IBTM5660 Utility Services

http://ibse.hk/IBTM5660/

Extra Low Voltage Systems

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- Basic concepts
- CABD and SMATV systems
- PBX and PA systems
- Security systems
- CCTV systems
- Access control systems
- Burglar & intruder alarms

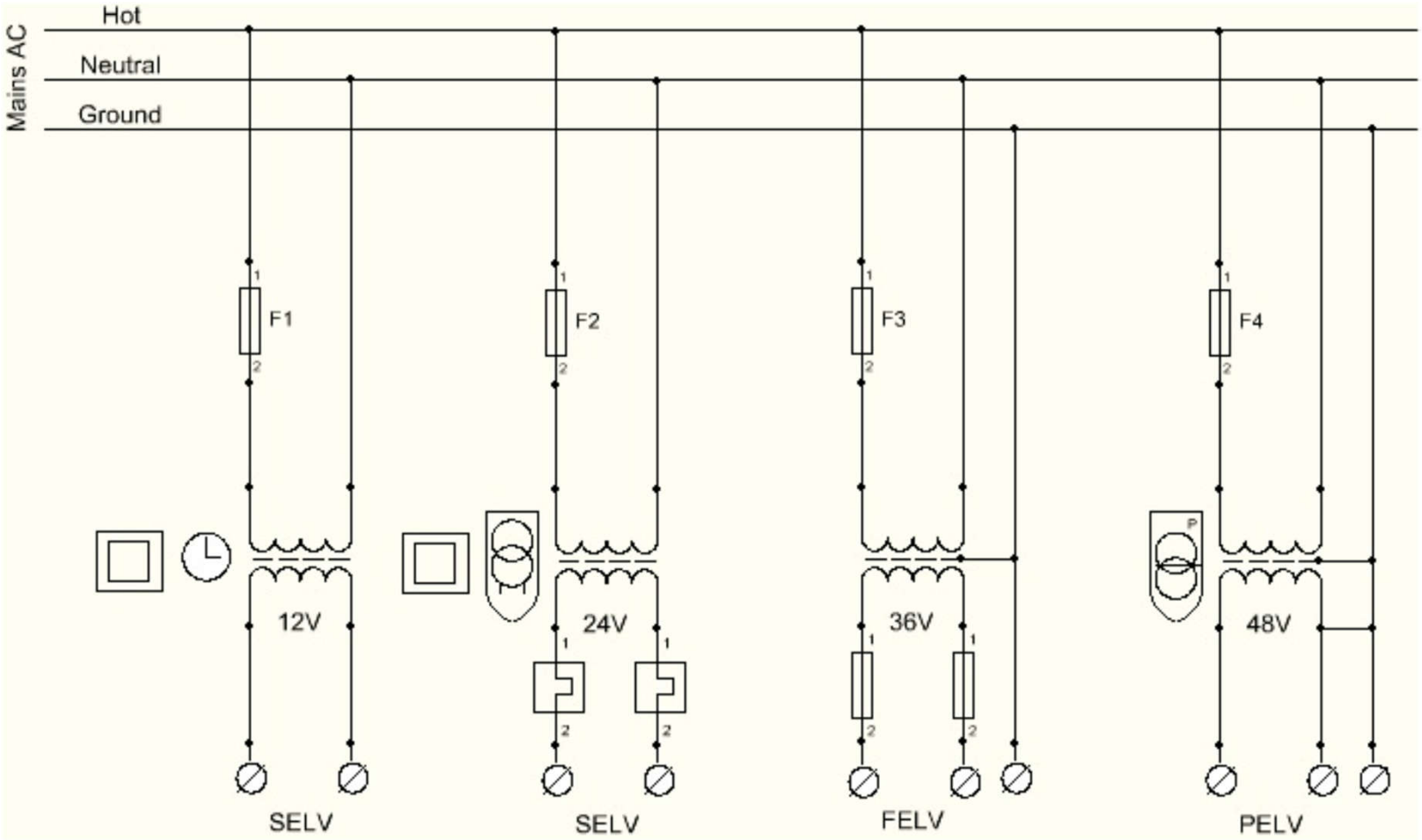
Basic concepts

- Extra low voltage (ELV): (特低壓電 / 弱電)
  - < 50 volts AC or < 120 volts DC (BS 7671)
  - Low risk of dangerous electrical shock
  - Intrinsically safe circuits (BS 1259)
- Three types of ELV sources:
  - Safety extra low voltage (SELV)
  - Protective extra low voltage (PELV)
  - Functional extra low voltage (FELV)

Do you know why we need ELV?

Electricity supply voltage & installations for extra low voltage

Voltage range	AC RMS voltage (V)	DC voltage (V)	Defining risk
High voltage	> 1000	> 1500	Electrical arcing
Low voltage	50 to 1000	120 to 1500	Electrical shock
Extra-low voltage	< 50	< 120	Low risk



FELV = Functional extra low voltage; PELV = Protective extra low voltage; SELV = Safety extra low voltage

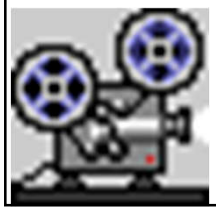
(Source: Extra-low voltage - Wikipedia https://en.wikipedia.org/wiki/Extra-low_voltage)

Basic concepts

- Safety extra low voltage (SELV) must be
  - Safely separated from other circuits that carry higher voltages
  - Isolated from earth (ground) and from the protective earth conductors of other circuits
- The safety of an SELV circuit is provided by
  - The extra low voltage
  - Low risk of accidental contact with a higher voltage
  - Lack of a return path through earth (ground) that a current could take in case of contact with a human body

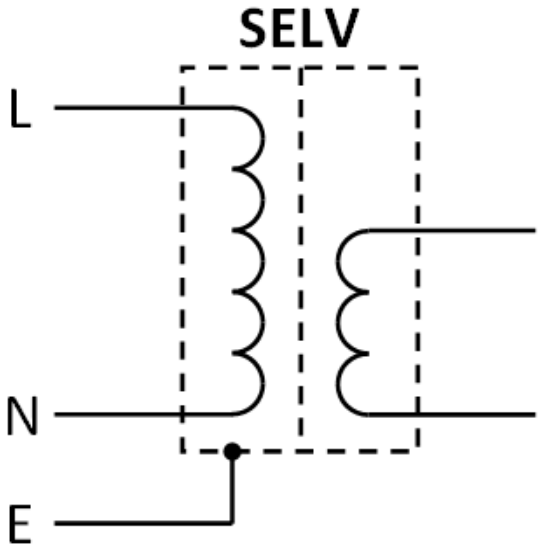
Basic concepts

- Protective extra low voltage (PELV)
  - Has a protective earth (ground) connection
  - Such as a computer with a IEC Class I power supply
- Functional extra low voltage (FELV)
  - Any other extra low voltage circuit that does not fulfill the requirements for an SELV or PELV circuit
  - Such as part of the circuit uses an ELV
    - Protection requirements for the higher voltage have to be applied to the entire circuit



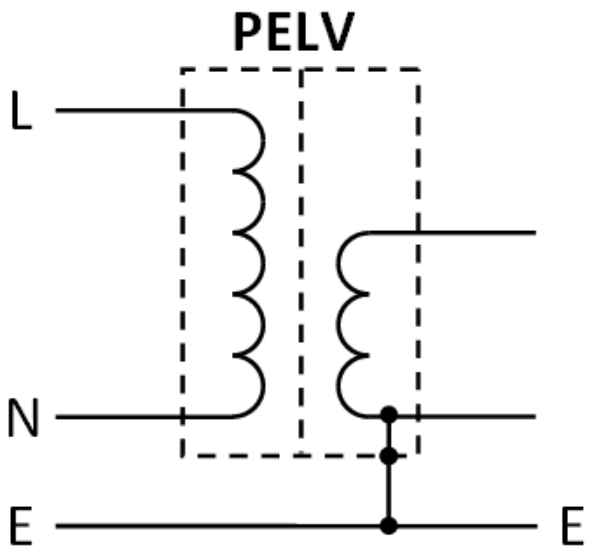
Video: Safety for extra low voltage circuit (5:18) https://youtu.be/fdxE8bl8Kmo

Three types of extra low-voltage (ELV) systems



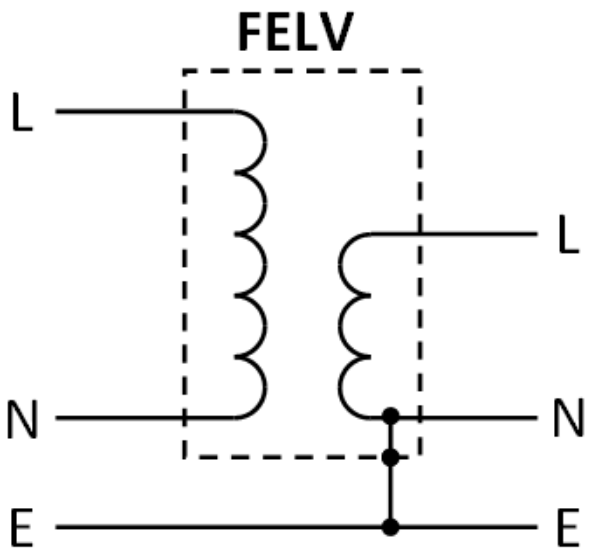
Safety extra low voltage (SELV)

- Presence of a special insulation
- The loads are not isolated by earthing (grounding)
- Eliminate the connection between earth & the equipment



Protective extra low voltage (PELV)

- Presence of a special insulation
- The loads are not isolated by earthing (grounding)

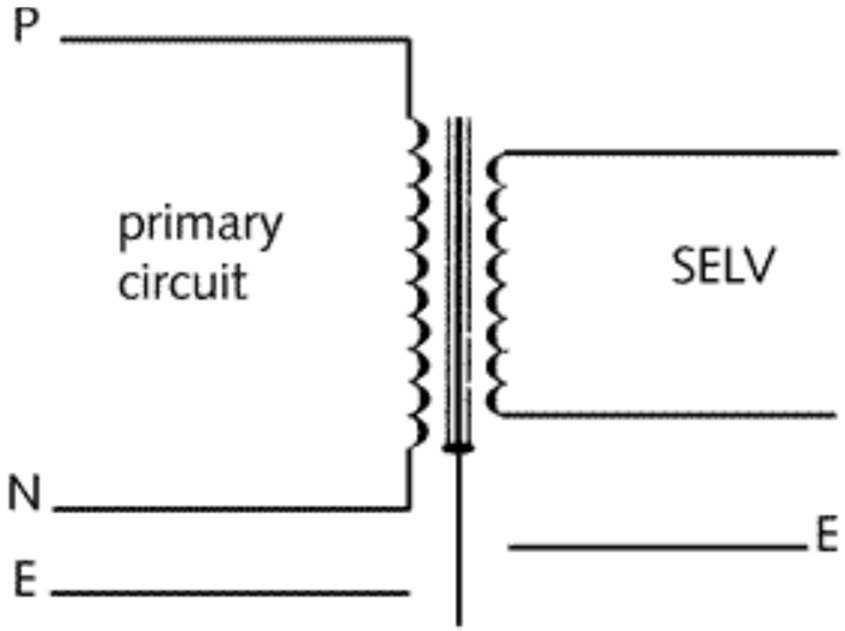


Functional extra low voltage (FELV)

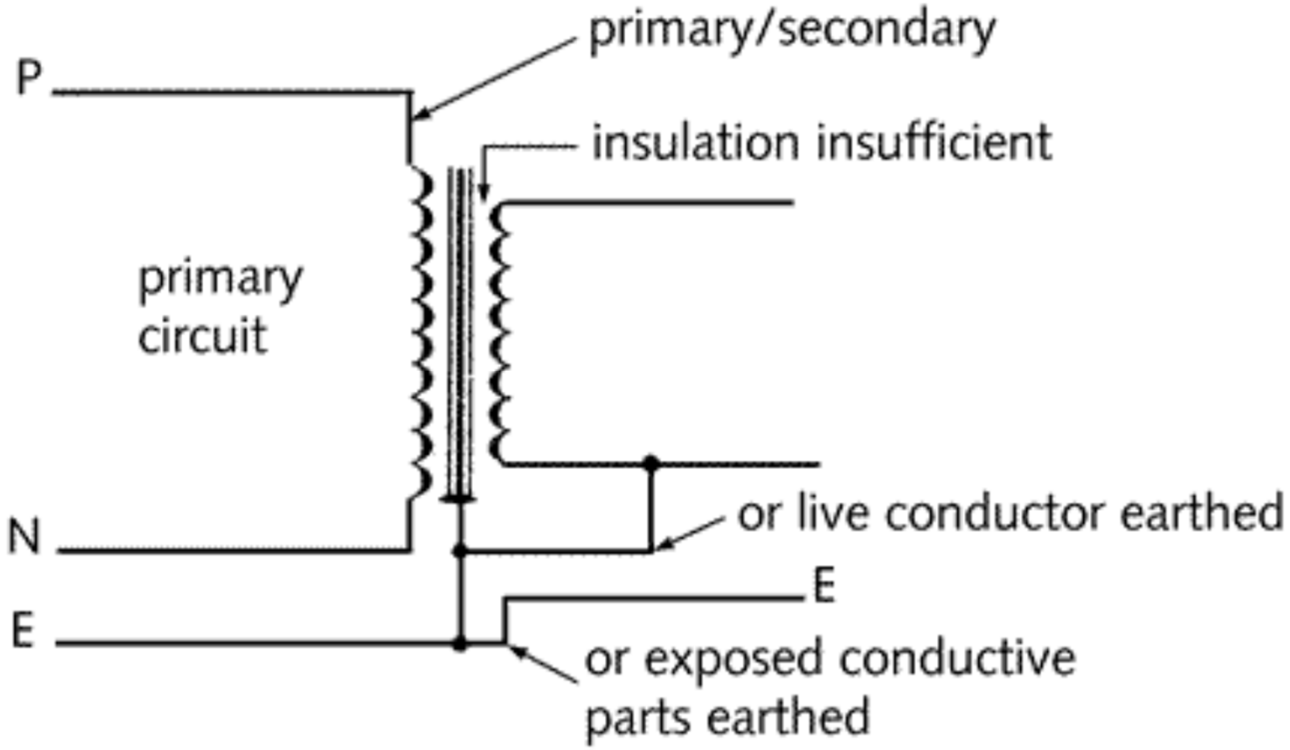
- Special insulation is not required
- The loads are not isolated by earthing (grounding)

(Source: Extra-low voltage https://www.e-magnetica.pl/doku.php/extra-low_voltage)

Earthing relationship, SELV and FELV systems



Safety extra low voltage (SELV)

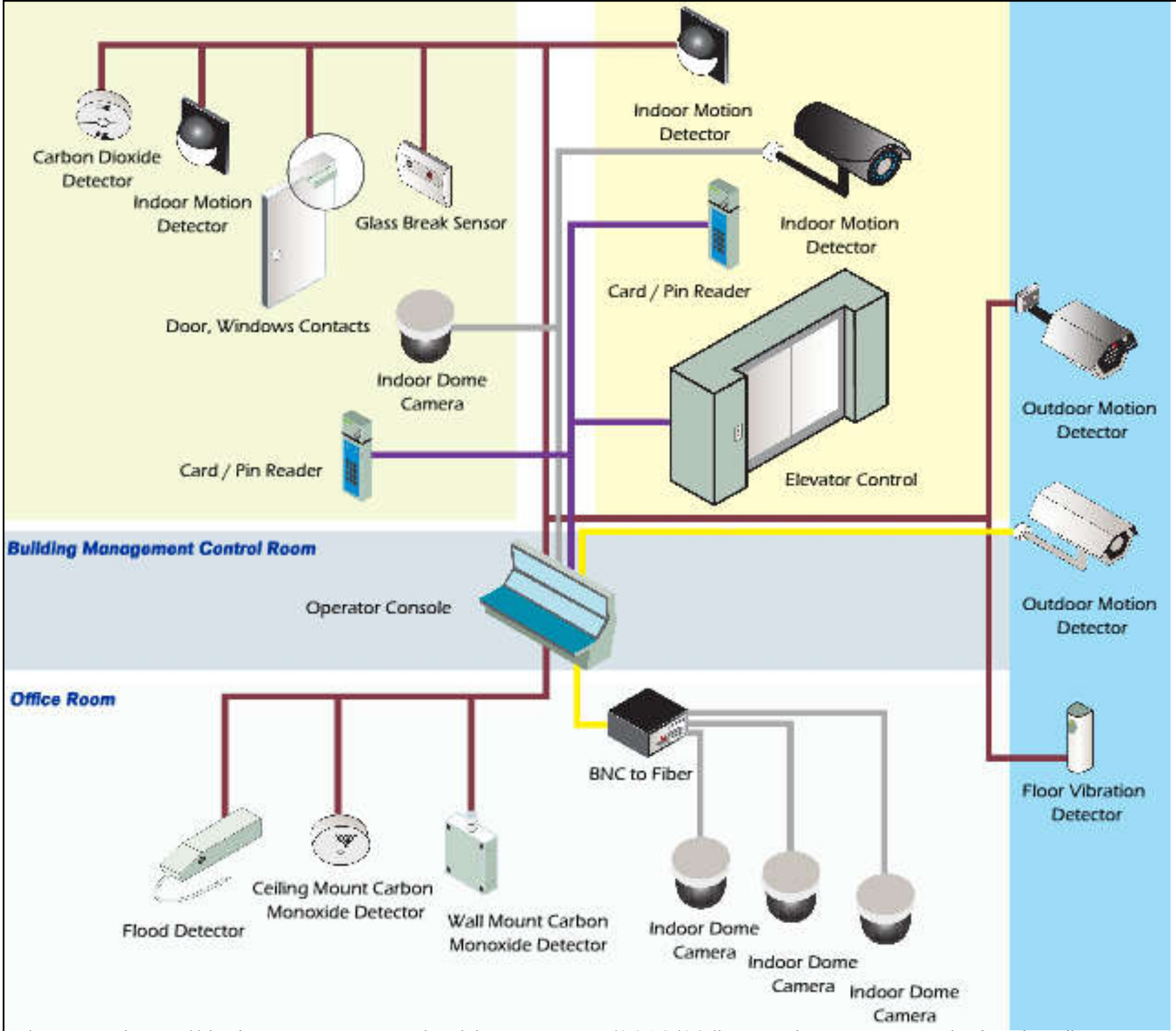


Functional extra low voltage (FELV)

(Source: https://www.tlc-direct.co.uk/Book/7.16.3.htm)

Basic concepts

- Common ELV systems include:
  - Communal aerial broadcast distribution (CABD)
    - Also known as “Public TV antenna” (公共天線)
  - Satellite master antenna television (SMATV) 衞星電視共用天線
  - Private branch exchange (PBX) telephone systems
  - Public address (PA) systems
  - Computer networking systems
  - Audio/visual system & intercom systems
  - Fire alarms & security systems

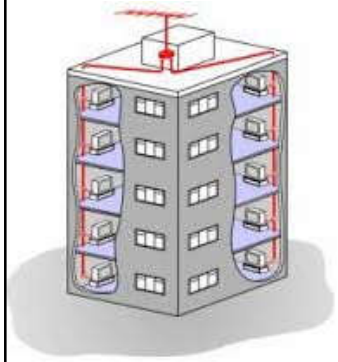


Examples of extra low voltage (ELV) systems & devices in buildings

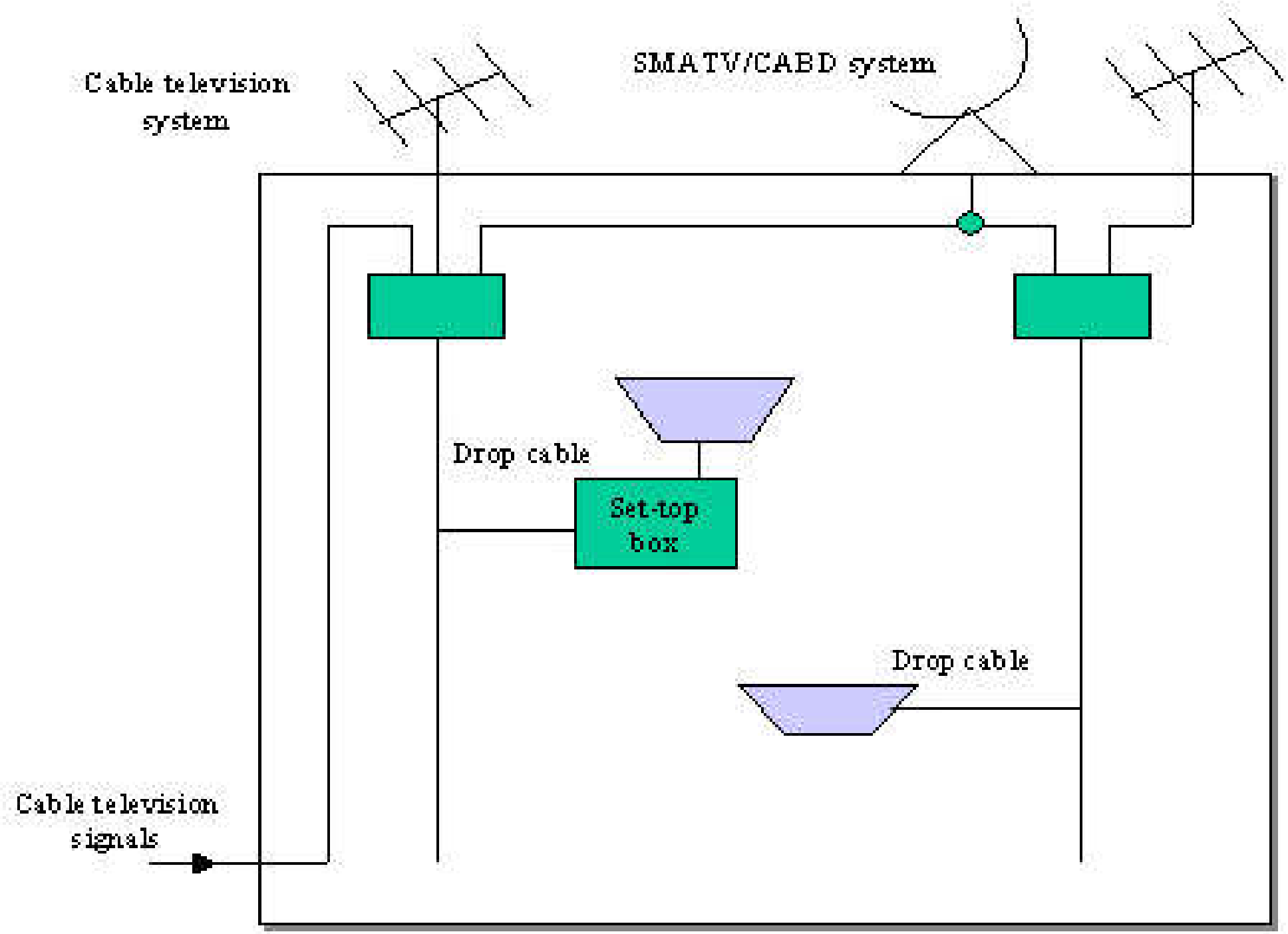
(Source: https://designsystemexamples.blogspot.com/2018/03/low-voltage-system-design.html)

CABD and SMATV systems

- CABD and SMATV systems
  - Also known as “In-Building Coaxial Cable Distribution Systems” (IBCCDS)
    - Comprises aerial, head-end equipment (amplifier/filter) and co-axial cable network (block wiring systems) inside multi-storey buildings
    - For reception & distribution of TV & FM radio broadcast
    - In some buildings, it is also used to distribute cable TV, satellite TV, closed circuit television (CCTV) & Internet services



In-building coaxial cable distribution system (IBCCDS)



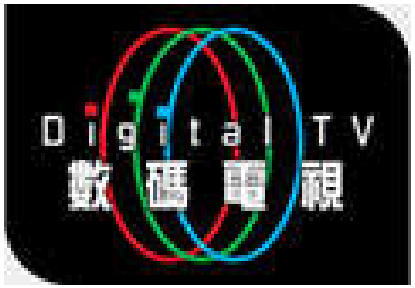
(Source: https://itu-coe.ofca.gov.hk/vtm/fsm/lecture/Lecture_FSM_P7.htm)

