Secure authentication mechanisms

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WP9T2 / PSNC

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Agenda

- brief SymbIoTe H2020 project introduction
- Multi-level security
  - Cohesive design driven responsibility separation
- Workshop part 1. Mutual Authentication
- Workshop part 2. Attributes Based Authorization Control

Goals (Learn about):

- security best practices & design goals **YOU** can (should) apply
  - and tools to support them
  - any why it is safer not to reinvent the wheel
- our design mistakes
  - and how **YOU** can avoid them
- why some security related questions cannot be (simply) answered

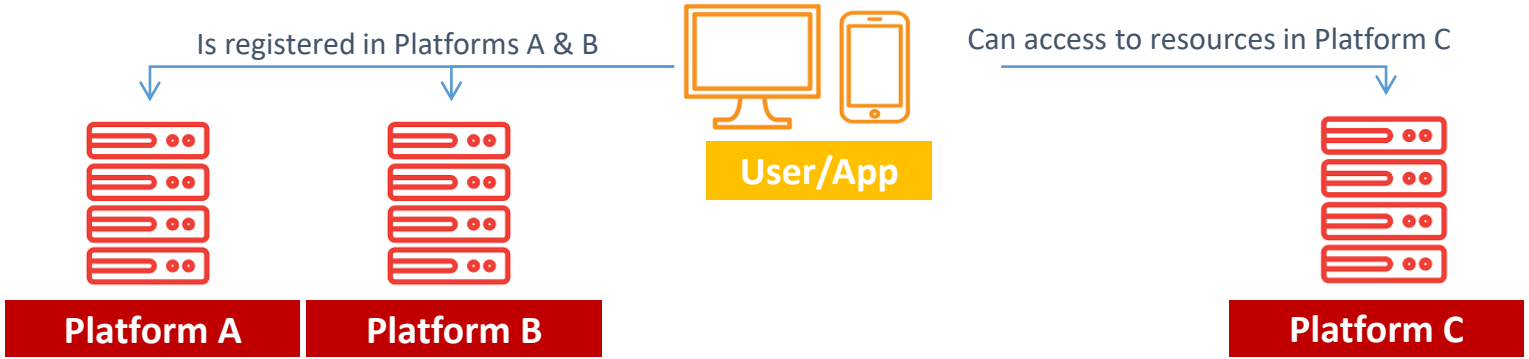
H2020 SymbIoTe Motivation: A simple interoperable IoT app

- Universal light switch on your mobile phone
  - … switch on/off the lights wherever you go (at home, in the office, in public spaces…)
  - … but of course, only if you are allowed to do so…

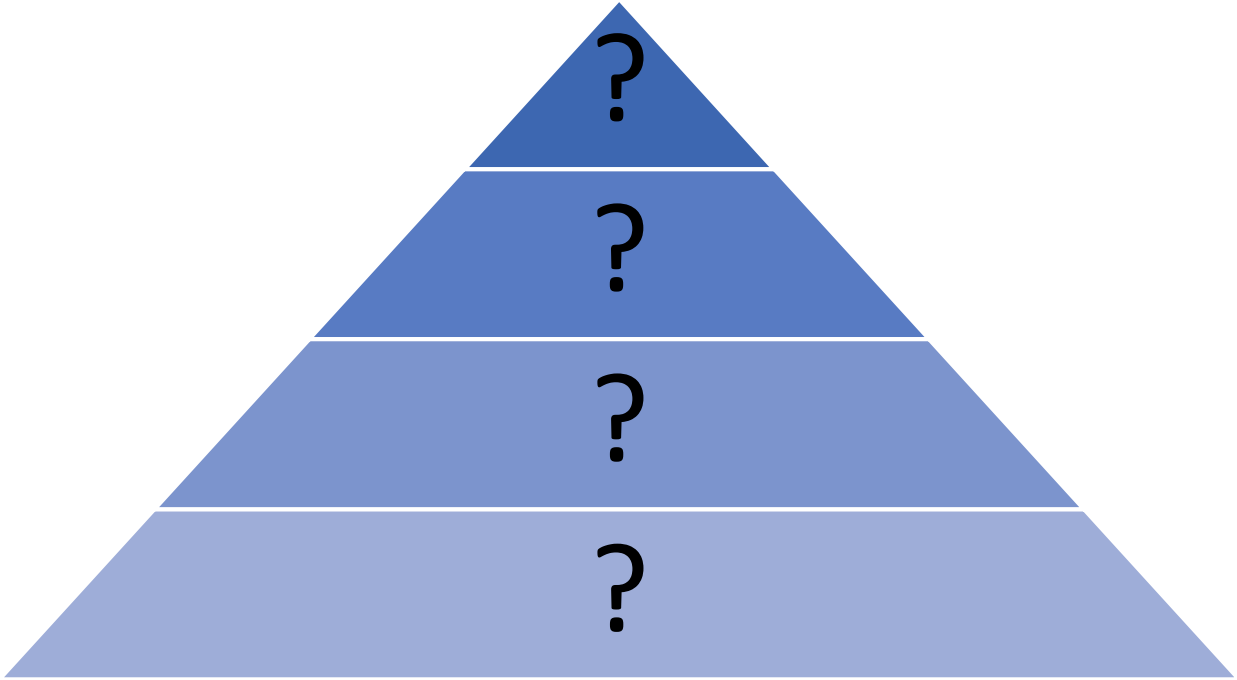
Main goal and approach

- Target goals:
  - **generic…**
  - **secure…**
  - **multi-domain…**
  - **attributes-based**
  - **access right composition.**

