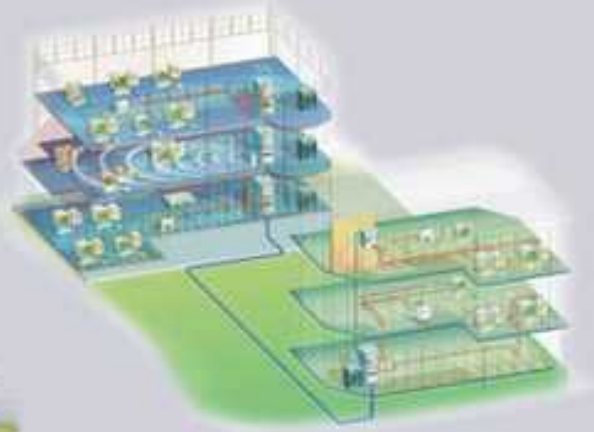
FORMATION RÉSEAU & CLIENTS -



Introduction

VDI : Voice Data Image

- "Information Technology"
  - Voice : phone network
  - Data : ethernet network
  - Image : video network

Introduction

Commercial buildings today

- Considerable personnel change — Every 18 months
- Change of computer workstations — Every 2-3 years
- Evolution of computer networks — Every 4-5 years

Introduction

The Structured Cabling System

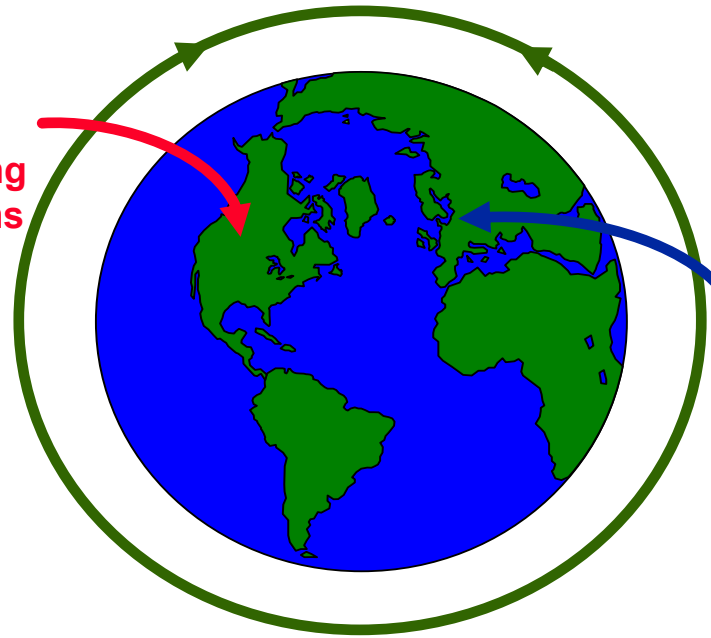
- For all computing and telephone applications
- Independence from manufacturers
- Flexible and reconfigurable

Average lifetime of cabling system:
8-10 years

Standard's reminds

ISO/IEC 11801:2002
IT Generic Cabling for Customer Premises

ANSI/TIA/EIA 568-B
Commercial Building Telecommunications Wiring Standard



EN50173:2002
Performance des équipements et des systèmes de câblage génériques

The standard

→ NF EN 50 173-1

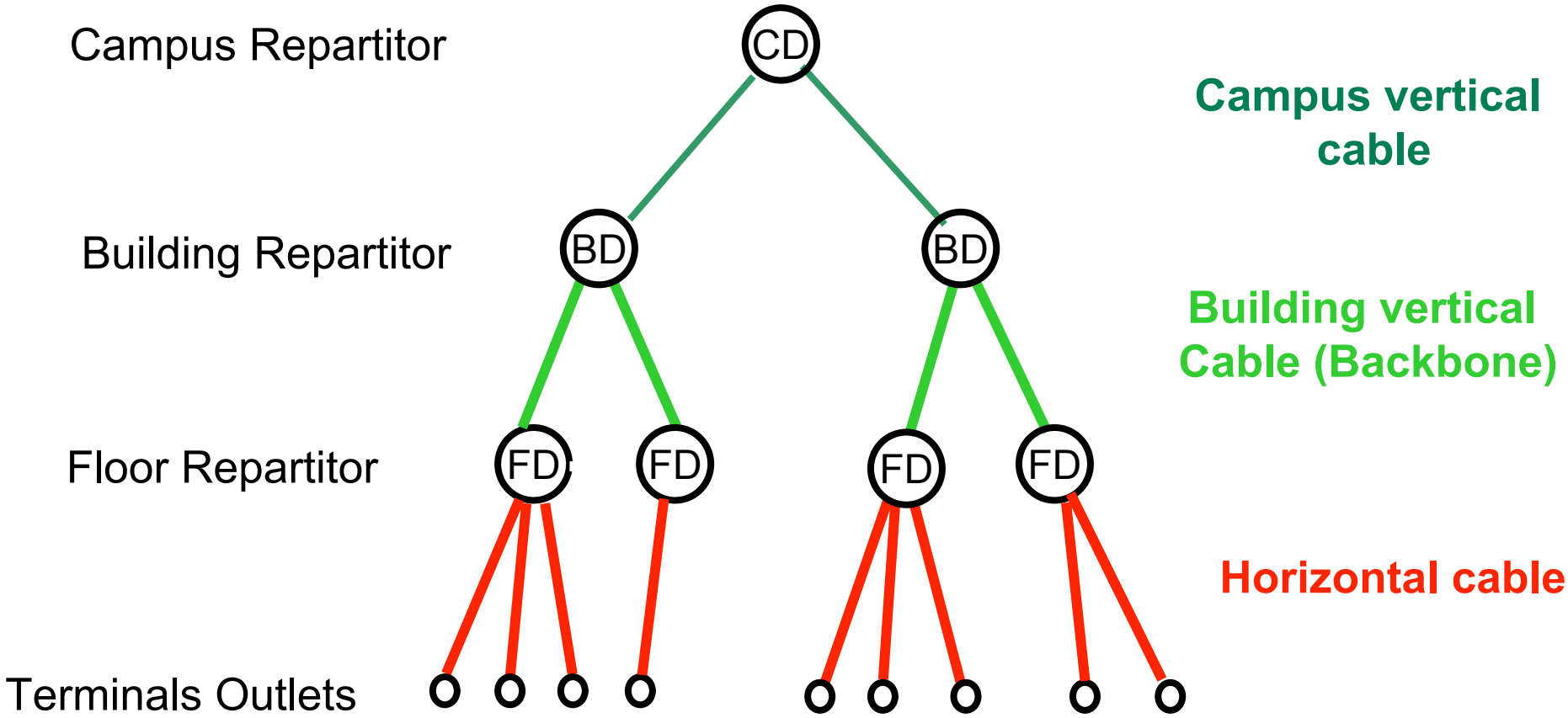
Last edition August 2003

→ ISO/IEC 11 801 : 2002

Last edition September 2002

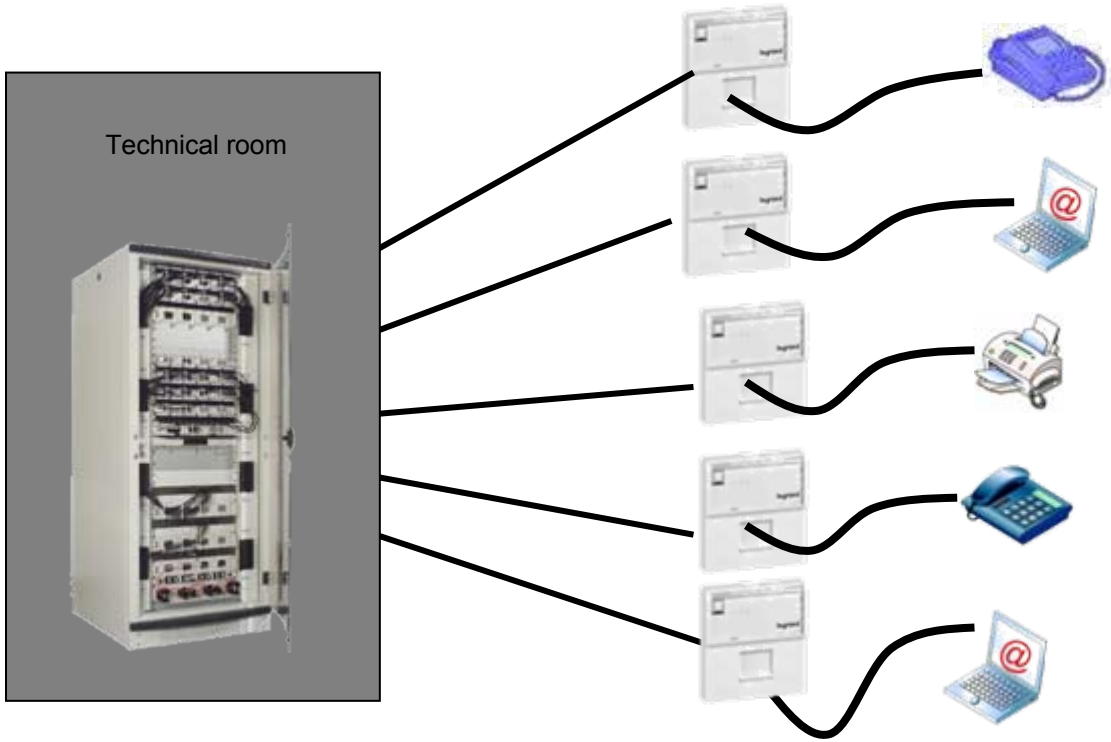
The standard : ISO/IEC 11 801

Architectures : Star with 3 levels



Horizontal cabling subsystem

What is the horizontal cabling ?



Star architecture

One 4 twisted pairs cable by socket

Universal Socket

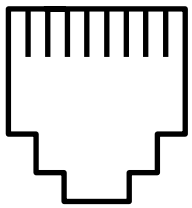
Socket not dedicated to an application

Horizontal cabling subsystem

The NF EN 50 173-1 and ISO 11801 Standard

- Connectic hardware

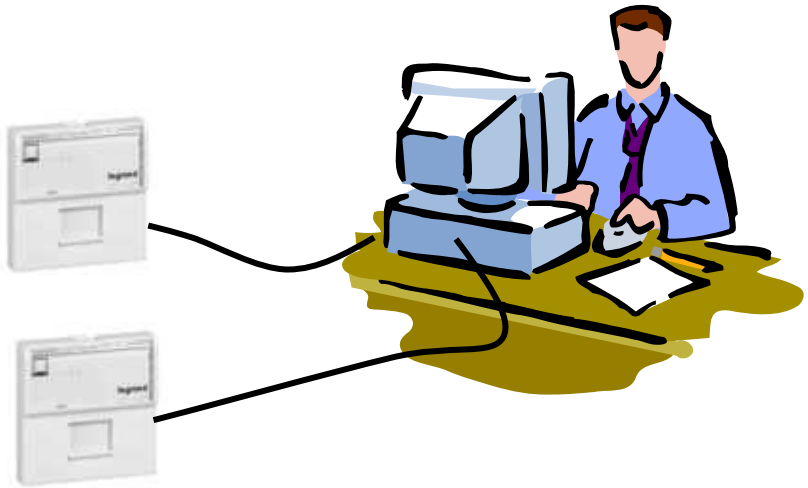
→ Generic outlets



RJ 45

→ The work area

A minimum of
2 terminal outlets



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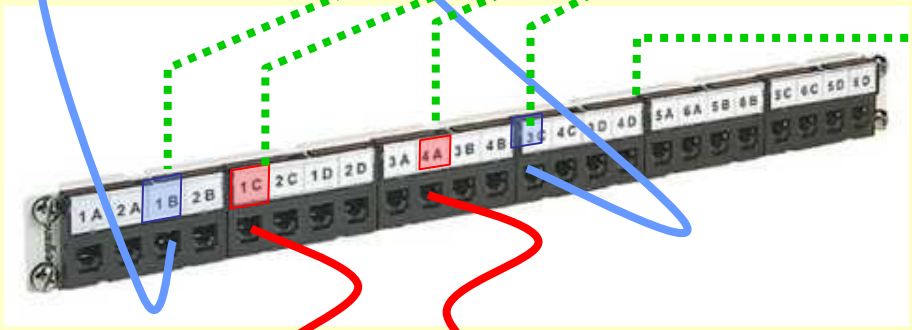
Phone input

Phone Ressources

PABX



Switch

Data Ressources

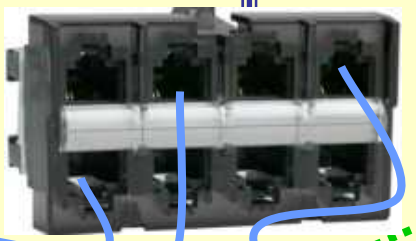
90 m max.

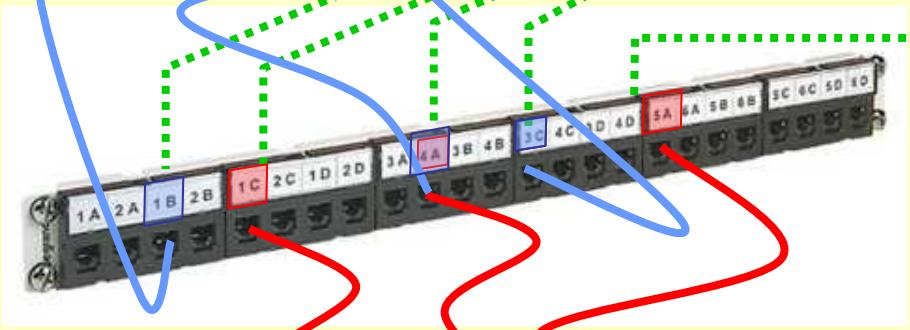
legrand

Phone input

Phone Ressources

PABX





90 m max.

Switch

Data Ressources

legrand

Horizontal cabling subsystem

The NF EN 50 173-1 and ISO 11801 Standard

The 4 key points of class D and E

1. Performances: classes and categories
2. Cable length
3. Cables Structures
4. Cable laying

Horizontal cabling subsystem

The NF EN 50 173-1 and ISO 11801 Standard

- Current Classes and categories

Catégory	Class	Ethernet Rate	Fréquency
5e	D	≤100Mbit/s*	100 MHz
6	E	≤1Gbit/s	250 MHz
7	F	≤1Gbit/s	600 MHz

* 1Gbit/s possible

Horizontal cabling subsystem

The NF EN 50 173-1 and ISO 11801 Standard

- Classes and categories

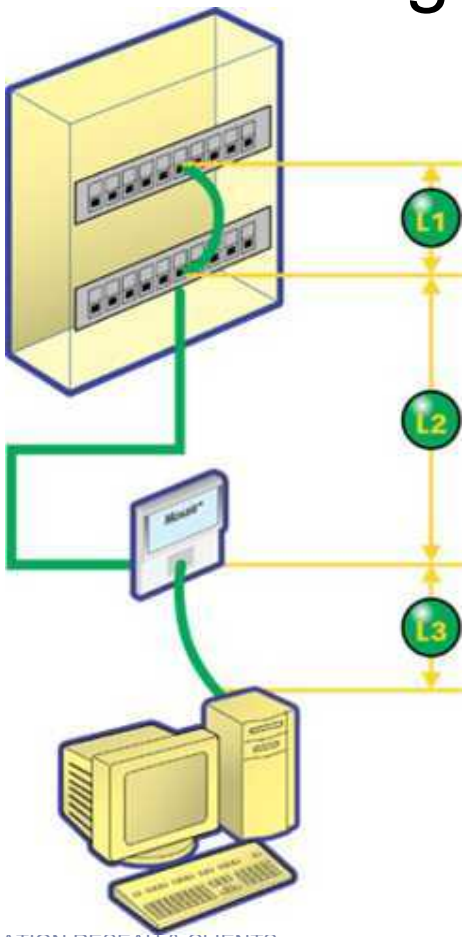
Category	Class	Rate	Frequency
5e	D	≤100Mbit/s	100 MHz
6	E	≤1Gbit/s	250 MHz
6a*	Ea	≤10Gbit/s	500 MHz
7	F	≤10Gbit/s	600 MHz
7a*	Fa	≤10Gbit/s	1000 MHz

* Channel specification

Horizontal cabling subsystem

The NF EN 50 173-1 and ISO 11801 Standard

- Cable length



Patch cord

Permanent link

≤ 90 m

User Cord

Channel

≤ 100 m

Horizontal cabling subsystem

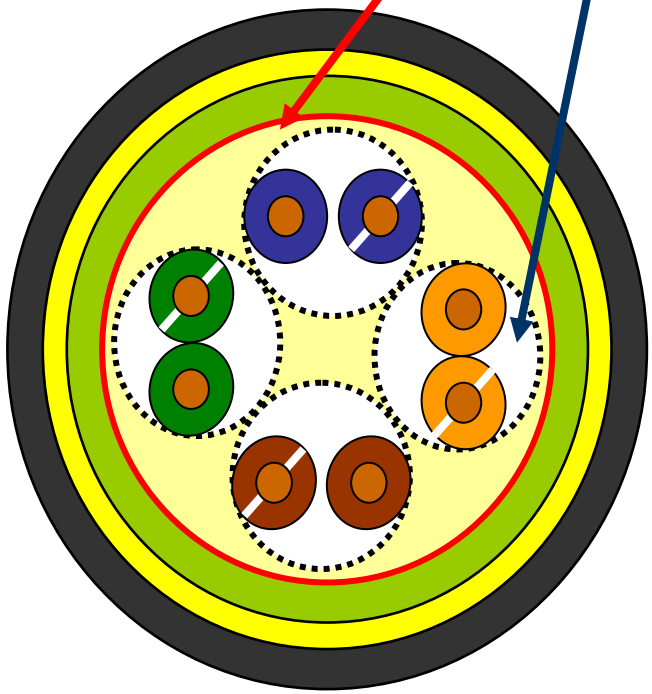
The standard ISO 11 801

The cables : acronyms for balanced cabling

XX / Z **TP** → Twisted Pair

Overall screen :

U = unshielded
F = foiled screened (Alu/Polyester)
S = braid screened (cooper)
SF = both foil+braid



Individual screen :

