



# Using Dark Storage to reach NDSA level 4

PASIG 2019



Technology changes. Information prevails.

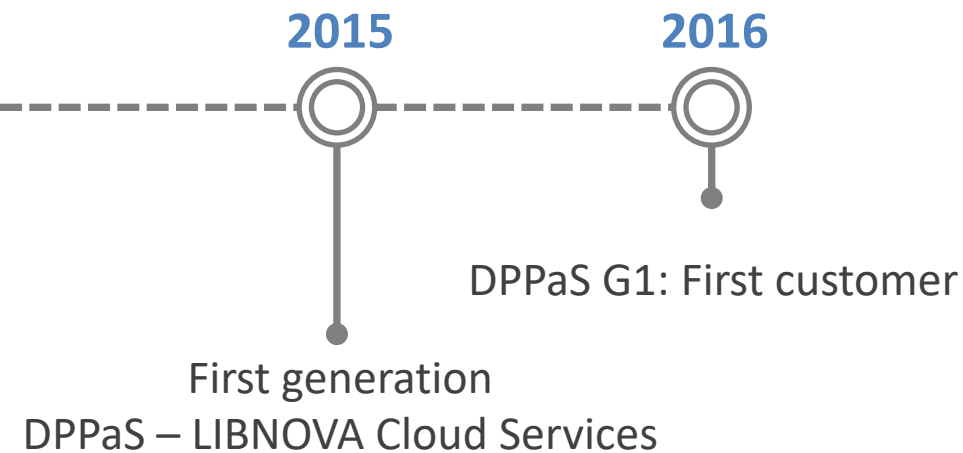
2015



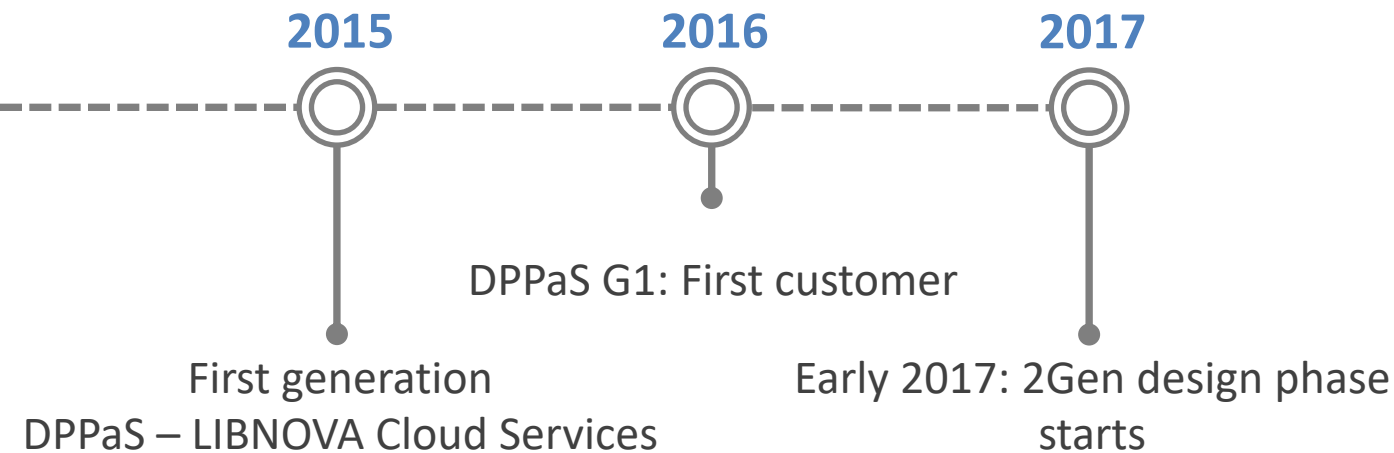
First generation

DPPaS – LIBNOVA Cloud Services

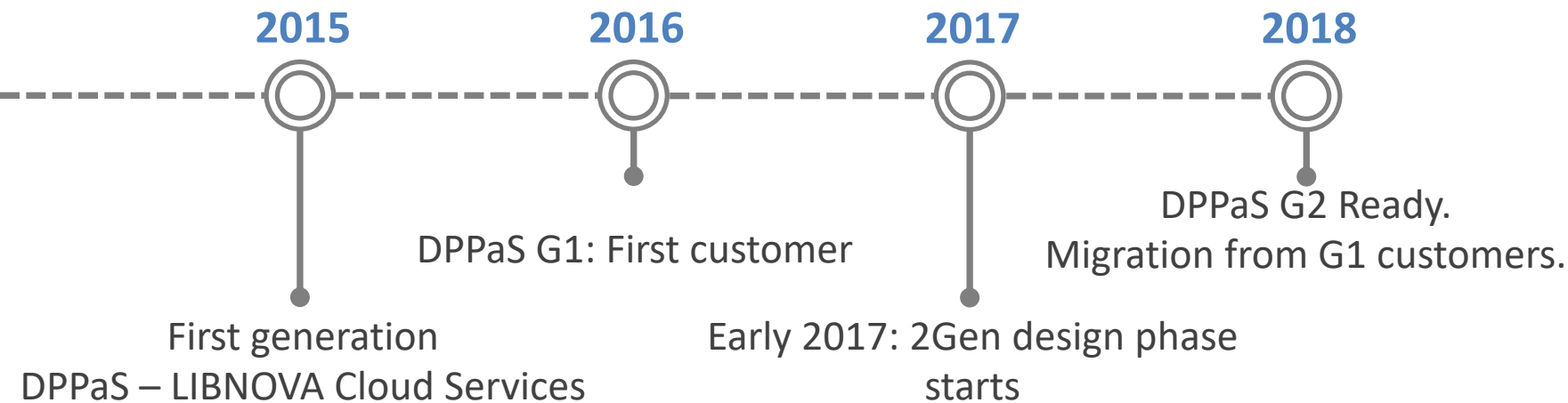
In 2015, we start offering our first iteration of a DPPaS (Digital Preservation Platform as a service), as part of LIBNOVA Cloud Services



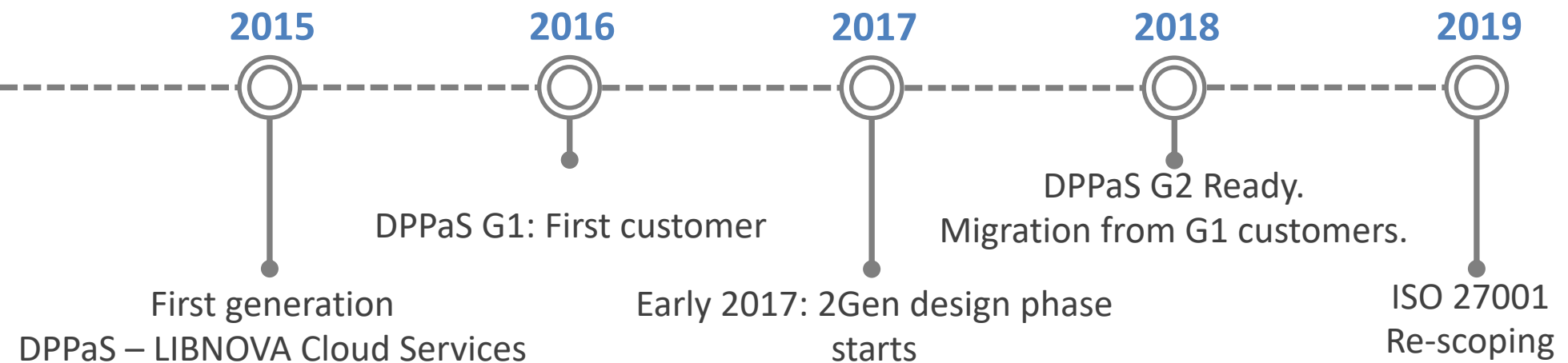
In 2016, we bring our first customer on board to the new platform.



In 2017, we start working on the second generation platform, with an NDSA 4 (Storage, Integrity and Security) - 100% data durability target by default – Risk assessment completed.



In 2018, we finish or testing over the new architecture and start the G1 to G2 data migration.



Early 2019: we changed the scope of our existing ISO 27001 to include the 2<sup>nd</sup> generation LIBNOVA Cloud services. External certification to happen on Sept. 2019.