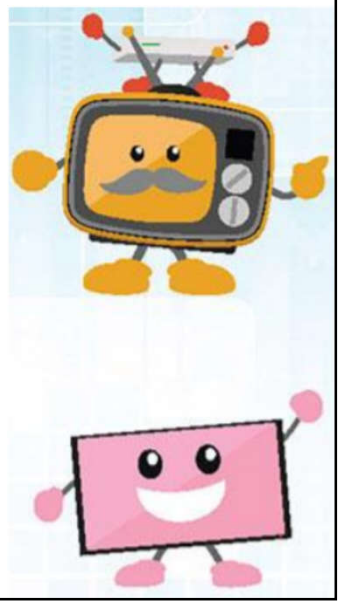
CABD and SMATV systems

- CABD and SMATV systems (cont'd)
  - Services include:
    - Free TV Programme (TVB, HK Open TV & ViuTV)
    - Satellite TV
    - Pay TV (CableTV, PCCW Media & TVB Pay Vision)
    - Digital Terrestrial Television (DTT) (from 2007)
  - SMATV: receiver dishes on rooftops & signals are fed down through IBCCDS
  - Set-top boxes (機頂盒) : access function & security function

CABD and SMATV systems

- Digital TV
  - Broadcast TV services in digital format
    - Clear picture & no ghosting
  - Supports more free-to-air TV channels, high definition TV (HDTV) & interactive TV
  - Support mobile / portable reception
  - How to receive it?
    - External decoder added between TV socket and conventional TV set
    - Integrated digital TV set with decoder built in





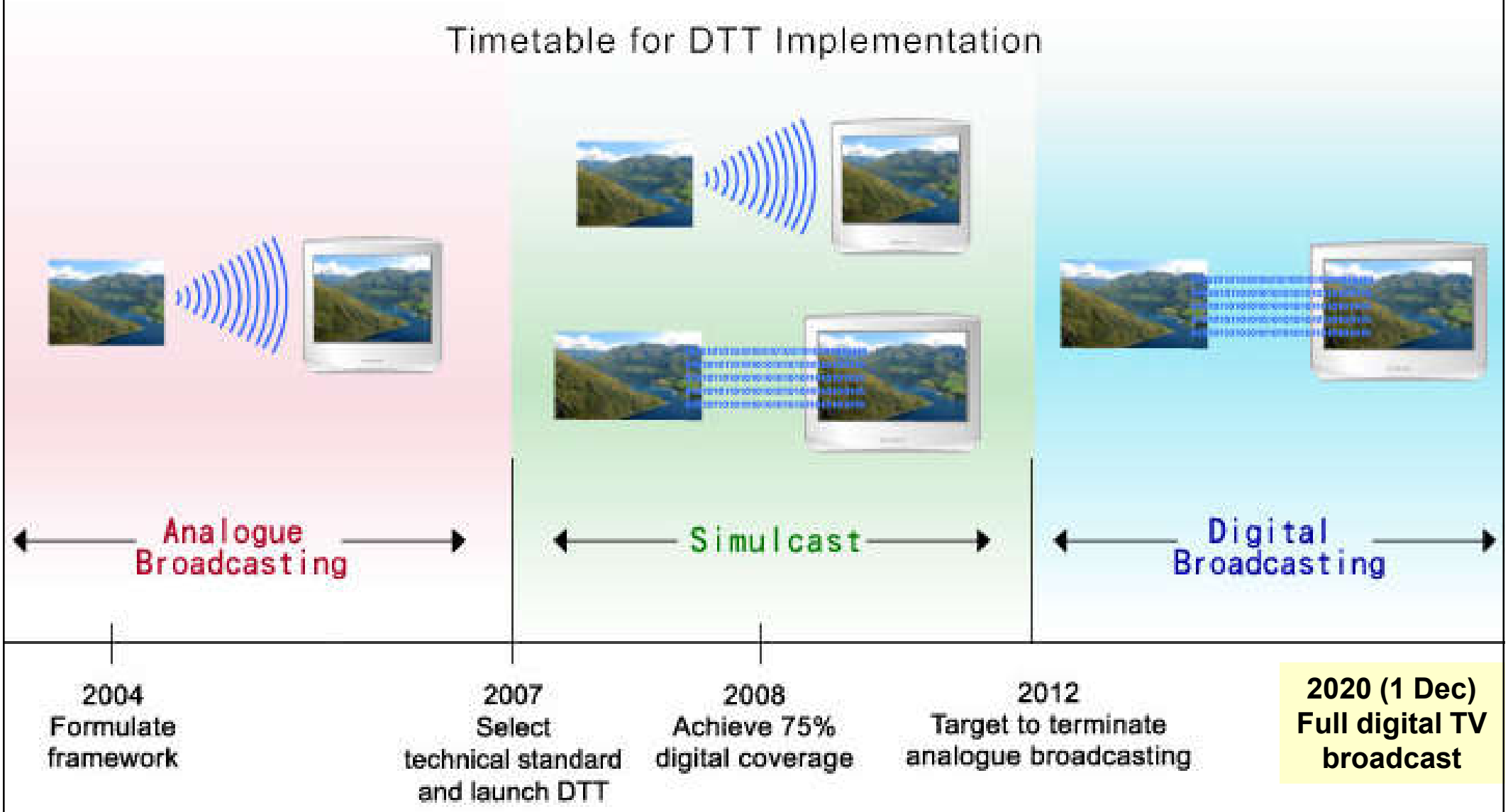
Comparison of analogue & digital TVs

What type of TV do you have at home?

Analogue TV (standard definition)	**Digital TV (high definition)**
Resolution up to 575 lines (vertical) x 720 pixels (horizontal)	Resolution up to 1080 lines (vertical) x 1920 pixels (horizontal)
Aspect ratio 4:3	Aspect ratio 16:9 (Widescreen)
Stereo sound	Multi sound channels (e.g. Dolby 5.1 multi-channel sound)

(Source: Office of Telecomm Authority www.ofta.gov.hk)

Timetable for Digital Terrestrial Television (DTT) implementation in HK



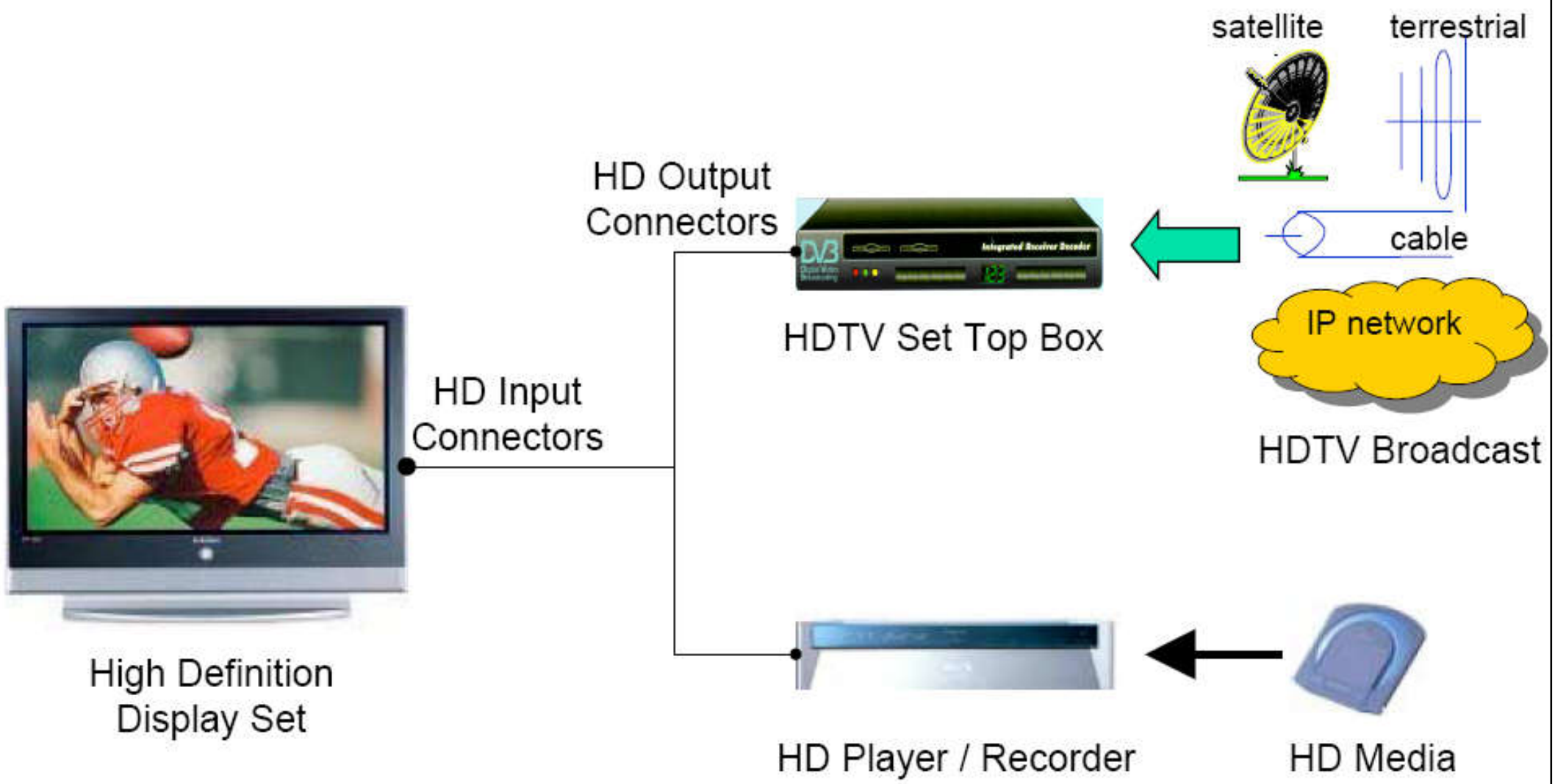
(* Simulcast = simultaneous analogue & digital broadcasts)

(Source: www.digitaltv.gov.hk)

CABD and SMATV systems

- Digital TV platforms in Hong Kong
  - Terrestrial radiocommunications
    - Through Ultra High Frequency (UHF) radio spectrum
    - By TVB and ATV (launched in Dec 2007)
  - Cable (e.g. by Cable TV)
    - Via hybrid fibre coaxial cable (HFC) network
  - Broadband network
    - By PCCW Media & TVB Pay Vision (Galaxy)
  - Satellite (through SMATV systems)
    - Some foreign & local satellite television broadcasts are providing HDTV programmes

High definition TV (HDTV) equipment setup

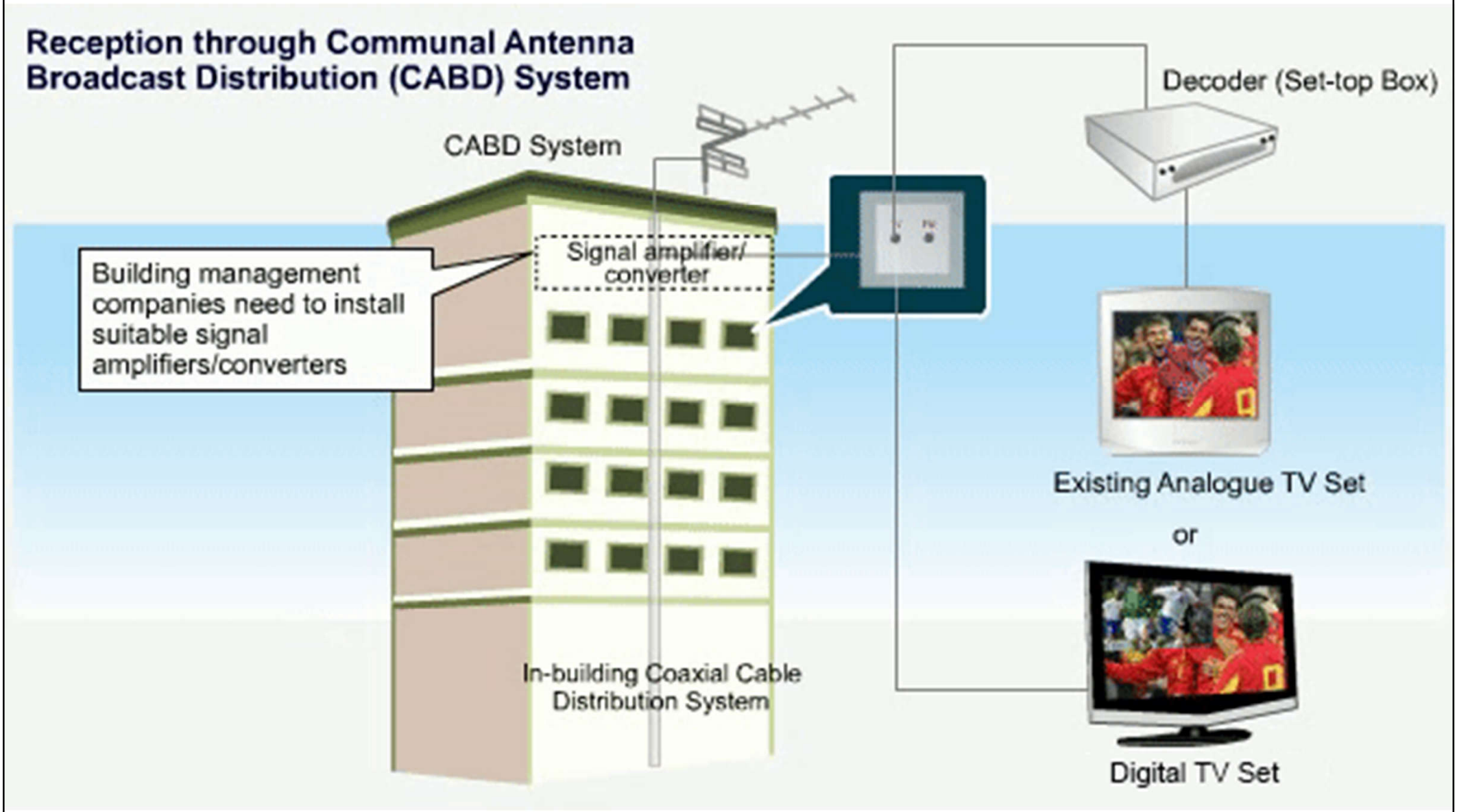


(Source: Office of Telecomm Authority www.ofta.gov.hk)

Transmitting stations of digital terrestrial television (DTT) in HK

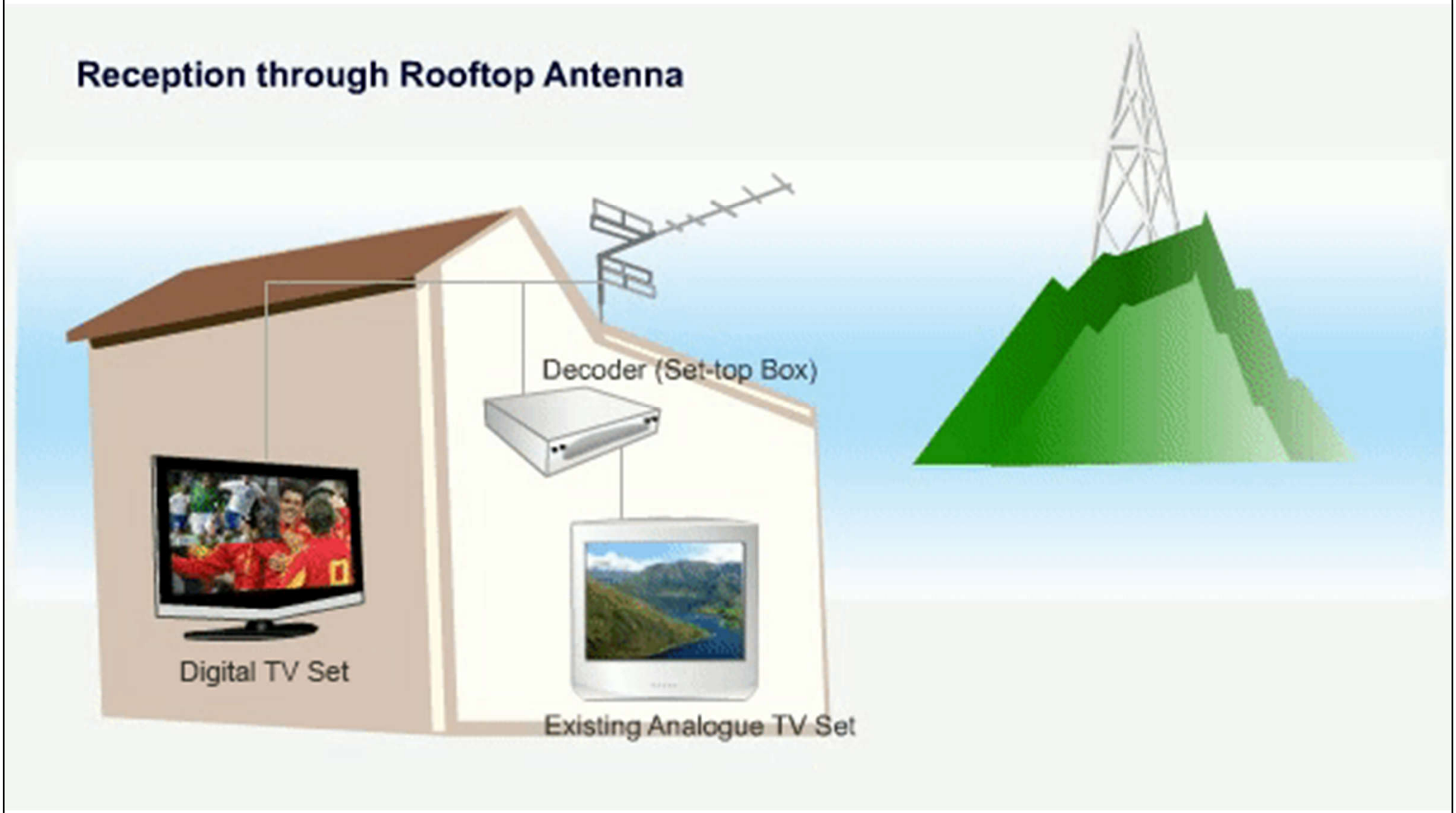
(Source: www.digitaltv.gov.hk)

Reception of Digital TV signals through CABD systems



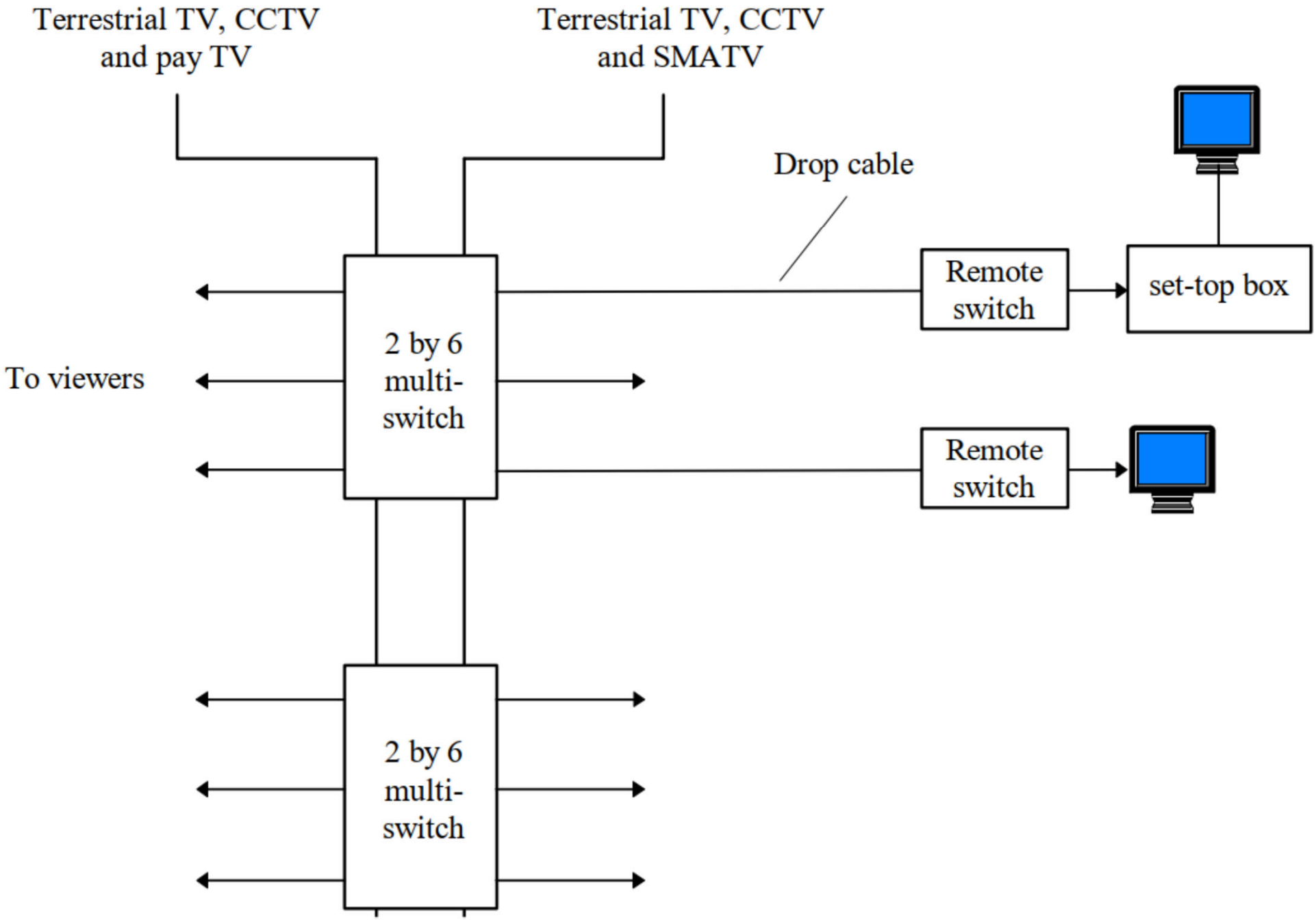
(Source: www.digitaltv.gov.hk)

Reception of Digital TV signals through rooftop antenna



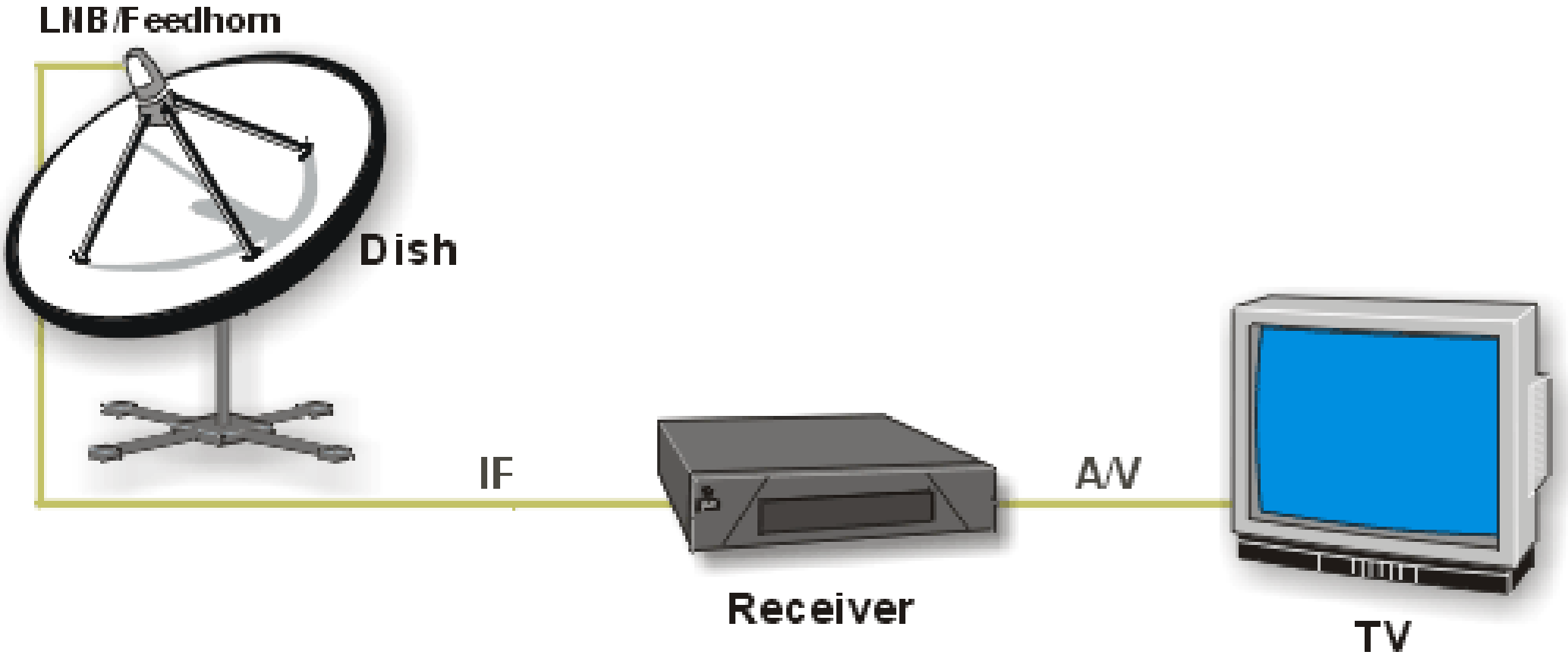
(Source: www.digitaltv.gov.hk)

