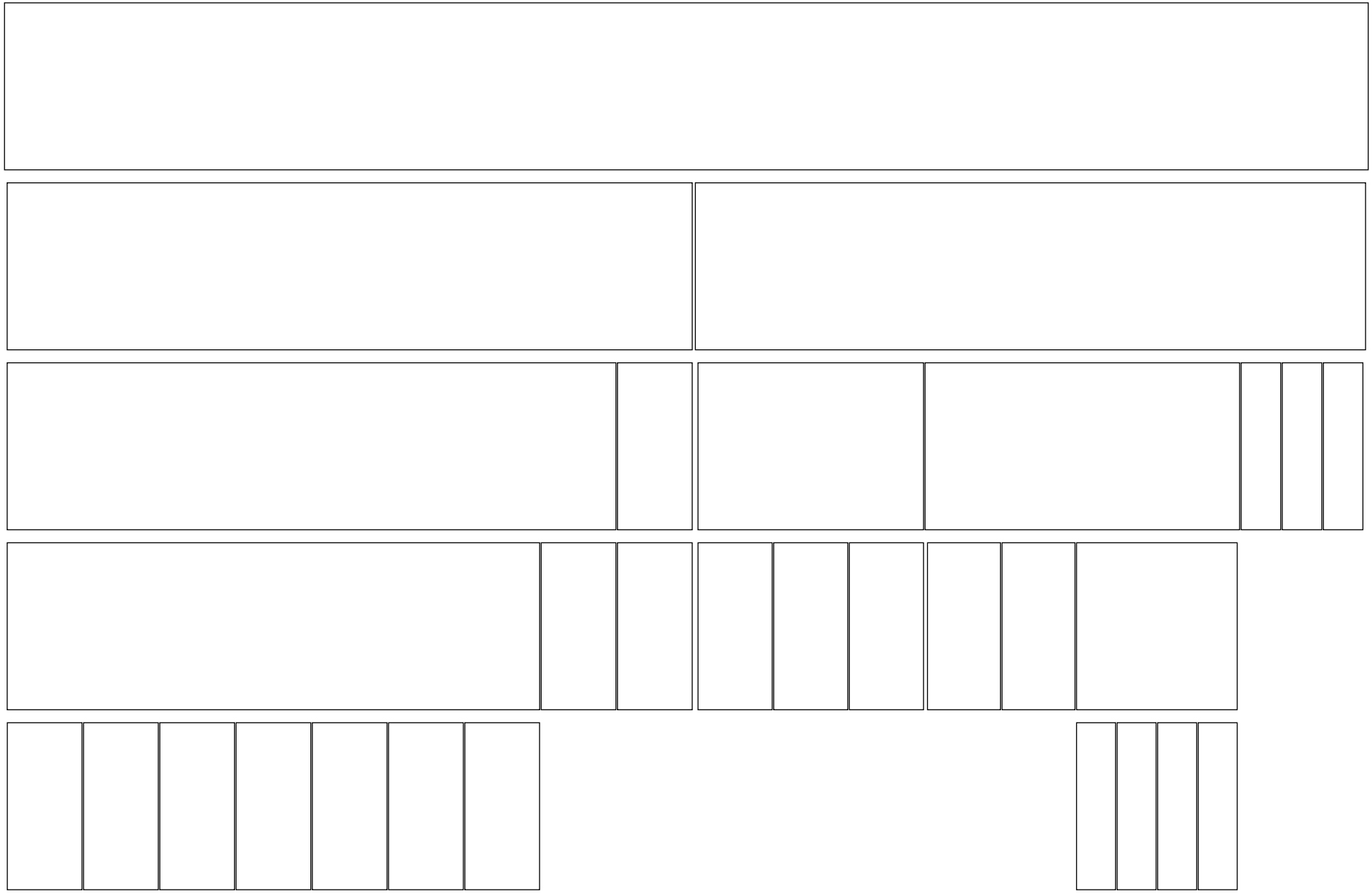
Remote Access



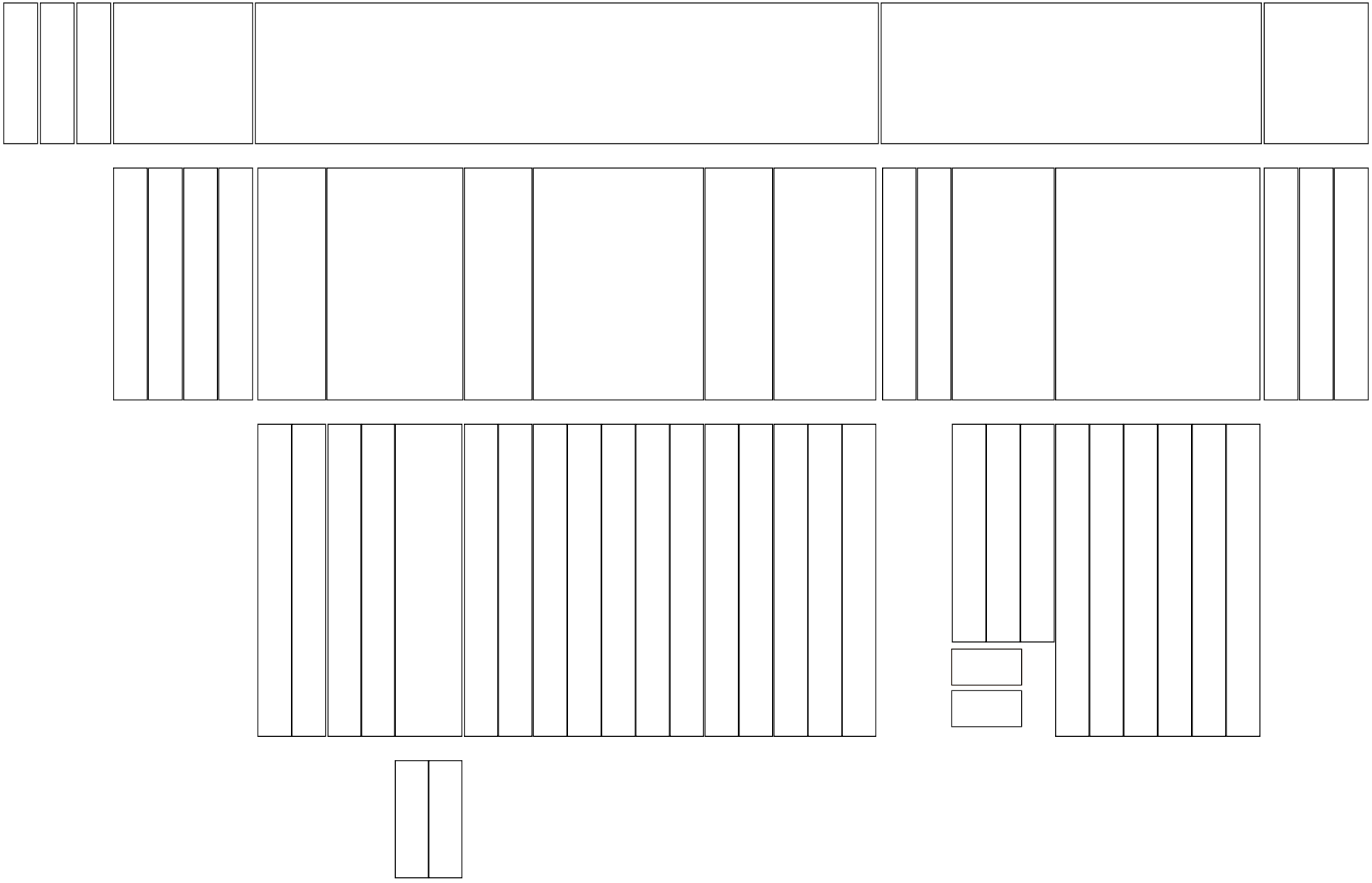