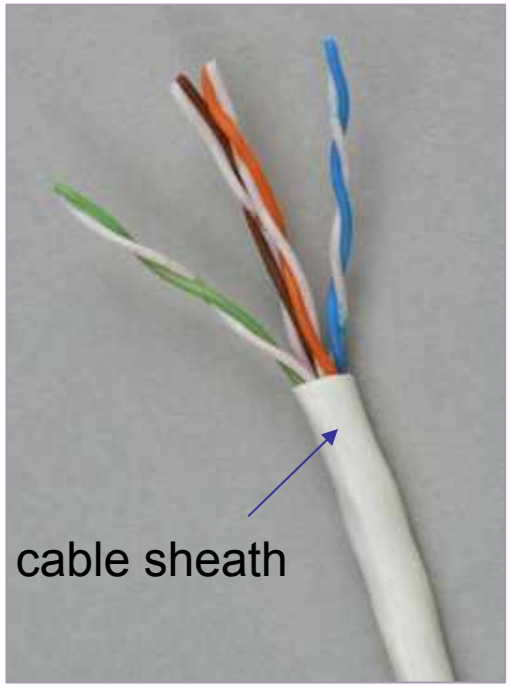
U = unshielded
F = foiled screened

U = Unshielded
F = Foiled
S = Shielded

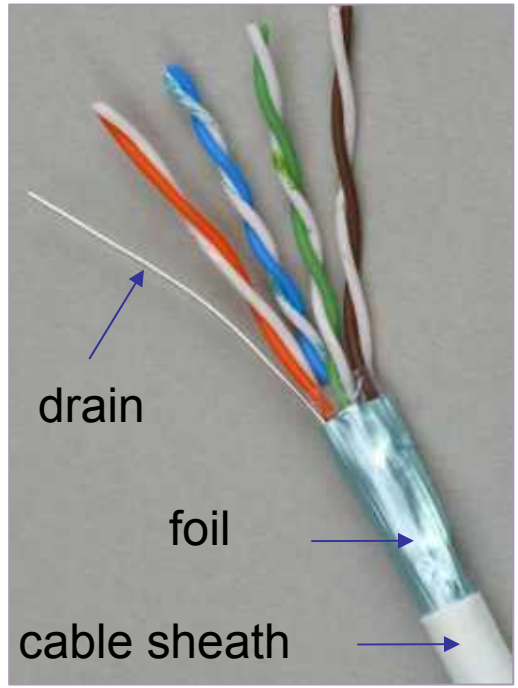
Horizontal cabling subsystem

The NF EN 50 173-1 and ISO 11801 Standard

- Cable structures



Impedance
100 ohms



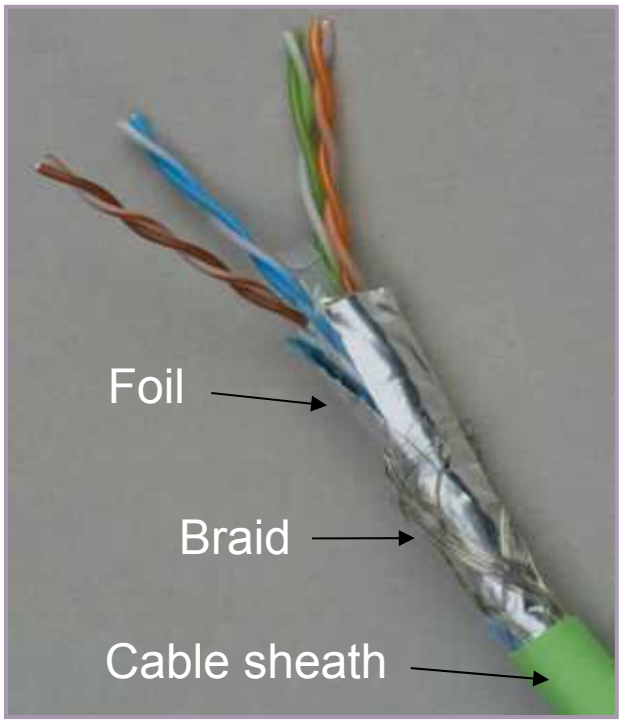
"U/UTP" (UTP)
Unshielded / Unshielded Twisted Pairs

"F/UTP" (FTP)
Foiled / Unshielded Twisted Pairs

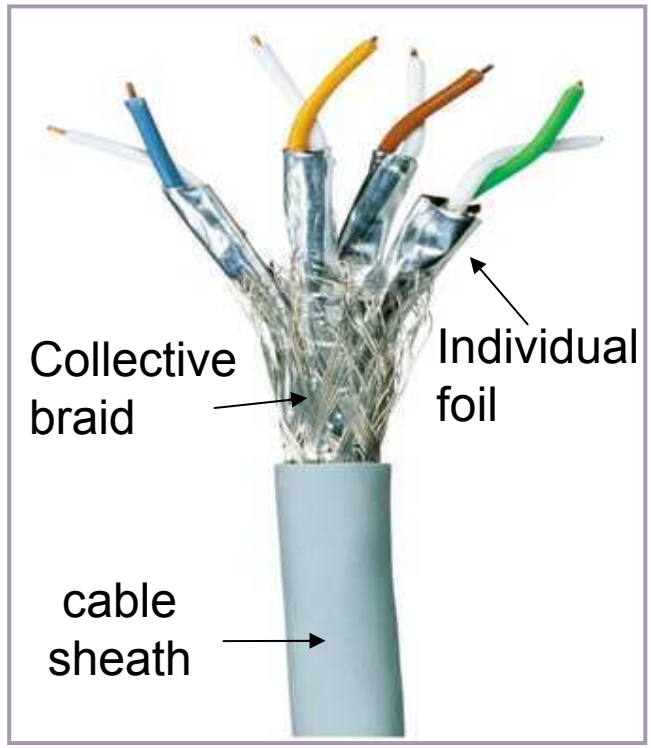
Horizontal cabling subsystem

The NF EN 50 173-1 and ISO 11801 Standard

- Cable structures



Impedance
100 ohms



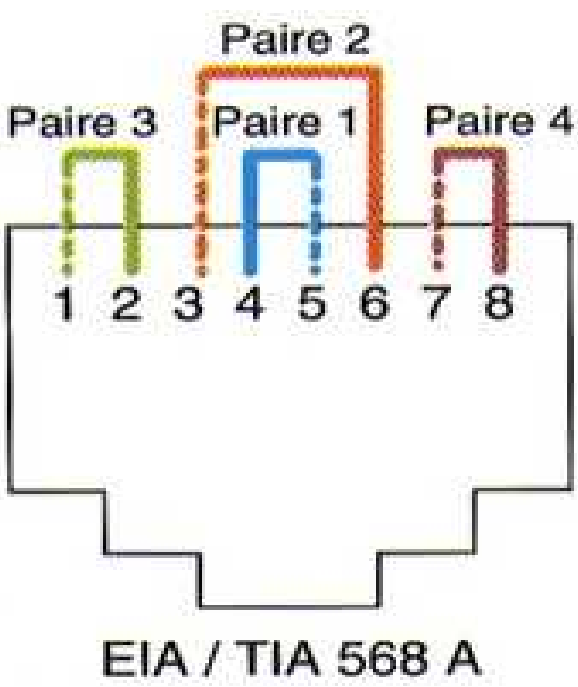
"SF/UTP" (SFTP)
Shielded Foiled / Unshielded Twisted Pairs

"S/FTP" (SSTP)
Shielded / foiled Twisted Pairs

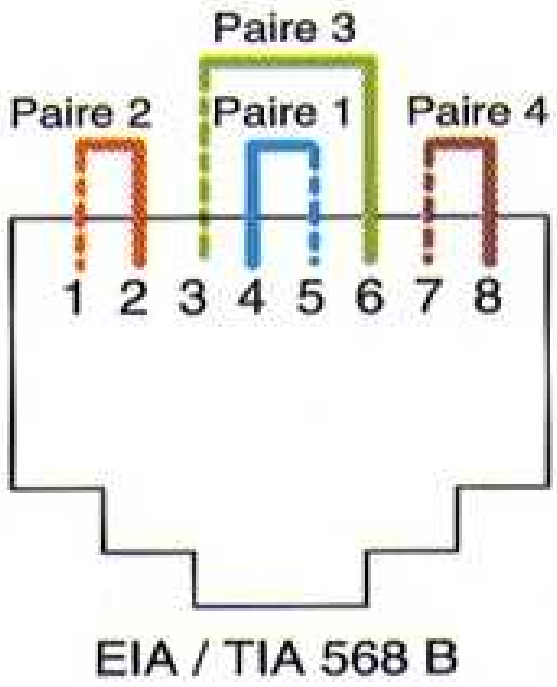
Horizontal cabling subsystem

The NF EN 50 173-1 and ISO 11801 Standard

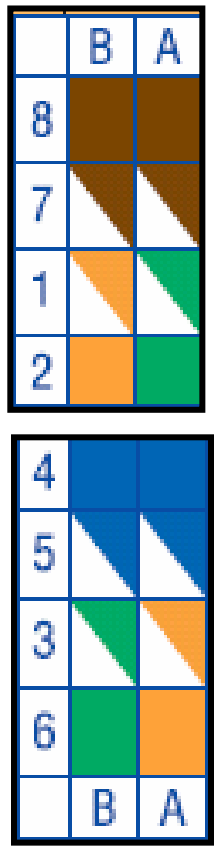
- RJ45 connection diagram



EIA / TIA 568 A



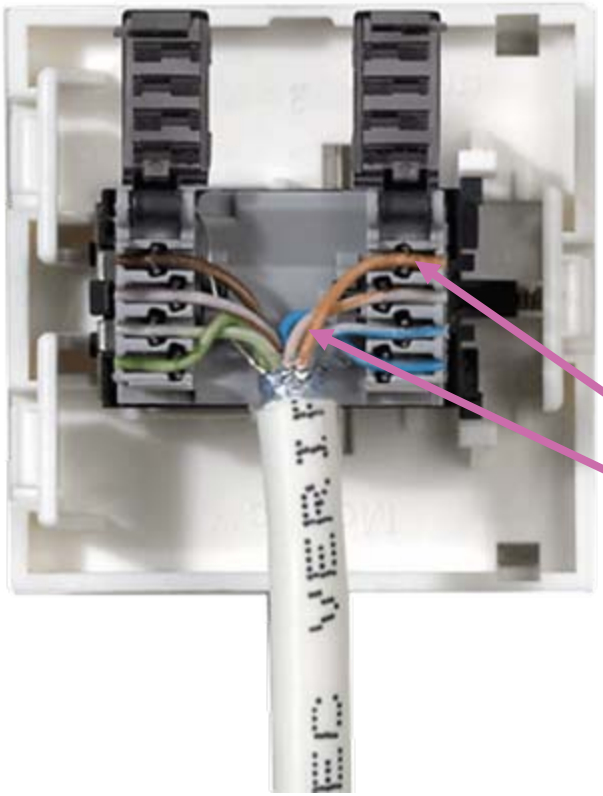
EIA / TIA 568 B

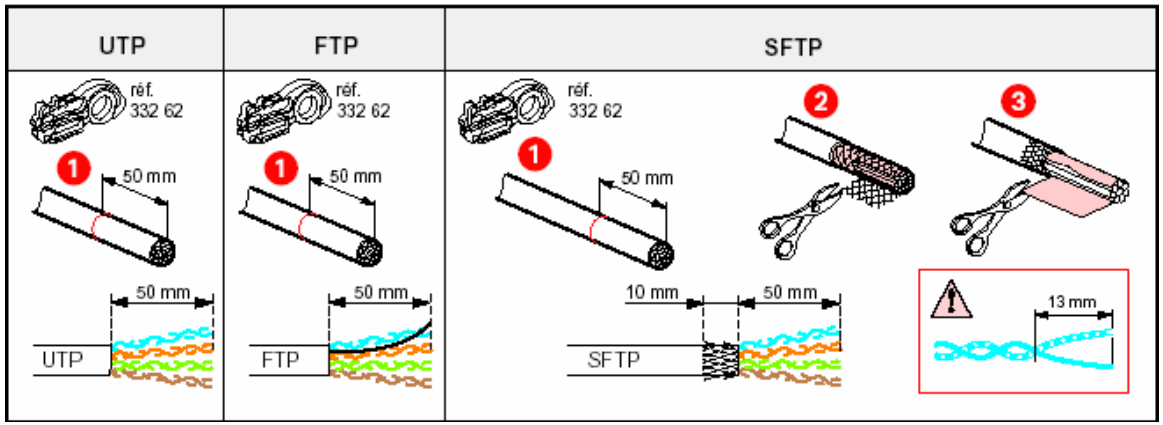


Horizontal cabling subsystem

The NF EN 50 173-1 and ISO 11801 Standard

- RJ45 Use





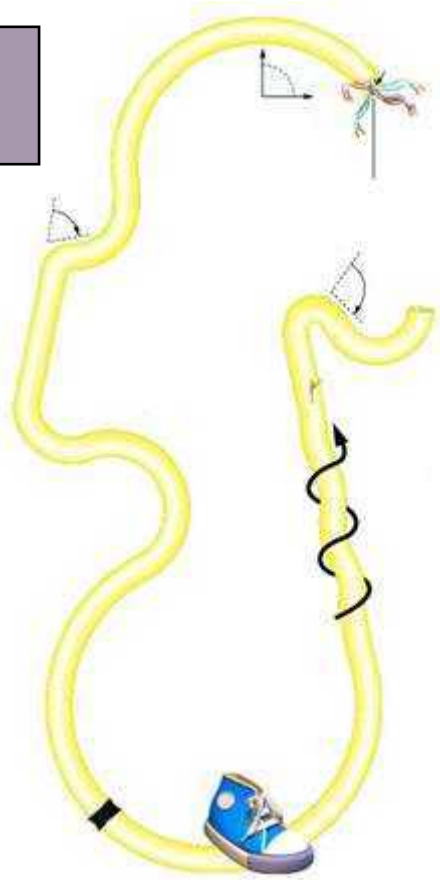
Untwisting
maxi 13 mm

Horizontal cabling subsystem

The NF EN 50 173-1 and ISO 11801 Standard

- Cable laying

Don’t pull cable , unwind it



don‘t notch copper

Avoid sharp angles

Don’t tear cable

Avoid excessive cable torsion

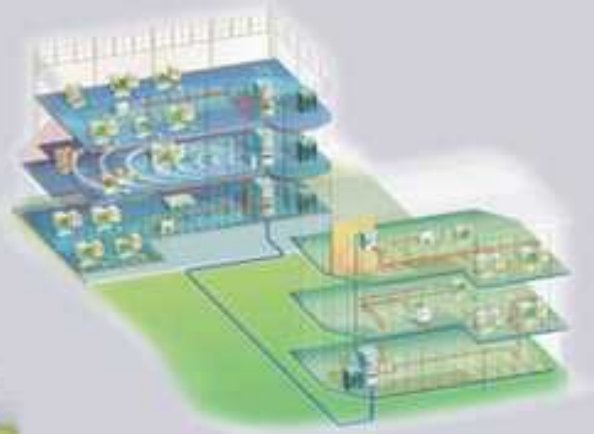
Radius of curvature at least 8 times cable diameter

Don’t crush the cable with tight ties

Don’t walk on cable

Legrand Cabling System
LCS

FORMATION RÉSEAU & CLIENTS -



Legrand Cabling System

A Full system

Débit

100 Mbit/s | 1 Gbit/s | 10 Gbit/s

Disturbance of the environment

+

-

STP

FTP

UTP

LCS^5

LCS^6

LCS ^{10G}

legrand

Legrand Cabling System

LCS^5 et LCS^6

Attestation of Conformity

Unscreened Category 6
ISO/IEC, EN & TIA/EIA Connecting Hardware

Legrand Identification AL51
Category 6, Unscreened, Connection Module
Electrical Transmission Performance

Legrand
128 Avenue de Lattre de Tassigny
F-87045 Limoges Cedex, France

Attestation of Conformity No. 102207

This Unscreened ISO/IEC, EN & TIA/EIA Connection Module having board identification "AI 3902" has been tested by 3P Third Party Testing and complies with the Category 6 transmission requirements of 2nd edition ISO/IEC Generic Cabling Standard 11801, CENELEC Generic Cabling Standard EN 50173-1, ANSI/TIA/EIA Generic Cabling Standard 568-B.2-1 and IEC Draft Connecting Hardware Standard 60603-7-4. The mated pair requirements are passed using the complete specified de-embedded range of RJ 45 plugs. The Attestation of Conformity is valid for the actually tested connecting hardware sample and no verification of the running production is performed.

Hoersholm, 5 November 2002
Ole Lambertsen
Test Responsible

Hoersholm, 5 November 2002
Poul Villien
Coordinating Manager

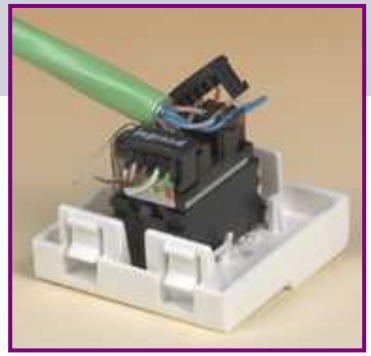
LCS^5 STP FTP

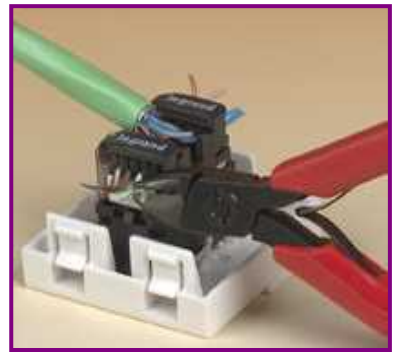
LCS^6 UTP

- Mix used allowed
- Down use compatibility
- Up to Gbit/s

LCS : Legrand Cabling system

One connector





- **the same for all the range**
  - **patch panels**
  - **RJ45 outlet**
  - **Area distribution box**
  - **WIFI access point**

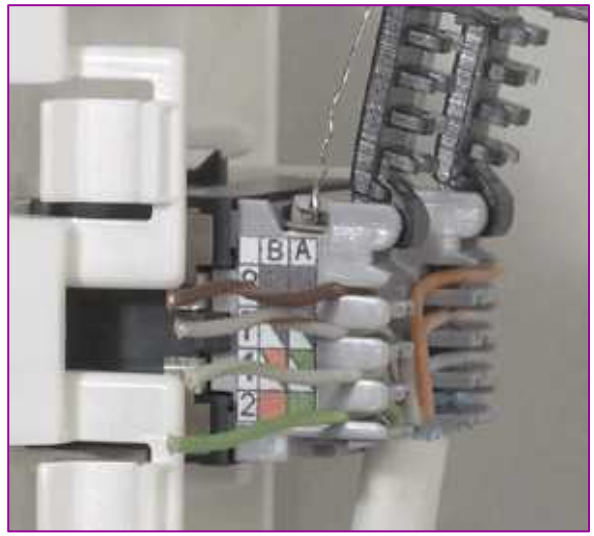
- tool less, simple, fast and safety connexion for all the categories 5e, 6 ou 10giga.
- perfect wiring devices integration.

Legrand Cabling System

The connection

- Reliability and safety

  - → RJ45, RJ12 and RJ11 compatibility
  - → cable arrival from any direction
  - → Low depth
  - → re-connection possible (5 times)
  - → Installation of the shielding afterwards



Legrand Cabling System

Mosaic Terminal Outlet

UTP	CAT 5e	X	X
	CAT 6	X	X
FTP	CAT 5e	X	X
	CAT 6	X	X
STP	CAT 6	X	X
	10 Giga	X	X

Legrand Cabling System

The LCS 10 Giga system

- Proprietary device
- Only STP
- 10 Gbits/s

Legrand Cabling System

Cables

Cat 5 Cat 6 Cat10giga

- Sheath PVC or LSOH (for public area)
- 2 x 4 pairs to safe time
- Optimum for EIATIA 568 A colour code
- NVP and measuring printed on the sheath
- U/UTP, F/UTP, SF/UTP, according to category
- Packaging in boxes (305 m) or reel (500 m)

Legrand Cabling System

100Ω

The patch cords

Cat 5 Cat 6 Cat 10giga

- An essential part of the system
  - → Anti-traction sleeve to ensure a radius of curvature and behaviour tractions
  - → A precise positioning in the plug for an optimum connection
  - → Available in 1, 2, 3 or 5 m length

legrand

LCS : Legrand Cabling system

One 19" size in the repartitor

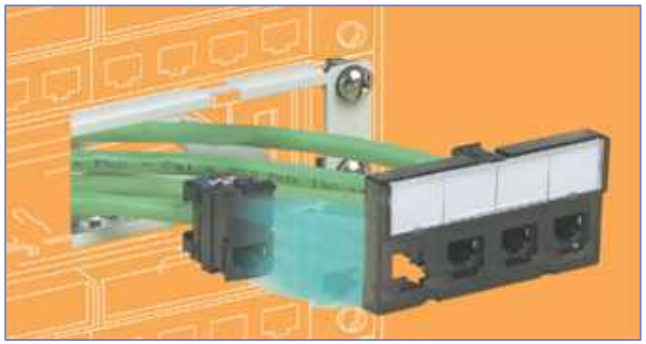
- **same for all the products**
  - **telephone blocks**
  - **patch panel blocks**
  - **PoE power supply block**
  - **optical block, copper optical converter**
  - **switch block, TV splitters**

- allow modularity.
- Eaquiped or to be equiped offers
- Automatic grounding system.