Typical configuration of a parallel distribution system



(Source: CA, 2012. *Code of Practice for the Installation and Maintenance of In-Building Telecommunications Systems and In-building Access by Telecommunications Network Operators*, Communications Authority (CA), Hong Kong. https://www.coms-auth.hk/filemanager/statement/en/upload/105/cop201202e.pdf)

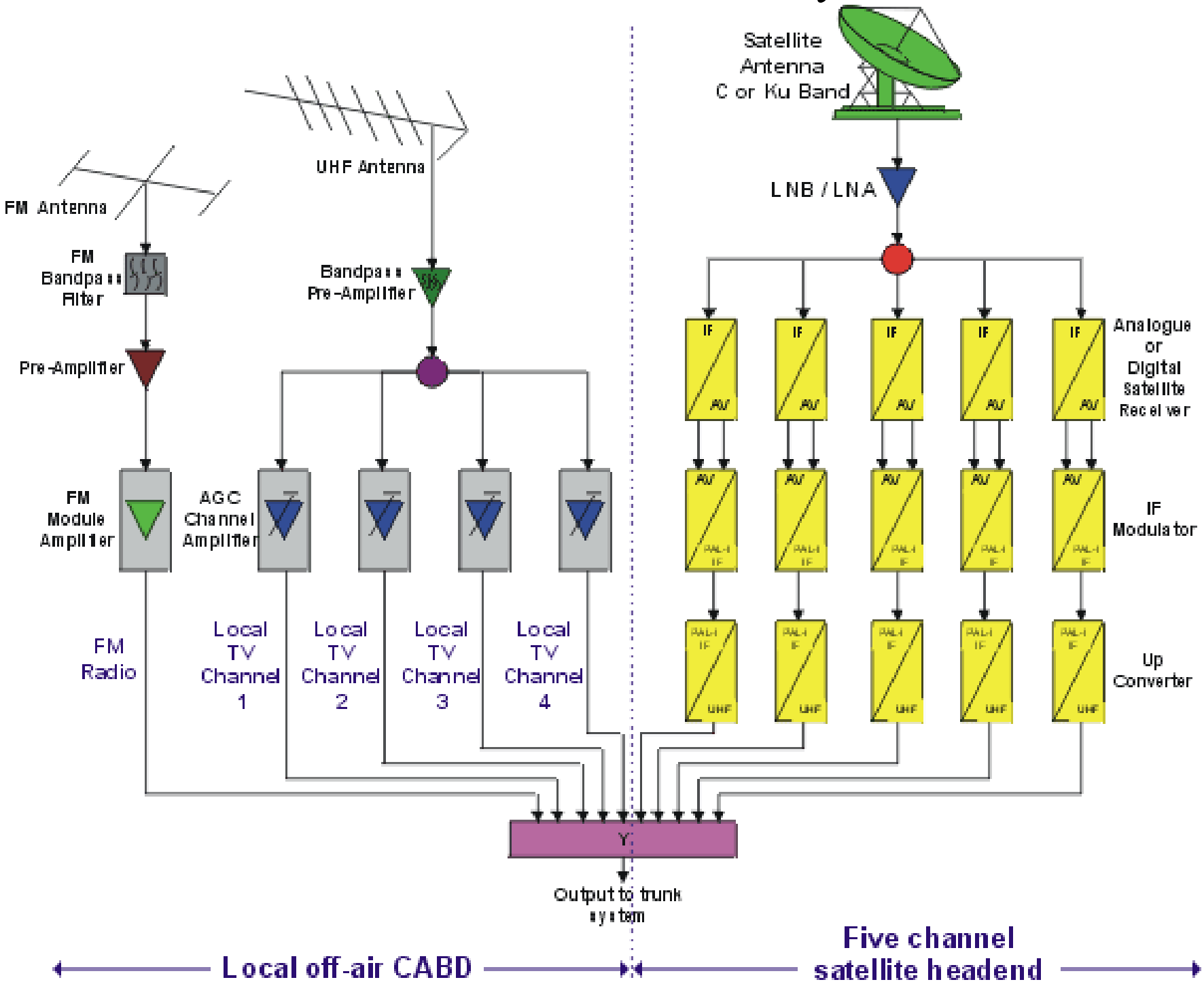
Satellite antenna television system



Dish = satellite dish
LNB = low noise block down converter

(Source: www.asiasat.com.hk)

Satellite antenna television system



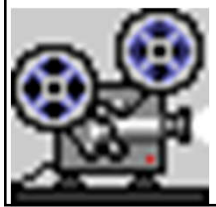
(Source: www.asiasat.com.hk)

CABD and SMATV systems

- Satellites receivable by SMATV systems in HK https://www.ofca.gov.hk/filemanager/ofca/en/content_295/st_smatv.pdf
  - Apstar 6C (亞太衛星6C), Apstar 7 (亞太衛星7)
  - AsiaSat 5 (亞洲衛星5), AsiaSat 7 (亞洲衛星7)
  - Chinasat 6A (中星6A), Chinasat 6B (中星6B)
  - Intelsat 19 (國際19), Intelsat 20 (國際20)
  - Measat 3/3a (馬星3/3a)
  - Palapa D (印尼Palapa D)

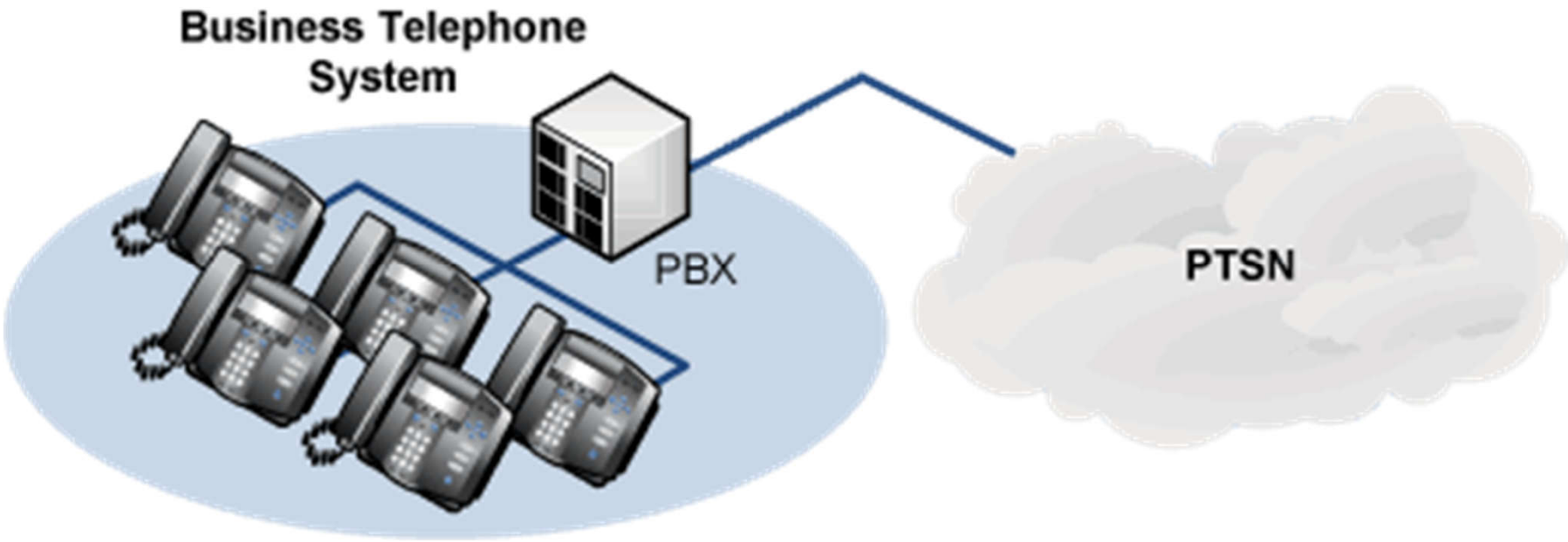
PBX and PA systems

- Private branch exchange (PBX) systems
  - Also, private automatic branch exchange (PABX)
  - A telephone exchange that is owned by a private business, to allow all users to share a certain number of external phone lines
    - Main purpose: to save the cost of requiring a line for each user
  - Old PBXs use analog technology
  - New PBXs use digital technology



Video: What is PBX? (2021) (3:48) https://youtu.be/KviuXiNr_7w

Old PBX with publicly switched telephone network (PSTN) & "IPBX" uses Internet Protocol to carry calls



(Source: https://www.businesstelephonesystem.org/pbx-telephone-systems-explained/, https://worlditpark.com/pbx-private-branch-exchange-in-telephony/)

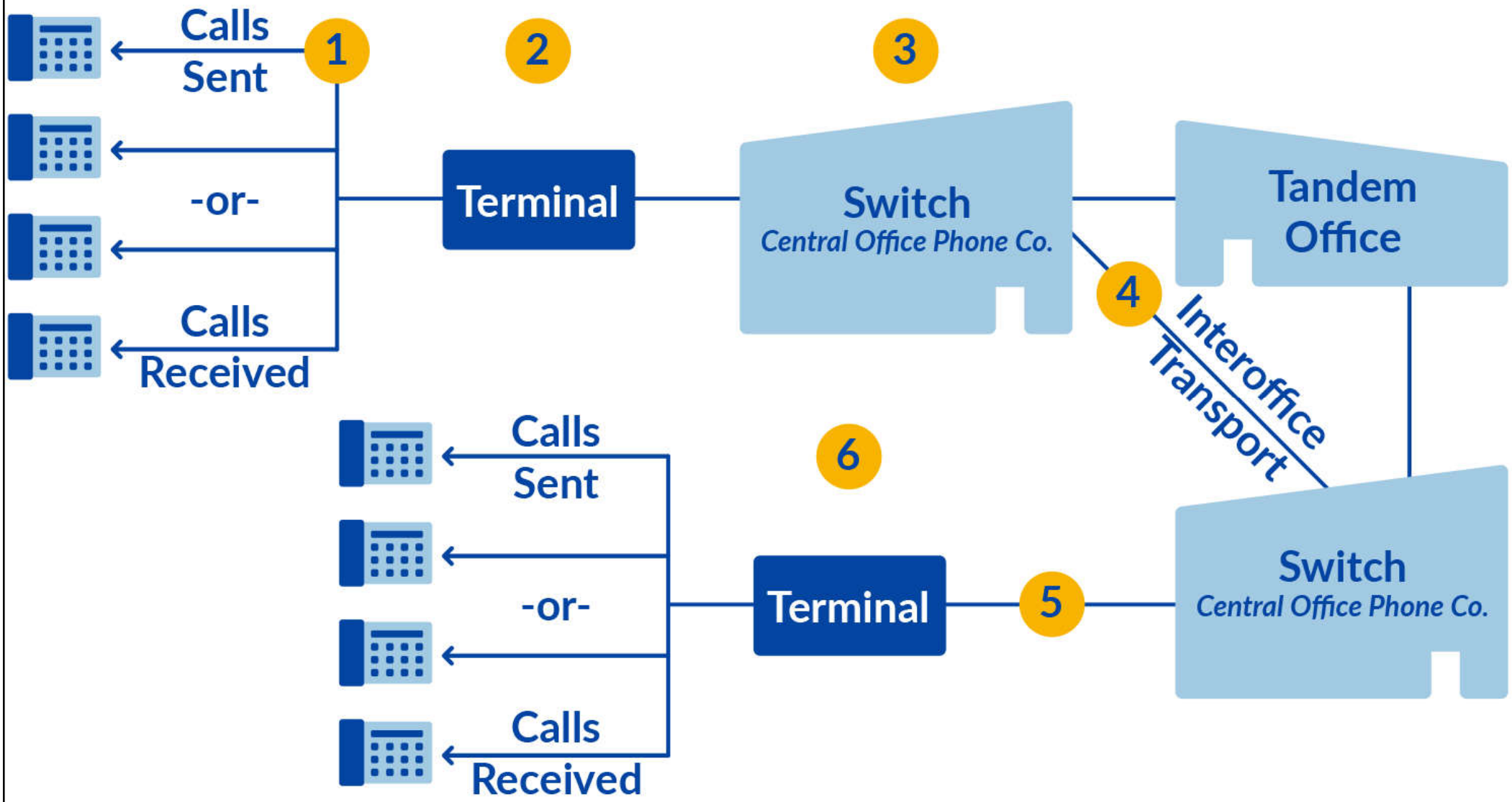
PBX and PA systems

- PBX performs three main duties
  - Establish connections (circuits) between the telephone sets of two users (e.g. mapping a dialled number to a physical phone, ensuring the phone isn't already busy)
  - Maintain such connections as long as the users require them. (i.e. channeling voice signals between the users)
  - Provide info for accounting purposes
- Other functions, e.g. call transfer

PBX and PA systems

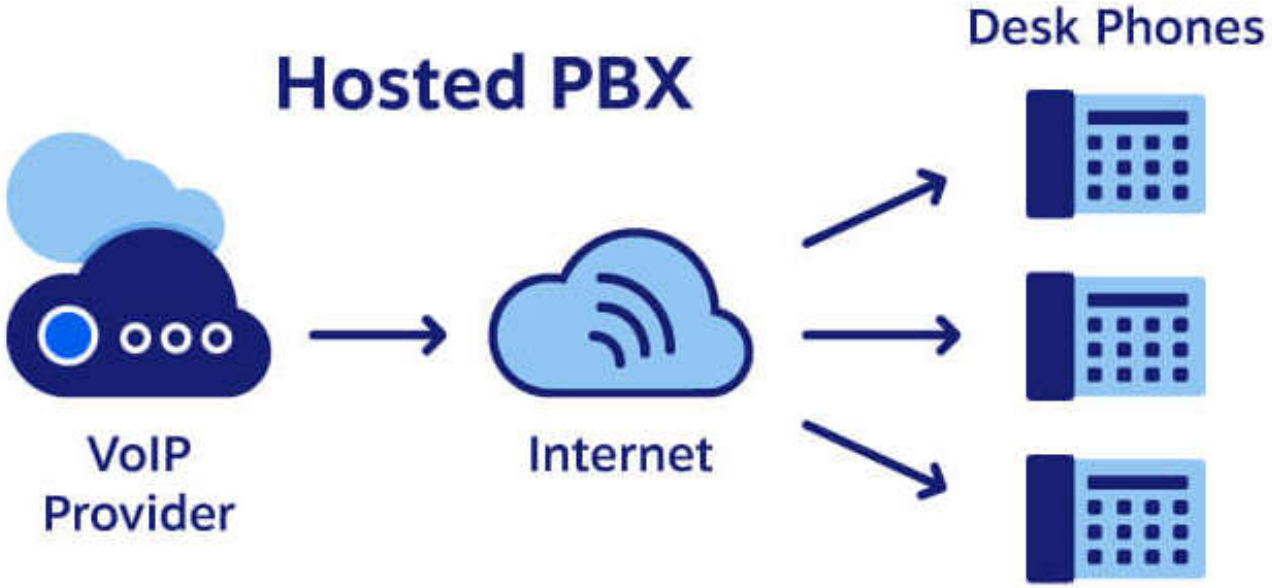
- A PBX includes:
  - Telephone trunk (multiple phone) lines that terminate at the PBX
  - A computer with memory that manages the switching of the calls within the PBX and in and out of it
  - The network of lines within the PBX
  - Usually a console or switchboard for a human operator
- Larger manufacturers of PBXs:
  - Lucent Technologies, NORTEL, Rolm/Siemens, NEC, GTE, Intecom, Fujitsu, Hitachi, and Mitel
- Latest trends: "IPBX" uses Internet Protocol to carry calls, the use of cloud PBX (hosted/virtual PBX)

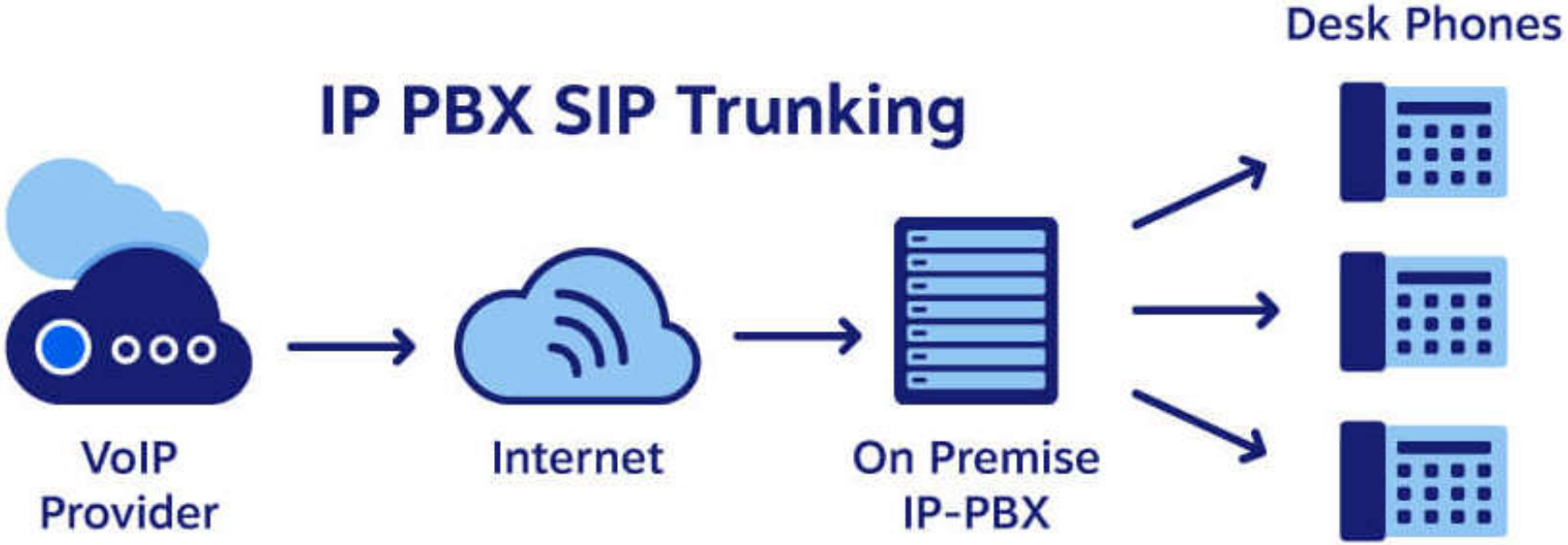
Plain old telephone system using publicly switched telephone network (PSTN)



(Source: https://www.nextiva.com/blog/what-is-pbx.html)

New PBX system using Internet Protocol (IP), Session Initiation Protocol (SIP) & Voice over Internet Protocol (VoIP) technology





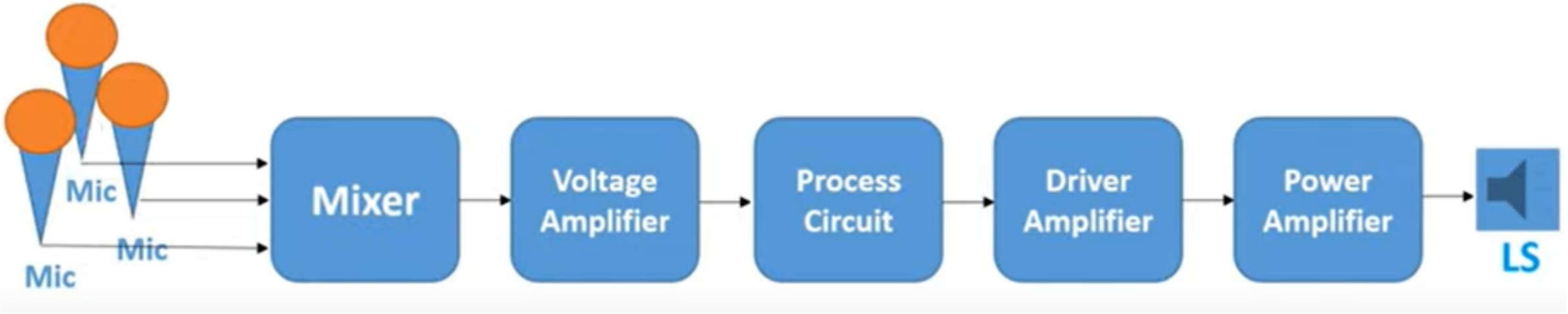
(Source: https://www.nextiva.com/blog/what-is-pbx.html)