Access Control



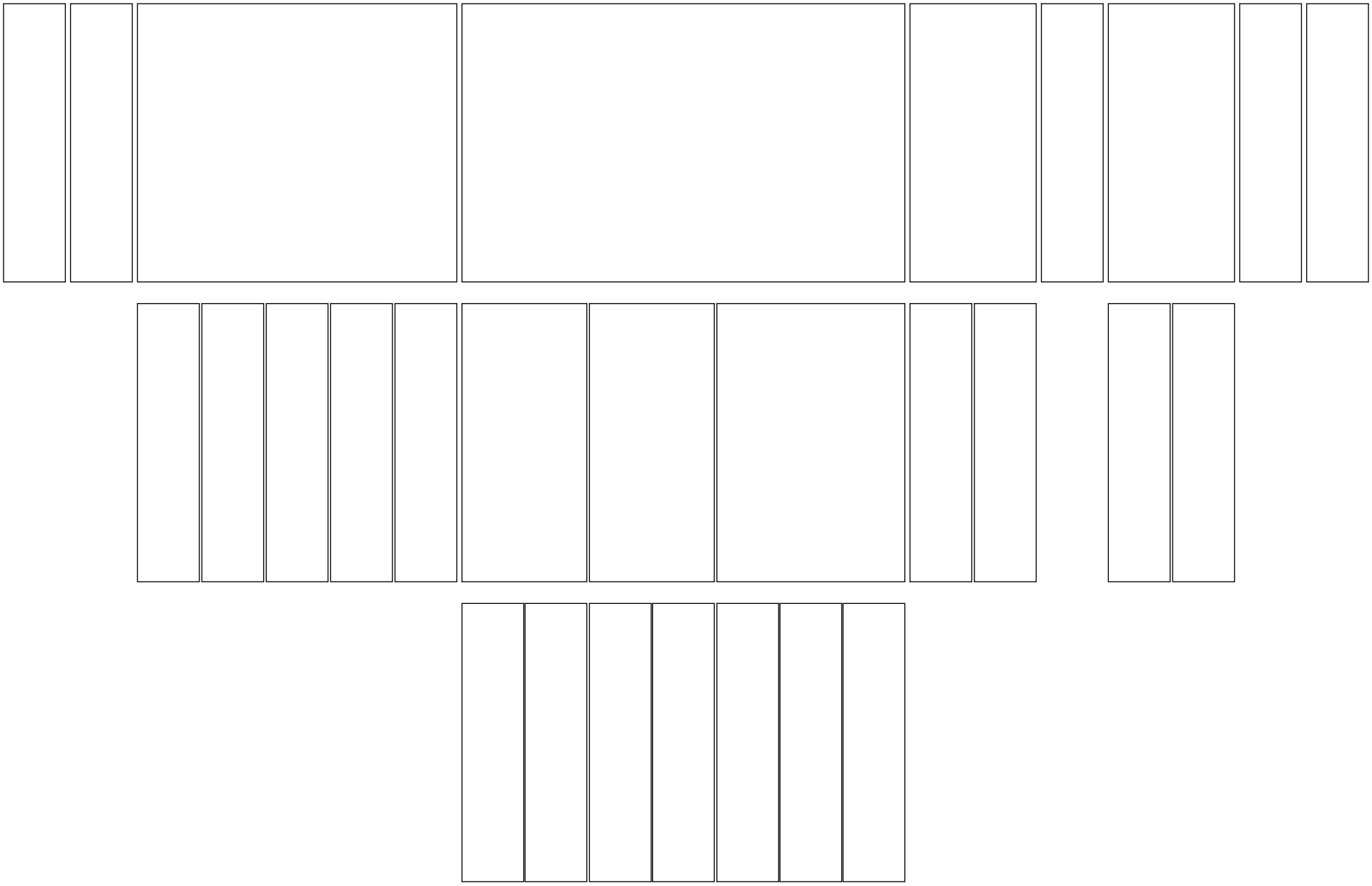
Single Sign-on / Federated Access



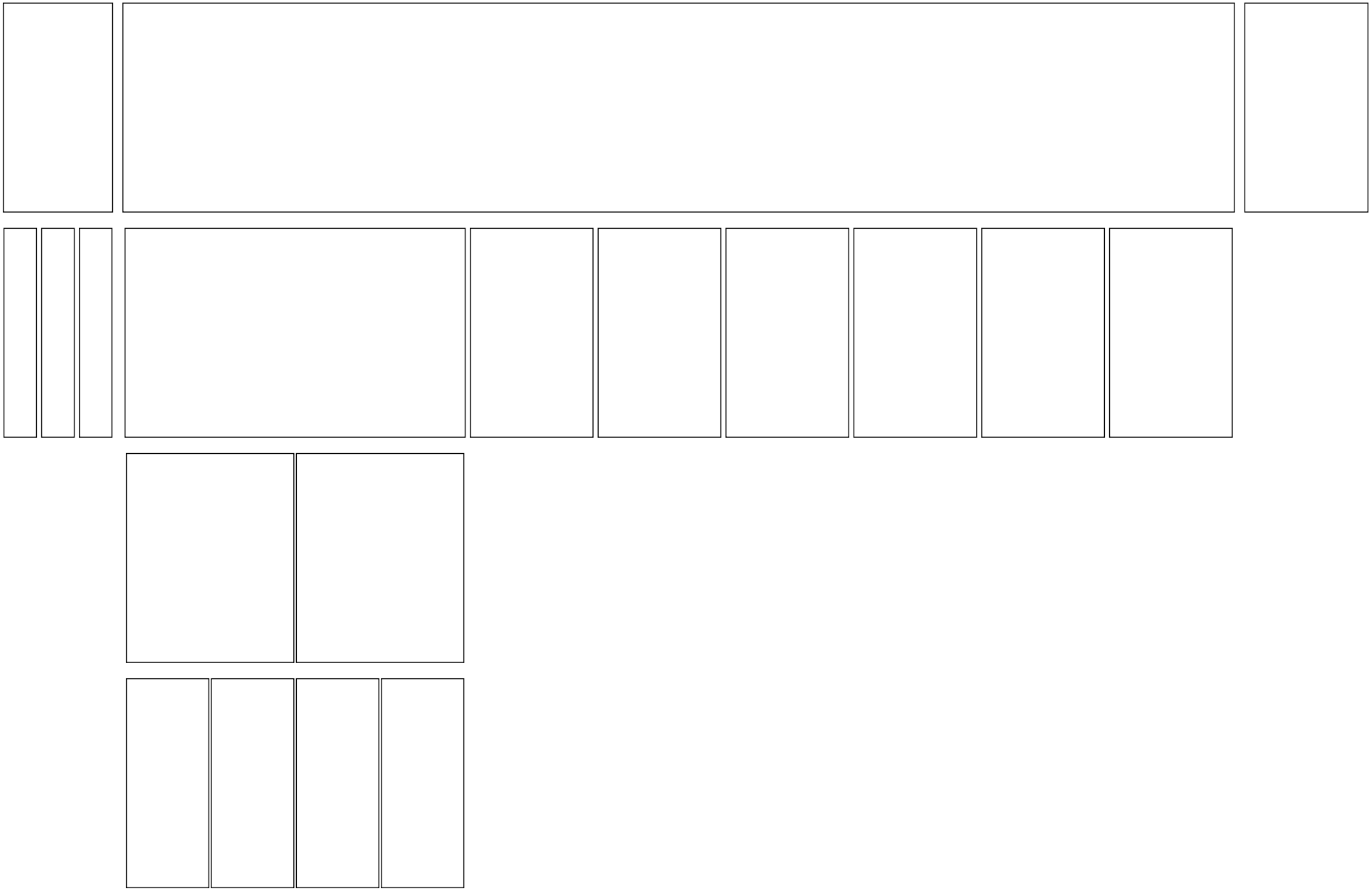
Security Assessment and Testing



