Incremental Threat Modelling

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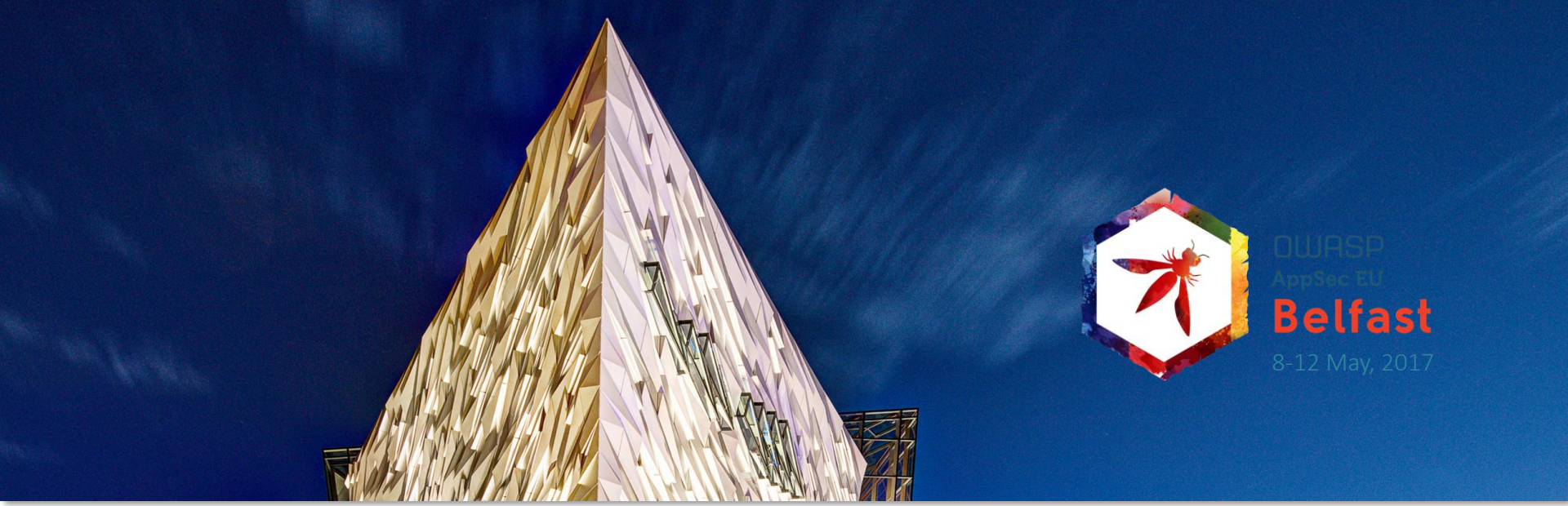
Principal Security Consultant



Never try to boil an ocean

Who am I

- Coming from software development and architecture
  - 20 years as software engineer, architect, technical lead
- Variety of consulting and testing work
  - From corporations to start-ups
- Favourite engagement type – threat modelling

Agenda

- STRIDE – quick recap
- Introducing our example
- Incremental modelling walk-through
- Sting in the tail
- Conclusions
- Q&A

Threat modelling - reminder

- Decompose architecture using DFDs
- Search for threats using STRIDE
- Rank or quantify – out of scope for today

Data Flow Diagrams

External Entity	Process	Data Flow	Data Store	Trust Boundary
• People • Other systems	• Logical component • Service • Process in memory	• RPC • Network traffic • File I/O	• Database • File • Queue/Stack	• Process boundary • Network boundary





