THREAT AND RISK ANALYSIS

Bank of Anthos

Anthos Bank Investment Ltd.

Version	1.1
Date	2020-07-02
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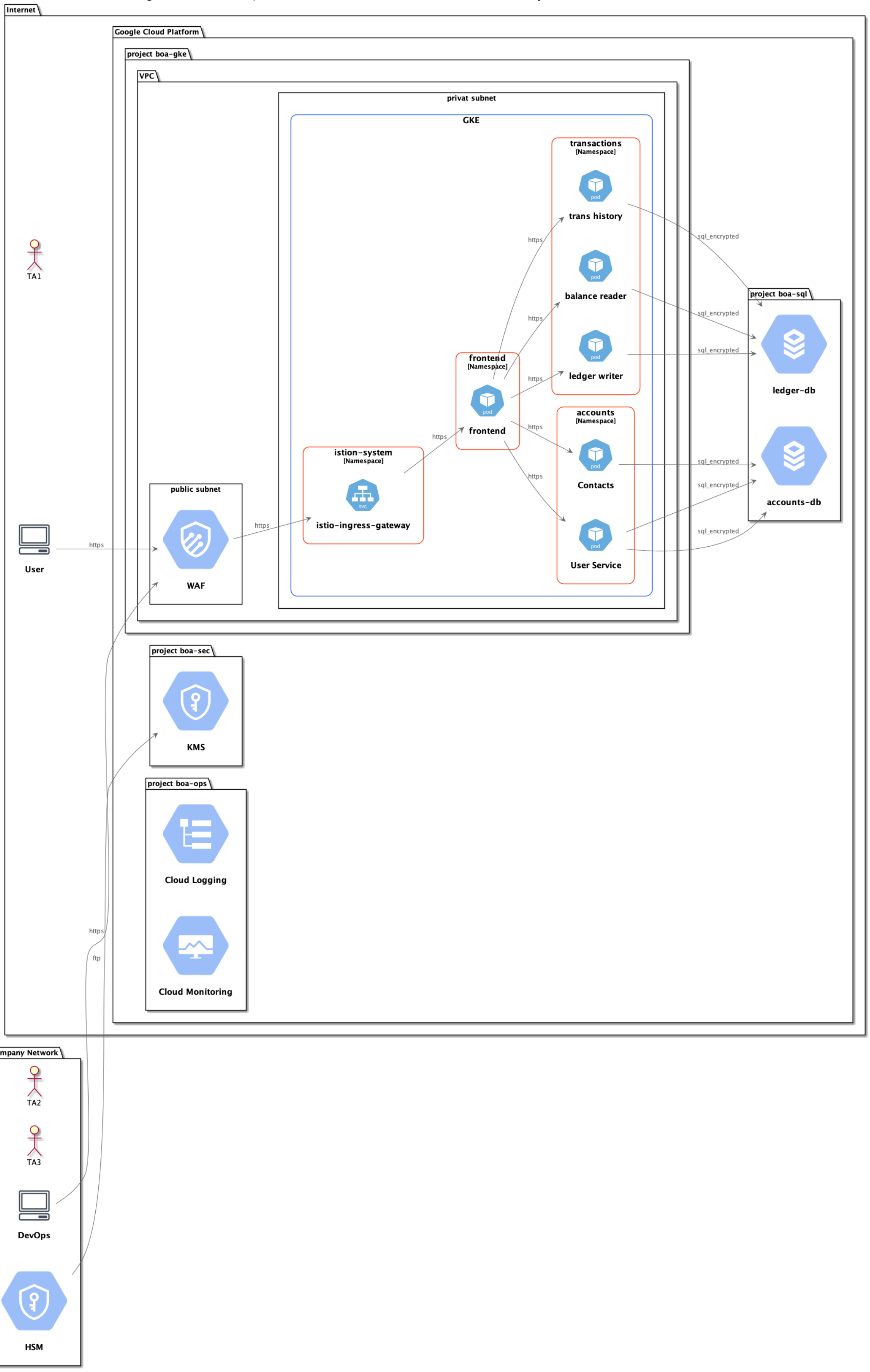
Scope and Assumptions

System Description

The Data Flow Diagram below provides an overview of the analyzed architecture.