Legrand Cabling System

The patch panel

- Make use



Wiring

→ on the front side

→ on the back side

Supplied with screws

Legrand Cabling System

The equiped panels

- Telephone patch panel

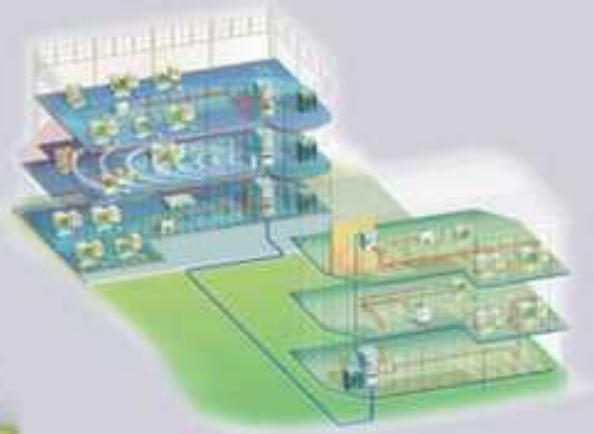
  48 inputs analogic or digital networks

- Panel LCS^5, LCS^6, LCS^{10giga}

  24 connectors UTP, FTP, STP

V D I
Splitters

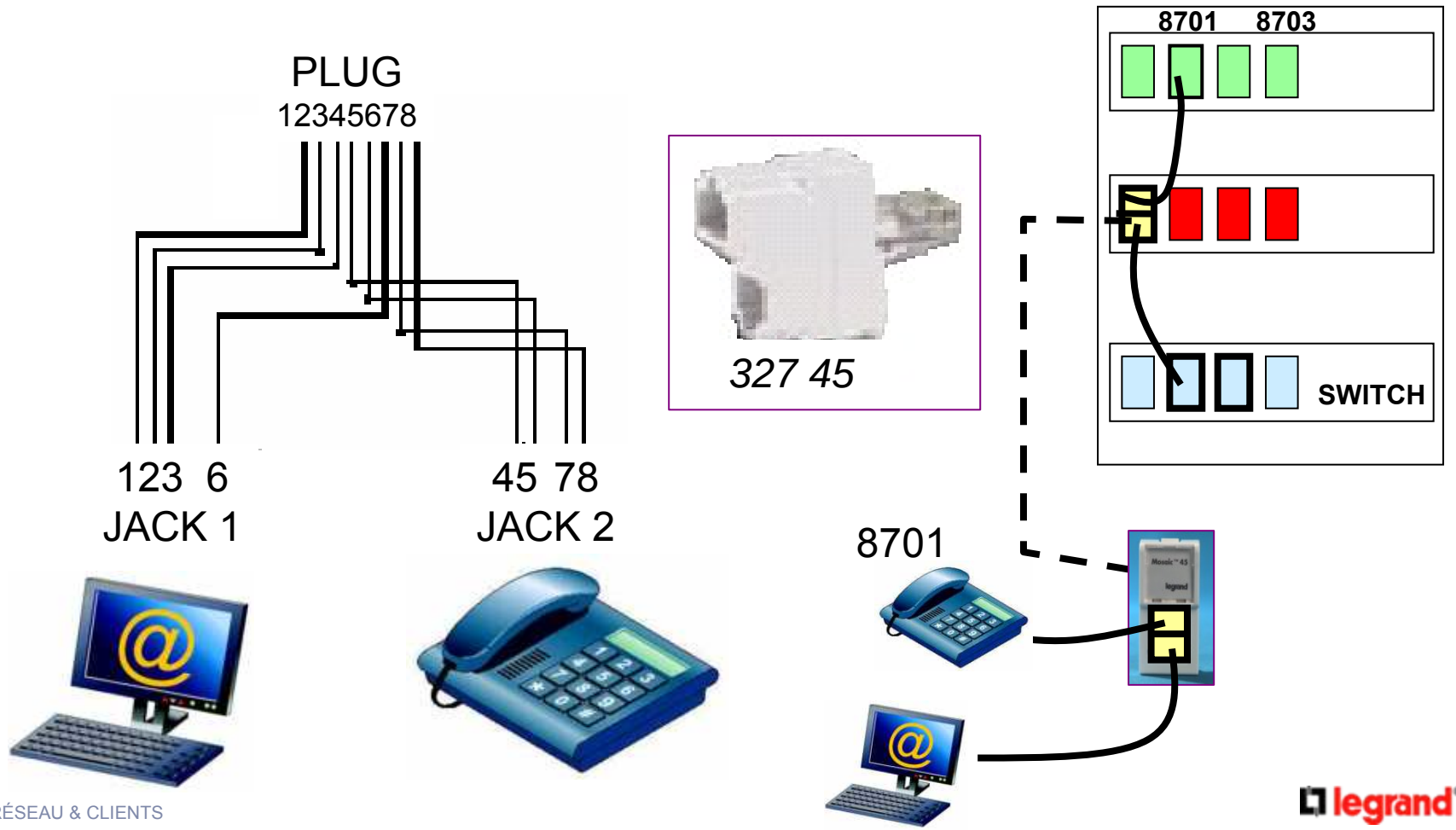
FORMATION RÉSEAU & CLIENTS -



The splitters

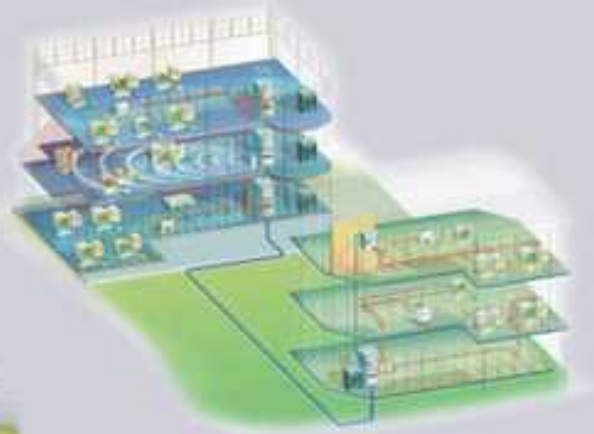
32745	32746	32747	32747	32748
	Line 1 	Line 1 	Line 1 	
+	+	+	+	+
	 Line 2	 Line 1	 Line 2	
	analog	analog	isdn	

Splitters for Analog telephone and Ethernet



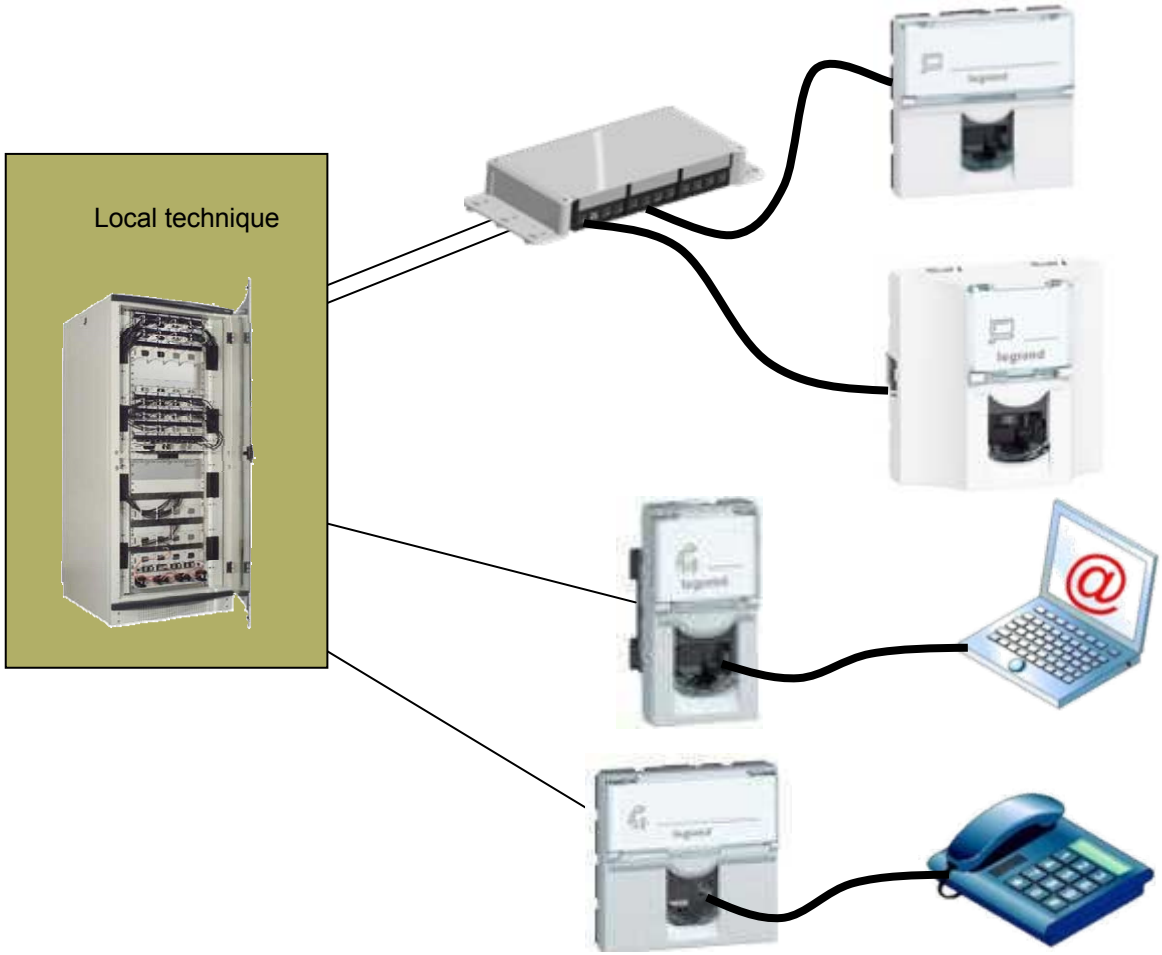
Legrand Cabling System
Area distribution box

FORMATION RÉSEAU & CLIENTS -



Horizontal wiring: flexibility / rentability

Similar to « consolidation point » of the NF EN 50173-1



2 solutions

- Flexibility

Advantages

- Evolutivity
- Rapidity
- Simplicity
- Rentability

Legrand Cabling System

Area distribution box

H ≥ 15 meters

CP

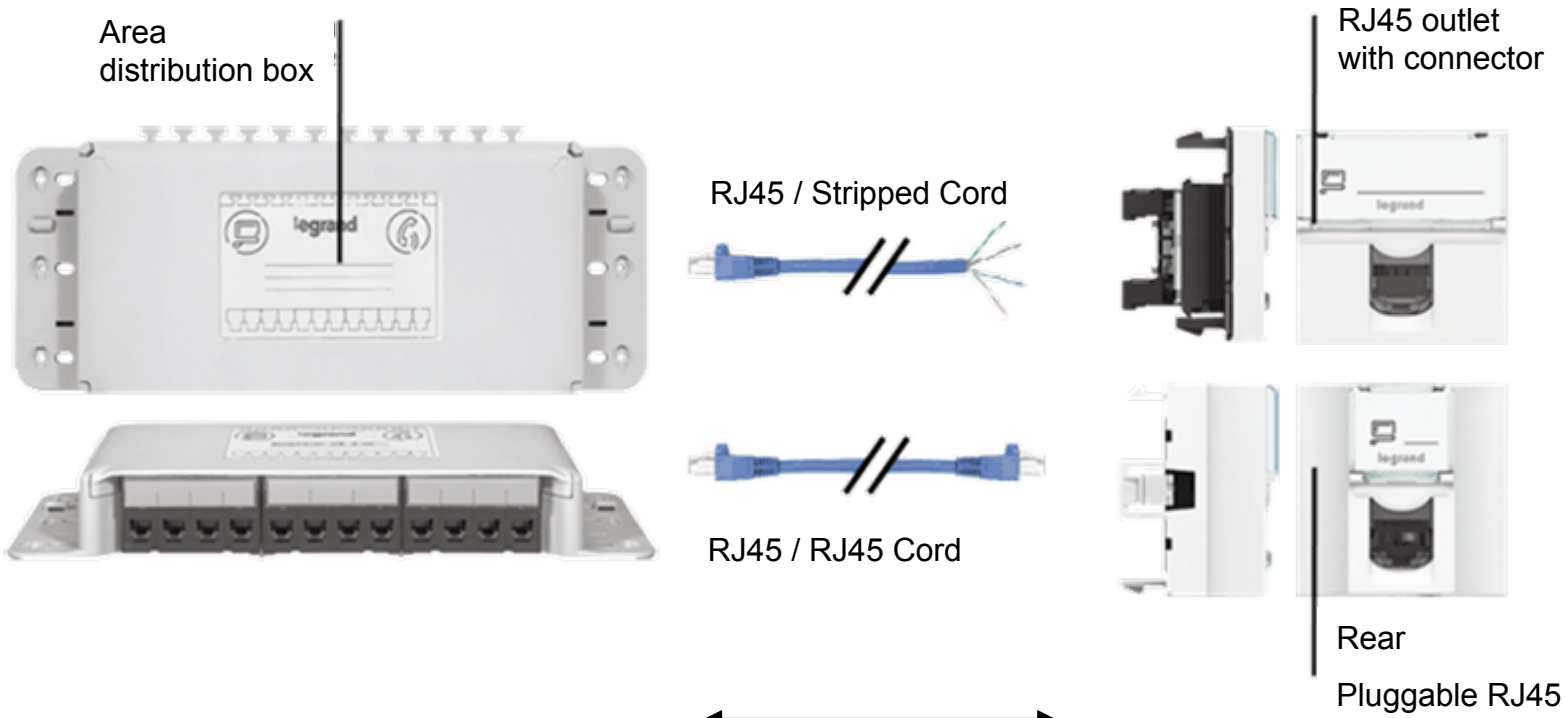
Max 20 meter

Max 12 work area

Legrand Cabling System

Area distribution box

2 answers for Area distribution

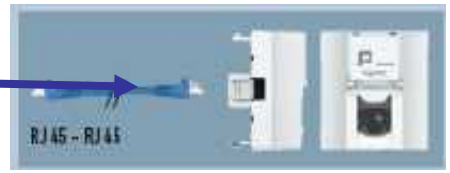


Legrand Cabling System

Area distribution box

With the new rear pluggable RJ45

- Simple connexion with RJ45/RJ45 cords
- Rentability on installation time
- CAT5e , CAT6, UTP and FTP
- Performances on CAT5 and CAT6 with specific cords and specific permanent link lengh



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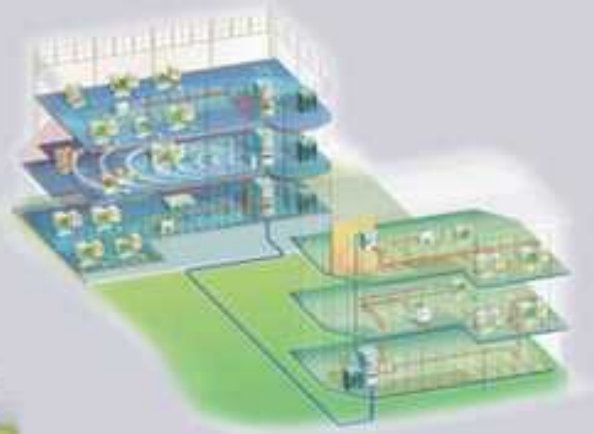
Wiring Architecture

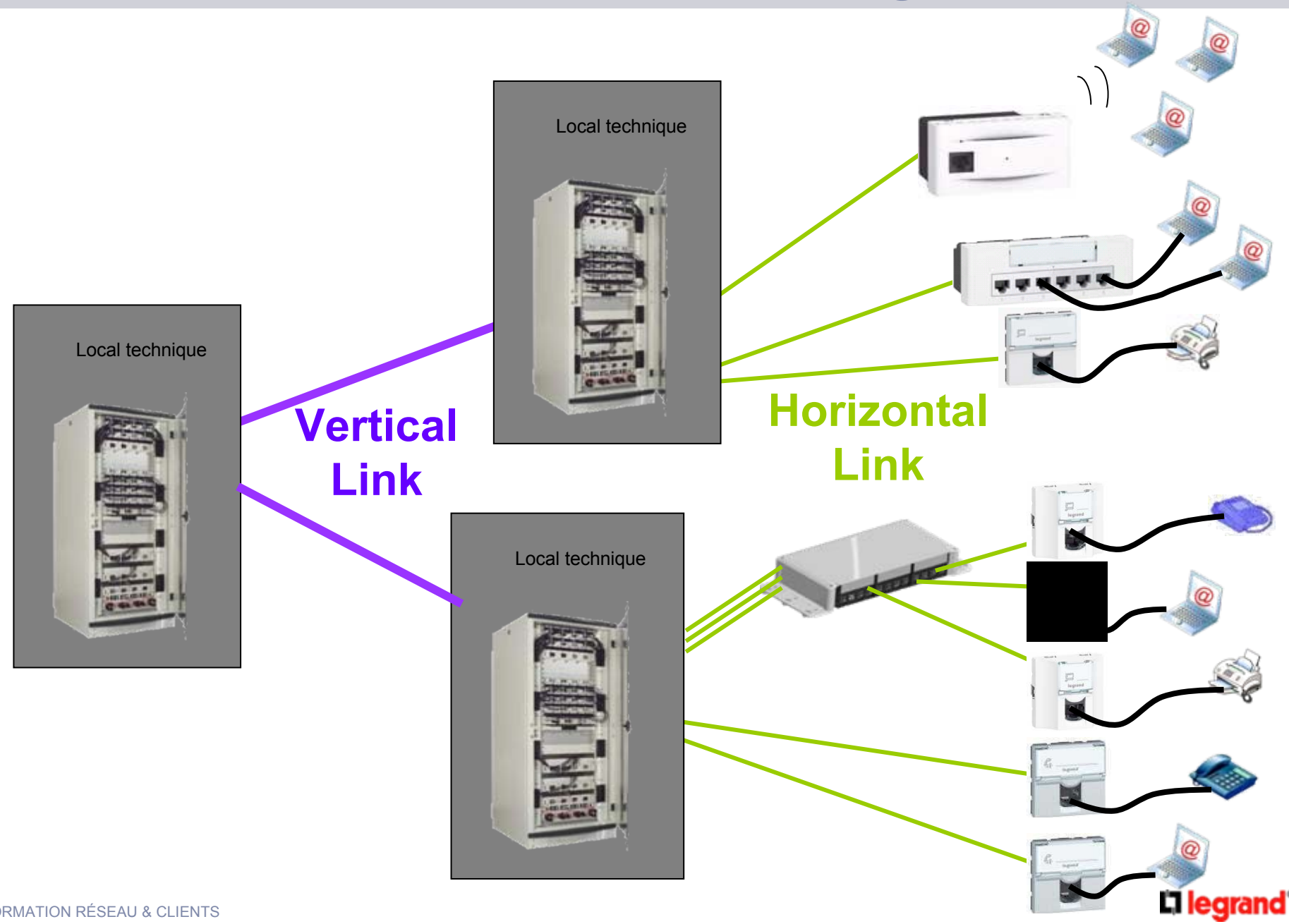
The Vertical Link in the Building

FORMATION RÉSEAU & CLIENTS -



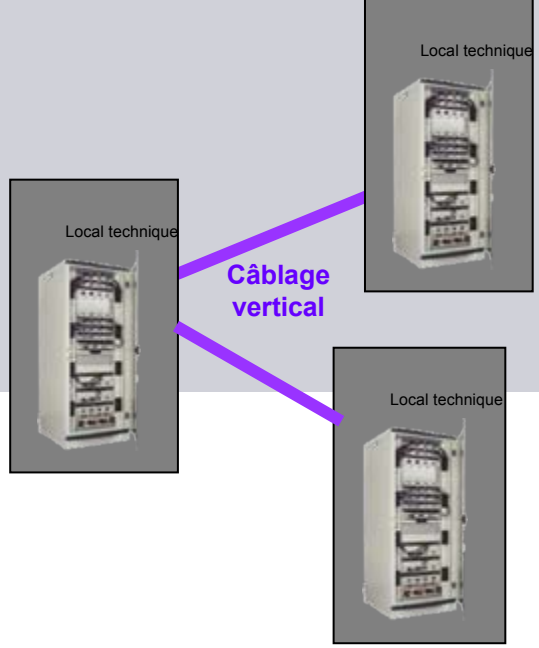
legrand®

The Vertical Link in the Building



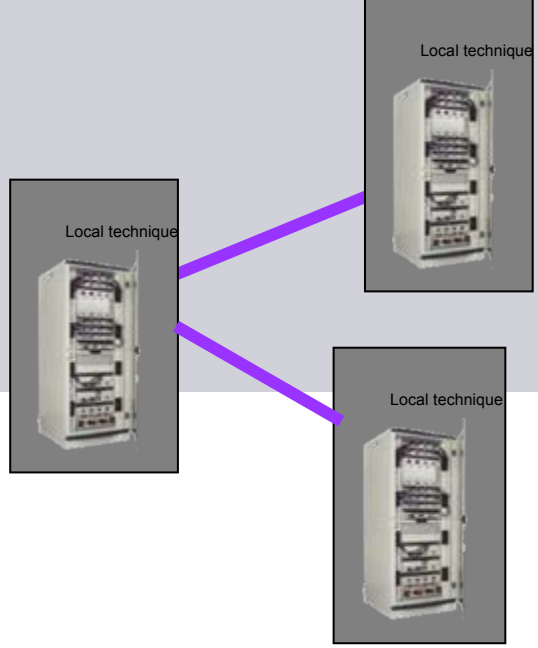
The Vertical Link

An alternative of cabling



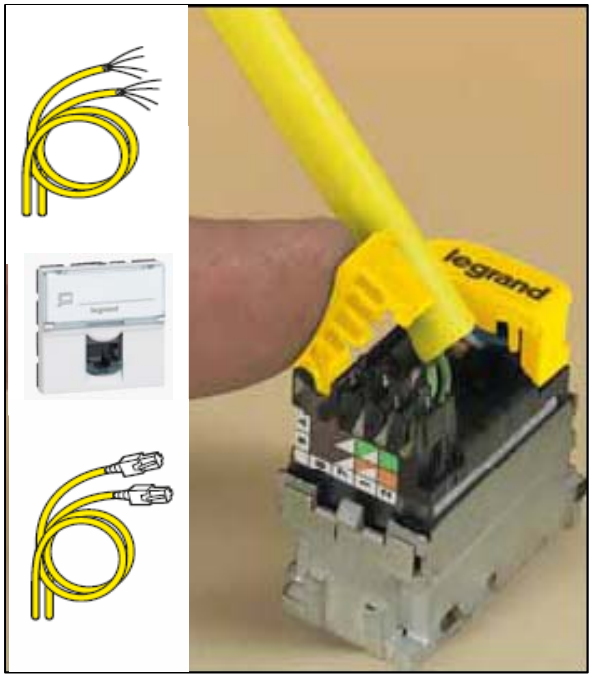
- **Copper backbone ≤ 90m**
  - **LCS 10^{giga} offer simple to operate**

