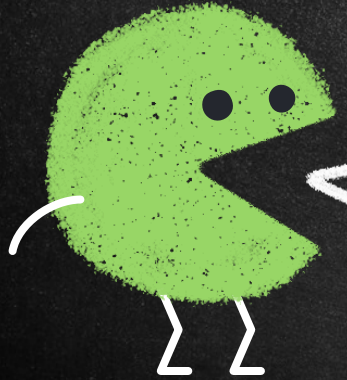
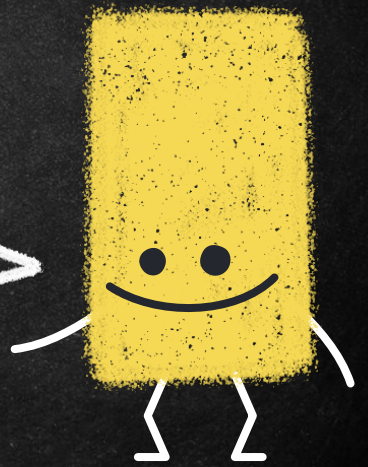
Sécurité des données
A2021

Encryption Symétrique

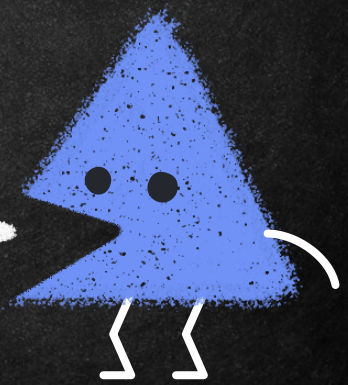




Yannick Charron

Plan de la séance

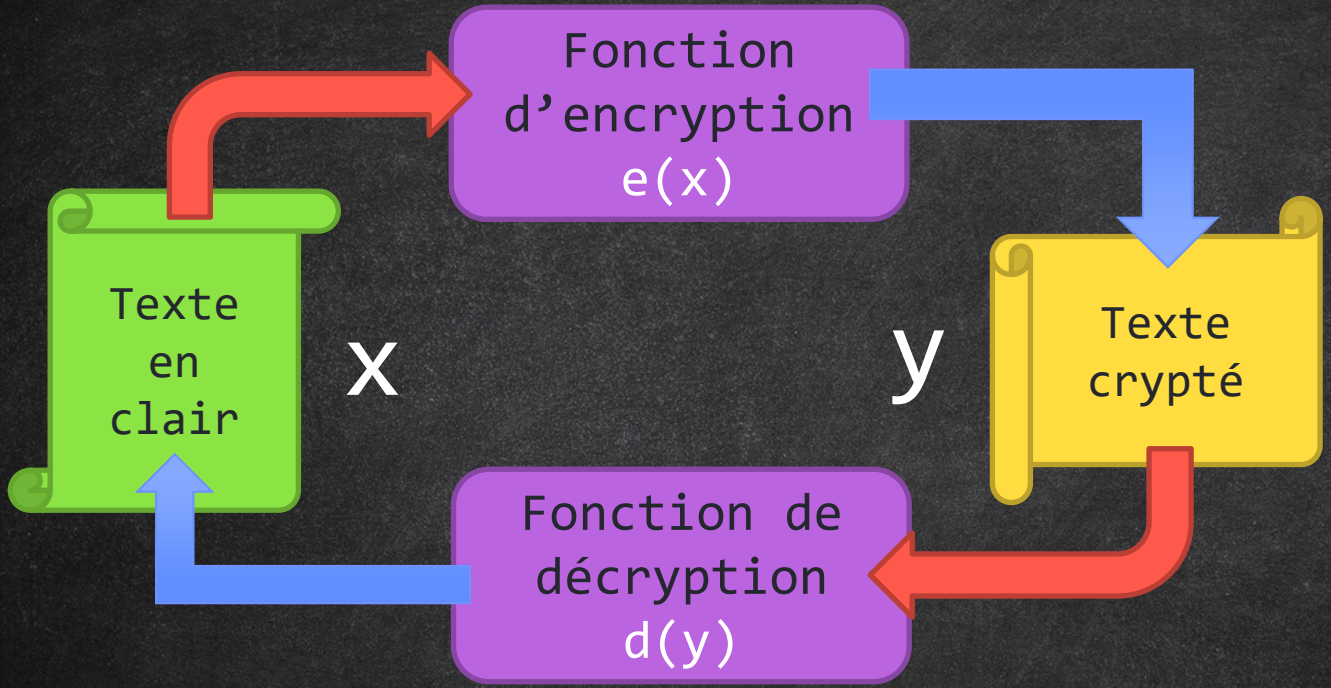
- Concept général
- Encryption simple
- Encryption alphabétique
- Encryption moderne