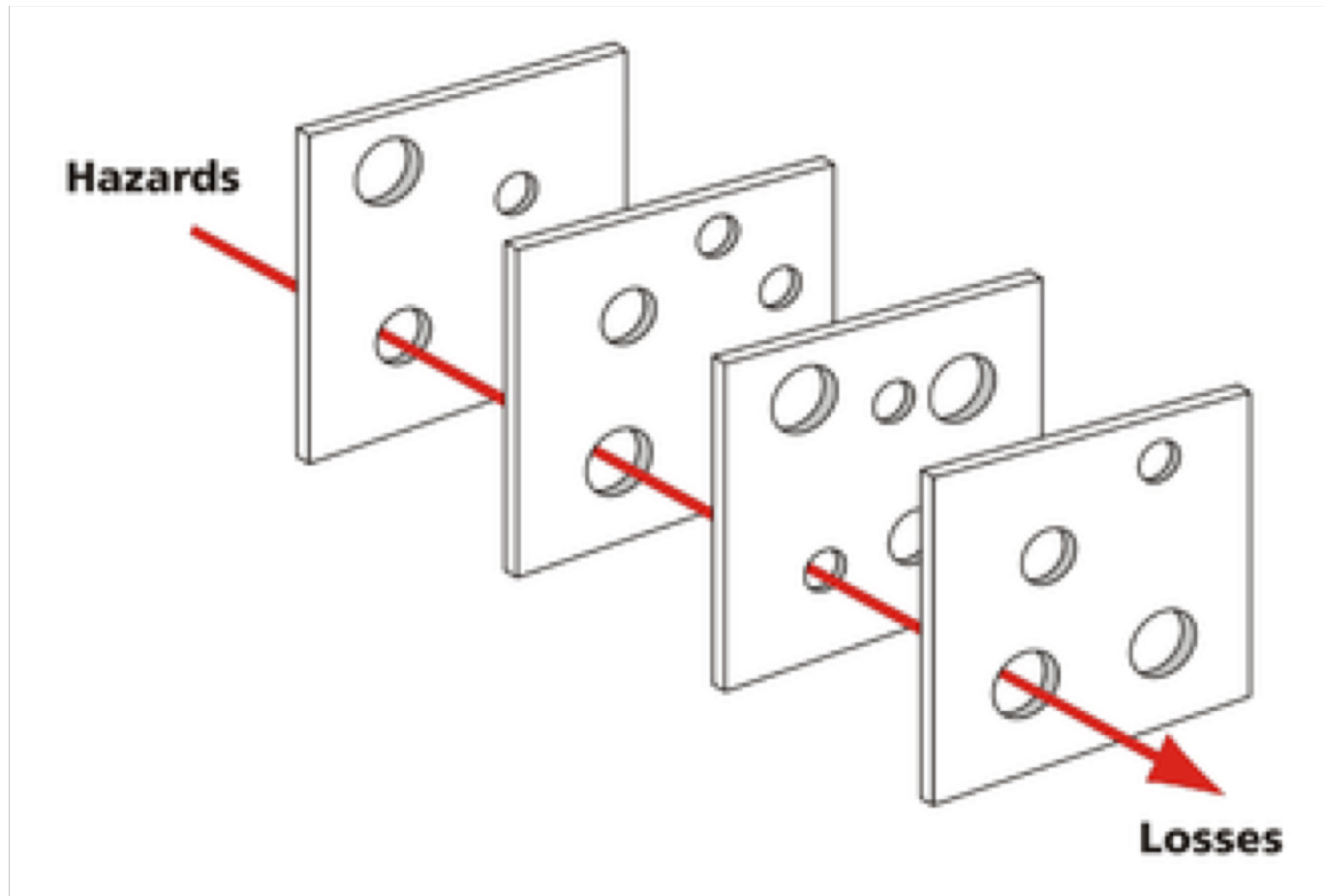
## Challenges applicable to anybody:

- Full compliance with NDSA Level 4 (Storage, Integrity and Security)
  - Full integrity... - At least three copies... - Not a single person...
- 100% Durability target
  - Durability? - Even under non-standard circumstances
  - Even if we are not there – Customer-accessible escrow with glacier
- 100% Integrity target
- Isolated environments to reduce risk

## Challenges more specific for us:

- ISO 27001-certifiable (systems and processes)
- Transparent – to allow ISO 16363 customer-initiated certification or self audit
- Territory (US/EU – GDPR, etc.) – Customer data isolation