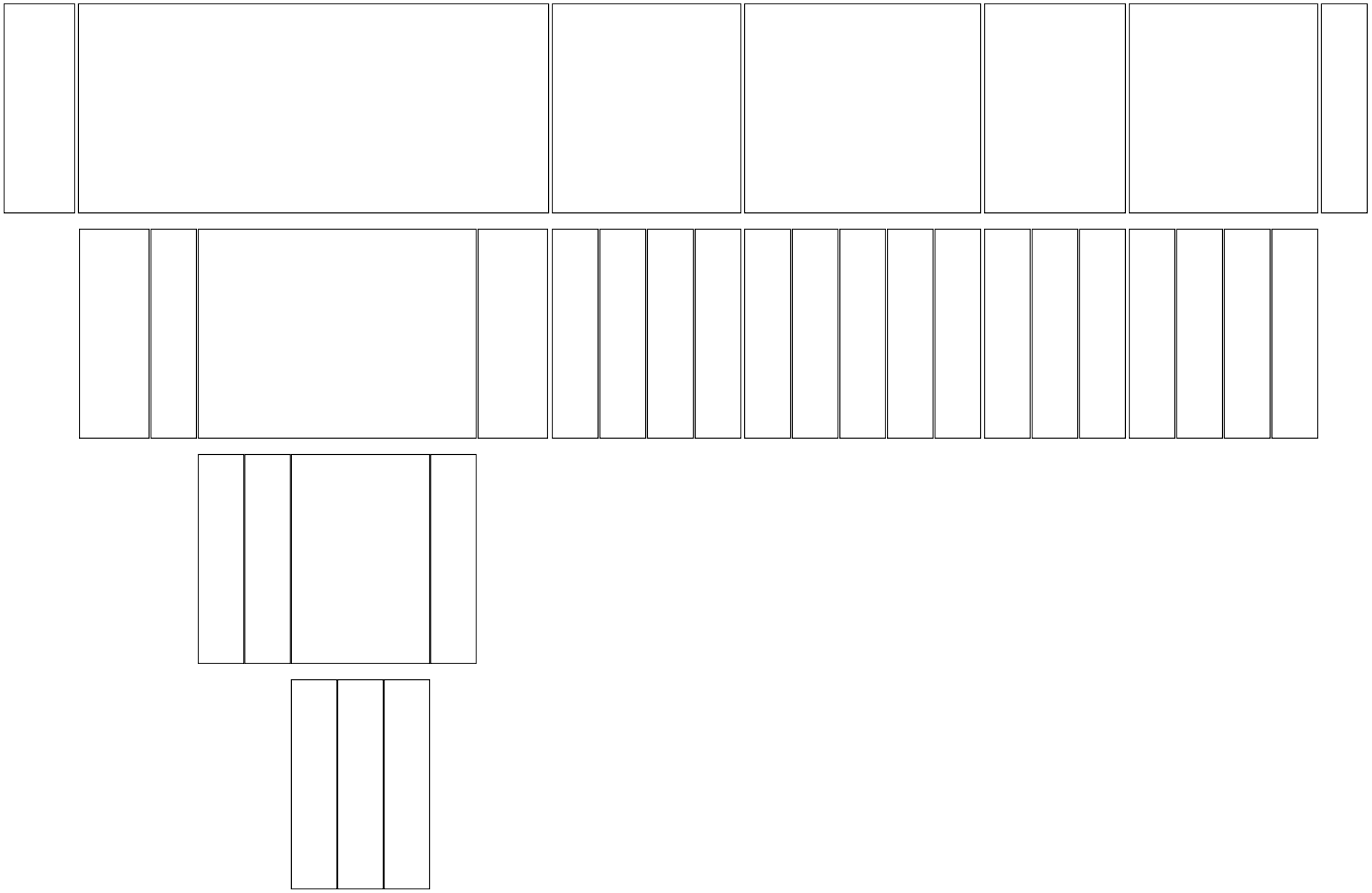
Identifying Vulnerabilities



Log Review & Analysis