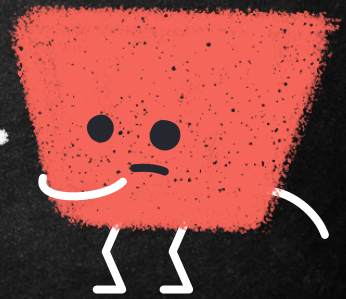


Concept général

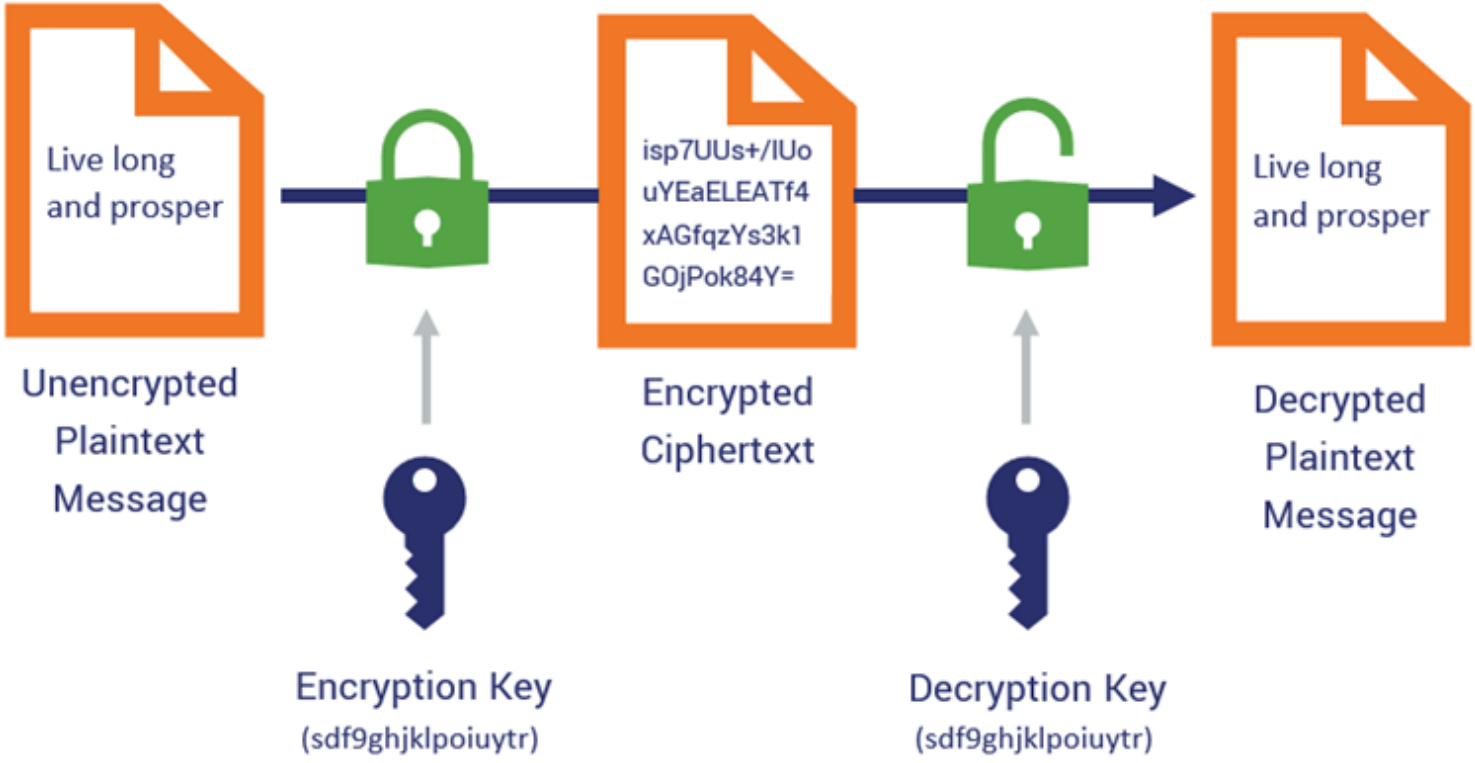
- Protéger le contenu d'un message dans le but de le communiquer
- Permettre à un nombre limité de participant de consulter le contenu du message

