

Cloud Security Guidance

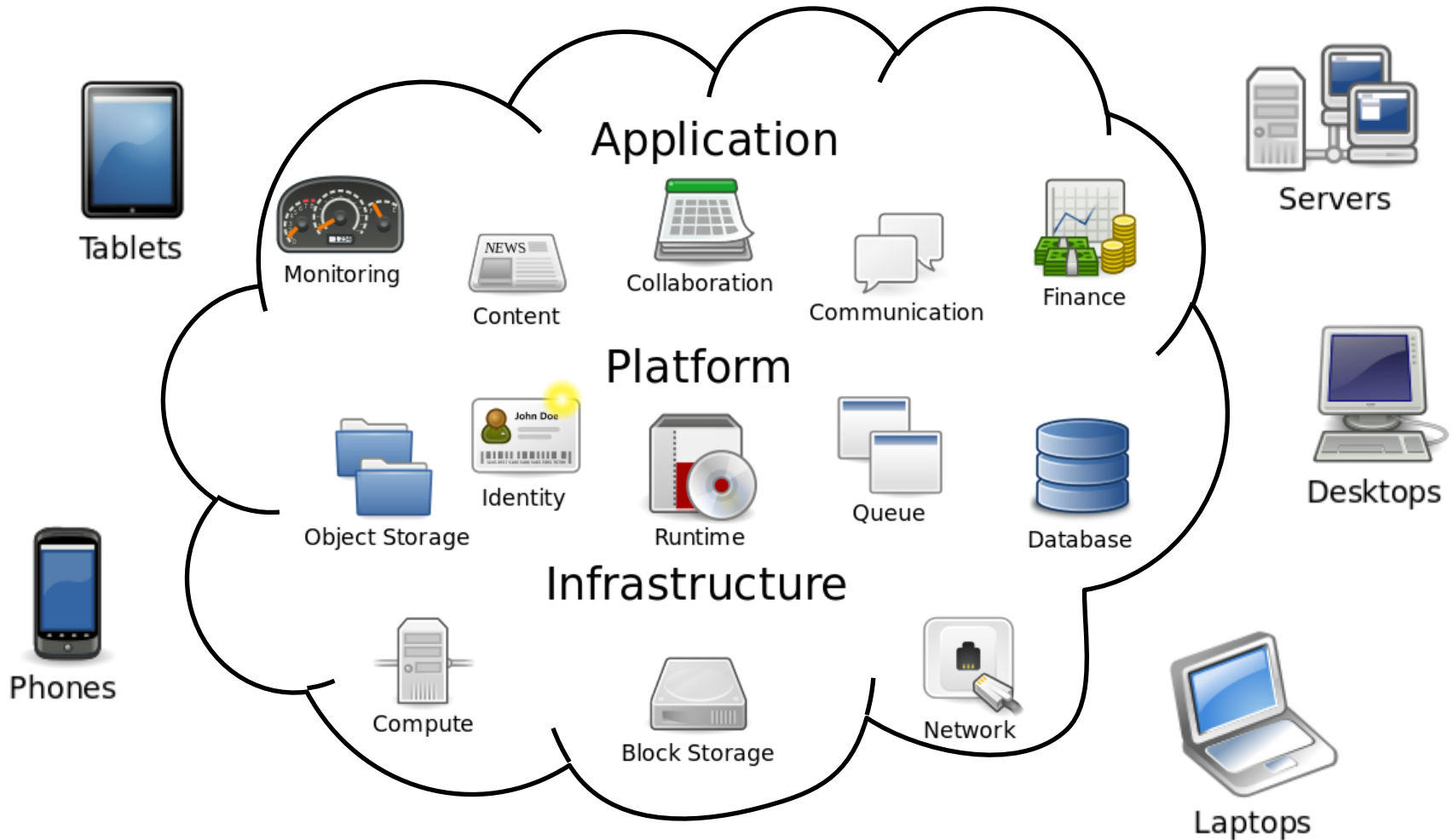


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www.smalsresearch.be

Overview of the cloud



What about the security of the cloud?

- **Not 100%** guaranteed by the cloud services
- Problematic for **sensitive data**
 - Especially in our context « social security and eHealth»



Assess the security of a cloud service before using it



During this presentation...

Look through the **key-points** of cloud security

Common thread

**Security assessment model
of cloud services**

+

Dropbox for Business



Agenda

1 Security assessment model

Governance

Identity and access management

IT security

Operational security

2 Example: Dropbox for Business

3 How to choose a cloud service

4 Conclusion





Security assessment model

Goal of the model

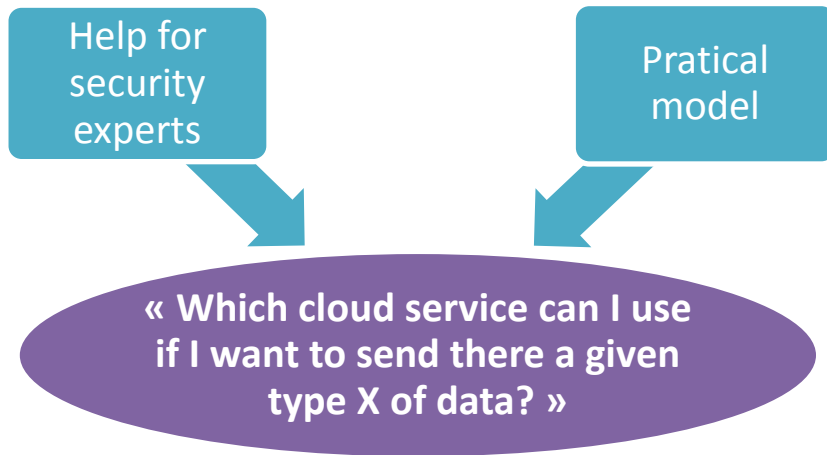
Help for
security
experts

Practical
model

« Which cloud service can I use
if I want to send there a given
type X of data? »



Goal of the model



Eliminate/filter non fruitful tracks

Select potential candidates



Components of the model

4 major
criteria

- Governance
- Identity and Access Management
- IT Security
- Operational Security

Cloud Policy of the
Belgian social security

Type of data

2 evaluation
forms

- Assess the security level of a cloud service
- Assess the possibility of using a cloud service



Components of the model

4 major criteria

- Governance
- Identity and Access Management
- IT Security
- Operational Security

Cloud Provider
Belgium

type of data

Only a human expert must judge the result

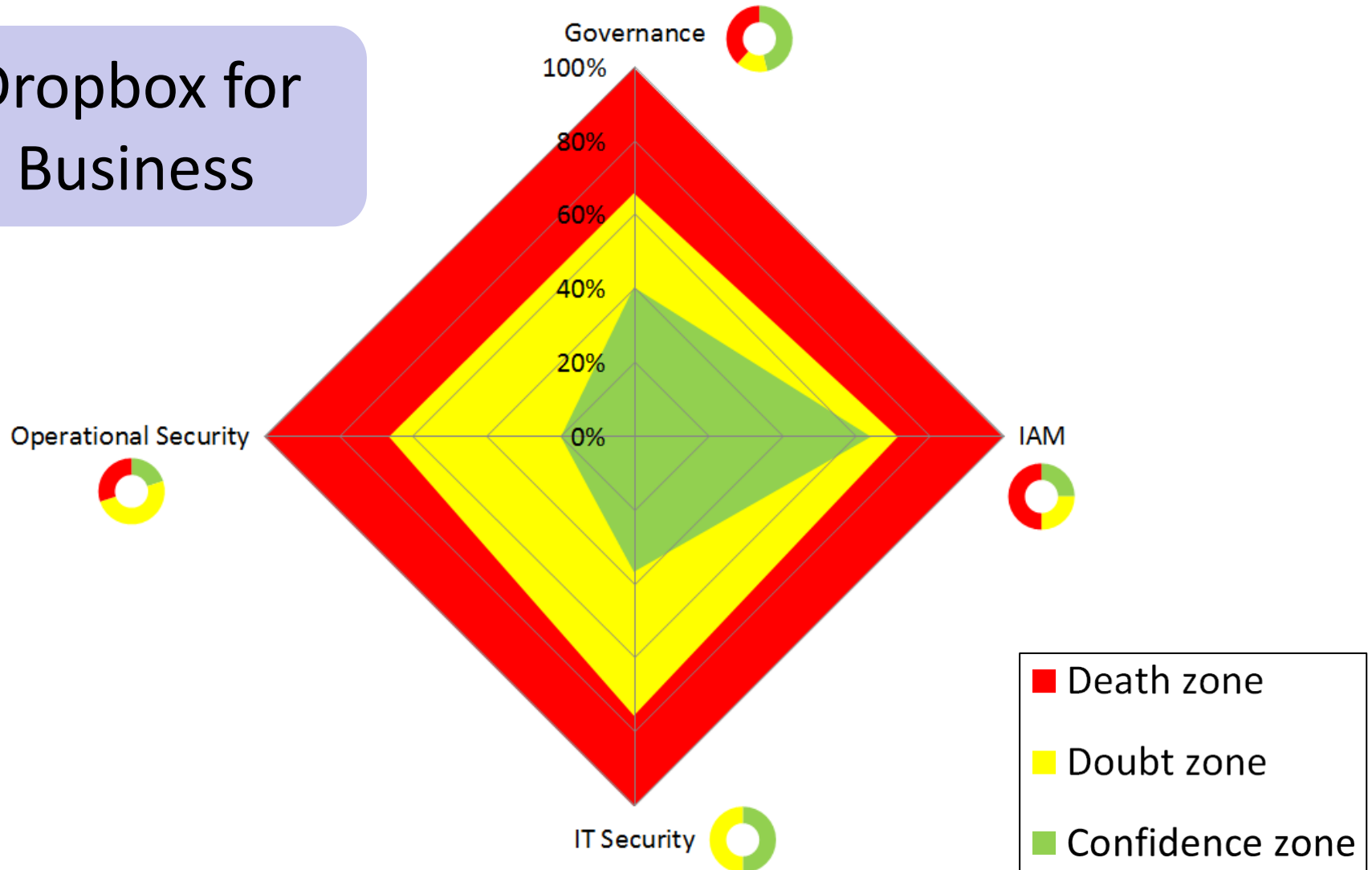
2 evaluation forms

- Assess the security level of a cloud service
- Assess the possibility of using a cloud service



What looks like the model?