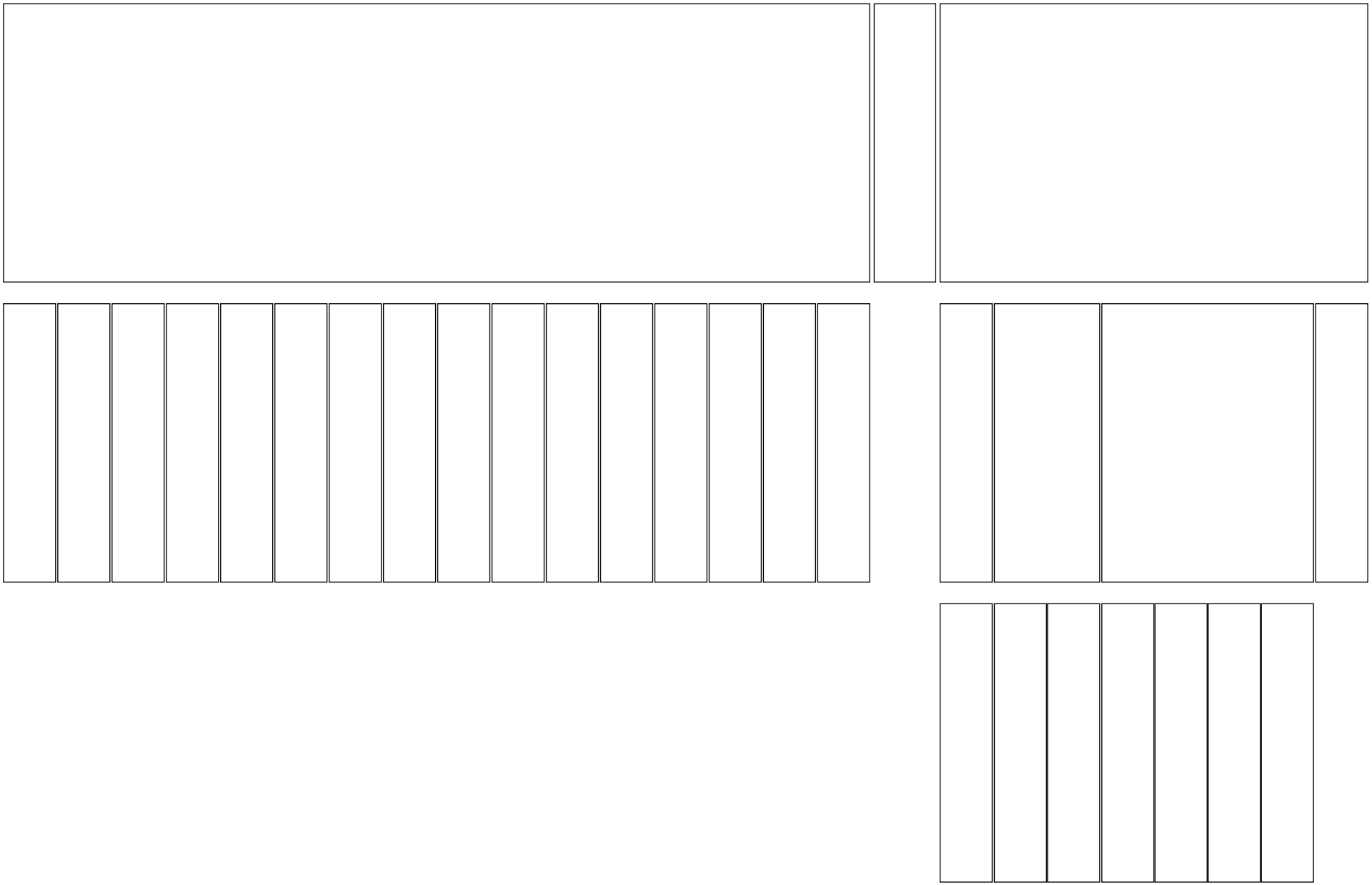


Investigations