Concept Général

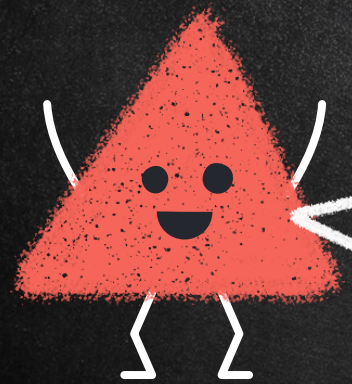


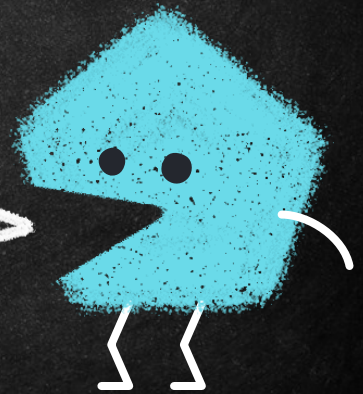


How Symmetric Encryption Works



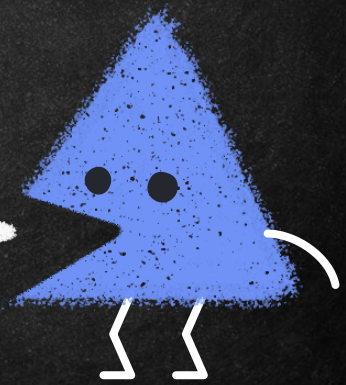
Encryption Simple

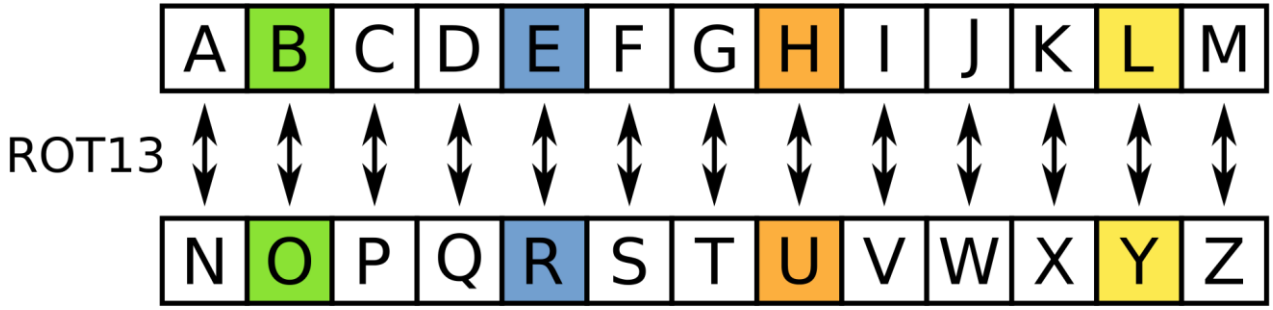


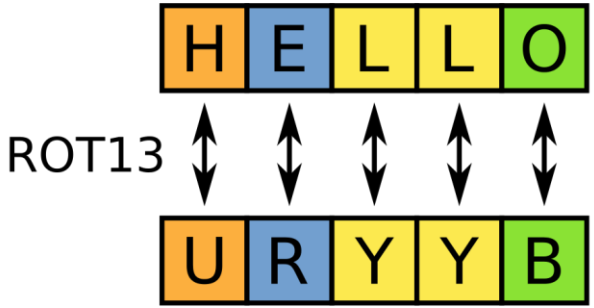


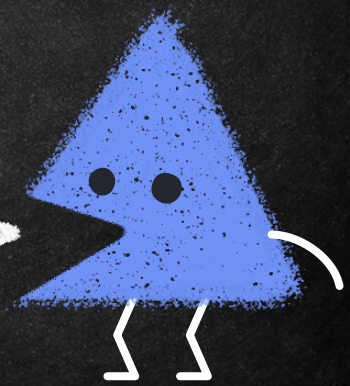
Encryption Monoalphabétique

- Monoalphabétique
  - Code César
  - Rot13




A B C D E F G H I J K L M
ROT13
N O P Q R S T U V W X Y Z

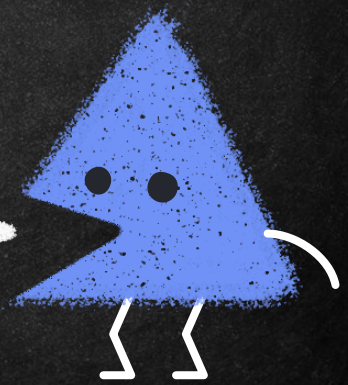

H E L L O
ROT13
U R Y Y B



Encryption polyAlphabétique

- Le décalage n'est pas fixe, il utilise une clé
- Décalage selon le rang de la lettre dans la clé (A = 0)