Authorizing users registered in one or more A&A authorities to access resources exposed elsewhere



Security solution layers (0)



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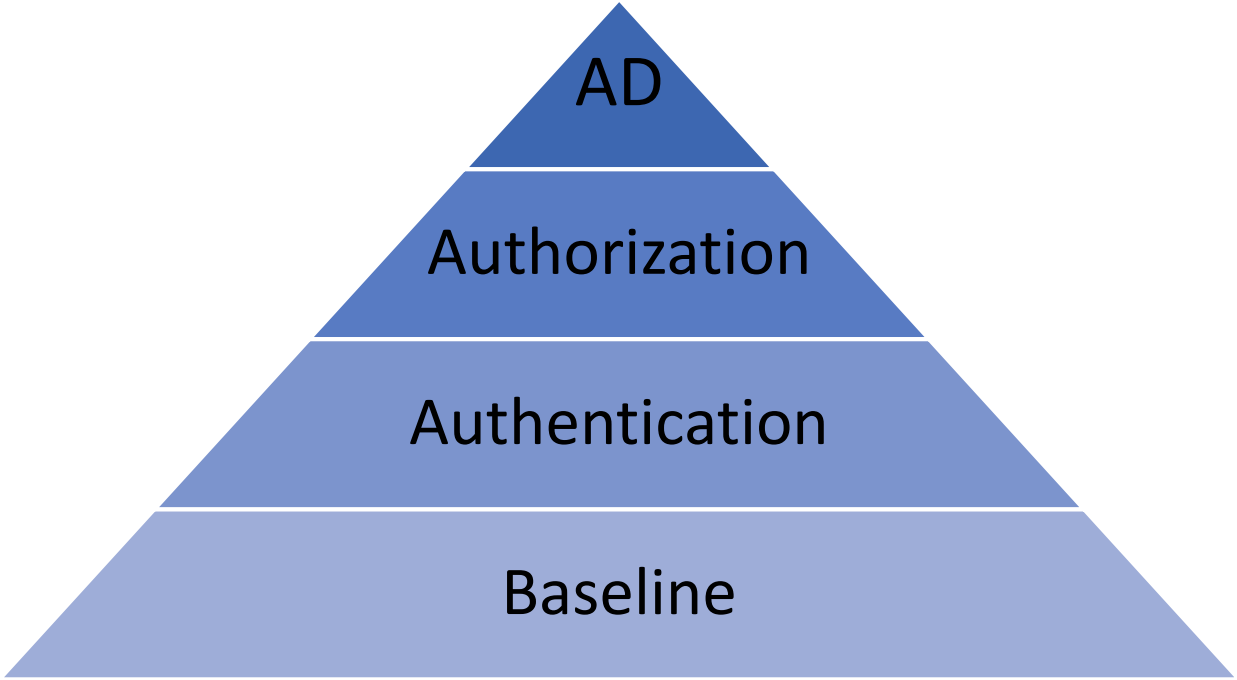
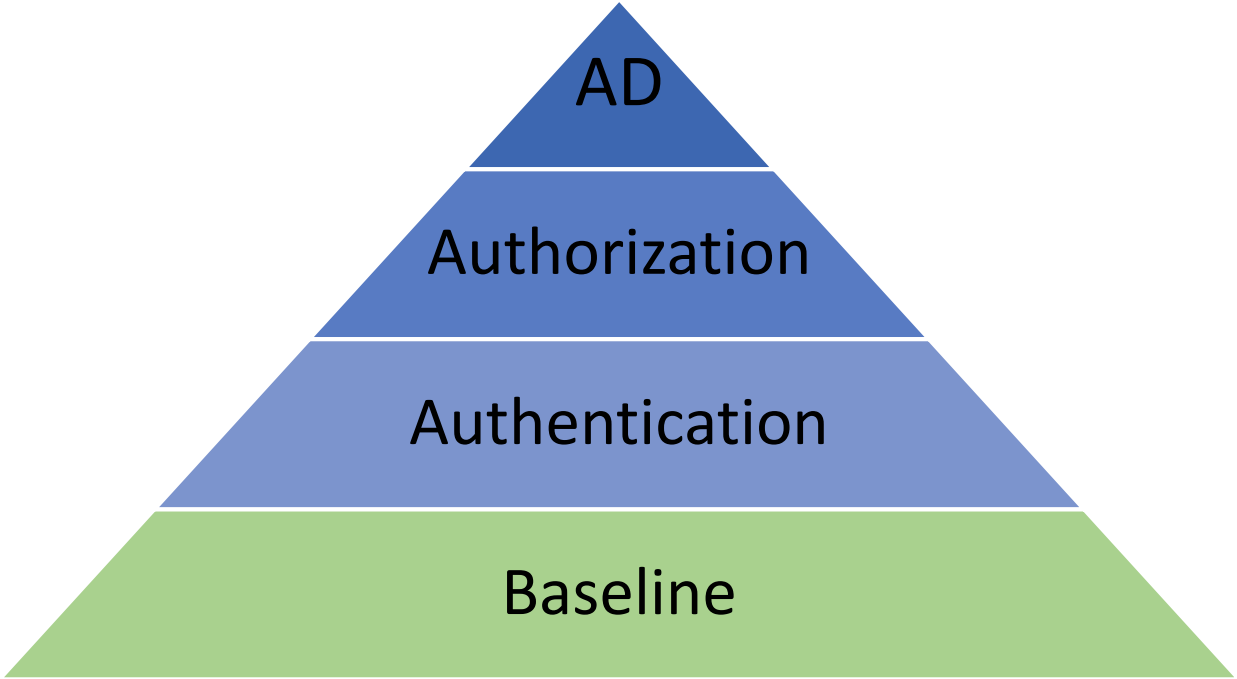
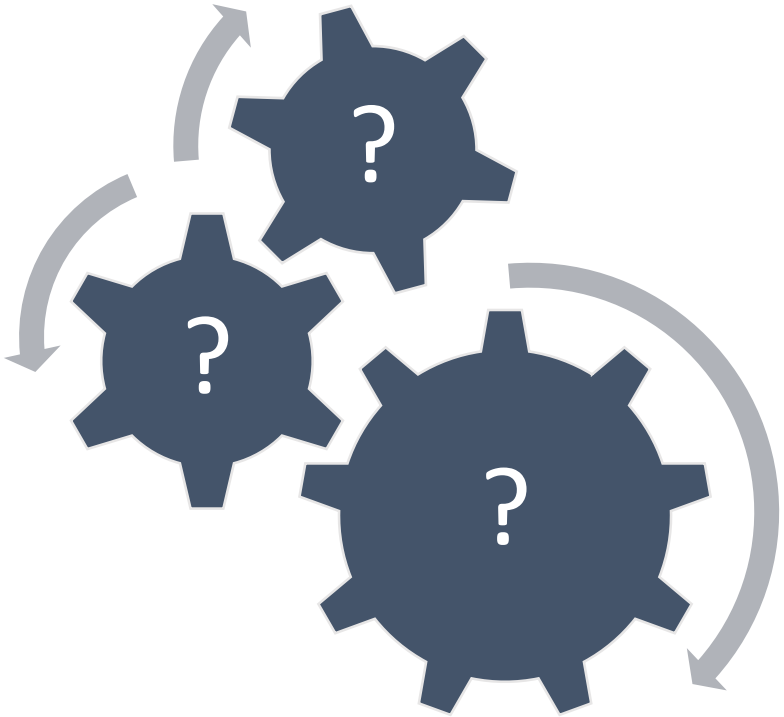