STRIDE

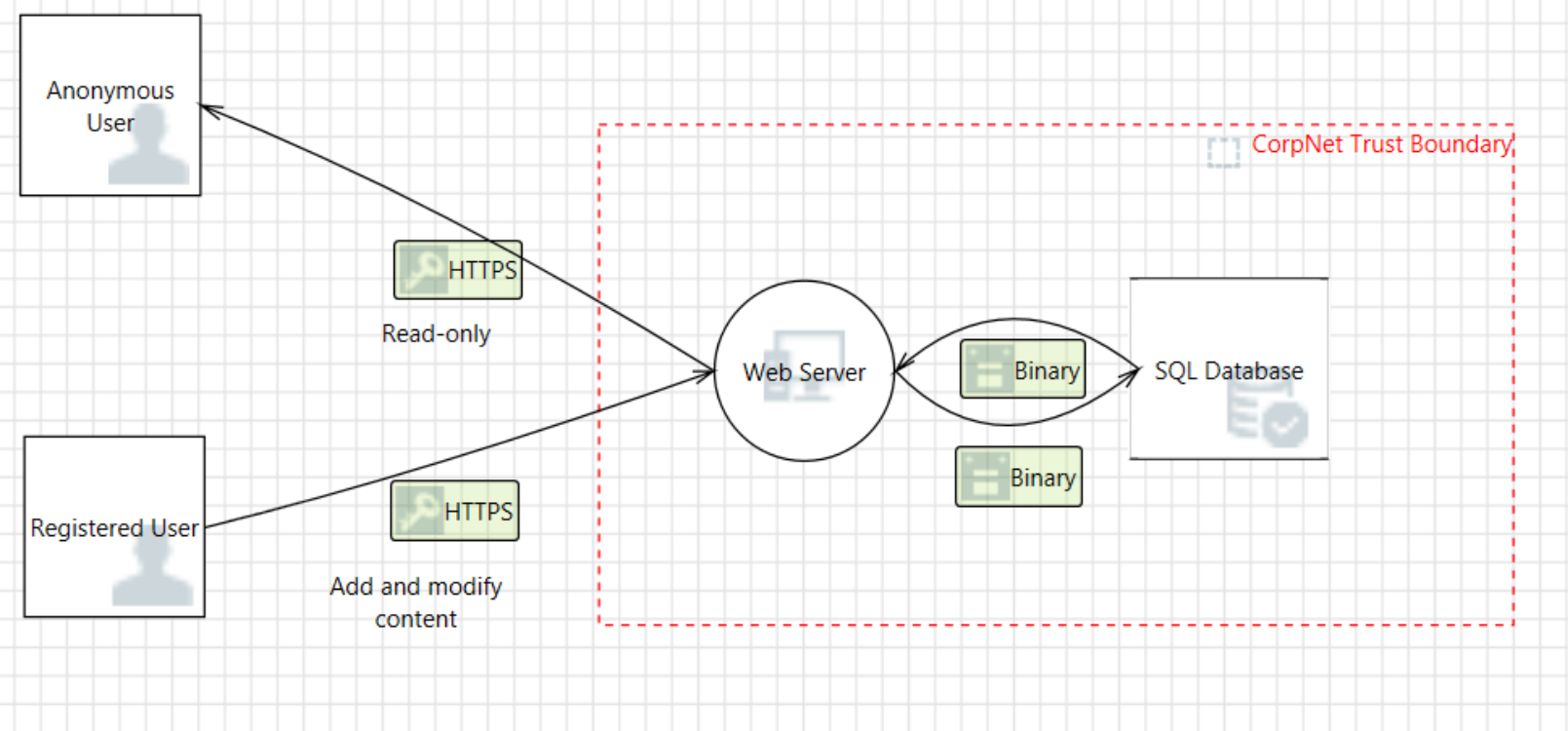
OWASP AppSec EU Belfast

Threat	Property	Definition
Spoofing	Authentication	Impersonating something or someone else
Tampering	Integrity	Modifying data or code
Repudiation	Non-repudiation	Claiming to have not performed an action
Information Disclosure	Confidentiality	Exposing information to non-authorised party
Denial of Service	Availability	Deny or degrade service
Elevation of Privilege	Authorization	Gain capabilities without proper authorisation