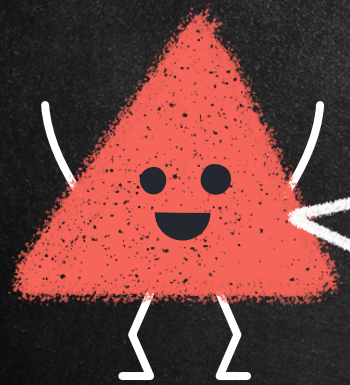
M	O	N		M	E	S	S	A	G	E		S	E	C	R	E	T		U	R	G	E	N	T
C	I	T	R	O	N	C	I	T	R	O	N	C	I	T	R	O	N	C	I	T	R	O	N	C
2	8	19	17	14	13	2	8	19	17	14	13	2	8	19	17	14	13	2	8	19	17	14	13	2

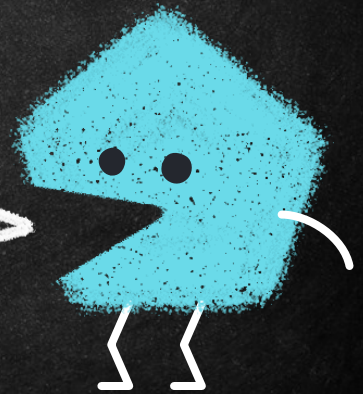


	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
A	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
B	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A
C	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B
D	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C
E	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D
F	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E
G	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F
H	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G
I	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H
J	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I
K	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J
L	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K
M	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L
N	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M
O	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N
P	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Q	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
R	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
S	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
T	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
U	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
V	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
W	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
X	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
Y	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Z	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y

Égnima

Un mélange de Mono et Poly






Q W E R T Z U I O
A S D F G H J K
P Y X C V B N M L
Q W E R T Z U I O
A S D F G H J K
P Y X C V B N M L

Geheime Kommandosache! Jeder einzelne Tagesschlüssel ist geheim! Mitnahme im Flugzeug verboten! Nº 000082

Luftwaffen-Maschinen-Schlüssel Nr. 2744

Achtung! Schlüsselmittel dürfen nicht unversehrt in Feindeshand fallen. Bei Gefahr restlos und frühzeitig vernichten.