Divide (your design) and conquer!

Security solution layers (1)



Baseline security



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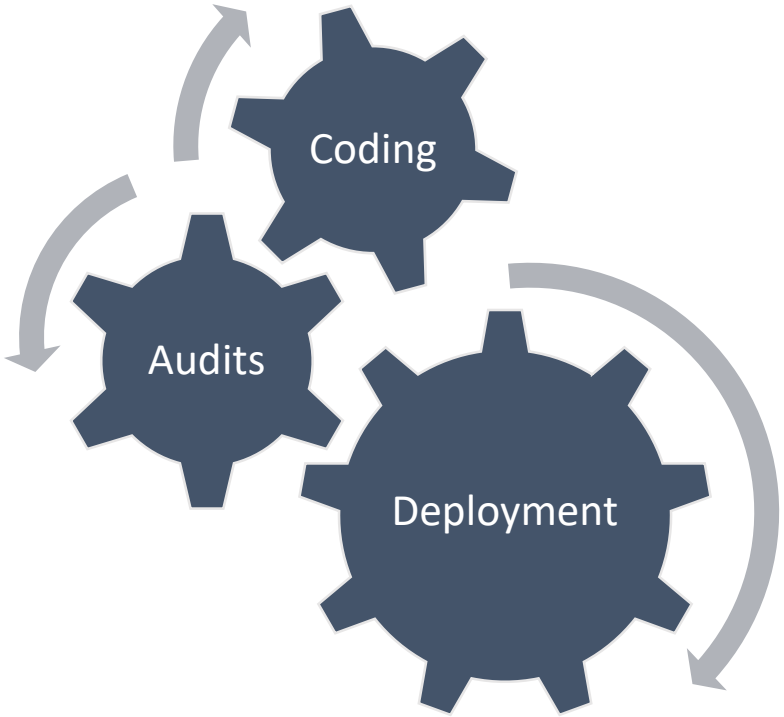
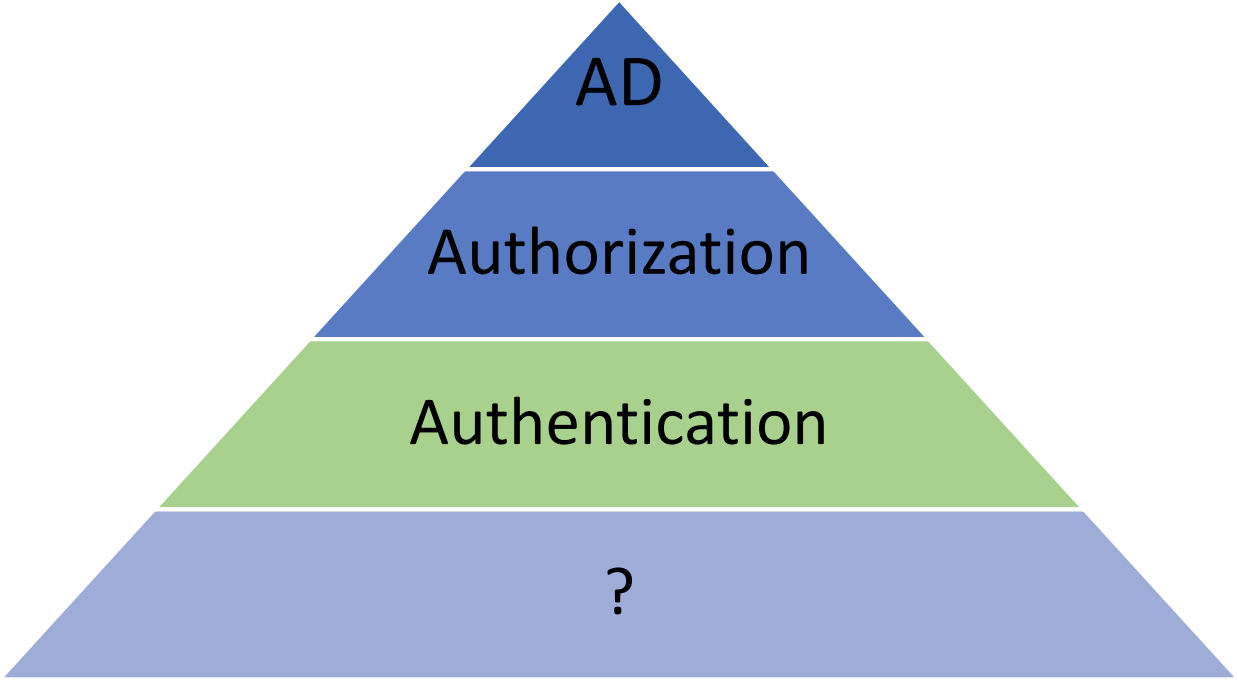


