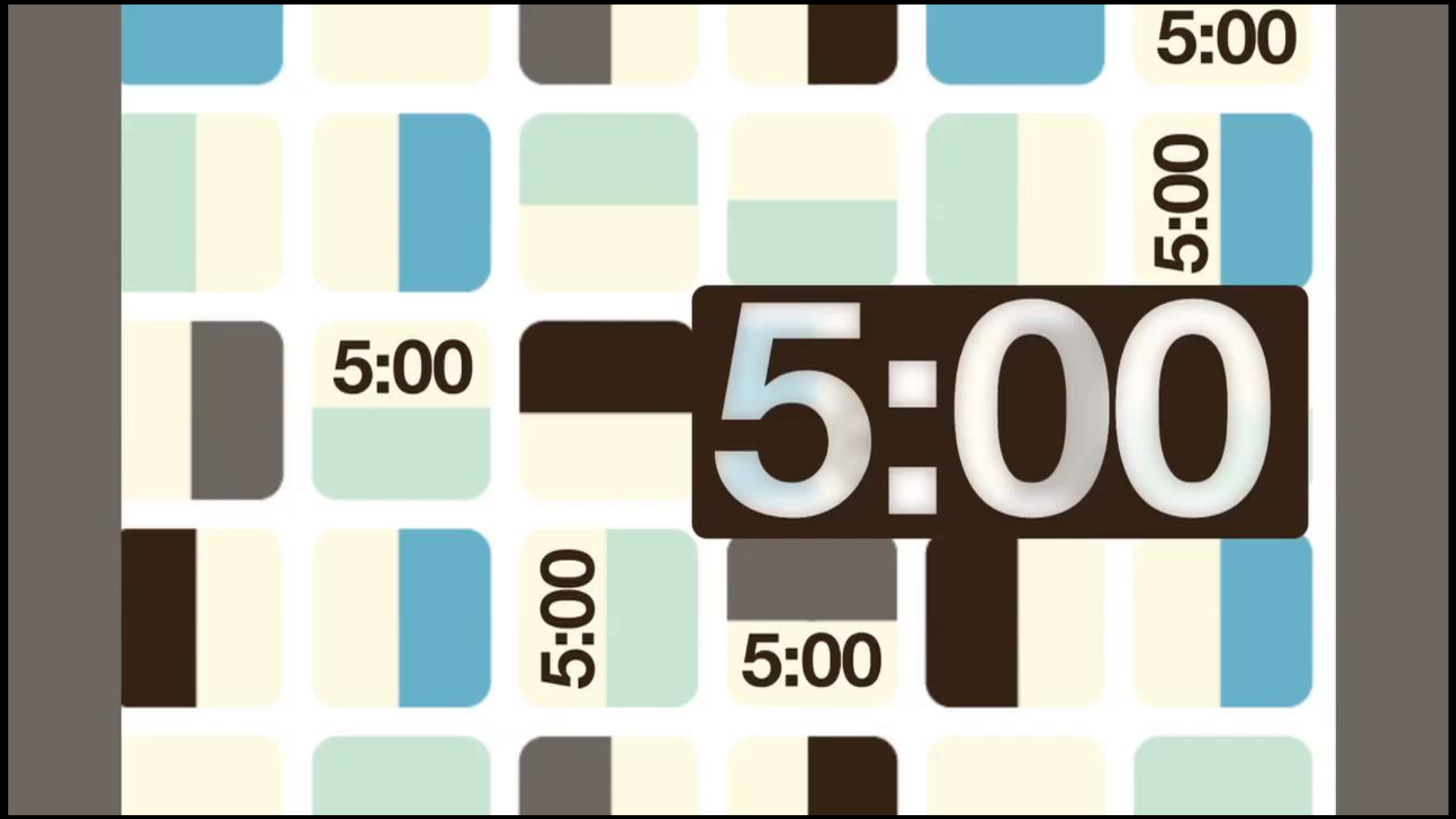
Hello, Galaxy!

Hello World at Scale

Dylan Beattie
Progressive.NET Tutorials 2017
@dylanbeattie #prognet

https://github.com/dylanbeattie/ProgNet2017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Dylan Beattie *(me!)*

