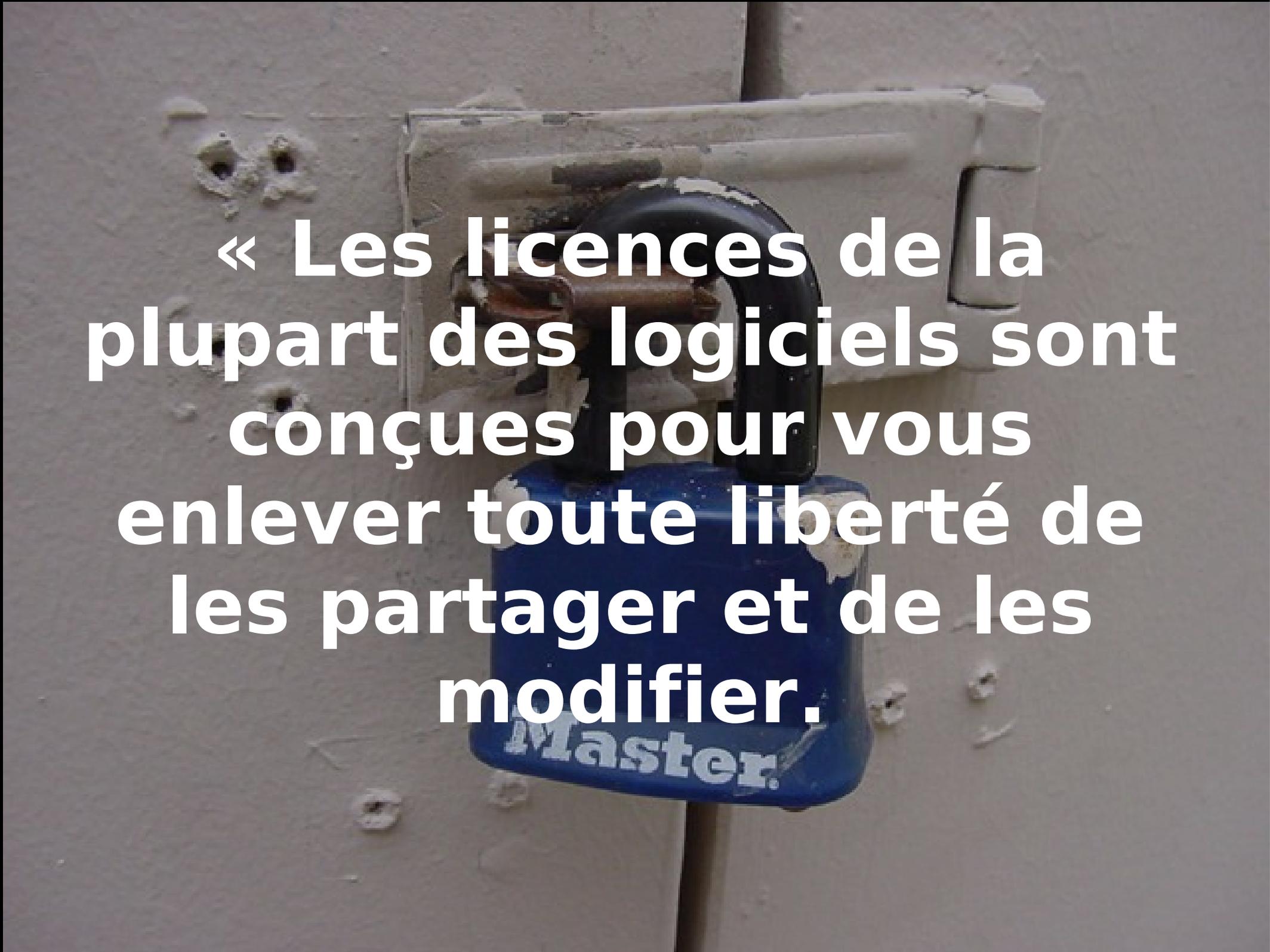




Logiciels Libres
*libertés, partage et
collaboration*

*Gaël Utard – Thomas Petazzoni
INSA de Toulouse – 23 avril 2007*

A blue Master Lock padlock is attached to a metal surface, symbolizing restriction or control. The lock is positioned in the center of the frame, with the word "Master" visible on its lower half. The background is a textured, grey metal surface with several small holes and a white plastic component partially visible at the top.

« Les licences de la plupart des logiciels sont conçues pour vous enlever toute liberté de les partager et de les modifier. »

A contrario, la GPL est destinée à garantir votre liberté de partager et de modifier les logiciels libres, et à assurer que ces logiciels soient libres pour tous leurs utilisateurs. »

Préambule de la GPL



Quatre libertés fondamentales

Utiliser



Copier



Étudier

Méthode A pour trouver A^{-1} lorsque A est inversible

$$\left(\begin{array}{c|c} A & I \end{array} \right) \xrightarrow{*} \left(\begin{array}{c|c} I & A^{-1} \end{array} \right)$$

* Soit $A = (a_{ij})$ une matrice carrée d'ordre n .

1. On écrit A à gauche de l'identité I .
2. On applique des opérations élémentaires de lignes à A pour transformer A en I .
3. On applique les mêmes opérations à I .

Exemple: $A = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix}$

$$\left(\begin{array}{cc|cc} a_{11} & a_{12} & 1 & 0 \\ a_{21} & a_{22} & 0 & 1 \end{array} \right) \xrightarrow{R_1 \leftrightarrow R_2} \left(\begin{array}{cc|cc} a_{21} & a_{22} & 0 & 1 \\ a_{11} & a_{12} & 1 & 0 \end{array} \right) \xrightarrow{R_1 + \frac{a_{21}}{a_{11}} R_2} \left(\begin{array}{cc|cc} 1 & 0 & \frac{1}{a_{11}} + \frac{a_{21}}{a_{11} a_{22}} & \frac{a_{21}}{a_{11}} \\ a_{21} & a_{22} & 0 & 1 \end{array} \right)$$
$$\xrightarrow{R_2 - a_{21} R_1} \left(\begin{array}{cc|cc} 1 & 0 & \frac{1}{a_{11}} + \frac{a_{21}}{a_{11} a_{22}} & \frac{a_{21}}{a_{11}} \\ 0 & a_{22} & -\frac{a_{21}}{a_{11}} & 1 \end{array} \right) \xrightarrow{R_2 \cdot \frac{1}{a_{22}}} \left(\begin{array}{cc|cc} 1 & 0 & \frac{1}{a_{11}} + \frac{a_{21}}{a_{11} a_{22}} & \frac{a_{21}}{a_{11}} \\ 0 & 1 & -\frac{a_{21}}{a_{11} a_{22}} & \frac{1}{a_{22}} \end{array} \right)$$
$$\xrightarrow{R_1 - \left(\frac{1}{a_{11}} + \frac{a_{21}}{a_{11} a_{22}} \right) R_2} \left(\begin{array}{cc|cc} 1 & 0 & 1 & \frac{a_{21}}{a_{11}} - \frac{a_{21}}{a_{11} a_{22}} \\ 0 & 1 & -\frac{a_{21}}{a_{11} a_{22}} & \frac{1}{a_{22}} \end{array} \right) = A^{-1}$$