Ask SecOps for assistance in baseline security

Code quality ahead of features

Security solution layers (2)



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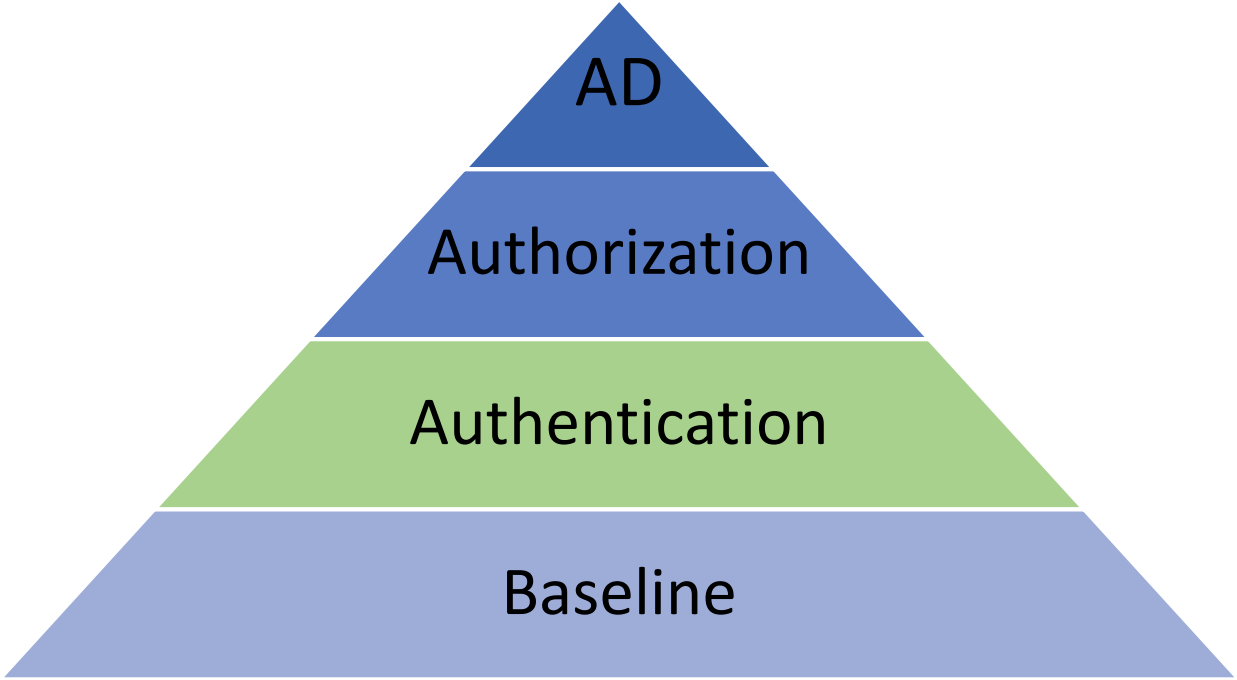
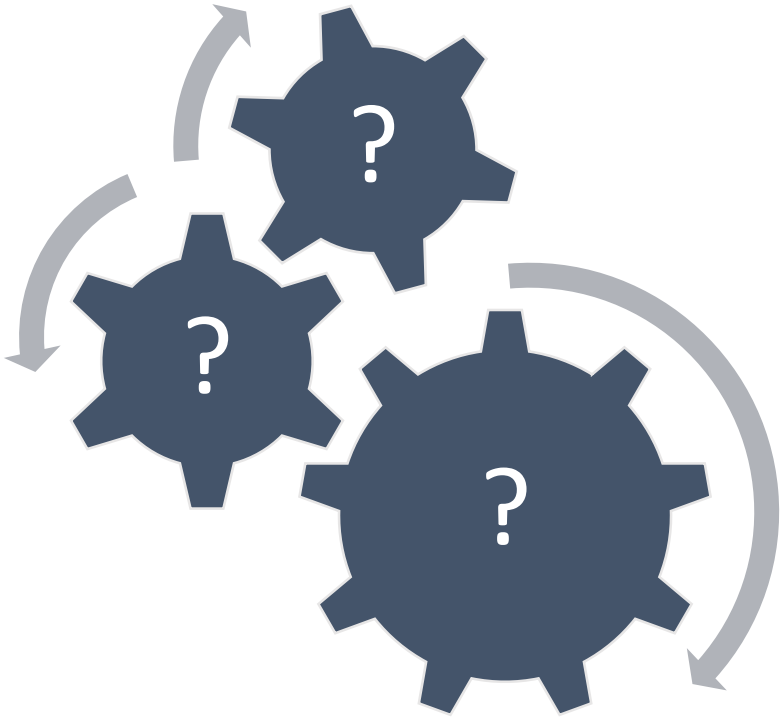