The Vertical Link



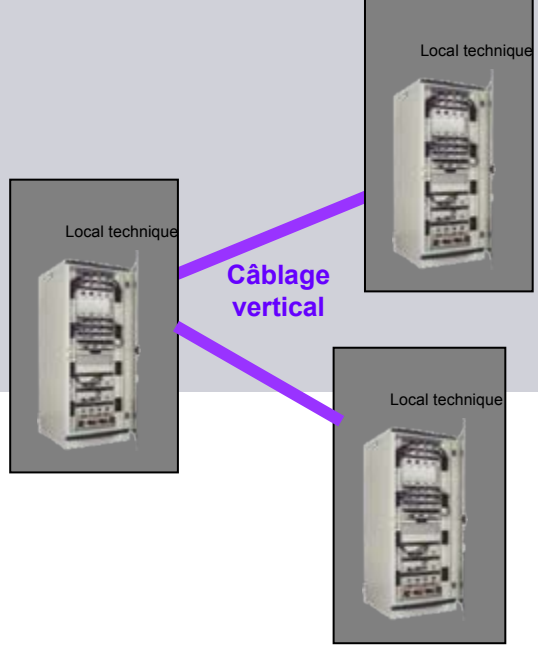
An alternative of cabling

The LCS 10 Giga system



- Optimal performances 10 Gbit/s with the full system Legrand
- Only STP

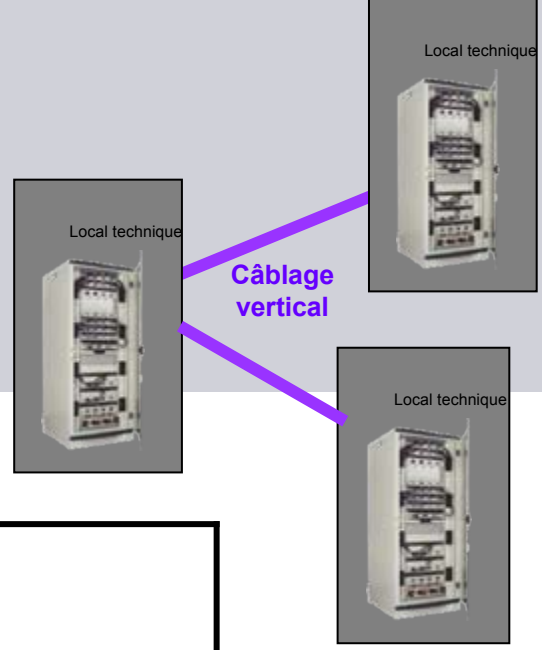
The Vertical Link



An alternative of cabling

- **Copper backbone ≤ 90m**
  - **LCS 10^{giga} offer simple to operate**
- **Optical backbone**
  - **Pre-fitted optic links (on demand)**
  - **Fast crimping Connectors**
  - **Epoxy Connectors**

The Vertical Link

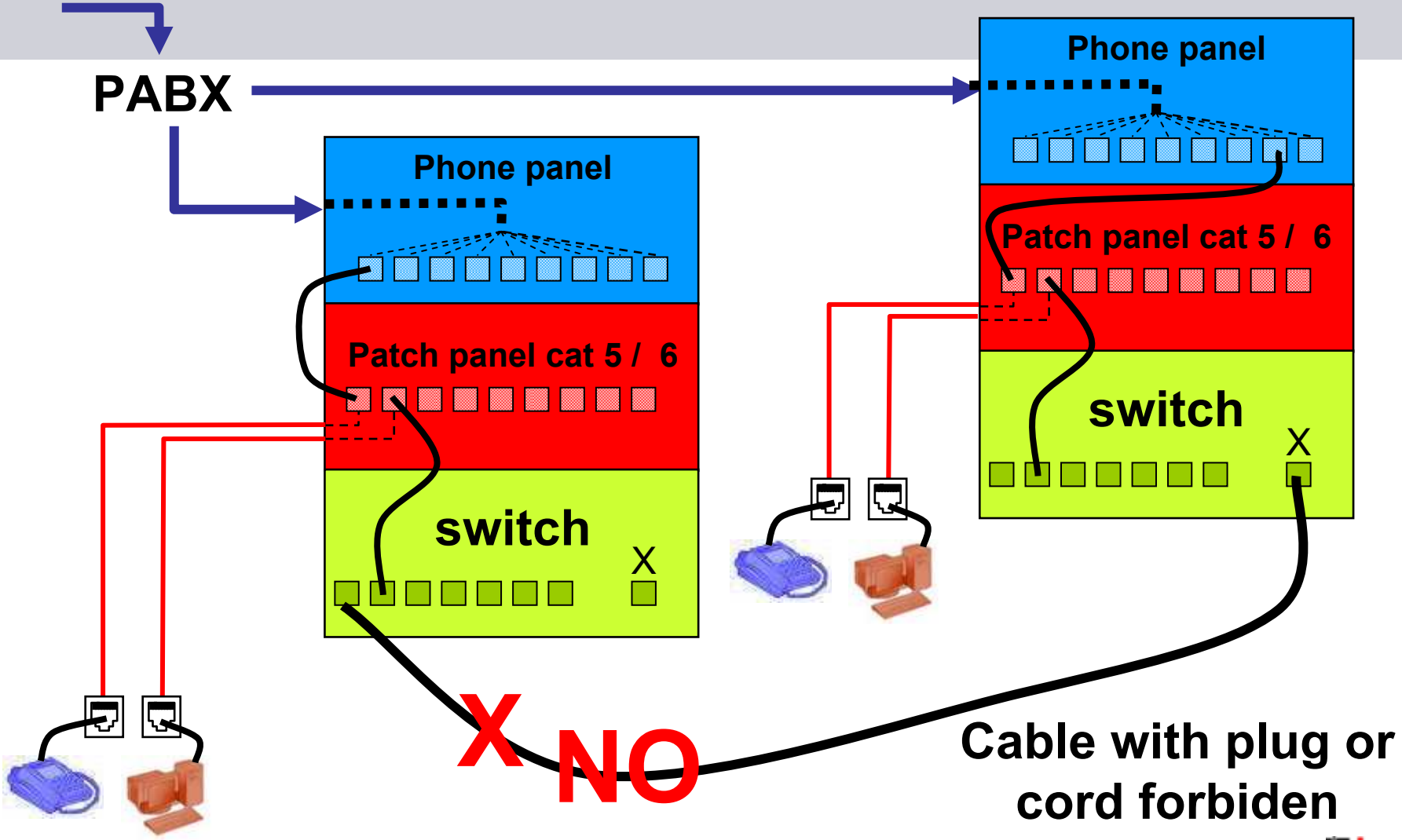


An alternative of cabling

Cooper offer LCS6 and LCS 10 Giga	Optic offer LCS Optical fiber
Advantages: ▪ The same way to be used for horizontal and vertical links. ▪ full RJ 45 . ▪ Same active devices. ▪ More economic.	***Advantages:*** ▪ Lenght > 90 meters. ▪ Less perturbations. No earth connexion (a light signal instead of electrical signal in the fiber optic link).

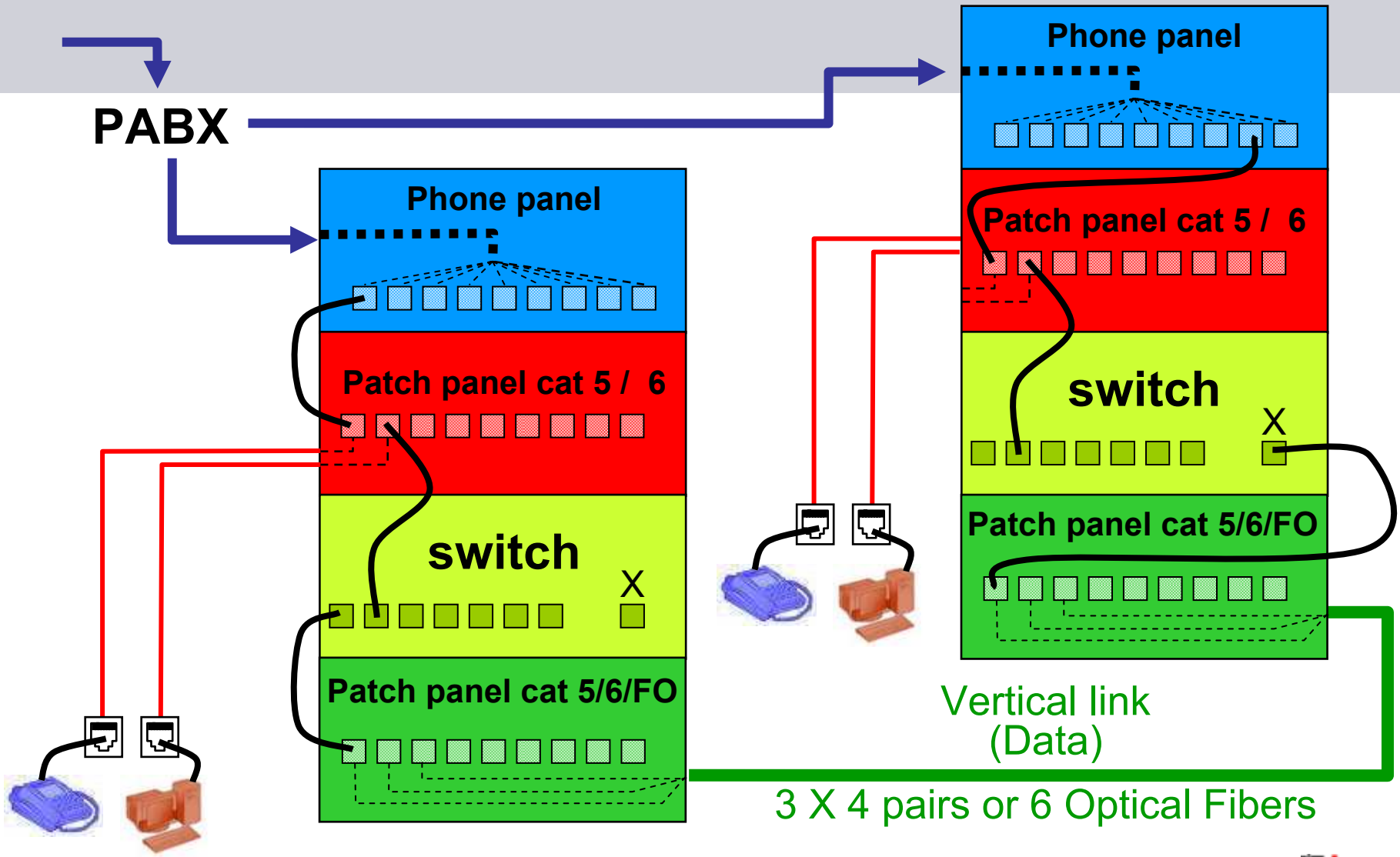
Wiring Architecture

The Wiring with Two Repartitors



Wiring Architecture

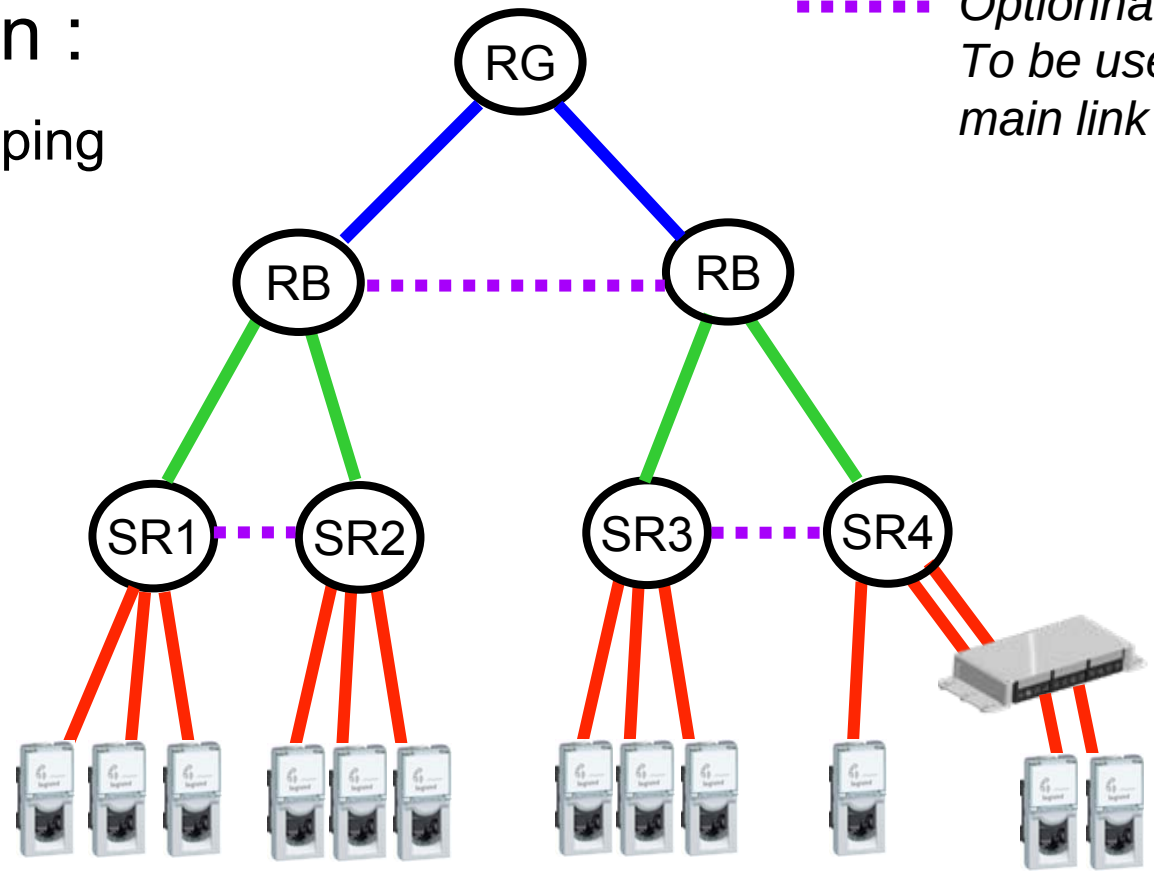
The Wiring with Two Repartitors



Wiring Architecture

Data security

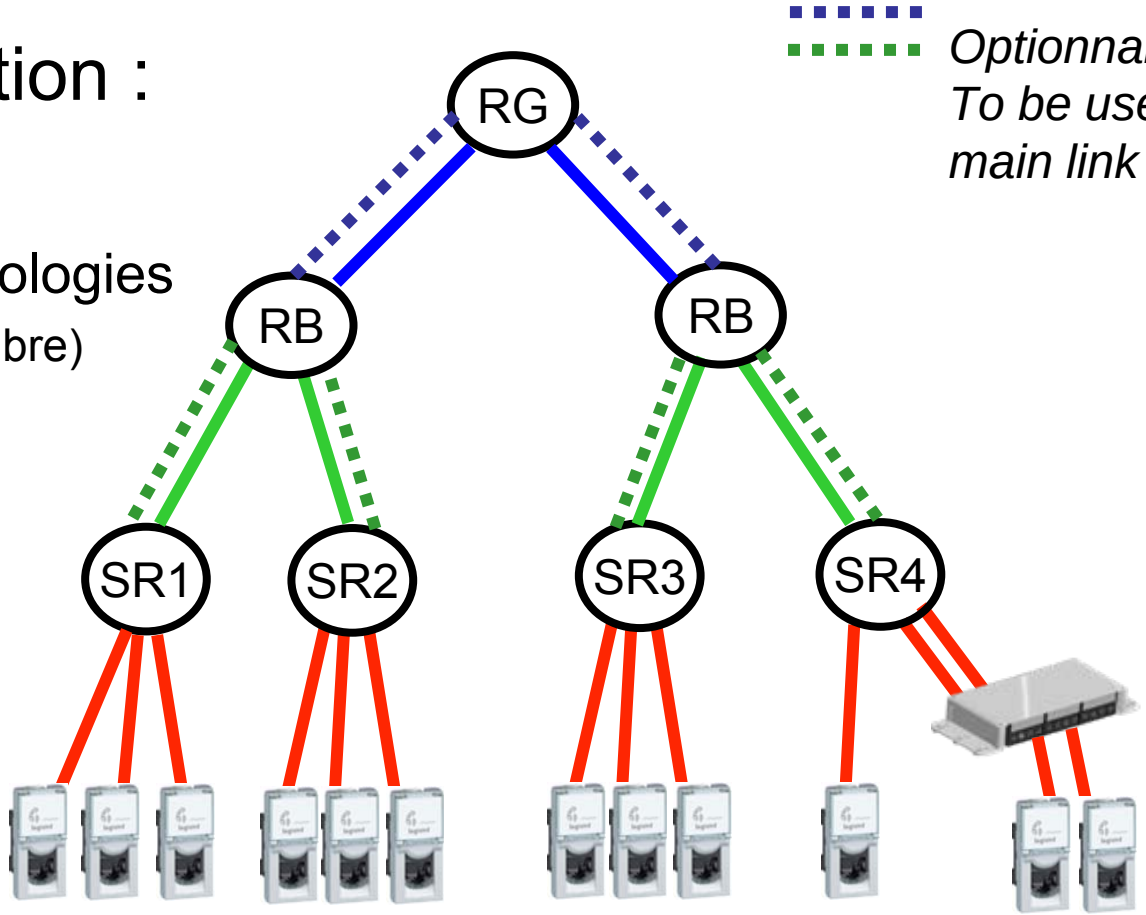
- First Solution :
  - Repartotor looping