Exemple: $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$

$$\left(\begin{array}{cc|cc} 1 & 2 & 1 & 0 \\ 3 & 4 & 0 & 1 \end{array} \right) \xrightarrow{R_2 - 3R_1} \left(\begin{array}{cc|cc} 1 & 2 & 1 & 0 \\ 0 & -2 & -3 & 1 \end{array} \right) \xrightarrow{R_2 \cdot (-\frac{1}{2})} \left(\begin{array}{cc|cc} 1 & 2 & 1 & 0 \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right) \xrightarrow{R_1 - 2R_2} \left(\begin{array}{cc|cc} 1 & 0 & -2 & 1 \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right)$$
$$\xrightarrow{R_1 + 2R_2} \left(\begin{array}{cc|cc} 1 & 0 & 1 & 0 \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right) \xrightarrow{R_1 - R_2} \left(\begin{array}{cc|cc} 1 & 0 & \frac{1}{2} & \frac{1}{2} \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right) \xrightarrow{R_1 \cdot 2} \left(\begin{array}{cc|cc} 2 & 0 & 1 & 1 \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right)$$
$$\xrightarrow{R_1 - R_2} \left(\begin{array}{cc|cc} 2 & 0 & -\frac{1}{2} & \frac{3}{2} \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right) \xrightarrow{R_1 \cdot 2} \left(\begin{array}{cc|cc} 4 & 0 & -1 & 3 \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right) \xrightarrow{R_1 + R_2} \left(\begin{array}{cc|cc} 4 & 0 & \frac{5}{2} & \frac{5}{2} \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right)$$
$$\xrightarrow{R_1 \cdot \frac{1}{4}} \left(\begin{array}{cc|cc} 1 & 0 & \frac{5}{8} & \frac{5}{8} \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right) \xrightarrow{R_1 - \frac{5}{8} R_2} \left(\begin{array}{cc|cc} 1 & 0 & \frac{5}{8} - \frac{15}{8} & \frac{5}{8} + \frac{5}{8} \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right) = A^{-1}$$

Exemple: $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$

$$\left(\begin{array}{cc|cc} 1 & 2 & 1 & 0 \\ 3 & 4 & 0 & 1 \end{array} \right) \xrightarrow{R_2 - 3R_1} \left(\begin{array}{cc|cc} 1 & 2 & 1 & 0 \\ 0 & -2 & -3 & 1 \end{array} \right) \xrightarrow{R_2 \cdot (-\frac{1}{2})} \left(\begin{array}{cc|cc} 1 & 2 & 1 & 0 \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right) \xrightarrow{R_1 - 2R_2} \left(\begin{array}{cc|cc} 1 & 0 & -2 & 1 \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right)$$
$$\xrightarrow{R_1 + 2R_2} \left(\begin{array}{cc|cc} 1 & 0 & 1 & 0 \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right) \xrightarrow{R_1 - R_2} \left(\begin{array}{cc|cc} 1 & 0 & \frac{1}{2} & \frac{1}{2} \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right) \xrightarrow{R_1 \cdot 2} \left(\begin{array}{cc|cc} 2 & 0 & 1 & 1 \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right)$$
$$\xrightarrow{R_1 - R_2} \left(\begin{array}{cc|cc} 2 & 0 & -\frac{1}{2} & \frac{3}{2} \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right) \xrightarrow{R_1 \cdot 2} \left(\begin{array}{cc|cc} 4 & 0 & -1 & 3 \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right) \xrightarrow{R_1 + R_2} \left(\begin{array}{cc|cc} 4 & 0 & \frac{5}{2} & \frac{5}{2} \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right)$$
$$\xrightarrow{R_1 \cdot \frac{1}{4}} \left(\begin{array}{cc|cc} 1 & 0 & \frac{5}{8} & \frac{5}{8} \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right) \xrightarrow{R_1 - \frac{5}{8} R_2} \left(\begin{array}{cc|cc} 1 & 0 & \frac{5}{8} - \frac{15}{8} & \frac{5}{8} + \frac{5}{8} \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right) = A^{-1}$$


A close-up photograph of a hand using a file to shape a glowing metal rod on an anvil. The rod is bright orange-red from heat, and the hand is wearing a dark, textured glove. The background is dark and out of focus.

Modifier

**...et redistribuer
les modifications**

Code source

```
dec_zone_page_state (page NR) (A...E);
tlb->mm->nr...

}

static inline void free_pmd_range(struct mmu_gather *tlb, pud_t *pud,
                                unsigned long addr, unsigned long end,
                                unsigned long floor, unsigned long ceiling)
{
    pmd_t *pmd;
    unsigned long next;
    unsigned long start;

    start = addr;
    pmd = pmd_offset(pud, start);
    next = pmd_addr_end(addr, end);
    if (pmd_none_or_clear_bad(pmd))
        continue;
    free_pte_range(tlb, pmd);
    while (pmd++, addr = next, addr != end);

    start &= PUD_MASK;
    if (addr < floor)
        floor = start;
    if (ceiling) {
        ceiling &= PUD_MASK;
        if (ceiling > end)
            ceiling = end;
    }
    if (end - 1 > ceiling - 1)
        return;

    pmd = pmd_offset(pud, start);
    pud_clear(pud);
    pmd_free_tlb(tlb, pmd);
}

static inline void free_pud_range(struct mmu_gather *tlb, pgd_t *pgd,
                                unsigned long addr, unsigned long end,
                                unsigned long floor, unsigned long ceiling)
{
    pud_t *pud;
    unsigned long next;
```

```
int main(void)
```

```
{
```

```
    printf("Bonjour\n");
```

```
    return 0;
```

```
}
```

```
    pmd = pmd_offset(pud, start);
    pud_clear(pud);
    pmd_free_tlb(tlb, pmd);
```

```
static inline void free_pud_range(struct mmu_gather *tlb, pgd_t *pgd,
                                unsigned long addr, unsigned long end,
                                unsigned long floor, unsigned long ceiling)
```

```
{
    pud_t *pud;
    unsigned long next;
```