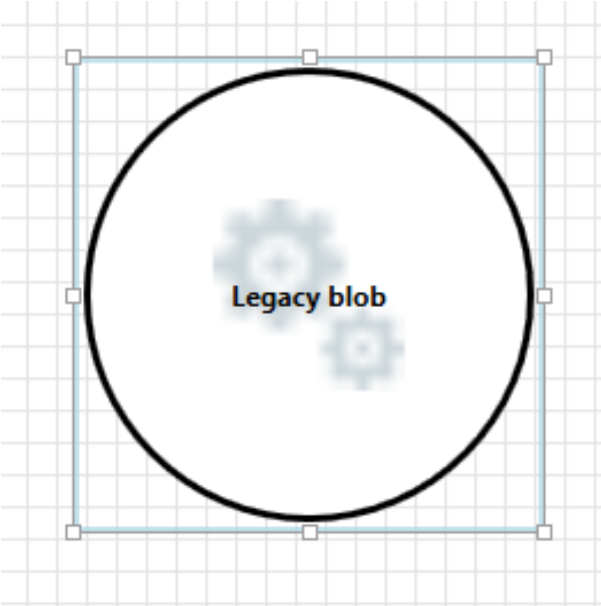
Introducing our example

- Explain the existing architecture and the feature we are planning to add
- Pretend that threat model for the existing part does not exist
- Model new feature

A very simple architecture

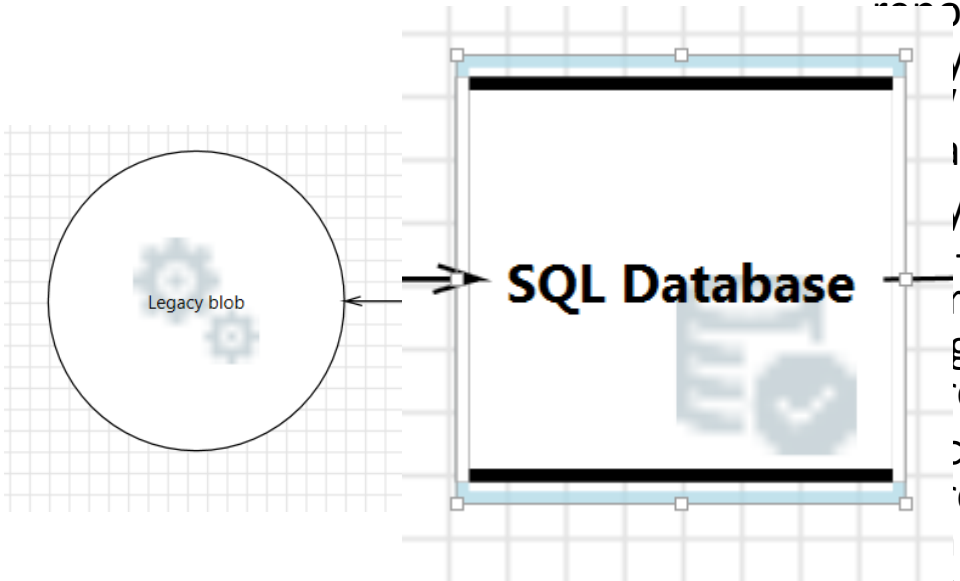


Now pretend to forget it



We are going to use a 3rd party reporting and analytics technology. They are going to host Data Warehouse (DWH) and reporting server on their infrastructure.
They will give us licences to use their web-based Analytics App, which can query the reporting server.
The only thing we need to build in-house is an aggregator process,
which will get data from our database, aggregate it and upload it to the DWH on a regular basis (they provide API for automated upload).