Authentication layer components (concepts)



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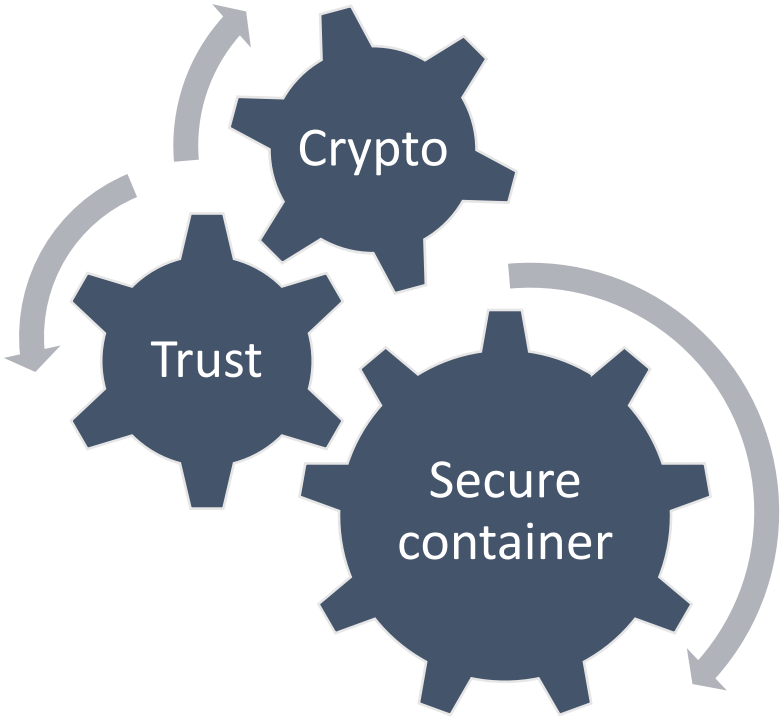
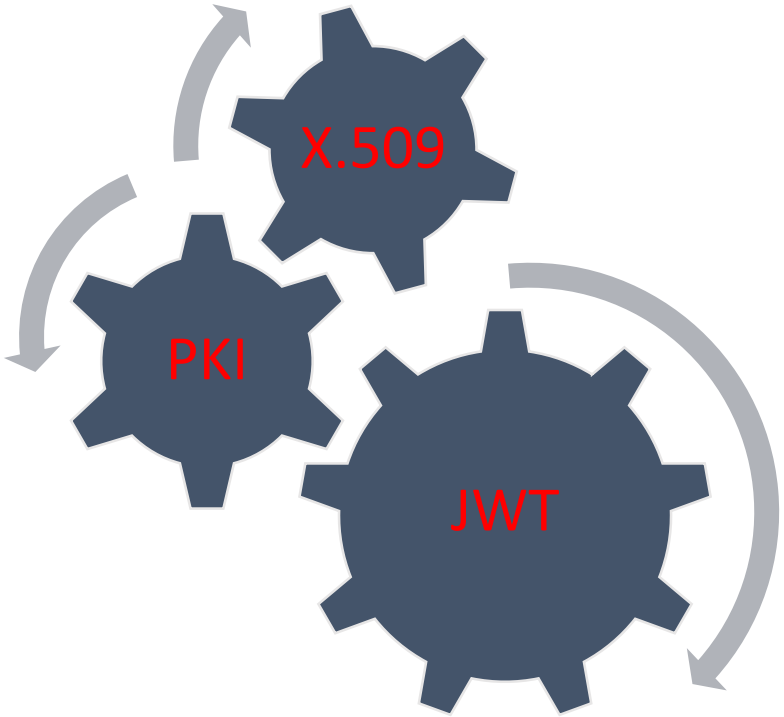