	Monats-Tag	Walzenlage			Ringstellung			an der Umkehrwalze	Steckerverbindungen am Steckerbrett 1	2	3	4	5	6	7	8	9	10	Zusatzstecker-verbindungen 1 (1500)	2 (2300)	Kenngruppen		
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2744	30	I	IV	V	08	17	21		LS	DH	MT	EO	AP	UZ	FQ	WY	BK	GR	CI	JN	uaq	omn	ume	duf
2744	29	V	II	III	11	14	05		DO	JW	CN	IV	PZ	BM	HU	AL	FR	KX	EQ	GT	don	cqo	xum	bpg
2744	28	II	IV	V	02	20	16		NT	HK	BW	EP	LQ	AU	OY	FJ	CX	GI	DZ	MR	lui	pyg	sby	dtq
2744	27	III	V	IV	18	13	22		HM	GV	KZ	AI	DQ	NR	ES	BL	OU	FT	CP	JY	cmy	fqr	scl	bur
2744	26	I	III	II	24	10	01		GW	AQ	MO	FV	PS	DI	RU	JZ	BN	EH	KT	CL	kbj	yaq	udm	cnz
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2744	24	V	III	I	09	19	06		GL	MY	CR	HN	JX	DT	AF	PU	IQ	BO	EW	KS	cmz	aoj	zod	auh
2744	23	IV	I	V	15	03	19	HK GL NQ BF AD RW	IT	DV	HQ	AJ	MU	EX	KO	CS	FY	LN	BP	GZ	kra	yas	xun	cob
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2744	20	IV	II	I	02	22	05		HT	NP	AM	DX	GJ	KQ	BS	OV	ER	CW	IU	FL	boy	wac	uow	cse
2744	19	V	I	II	08	19	17		GM	OX	BT	QU	DP	HJ	FK	SW	AN	EL	CY	IR	xjc	wad	unj	ctd
2744	18	III	IV	I	11	21	01		KW	IP	DM	SV	JR	CX	EN	AZ	QT	BU	FH	GY	kpn	rzi	vcm	bpo
2744	17	I	V	II	18	23	14		BV	HW	AR	NX	DS	PT	CZ	FI	LY	EJ	GK	MQ	kdx	crq	vcn	cod
2744	16	III	IV	V	16	04	07		LU	CV	FM	KR	BY	GN	QW	DJ	PS	AO	EI	HX	lgx	jri	uob	aur
2744	15	V	III	IV	24	13	10		HZ	NQ	AD	TV	IX	KM	BG	LO	CE	RY	JU	FP	wpt	vhy	zoe	aus
2744	14	I	IV	II	06	20	25		FN	UY	CJ	IW	LP	AS	DK	GQ	MO	BZ	ET	HR	wog	hxi	zxi	bpi
2744	13	III	II	I	03	26	18		KR	IZ	AT	NV	BH	MP	CG	OY	ES	DF	UW	LQ	lqv	iqb	zsy	coe
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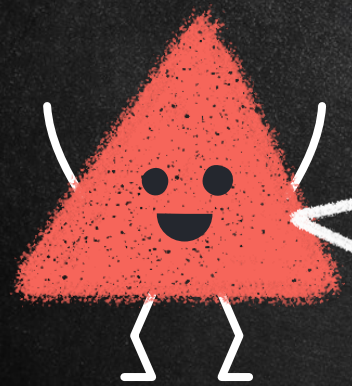
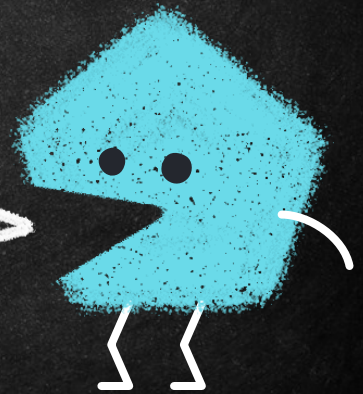
Diese Zusatzsteckerverbindungen ersetzen zu den angegebenen Zeiten die Steckerverbindungen 1 und 9


ENIGMA,
LE CODE
PARFAIT ?

Encryption symétrique



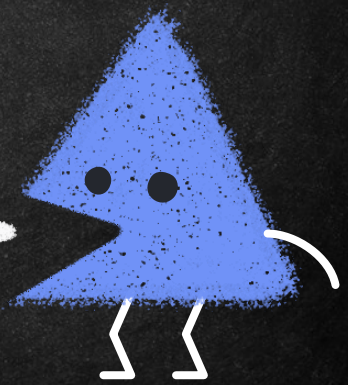


Algorithmes

- Data Encryption Standard (DES)
  - Triple DES
- RC
- Rijndael algorithm family (AES)
- Autres
  - Domaine de l’internet de objet

Vocabulaire

- Cipher et Decipher
- Clé:
- iv: Initialization vectors



Clé d'encryption ou secret

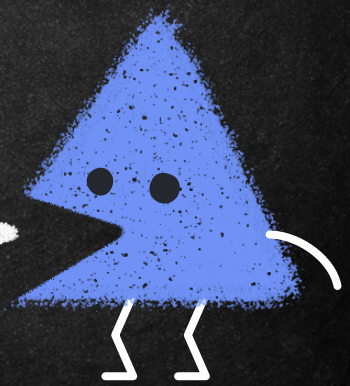
- Seulement une clé d'encryption
- Chaque partie prenante de la communication doit avoir le même secret

Algorithmes connus

DES	RC
Début 1970 Norme en 1977 Clé de 56 bits 1990: protection faible	RC2 et RC4 :1987 Clé de 40 bits Ne sont plus considéré sécuritaire RC5 Clé jusqu'à 2040 bits Sécurité vs Performance Brevet …
Triple DES	
3 clés d'encryptions	

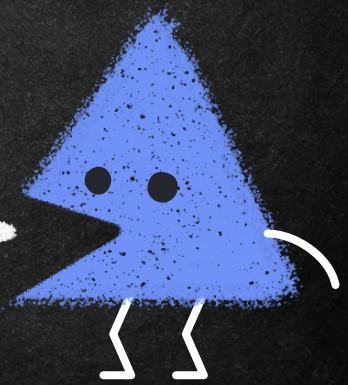
Advanced Encryption Standard

- 2001
- 3 tailles de clé (128, 192, 256 bits)
- Protection de niveau militaire
- Avec une clé de 128 bits
  - Milliards d’année pour briser avec un ordinateurs classique