Trust Boundaries

Name	Technology	Description
Internet	internet	Internet
Google Cloud Platform	internet	Google Cloud
project boa-gke	subscription	Google Project
VPC	vpc	Virtual Private Cloud
public subnet	subnet	internet facing zone
privat subnet	subnet	Application Network
GKE	kubernetes-cluster	kubernetes cluster
frontend	kubernetes-network-policies	kubernetes frontend namespace
accounts	kubernetes-network-policies	kubernetes default namespace
transactions	kubernetes-network-policies	kubernetes default namespace
istion-system	kubernetes-network-policies	kubernetes istio-system
project boa-sql	cloud-services	Azure Shared Services
project boa-sec	project	Contains Secret Manager and KMS instances for secrets that are specific to the Bank of Anthos application.
project boa-ops	project	Used for storing environment logs as well as monitoring the environment instance of the Bank of Anthos application.
Company Network	on-premise	trusted on-premise company network

Technical Assets

Name	Technology	Description
User	browser	The browser used by the end customer
DevOps	devops-client	laptop used by developers and operators to manage the system
WAF	waf	Google Cloud Armor Web Application Firewall
istio-ingress-gateway	kubernetes-ingress	ISTIO ingress gateway
frontend	kubernetes-pod	Exposes an HTTP server to serve the website. Contains a login page, a signup page, and a home page.
User Service	kubernetes-pod	
Contacts	kubernetes-pod	Stores a list of additional accounts that are associated with a user. These accounts are listed in the application's Send Payment and Deposit forms.
User Service	kubernetes-pod	Manages user accounts and authentication. The service signs JWTs that are used for authentication by other services.
ledger writer	kubernetes-pod	Accepts and validates incoming transactions before writing them to the ledger.
balance reader	kubernetes-pod	Provides an efficient readable cache of user balances, as read from ledger-db.
trans history	kubernetes-pod	Provides an efficient readable cache of past transactions, as read from ledger-db.
accounts-db	database-sql	SQL database
ledger-db	database-nosql	CloudSQL for hyperledger
KMS	hsm	Google Key Management Service
HSM	hsm	on-premise Harware Security Module (HSM)
Cloud Logging	logging	Cloud Monitoring
Cloud Monitoring	monitoring	KMS

Problem Description

Data Assets

The following data assets are used:

Name	Description	C	I	A
A1	Angular and other client-side code delivered by the application.	1	1	1
A2	OIDC identity token	2	1	1
A3	OAuth2 access token	2	1	1
A4	OAuth2 refresh token	2	1	1
A5	product catalog	1	1	1
A6	root certificates	3	2	2

Threat Agents

The following threat agents are used:

Name	Description
TA1	external threat agent
TA2	authorized employee
TA3	Employee of the company that is not authorized to access the system

Risk Assessment

Risk Matrix

We follow the OWASP Risk Rating Methodology.

Overall Risk Severity = Impact x Likelihood				
Impact	HIGH	Medium	High	Critical
	MEDIUM	Low	Medium	High
	LOW	Low	Low	Medium
		LOW	MEDIUM	HIGH
	Likelihood			

Identified Risks

The following risks have been identified:

ID	Likelihood	Impact	Severity	Risk
0	LOW(1)	HIGH(3)	LOW(3)	CWE-319 Unencrypted Communication: asset 'hsm' communicating to 'kms' uses insecure protocol 'ftp' Data at transition should be encrypted. Mitigation: apply an authentication method to the technical asset.

Methodology

STRIDE

Likelihood Scale

Impact Scale

About Taralizer

Risk rules checked by Taralizer

OWASP Application Security Verification Standard - 4.0.2

The OWASP Application Security Verification Standard is specified HERE

The following list provides supported rules:

Rule missing-authentication

Title	Missing Authentication
Description	Technical assets should autheticate incoming requests.
CWE	306
Mitigration	apply an authentication method to the technical asset.
URL	https://cheatsheetseries.owasp.org/cheatsheets/Transport_Layer_Protection_Cheat_Sheet.html
Base Likelihood	HIGH(3)
Base Impact	MEDIUM(2)