Authentication layer in SymbIoTe



Security material containers - JSON Web Tokens

- Well-known structure* used for storing client's attributes
  - Basically a key-value map
- Extendable with any custom claims (attributes)
- Highly configurable as can be used to provide
  - Trust -> JWSignature or
  - Confidentiality -> JWEncryption

*RFC 7519 https://tools.ietf.org/html/rfc7519
resources https://jwt.io/

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jti = JWT_ID
alg = $ECDSA_{256}$
iss = AAM_ID
sub = APP_ID
iat = ISSUE_DATE
exp = EXPIRATION_DATE
ipk = AAM_PUBLIC_KEY
spk = APP_PUBLIC_KEY
att = ATTRIBUTE_VALUE
ttyp = TOKEN_TYPE
sign = SIGN-$ECDSA_{256}$($H(T_U)$, AAM_PRIVATE_KEY)

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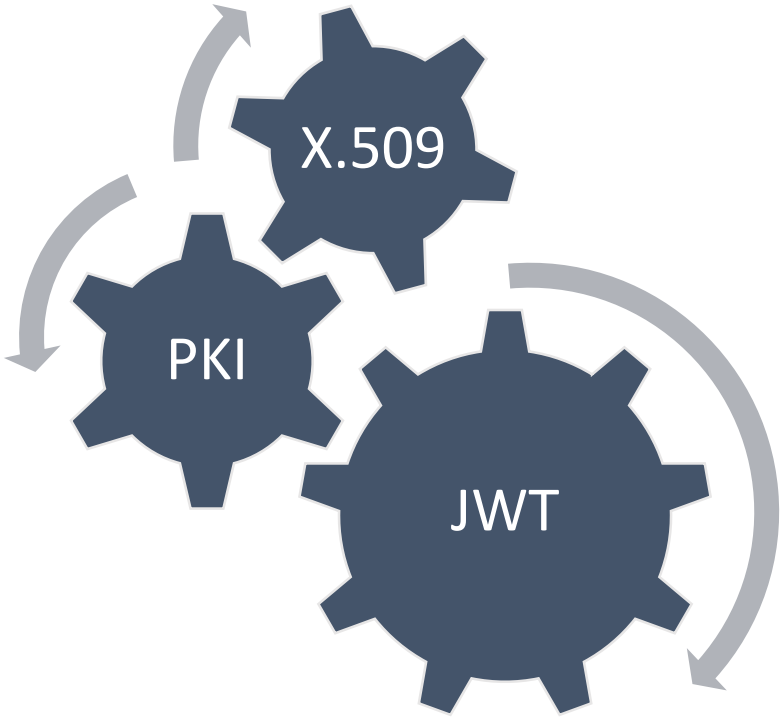
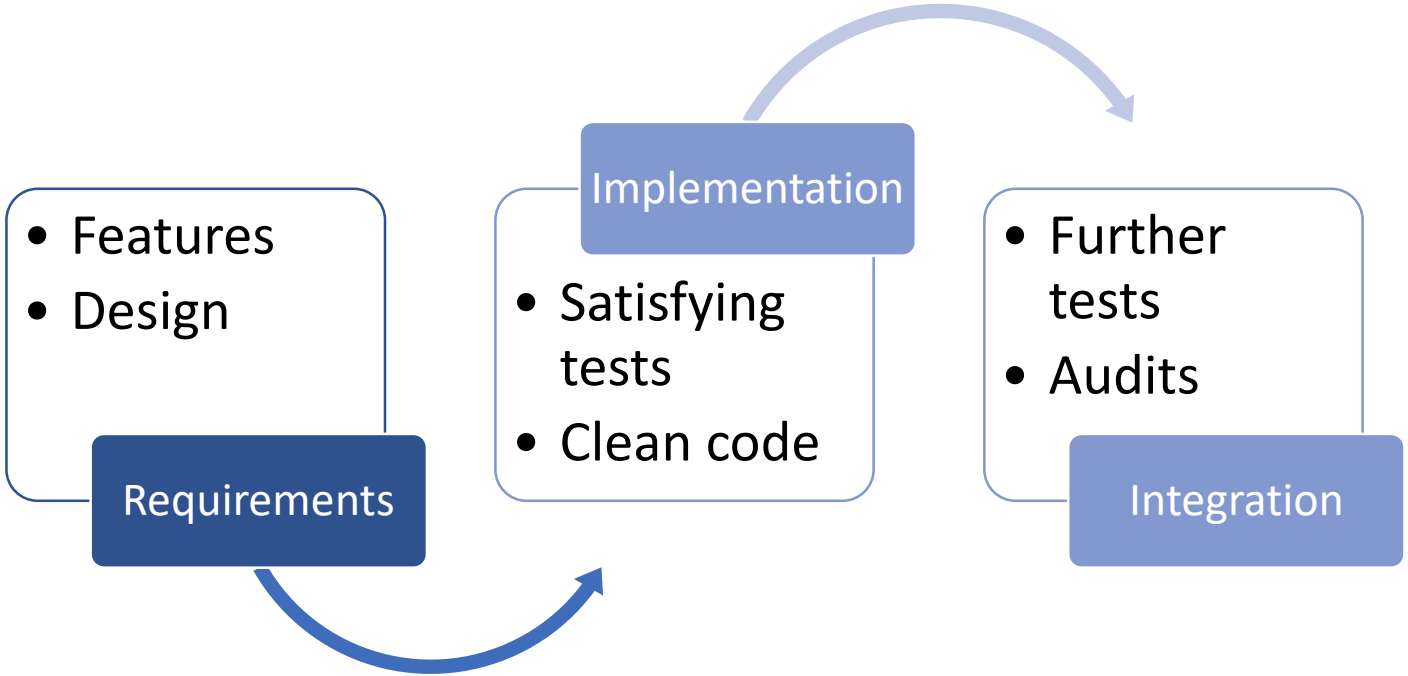
Authentication layer