# Swiss cheese model





# Risk assessment and mitigation process

LIBSAFE Cloud Risk Management and Mitigation Plan/TRA				Probability		Impact		Current		Target		Confidence								
Item	Owner	Category	Risk Title	Score	Severity	Frequency	Consequence	Score	Severity	Frequency	Consequence	Score	Confidence							
001	Information Security	Data Storage Fault	001. Data storage integrity	5	5	5	5	5	5	5	5	5	5							
														001. Data storage integrity	5	5	5	5	5	5
														001. Data storage integrity	5	5	5	5	5	5
002	Information Security	Data Storage Fault	002. Data storage availability	5	5	5	5	5	5	5	5	5	5							
														002. Data storage availability	5	5	5	5	5	5
														002. Data storage availability	5	5	5	5	5	5
003	Information Security	Technology of cloud services	003. Use of the latest cloud services	5	5	5	5	5	5	5	5	5	5							
														003. Use of the latest cloud services	5	5	5	5	5	5
														003. Use of the latest cloud services	5	5	5	5	5	5
004	Information Security	Technology of cloud services	004. Reliability of cloud services	5	5	5	5	5	5	5	5	5	5							
														004. Reliability of cloud services	5	5	5	5	5	5
														004. Reliability of cloud services	5	5	5	5	5	5
005	Information Security	Business process	005. Long-term retention of the business process	5	5	5	5	5	5	5	5	5	5							
														005. Long-term retention of the business process	5	5	5	5	5	5
														005. Long-term retention of the business process	5	5	5	5	5	5
006	Information Security	Business process	006. Business process optimization	5	5	5	5	5	5	5	5	5	5							
														006. Business process optimization	5	5	5	5	5	5
														006. Business process optimization	5	5	5	5	5	5
007	Information Security	Business process	007. Scalability to process new business functions	5	5	5	5	5	5	5	5	5	5							
														007. Scalability to process new business functions	5	5	5	5	5	5
														007. Scalability to process new business functions	5	5	5	5	5	5
008	Information Security	Business process	008. Virtualization of business functions	5	5	5	5	5	5	5	5	5	5							
														008. Virtualization of business functions	5	5	5	5	5	5
														008. Virtualization of business functions	5	5	5	5	5	5
009	Information Security	Business process	009. Optimization of business functions	5	5	5	5	5	5	5	5	5	5							
														009. Optimization of business functions	5	5	5	5	5	5
														009. Optimization of business functions	5	5	5	5	5	5
010	Information Security	Business process	010. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														010. Scalability of business functions	5	5	5	5	5	5
														010. Scalability of business functions	5	5	5	5	5	5
011	Information Security	Business process	011. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														011. Reliability of business functions	5	5	5	5	5	5
														011. Reliability of business functions	5	5	5	5	5	5
012	Information Security	Business process	012. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														012. Scalability of business functions	5	5	5	5	5	5
														012. Scalability of business functions	5	5	5	5	5	5
013	Information Security	Business process	013. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														013. Reliability of business functions	5	5	5	5	5	5
														013. Reliability of business functions	5	5	5	5	5	5
014	Information Security	Business process	014. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														014. Scalability of business functions	5	5	5	5	5	5
														014. Scalability of business functions	5	5	5	5	5	5
015	Information Security	Business process	015. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														015. Reliability of business functions	5	5	5	5	5	5
														015. Reliability of business functions	5	5	5	5	5	5
016	Information Security	Business process	016. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														016. Scalability of business functions	5	5	5	5	5	5
														016. Scalability of business functions	5	5	5	5	5	5
017	Information Security	Business process	017. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														017. Reliability of business functions	5	5	5	5	5	5
														017. Reliability of business functions	5	5	5	5	5	5
018	Information Security	Business process	018. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														018. Scalability of business functions	5	5	5	5	5	5
														018. Scalability of business functions	5	5	5	5	5	5
019	Information Security	Business process	019. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														019. Reliability of business functions	5	5	5	5	5	5
														019. Reliability of business functions	5	5	5	5	5	5
020	Information Security	Business process	020. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														020. Scalability of business functions	5	5	5	5	5	5
														020. Scalability of business functions	5	5	5	5	5	5
021	Information Security	Business process	021. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														021. Reliability of business functions	5	5	5	5	5	5
														021. Reliability of business functions	5	5	5	5	5	5
022	Information Security	Business process	022. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														022. Scalability of business functions	5	5	5	5	5	5
														022. Scalability of business functions	5	5	5	5	5	5
023	Information Security	Business process	023. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														023. Reliability of business functions	5	5	5	5	5	5
														023. Reliability of business functions	5	5	5	5	5	5
024	Information Security	Business process	024. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														024. Scalability of business functions	5	5	5	5	5	5