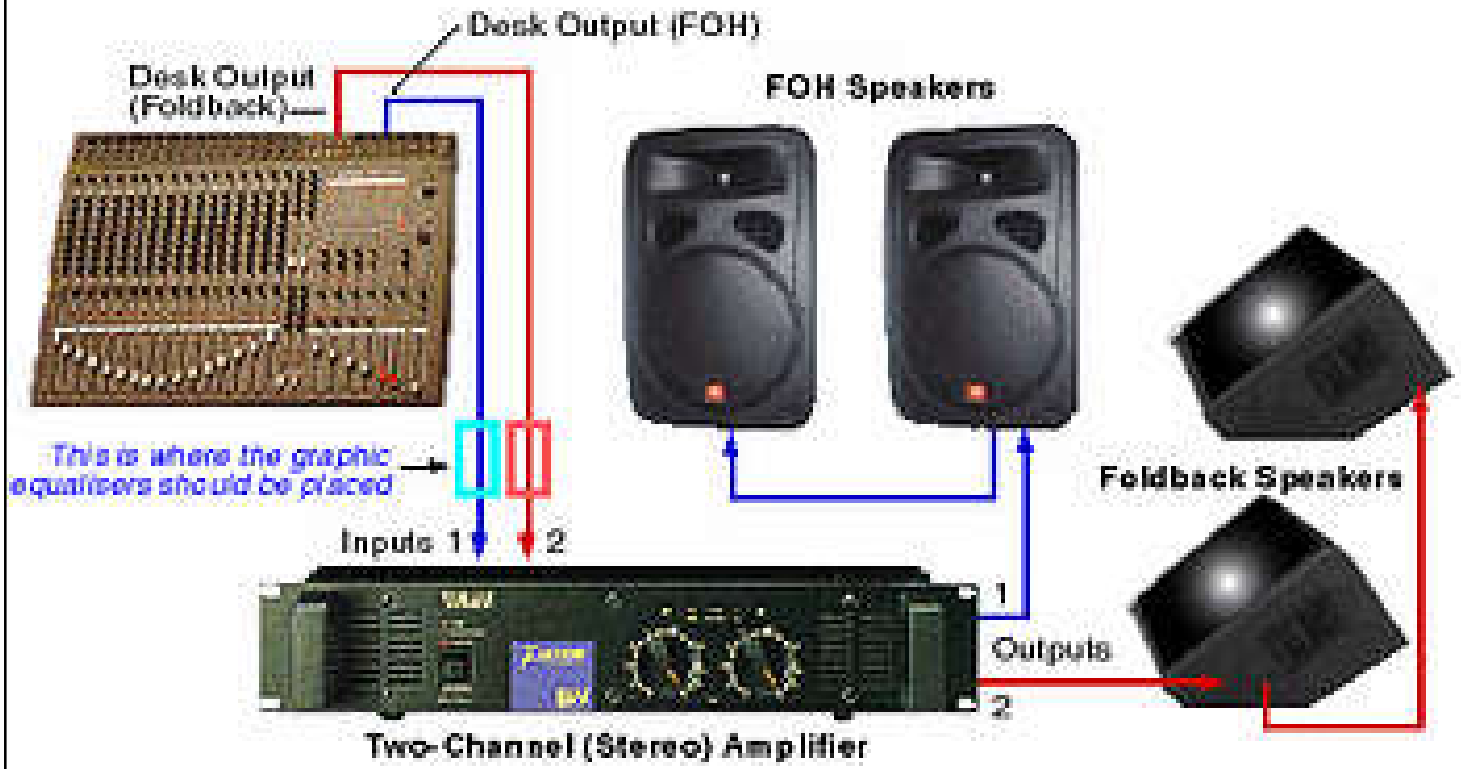
PBX and PA systems

- Public address (PA) systems 擴音系統

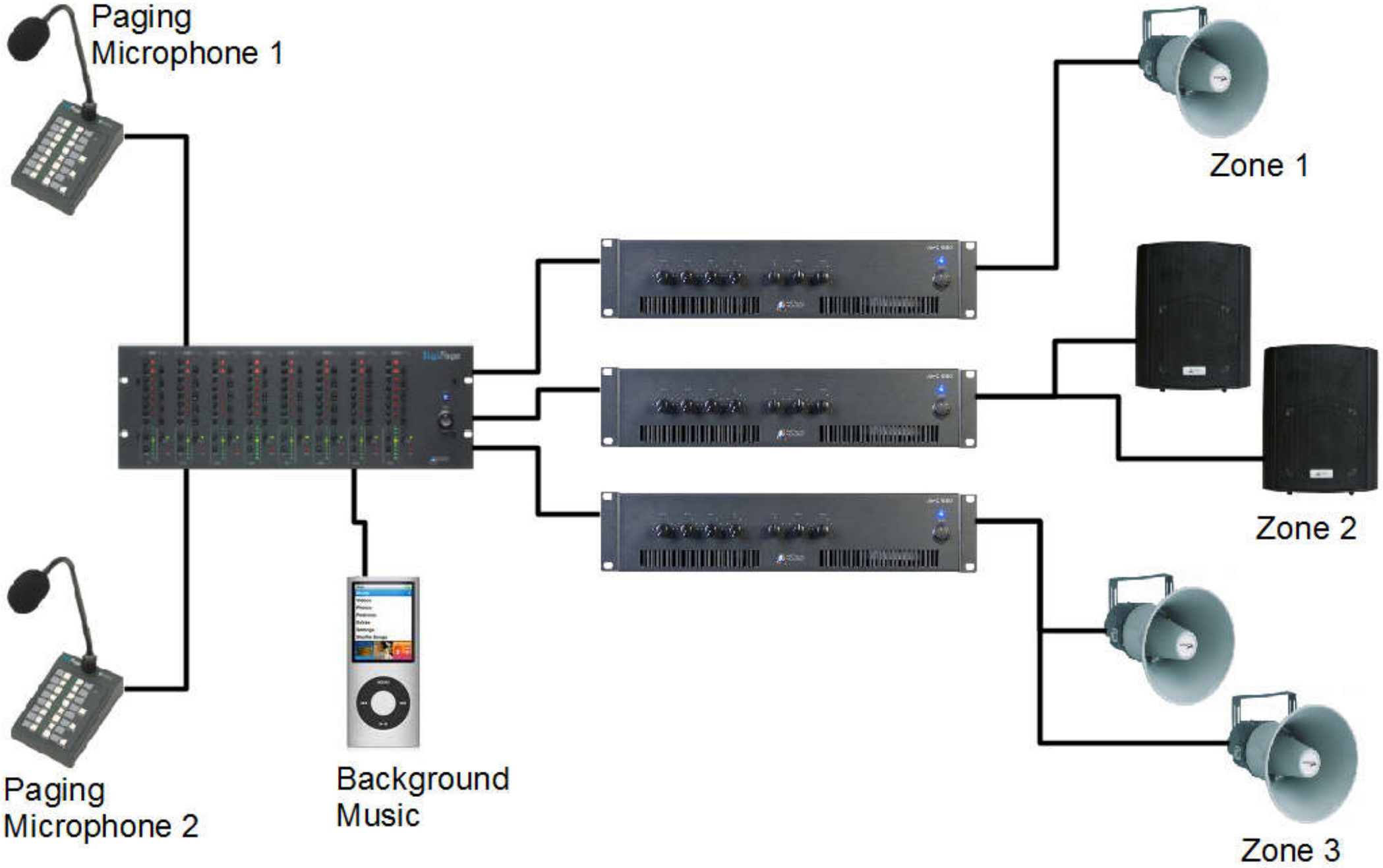
  - Also known as “Tannoy”
  - An electronic amplification system used as a communication system in public areas
    - Amplifier, loud speaker & mixer for sound control
    - Can be fixed or portable, indoor or outdoor
    - For general announcement, background music or emergency messages
  - Details of equipment are determined by discussion with the manufacturers

Examples of public address (PA) systems



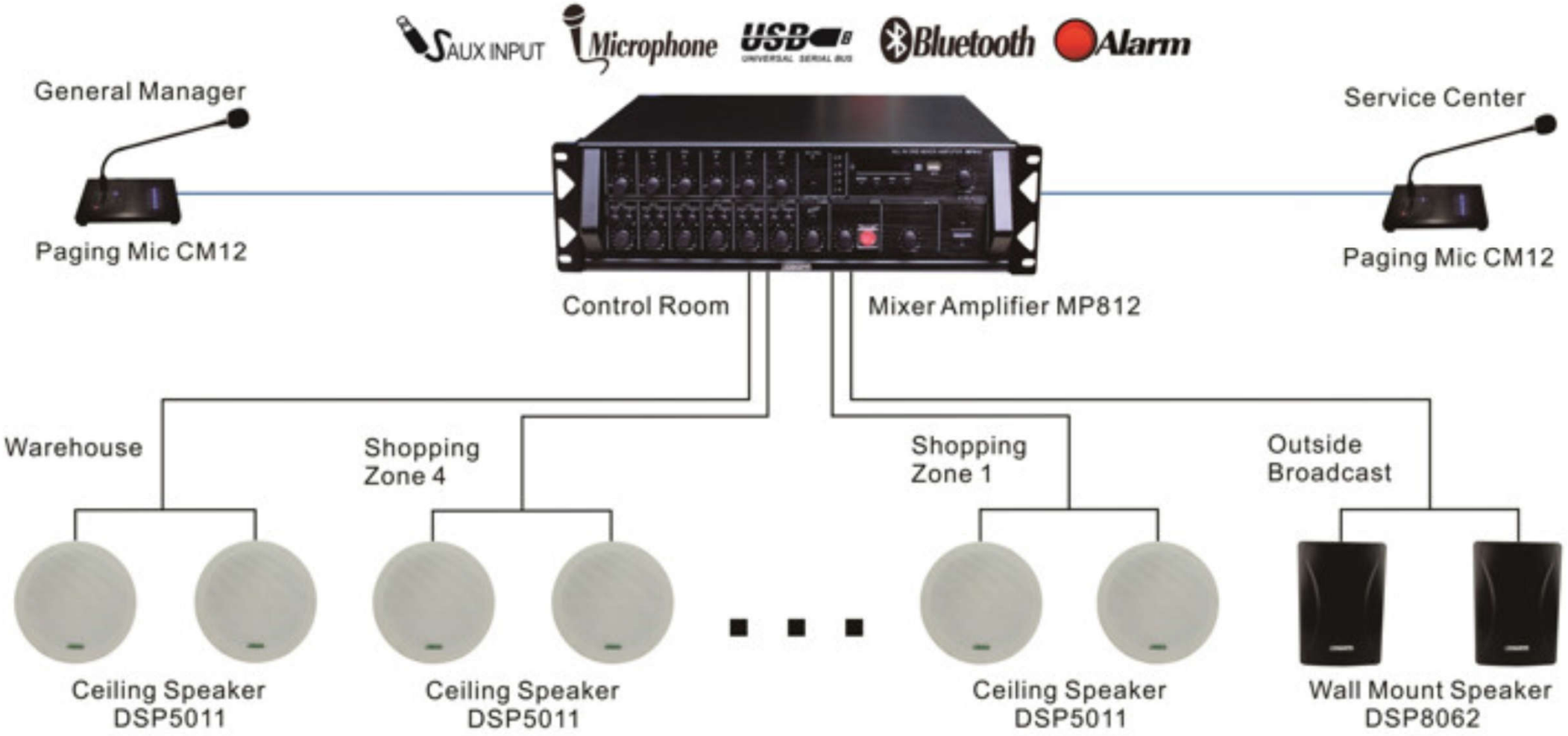


Public address (PA) system with electronic sound amplification & distribution



(Source: http://qannas.net/public-address-systems/)

An examples of public address (PA) system for shopping centre



(Source: https://www.dsppatech.com/mp812-6-zones-public-address-solution.html)

PBX and PA systems

- Public address (PA) systems
  - Typical PA components for assembly hall or playground in schools:
    - Microphone complete with floor-stand
    - Cassette deck
    - Mixer power amplifier
    - Column speakers (for assembly hall) and horn speakers (for covered playground)
    - Monitor speaker
    - Wooden Cabinet for housing the items

Do you know how to select & plan the PA systems?

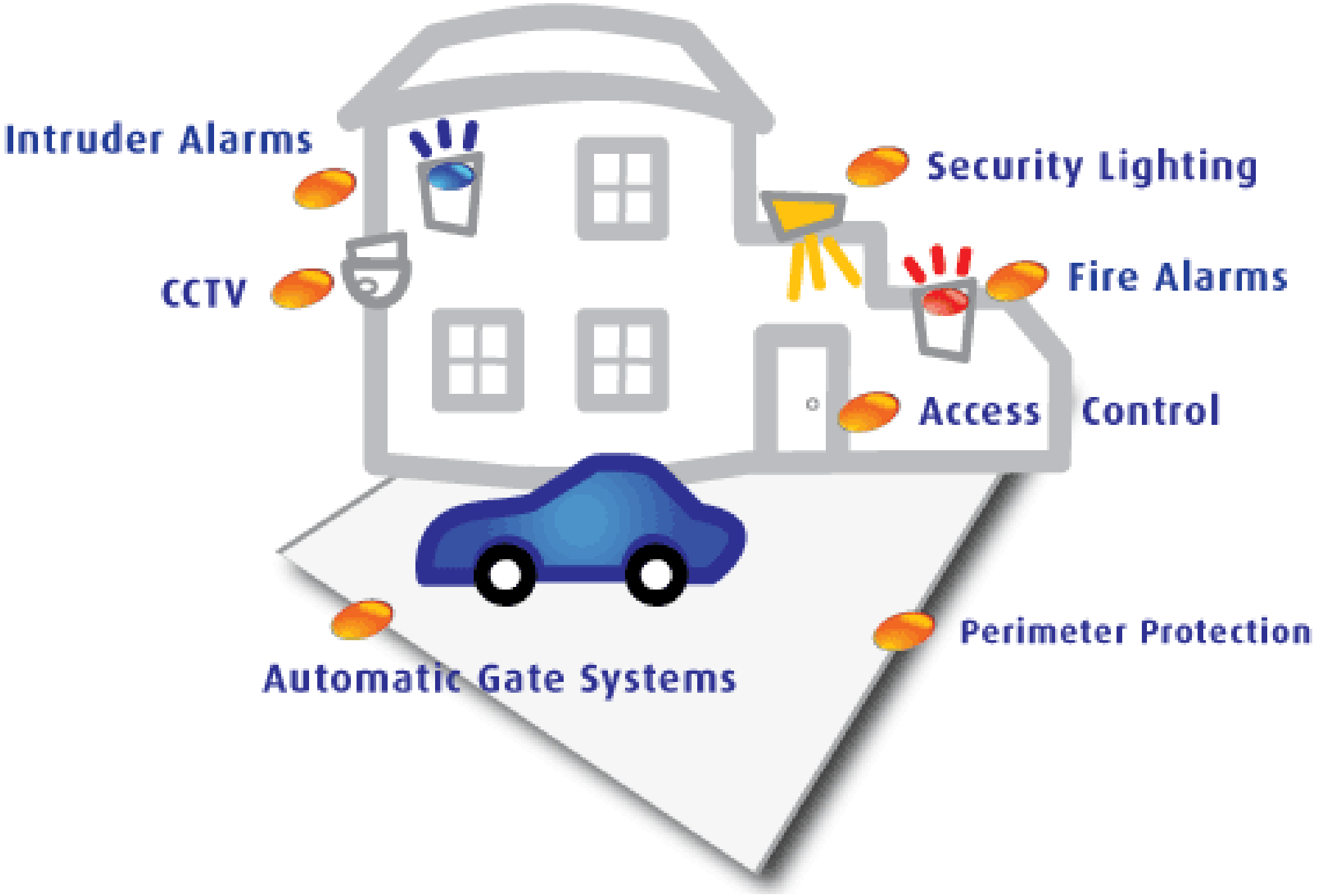
PBX and PA systems

- Basics of public address (PA) systems
  - Intensity of sound decreases with distance
  - Amplification is required for comfortable listening
  - For better understanding, sound quality is crucial
  - PA system can improve sound quality in big space
  - It is used in sports meet, public meetings, auditoriums, concerts, functions, etc.
  - Ambient noise, acoustic feedback & reverberation

Security systems

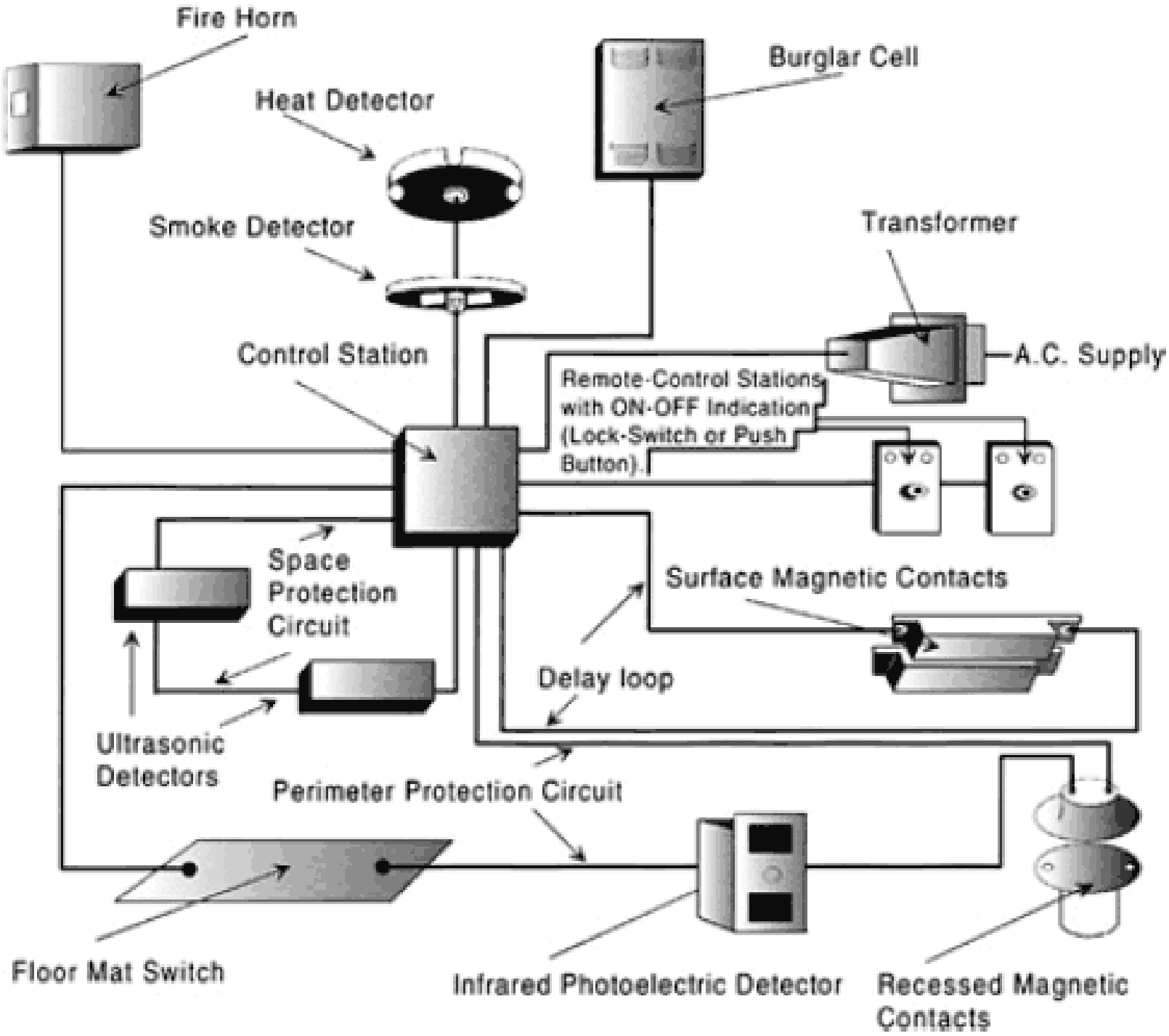
- Electronic security systems 電子防盜系統
  - For security operations like surveillance, access control, alarming or an intrusion control
  - Applied to residential buildings, workplaces, commercial places, shopping centres, and public places like railway stations & traffic management
  - Often work together with fire alarm/detection & building automation/management systems

Security and alarm systems



(Source: www.acesec.co.uk)

Components for a typical security/fire-alarm system

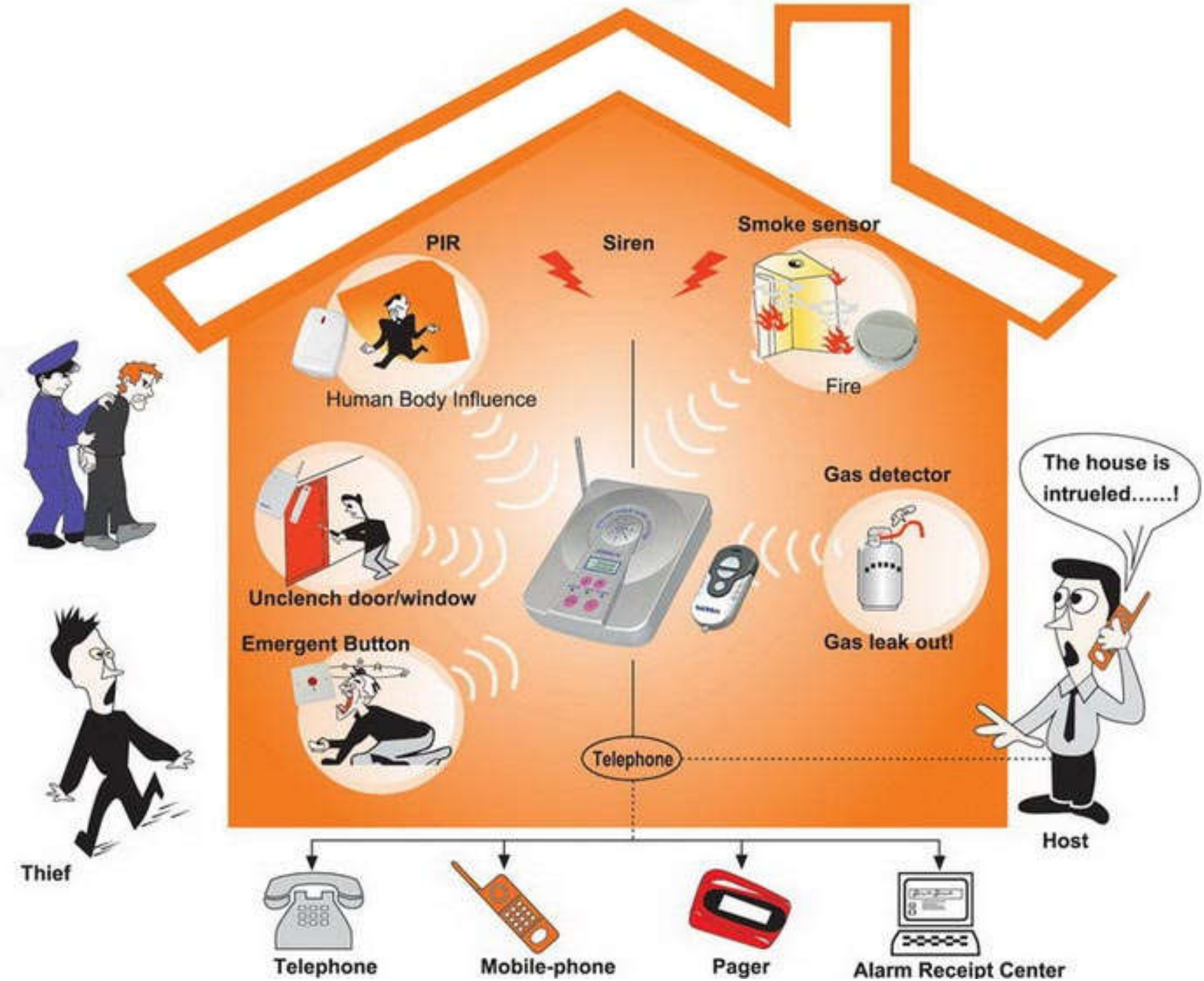


(Source: Kennedy, T. and Traister, J. E., 2002. *Low Voltage Wiring: Security/fire Alarm Systems*)

Security systems

- Common types of security systems
  - Burglar alarm system
    - Central or local (w/ direct link to police)
  - C.C.T.V. surveillance system
  - Intruder detection & access control
  - Intercom systems (audio/video)
  - Door-phone system & interlocking system
  - P.A. (panic attack) button & sound system
  - Security lighting
  - Guard tour/monitoring system

Example of home security system



(Source: http://pubs.sciepub.com/jit/1/1/1/)

Typical components of security and alarm systems

Intrusion Alarms

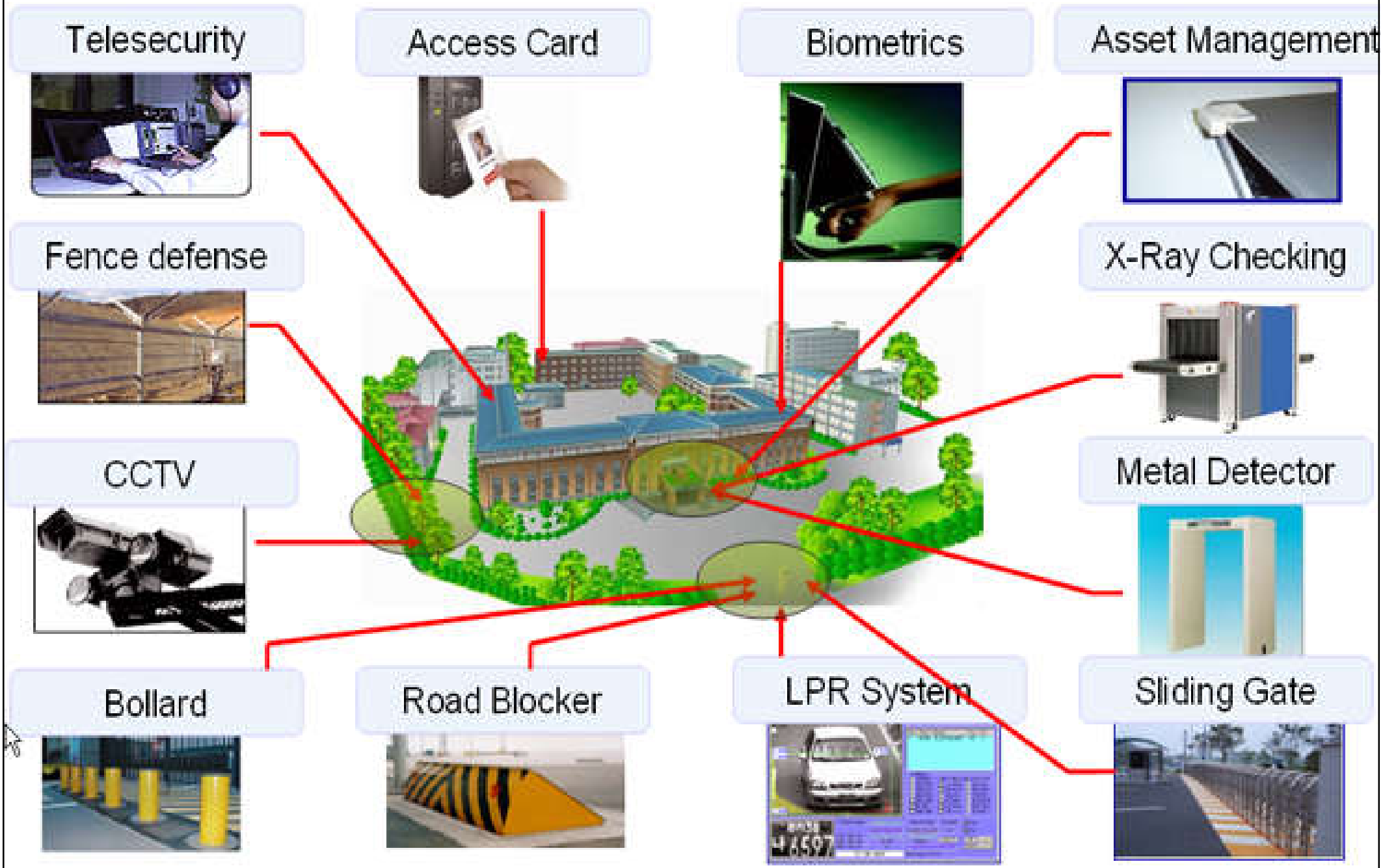
Closed Circuit Television

Digital Video Surveillance

Access Control

Critical Process Monitoring

Integrated security in a typical building management solution



[Source: http://altimaglobal.com/Building-Management-Lighting-Management.html]

Example of a highly secured premise in Hong Kong

CCTV

Security control centre

Access control

Blocks & fencing

(Source: Hong Kong Note Printing Limited http://www.hknpl.com.hk/)

A typical building security & car park control system

(1) Building entry access system with intercom system

(2) Lift access control restricting tenants within floors

(3) Secure alarmed areas within office complexes

(4) Energy management & building service control systems (lighting and air conditioning)

(5) Car park access control for entry and exit

(Source: http://www.baps.co.nz)

Security systems

- Security Products (HK Police Crime Prevention) http://www.police.gov.hk/ppp_en/04_crime_matters/cpa/sec_products.html
  - Access control systems, alarms, CCTV
  - Guard monitoring systems
  - Security lighting
  - Locks
  - Perimeter protection (fencing, barriers)
  - Personal panic alarm
  - Property marking
  - Screening, storage
  - Vehicle security system

Are you aware of the security products around us?