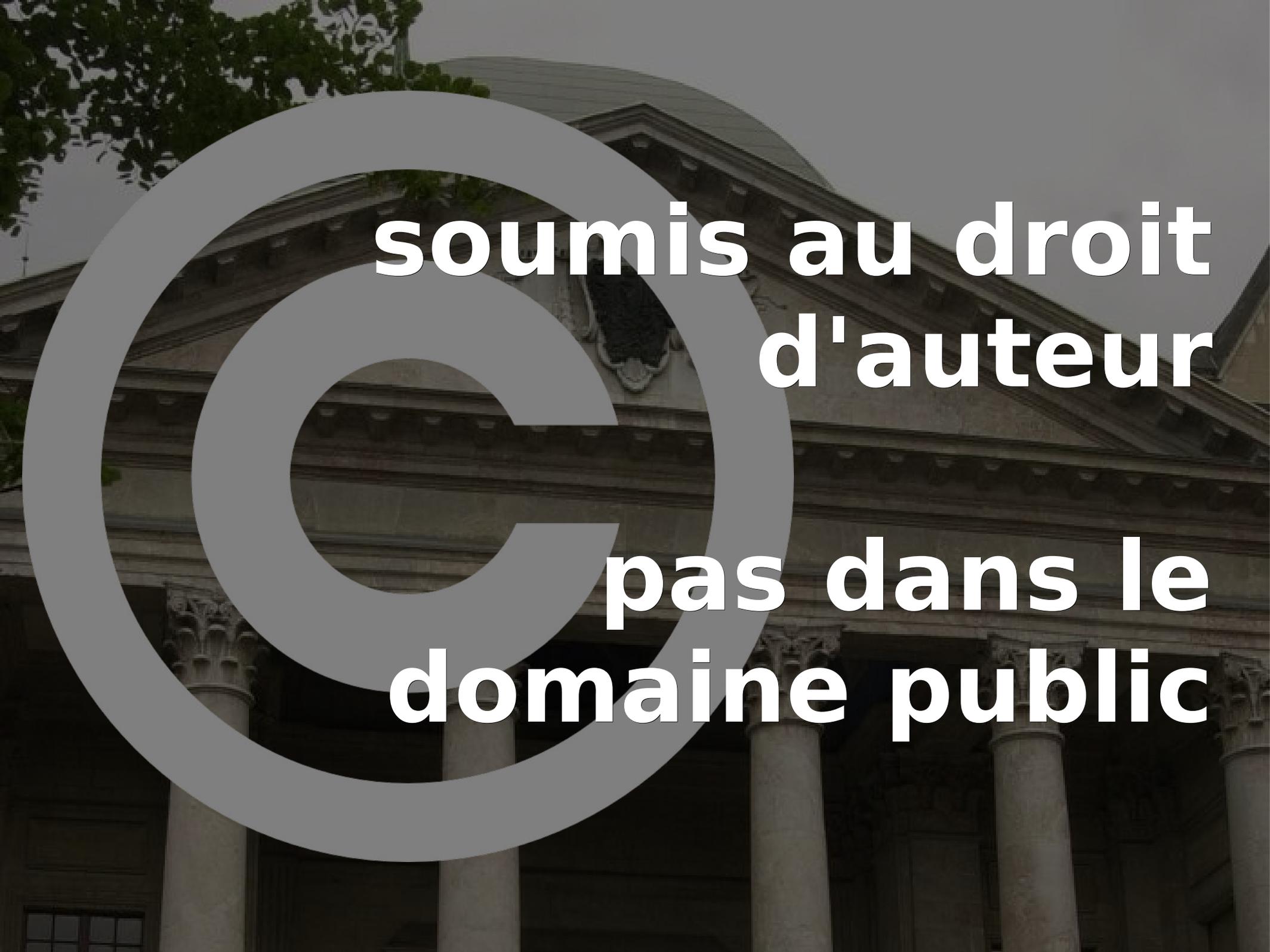
Code binaire

01100111100011010101
01101011011010111101
01101010010000100100



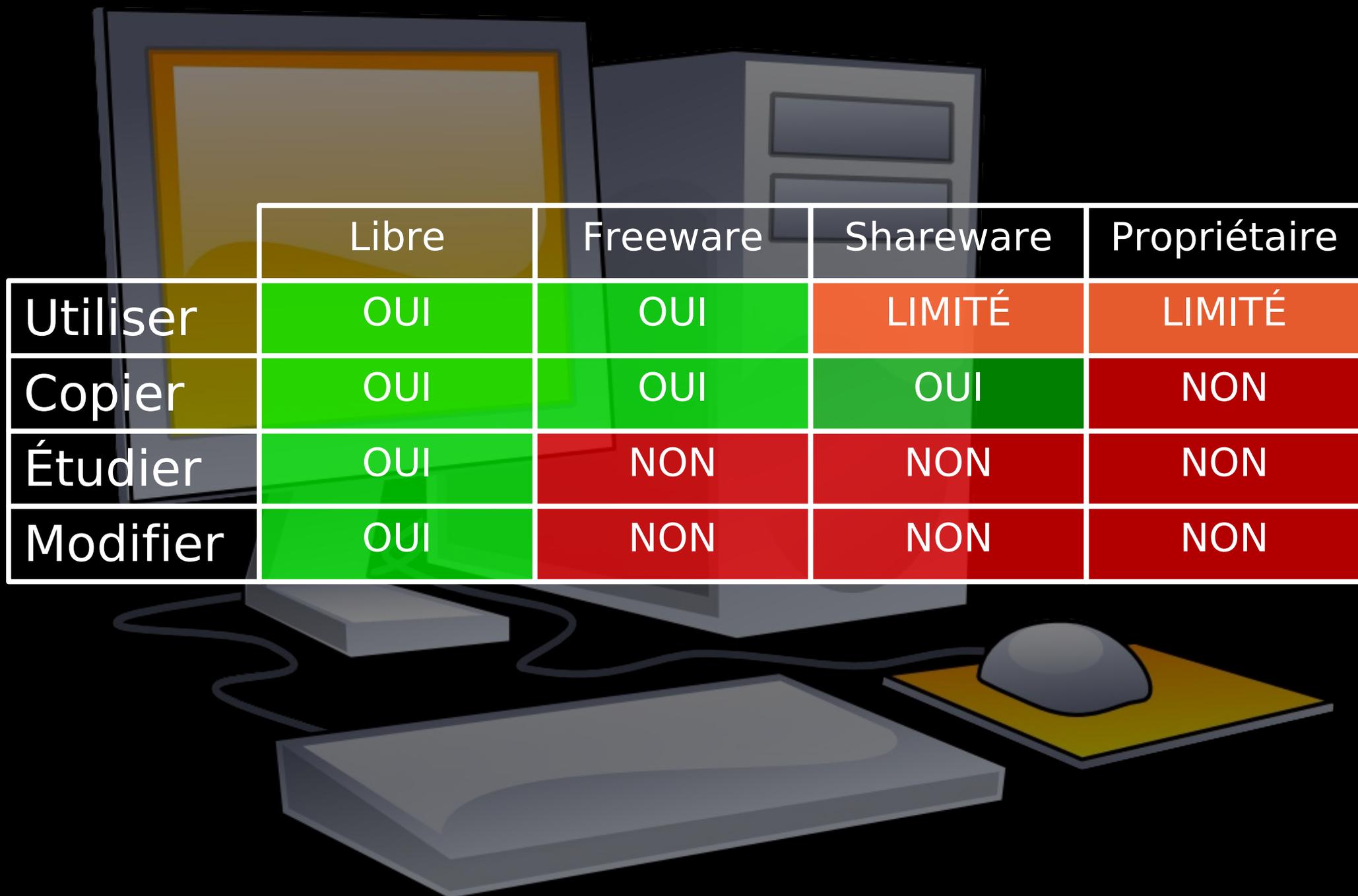
Libre

!!!
Gratuit



**soumis au droit
d'auteur**

**pas dans le
domaine public**



| | Libre | Freeware | Shareware | Propriétaire |
|----------|-------|----------|-----------|--------------|
| Utiliser | OUI | OUI | LIMITÉ | LIMITÉ |
| Copier | OUI | OUI | OUI | NON |
| Étudier | OUI | NON | NON | NON |
| Modifier | OUI | NON | NON | NON |