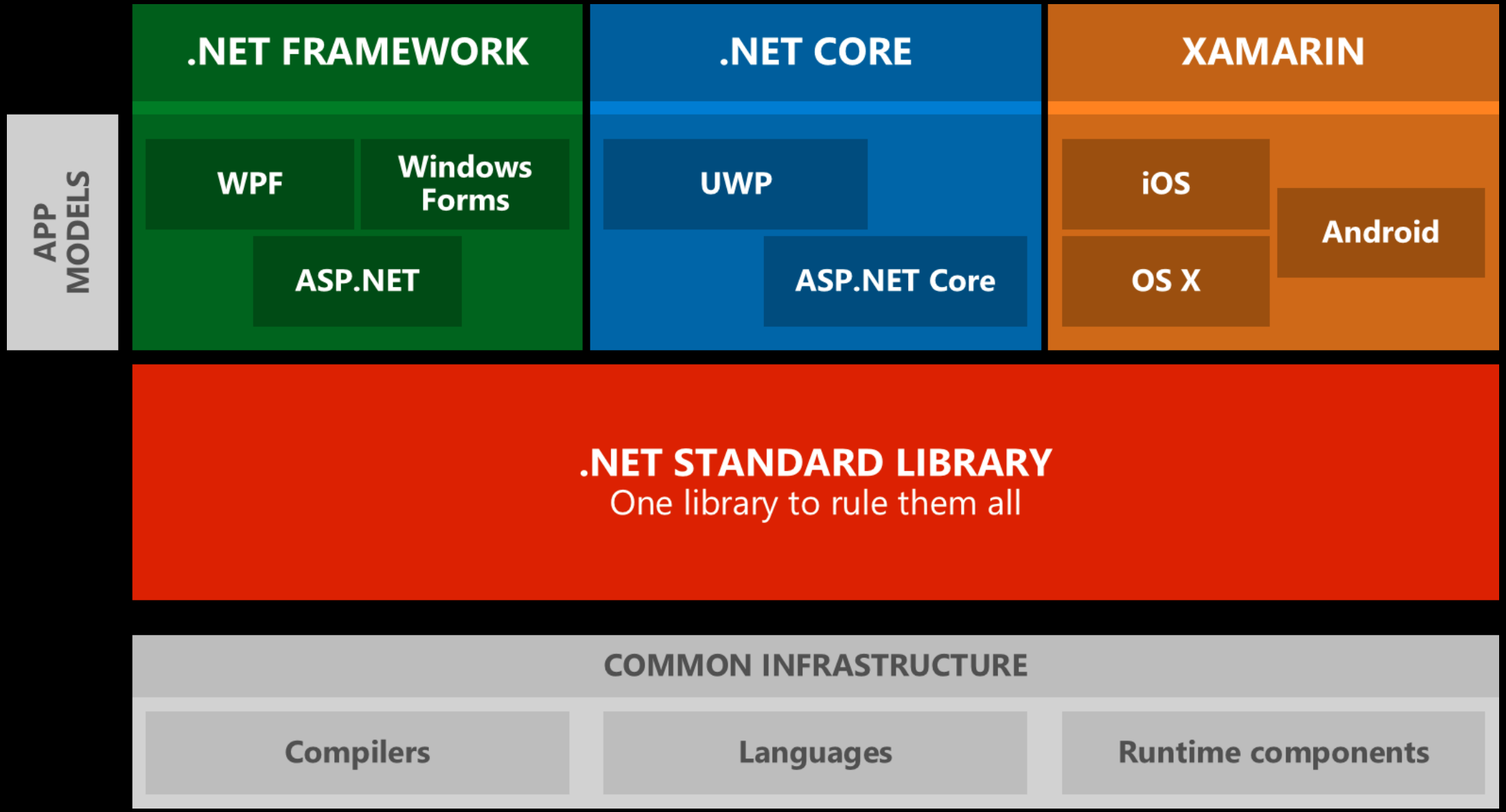
@dylanbeattie

- Building websites since 1992
- Systems architect at www.spotlight.com
- Website: www.dylanbeattie.net
- dylan@dylanbeattie.net

14:00	TALK: Intro & Background
14:30	CODE: building the “Hello, World” API
	(break)
15:00	TALK: Scaling Security
15:20	CODE: Implementing API security
	(break)
15:40	TALK: Logging
16:00	CODE: Implement logging in your API
	(break)
16:20	TALK: Discoverability, Endpoints and Monitoring
16:40	CODE: Implementing discovery and status endpoints
	(break)
17:00	TALK: Deployment and Configuration
17:30	TALK: Going Serverless

Intro & Background

Systems, Scaling, and the State of .NET in 2017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.NET FRAMEWORK
WPF
Windows Forms
ASP.NET
.NET CORE
UWP
ASP.NET Core
XAMARIN
iOS
Android
OS X
.NET STANDARD LIBRARY
One library to rule them all
COMMON INFRASTRUCTURE
Compilers
Languages
Runtime components


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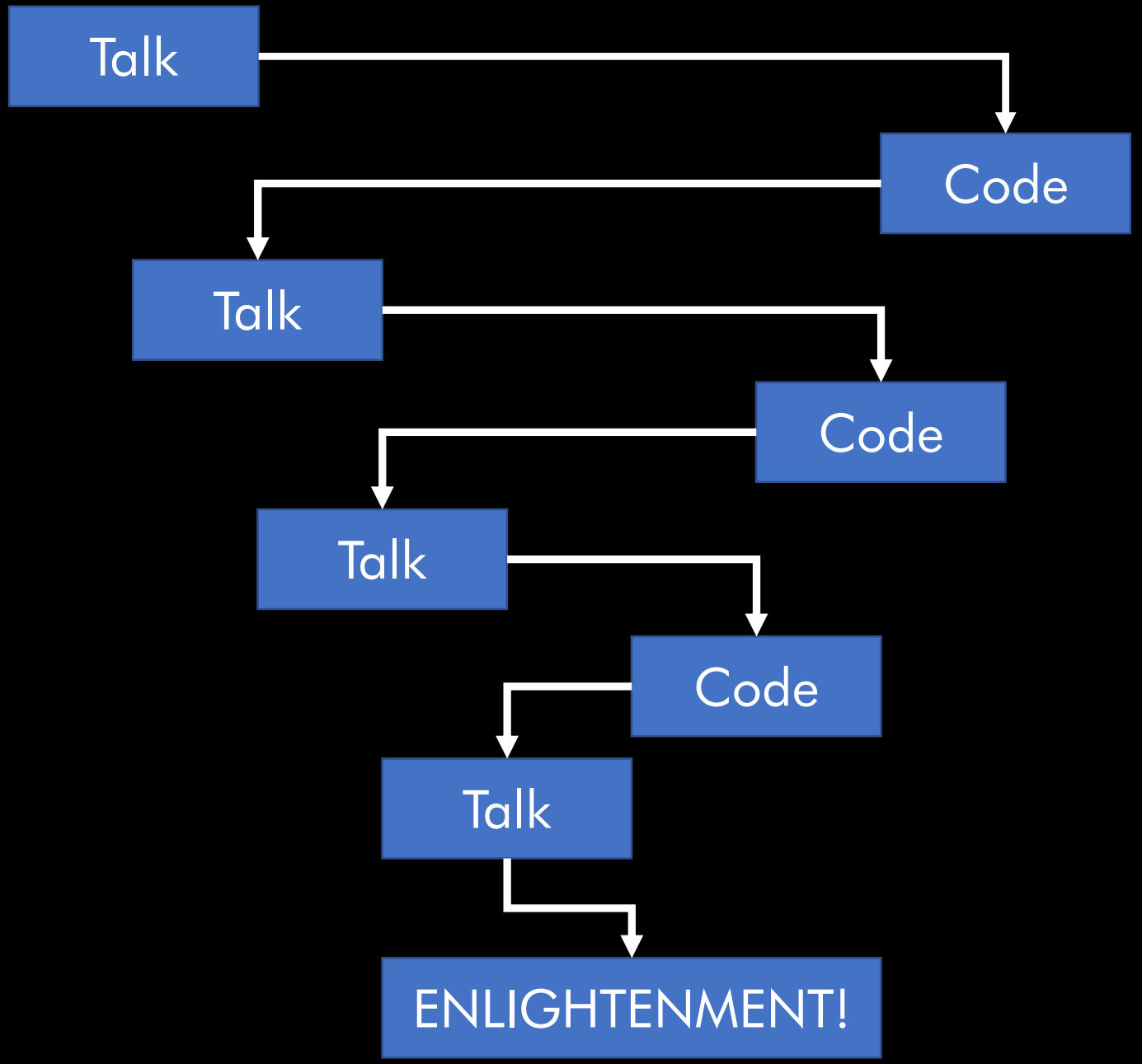
Talk
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ENLIGHTENMENT!