Dropbox for
Business

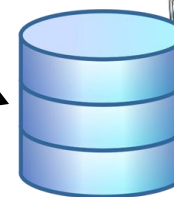
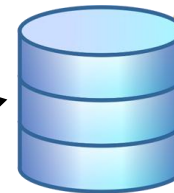
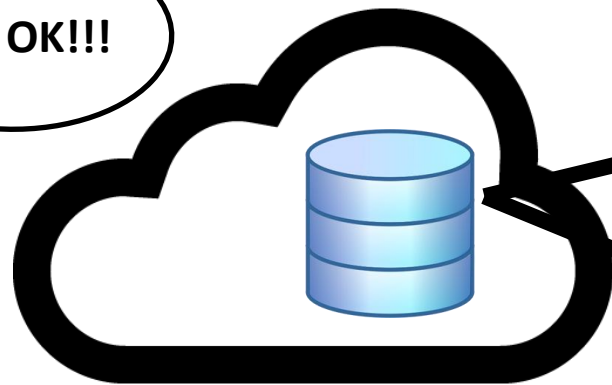




Governance

Legal implications

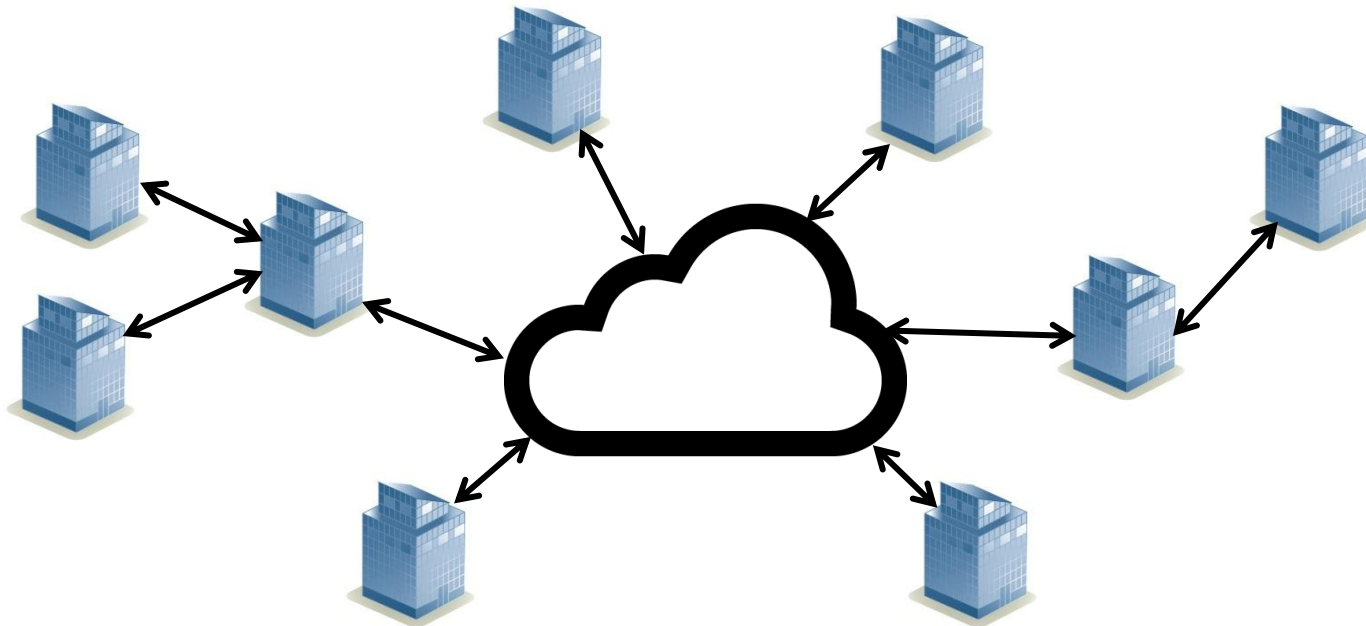
Which laws apply to the data?



Voc: CSP (Cloud Service Provider)



Supply chain management



CSP always responsible for its contractual commitments?



Audit



Every 6 months

10 / 10

Every year



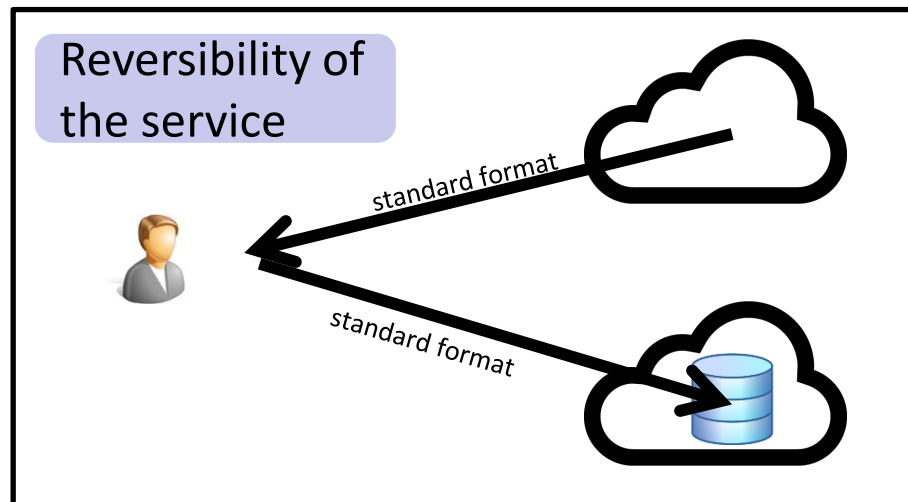
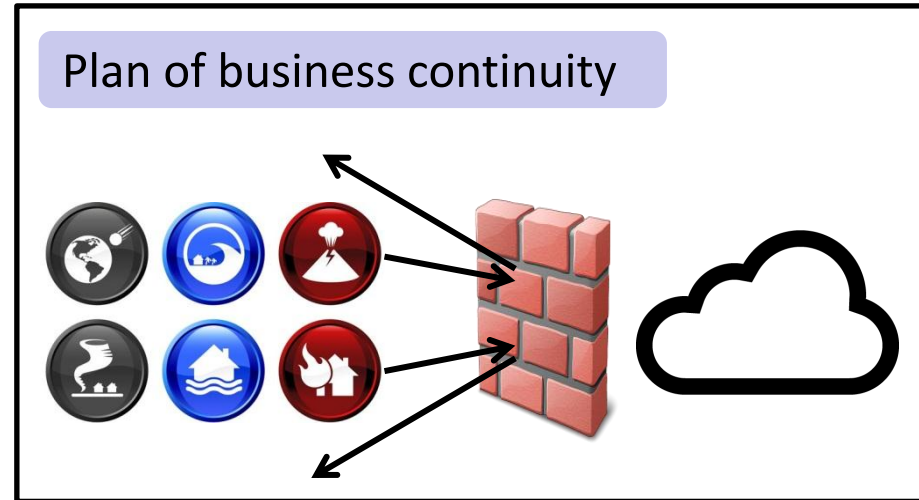
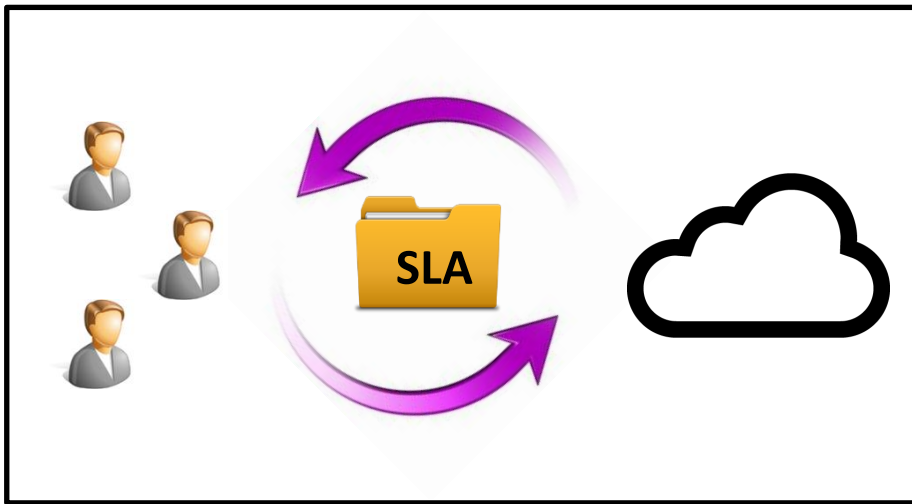
Meta-data



Meta-data only used for
the cloud service?



Quality of the service



Governance: to remember

Which laws?

Reliable
supply chain?

Regular
audit?

No misuse of
meta-data?

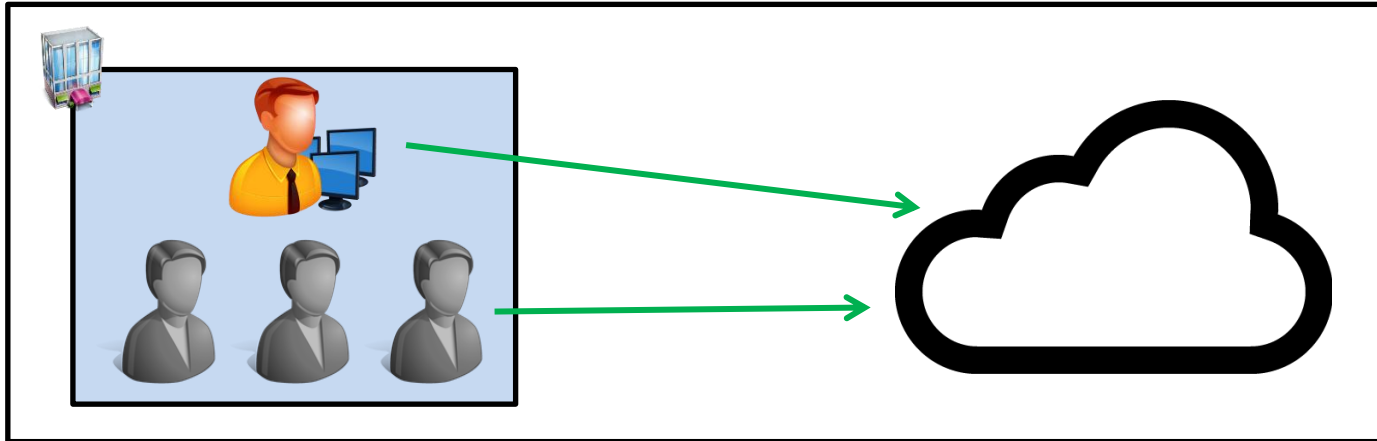
Good quality
of service?