														024. Scalability of business functions	5	5	5	5	5	5
025	Information Security	Business process	025. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														025. Reliability of business functions	5	5	5	5	5	5
														025. Reliability of business functions	5	5	5	5	5	5
026	Information Security	Business process	026. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														026. Scalability of business functions	5	5	5	5	5	5
														026. Scalability of business functions	5	5	5	5	5	5
027	Information Security	Business process	027. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														027. Reliability of business functions	5	5	5	5	5	5
														027. Reliability of business functions	5	5	5	5	5	5
028	Information Security	Business process	028. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														028. Scalability of business functions	5	5	5	5	5	5
														028. Scalability of business functions	5	5	5	5	5	5
029	Information Security	Business process	029. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														029. Reliability of business functions	5	5	5	5	5	5
														029. Reliability of business functions	5	5	5	5	5	5
030	Information Security	Business process	030. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														030. Scalability of business functions	5	5	5	5	5	5
														030. Scalability of business functions	5	5	5	5	5	5
031	Information Security	Business process	031. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														031. Reliability of business functions	5	5	5	5	5	5
														031. Reliability of business functions	5	5	5	5	5	5
032	Information Security	Business process	032. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														032. Scalability of business functions	5	5	5	5	5	5
														032. Scalability of business functions	5	5	5	5	5	5
033	Information Security	Business process	033. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														033. Reliability of business functions	5	5	5	5	5	5
														033. Reliability of business functions	5	5	5	5	5	5
034	Information Security	Business process	034. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														034. Scalability of business functions	5	5	5	5	5	5
														034. Scalability of business functions	5	5	5	5	5	5
035	Information Security	Business process	035. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														035. Reliability of business functions	5	5	5	5	5	5
														035. Reliability of business functions	5	5	5	5	5	5
036	Information Security	Business process	036. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														036. Scalability of business functions	5	5	5	5	5	5
														036. Scalability of business functions	5	5	5	5	5	5
037	Information Security	Business process	037. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														037. Reliability of business functions	5	5	5	5	5	5
														037. Reliability of business functions	5	5	5	5	5	5
038	Information Security	Business process	038. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														038. Scalability of business functions	5	5	5	5	5	5
														038. Scalability of business functions	5	5	5	5	5	5
039	Information Security	Business process	039. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														039. Reliability of business functions	5	5	5	5	5	5
														039. Reliability of business functions	5	5	5	5	5	5
040	Information Security	Business process	040. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														040. Scalability of business functions	5	5	5	5	5	5
														040. Scalability of business functions	5	5	5	5	5	5
041	Information Security	Business process	041. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														041. Reliability of business functions	5	5	5	5	5	5
														041. Reliability of business functions	5	5	5	5	5	5
042	Information Security	Business process	042. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														042. Scalability of business functions	5	5	5	5	5	5
														042. Scalability of business functions	5	5	5	5	5	5
043	Information Security	Business process	043. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														043. Reliability of business functions	5	5	5	5	5	5
														043. Reliability of business functions	5	5	5	5	5	5
044	Information Security	Business process	044. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														044. Scalability of business functions	5	5	5	5	5	5
														044. Scalability of business functions	5	5	5	5	5	5
045	Information Security	Business process	045. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														045. Reliability of business functions	5	5	5	5	5	5
														045. Reliability of business functions	5	5	5	5	5	5
046	Information Security	Business process	046. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														046. Scalability of business functions	5	5	5	5	5	5
														046. Scalability of business functions	5	5	5	5	5	5
047	Information Security	Business process	047. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														047. Reliability of business functions	5	5	5	5	5	5
														047. Reliability of business functions	5	5	5	5	5	5
048	Information Security	Business process	048. Scalability of business functions	5	5	5	5	5	5	5	5	5	5							
														048. Scalability of business functions	5	5	5	5	5	5
														048. Scalability of business functions	5	5	5	5	5	5
049	Information Security	Business process	049. Reliability of business functions	5	5	5	5	5	5	5	5	5	5							
														049. Reliability of business functions	5	5	5	5	5	5
														049. Reliability of business functions	5	5				