Short relief

Let’s talk about SDLC

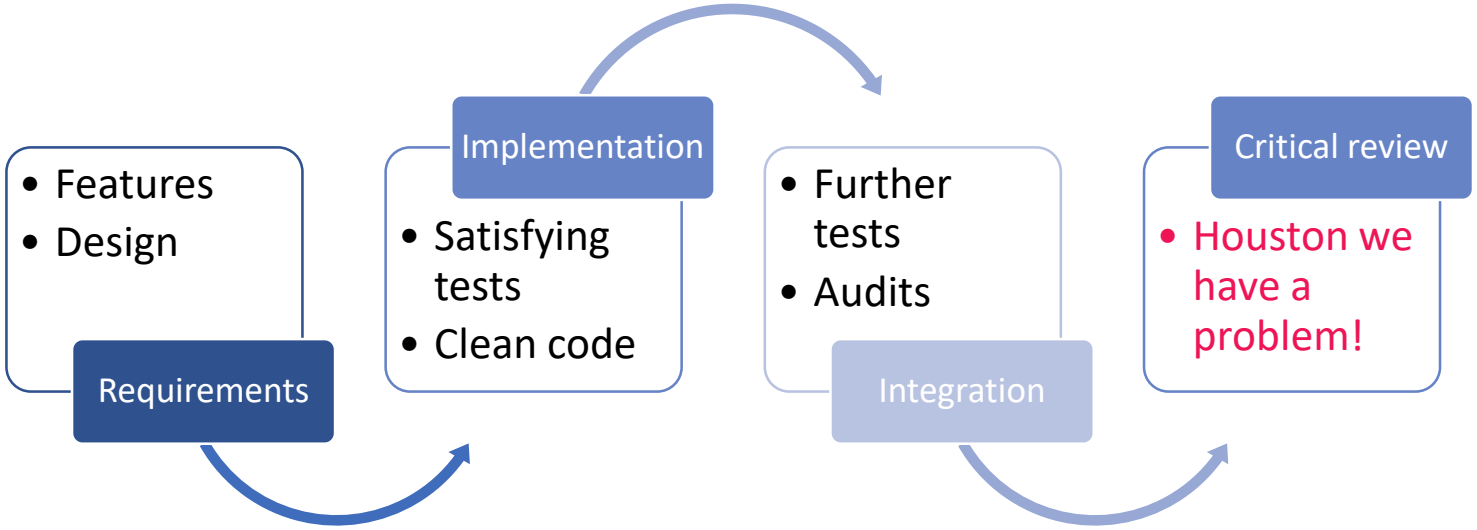
Software development life-cycle



Initial implementation (release) review results

- PKI
  - actors' management done
  - issuing & revoking certificates by username and password done
- JWT
  - Generating Auth(Z) payloads for actors
    by Auth(N) using username and password done
- Authorization using acquired JWT is working
- Ready to code new features! :D

Software development life-cycle



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Task 1

- Authenticate yourself and claim your certificate!

Security material containers - JSON Web Tokens

- Well-known structure used for storing client's attributes
- Extendable with any custom claims (attributes)
- Configurable for a variety of purposes
  - Authorization JWS – described later
  - Introduced
    - (authorization token) Acquisition JWS - two step process
      - First issuing certificate using username and master password
      - Daily basis use of the client certificate
    - …

Auth(Z) token Acquisition JWS

- Mandatory information
  - ?
  - ?
  - ?

Auth(Z) token Acquisition JWS

- Mandatory information
  - ?
  - ?
  - ?

alg = $ECDSA_{256}$
iss = ACTOR_ID
sub = CLIENT_ID
iat = ISSUE_DATE
exp = EXPIRATION_DATE
sign = SIGN-ECDSA256(H(T_U), A_PRIVATE_KEY)

Task 2

- Claim your token!