Identity and Access Management

Authentication level



Username + Password



Username + Password + Token



Username + Password + Certificat

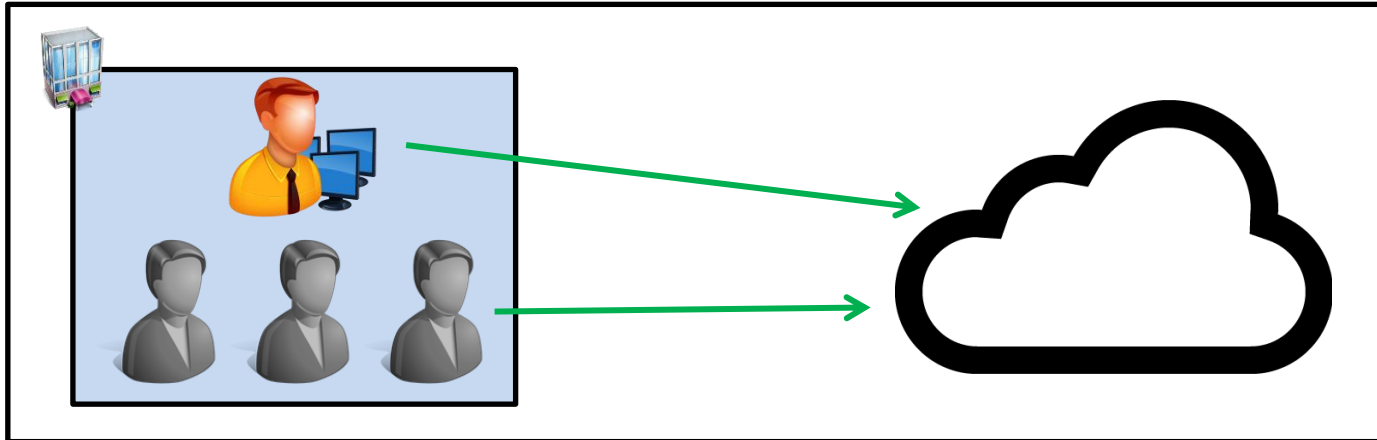


Username + Password + Certificat/Token + Location

10 /10



Authentication level



« 2-factor » authentication

Username + Password + Token



Username + Password + Certificat

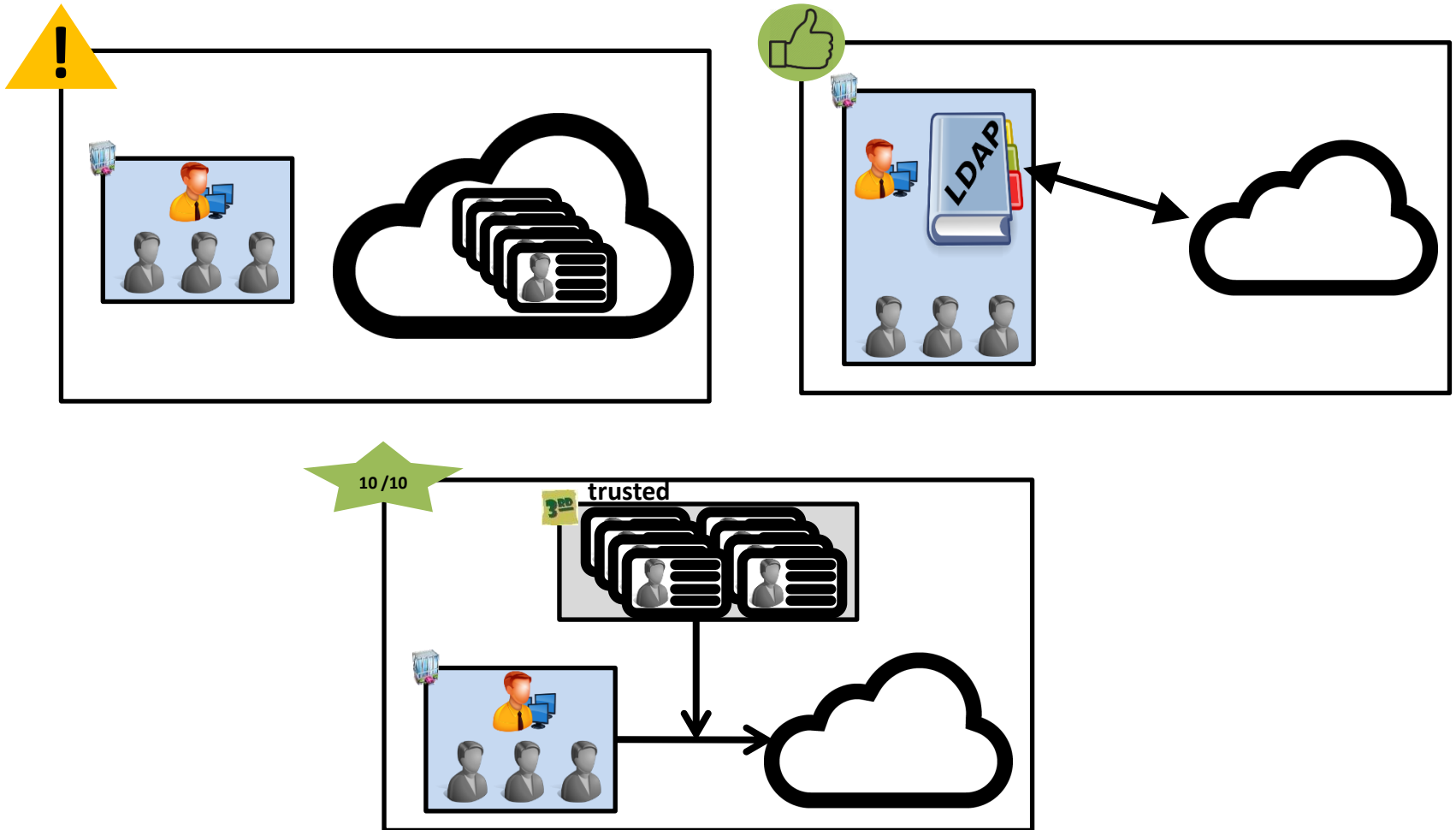


Username + Password + Certificat/Token + Location

10 / 10



User management



IAM: to remember

2-factor
authentication?

Controlled user
management?

Well-defined
access
management?






IT Security

Security standards


OS

- Anti-virus, anti-malwares
- Patch management process
- Acceptance environments

Physical + Virtual Infra

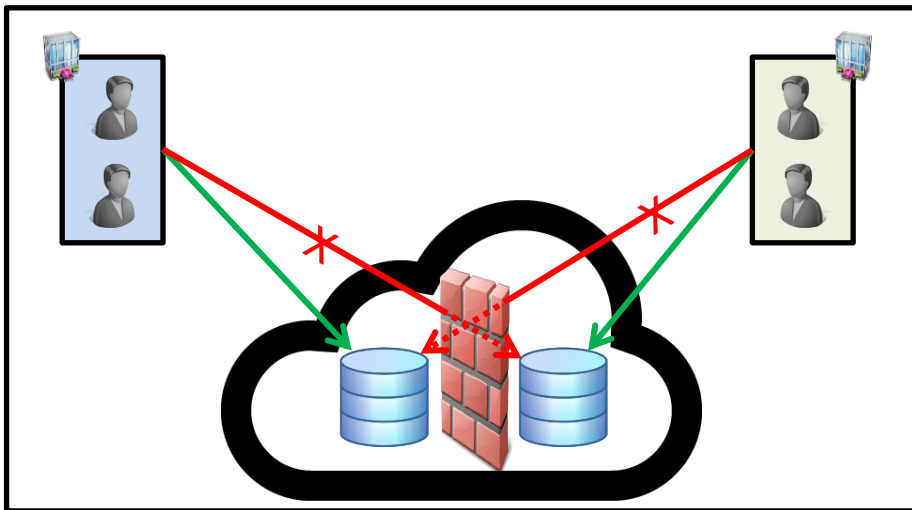
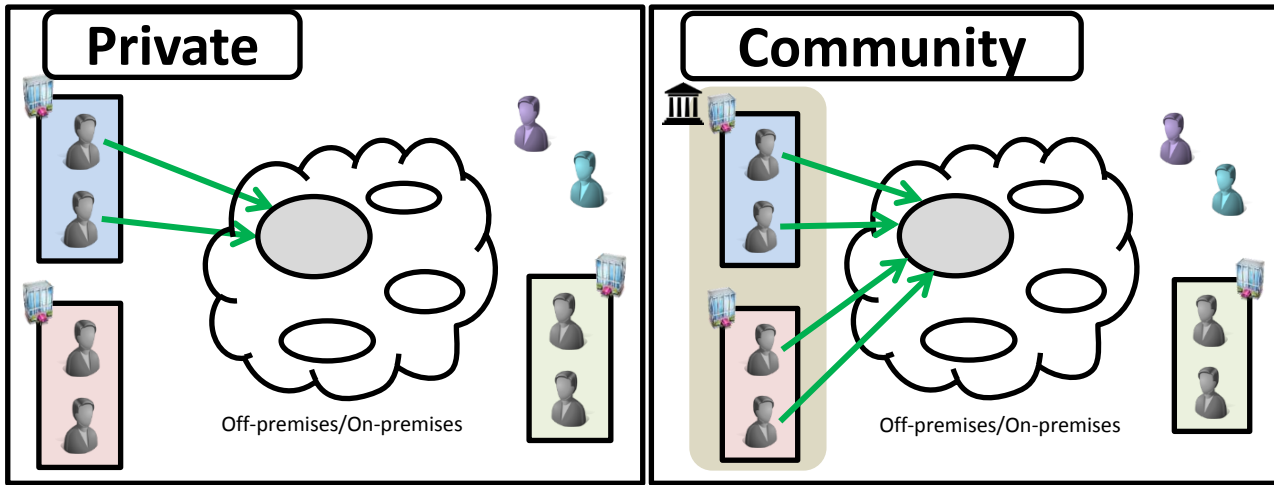
- Network security: firewall, APT detection tools 
- Monitoring: IDS/IPS, file integrity
- Data leak detection: DLP tools
- Protection of hypervisors and admin consoles
- Secure data deletion: crypto wiping, demagnetization

Interface

- Data integrity and security in input and output
- API developed according to standards (e.g. OWASP) 



Segregation of data



Very important point
BUT
often not documented

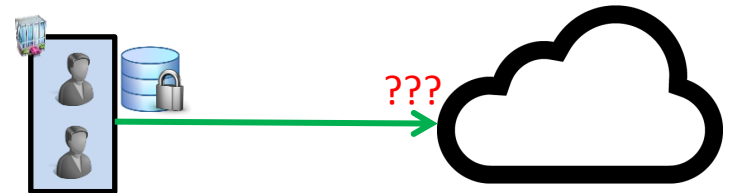


Cryptography

Strong
crypto

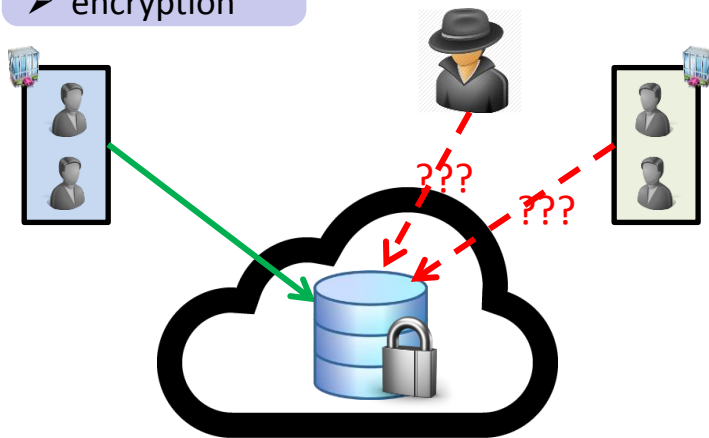
NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

Confidentiality towards the CSP
➤ encryption

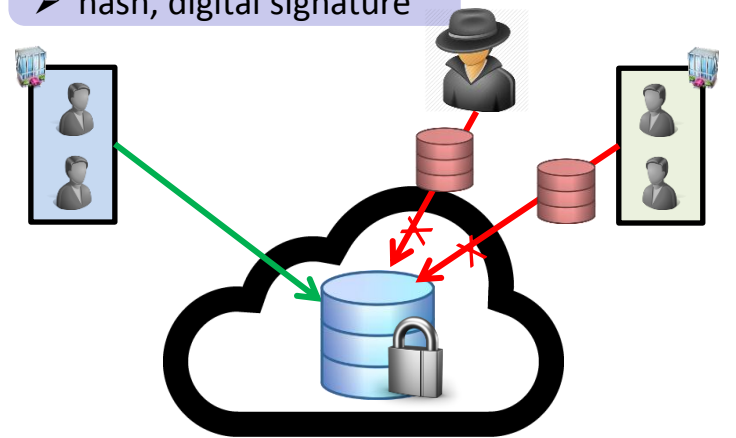


Outils:  

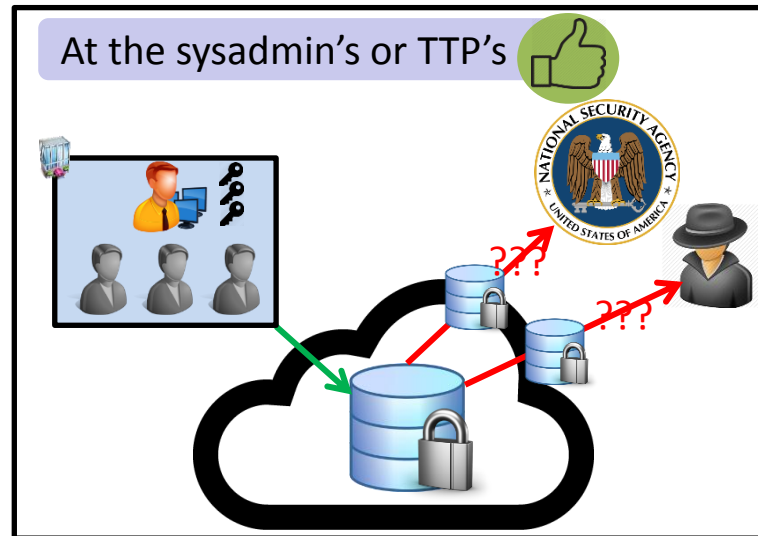
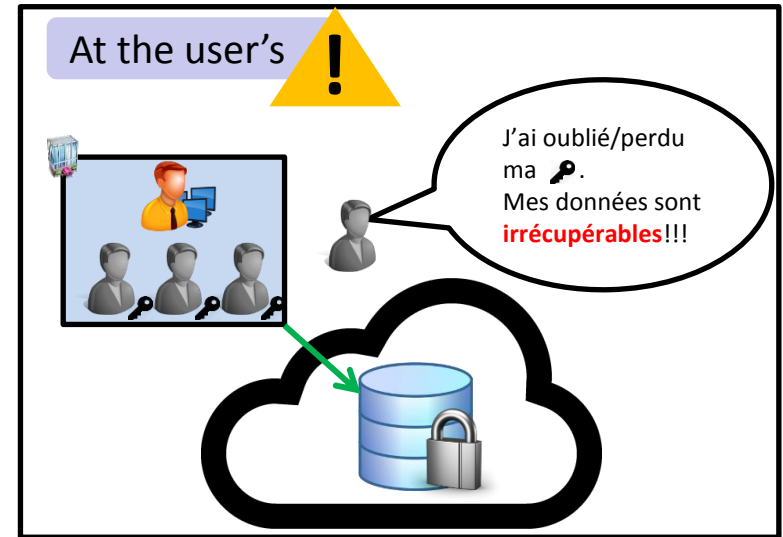
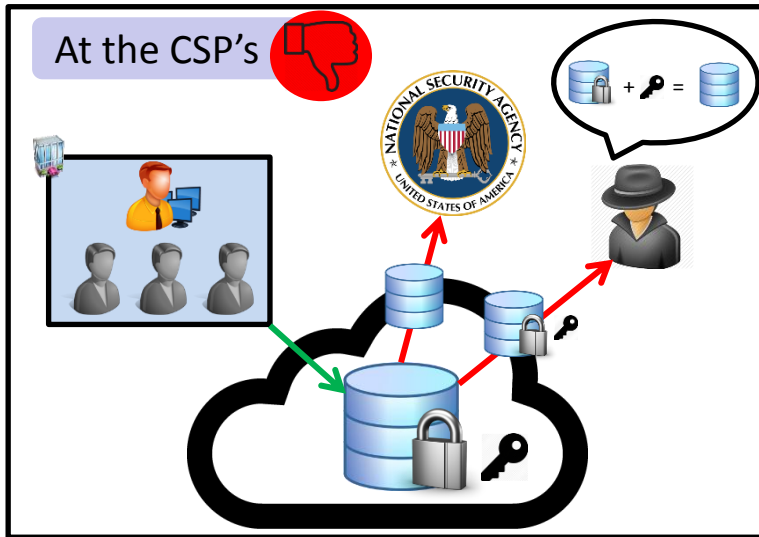
Confidentiality
➤ encryption