Security systems

- Security company licence in HK
  - Type I – provision of security guarding services
  - Type II – provision of armoured transportation services
  - Type III – installation, maintenance and/or repairing of a security device and/or designing (for any particular premises or place) a security system incorporating a security device

- Managed by the Security and Guarding Services Industry Authority (SGSIA) http://www.sb.gov.hk/eng/links/sgsia/

CCTV systems

- Closed circuit television (CCTV) system 閉路電視
  - Functions

    - 24 hour surveillance/deterrence
    - Real time or time lapse recording (on a closed loop basis)
    - Motion/alarm activated monitoring & recording
    - Area search using remotely controlled cameras
    - Integration with access control & other security systems

  - Components (now mainly digital)

    - Video camera (colour or monchrome)
    - Monitors, recorders and switchers
    - Multiplexer (triplex operation simultaneous playback and recording)
  - Key factors: quality, storage, export, playback

(* See also: HK Police requirements for digital CCTV systems http://www.police.gov.hk/info/doc/cpa/CCTV%20English.pdf)

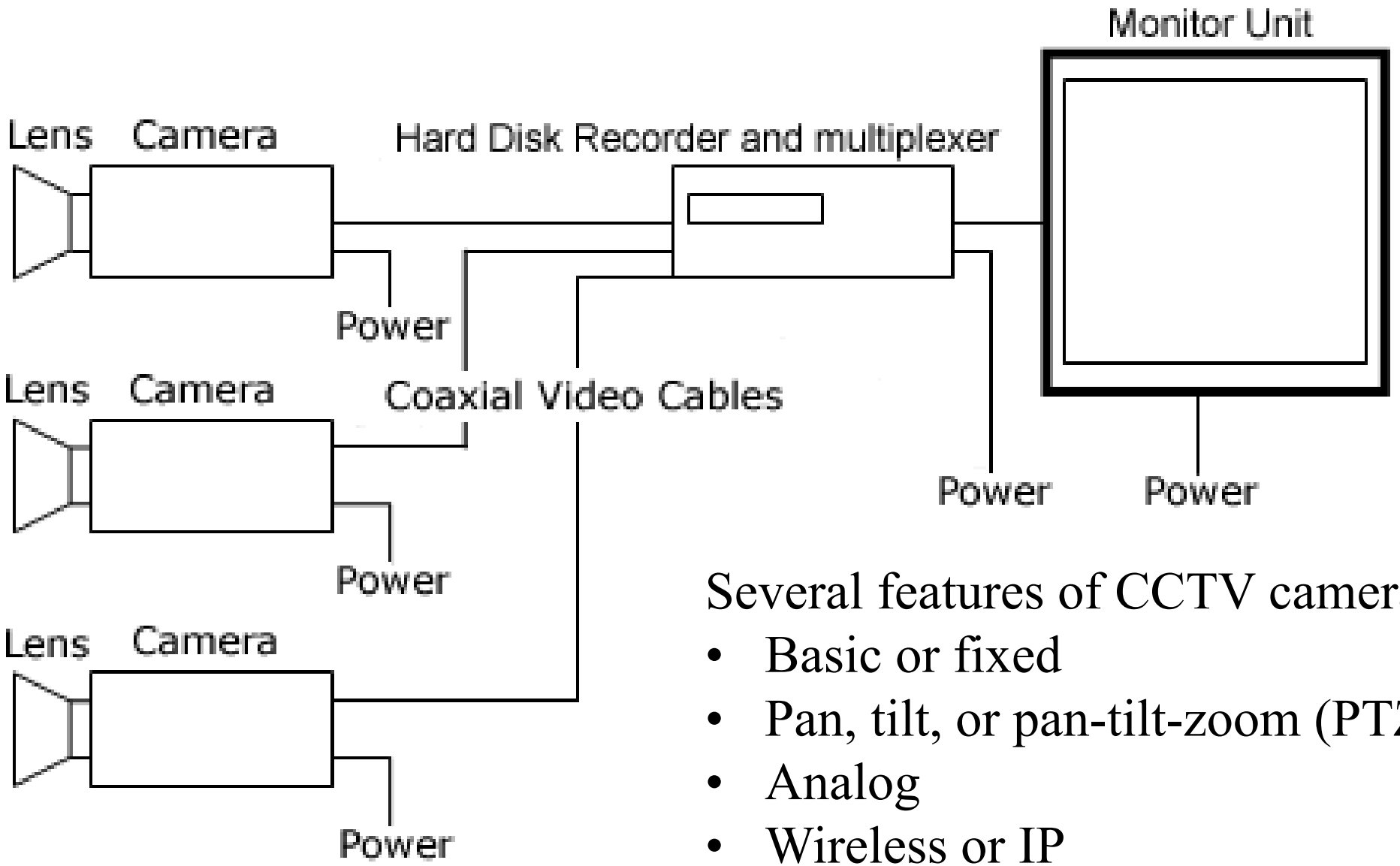
Different types of CCTV cameras

Types of cameras:-

- Dome camera
- Bullet camera
- Fisheye camera
- C-Mount camera
- Pan-tilt-zoom (PTZ) camera
- Day/Night camera
- Thermal camera
- Infrared/Night vision camera
- Network/IP camera
- Wireless camera
- High-definition HD camera

(Source: https://en.wikipedia.org/wiki/Closed-circuit_television_camera)

Basic concept of a multi-camera CCTV system



Several features of CCTV cameras:

- Basic or fixed
- Pan, tilt, or pan-tilt-zoom (PTZ)
- Analog
- Wireless or IP
- Night vision
- Exterior
- Motion-detection

(Source: https://ciaalarms.co.uk/cctv/closed-circuit-television-overview/)

CCTV systems

- Uses of CCTV systems:
  - Crime prevention (and deterring)
  - Crime investigation (a forensic tool)
  - Vehicle traffic monitoring (e.g. in car parks)
  - Pedestrian traffic (crowed) monitoring
  - Allow drivers to confirm people are clear of doors
  - Monitor access to secure or private areas
  - Employee/staff monitoring
  - Video surveillance in schools, shops or homes

The resolution makes a big difference – comparing CCTV cameras

(Source: https://kintronics.com/ip-cameras-better-analog-cctv-cameras/)

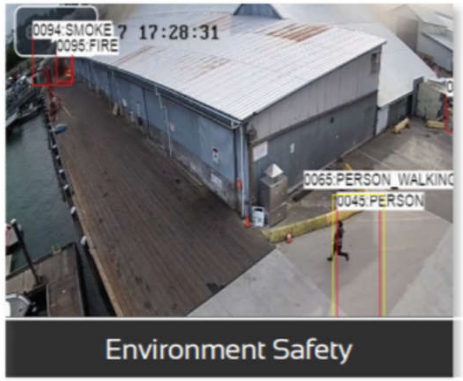
CCTV systems

- Technological advances of CCTV systems:
  - Video at full-colour & high-definition
  - Compression & storage of recordings
  - Save to the cloud via wired or Wifi network
  - Video content analysis (e.g. artificial intelligence)
    - Facial & image recognition, behaviours (suspicious or violent activities)
  - Internet protocol (IP) cameras
  - Wireless & networking security cameras
  - Talking CCTV (by the operator)

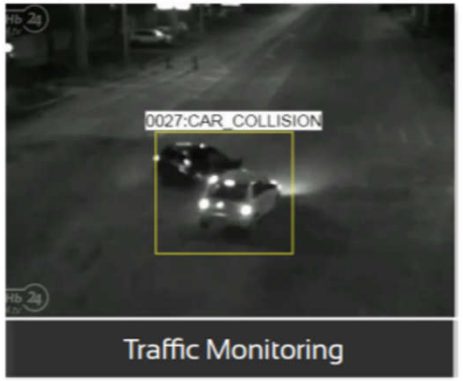
Do you know the potential of CCTV for image recognition?

Behavioral recognition by using CCTV video content analysis

Violent Activity Recognition



Environment Safety



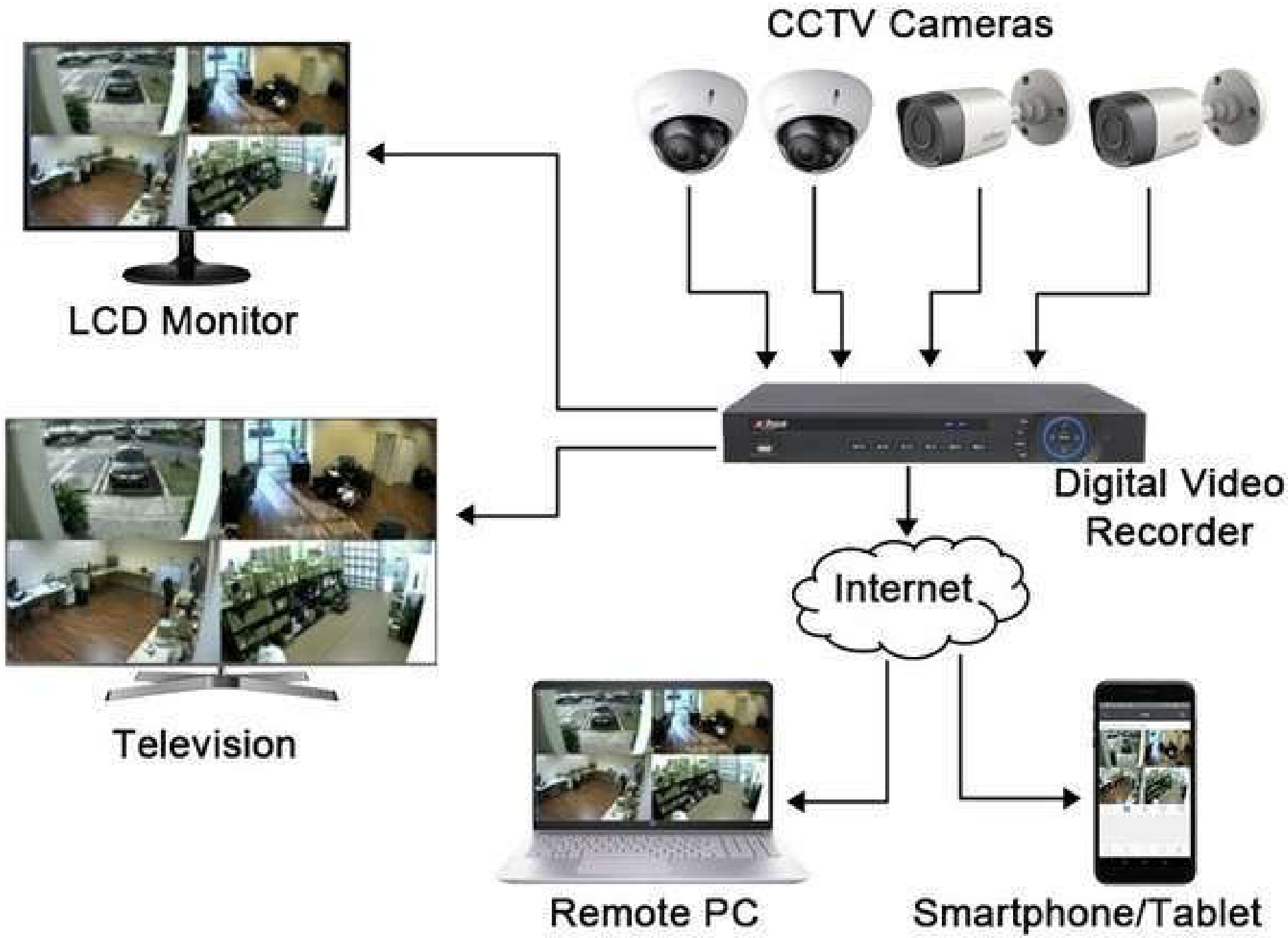
Traffic Monitoring

Violent Activity • People fighting • Brawl/Riot • Vandalism • Person with blood • Person with weapon	**Suspicious Activity** • Contextual loitering, tailgating • Person abandons an object • Person with mask /no mask • Person running/walking/falling • Person gets in/out of a vehicle	**Person & Crowd Behaviour** • Crowd classification by size • Crowd moving /gathering /dispersing • Occupancy analytics • Person to person proximity
Perimeter Protection • Person entering/exiting predefined zone • Vehicle entering/exiting predefine zone	**Traffic Monitoring** • Vehicle counting & classification • Vehicle behaviour • Accidents & hazards recognition • Urban mobility (vehicle+person) • Traffic congestion	**Environment+Personal Safety** • Smoke/Fire • Person with/without safety equipment • Person/Equipment in hazard • Person falling/on the ground

Video understanding for security and surveillance (3:04)
https://www.viisights.com/products/wise/

(Source: https://www.viisights.com/)

Internet-based CCTV systems

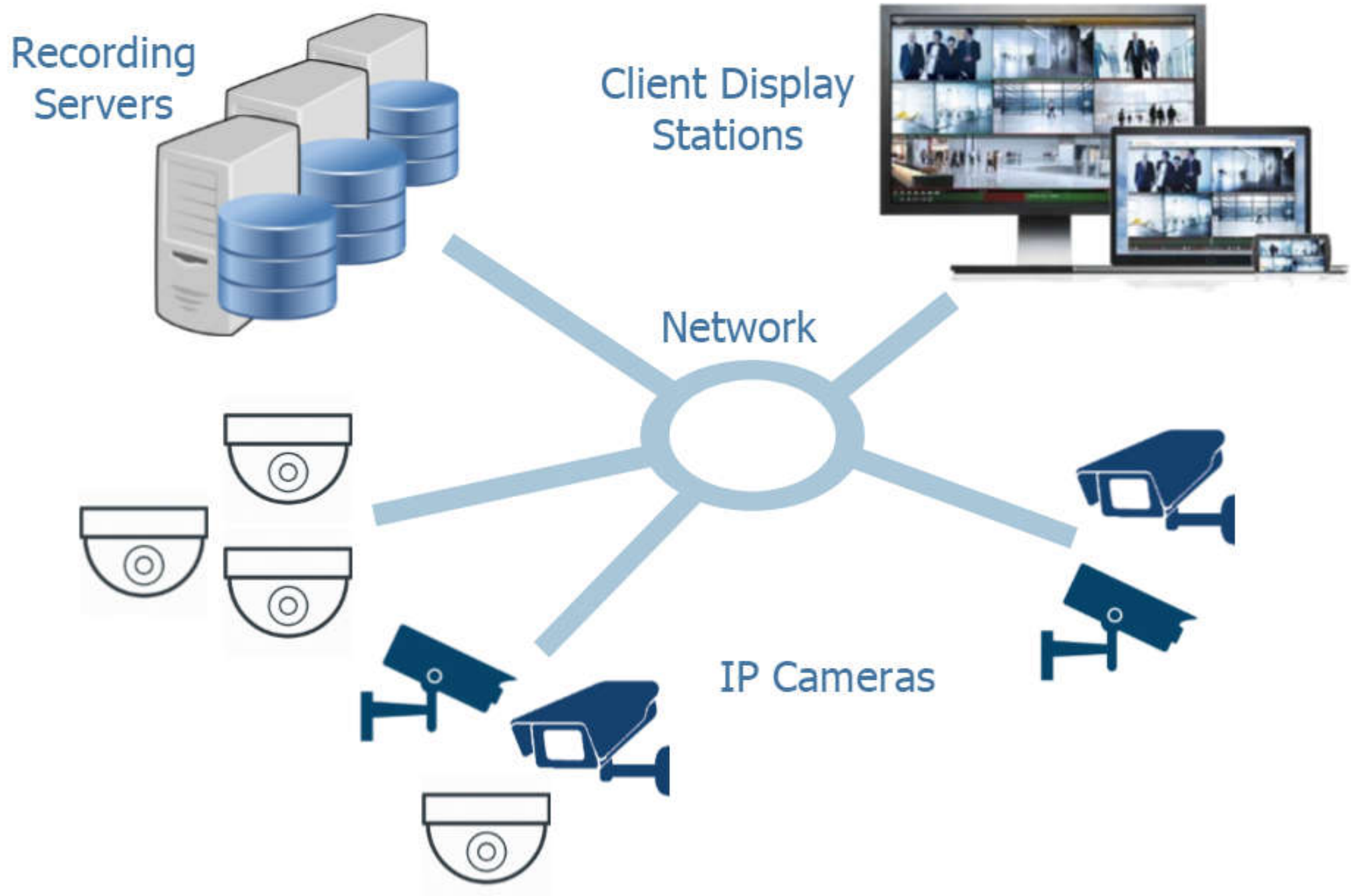


(Source: https://57543.8b.io/CCTVSystem.html)

CCTV systems

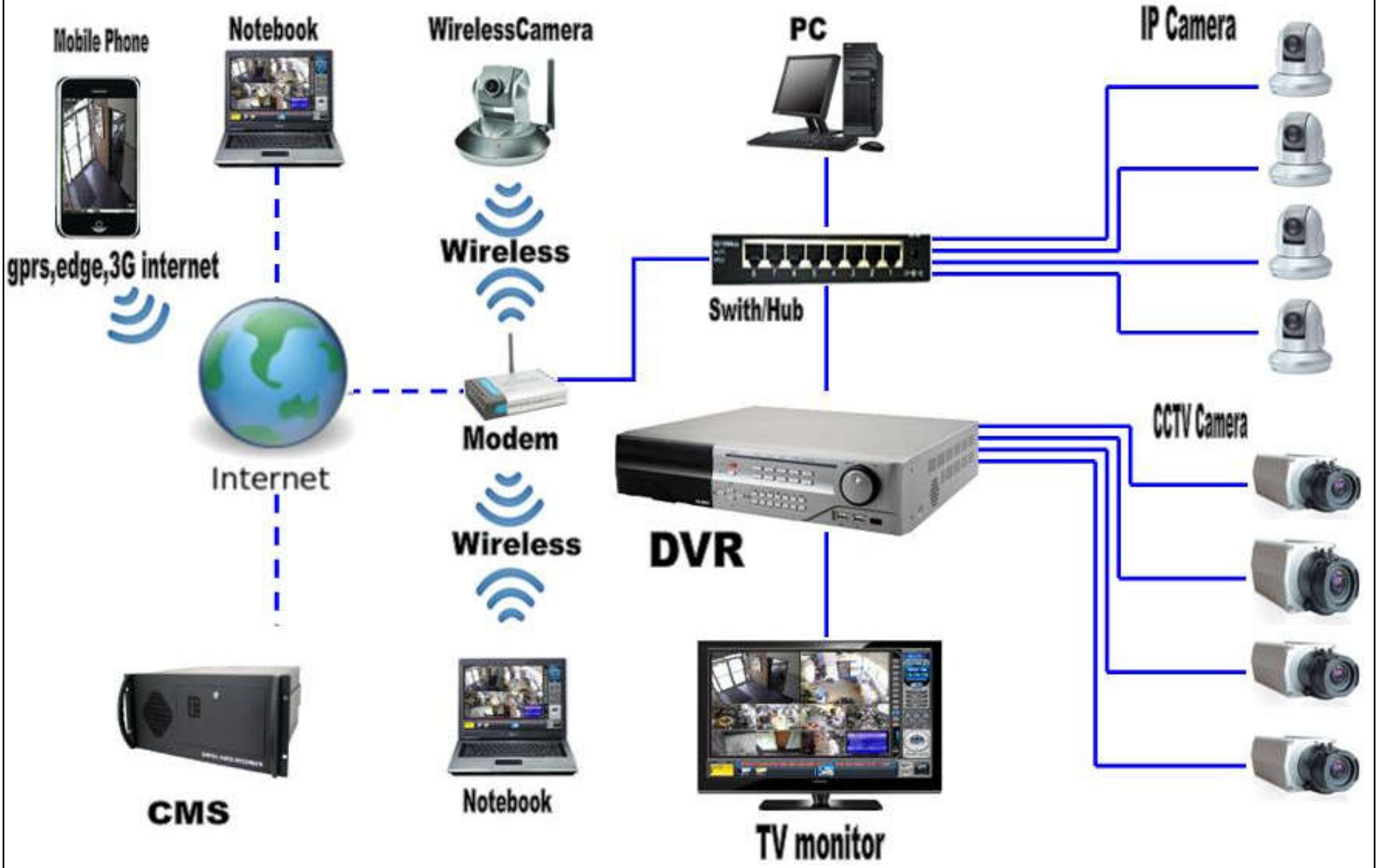
- Internet protocol (IP) cameras
  - Connect to the network rather than to a digital video recorder (DVR) using a coax cable
  - The IP camera system includes not only the cameras but also the video recording system
  - Network infrastructure
  - Power over Ethernet (PoE): enough power to support IP devices
  - Video management & recording system
  - Network video recorders (NVR)