Wiring Architecture

Data security

- Second solution :
  - Redundancy
  - Several Technologies
    (Copper/ Optical fibre)



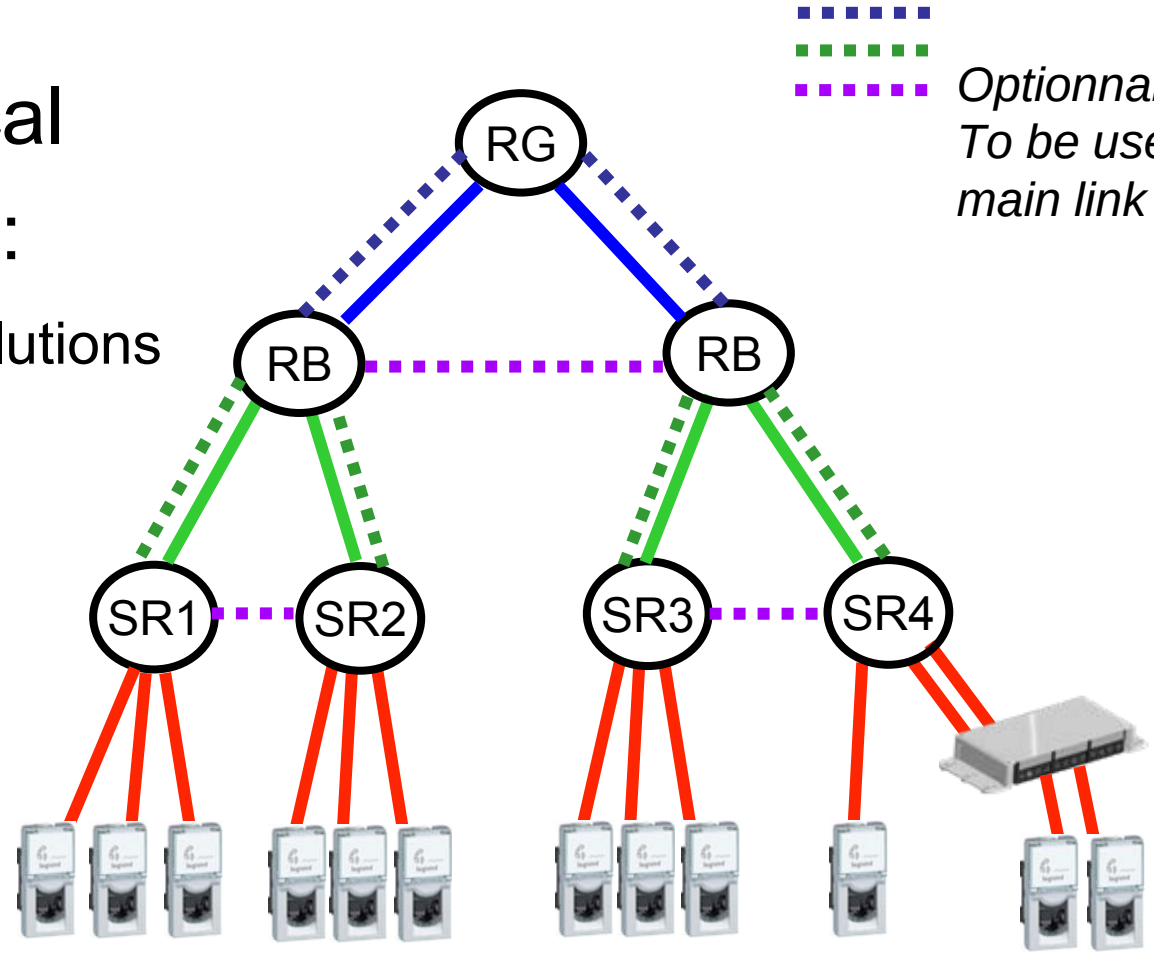
Optionnal link.
To be use in cas of main link failure.

Wiring Architecture

Data security

→ Highly critical installations :

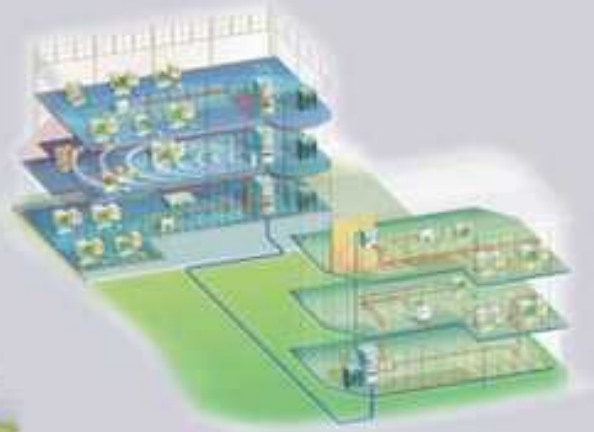
- Both 1 + 2 solutions



Optionnal link.
To be use in cas of main link failure.

Optical Fiber

The basics



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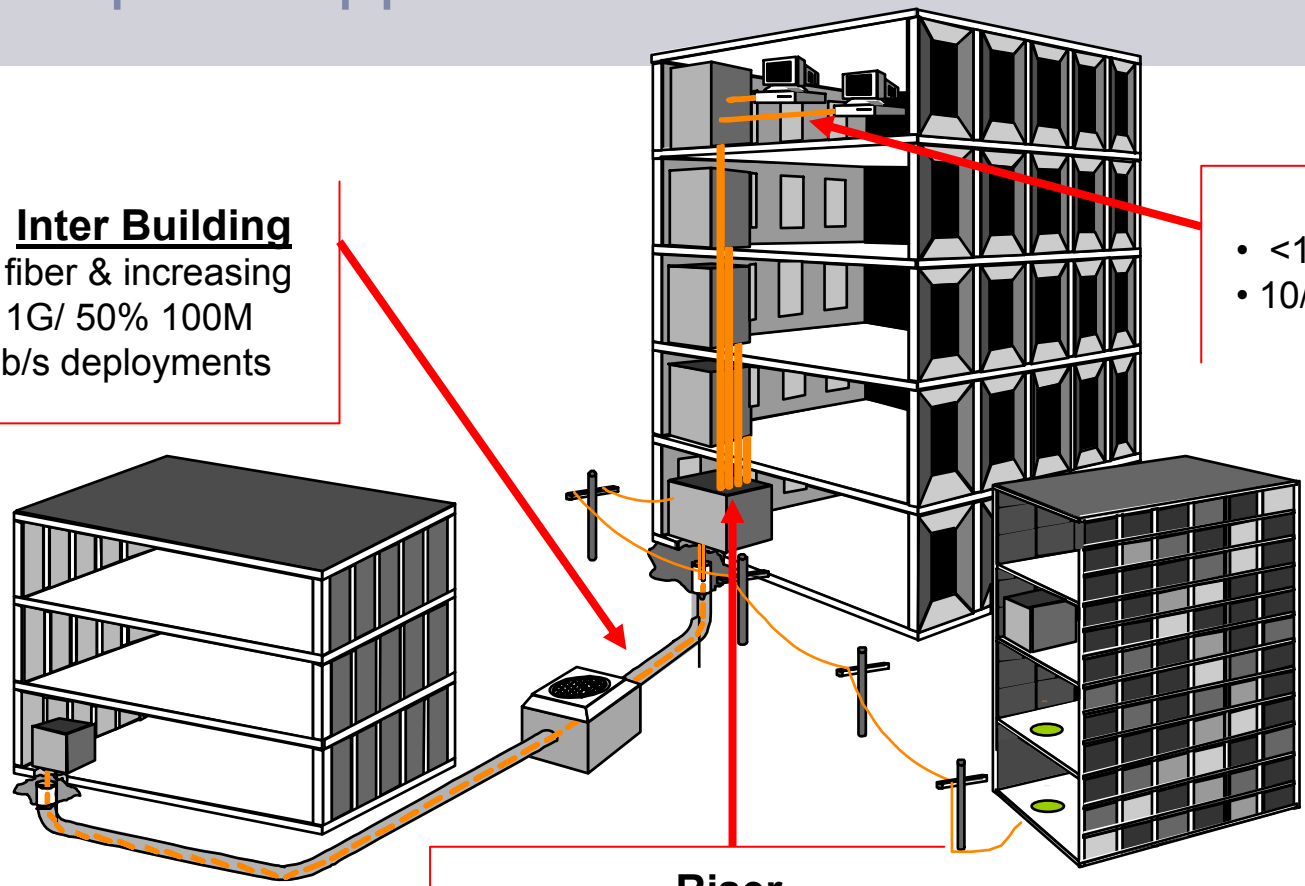
Optical Fiber : the basics

Fiber Optic / Applications



Inter Building
- 95% fiber & increasing
- 50% 1G/ 50% 100M
- 10 Gb/s deployments

Horizontal
- <1%Fiber
- 10/100/1000 Mb/s

Riser
- 80% fiber
- 25% 1Gb/s - 75% 100 Mb/s

Souce: Corning Optical Fiber/Corning Cable Systems Analysis

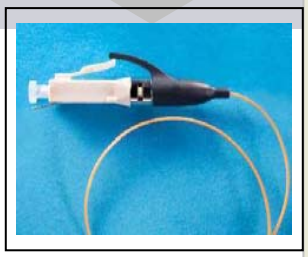
Optical Fiber : the basics

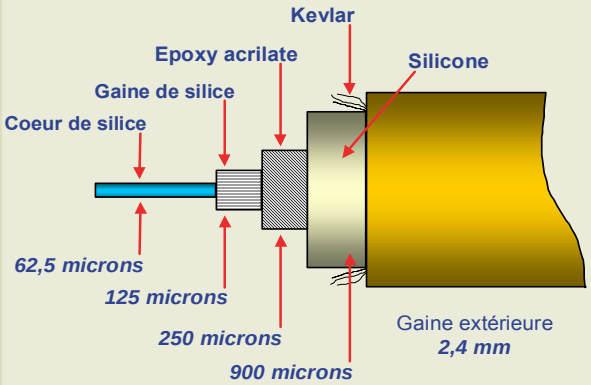
« How does it work ?"

- The data is carried by sequences of « light present » or « light absent » ("1" et "0")
- An interface ,the transciever, transforms the light signal into an electrical signal
- 2 Fibers needed for a link : « outward » and « inward »

Optical Fiber : the basics

Patch panel *Connector* *Cable* *Patch cord*



- Multimode

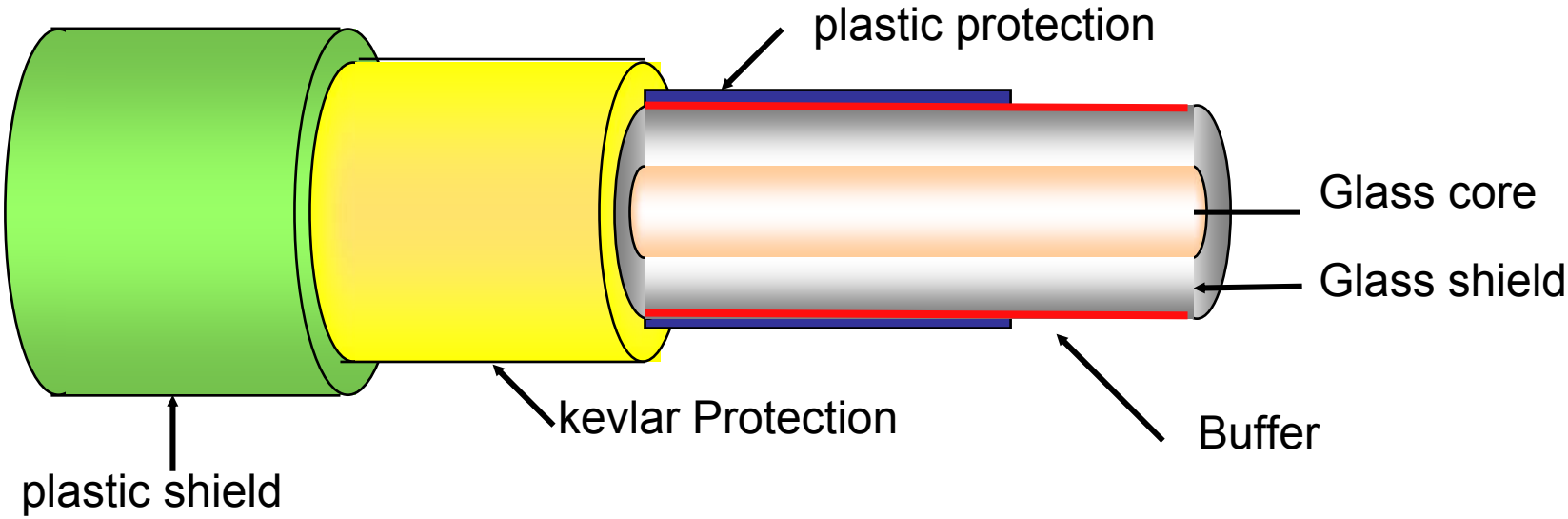
- OM1	10/100 méga	« CAT5 »
- OM2	Gigabit	« CAT6 »
- OM3	10 gigabits / 300 m	

- Singlemode

- OS1	10 gigabits / km

Optical Fiber : the basics

The optical fiber



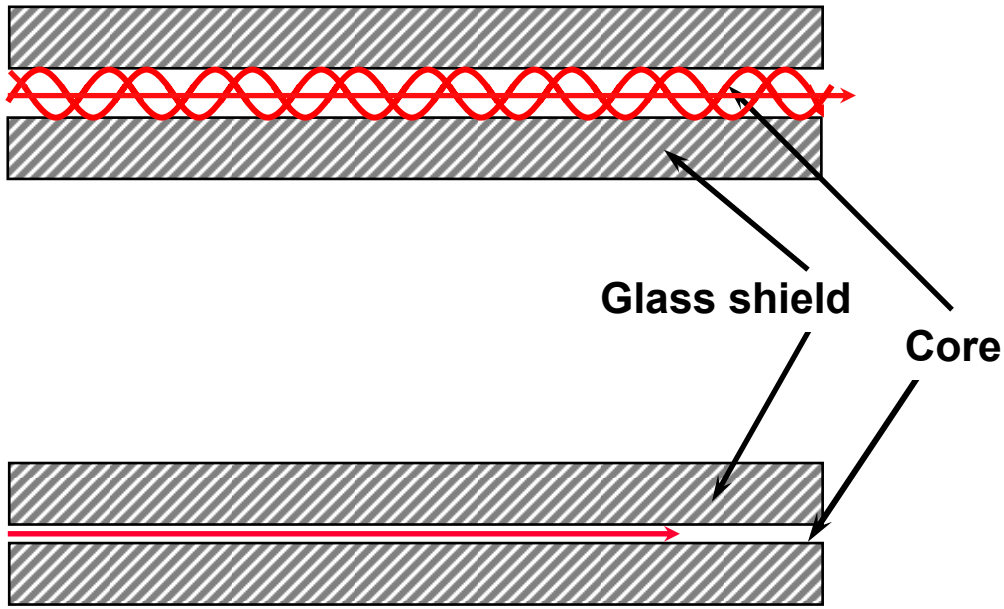
- Multimode — 62,5 / 125 µm
  50 / 125 µm)
- Singlemode — 9 / 125 µm

} = diameter of core / core + glass shield

Optical Fiber : the basics

The light paths

Multimode : LED or Vcsel



Singlemode :diode laser

Optical Fiber : the basics

The optical Fibers

- Multimode (62,5 µm et 50 µm) :

  Mainly used for Local Area Networks (LAN)

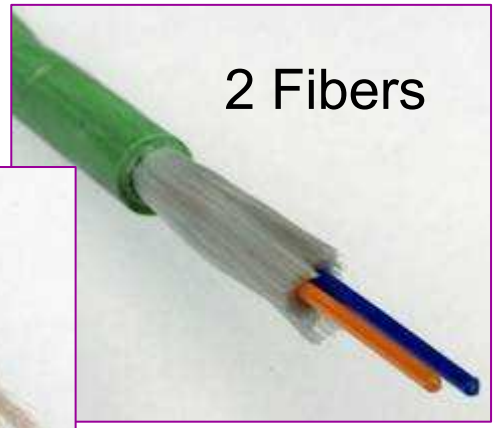
- Singlemode (9 µm) :

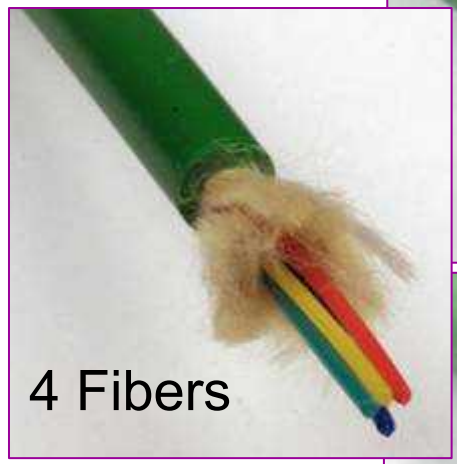
  Usually reserved for applications requiring high data rates over long distances

Optical Fiber : the basics

The different types of Fiber

- The tight structure or mini break out





- The loose structure

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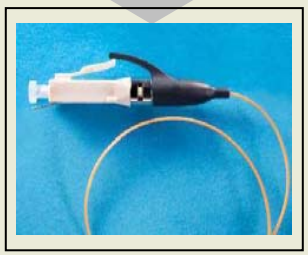
Fiber optic / Link components

Patch panel *Connector* *Cable* *Patch cord*

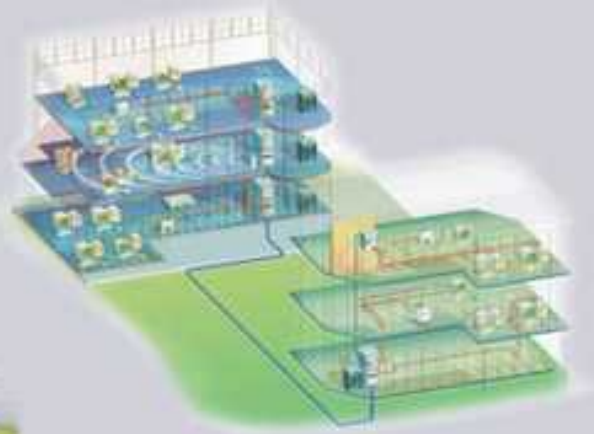
- Optical Connectors

- ST	35 %	↓
- SC	45 %	↑
- LC	15 %	↑
- MTRJ	5%	↓

LC ST SC

LCS Optical offer

The Legrand optical products



Optical LCS offer

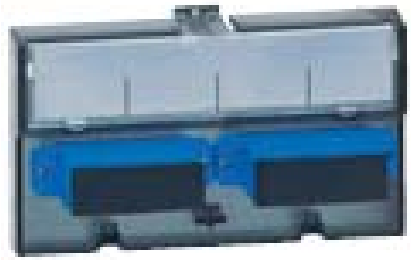
The performances choice

- 1Gbit/s on length < 550m
  - OM2 Multimode solution
- 10 Gbit/s on length < 300m
  - OM3 Multimode solution
- 10 Gbit/s on length < 2km
  - OS1 Single mode solution

Optical LCS offer

The LCS optical units

- Singlemode unit
  - SC 4 fibers
  - LC 6 fibers "hight density"



- Multimode unit
  - SC 4 fibers
  - LC 4 fibers
  - LC 6 fibers "Hight density"
  - ST 4 fibers

Dedicated to optic drawer and optic cassette

Optical LCS offer

The optical fiber drawer

- Capacity : 6 LCS units
  - 24 fibers SC, ST, LC
  - 36 fibers LC

331 22

- 1U / depth 220mm
- 4 Fiber coiling accessories , 2 cable glands
- Accept the LCS media converter copper/fiber

Optical LCS offer

The optical fiber cassette

Capacity : from 2 to 12 Fibers (2 LCS units)