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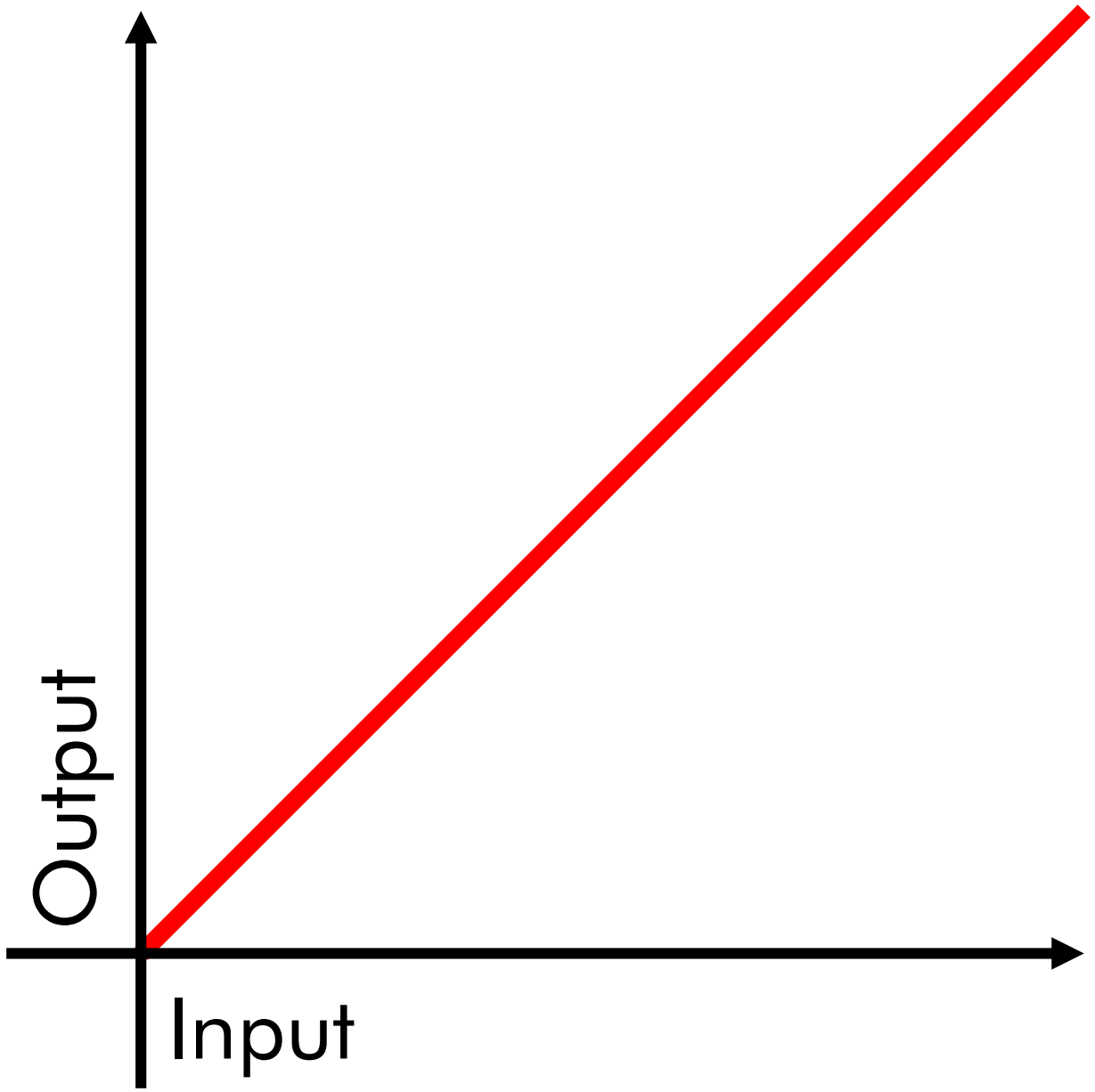
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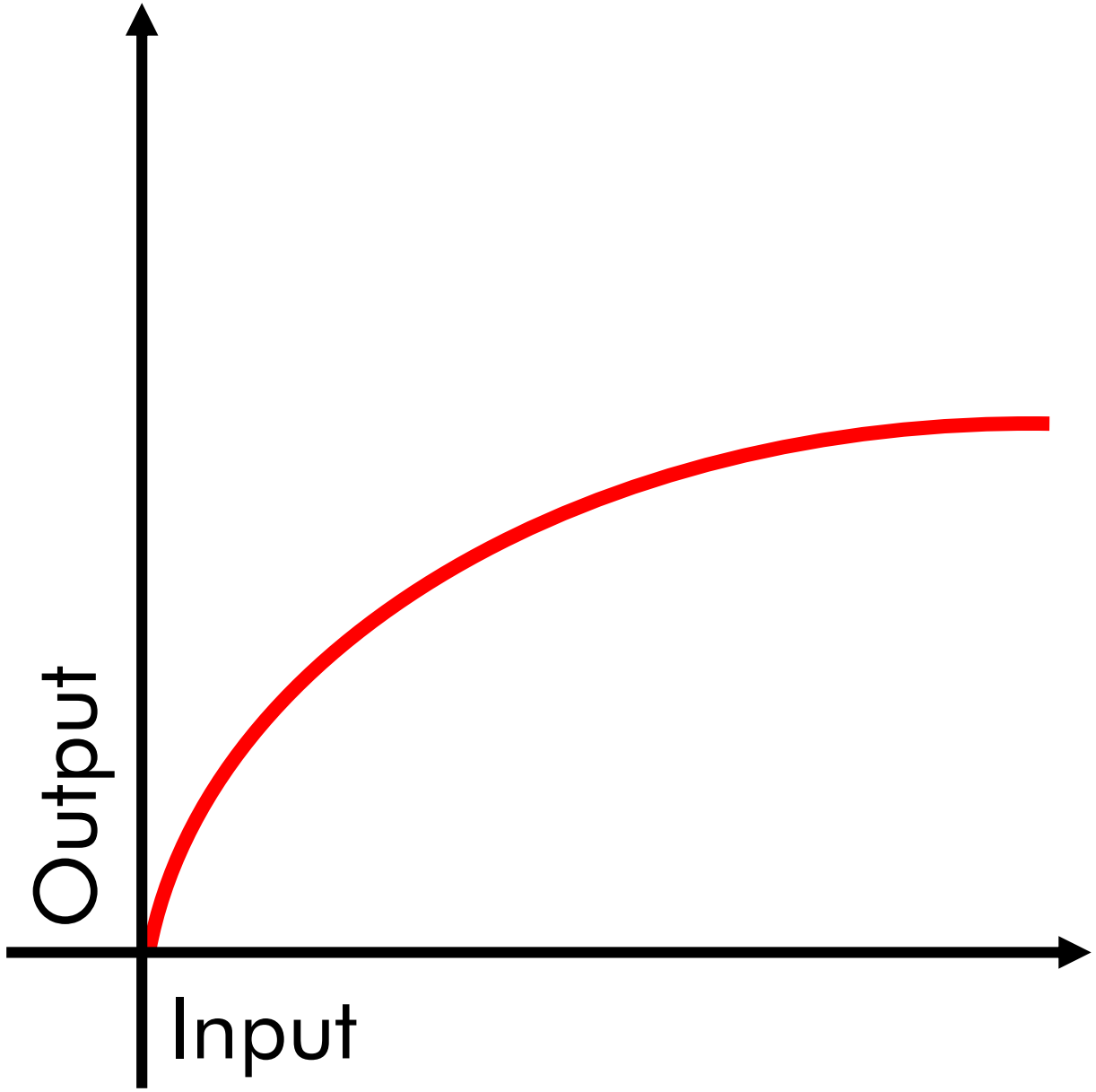