Massachusetts Institute of Technology



Richard Stallman



Projet GNU

**GNU's
Not
Unix**



Licence GPL

GNU GENERAL PUBLIC LICENSE

Version 2, June 1991

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When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

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**Fondation pour le
Logiciel Libre
1984**



Copyright

**Ce qui est libre
doit le rester**



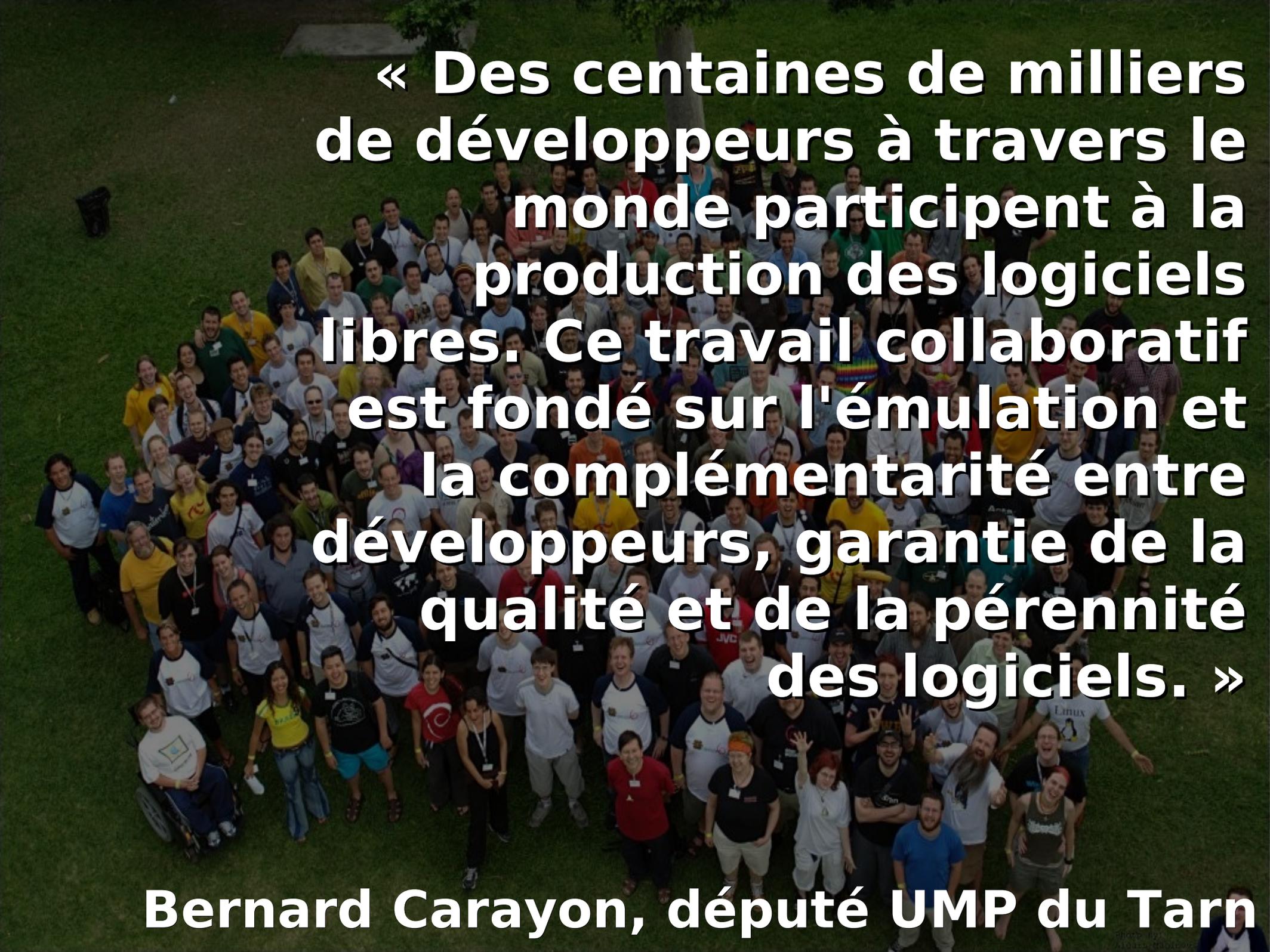
**« Un pot commun
auquel chacun
peut ajouter mais
duquel personne
ne peut rien
retirer »**

Eben Moglen



Bénévoles

Salariés



« Des centaines de milliers de développeurs à travers le monde participent à la production des logiciels libres. Ce travail collaboratif est fondé sur l'émulation et la complémentarité entre développeurs, garantie de la qualité et de la pérennité des logiciels. »