327 26

Optical LCS offer

The new Fast crimping connector tool kit

- Fast crimping solution
  - Dedicated connectors

  - The **Installation kit**

Optical LCS offer

The pre-fitted on demand

- For Indoor, indoor/outdoor, outdor applications
- With 4, 6, 12 or 24 Fibers (According to applications)
- Multimode : OM1 → 62,5 / 125 OM2 → 50 / 125
- Monomode : OS1
- Connectors ST , SC , LC , other
- Packaging in box or in reel (length >50m)

Optical LCS offer

Duplex Jumpers and accessory

- multimode 50/125µm
  - OM2 : SC, LC, ST
  - OM3 : SC,LC

- singlemode 9/125µm
  - SC,LC

1,2, 3 mètres

Optical LCS offer

The terminal outlets

ST

742 28

SC

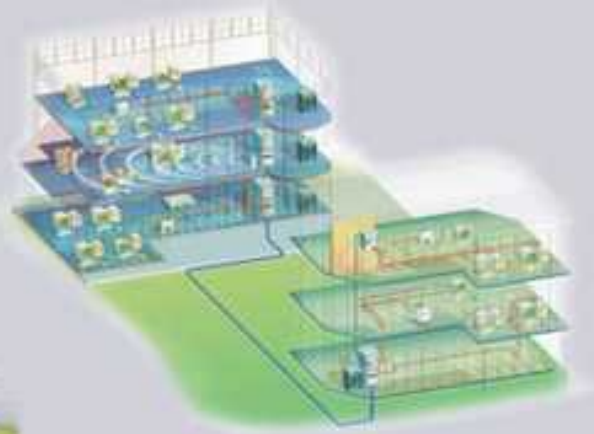
742 29

LC

74230

Legrand Cabling System
WiFi : Technologie

FORMATION RÉSEAU & CLIENTS -



Legrand Cabling System

WiFi : Standards

802.11 b/g

- 2,4 GHz (13 channels)
- 11 / 54 Mbit/s
- Commercial and residential

802.11 a

- 5 GHz (8 channels)
- 54 Mbit/s
- Commercial premises

Old standard : 802.11b (11Mbit/s)

Future standard : 802.11n (> 200 Mbit/s)

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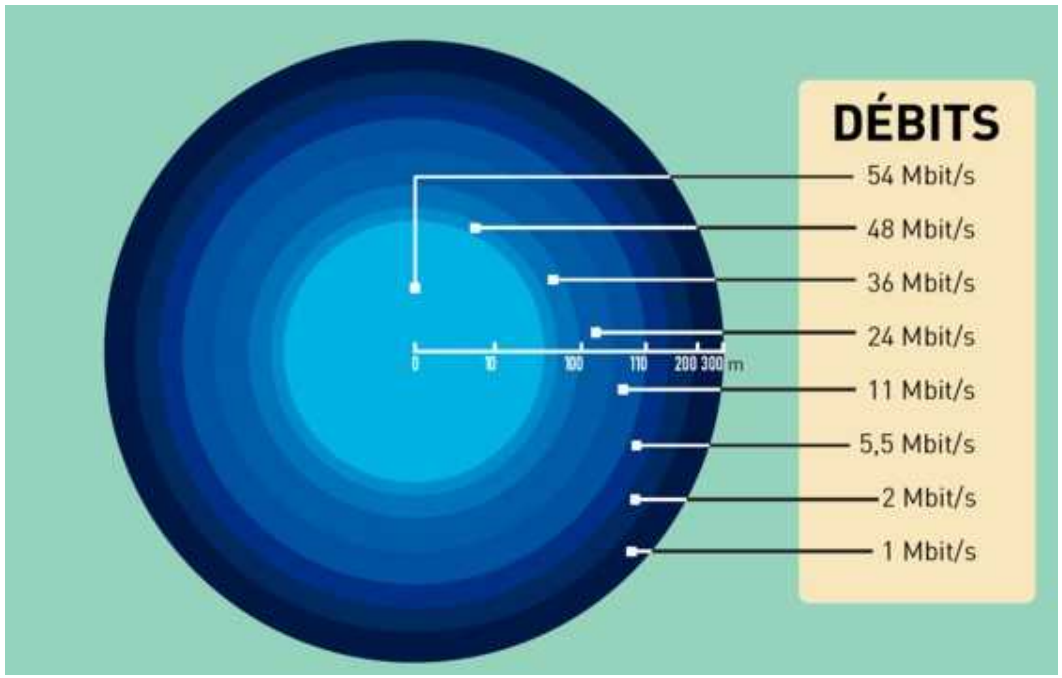
Legrand Cabling System

WiFi : The rate

- Depend on distance between Wifi card to the AP



- The rate decrease with the air l'attenuation and obstacles

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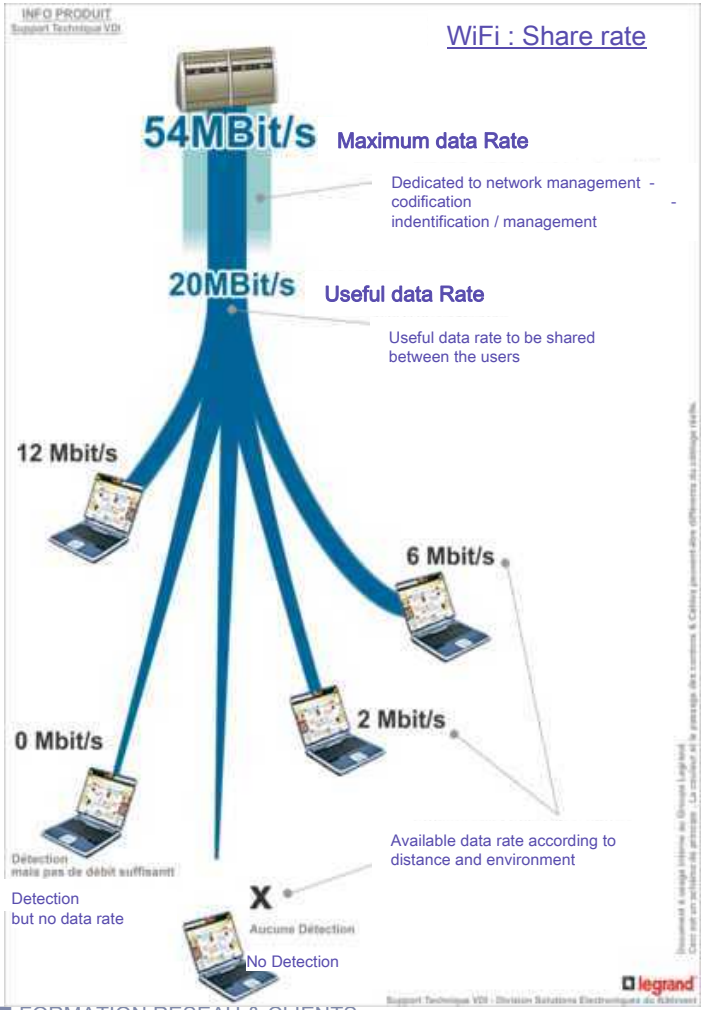
WiFi : Limits



- Lower performance than a cable connection → around 20Mbit/s
- According to the number of users :
  → 20Mbit/s to be shared between the users
- Depends on the distance
- Depends on the environment : wall structure, people, etc…

➲**Increase the number of access points in order to increase the performance**

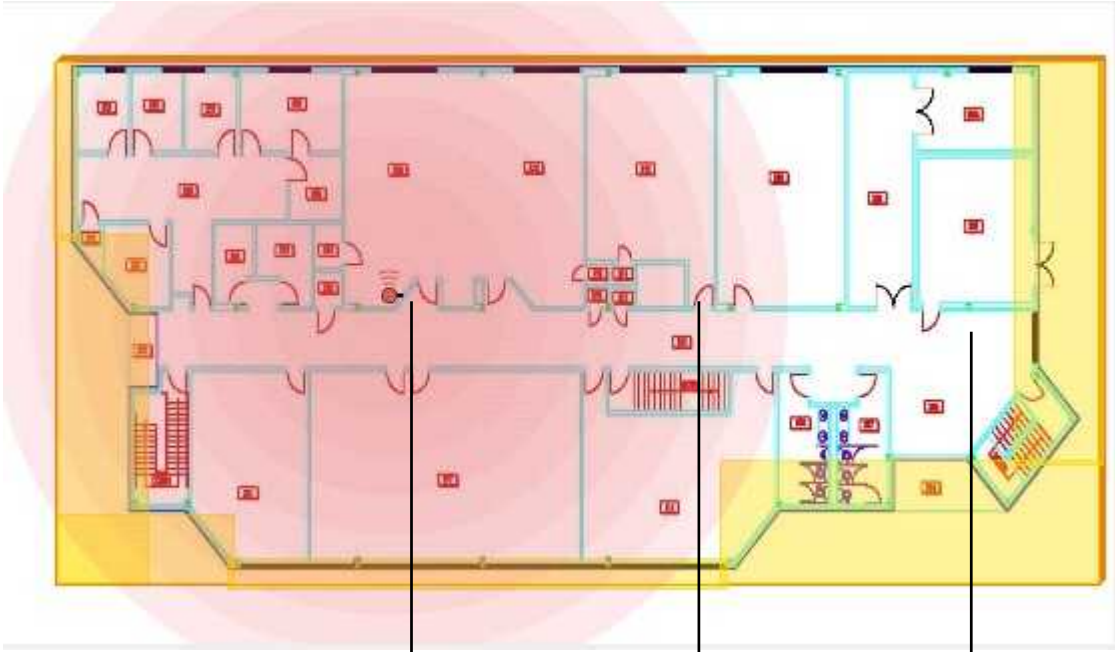
Legrand Cabling System

Option 1 : guest / meeting rooms

- 1 Wifi AP

Guest access

Lan access in the meeting room



Legrand Cabling System

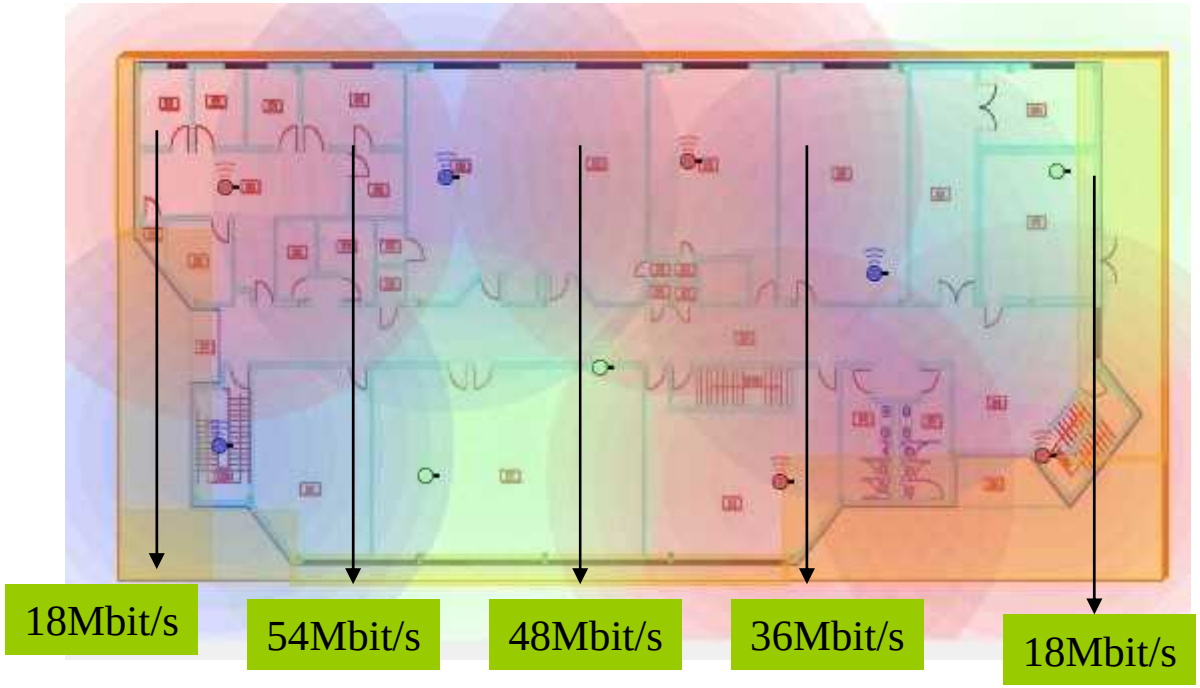
Option 3 : hight rate wifi

➲10 bornes Wifi

Global Lan access for employees

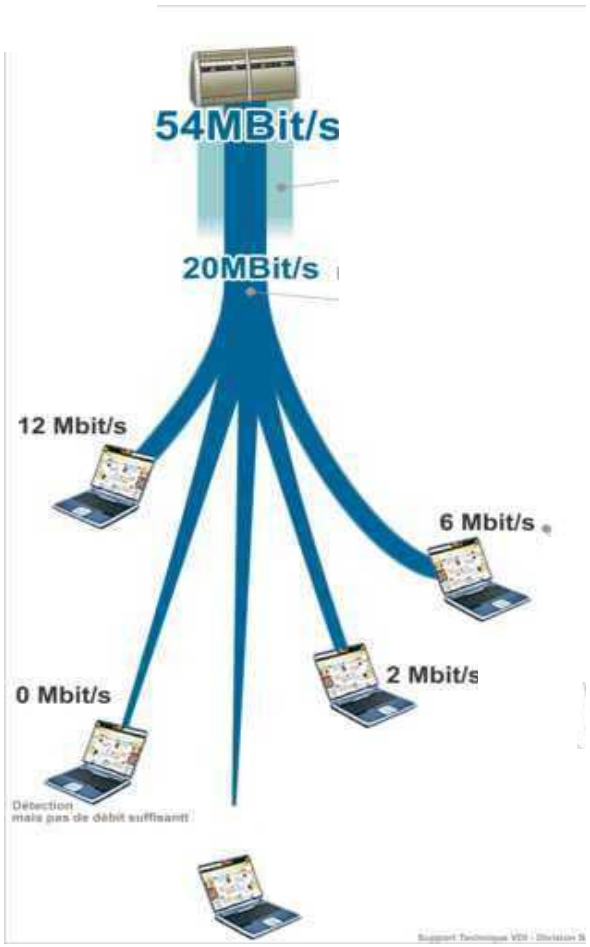
Hight rate everywhere in the building

Example : laboratory



Legrand Cabling System

WiFi : Project Scope



Requested performances

- Current uses : 1 to 2 Mbit/s

Number of users

- Ideal performance : 10 users for each Access Point

User area

- Ideal performance : 1 Access Point for each 100m2
- !! : Concrete wall = hight performance loses

General rules

Ask for the drawing of the building

Ask for the following information

- Number of users
- Requested redundancy
- Frequency (a or/and b/g)
- Requested performance for each user

To be checked for a good quotation

Legrand Cabling System

WiFi : Security

WEP Wired equivalent privacy

- General public uses
- Basic Encoding, old equipement

WPA Wifi Protected Access

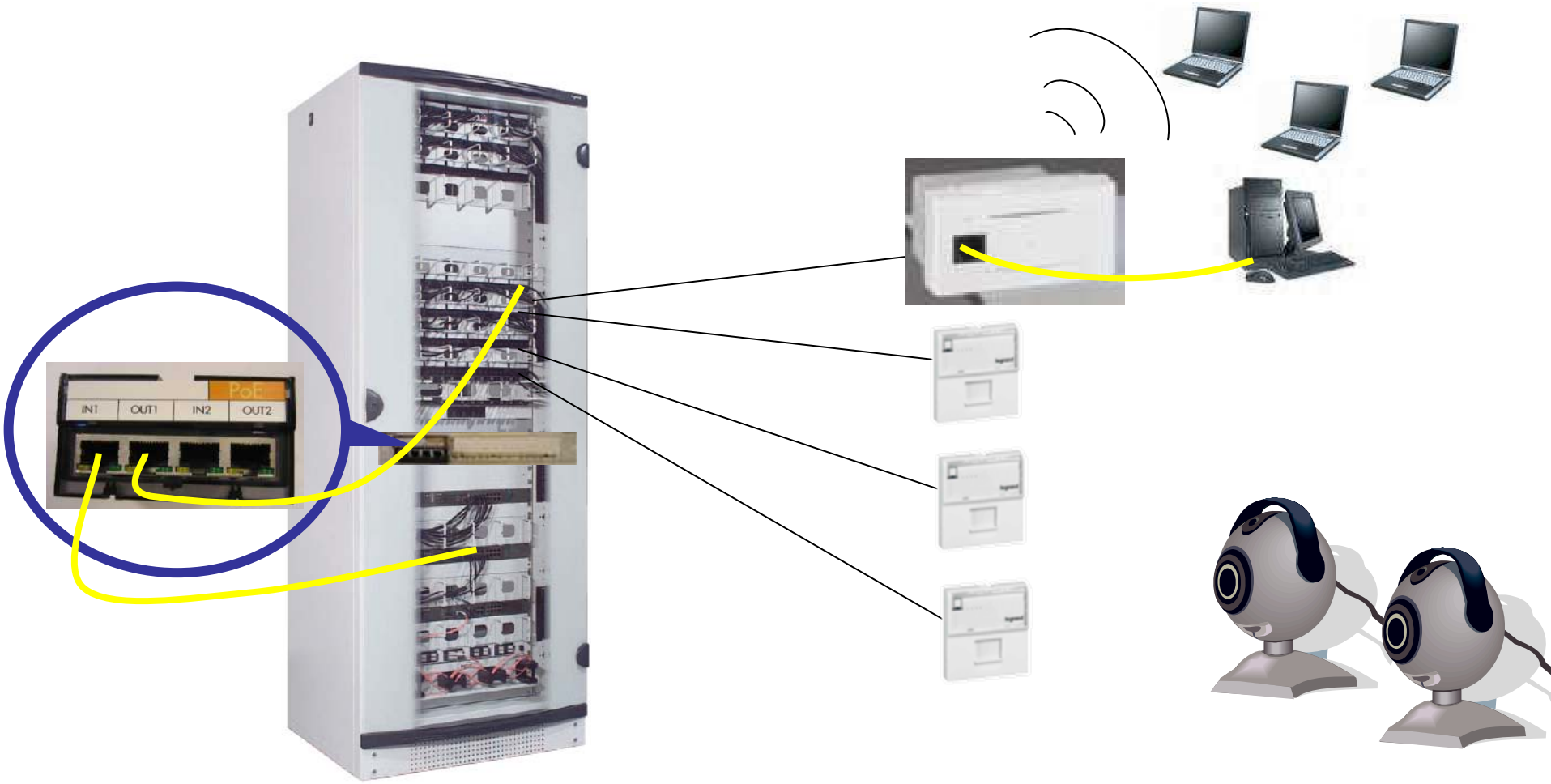
- General public uses
- More sophisticated encoding, current equipement

WPA 2 ou 802.11i

- Profesionnal uses
- Hightest data security encoding
- Include 802.1x authentification