Security material containers - JSON Web Tokens

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  - (authorization token) Acquisition JWS - two step process
    - First issuing certificate using username and master password
    - Daily basis use of the client certificate
  - Other?

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  - (authorization token) Acquisition JWS - two step process
    - First issuing certificate using username and master password
    - Daily basis use of the client certificate
  - Authentication (challenge) JWS

Auth(N) challenge-response JWS

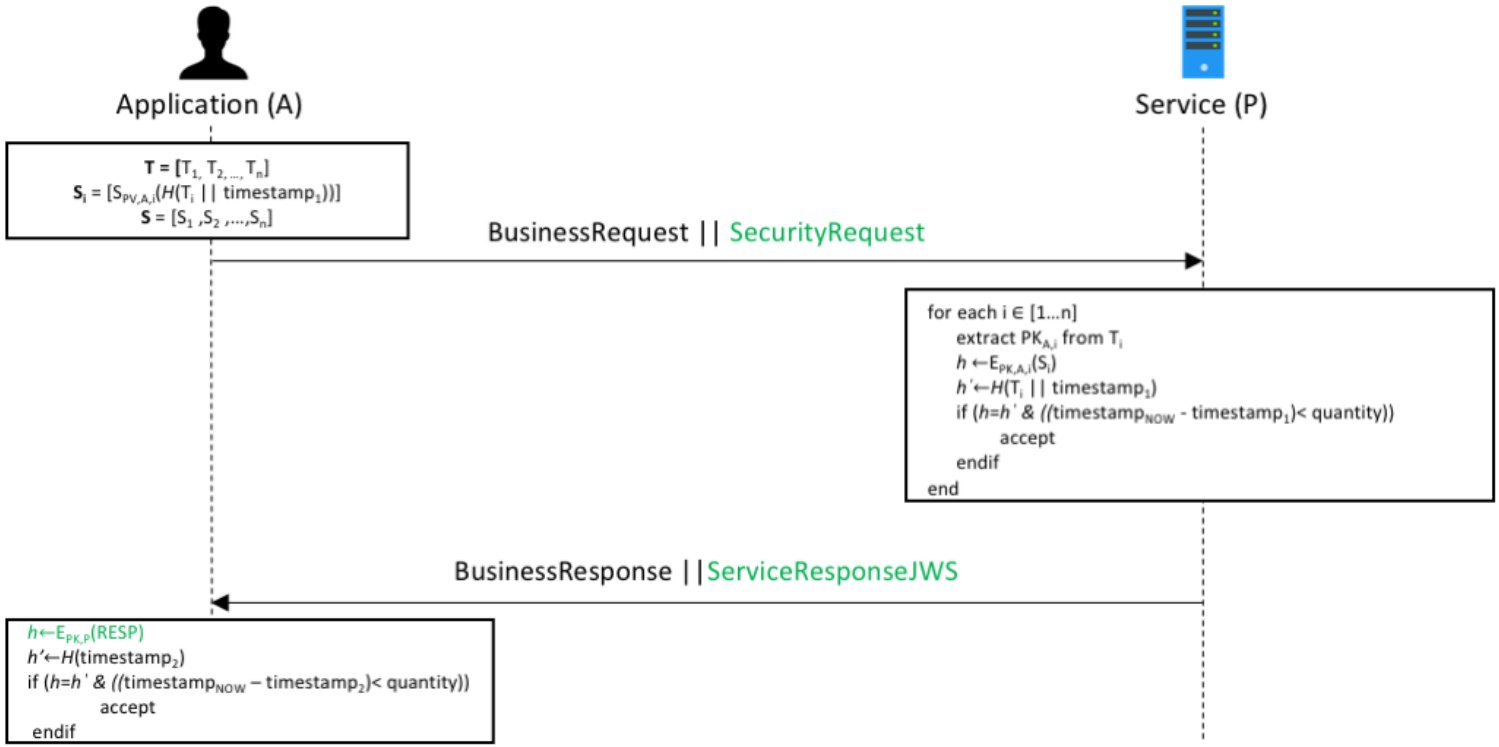
- Why?
- What to prove?
- How?

Auth(N) challenge-response JWS

- Why?
  - Auth(Z) token stateless
- What to prove?
  - Ownership / identity
- How?
  - By signing
  - Including timestamp!!!

iss = sub$_T$ = APP_ID
sub = jti$_T$ = JWT_ID
ipk = spk$_T$ = APP_PUBLIC_KEY
hash = hashed(TOKEN+TIMESTAMP)
iat = ISSUE_DATE
exp = EXPIRATION_DATE
sign = SIGN-ECDSA$_{256}$(H(T_U), APP_PRIVATE_KEY)

Auth(N) by challenge-response JWSes



Task 3

- Prove that you are you,
- and the server is who you think it is!

Don’t reinvent the wheel
Open acknowledged standards FTW
Let someone review your processes

Summary

Baseline

Authentication

Authorization

Anomalies

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Authorization	Coming soon on Workshop 2 Part 2!
Anomalies	Coming soon on Workshop 2 Part 2!
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Thank you

Any questions?

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