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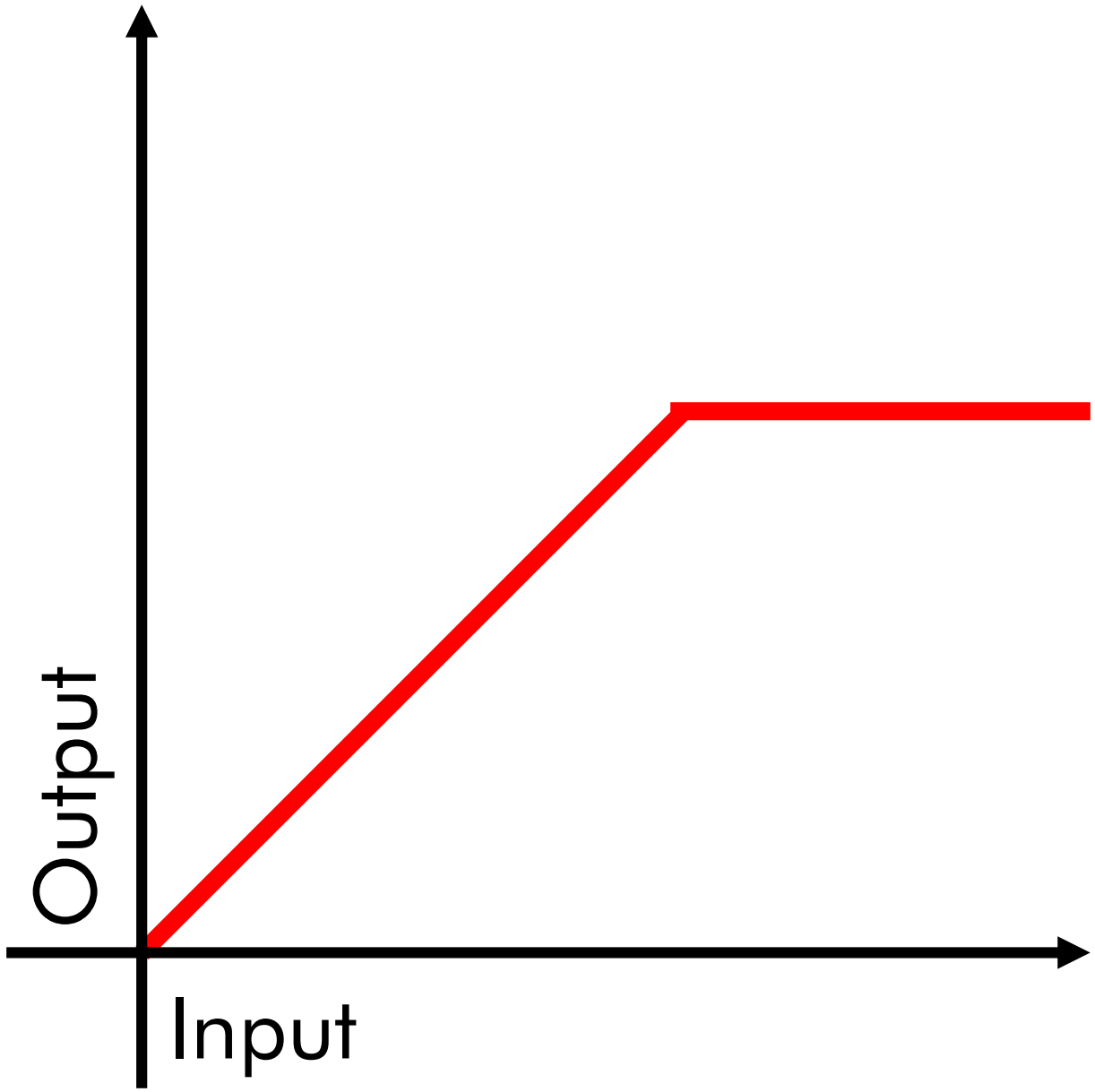
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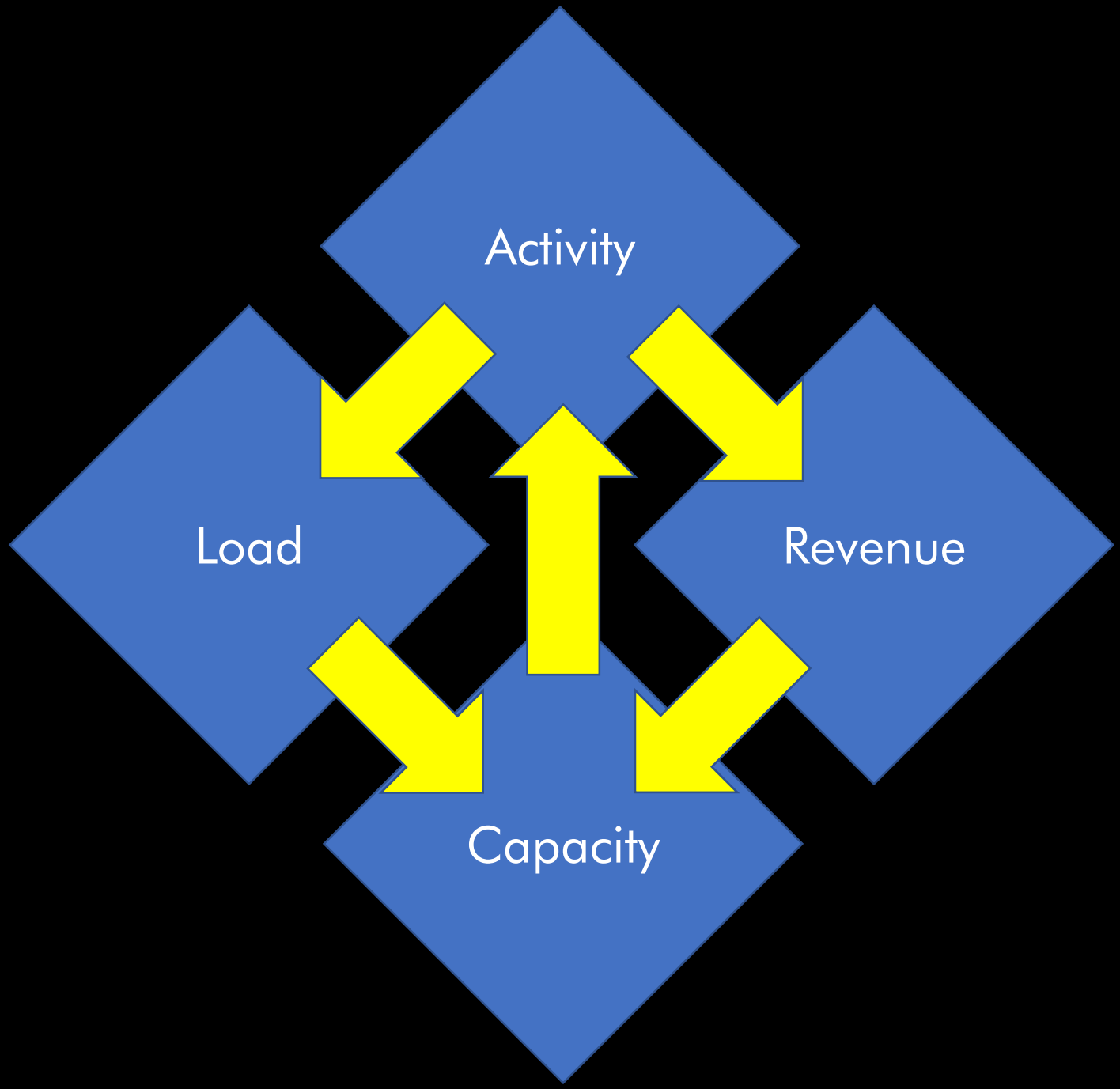