Bernard Carayon, député UMP du Tarn



**Modèle
du bazar**

**Écosystème
de projets
indépendants**

Travail centré autour d'Internet

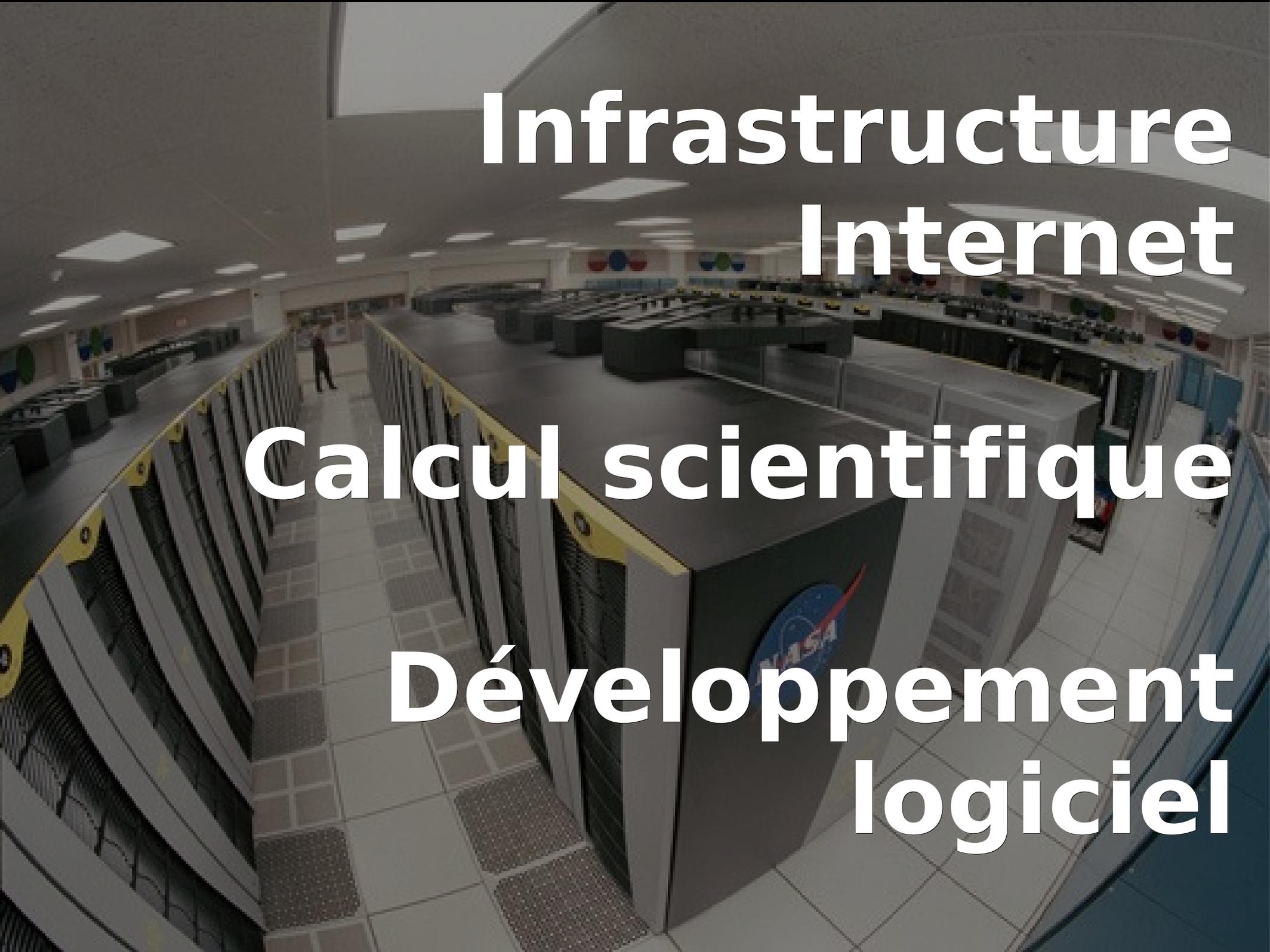




Communauté

entre utilisateurs

entre utilisateurs et développeurs

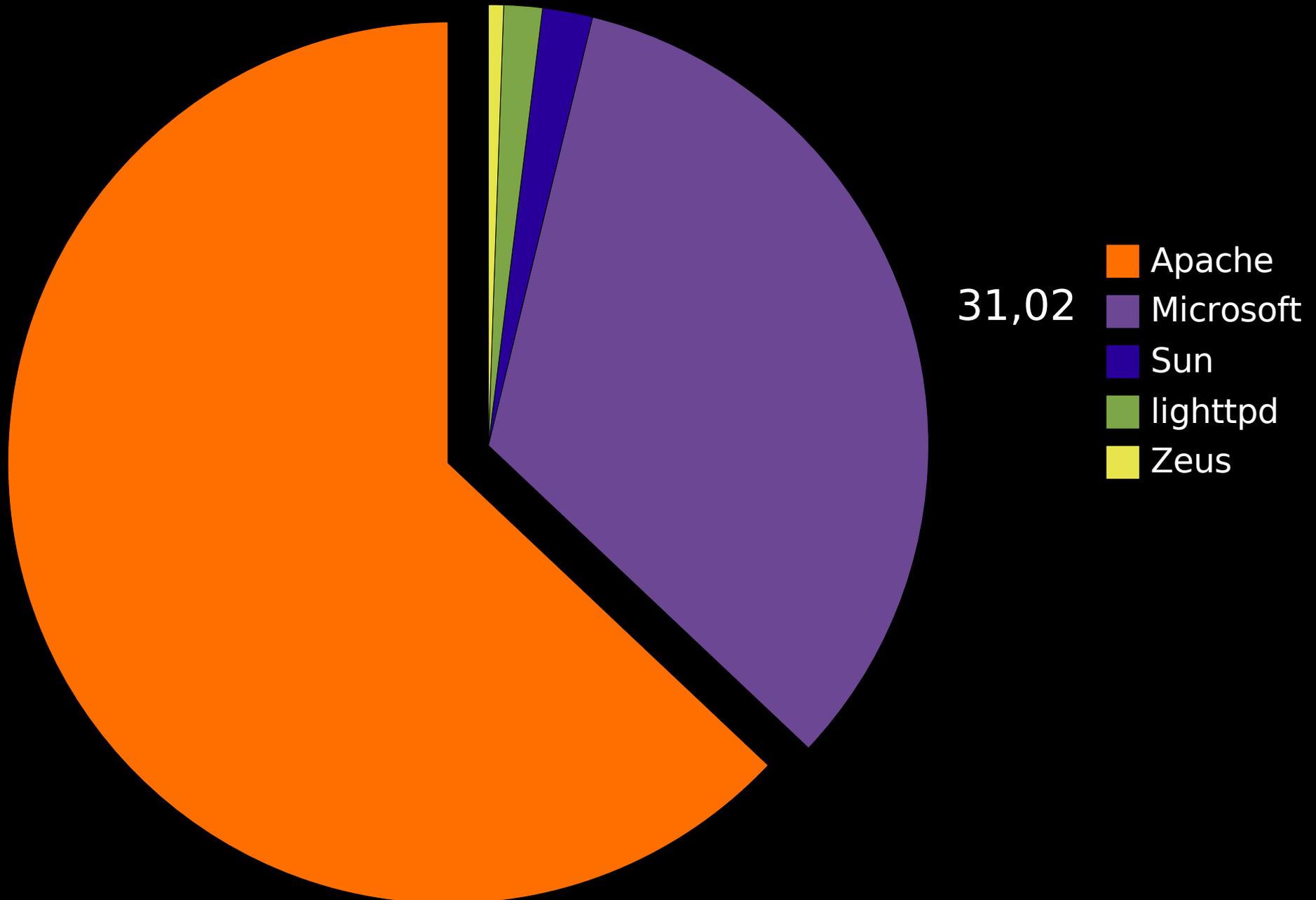
A wide-angle, slightly elevated view of a large server room. The room is filled with rows of server racks, some of which are dark grey and others are light grey. A person is visible in the distance, walking through the aisles. The floor is a light-colored tile. The ceiling has recessed lighting. The overall atmosphere is clean and professional.