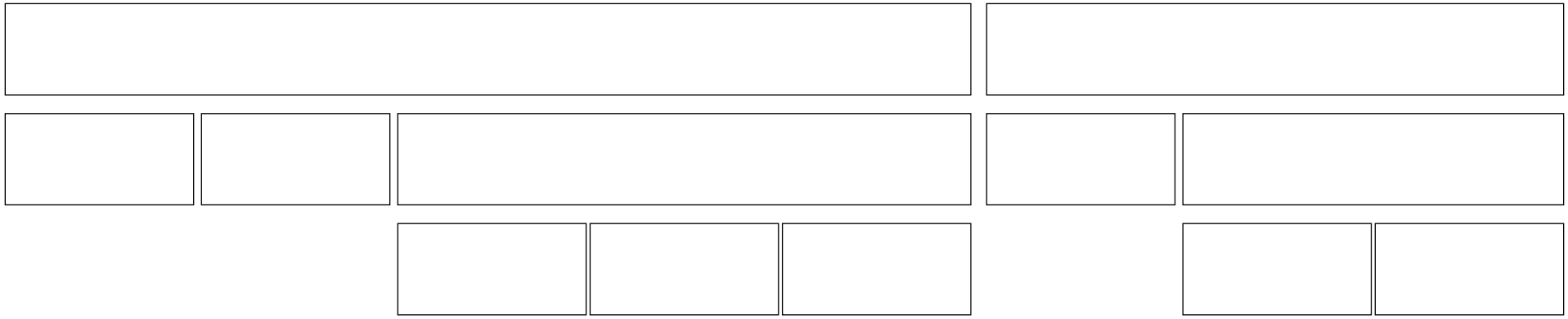


Incident Response

Malware



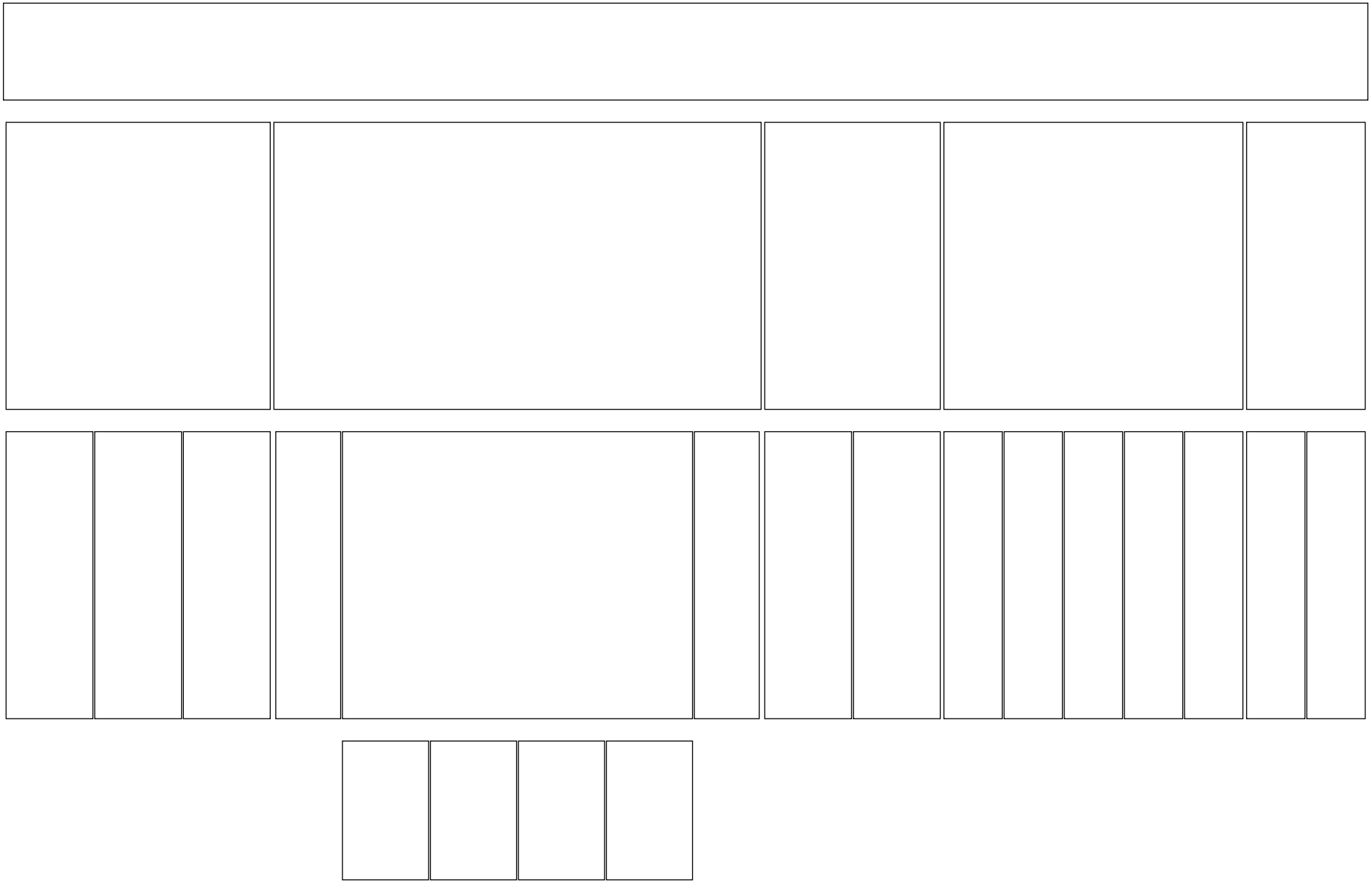