Integrity
➤ hash, digital signature



Key management



IT security: to remember

Security standards in place?

Segregation of data?

Cryptography standards used?

Data confidentiality and integrity?

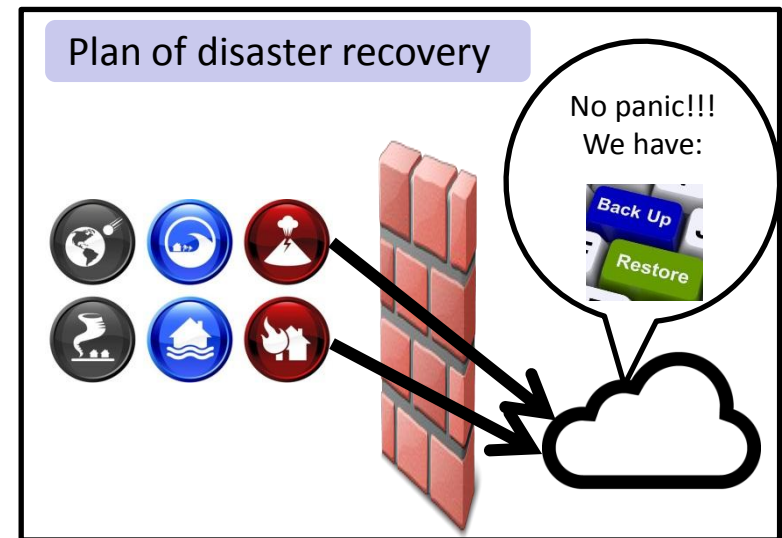
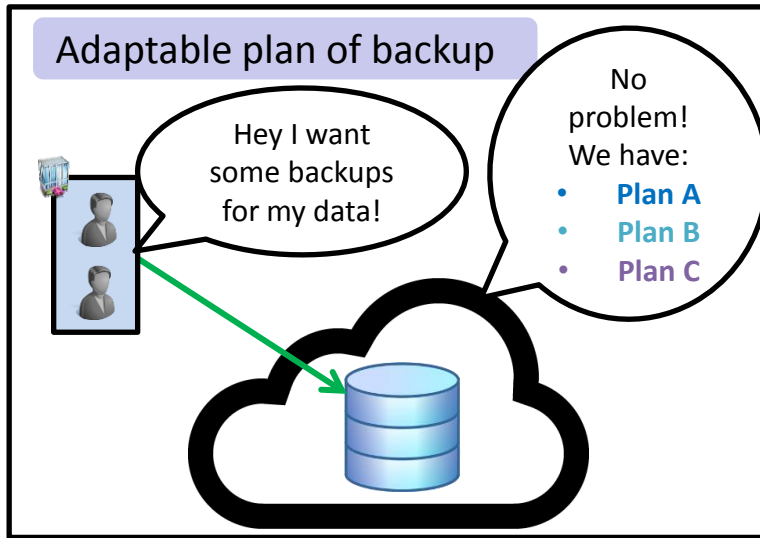
Key management at the sysadmin's?





Operational Security

Backup and disaster recovery



Some values on the RTO and RPO

≈ 1 week



≈ 1 day



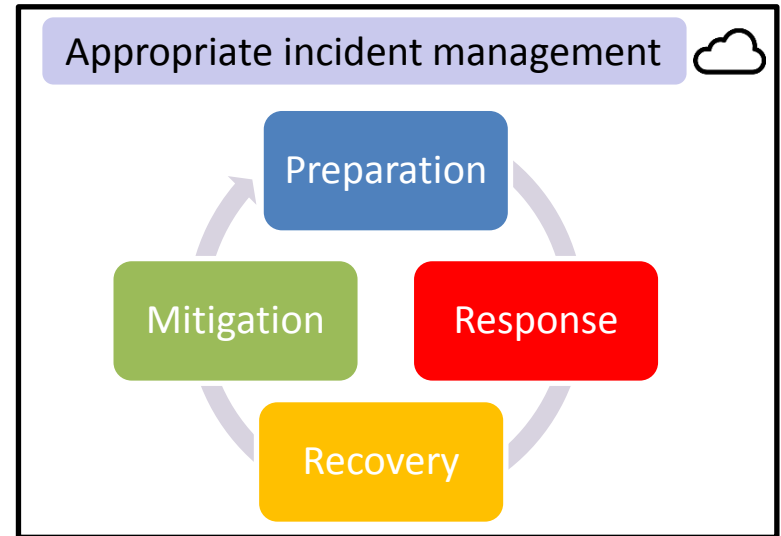
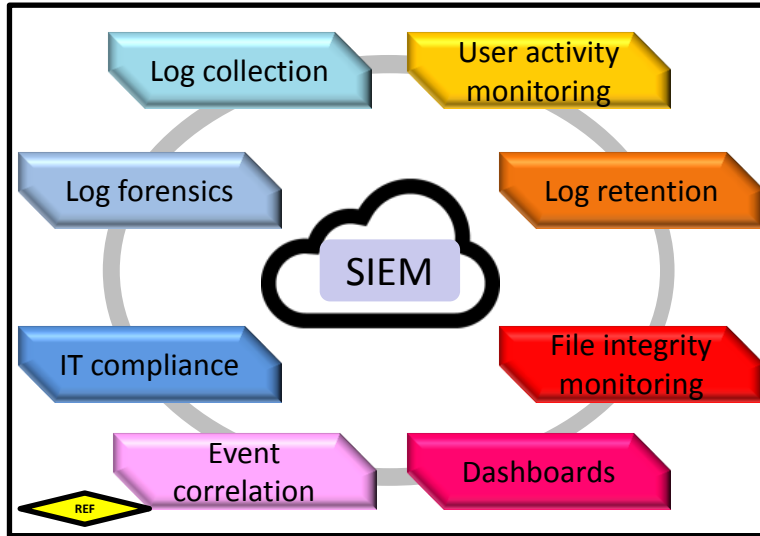
≈ 1 hour

10 / 10



Voc: RTO (Recovery Time Objective), RPO (Recovery Point Objective)

Incident management



Operational security: to remember

Adaptable
plan of
backup?

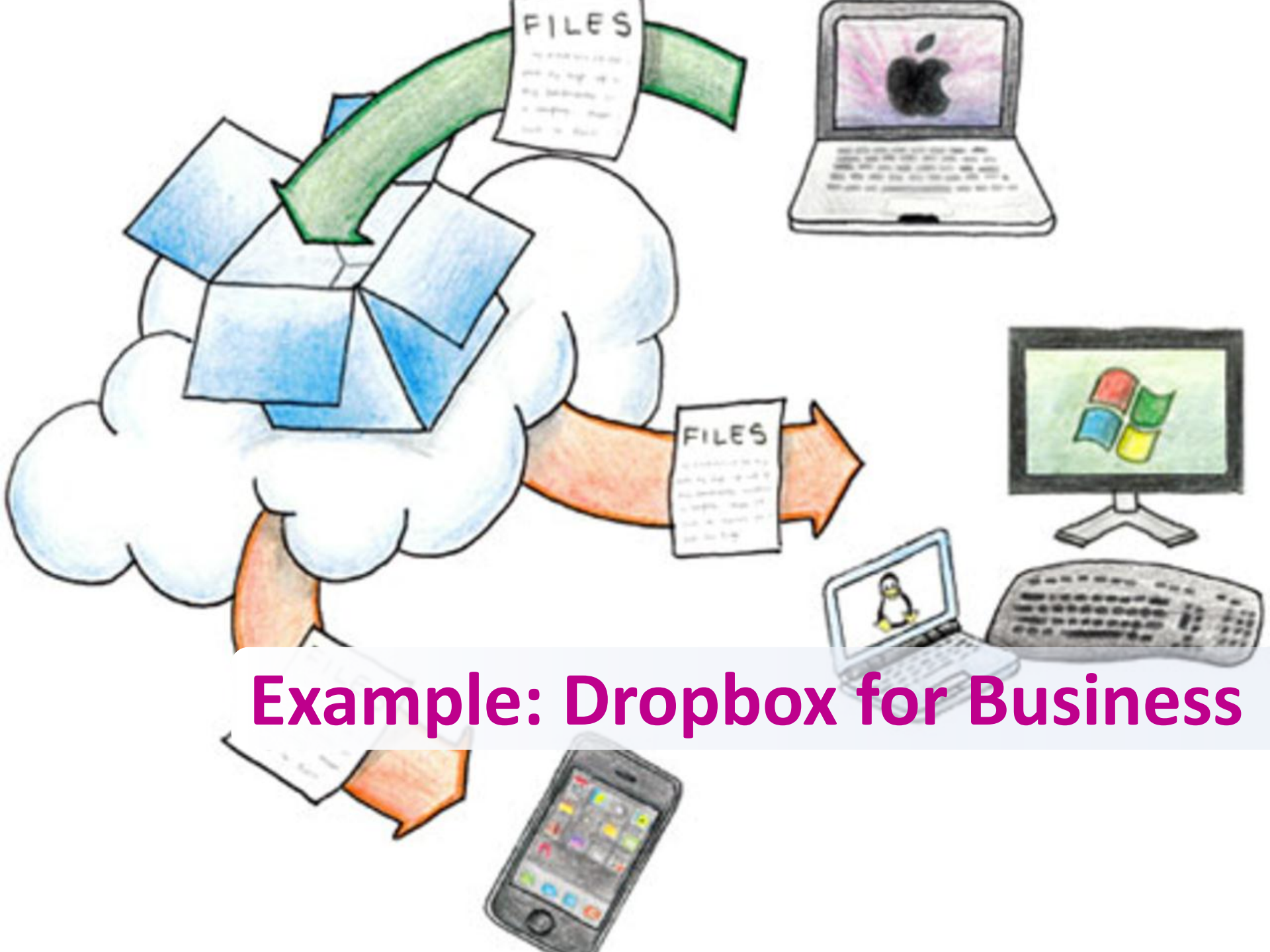
RTO and RPO
< 1 day?

SIEM?

Appropriate
incident
management?

Security
training of
employees?





Example: Dropbox for Business

How works the model?