Rule insecure-proto

Title	Unencrypted Communication
Description	Data at transition should be encrypted.
CWE	319
Mitigration	apply an authentication method to the technical asset.
URL	https://cheatsheetseries.owasp.org/cheatsheets/Transport_Layer_Protection_Cheat_Sheet.html
Base Likelihood	HIGH(3)
Base Impact	MEDIUM(2)

Rule missing-vault

Title	Missing Vault (Secret Storage)
Description	In order to avoid the risk of secret leakage via config files (when attacked through vulnerabilities being able to read files like Path-Traversal and others), it is best practice to use a separate hardened process with proper authentication authorization, and audit logging to access config secrets (like credentials, private keys, client certificates, etc.). This component is usually some kind of Vault.
CWE	522
Mitigration	Consider using a Vault (Secret Storage) to securely store and access config secrets (like credentials, private keys, client certificates, etc.)
URL	https://cheatsheetseries.owasp.org/cheatsheets/Cryptographic_Storage_Cheat_Sheet.html
Base Likelihood	LOW(1)
Base Impact	LOW(1)

Rule missing-waf

Title	Missing Web Application Firewall (WAF)
Description	To have a first line of filtering defense, security architectures with web-services or web-applications should include a WAF in front of them. Even though a WAF is not a replacement for security (all components must be secure even without a WAF) it adds another layer of defense to the overall system by delaying some attacks and having easier attack alerting through it
CWE	1008

Mitigration	Consider placing a fully-managed Web Application Firewall (WAF) in front of the web-services and/or web-applications
URL	https://cheatsheetseries.owasp.org/cheatsheets/Virtual_Patching_Cheat_Sheet.html
Base Likelihood	LOW(1)
Base Impact	LOW(1)

Rule cross-site-scripting

Title	Cross-Site Scripting (XSS)
Description	For each web application Cross-Site Scripting (XSS) risks might arise. In terms of the overall risk level take other applications running on the same domain into account as well.
CWE	79
Mitigration	Try to encode all values sent back to the browser and also handle DOM-manipulations in a safe way to avoid DOM-based XSS. When a third-party product is used instead of custom developed software, check if the product applies the proper mitigation and ensure a reasonable patch-level.
URL	https://cheatsheetseries.owasp.org/cheatsheets/Cross_Site_Scripting_Prevention_Cheat_Sheet.html
Base Likelihood	MEDIUM(2)
Base Impact	MEDIUM(2)

Disclaimer

Ferenc Bator conducted this threat analysis using the open-source TARALIZER toolkit on the applications and systems that were modeled as of this report's date. Information security threats are continually changing, with new vulnerabilities discovered on a daily basis, and no application can ever be 100% secure no matter how much threat modeling is conducted. It is recommended to execute threat modeling and also penetration testing on a regular basis (for example yearly) to ensure a high ongoing level of security and constantly check for new attack vectors. This report cannot and does not protect against personal or business loss as the result of use of the applications or systems described. Ferenc Bator and the TARALIZER toolkit offers no warranties, representations or legal certifications concerning the applications or systems it tests. All software includes defects: nothing in this document is intended to represent or warrant that threat modeling was complete and without error, nor does this document represent or warrant that the architecture analyzed is suitable to task, free of other defects than reported, fully compliant with any industry standards, or fully compatible with any operating system, hardware, or other application. Threat modeling tries to analyze the modeled architecture without having access to a real working system and thus cannot and does not test the implementation for defects and vulnerabilities. These kinds of checks would only be possible with a separate code review and penetration test against a working system and not via a threat model. By using the resulting information you agree that John Doe and the Threagile toolkit shall be held harmless in any event. This report is confidential and intended for internal, confidential use by the client. The recipient is obligated to ensure the highly confidential contents are kept secret. The recipient assumes responsibility for further distribution of this document. In this particular project, a timebox approach was used to define the analysis effort. This means that the author allotted a prearranged amount of time to identify and document threats. Because of this, there is no guarantee that all possible threats and risks are discovered. Furthermore, the analysis applies to a snapshot of the current state of the modeled architecture (based on the architecture information provided by the customer) at the examination time.

Report Distribution

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