**Infrastructure
Internet**

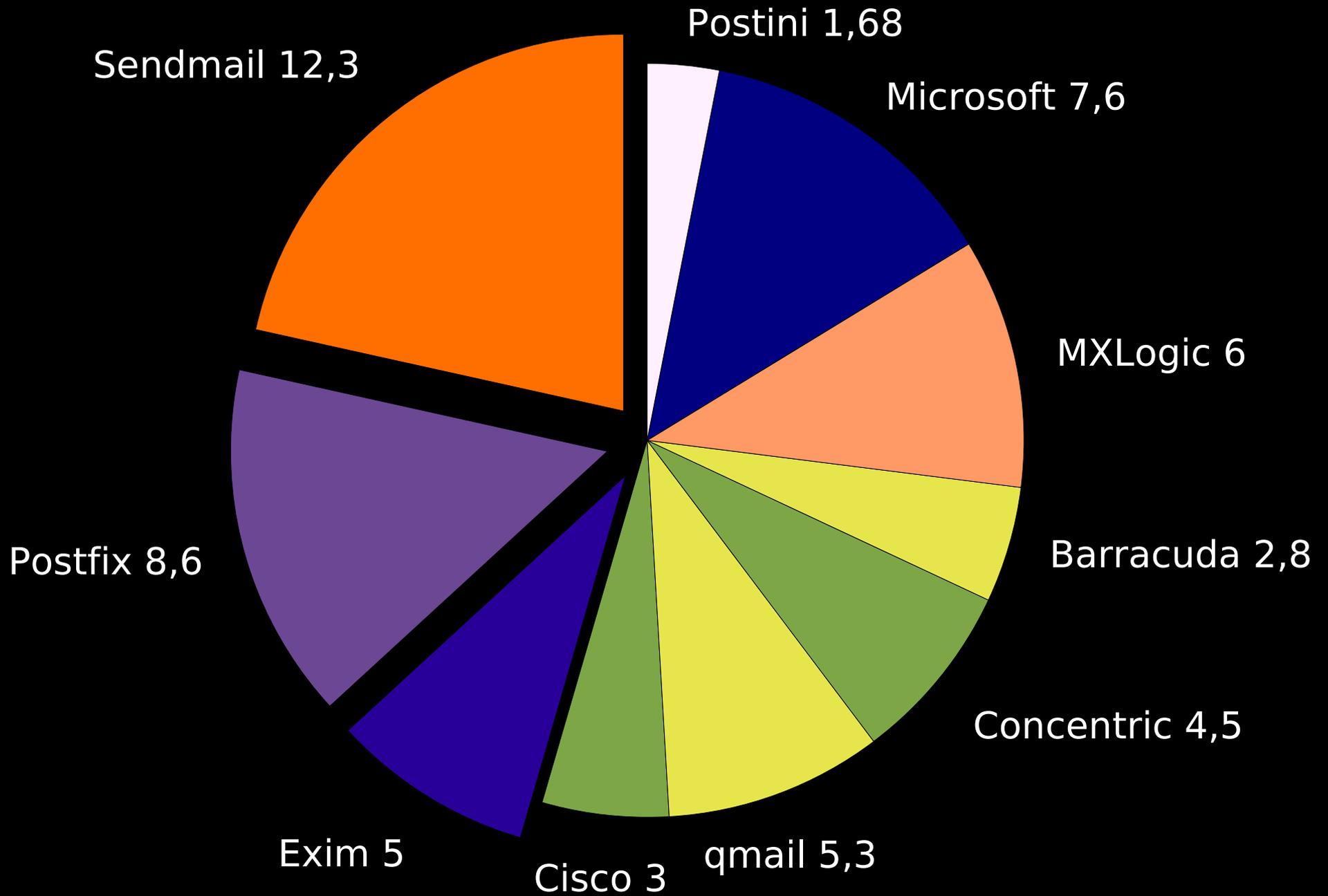
Calcul scientifique

**Développement
logiciel**

Serveurs Web



Serveurs de courrier électronique



The image shows a large white sign with the Google logo in its multi-colored font. Below the logo, the address "1545 CHARLESTON ROAD B47" is printed in a dark, sans-serif font. The sign is set against a background of tall, dark evergreen trees and a clear sky. In the foreground, there is a green lawn and a chain-link fence with a sign that says "NATIONAL".

Google

1545 CHARLESTON ROAD B47

**~450.000 serveurs
sous Linux**

A photograph of three people in a dimly lit room, gathered around a computer desk. A man with curly hair and glasses is leaning over the desk, pointing at a large computer monitor. A woman with long dark hair is sitting at the desk, looking at the monitor. A man with short dark hair is sitting next to her, also looking at the monitor. The room is dark, with the primary light source being the computer monitor. The background shows a brick wall and a window with curtains.

Bureautique

Internet

Multimédia

Création



**OpenOffice.org
Firefox
Thunderbird**

**80.000 postes
à la Gendarmerie
Nationale**



Ubuntu GNU/Linux

Tous les postes
des députés

A silver Peugeot convertible car is parked on a gravel surface. The car is viewed from a front-quarter angle. In the background, there is a stone building with arched windows and a green lawn. The text 'SuSe Linux Enterprise' is overlaid in large white font across the top half of the image.

SuSe Linux Enterprise

Peugeot
20.000 postes
2.500 serveurs



**Modèles
économiques**

Services

Éditeur

A photograph of a trade show booth for Sun Microsystems. The booth features a large blue banner at the top with the Sun Microsystems logo and the text "Sun microsystems". Below the banner, there are yellow and blue displays with the slogan "We make the net work." and the website "www.sun.de". Several people, including a woman in a yellow polo shirt and a man in a suit, are interacting at a curved counter. The background shows a large, bright exhibition hall with other booths and people.

**Grandes
entreprises**

SSII

SS2L

Indépendants



**Liberté
Égalité
Fraternité**

«L'UNESCO a toujours encouragé l'extension et la diffusion de la connaissance et reconnaît que dans le domaine du logiciel, le logiciel libre diffuse cette connaissance d'une manière que le logiciel propriétaire ne permet pas. L'UNESCO reconnaît aussi que le développement du logiciel libre encourage la solidarité, la coopération et le travail communautaire entre les développeurs et les utilisateurs des nouvelles technologies»