We decided to include Amazon Glacier to implement dark storage, but...

...Glacier is not dark storage by default: you need to tweak it to make it behave that way...

... but wait... What is dark storage?

Isolated environments >>> no shared risks



Security – fail-over balancing

Security – fail-over balancing



Copy A1

Copy A2

Copy A3

Copy B1

Copy B2



Primary

Fail-over

Secure Preservation pool



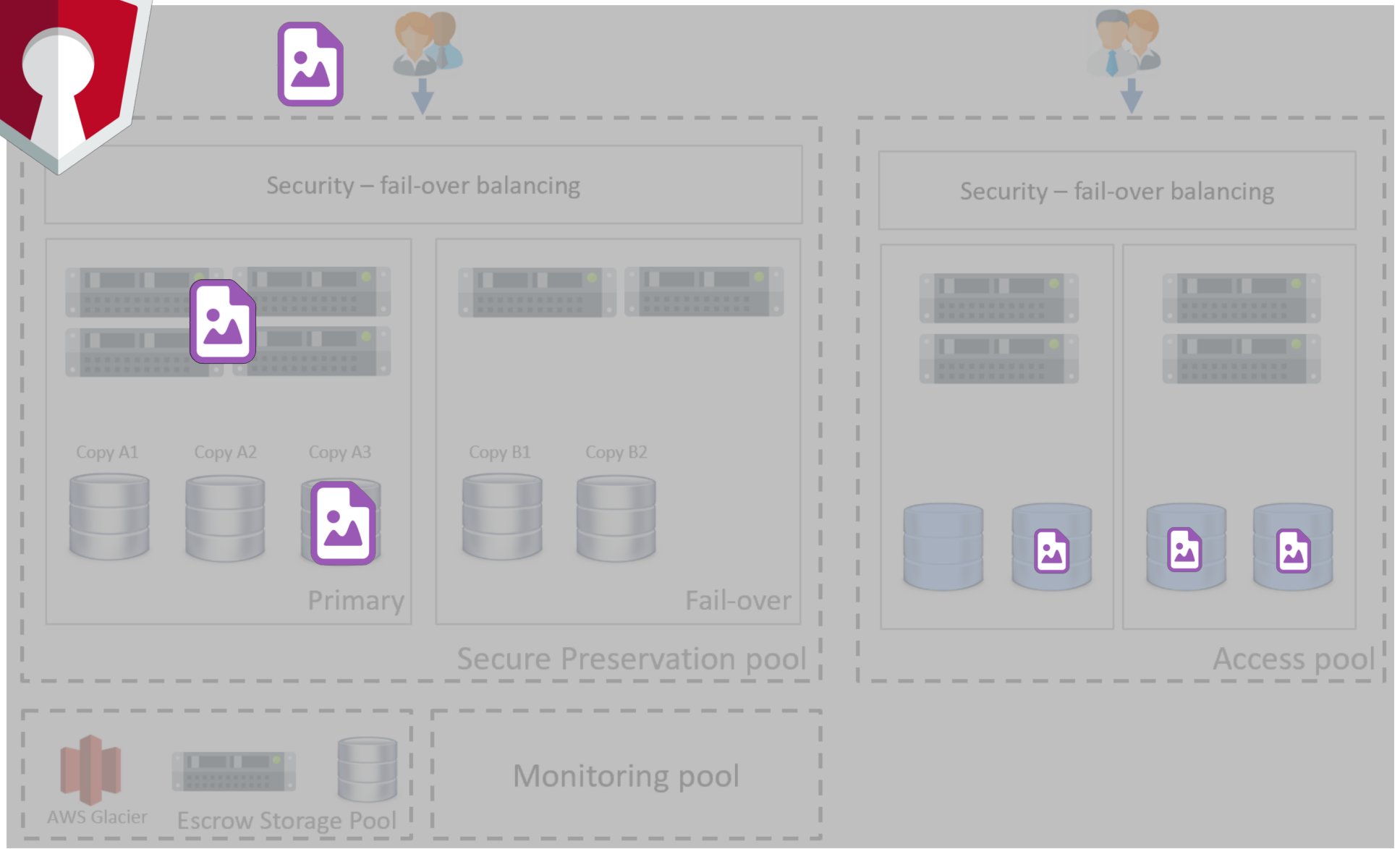
Access pool



AWS Glacier

Escrow Storage Pool

Monitoring pool



1: SIP Ingestion    2: AIP Generation    3: AIP copy    4: Escrow copy    5: Access copy