Step by step



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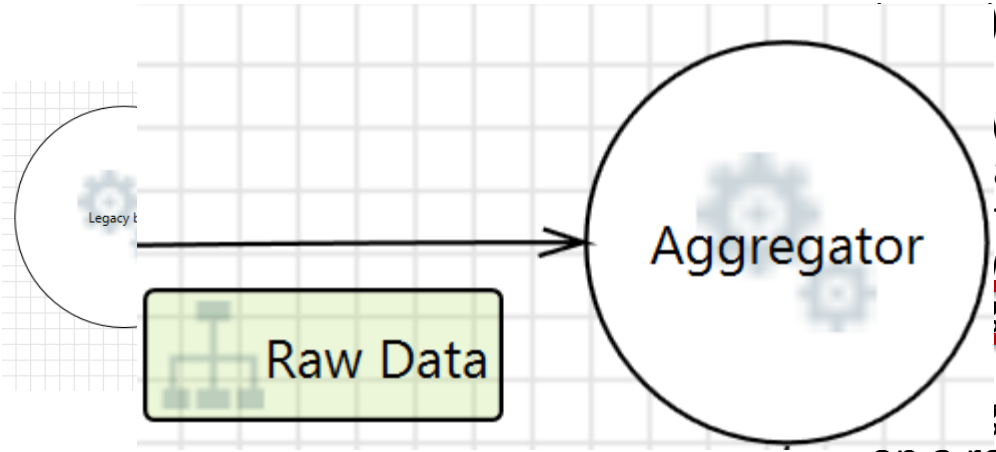

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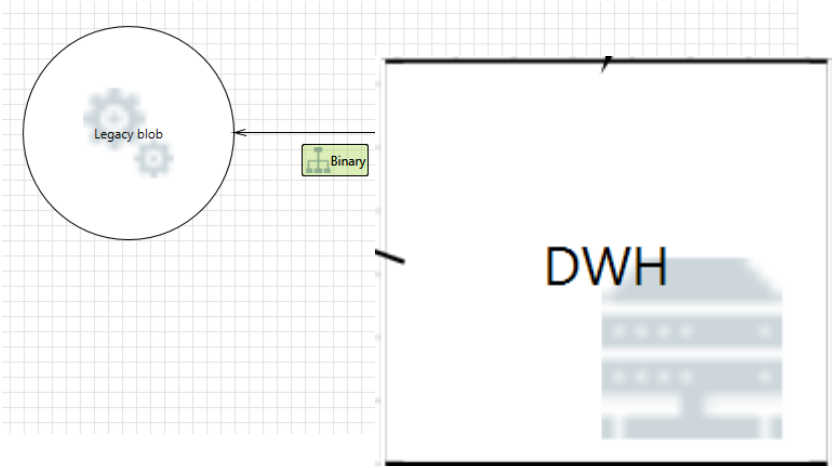

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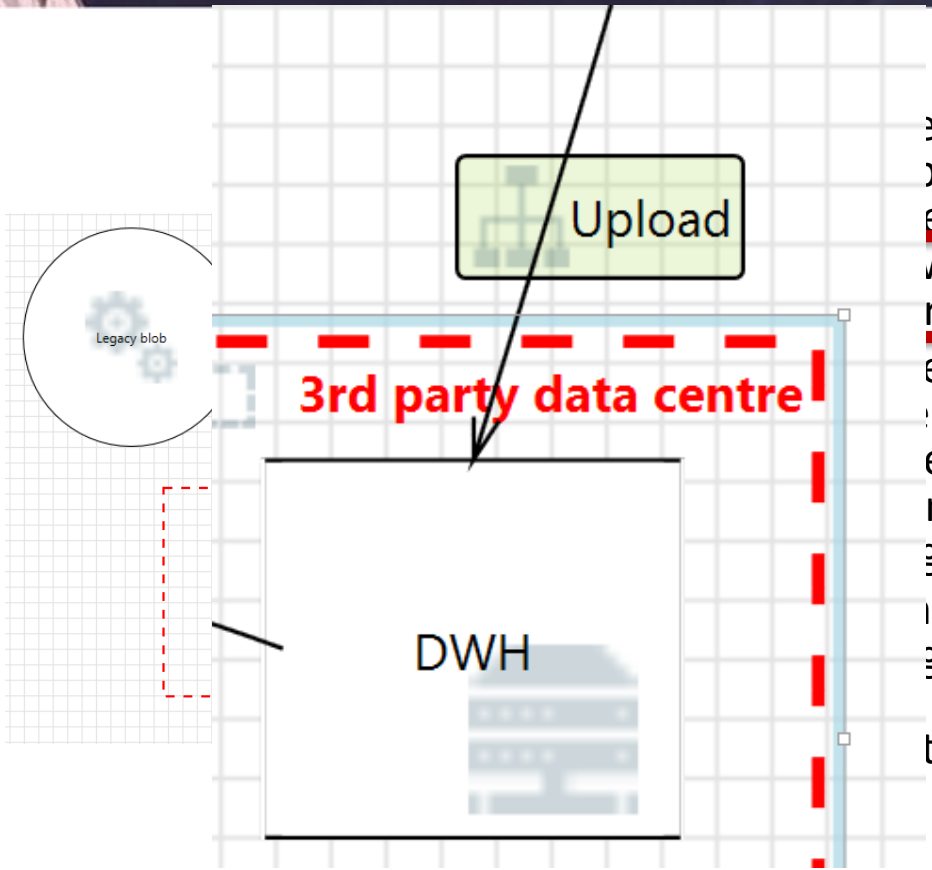