Abdul Waheed Khan, du département information et communication de l'UNESCO



**S'équiper légalement
et à faible coût**



**Indépendance par
rapport aux éditeurs**



Sécurité
Stabilité



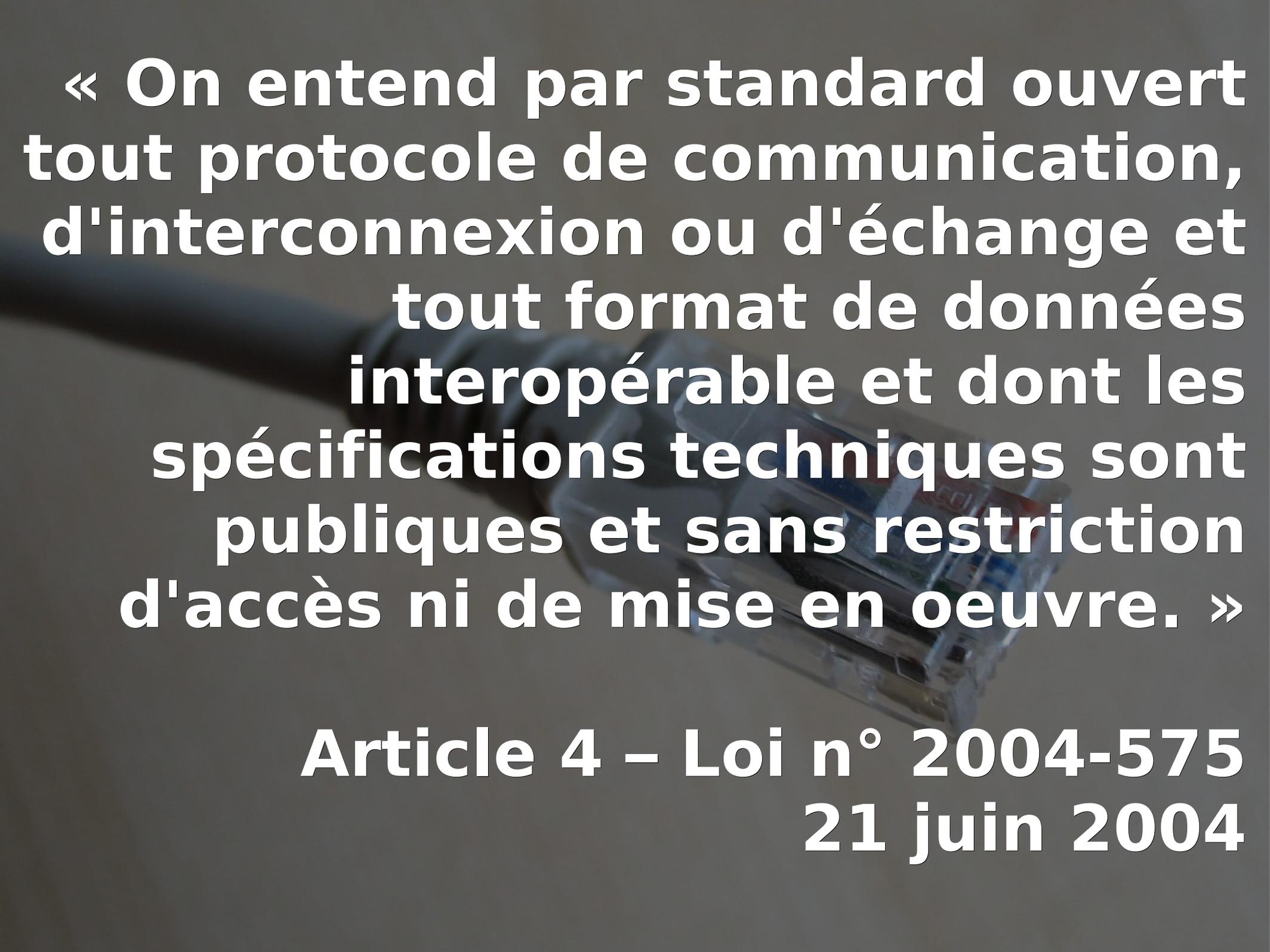
Adaptation Localisation

Portabilité



The image shows two blue Ethernet cables with RJ45 connectors, positioned diagonally against a solid yellow background. The cables are crossed in the middle, with one cable's head pointing towards the top left and the other's towards the top right. The text 'Formats et protocoles ouverts' is overlaid in white, bold, sans-serif font on the right side of the image.

Formats et protocoles ouverts



« On entend par standard ouvert tout protocole de communication, d'interconnexion ou d'échange et tout format de données interopérable et dont les spécifications techniques sont publiques et sans restriction d'accès ni de mise en oeuvre. »

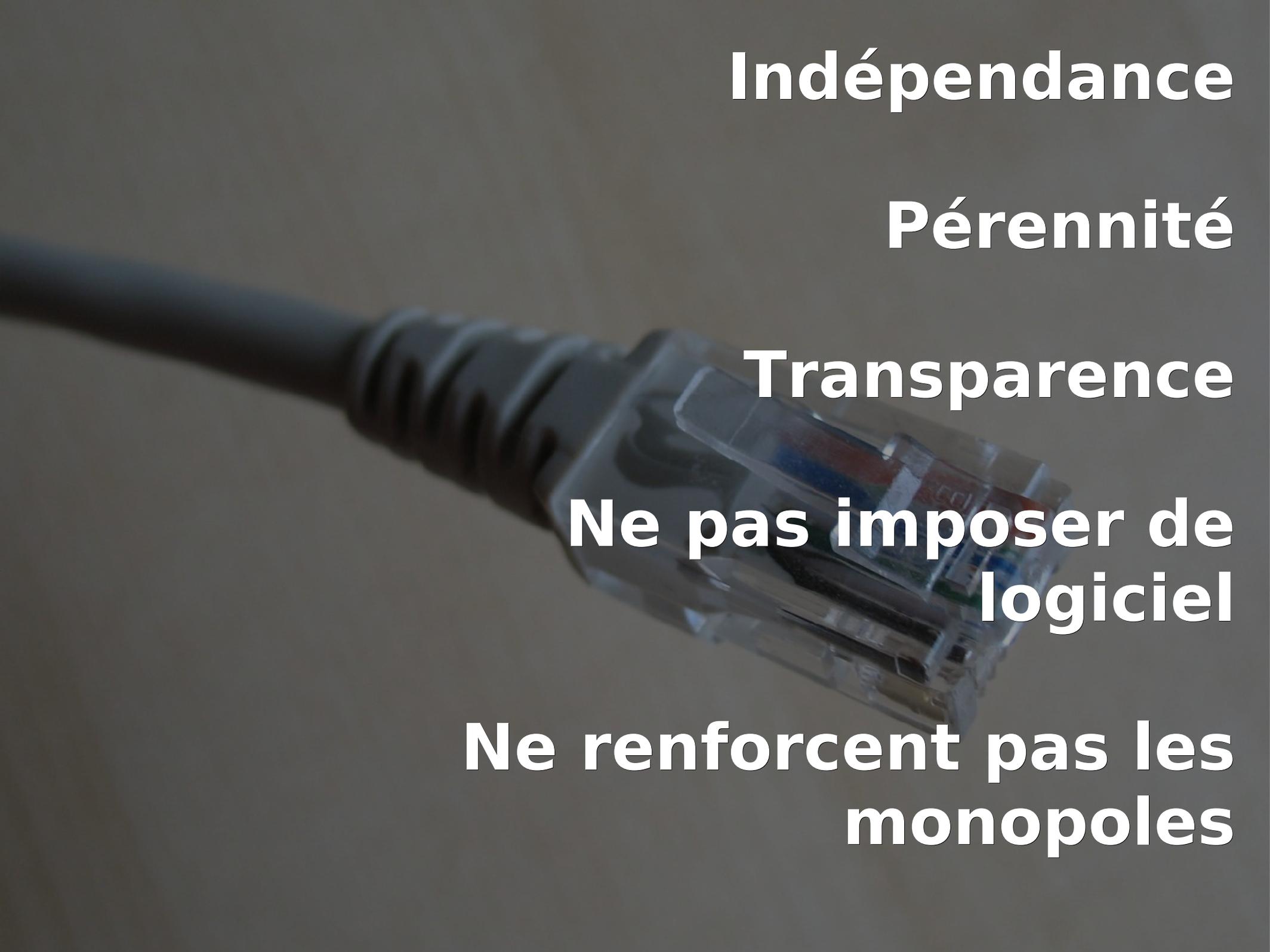
**Article 4 – Loi n° 2004-575
21 juin 2004**