Activity
Load
Revenue
Capacity

(a brief tangent
about databases)

```
CREATE TABLE Thing (
    ThingId INT IDENTITY(1,1) PRIMARY KEY,
    ThingName varchar(64),
    CreatedAt datetimeoffset
)
```

Hang on… we might end up with more than 2 billion Things.

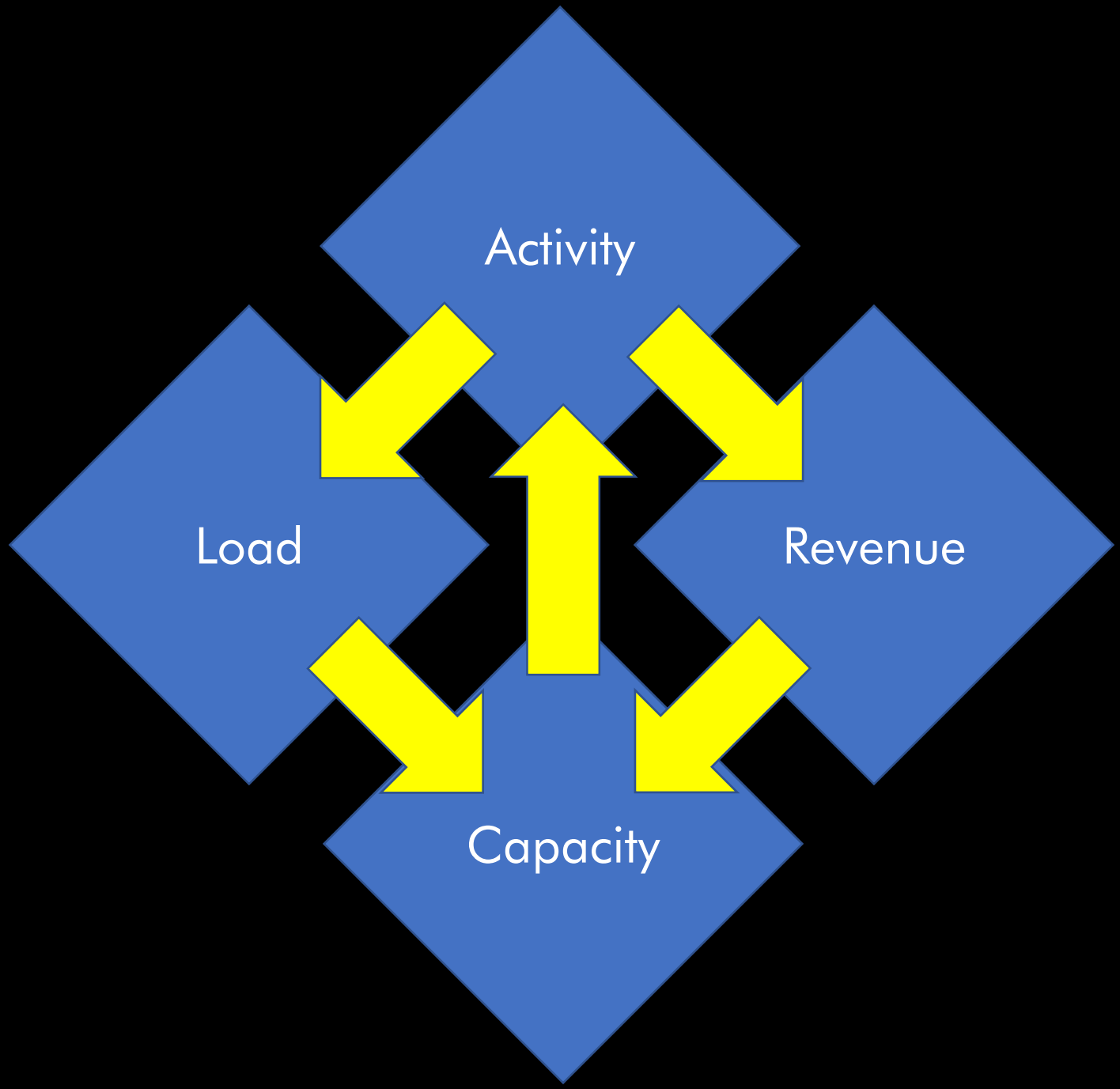
```
CREATE TABLE Thing (
    ThingId BIGINT IDENTITY(1,1) PRIMARY KEY,
    ThingName varchar(64),
    CreatedAt datetimeoffset
)
```

```
CREATE TABLE Thing (
    ThingId BIGINT IDENTITY(2147483648,1)
        PRIMARY KEY,
    ThingName varchar(64),
    CreatedAt datetimeoffset
)
```

Existing requirement: X

Future requirement: Y

How can we make Y happen now?