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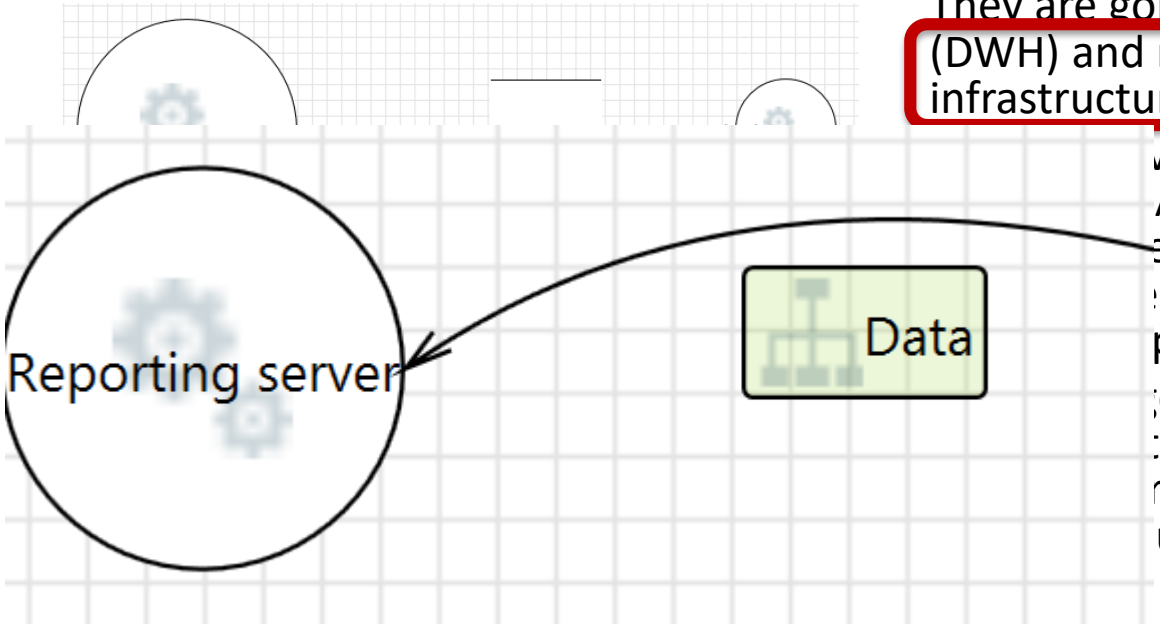