**OpenDocument, Ogg,
Wav, Xvid, Jabber, HTML,
CSS, HTTP, SMTP, JPG,
BMP, PNG, PDF**



**DOC, XLS, PPT, MP3,
WMA, Skype, MSN, Flash**





Indépendance

Pérennité

Transparence

**Ne pas imposer de
logiciel**

**Ne renforcent pas les
monopoles**

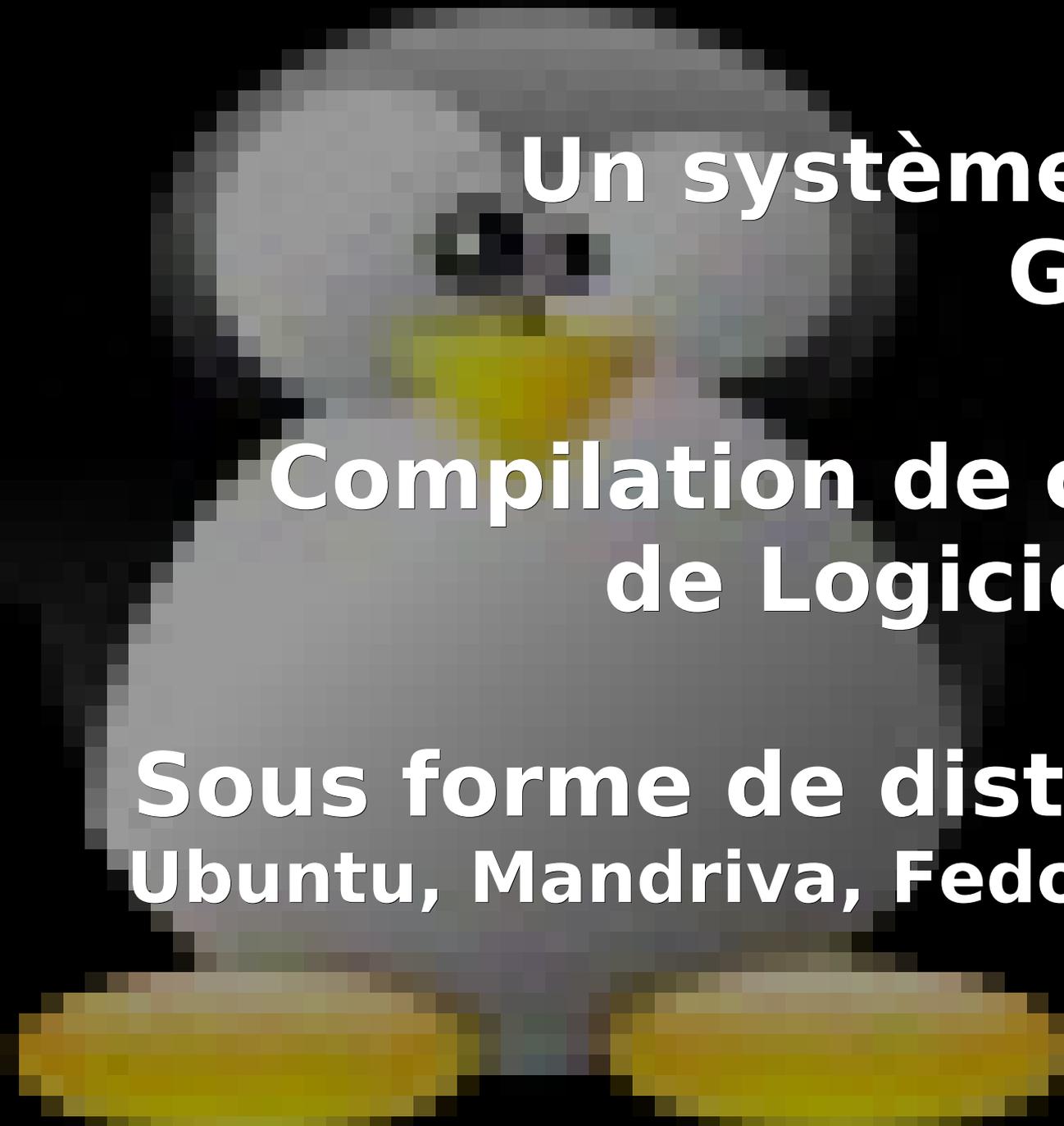
Bureautique
OpenOffice.org, Koffice...

Multimédia
**Mplayer, VLC, Rhythmbox, Amarok, Cinelerra,
Gimp, Blender, Inkscape...**

Internet
**Thunderbird, Firefox, Konqueror, Kmail, Gaim,
Kopete, Ekiga, Amule...**

Serveurs
**Apache, MySQL, Tomcat, Bind, Postfix, Samba,
OpenLDAP...**

Applications Web
SPIP, Dotclear, MediaWiki, Wikini...



**Un système complet
GNU/Linux**

**Compilation de centaines
de Logiciels Libres**

**Sous forme de distribution :
Ubuntu, Mandriva, Fedora, Debian,
Suse**

Passer au Libre

Logiciels Libres sous Windows
ou Mac OS X

Tester GNU/Linux avec un
LiveCD

Installer GNU/Linux en
parallèle ou en remplacement
de Windows ou Mac OS x

A person is playing a guitar. The guitar has a black body with white text that reads "WE'RE A REBEL". The person is wearing a black t-shirt with white text that reads "We are". The background is dark and out of focus.

**Appliquer les libertés à
d'autres formes de création**

Licence GFDL

Licences Creative Commons

Licence Art Libre



Encyclopédie Wikipédia

<http://fr.wikipedia.org>

Musique Libre

<http://www.jamendo.com>

<http://www.dogmazic.net>

Photos

<http://www.flickr.com/creativecommons>

Livres

<http://www.inlibroveritas.com>

Recherche



**promouvoir et démocratiser
les Logiciels Libres**

**rencontres bi-mensuelles
aide à l'installation et à l'utilisation
Centre Culturel Bellegarde
mercredis 2 mai, 16 mai, 30 mai, 19h**

<http://www.toulibre.org>



Questions ?