Result for the governance

	Category Title	Score	Minimal weighted score	Maximal weighted score
1	Governance		41%	66%
1.1	Legal implication		6%	11%
1.1.1	What is the physical location of data-at-rest?	Unknown	5,25	21
1.1.2	Which jurisdiction is the CSP subject to?	US	10,5	10,5
1.1.3	Can the CSP accomodate with the tenant's data retention requirements?	Unknown	0	8
1.1.4	Can the data be given to governments if requested for judicial requirements without informing the tenant or without constitutional guarantees?	Yes	0	0
1.1.5	Can the data be given to, shared with third parties, or used by the CSP for other purposes than the cloud service without the tenant's consent?	Yes	0	0
1.1.6	If the US-EU Safe Harbor applies, is the CSP registered?	Yes	8	8
1.2	Supply chain management		18%	22%
1.2.1	Does the CSP use subcontractors?	Yes	40	40
1.2.2	If so, will the CSP inform the tenant of the subcontractors hired to provide the cloud service?	Yes	20	20
1.2.3	If so, will the CSP inform the tenant of any change in the course of the contract?	Yes	20	20
1.2.4	If so, does the CSP guarantee contractually to remain fully responsible for his engagements, even with the hiring of subcontractors?	Unknown	0	20
1.3	Audit		10%	10%
1.3.1	At which time interval is the cloud service (including all its subcontractors) audited by a third party?	1 year	12,75	12,75
1.3.2	If the cloud service is audited, are the scopes of the audits accurately defined?	Yes	32	32
1.3.3	At which time interval is the cloud service (including all its subcontractors) pen-tested?	1 year	5,95	5,95
1.3.4	Did the cloud service define an ISP (Information Security Policy) and obtain a security-related certification?	Yes, ISP and certificate(s)	14	14
1.3.5	Is there a Tier certification of data centers (especially for physical availability and security) or equivalent certification?	No Tier certification or equivalent	0	0
1.4	Business continuity		0%	8%
1.4.1	Is the cloud service delivery managed under SLAs (Service Level Agreements)?	No	0	0
1.4.2	Does the CSP define and implement a business continuity plan?	Unknown	0	33
1.4.3	Is the reversibility of the cloud service provided?	No	0	0
1.5	Others		8%	15%
1.5.1	Does the CSP apply a segregation of duties in the CSP organization to protect the tenants?	Unknown	0	50
1.5.2	If meta-data are extracted by the CSP from the process of tenant's data, are they used for the cloud service only?	Yes	50	50



Worst case vs. Best case

Worst case

Best case

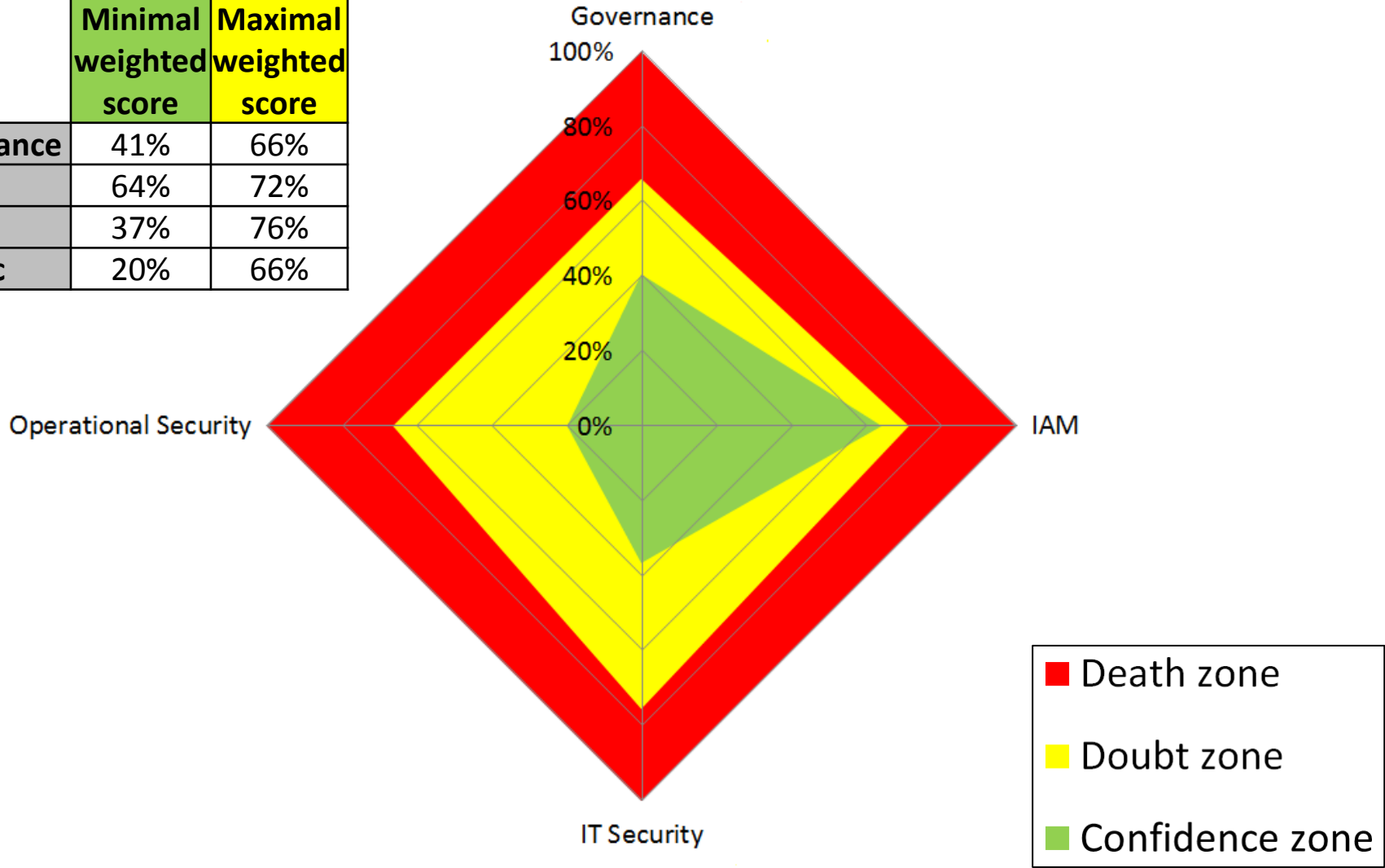
	Score	Minimal weighted score	Maximal weighted score
		41%	66%
		6%	11%
	Unknown	5,25	21
	US	10,5	10,5
	Unknown	0	8
ant or without constitutional guarantees?	Yes	0	0
ud service without the tenant's consent?	Yes	0	0
	Yes	8	8
		18%	22%
	Yes	40	40
	Yes	20	20
	Yes	20	20
n the hiring of subcontractors?	Unknown	0	20
		10%	10%

Result for the governance

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		6%	11%
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	US	10,5	10,5
	Unknown	0	8
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provide service without the tenant's consent?	Yes	0	0
	Yes	8	8
		18%	22%
	Yes	40	40
	Yes	20	20
	Yes	20	20
the hiring of subcontractors?	Unknown	0	20
		10%	10%

Preliminary result of the analysis

	Minimal weighted score	Maximal weighted score
Governance	41%	66%
IAM	64%	72%
IT Sec	37%	76%
Oppe Sec	20%	66%



Cloud policy of Belgian social security

Goal?

- Established the **security requirements** when an institution of the social security is considering using a cloud service

URL?

- QR code of the URL



Model?

- Each point is considered in the model
- But the model goes a bit further in the analysis



Cloud policy in the model

	Category Title	Score	Minimal weighted score	Maximal weighted score
1	Governance		41%	66%
1.1	Legal implication		6%	11%
1.1.1	What is the physical location of data-at-rest?	Unknown	5,25	21
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1.1.4	Can the data be given to governments if requested for judicial requirements without informing the tenant or without constitutional guarantees?	Yes	0	0
1.1.5	Can the data be given to, shared with third parties, or used by the CSP for other purposes than the cloud service without the tenant's consent?	Yes	0	0
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Cloud policy in the model

	Category Title	Score	Minimal weighted score	Maximal weighted score	Compliance with cloud policy
1	Governance		41%	66%	
1.1	Legal implication		6%	11%	
1.1.1	What is the physical location of data-at-rest?	Unknown	5,25	21	
1.1.2	Which jurisdiction is the CSP subject to?	US	10,5	10,5	
1.1.3	Can the CSP accomodate with the tenant's data retention requirements?	Unknown	0	8	
1.1.4	Can the data be given to governments if requested for judicial requirements without informing the tenant or without constitutional guarantees?	Yes	0	0	X
1.1.5	Can the data be given to, shared with third parties, or used by the CSP for other purposes than the cloud service without the tenant's consent?	Yes	0	0	X
1.1.6	If the US-EU Safe Harbor applies, is the CSP registered?	Yes	8	8	
1.2	Supply chain management		18%	22%	
1.2.1	Does the CSP use subcontractors?	Yes	40	40	
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1.2.3	If so, will the CSP inform the tenant of any change in the course of the contract?	Yes	20	20	V
1.2.4	If so, does the CSP guarantee contractually to remain fully responsible for his engagements, even with the hiring of subcontractors?	Unknown	0	20	??
1.3	Audit		10%	10%	
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1.4	Business continuity		0%	8%	
1.4.1	Is the cloud service delivery managed under SLAs (Service Level Agreements)?	No	0	0	X
1.4.2	Does the CSP define and implement a business continuity plan?	Unknown	0	33	??
1.4.3	Is the reversibility of the cloud service provided?	No	0	0	X
1.5	Others		8%	15%	
1.5.1	Does the CSP apply a segregation of duties in the CSP organization to protect the tenants?	Unknown	0	50	
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Compliance display in the model

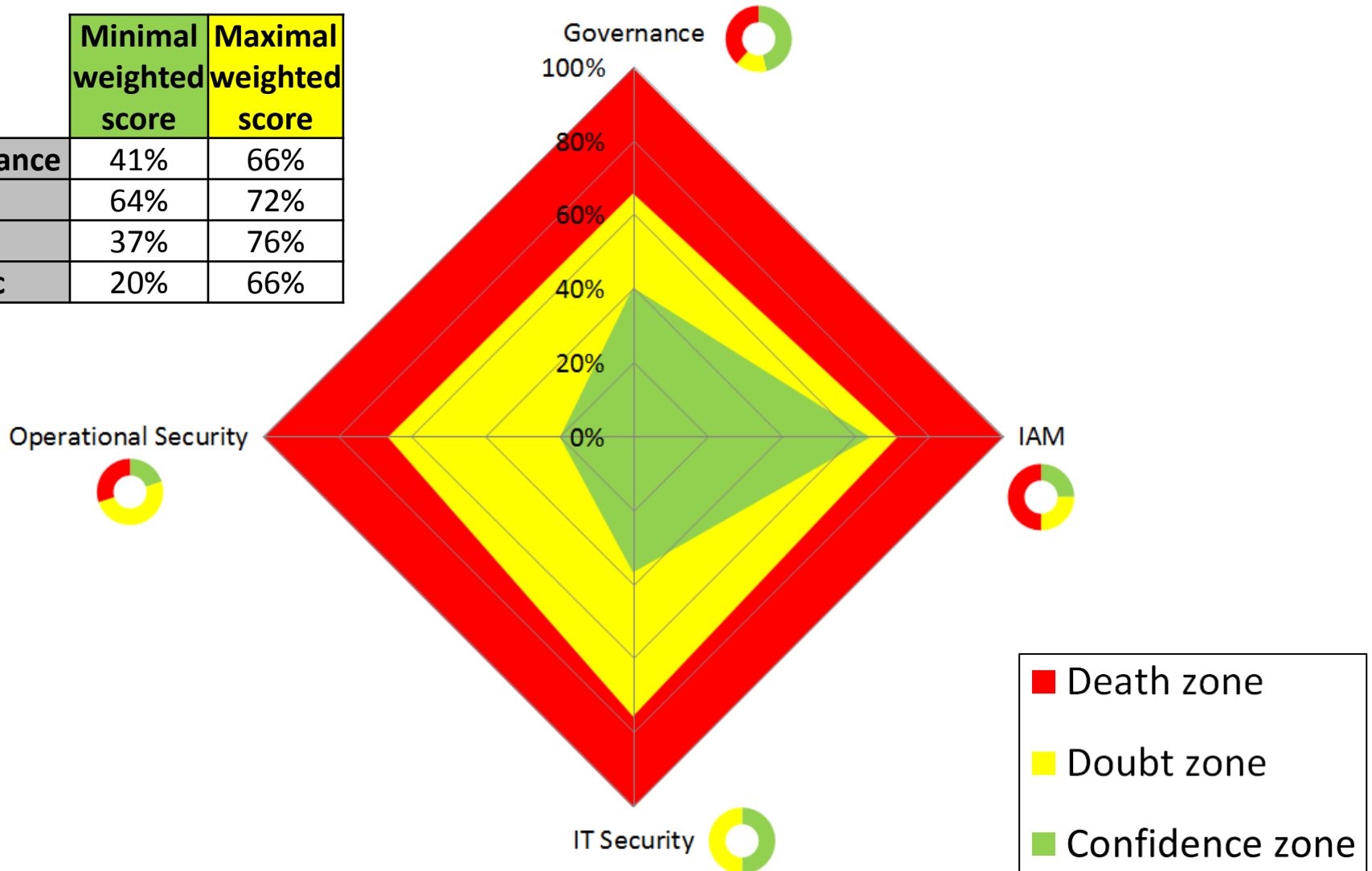
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Ope Sec	20%	66%	