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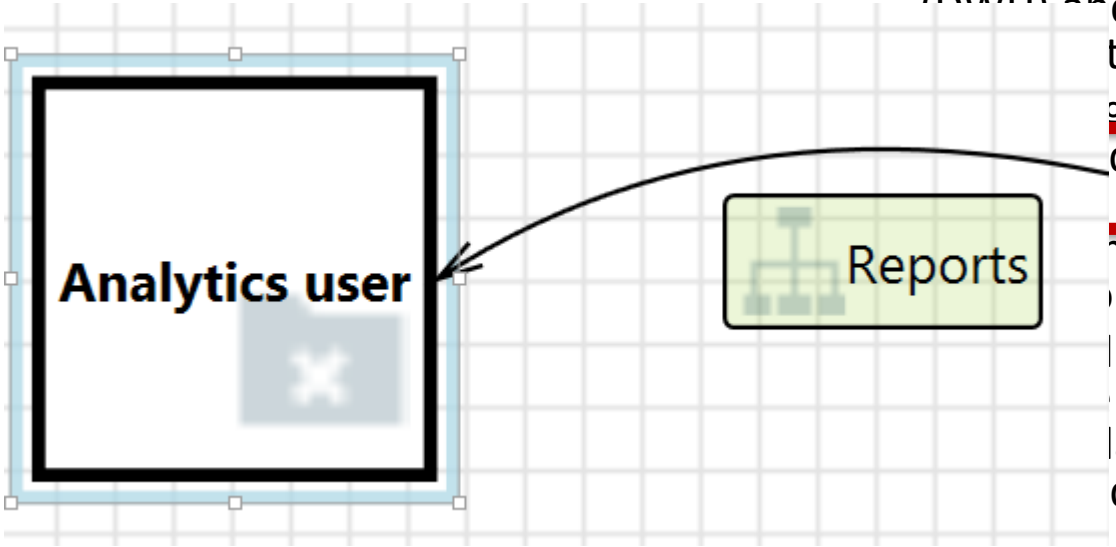

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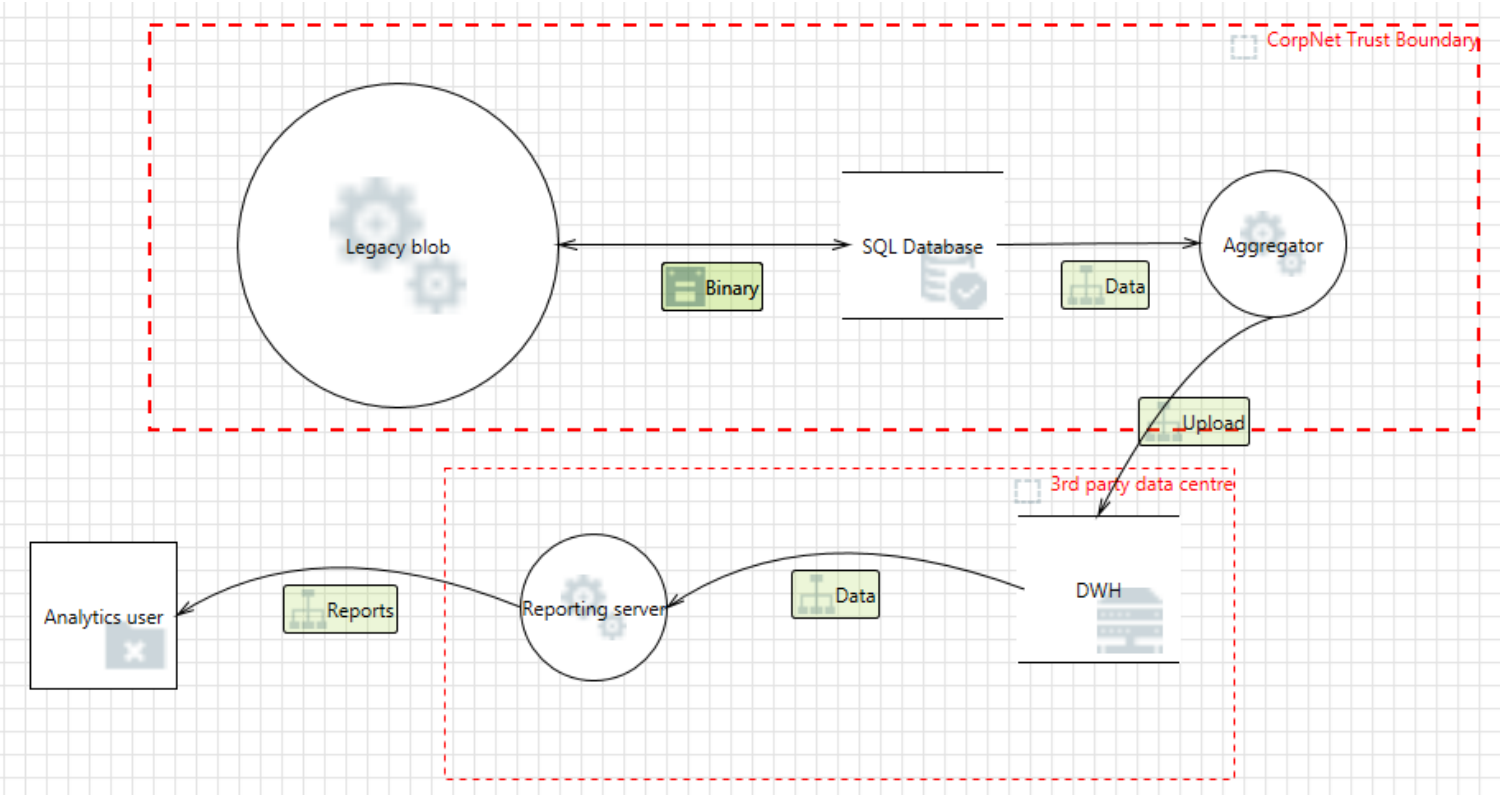