Activity
Load
Revenue
Capacity

Exercise 1

Implement the “Hellllo, World” API

https://github.com/dylanbeattie/ProgNet2017

https://github.com/dylanbeattie/ProgNet2017

GET	/greetings	Return a list of all the greetings available in the system
POST	/greetings	Add a new greeting to our system.
GET	/greetings/{id}	Return a “Hello, World!” style greeting in the specified format
GET	/greetings/{id}?name={name}	Return a “Hello, {name}” style greeting
PUT	/greetings/{id}	Replace the greeting at {id} with the supplied greeting
DELETE	/greetings/{id}	Delete the specified greeting

Scaling Security

As: a user,

I want to: enter my username and password

So that: I can access secure areas of the application

As: a user,

I want to: ~~enter my username and password~~

~~So that:~~ ~~I can~~ access secure areas of the application

Security in three rules

1. Keep MY STUFF safe
2. Let ME see MY STUFF
3. Don't share MY STUFF with anybody else *(unless I say it's OK)*

Security, services and scalability: Models

1. No security. Completely wide open.
2. Manual security. Limited number of clients, managed manually
3. Application security. Users are employees / developers / partners
4. Consumer security. Users are customers.
5. Federated security. Users are somebody else's customers.

Security, services and scalability: Mechanisms

1. Obfuscated endpoints
2. Credentials
    1. Per-request, e.g. HTTP Basic
    2. Session-based
3. Token-based, e.g. OAuth2
4. Certificate-based
5. One-time pad / shared secret / out-of-band authentication

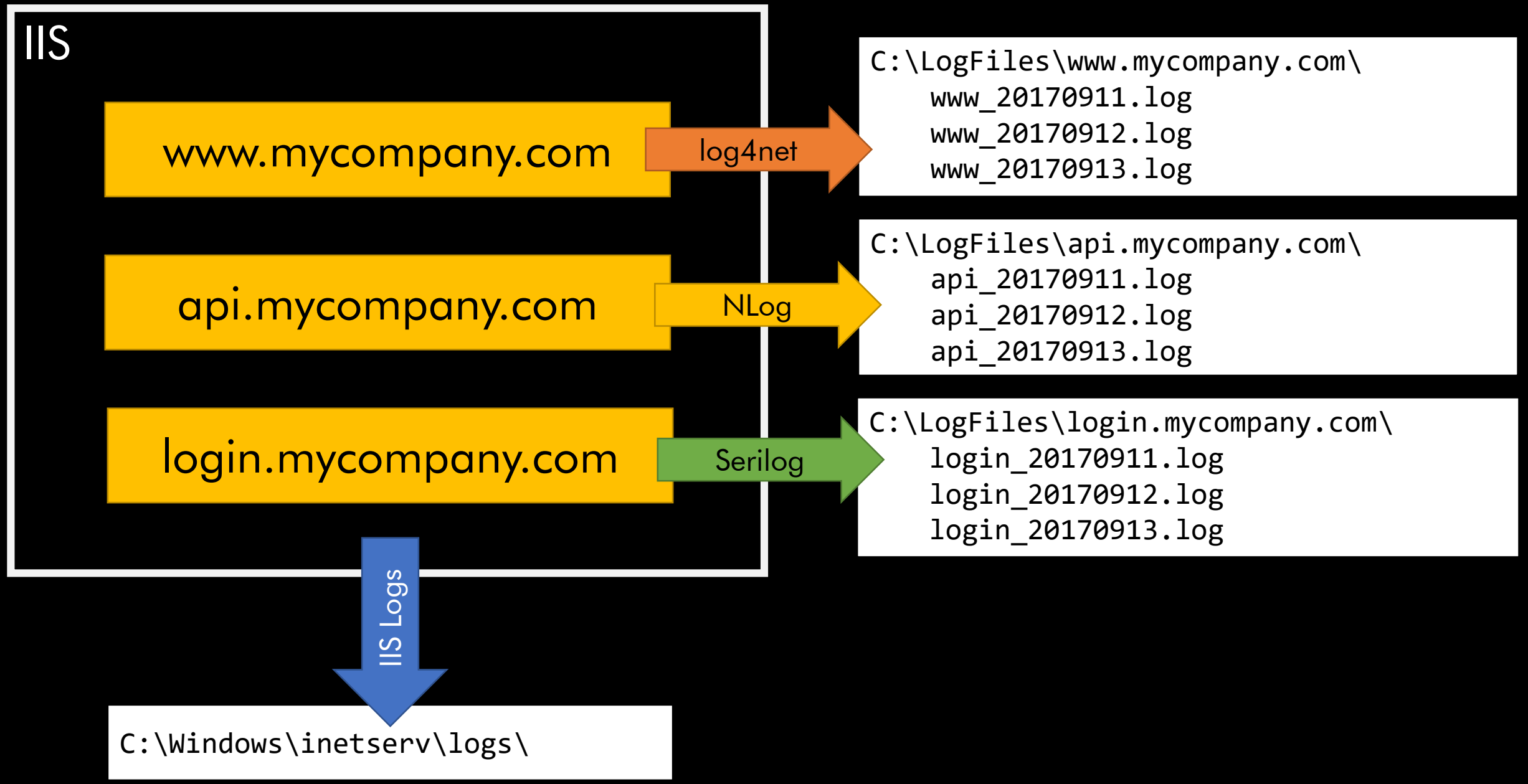
Scaling Security : Questions

- What's the worst that can happen?
- Look for asymmetric scenarios
  - E.g. revoking credentials vs reinstating
- What can you do WITHOUT security?
  - API endpoints?
  - Personalization?
  - Donut caching?