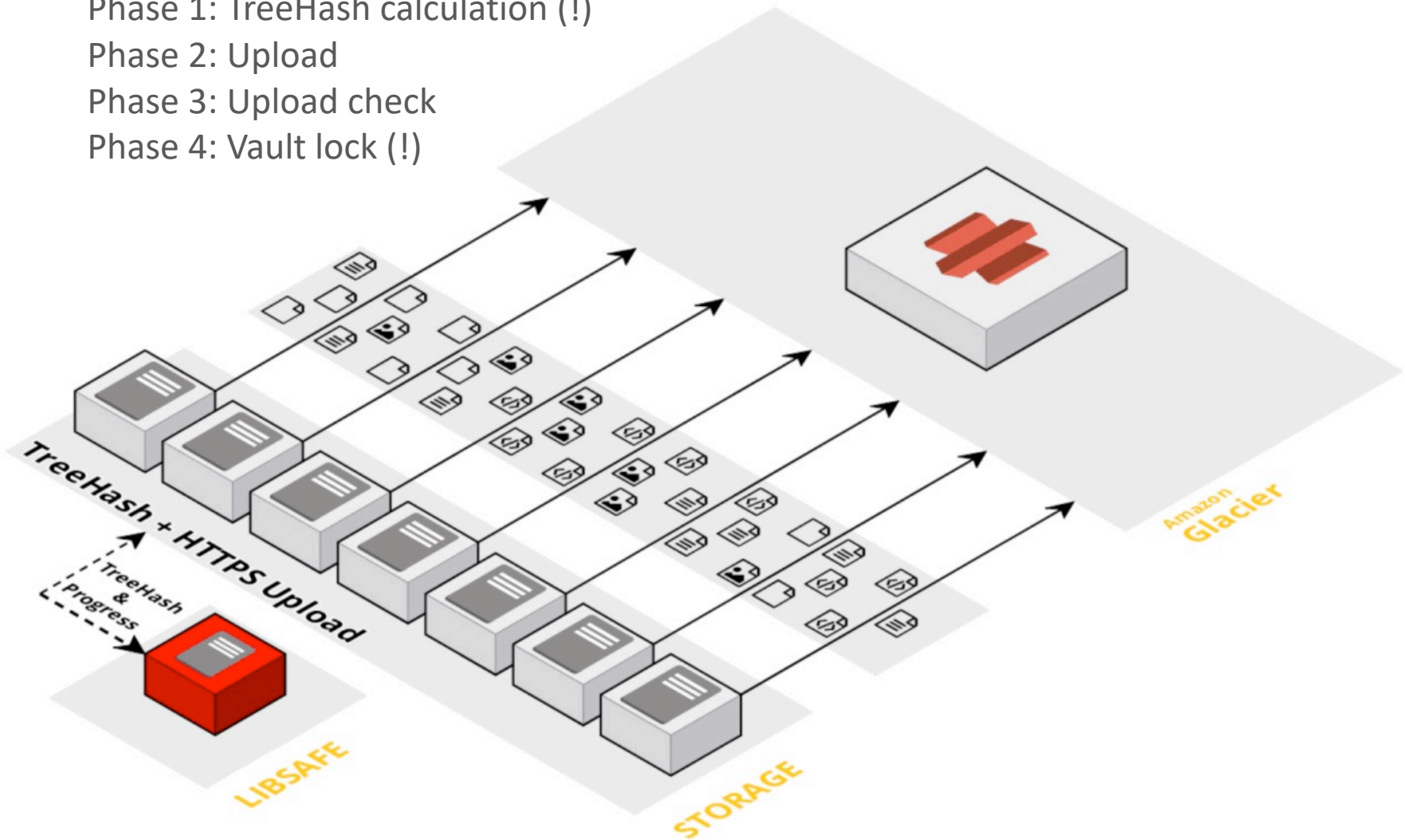
## Process: Storing

Phase 1: TreeHash calculation (!)

Phase 2: Upload

Phase 3: Upload check

Phase 4: Vault lock (!)