Full result of the analysis

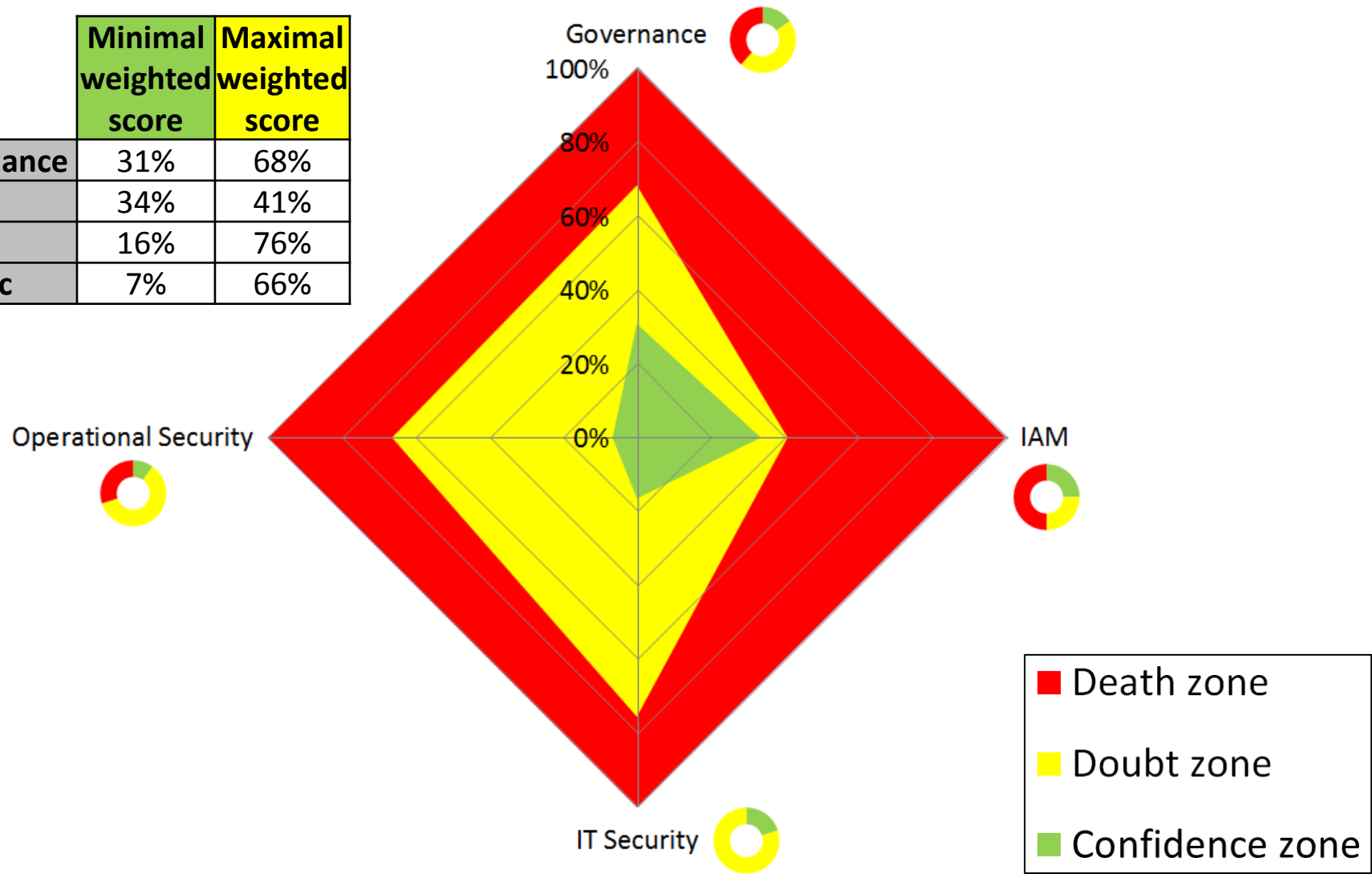
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Governance	41%	66%
IAM	64%	72%
IT Sec	37%	76%
Oppe Sec	20%	66%





What about Dropbox Free?

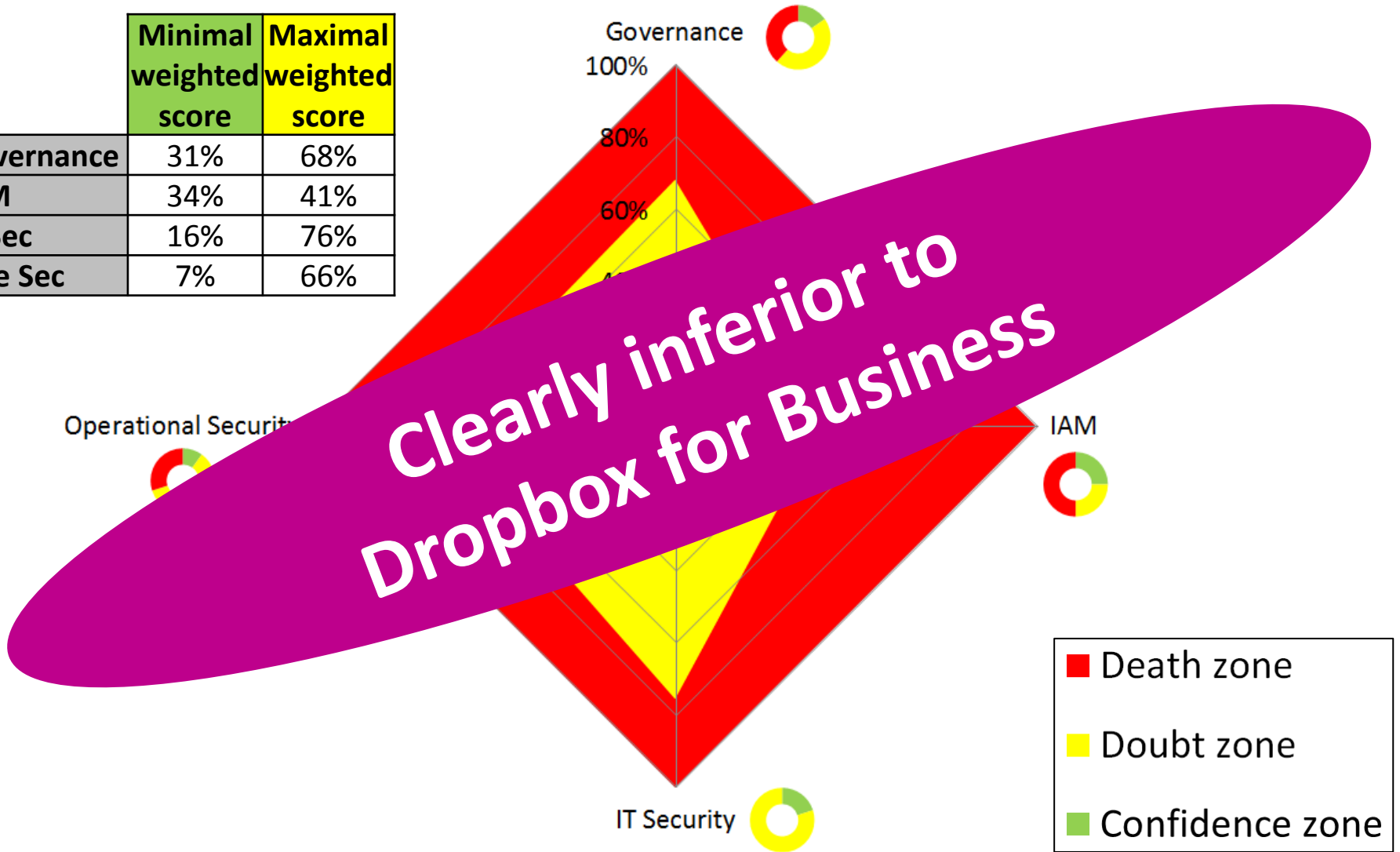
	Minimal weighted score	Maximal weighted score
Governance	31%	68%
IAM	34%	41%
IT Sec	16%	76%
Oppe Sec	7%	66%





What about Dropbox Free?

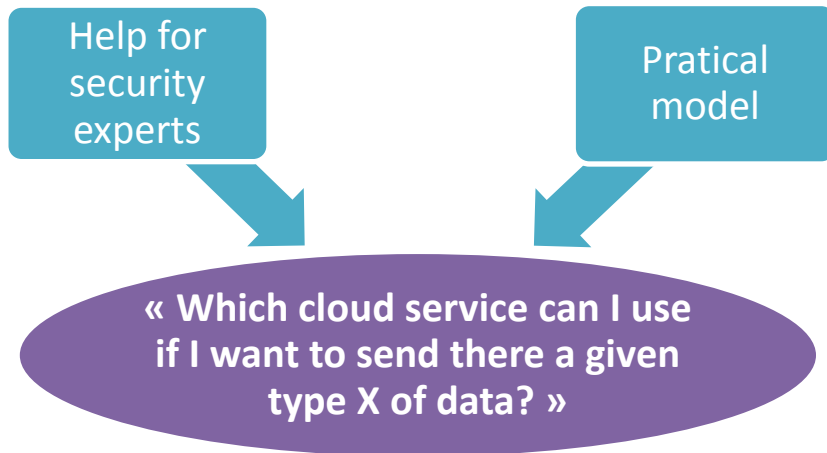
	Minimal weighted score	Maximal weighted score
Governance	31%	68%
IAM	34%	41%
IT Sec	16%	76%
Op Sec	7%	66%





How to choose a cloud service

Goal of the model



Eliminate/filter
non fruitful
tracks

Select
potential
candidates



How to choose a good candidate?

1

- Experts **analyze** cloud services
- Results are published



2

- Client makes a **self-assessment** of his needs/requirements



3

- Client **compares:**





Self-assessment

Which type of data?

Which security level?








Self-assess: which type of data?

Public

<https://www.ksz.fgov.be/>

Kruispuntbank van de Sociale Zekerheid >>
 KCSZ

Banque Carrefour de la Sécurité Sociale >>
 BCSS

Crossroads Bank for Social Security >>
 CBSS

Internal





Confidential

Financial roadmap



Committee reports



Personal



Social



NISS >>> >>>



Medical



Ref: Data classification policy of the Belgian social security





Self-assess: which security level?



- Question 1?
- Question 2?
- ...