Exercise 2

Securing the “Hello, World” API

Logging: How?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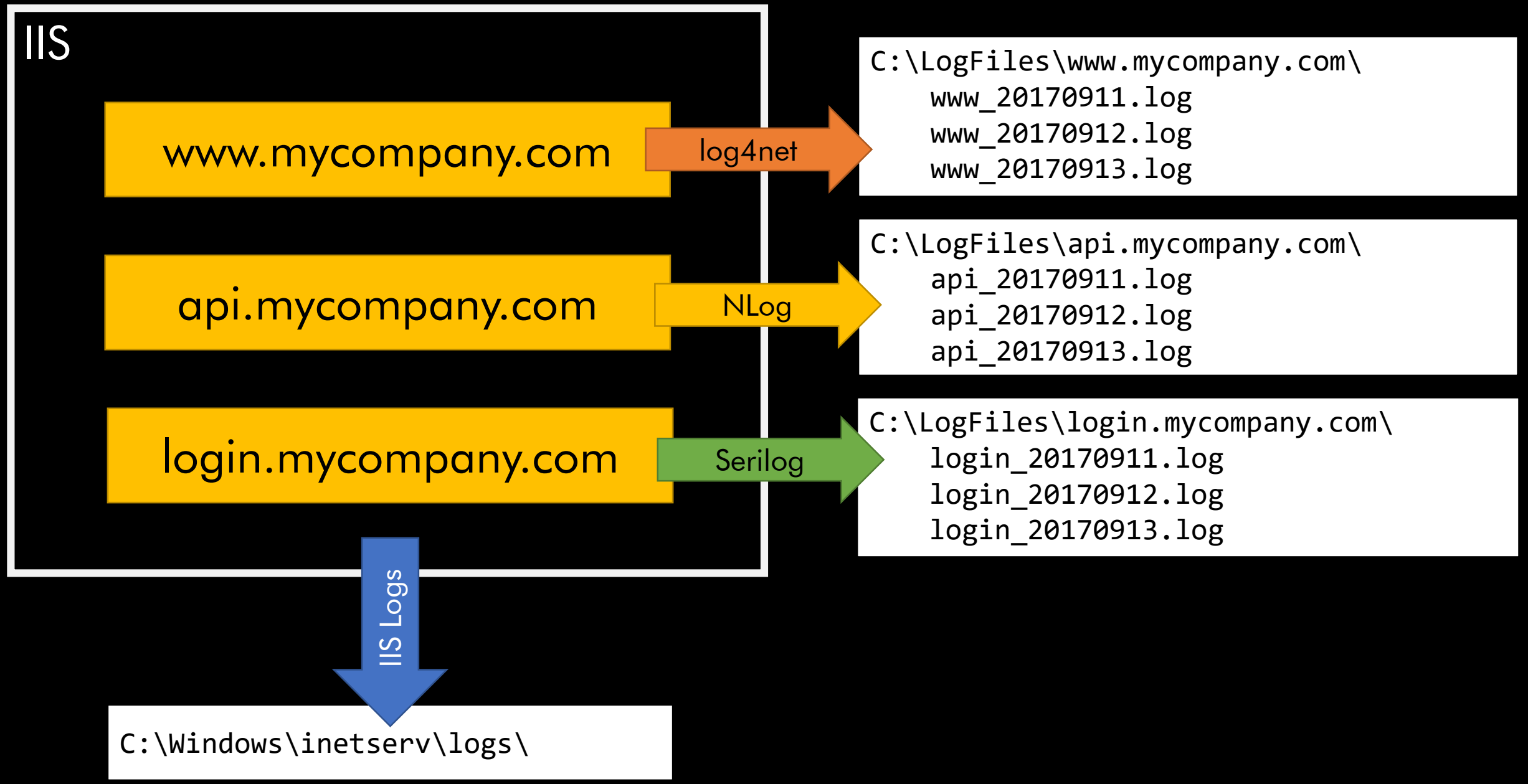
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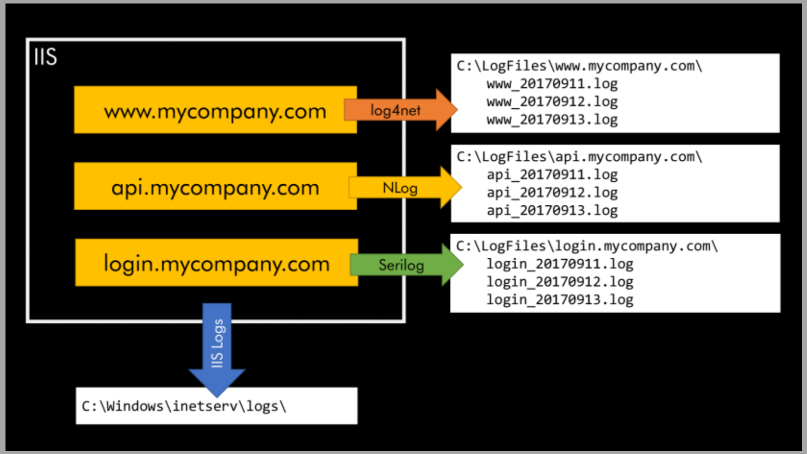
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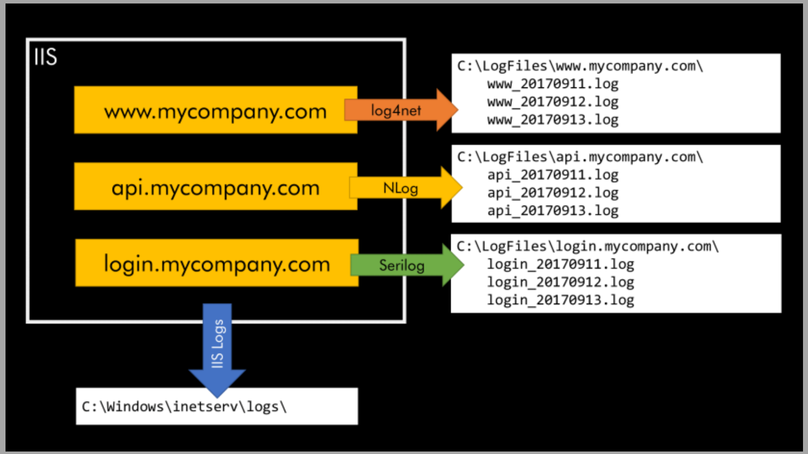
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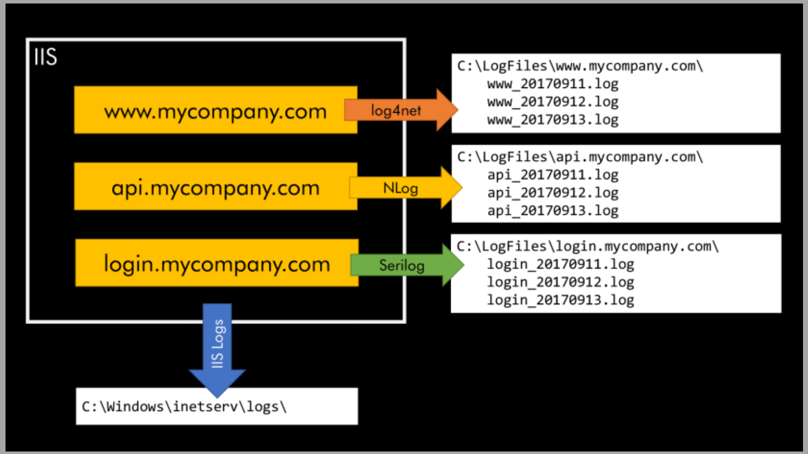
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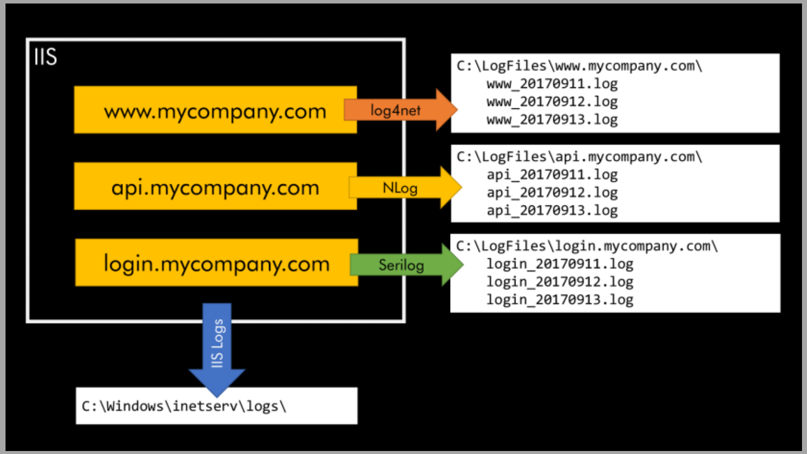