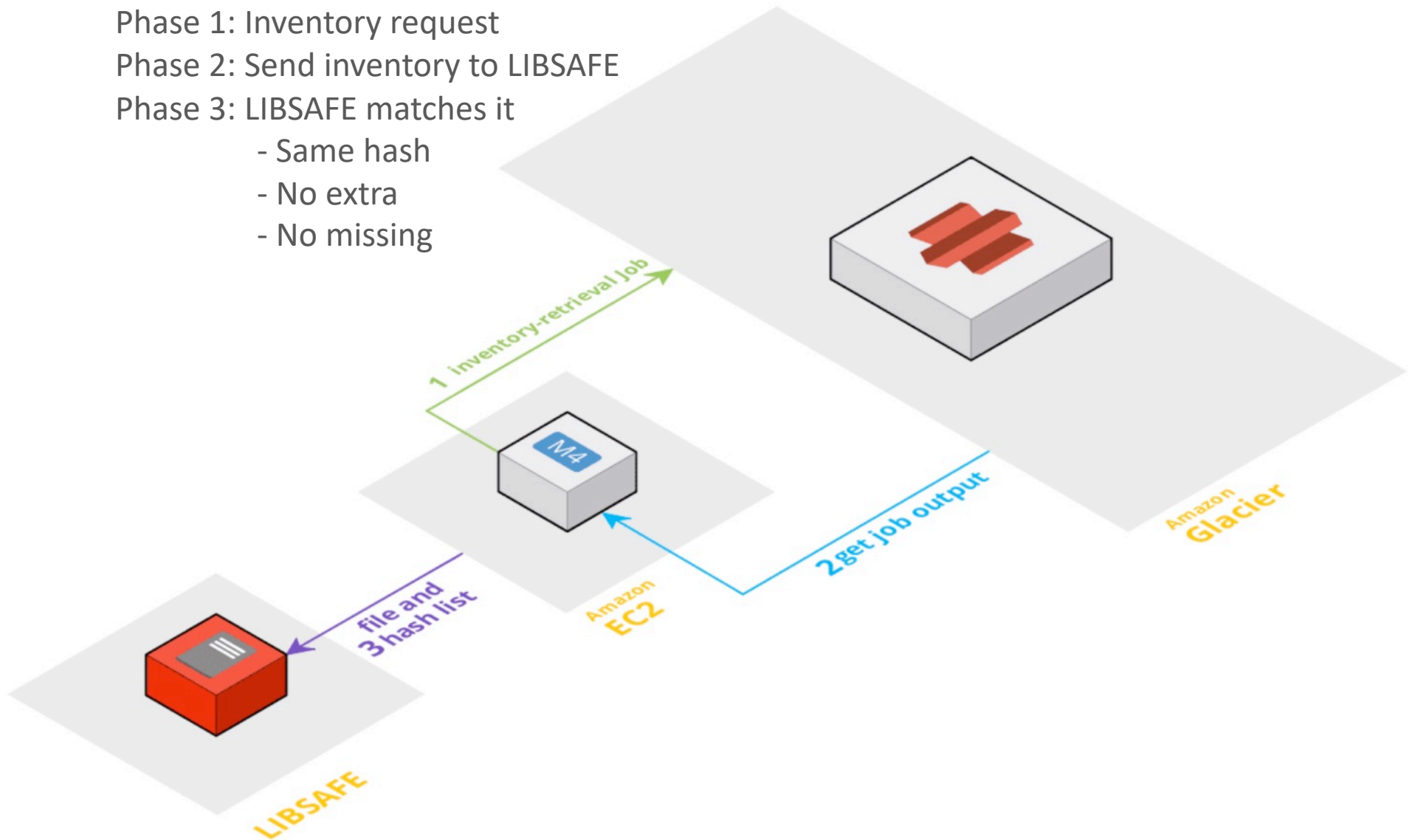
## Process: Audit level 1

Phase 1: Inventory request

Phase 2: Send inventory to LIBSAFE

Phase 3: LIBSAFE matches it

- Same hash
- No extra
- No missing



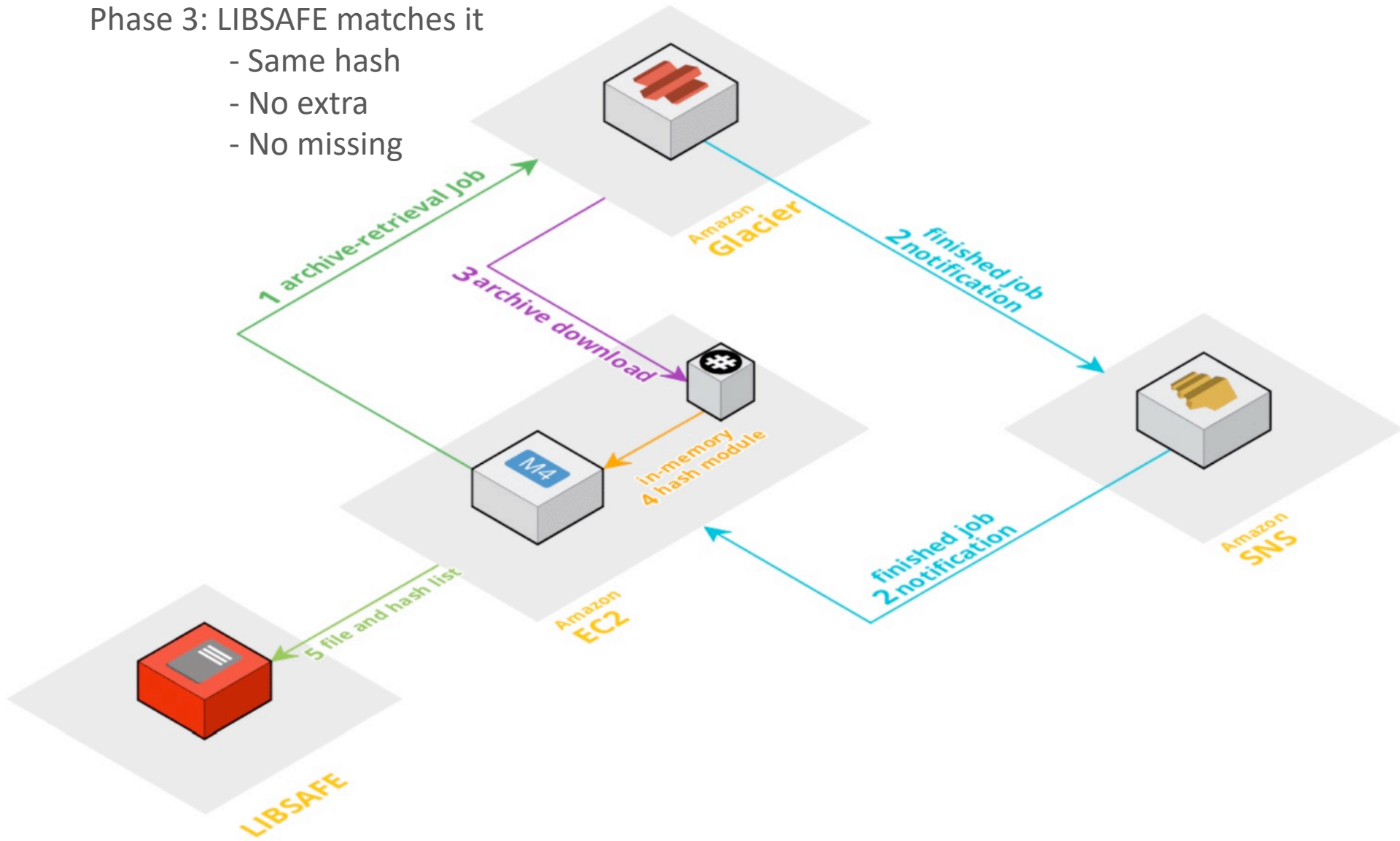
## Process: Audit level 2

Phase 1: Random % select and Glacier request using AWS SNS

Phase 2: in-memory SHA 256 hash to create results list

Phase 3: LIBSAFE matches it

- Same hash
- No extra
- No missing



Antonio Guillermo Martinez  
a.guillermo@libnova.com

Twitter @libnova

**LIBNOVA EUROPE**

Paseo de la Castellana, 153  
Madrid - España  
Tel: +34 91 449 08 94  
Fax: +34 91 141 21 21  
contacto@libnova.com

**LIBNOVA AMERICA**

14 NE First Ave (2nd Floor)  
Miami, Florida 33132, USA  
Tel: +1 844-894-6532  
contact@libnova.com