IP camera system diagram

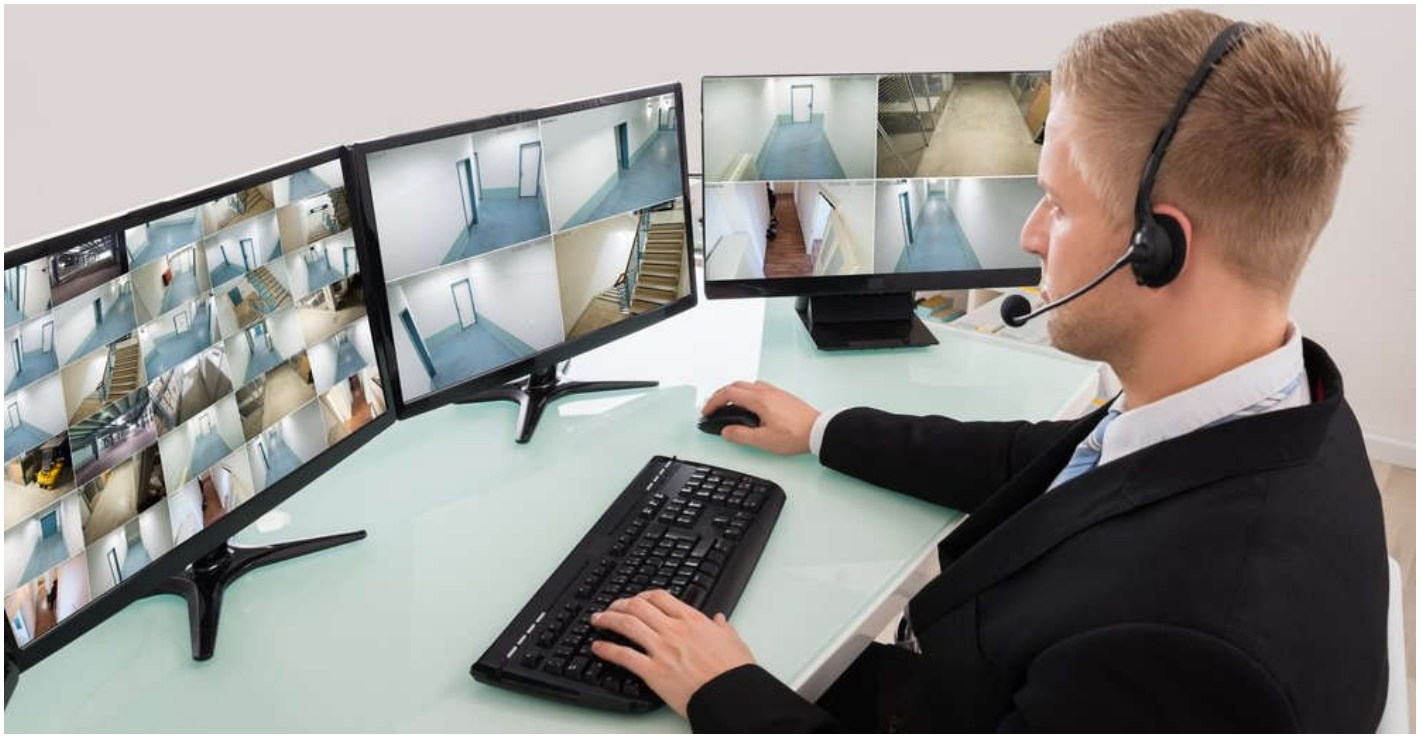


(Source: https://kintronics.com/how-to-install-your-ip-camera-system/)

Examples of CCTV installations with wireless, IP & analogue cameras



Talking CCTV - the system's operator can challenge criminals or members of the public via an intercom system (help stop antisocial behaviour)



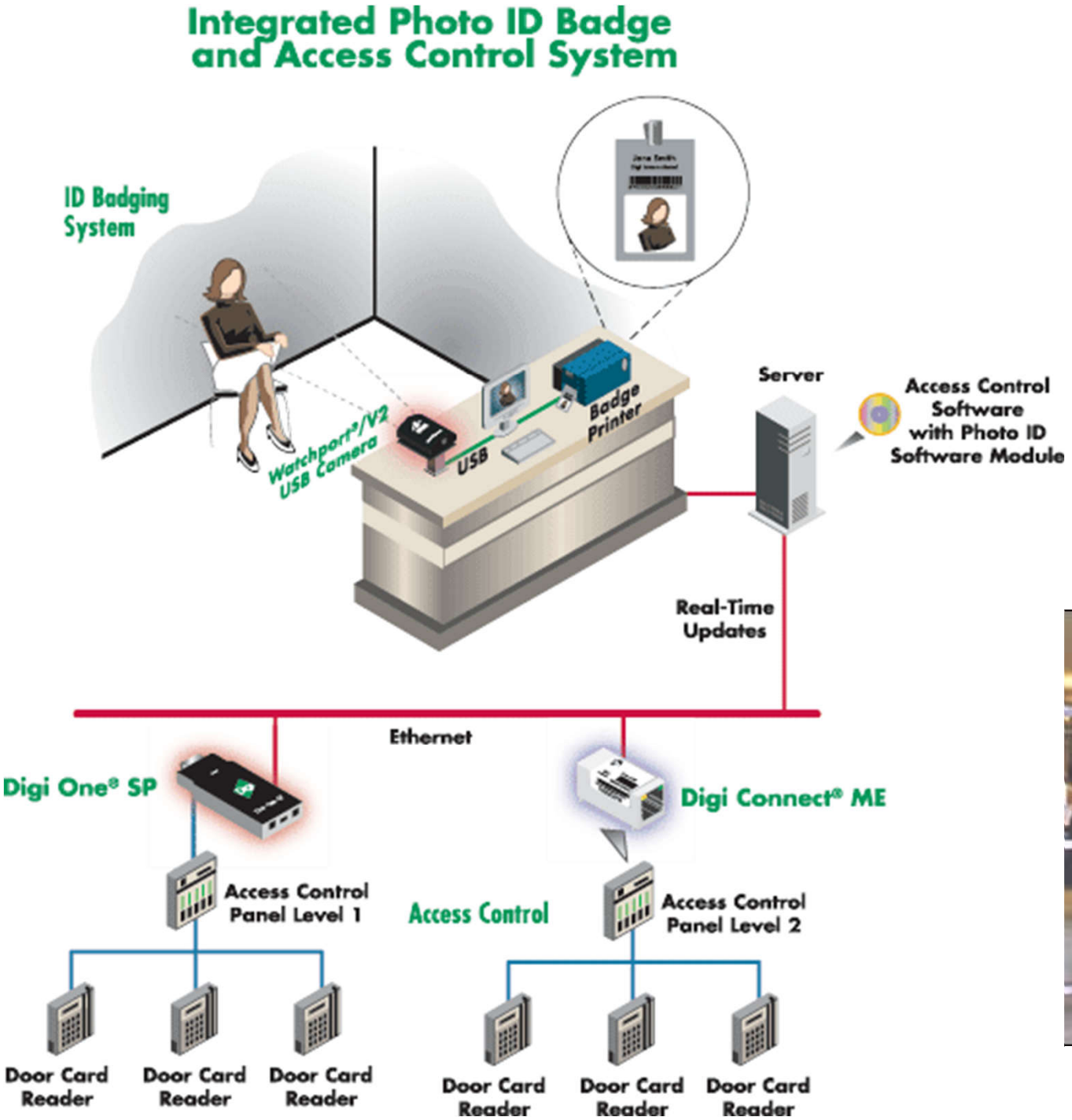
(Source: https://mammothsecurity.com/talking-cctv/)

Access control systems

- Access control
  - Stand-alone or online systems
  - Methods:
    - Digital codes
    - Magnetic stripe cards
    - Embedded wire cards
    - Proximity cards/tags
    - Biometric access control (e.g. retina, finger prints)
  - Pedestrian turnstiles (like those in subway stations)
  - Car park control (e.g. car park ticket validation)

(* See also: Introduction to Access Control Systems https://www.silvaconsultants.com/intro-to-access-control-systems)

Access control system

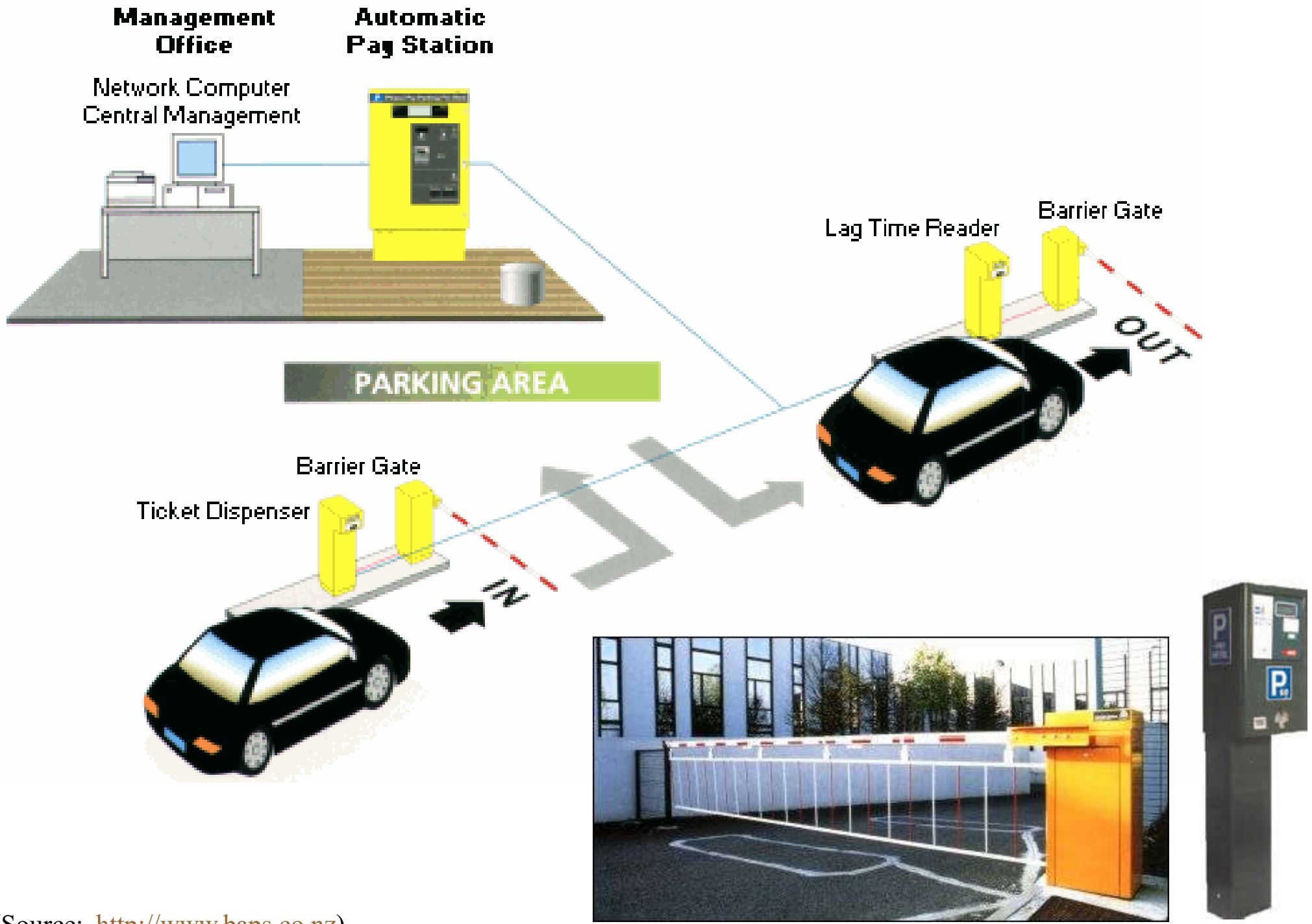


(Source: www.digi.com)

Pedestrian turnstiles

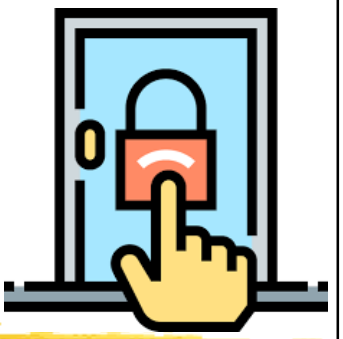
(Source: http://www.baps.co.nz)

Car park control system



(Source: http://www.baps.co.nz)

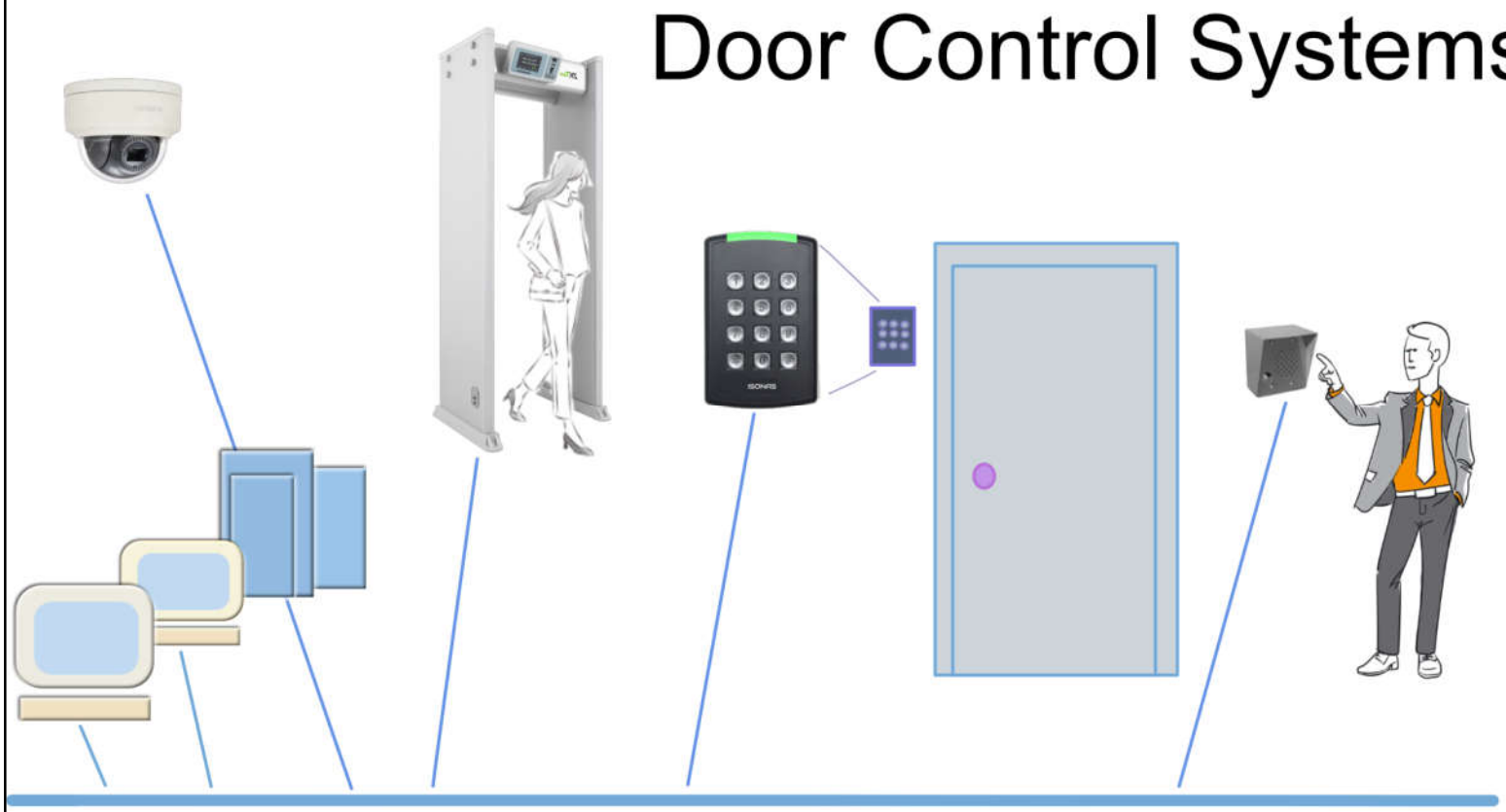
Access control systems



- Access control system (ACS)
  - Control passage into or out of any area
  - Computer-based, electronic access control
  - Basic components:
    - Access cards
    - Card readers
    - Access control keypads
    - Electric lock hardware
    - Access control field panels
    - Access control server computer

  - Latest trend: wireless & cloud-based systems

Examples of door access control systems (with door control readers, metal detectors, intercoms, IP cameras & emergency paging system)



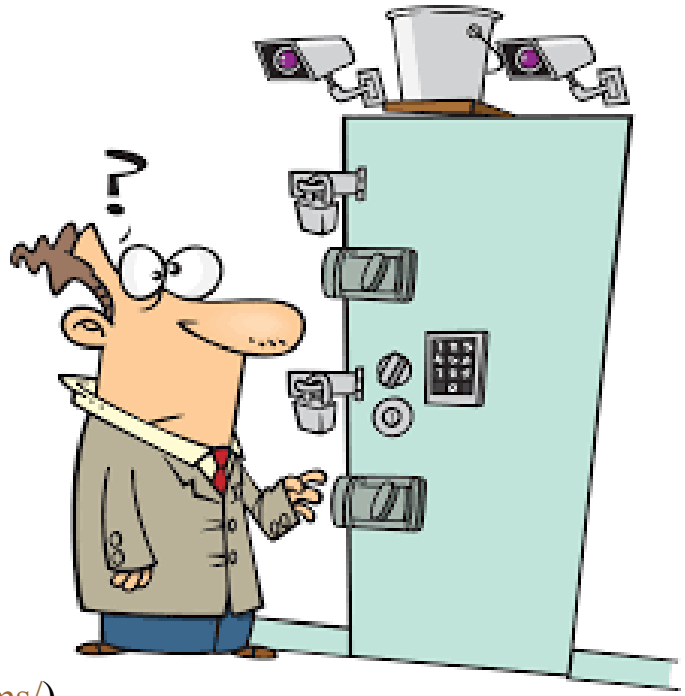
What are the key factors for door access control?

(Source: https://kintronics.com/security-provided-access-control-systems/)

Various levels of security for door access control systems

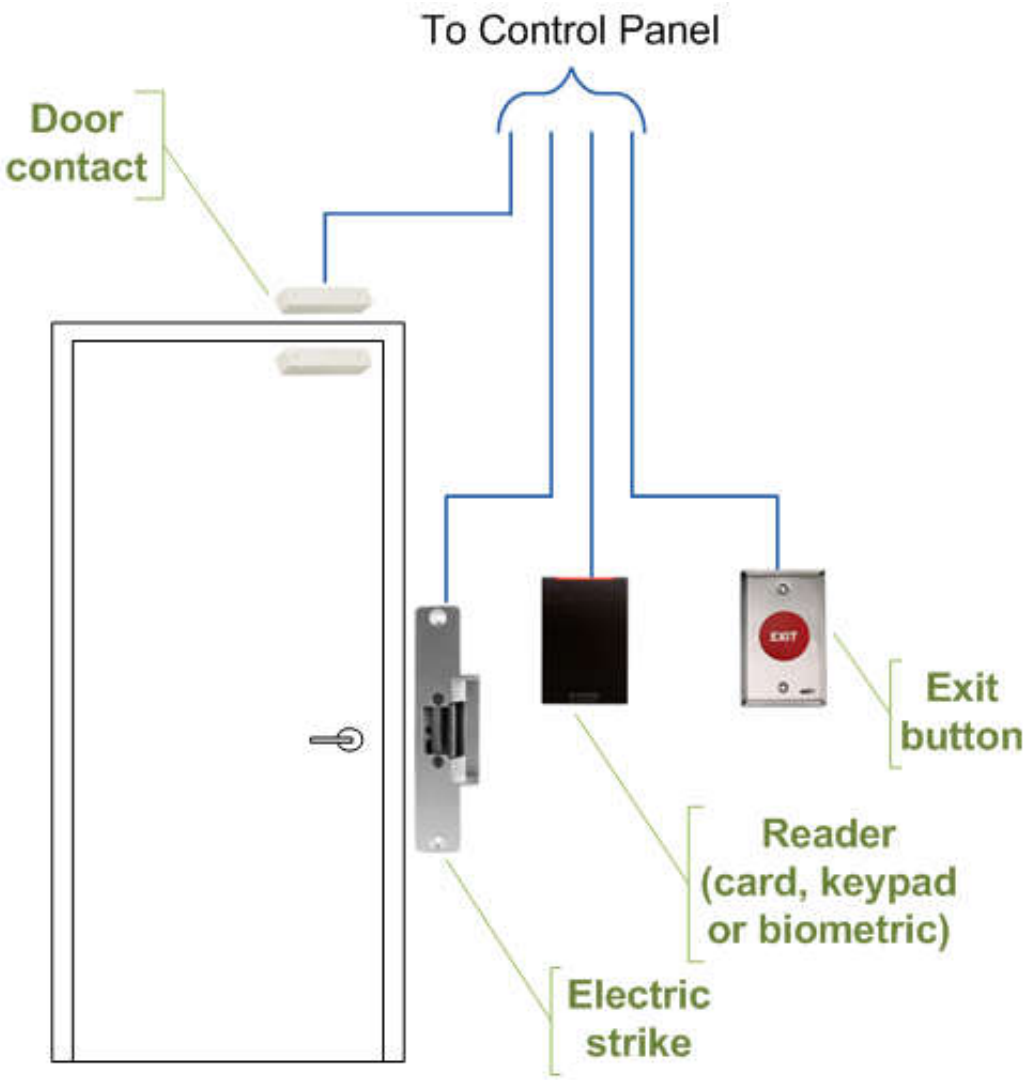
Level 1 Security – PIN Numbers	Lock with keypad Door Reader with keypad
Level 2 Security – Credentials	RFID IP Reader Intelligent IP Reader
Level 2.5 Credentials With Video	
Level 3 Security – Dual Authentication Systems	RFID IP Reader Intelligent IP Reader with Keypad
Level 3.5 Dual Authentication Plus Video	
Level 4 Security – Biometric Readers	Biometric IP Reader
Level 4.5 Biometric Readers Plus Video	

PIN = Personal identification numbers
RFID = Radio frequency identification
IP = Internet protocol

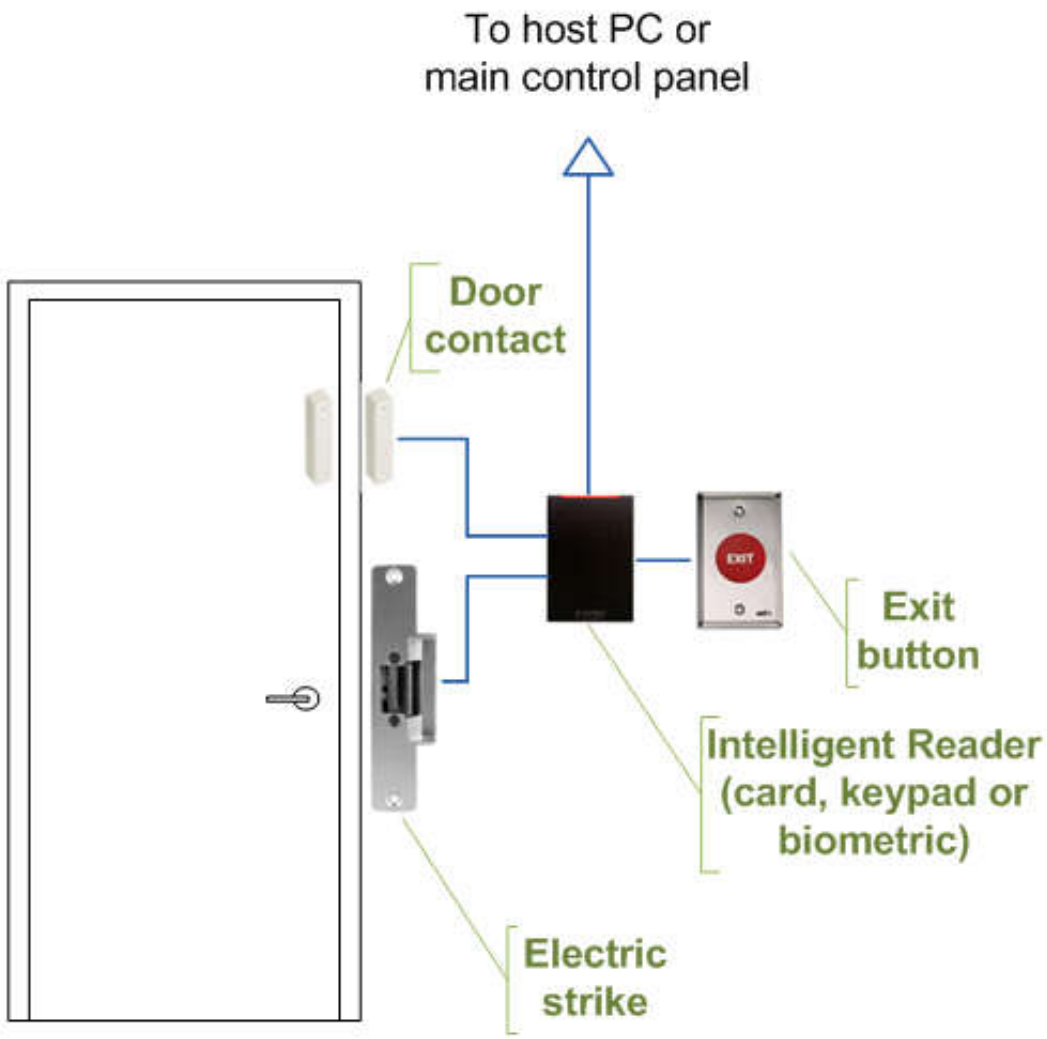


(Source: https://kintronics.com/comparison-security-provided-door-access-systems/)