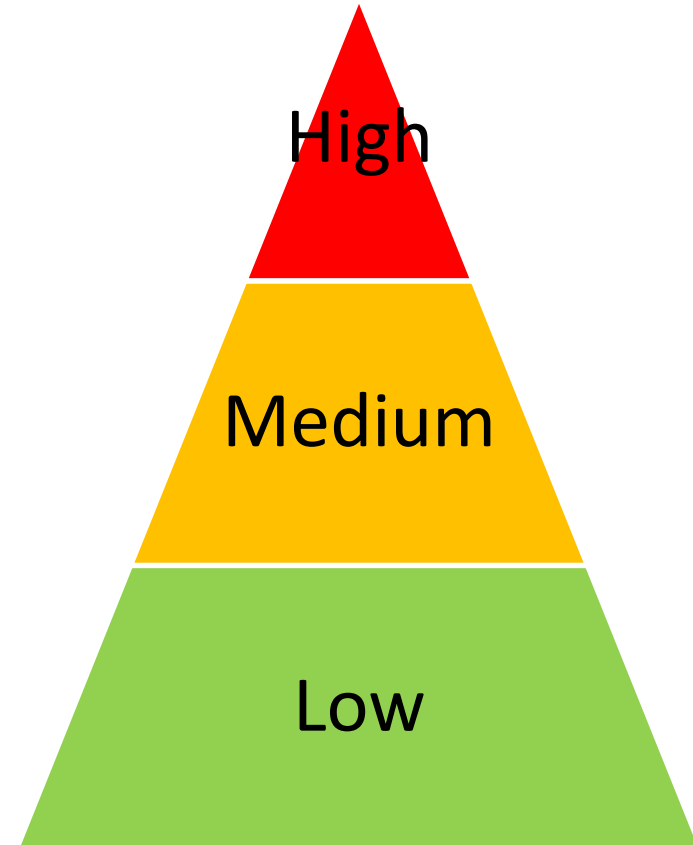
- Question 1?
- Question 2?
- ...



- Question 1?
- Question 2?
- ...



- Question 1?
- Question 2?
- ...





Self-assess: which security level?



- Question 1?
- Question 2?
- ...



Required score



- Question 1?
- Question 2?
- ...



Required score



- Question 1?
- Question 2?
- ...



Required score



- Question 1?
- Question 2?
- ...



Required score





Example: pay slip storage

	Category Title	Score	Required score
0	Data Type		
0.1	What type of data is intended to be moved to a cloud service?	Personal	
	Explanations / Examples		
	The choices of data type are extracted from the Data Classification Policy of the Social Security.		
	Score specification		
	Public	e.g. web site of BCSS/KSZ	
	Internal to the company	e.g. internal strategy, agenda, contact, email	
	Confidential of the company	e.g. financial roadmap	
	Personal	e.g. HR personal folder	
	Personal and social	e.g. National register data	
	Medical	e.g. medical record	
1	Governance		75%
1.1	Which level of governance must be attained by the cloud service?	High	75
2	Identity and Access Management (IAM)		78%
2.1	Which level of authentication must be offered by the cloud service?	High	28,9
2.2	Which level of control on the user management must be proposed by the cloud service?	High	24,75
2.3	Which level of access management must be provided by the cloud service?	High	24,75
3	IT Security		68%
3.1	Which deployment model must be provided by the cloud service?	Community cloud	16,5
3.2	Which level of interface security must be provided by the cloud service?	High	12
3.3	Which level of infrastructure and virtualization security must be achieved by the cloud service?	High	22,5
3.4	Which level of cryptography must be provided by the cloud service?	High	16,8
4	Operational Security		75%
4.1	Which level of backup and disaster recovery must be provided by the cloud service?	High	37,5
4.2	Which level of incident management must be provided by the cloud service?	High	37,5





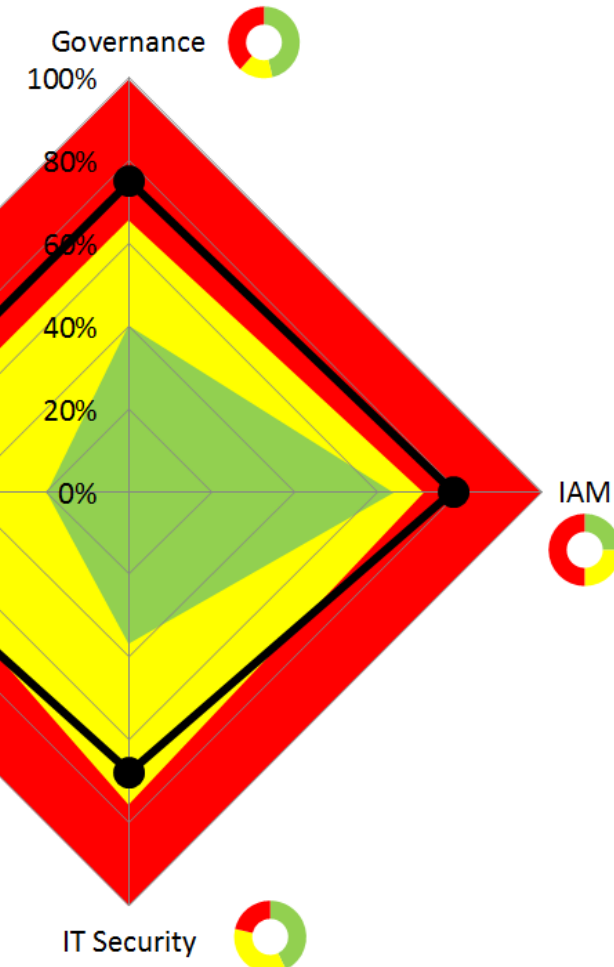
Example: pay slip storage

Category Title		Score
Data Type		
1	What type of data is intended to be moved to a cloud service?	Personal
Explanations / Examples		
The choices of data type are extracted from the Data Classification Policy of the Social Security.		
Score specification		
	Public e.g. web site of BCSS/KSZ	
	Internal to the company e.g. internal strategy, agenda, contact, email	
	Confidential of the company e.g. financial roadmap	
	Personal e.g. HR personal folder	
	Personal and social e.g. National register data	
	Medical e.g. medical record	
Governance		
1	Which level of governance must be attained by the cloud service?	High
Identity and Access Management (IAM)		
1	Which level of authentication must be offered by the cloud service?	High
2	Which level of control on the user management must be proposed by the cloud service?	High
2	Which level of access management must be provided by the cloud service?	High



Example: pay slip storage

	Minimal weighted score	Maximal weighted score	Required score	Does Dropbox for Business satisfy the required score?
Governance	41%	66%	75%	DOES NOT satisfy
IAM	64%	72%	78%	DOES NOT satisfy
IT Sec	37%	76%	68%	MAY satisfy
Ope Sec	20%	66%	75%	DOES NOT satisfy

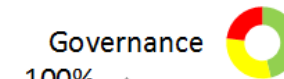


DOES NOT SATISFY



Example: pay slip storage

	Minimal weighted score	Maximal weighted score	Required score	Does Office 365 for Business satisfy the required score?
Governance	65%	83%	75%	MAY satisfy
IAM	97%	97%	78%	DOES satisfy
IT Sec	58%	81%	68%	MAY satisfy
Ope Sec	63%	73%	75%	DOES NOT satisfy



Operational Security



IAM



IT Security

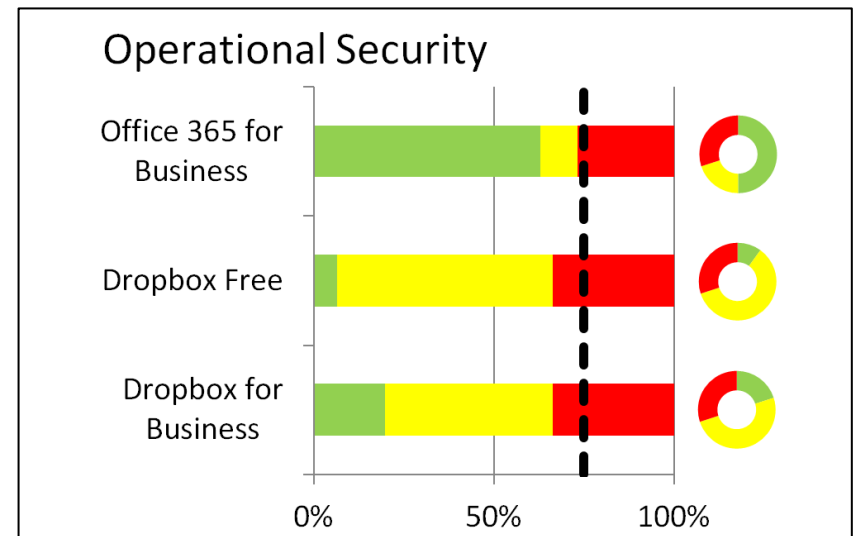
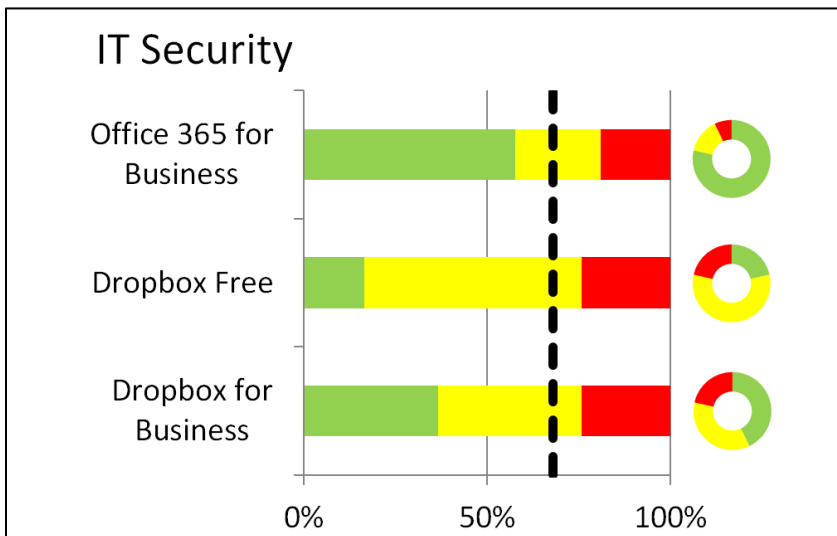
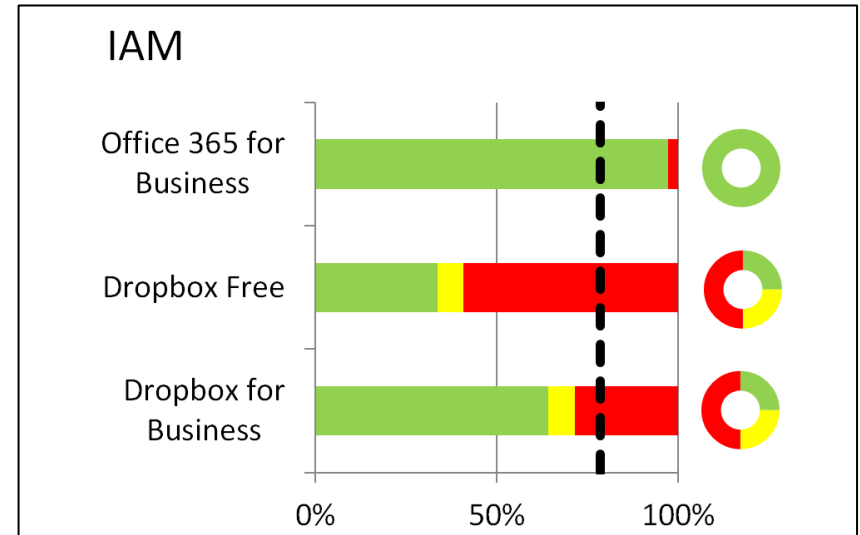
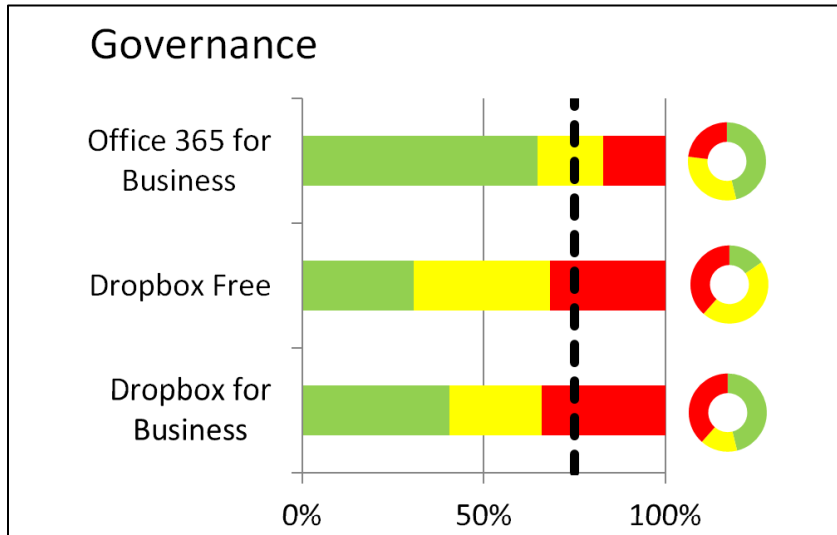