Legrand Cabling System

PoE: Implementation



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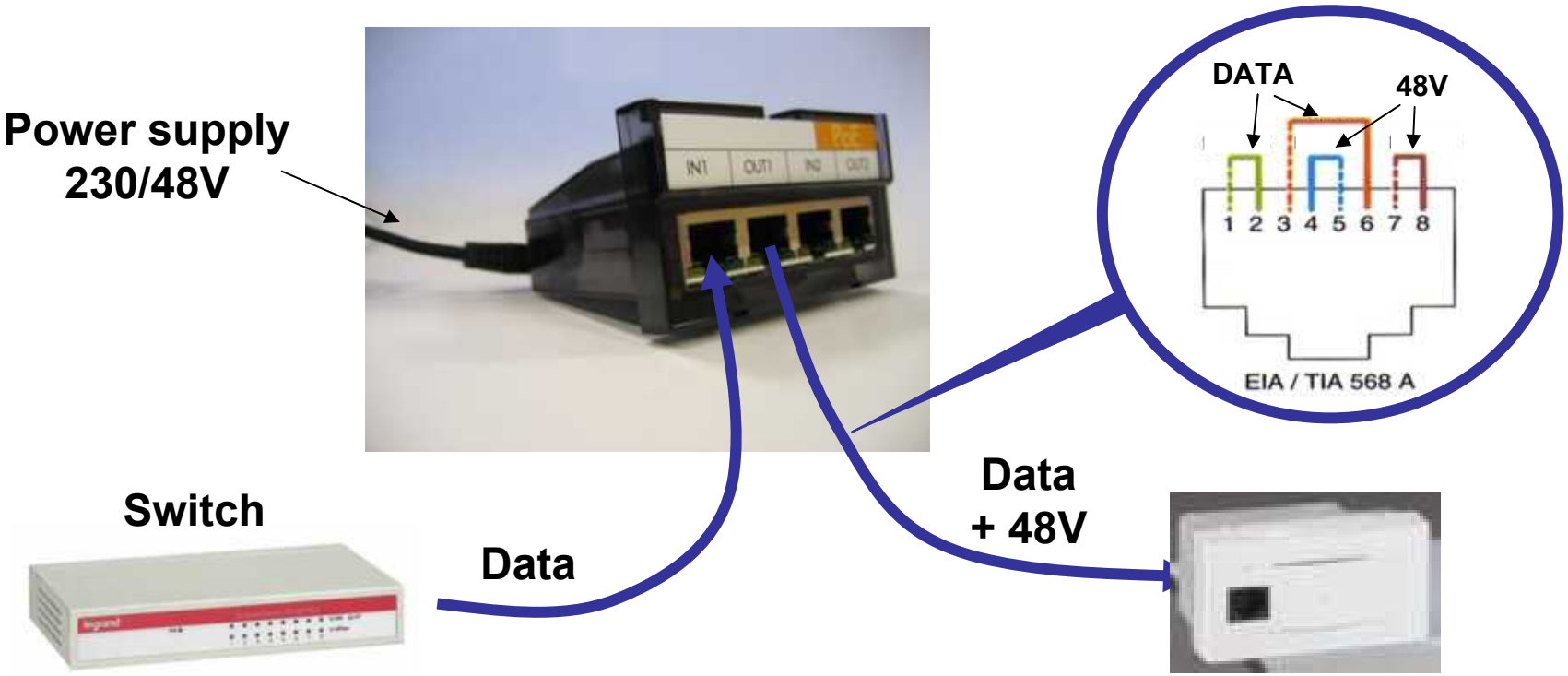
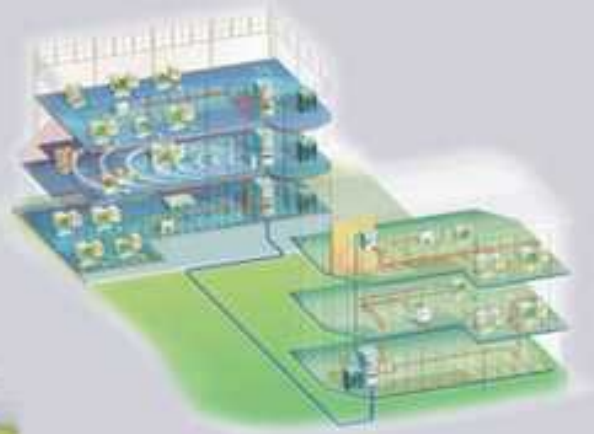
PoE: Injector

- The midspan solution : 10/100 Mbit/s



LCS PRO

FORMATION RÉSEAU & CLIENTS -



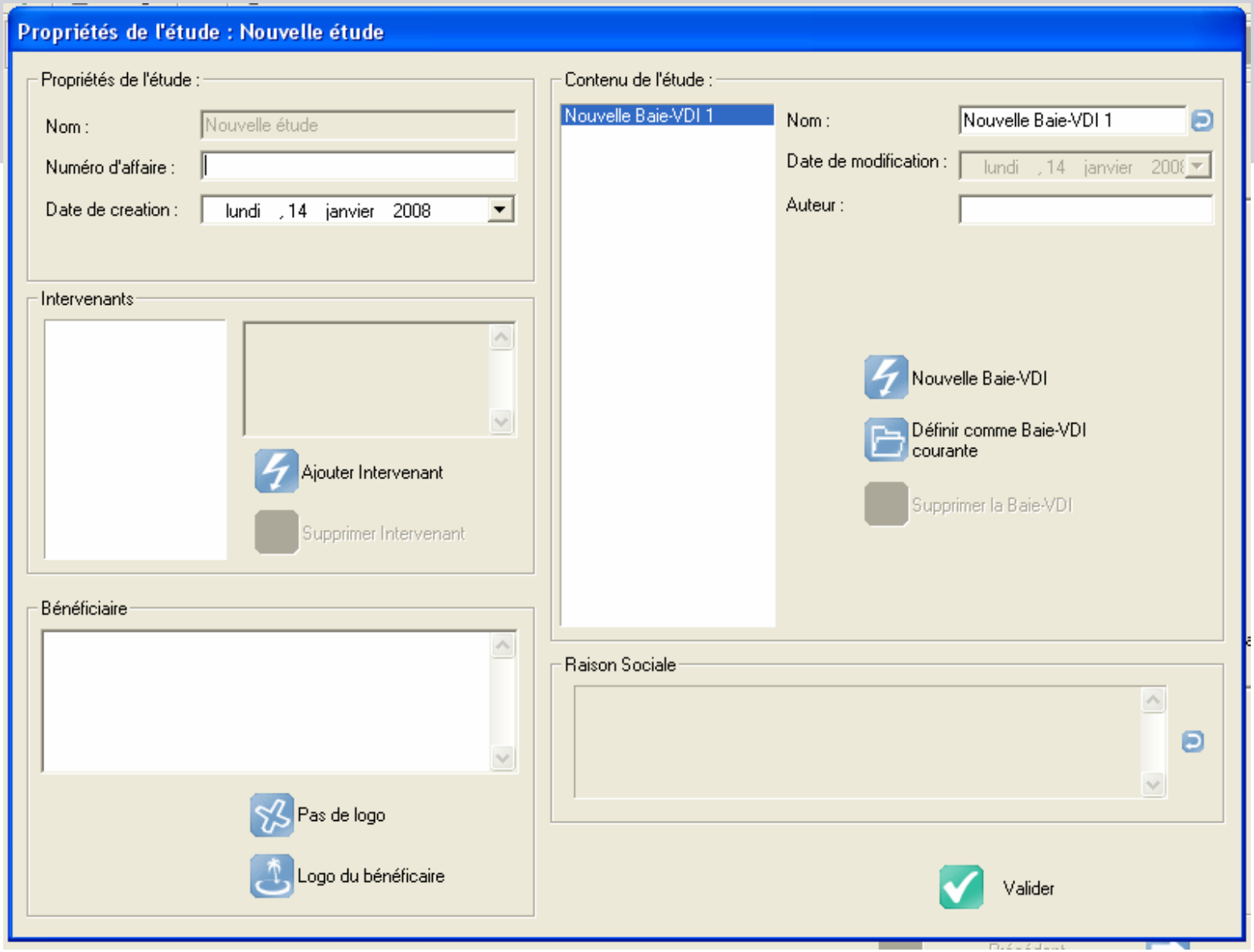
Which purpose ?

To give an answer to our clients in terms of

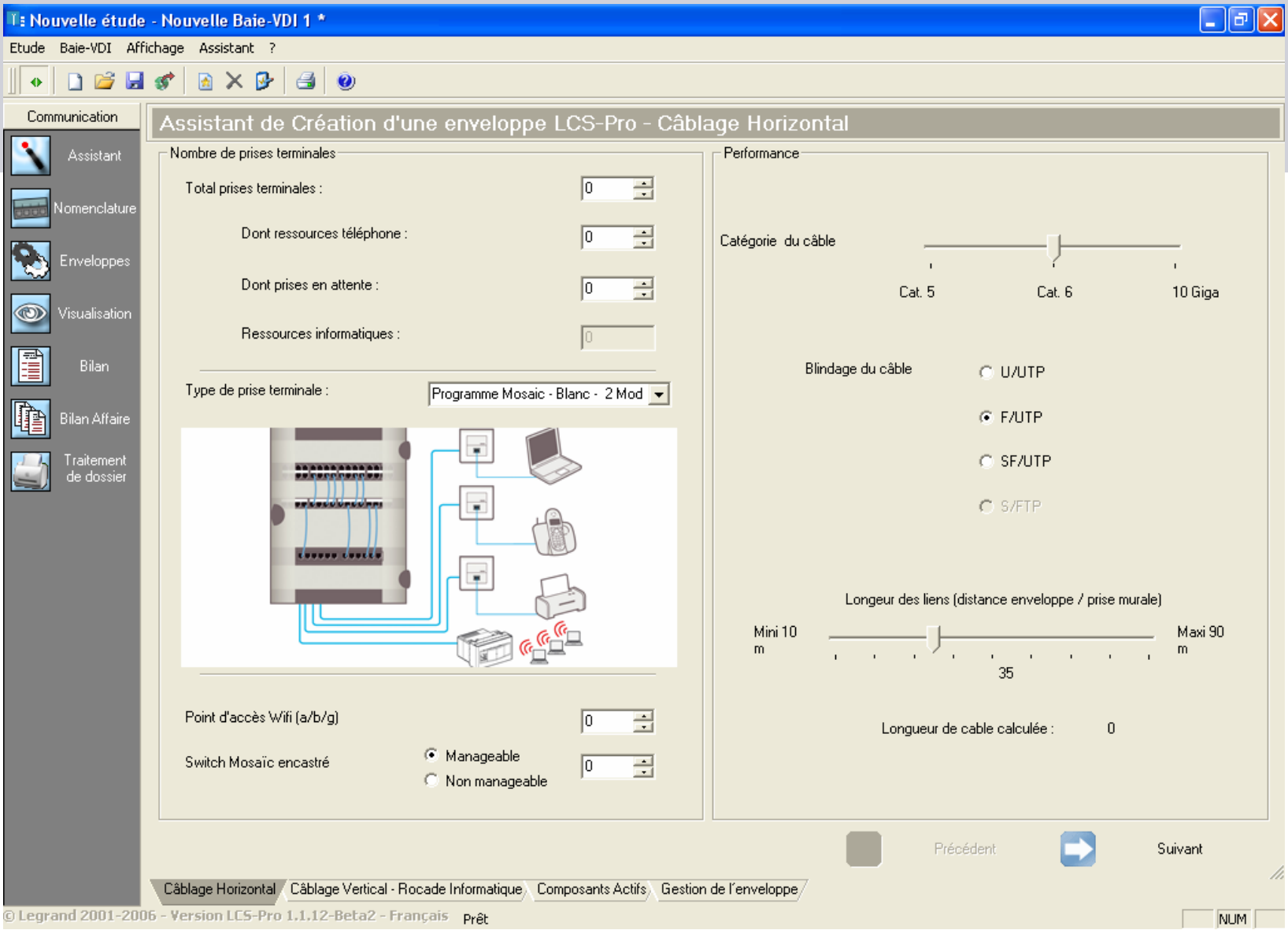
- Saving of study's time
- Define a complete, professional and selling file
- Realize a budget, calculate an affair……

What about the software ?