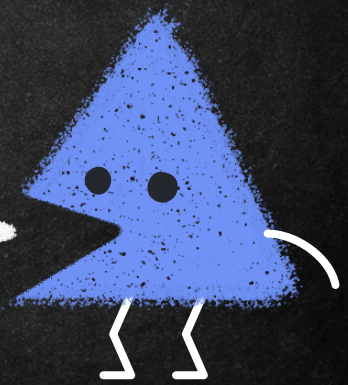
Informatique Quantique

- L’effet sur AES aura pour effets de diviser la longueur de clé par deux
- Donc AES-256 devrait toujours être sécuritaire
- L’encryption asymétrique sera néanmoins compromise

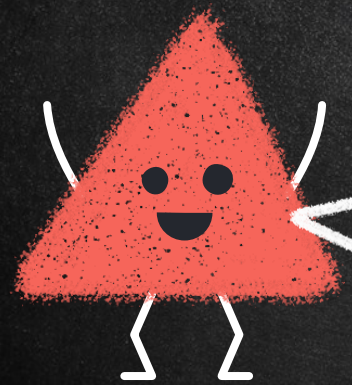


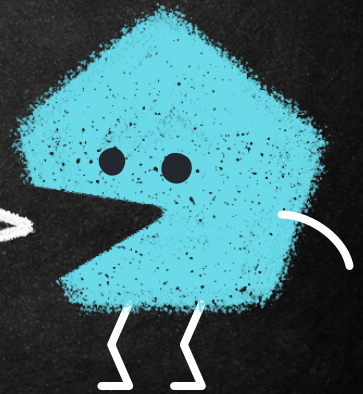
LIGHTWEIGHT

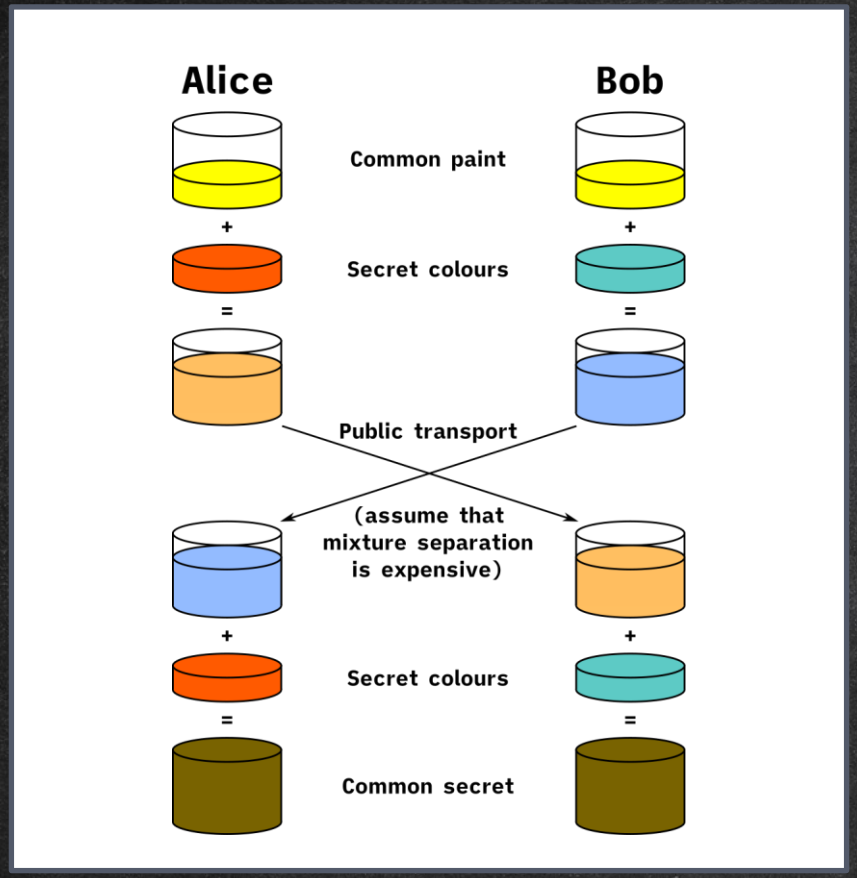
- Les recherches sont en cours
- Internet des objets
- https://csrc.nist.gov/projects/lightweight-cryptography



Diffie-Helleman






Alice
Bob
Common paint
+
Secret colours
=
Public transport
(assume that
mixture separation
is expensive)
+
Secret colours
=
Common secret