DOES NOT SATISFY



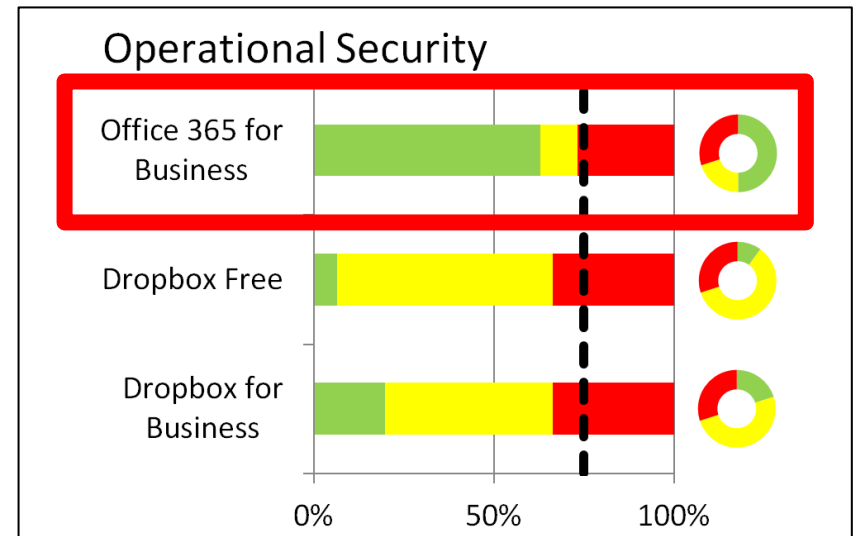
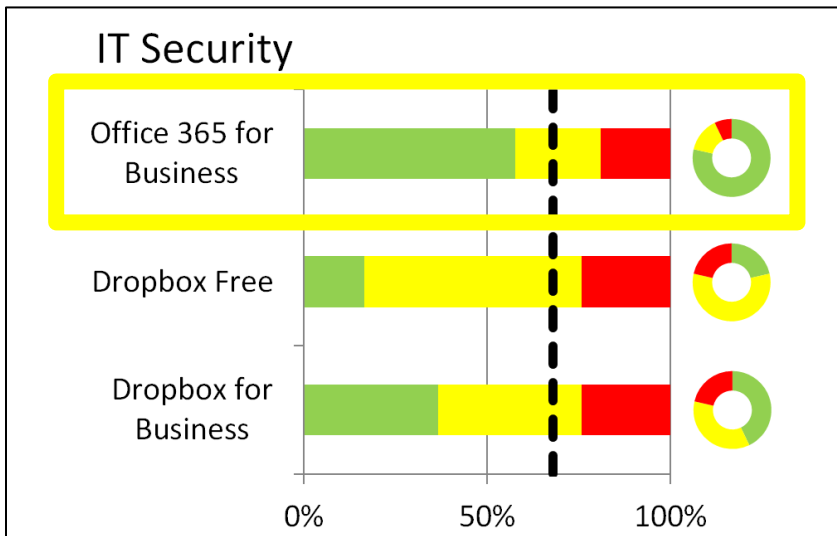
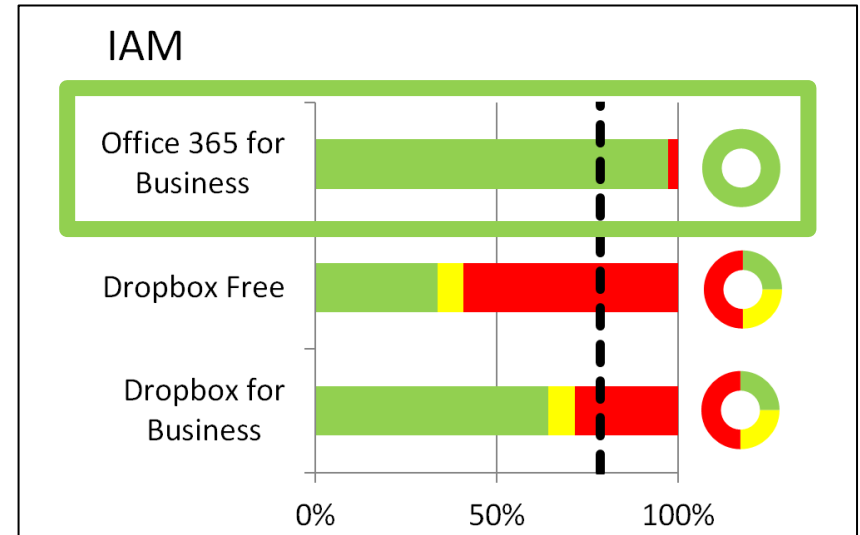
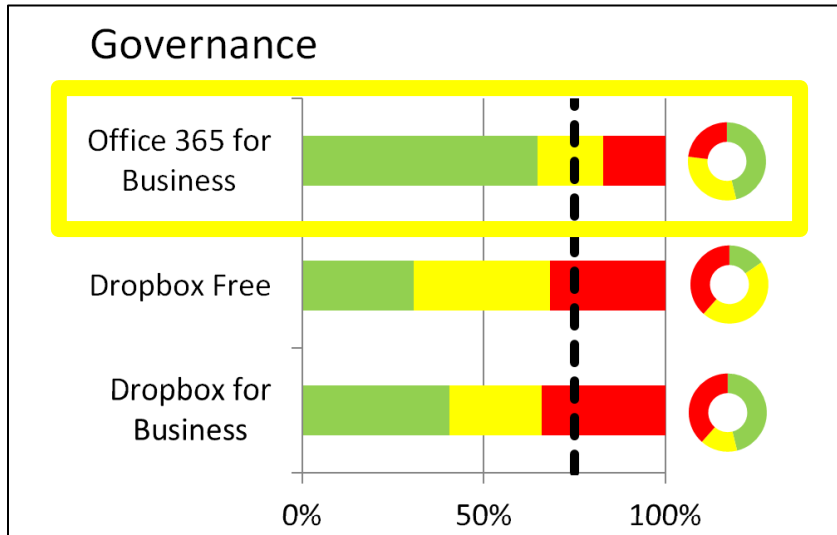


Example: pay slip storage



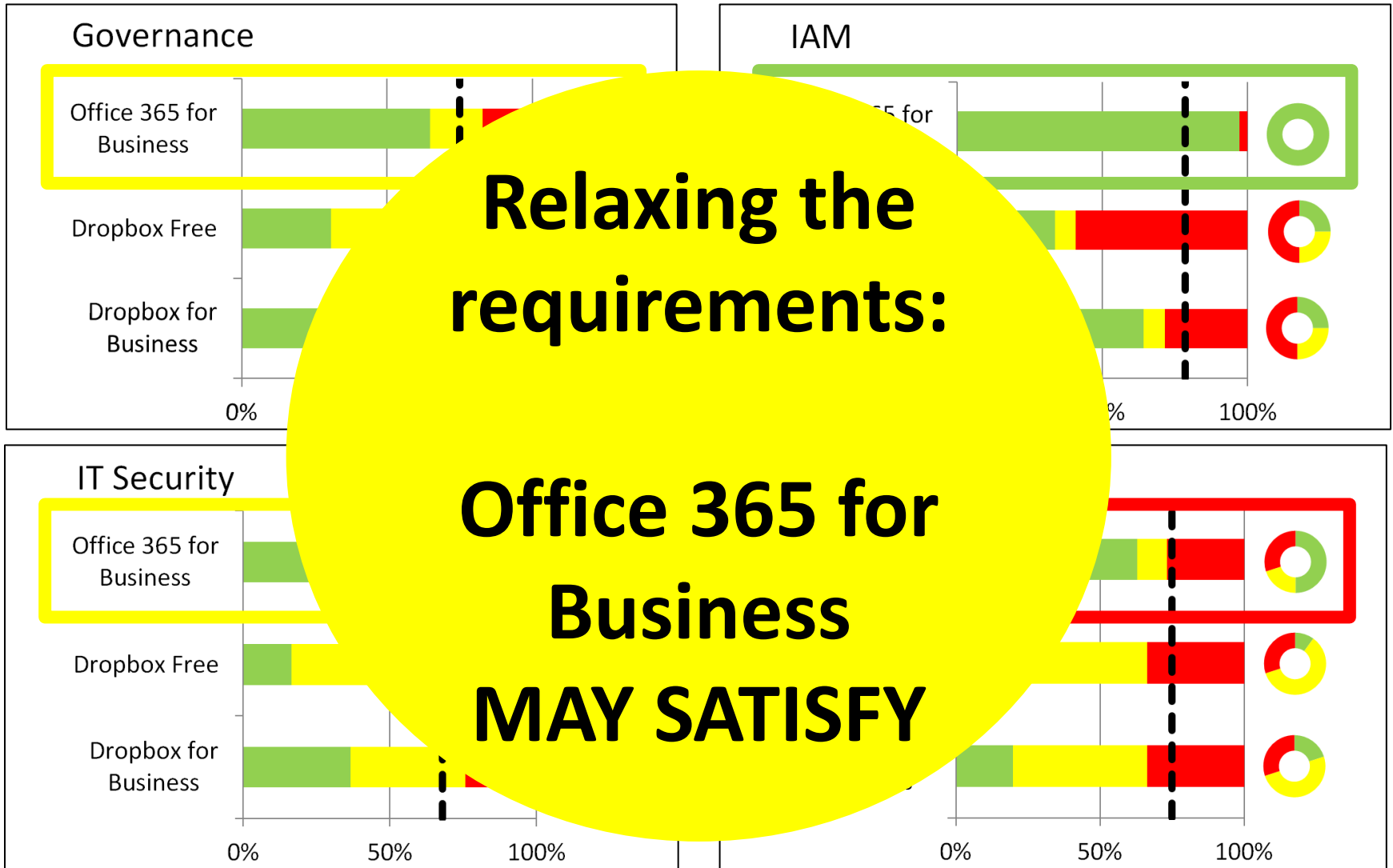


Example: pay slip storage





Example: pay slip storage





Conclusion

Conclusion

Cloud security
is **crucial**

Especially if we
want to send there
sensitive data

Importance of
assessing the
security of a cloud
service

Proposition of such
an assessment tool:
the model



A human expert is the only
true judge of the result



Where is the model?

URL?

- [Version FR](#)



- [Version NL](#)



For
who?

- Security experts and counsellors



Some interesting



- U.S. Government, "[The PATRIOT Act](#)"
- Tania Martin, "[Research Note 32: Advanced Persistent Threats - Etat de l'Art](#)"
- OWASP, "[The OWASP Project](#)"
- Kristof Verslype, "[Quick Review 65: BoxCryptor - Client-side encryptie voor FSS](#)"
- Kristof Verslype, "[Research Note 26: Security Information & Event Management \(SIEM\)](#)"
- Tania Martin, "[Social engineering : watch out because there is no patch for human stupidity](#)"
- Belgian social security, "[Politique de sécurité relative à des services de Cloud Computing](#)"
- Belgian social security, "[Policy dataclassification](#)"
- Smals Research, "[Modèle d'évaluation de sécurité cloud](#)"
- Smals Research, "[Cloud security evaluatiemodel](#)"





Tania Martin

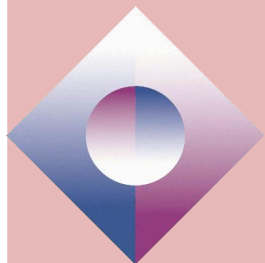


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