Typical access control door wiring



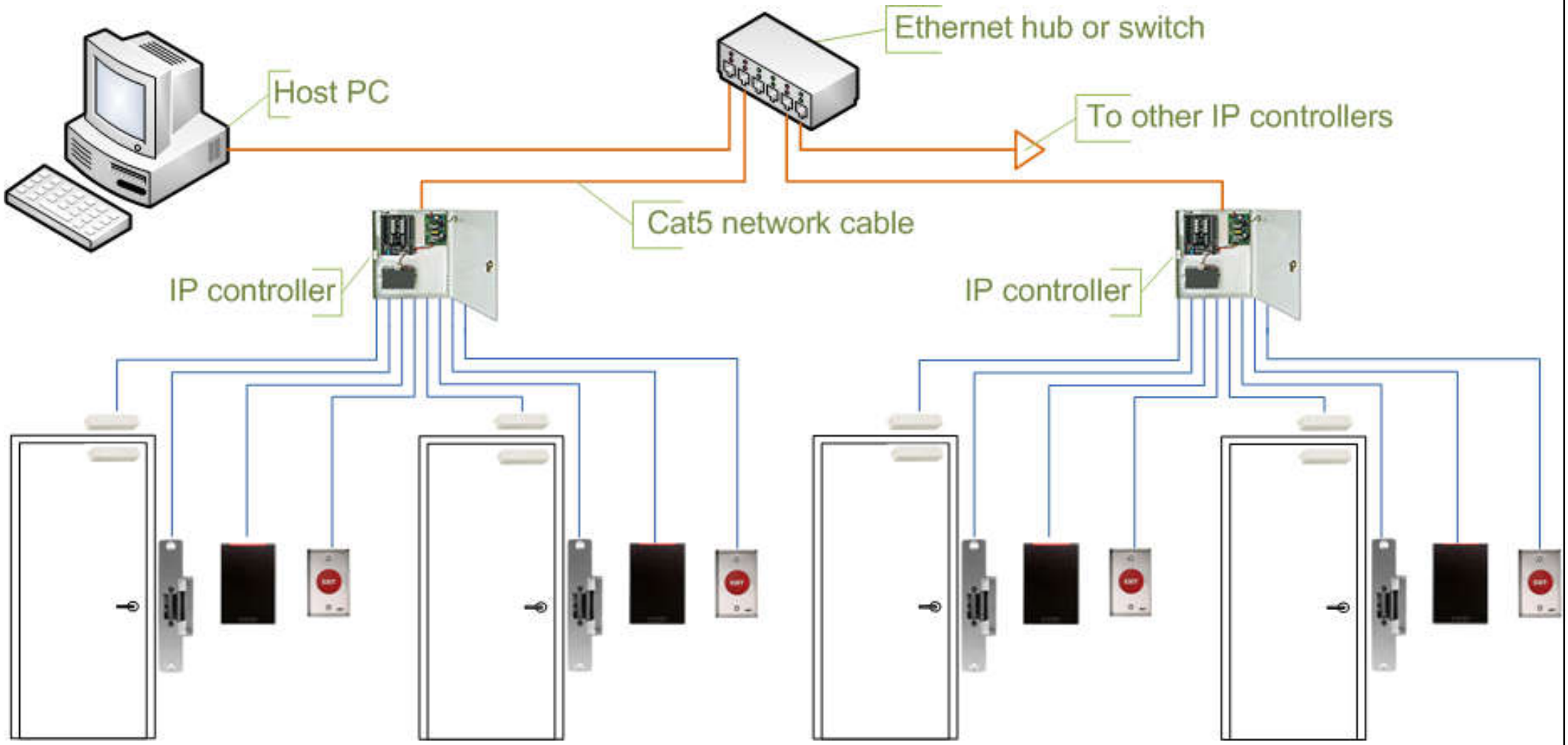
(a) With basic (non-intelligent) reader



(b) With intelligent reader

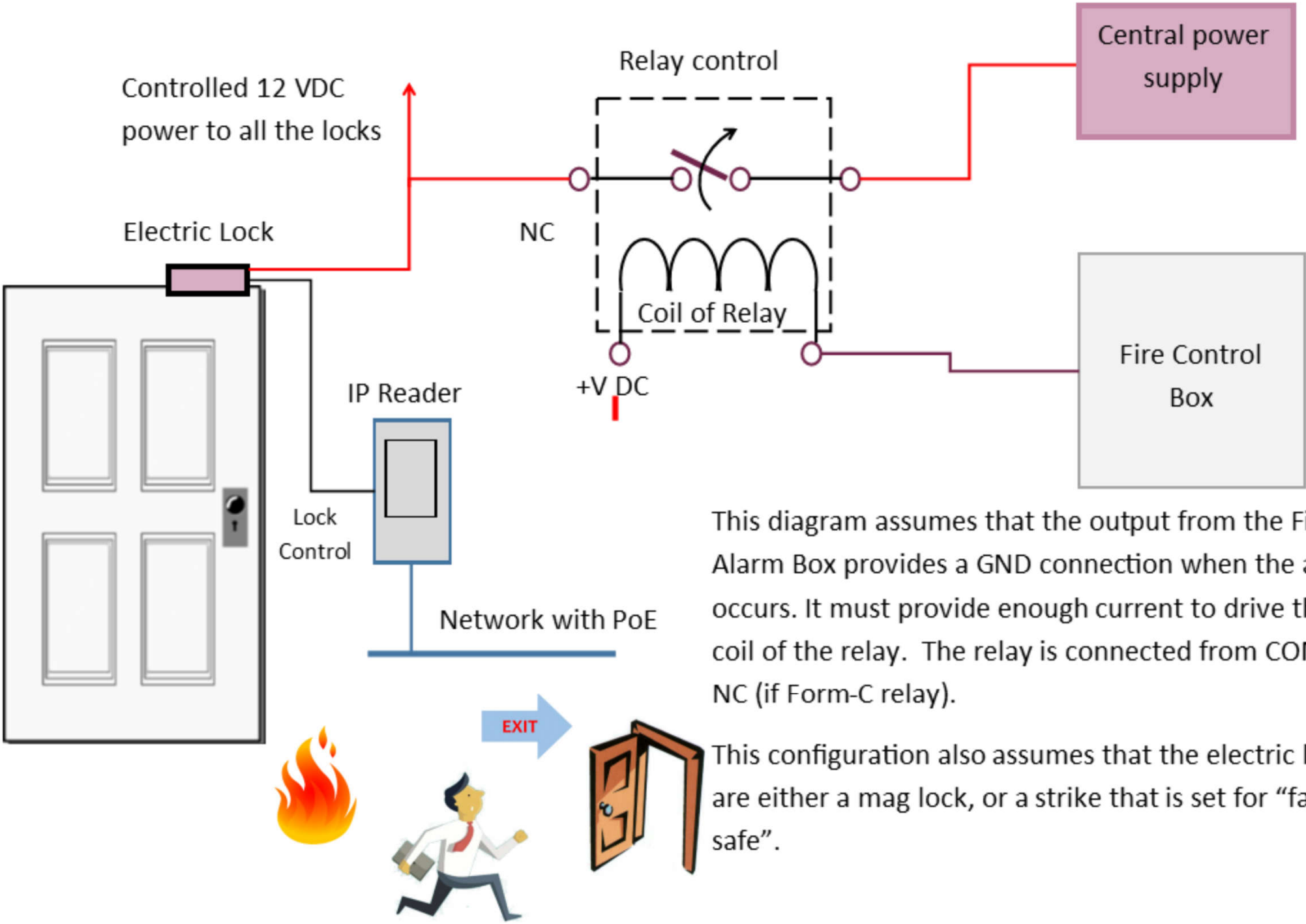
(Source: Access control - Wikipedia http://en.wikipedia.org/wiki/Access_control_system)

Access control system using IP controllers



(Source: Access control - Wikipedia http://en.wikipedia.org/wiki/Access_control_system)

How to integrate access control with fire alarm systems

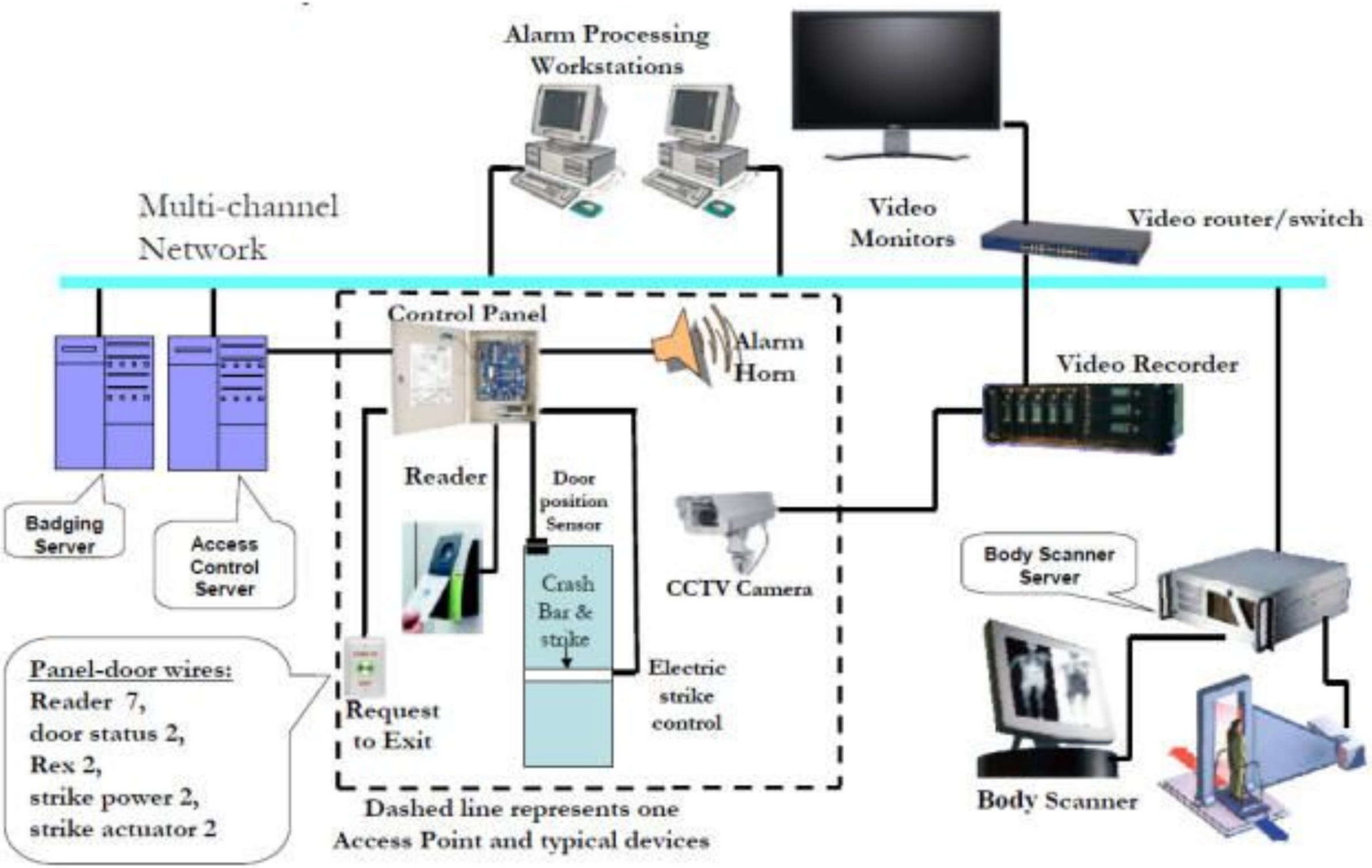


This diagram assumes that the output from the Fire Alarm Box provides a GND connection when the alarm occurs. It must provide enough current to drive the coil of the relay. The relay is connected from COM to NC (if Form-C relay).

This configuration also assumes that the electric locks are either a mag lock, or a strike that is set for "fail-safe".

(Source: https://kintronics.com/access-control-fire-alarm-system-integration/)

Architecture of an access control system with network support

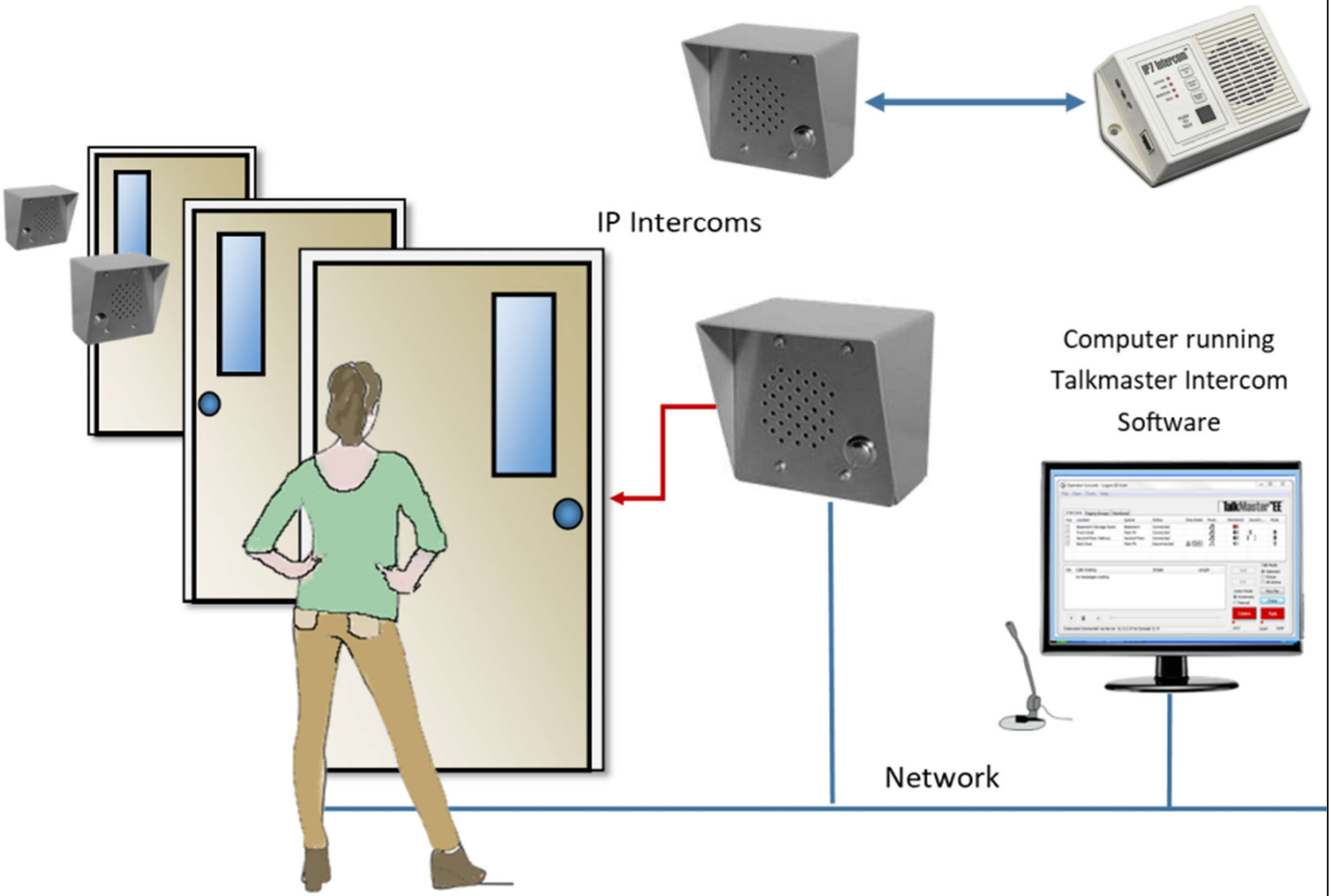


(Source: https://diamondlockandsecurity.com.au/)

Access control systems

- Intercom systems
  - Audio intercoms
    - One to one connections (two-way audio)
    - Many intercoms to a central control centre
  - Video intercoms
    - One intercom to one or many connections (e.g. smartphones & a central computer)
    - Integrate with IP camera systems & door access control systems to provide a complete security system
  - Visitor control systems (e.g. a delivery person)

Audio intercoms for door access control

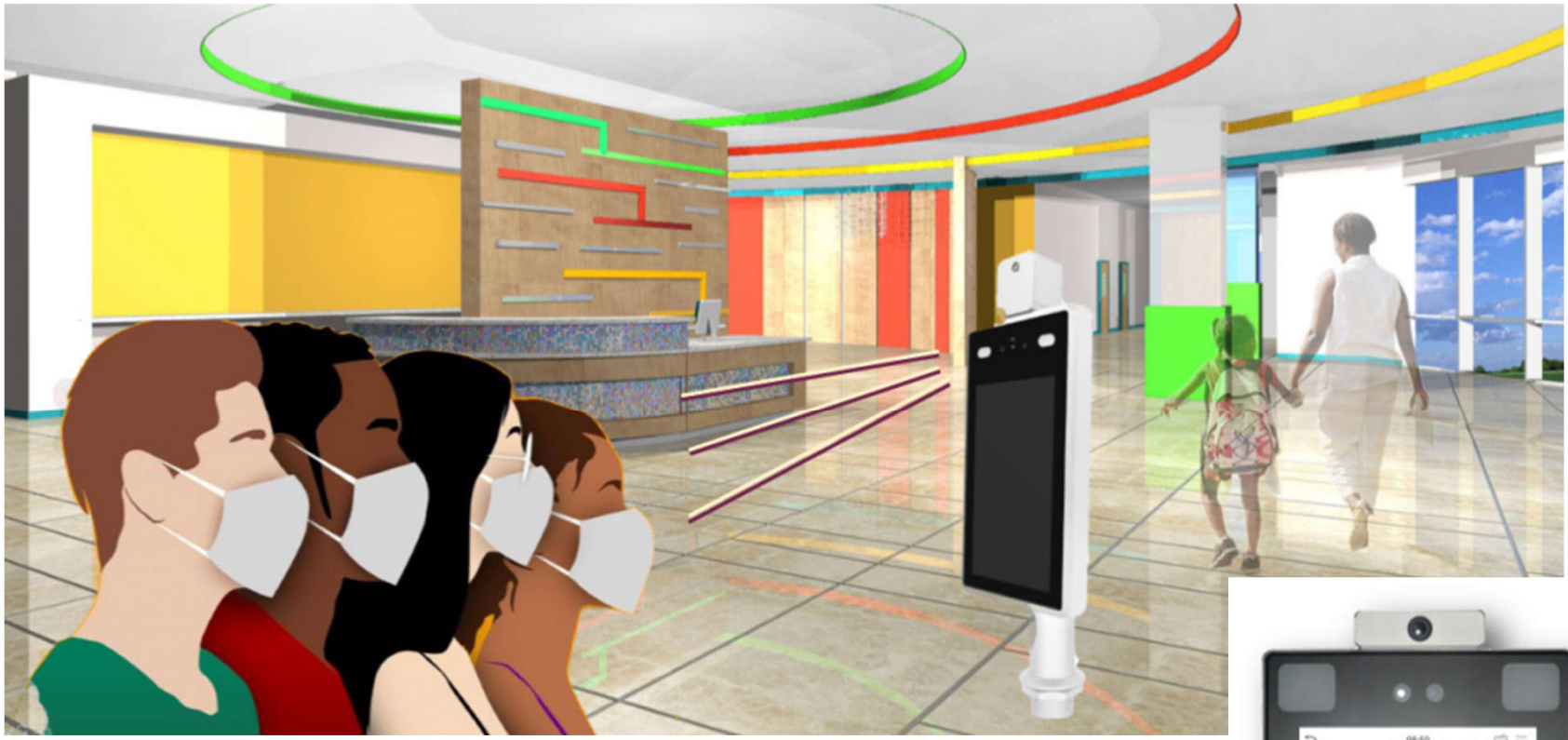


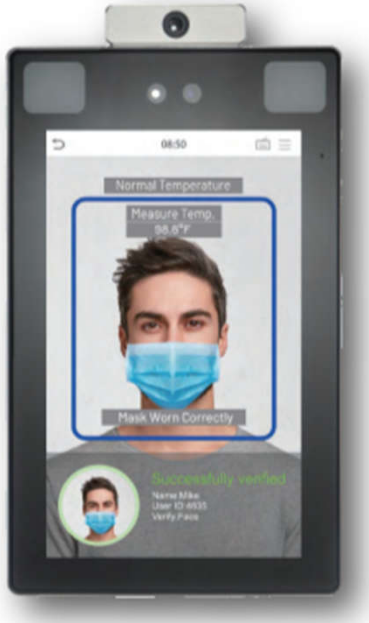
(Source: https://kintronics.com/ip-intercom-selection-and-comparison/)

Video intercoms and smartphone communication

(Source: https://kintronics.com/ip-intercom-selection-and-comparison/)

Biometric and body temperature access control
(check a person's temperature and check if they are wearing a mask)





Video: Access Control with Temperature Monitoring (1:44) https://youtu.be/w49T2gpbz8Q

(Source: https://kintronics.com/solutions/ip-door-access-control/comparison-of-face-recognition-and-temperature-access-control-panels/)

Burglar & intruder alarms

- Burglar alarm system include:
  - Control panel
  - Keypads
  - Intruder detectors and motion detectors (e.g. passive infrared, microwave, or photoelectric)
  - Door & window magnetic contacts
  - Alarm bells or siren
  - Central monitoring station/company (optional)