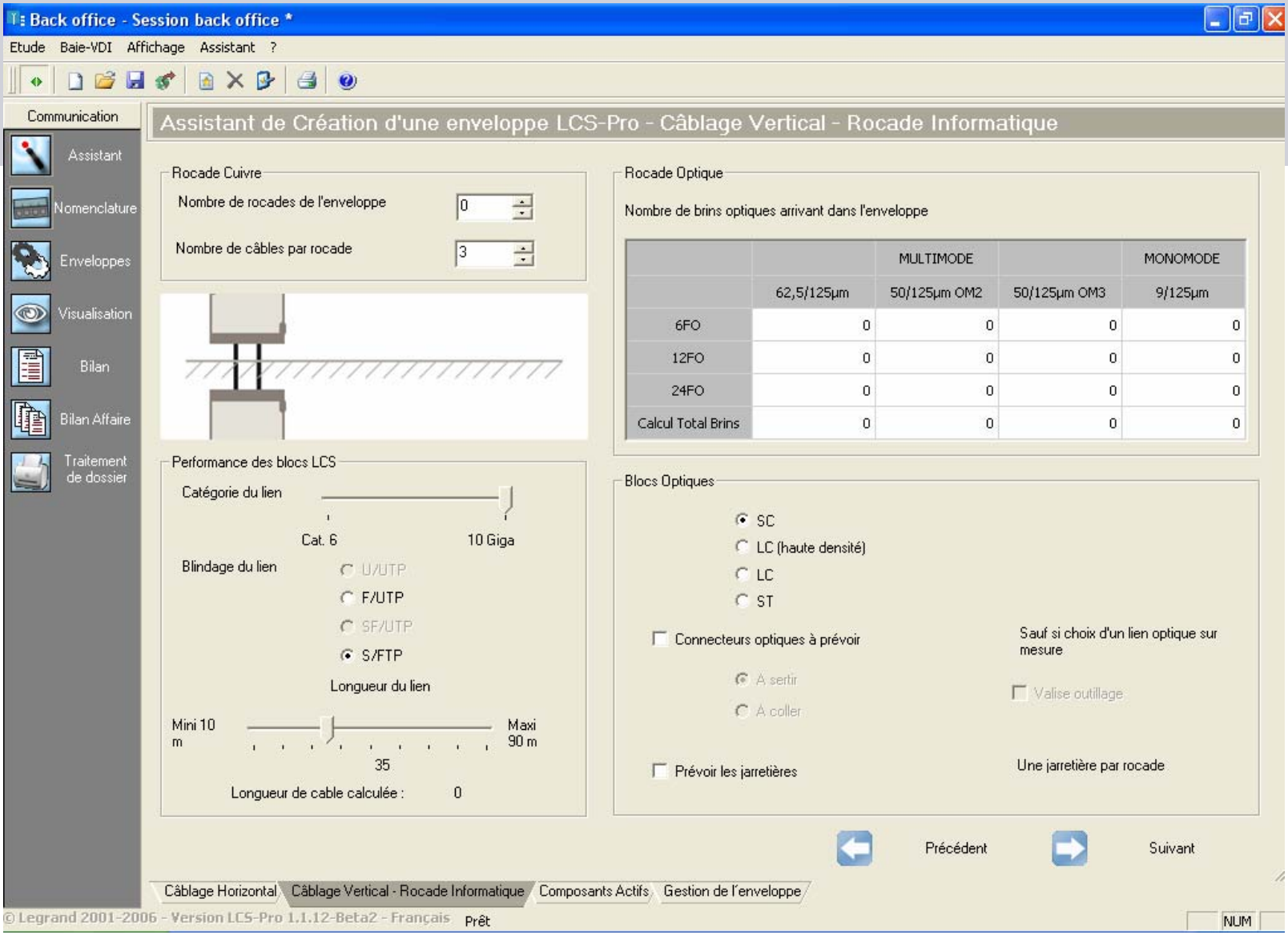
LCS PRO: the VDI cabinet creator



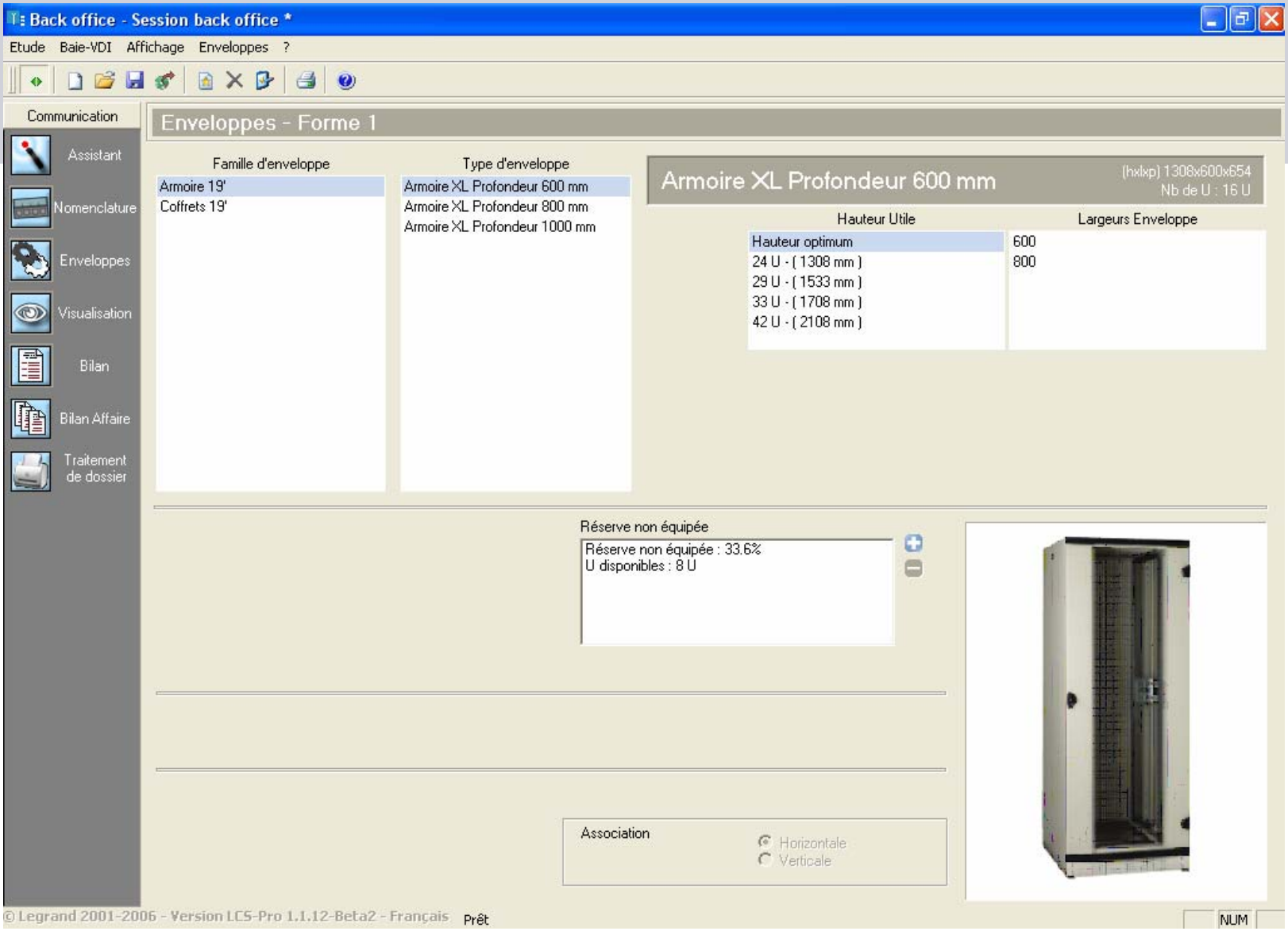
LCS PRO: the VDI cabinet creator



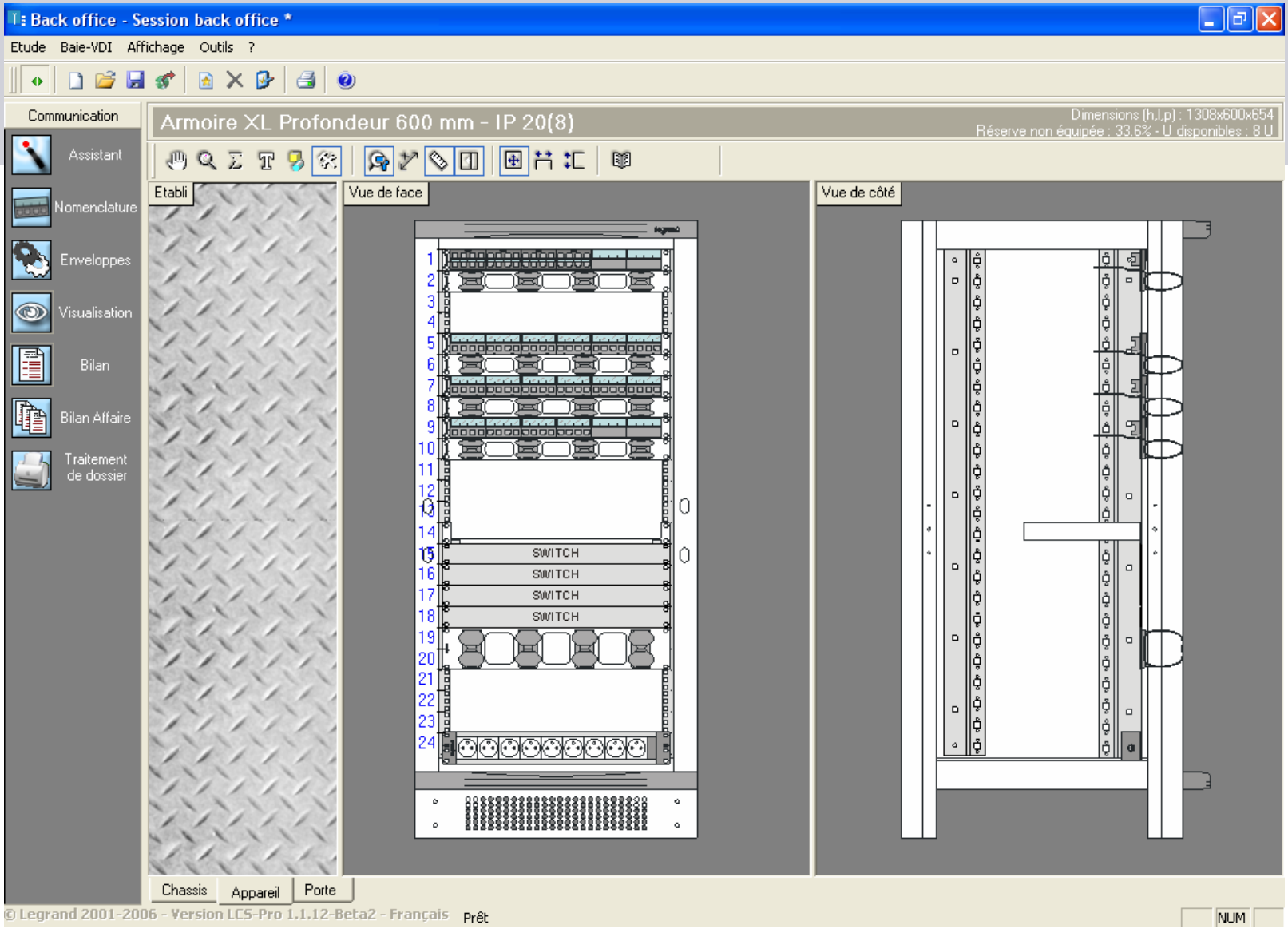
LCS PRO: the VDI cabinet creator



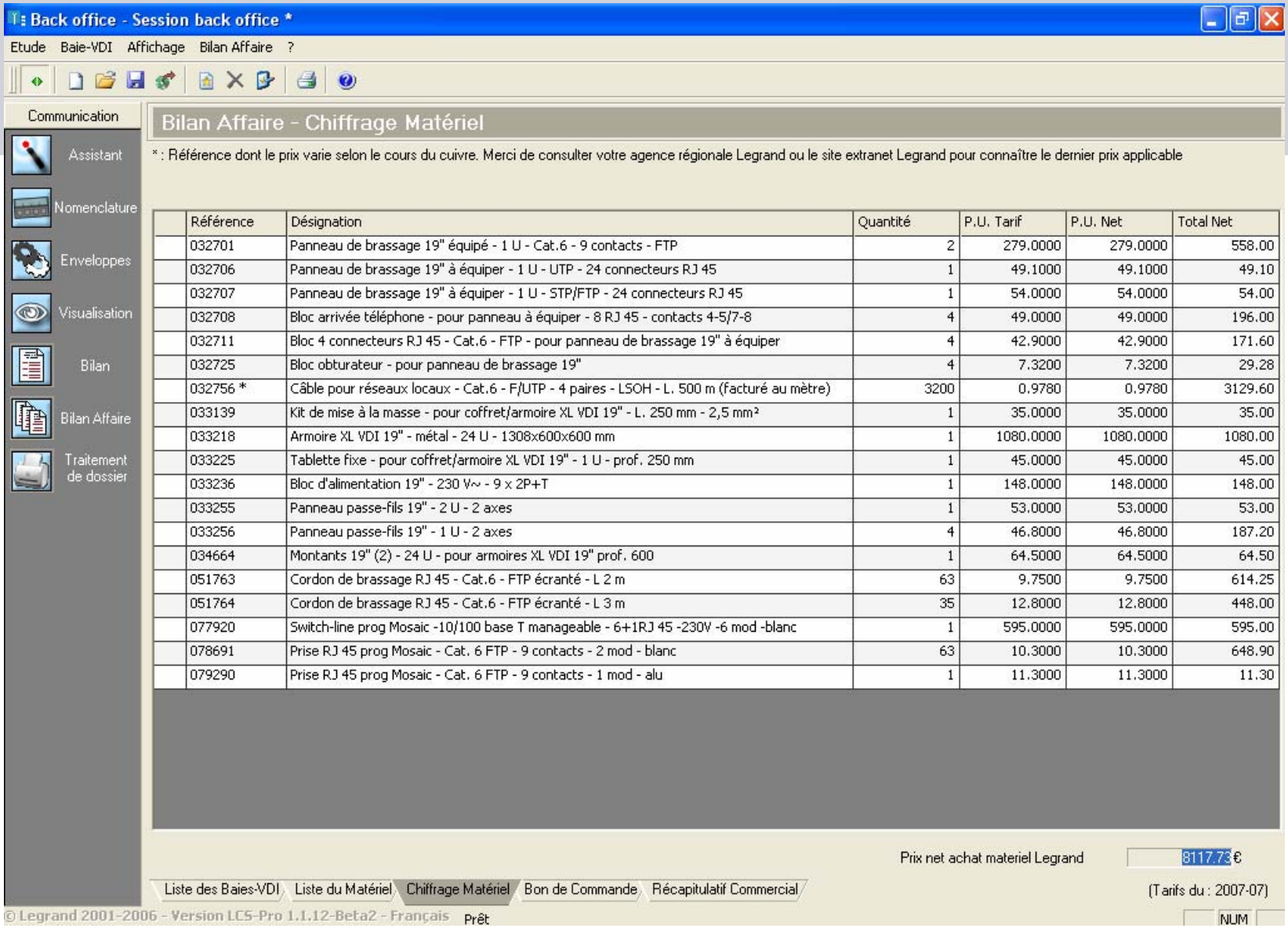
LCS PRO: the VDI cabinet creator



LCS PRO: the VDI cabinet creator

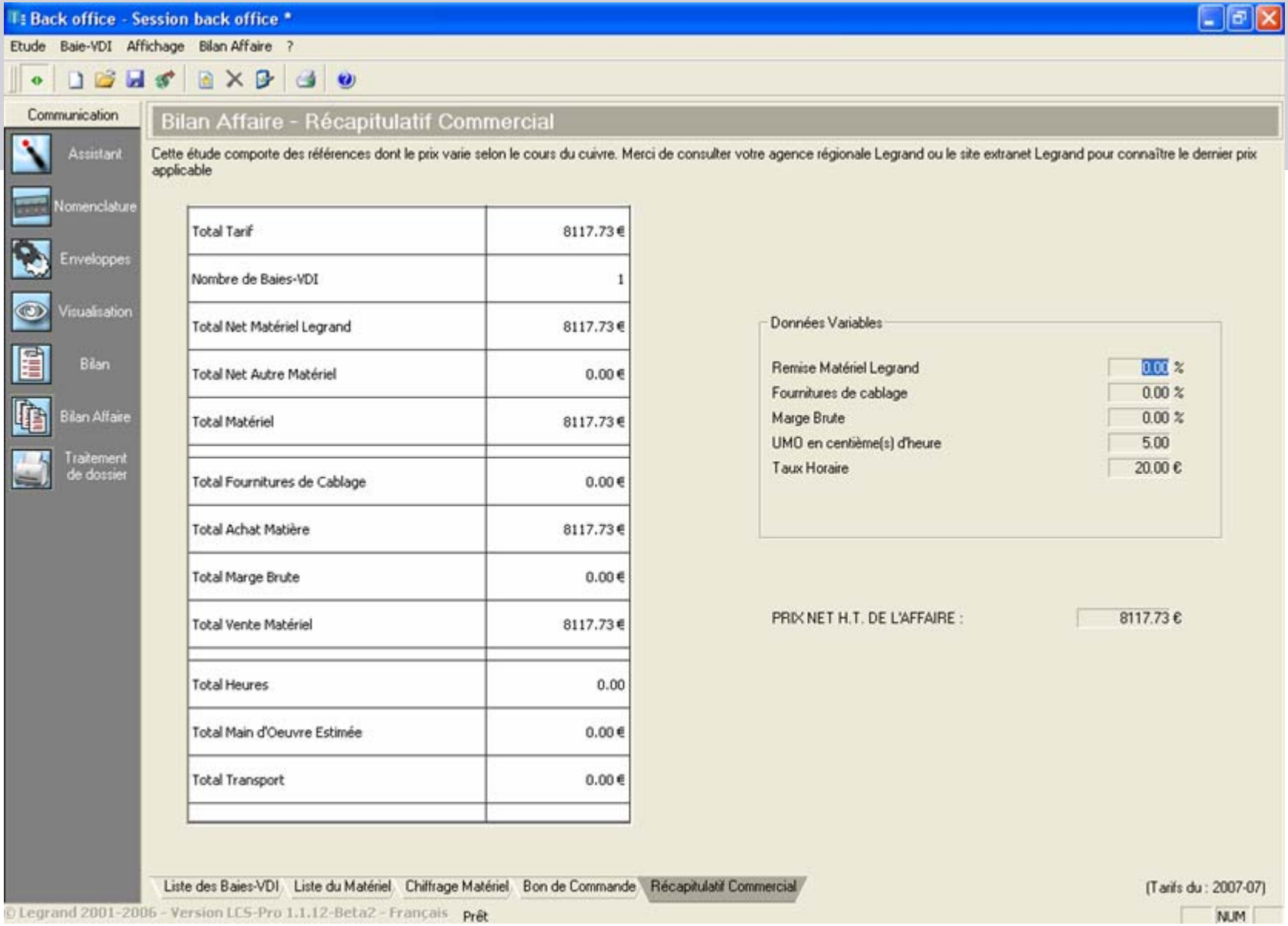


LCS PRO: the VDI cabinet creator



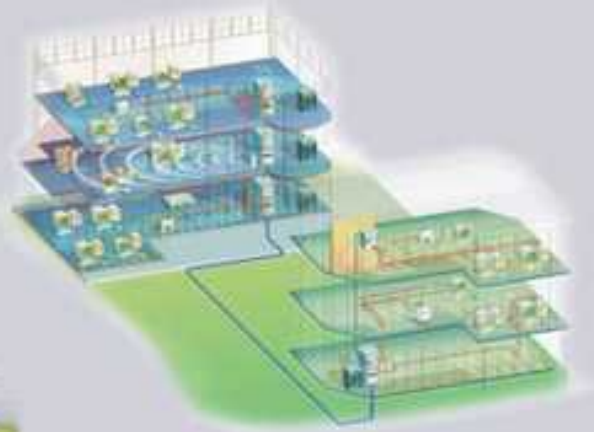
	Référence	Désignation	Quantité	P.U. Tarif	P.U. Net	Total Net
	032701	Panneau de brassage 19" équipé - 1 U - Cat.6 - 9 contacts - FTP	2	279.0000	279.0000	558.00
	032706	Panneau de brassage 19" à équiper - 1 U - UTP - 24 connecteurs RJ 45	1	49.1000	49.1000	49.10
	032707	Panneau de brassage 19" à équiper - 1 U - STP/FTP - 24 connecteurs RJ 45	1	54.0000	54.0000	54.00
	032708	Bloc arrivée téléphone - pour panneau à équiper - 8 RJ 45 - contacts 4-5/7-8	4	49.0000	49.0000	196.00
	032711	Bloc 4 connecteurs RJ 45 - Cat.6 - FTP - pour panneau de brassage 19" à équiper	4	42.9000	42.9000	171.60
	032725	Bloc obturateur - pour panneau de brassage 19"	4	7.3200	7.3200	29.28
	032756 *	Câble pour réseaux locaux - Cat.6 - F/UTP - 4 paires - LSOH - L. 500 m (facturé au mètre)	3200	0.9780	0.9780	3129.60
	033139	Kit de mise à la masse - pour coffret/armoire XL VDI 19" - L. 250 mm - 2,5 mm²	1	35.0000	35.0000	35.00
	033218	Armoire XL VDI 19" - métal - 24 U - 1308x600x600 mm	1	1080.0000	1080.0000	1080.00
	033225	Tablette fixe - pour coffret/armoire XL VDI 19" - 1 U - prof. 250 mm	1	45.0000	45.0000	45.00
	033236	Bloc d'alimentation 19" - 230 V~ - 9 x 2P+T	1	148.0000	148.0000	148.00
	033255	Panneau passe-fils 19" - 2 U - 2 axes	1	53.0000	53.0000	53.00
	033256	Panneau passe-fils 19" - 1 U - 2 axes	4	46.8000	46.8000	187.20
	034664	Montants 19" (2) - 24 U - pour armoires XL VDI 19" prof. 600	1	64.5000	64.5000	64.50
	051763	Cordon de brassage RJ 45 - Cat.6 - FTP écranté - L 2 m	63	9.7500	9.7500	614.25
	051764	Cordon de brassage RJ 45 - Cat.6 - FTP écranté - L 3 m	35	12.8000	12.8000	448.00
	077920	Switch-line prog Mosaic -10/100 base T manageable - 6+1RJ 45 -230V -6 mod -blanc	1	595.0000	595.0000	595.00
	078691	Prise RJ 45 prog Mosaic - Cat. 6 FTP - 9 contacts - 2 mod - blanc	63	10.3000	10.3000	648.90
	079290	Prise RJ 45 prog Mosaic - Cat. 6 FTP - 9 contacts - 1 mod - alu	1	11.3000	11.3000	11.30

LCS PRO: the VDI cabinet creator



The standardization

The LV / ELV routing



EN 50 174-2

The contents

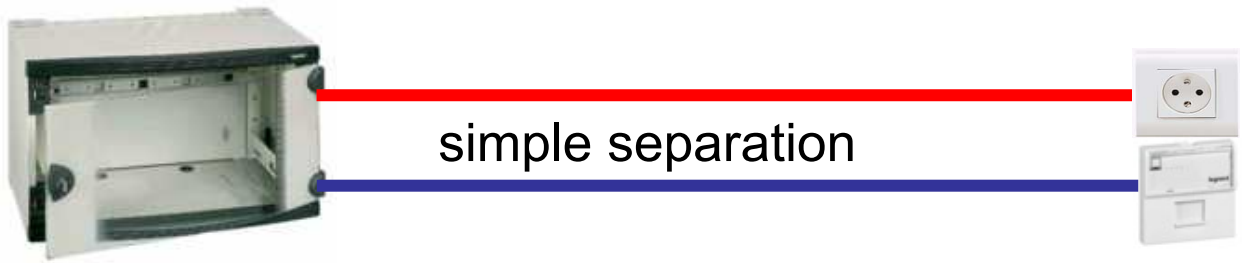
The practice of installation inside buildings

- safety prescrition
- earth link and equipotentiality
- protection against lighting and overvoltage…
- routing pratice…
- **ELV and LV routing**

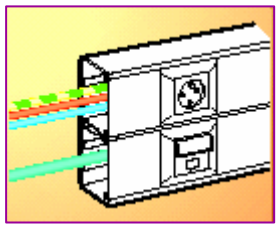
EN 50 174-2

ELV / LV routing for horizontal subsystems

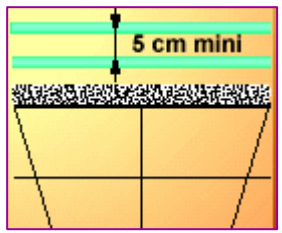
If link ≤ 35 m and shielded cable FTP / SFTP



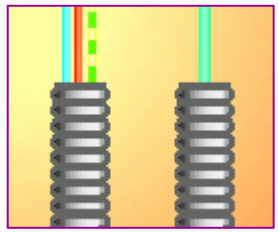
- for trunking : partition



- for ducting : 5 cm



- For conduits



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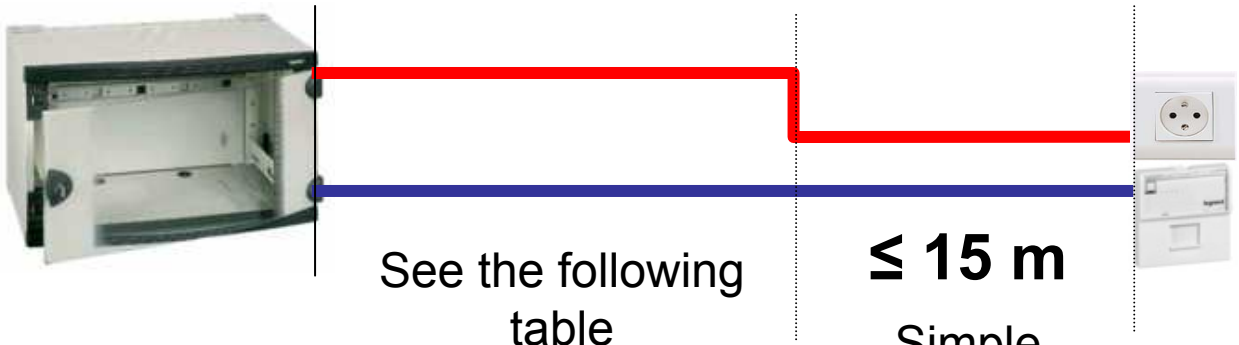
ELV / LV routing for horizontal subsystems

If link > 35 m or unscreened cable (UTP)

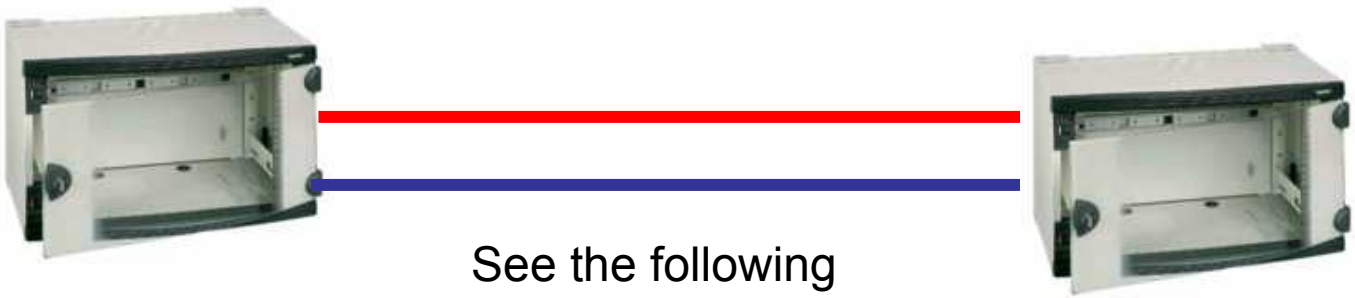


UTP : 20 cm *
FTP : 5 cm *
SFTP : 5 cm *

* : with unscreened low voltage cable and no metal partition

EN 50 174-2

ELV / LV routing for backbone subsystems



See the following table

UTP : 20 cm *
FTP : 5 cm *
SFTP : 5 cm *

* : with unscreened low voltage cable and no metal partition

EN 50 174-2

	No separation	Aluminium partition	Steel partition
Unscreened LV Unscreened ELV	**200 mm**	**100 mm**	**50 mm**
Unscreened LV Screened ELV	**50 mm**	**20 mm**	**5 mm**
Screened LV Unscreened ELV	**30 mm**	**10 mm**	**2 mm**
Screened LV Screened ELV	**0 mm**	**0 mm**	**0 mm**