Patching



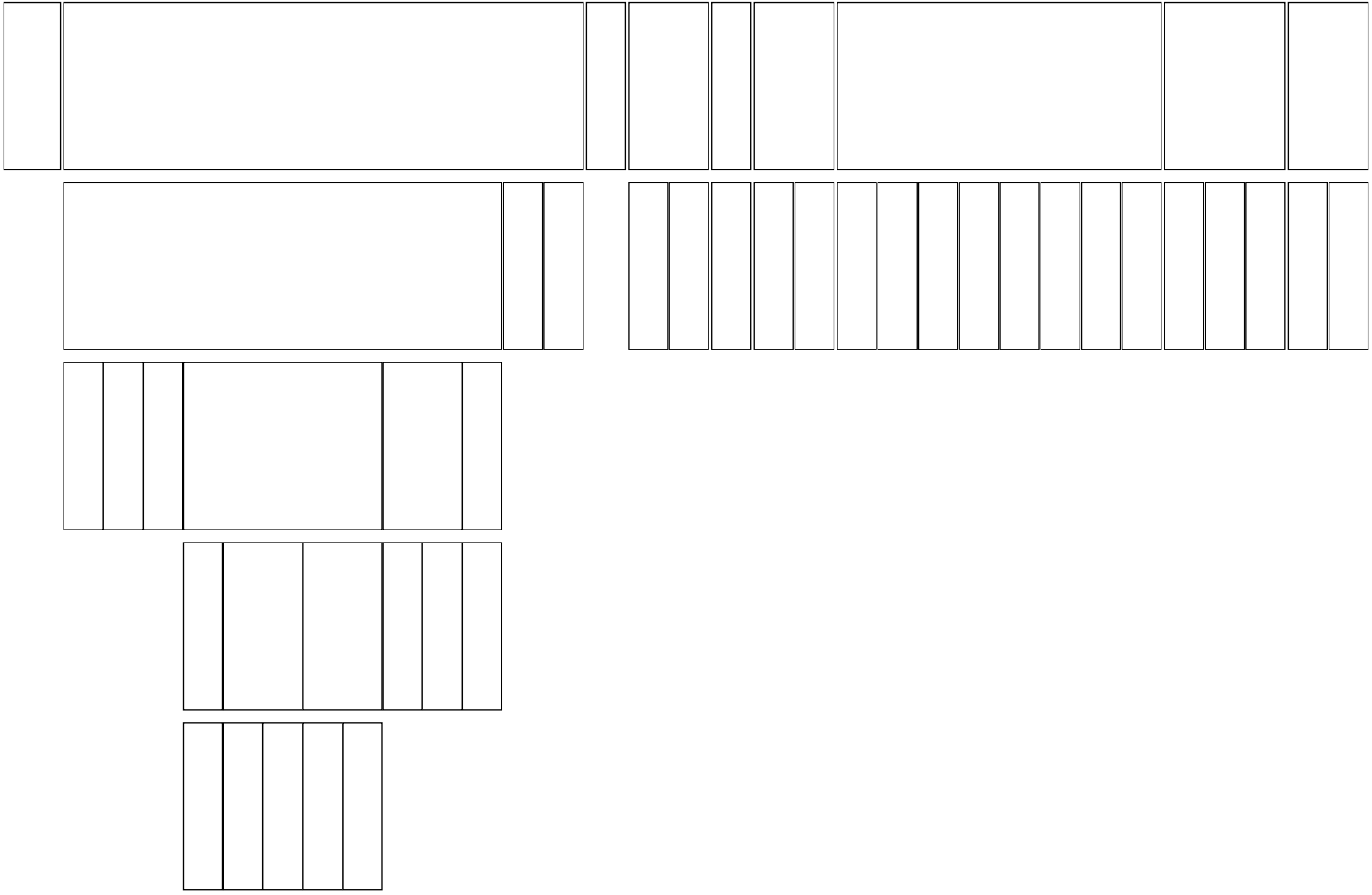
Change Management

Recovery Strategies

Business Continuity Management (BCM)



Secure Software Development



Databases