Basic approach of an alarm system

Input → **Control** → **Output**

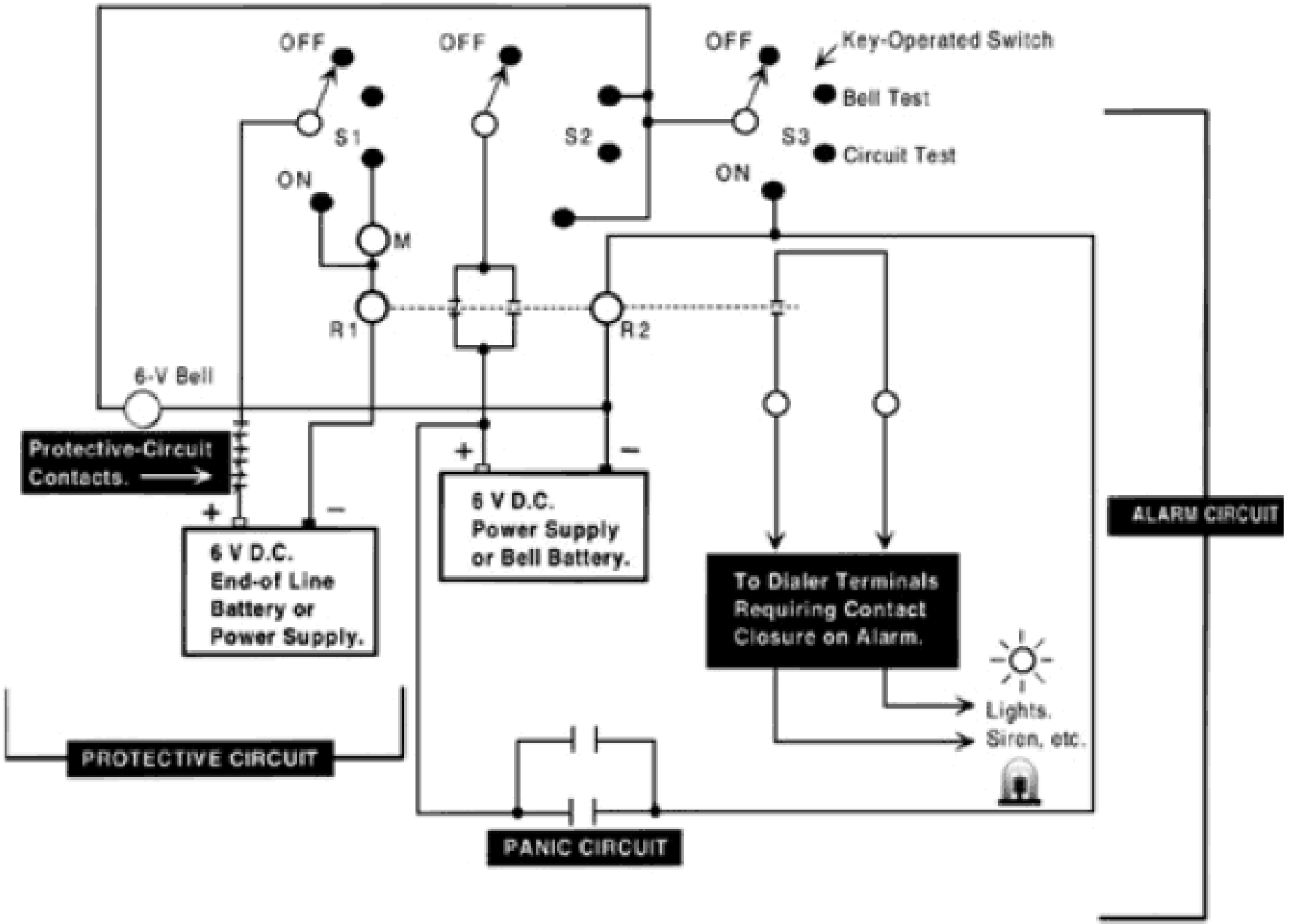
Input	Control	Output
Sensors	Panel	- Bell, siren, light - Dialer, email - Police-connect

Detection sensors:
- Infrared
- Ultrasonic
- Microwave (droppler effect)
- Dual technology
- Glass breaks, switches

Annunciation/
alarm signaling

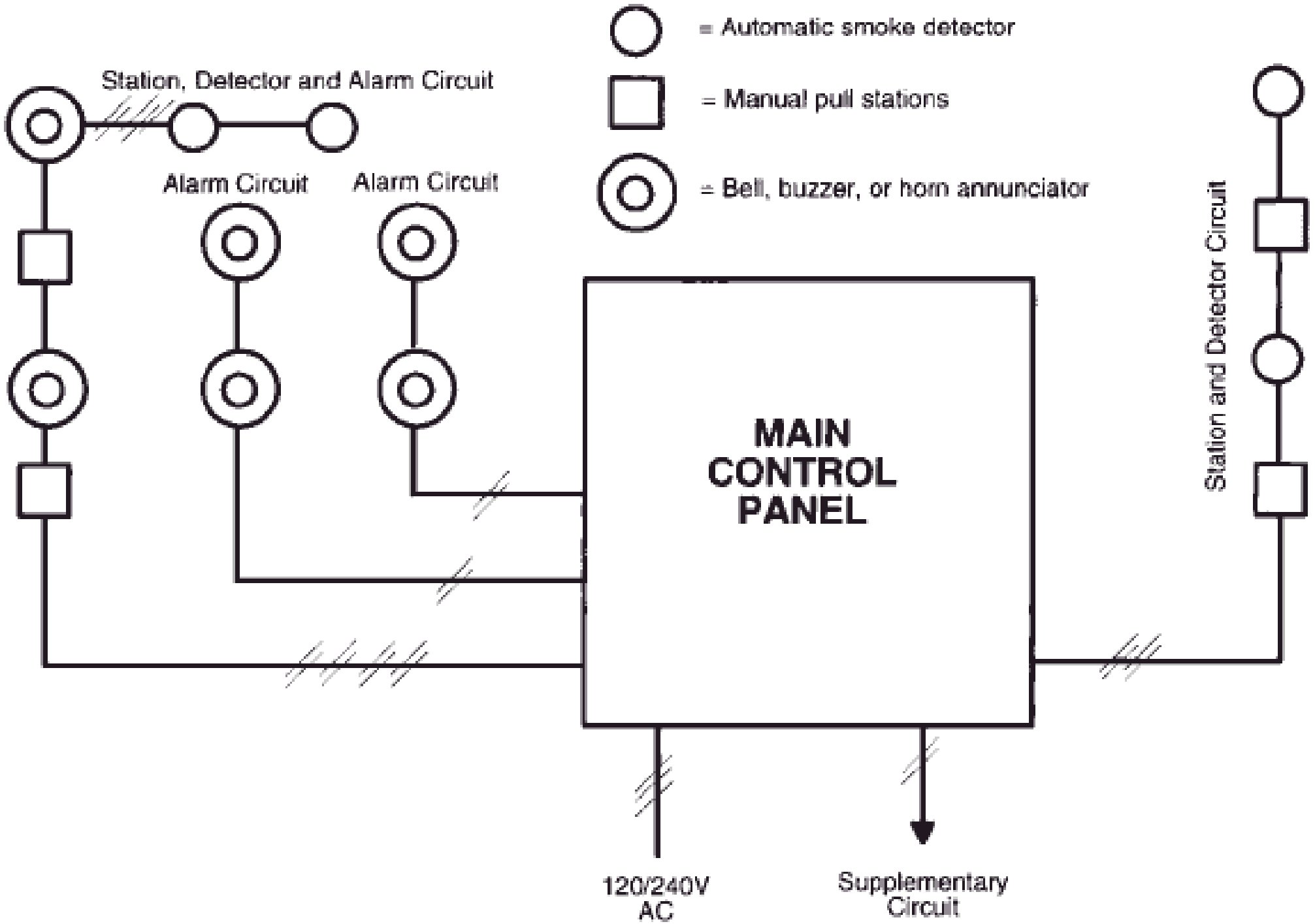
(* See also: Alarm Systems – An Overview http://www.shieldjournal.com/alarm-systems-an-overview/)

Closed-circuit security alarm system



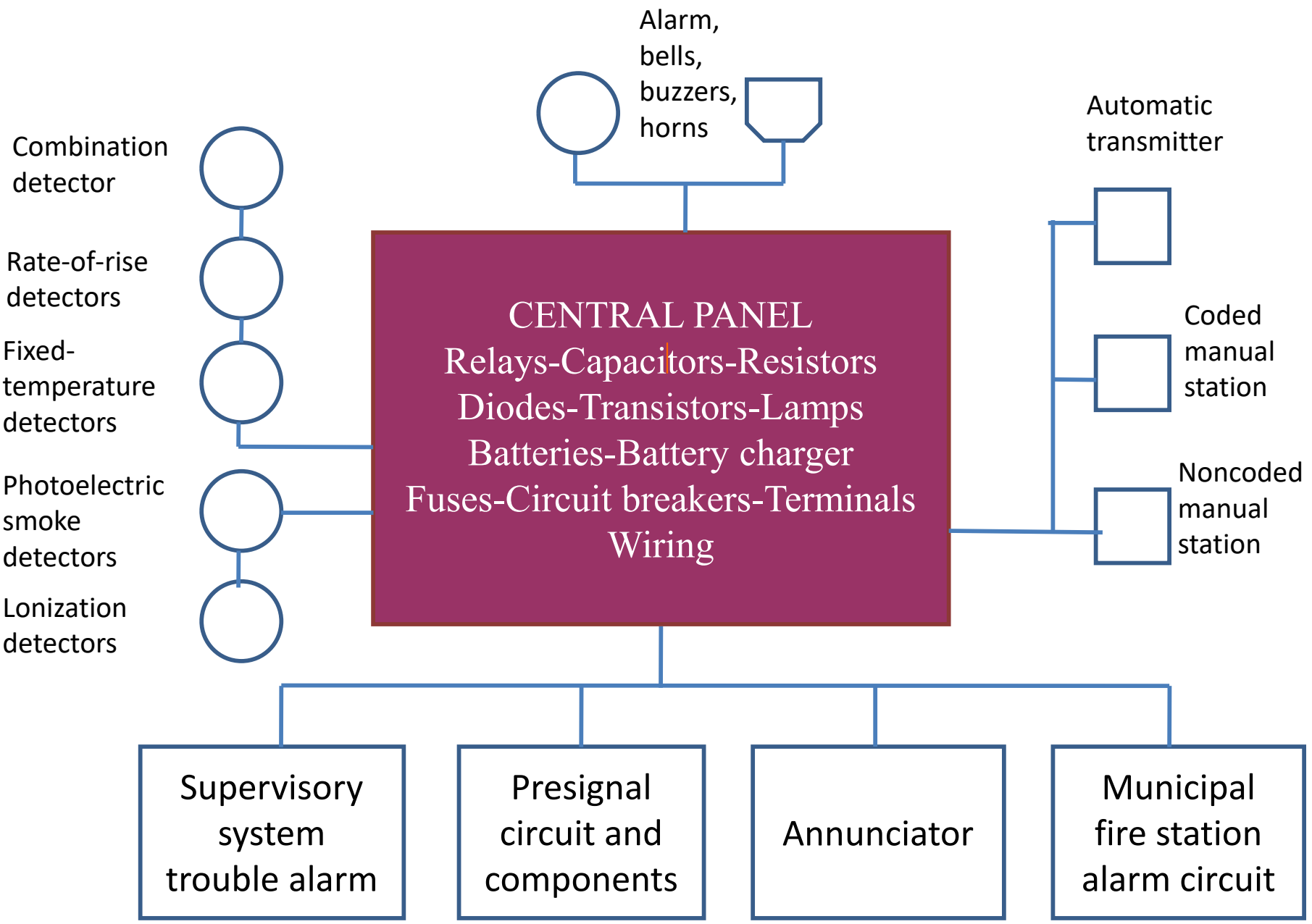
(Source: Kennedy, T. and Traister, J. E., 2002. *Low Voltage Wiring: Security/fire Alarm Systems*)

Schematic diagram of a fire-alarm main control panel



(Source: Kennedy, T. and Traister, J. E., 2002. *Low Voltage Wiring: Security/fire Alarm Systems*)

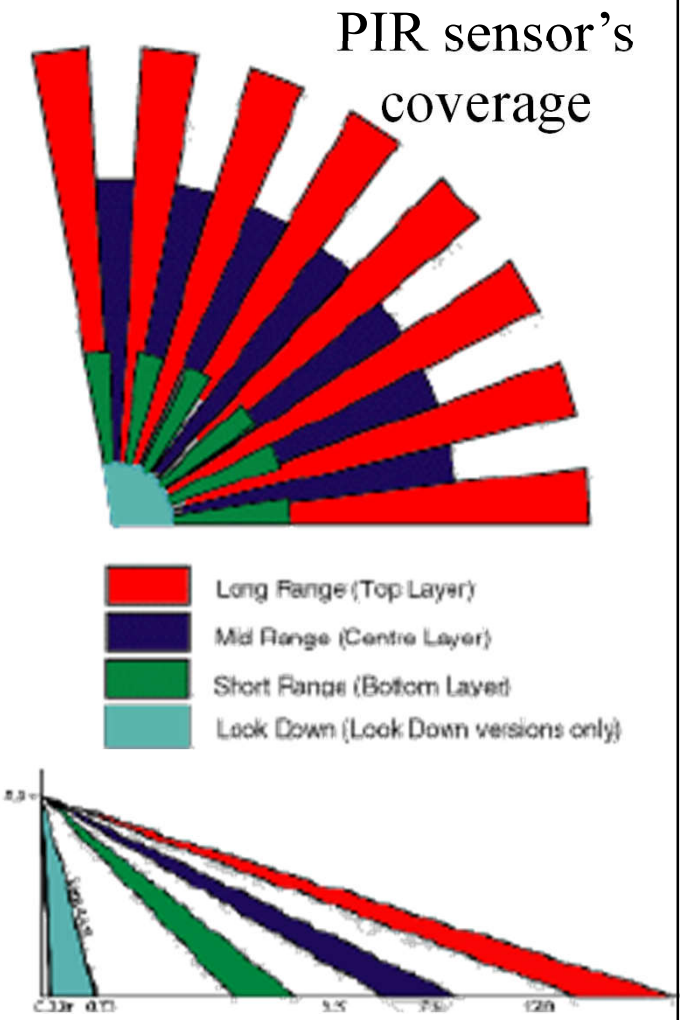
Components of a basic fire-alarm system



(Source: Kennedy, T. and Traister, J. E., 2002. *Low Voltage Wiring: Security/fire Alarm Systems*)

Burglar & intruder alarms

- Intruder detection alarm system
  - Mechanical contact switch
  - Magnetic contact switch
  - Glass-break & vibration detector
  - Photo-electric sensors
  - Motion sensors
    - e.g. passive infrared (PIR) sensors
  - Signaling devices
    - Both audible and visual types



(* See also: Introduction to Intrusion Alarm Systems https://www.silvaconsultants.com/intro-to-intrusion-alarm-systems; Basic information on intruder alarm systems https://www.dipolnet.com/basic_information_on_intruder_alarm_systems_bib770.htm)

Example of an intruder detection alarm system

(Source: http://www.xpertsecurity.com)

Components of intrusion detection alarm systems

- smoke detectors that detects smoke and sounds alarm to warn entire family.

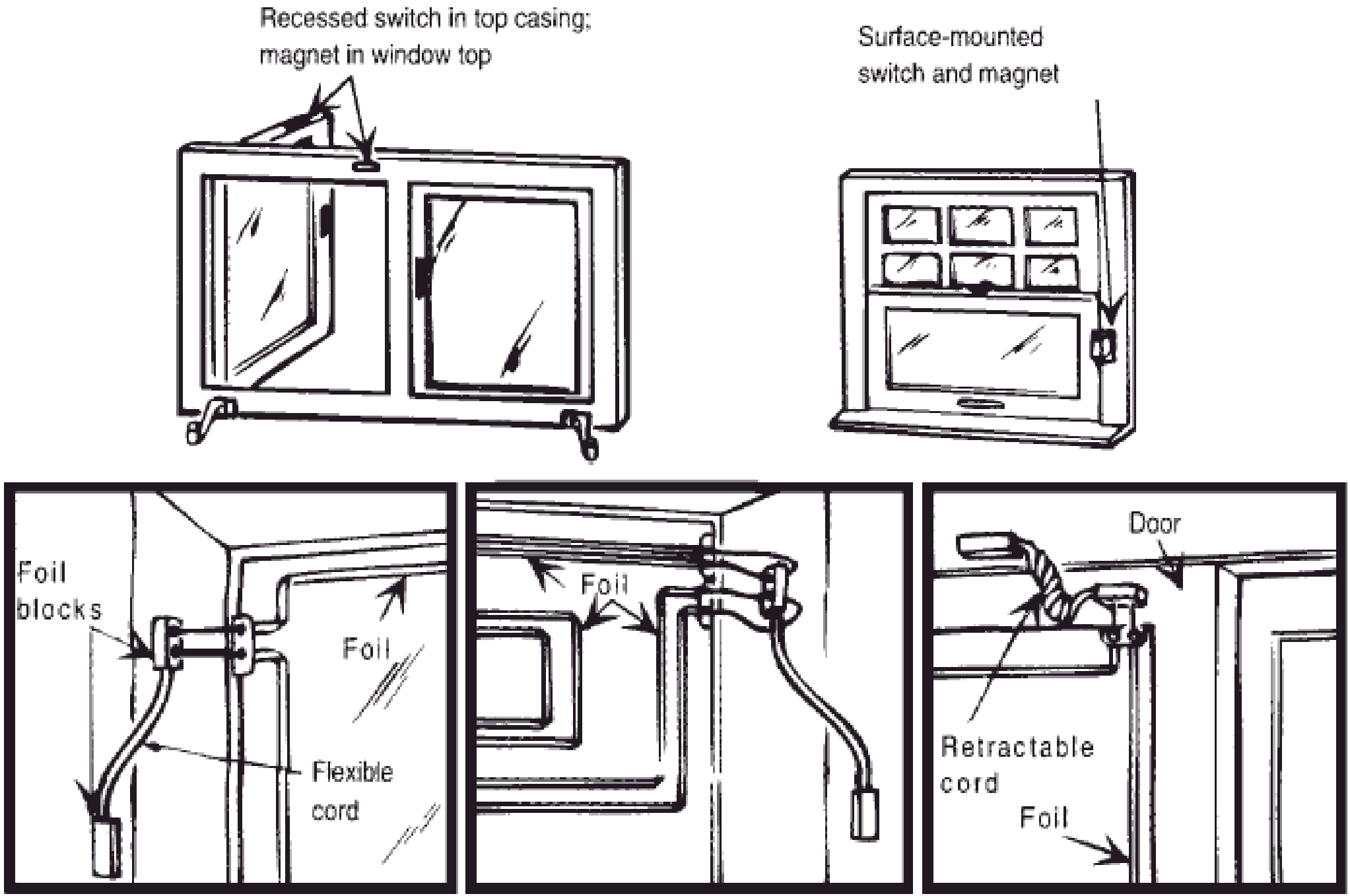
-window/door contacts

-motion detectors

-Interior Siren

(Source: https://lotussecuritysolutions.com/intrusion-detection-alarms/)

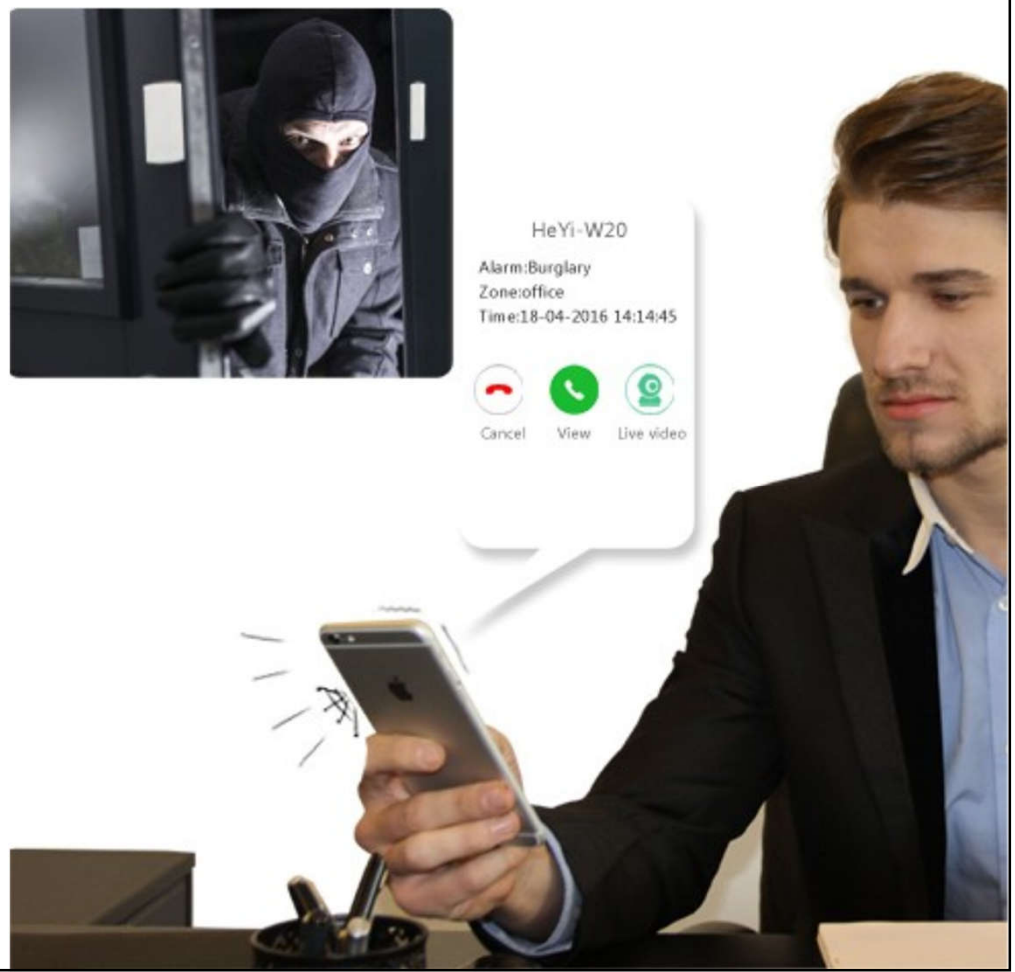
Magnetic contacts on windows and doors



(Source: Kennedy, T. and Traister, J. E., 2002. *Low Voltage Wiring: Security/fire Alarm Systems*)

Burglar & intruder alarms

- Additional items to the basic system
  - Smoke detectors
  - Glass break detectors
  - Panic buttons
  - Pressure mats
  - Closed circuit TV
  - Alarm screens
  - SMS alert service !! →



Burglar & intruder alarms

- Monitored systems
  - Contact a monitoring company by telephone
    - The security system senses something
    - The system waits for 30 to 45 seconds before going into alarm allowing the homeowner a chance to deactivate the system to prevent false alarms
    - If not deactivated, the security system goes into alarm and sends a message to the monitoring company over telephone lines
    - The monitoring company receives the message, determines the nature of the alarm and verifies the alarm, generally by placing a phone call to the home. If they do not receive the proper password or do not receive an answer, they call the police
    - The police receive the monitoring company's call and respond

Burglar & intruder alarms

- Unmonitored systems
  - Typically on-site alarms and/or flashing lights to indicate the security system has been breached
  - Relies on neighbours or passersby as to see or hear the alarms and then to call police
  - A combination of strobe lights and alarms
    - Many burglars will leave once alarms and strobes are activated

Burglar & intruder alarms

- False alarms
  - 95-99% of the alarms received are false
  - Some police departments impose fines for false alarms after a specified number of false alarms
- Common causes of false alarms
  - Environmental conditions e.g. a storm that causes loose windows and doors with sensors to rattle
  - Wandering pets that are not in a "safe" zone and may activate motion sensors
  - Drafts that move objects such as curtains or plants in the home within the motion sensor's detection area

False alarm management scheme in Hong Kong

Do you know how to overcome false alarm problems?

new alarm/reliable system

(Emergency Unit & Patrol – stay 1 hour)

3 false alarms in 30 days; 5 in 180 days

(Emergency Unit & Patrol – no stay)

5 false alarms in 30 days; 10 in 180 days

(Patrol – no priority to take care)

(Source: Hong Kong Police Crime Prevention Bureau)

Further Reading

- Extra-low voltage - Wikipedia https://en.wikipedia.org/wiki/Extra-low_voltage
- Security Products https://www.police.gov.hk/ppp_en/04_crime_matters/cpa/sec_products.html
- CCTV - Designing Buildings Wiki https://www.designingbuildings.co.uk/wiki/CCTV
- Introduction to Access Control Systems https://www.silvaconsultants.com/intro-to-access-control-systems
- Introduction to Intrusion Alarm Systems https://www.silvaconsultants.com/intro-to-intrusion-alarm-systems
- Basic information on intruder alarm systems https://www.dipolnet.com/basic_information_on_intruder_alarm_systems_bib770.htm

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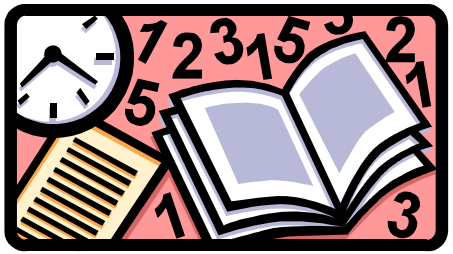

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- HK Police requirements for digital CCTV systems http://www.police.gov.hk/info/doc/cpa/CCTV%20English.pdf