CorpNet Trust Boundary
Legacy blob
Binary
SQL Database
Data
Aggregator
Upload
3rd party data centre
Analytics user
Reports
Reporting server
Data
DWH

Relevant Threats

Spoofing

- Can attacker upload data on our behalf? How we authenticate the destination before uploading?

Tampering and Information Disclosure

- Can attacker sniff the data or tamper with it?

Repudiation

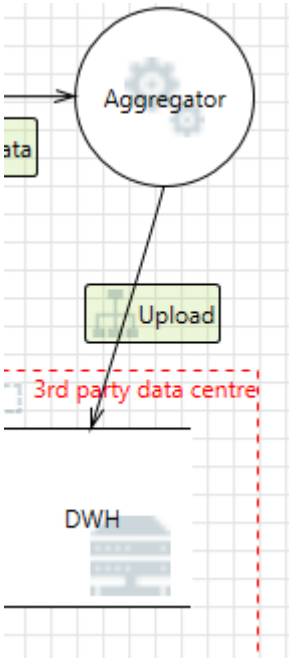
- Can DWH claim we didn't send the data? Or sent above the quota?

Denial of service

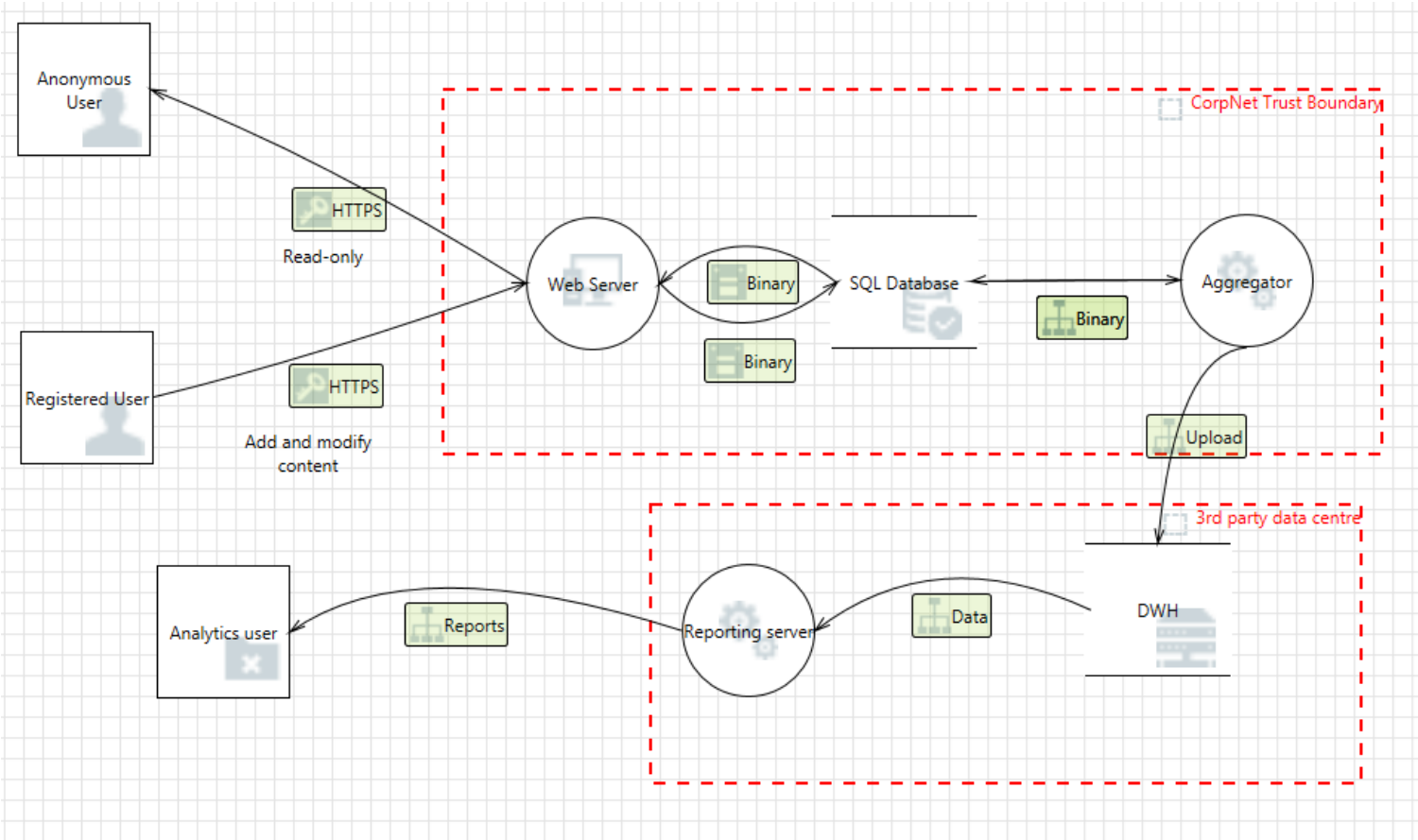
- Is there availability SLA for uploads?

Privacy

- Can our aggregation be reverse engineered?
- Do we need to notify the users that 3rd party is involved?



Irrelevant Threats



How to make them go away

- Can registered user inject malicious content?
  - We are not making it worse
- Can anonymous user bypass access controls and modify something?
  - We are not making it worse
- Is our datacentre infrastructure secure?
  - We are not making it worse (careful here!)
- Can analytics user abuse licencing?
  - Not our problem, 3rd party problem

Caveats

Not our problem

- If the team's task is not just to implement with a chosen provider, but to evaluate several providers.

We are not making it worse

- If you come across something so catastrophic in the "Legacy blob", that it's an immediately obvious critical flaw.

What if implementation deviates from design?

- Aggregator is implemented as two processes: one to read and aggregate the data, the other for actual upload

- Time pressure and we MUST have analytics in the release. Let's create a user for this 3rd party so they pull data directly from our DB.

Looks familiar?

1

Untested (ball of mud) legacy code

2

Introducing tests for new and modified code

3

Eventually getting (almost) fully tested code

This does not work in security!

- NTVDM bug – found in 2010, introduced in 1993
- Shellshock – found in 2014, introduced in 1989
- Heartbleed – found in 2014, introduced in 2011
- POODLE – found in 2014, existed since 1996
- JASBUG – found in 2015, introduced in 2000
- DROWN, Badlock, gotofail, etc.

Eventually need the whole picture

- What we don’t know can harm us
- The system is greater than the sum of its parts

Eventually is better than upfront

- People have developed the necessary skills
- Many subsystems will be already analysed
- Easier to achieve management buy-in

Conclusion

- Incremental threat modelling can fit any time-box, without disturbing the regular development cadence.
- You can build a model of the whole system in parallel, starting from day 1, or waiting for several cycles, whatever suits your situation.
- As a shortcut, you can bring external resources to help with the initial model.
- But for the best results in agile environment you have to involve the whole team.

Conclusion

Points of contact

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