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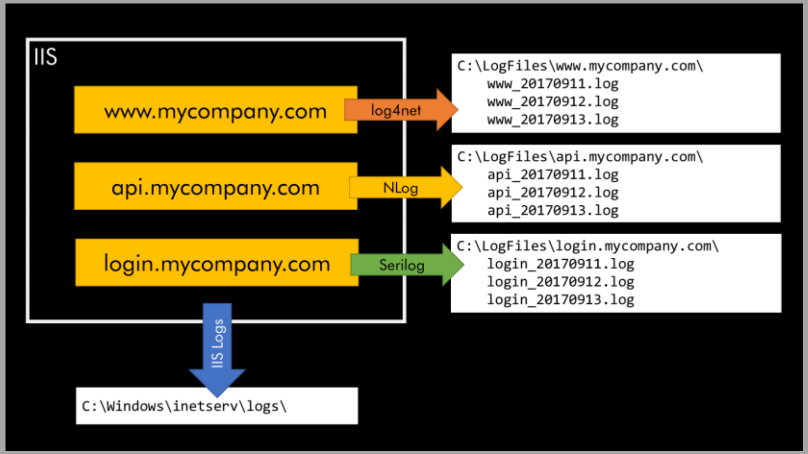
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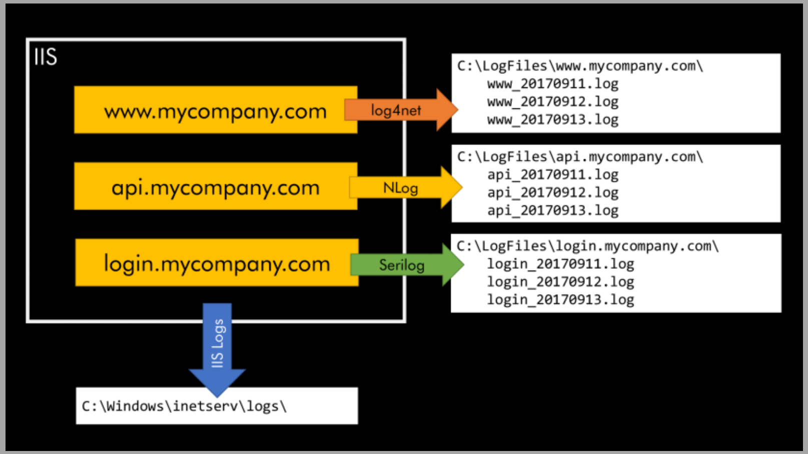
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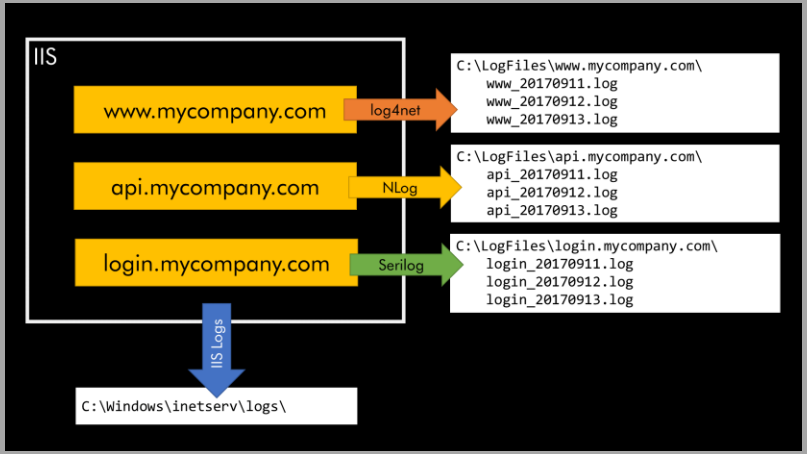
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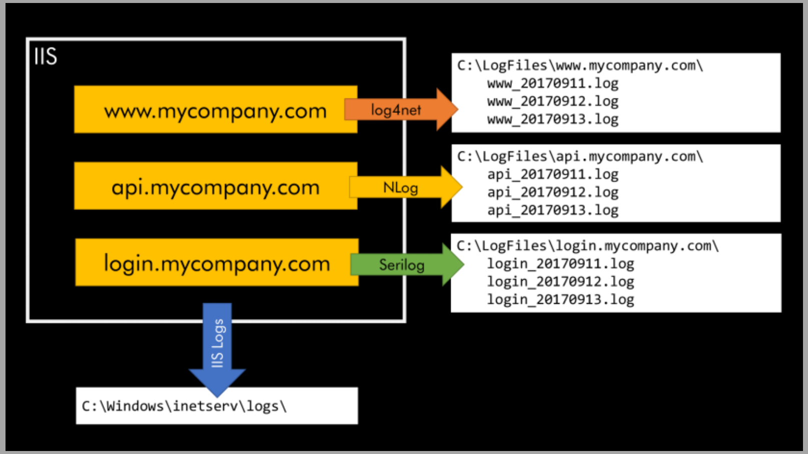
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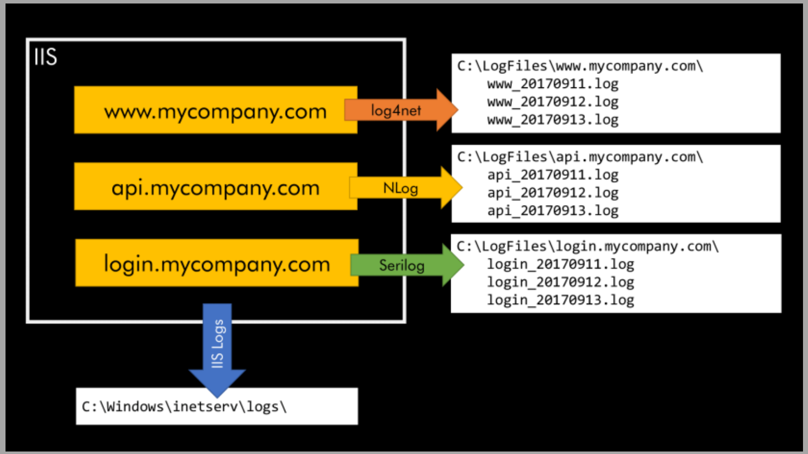
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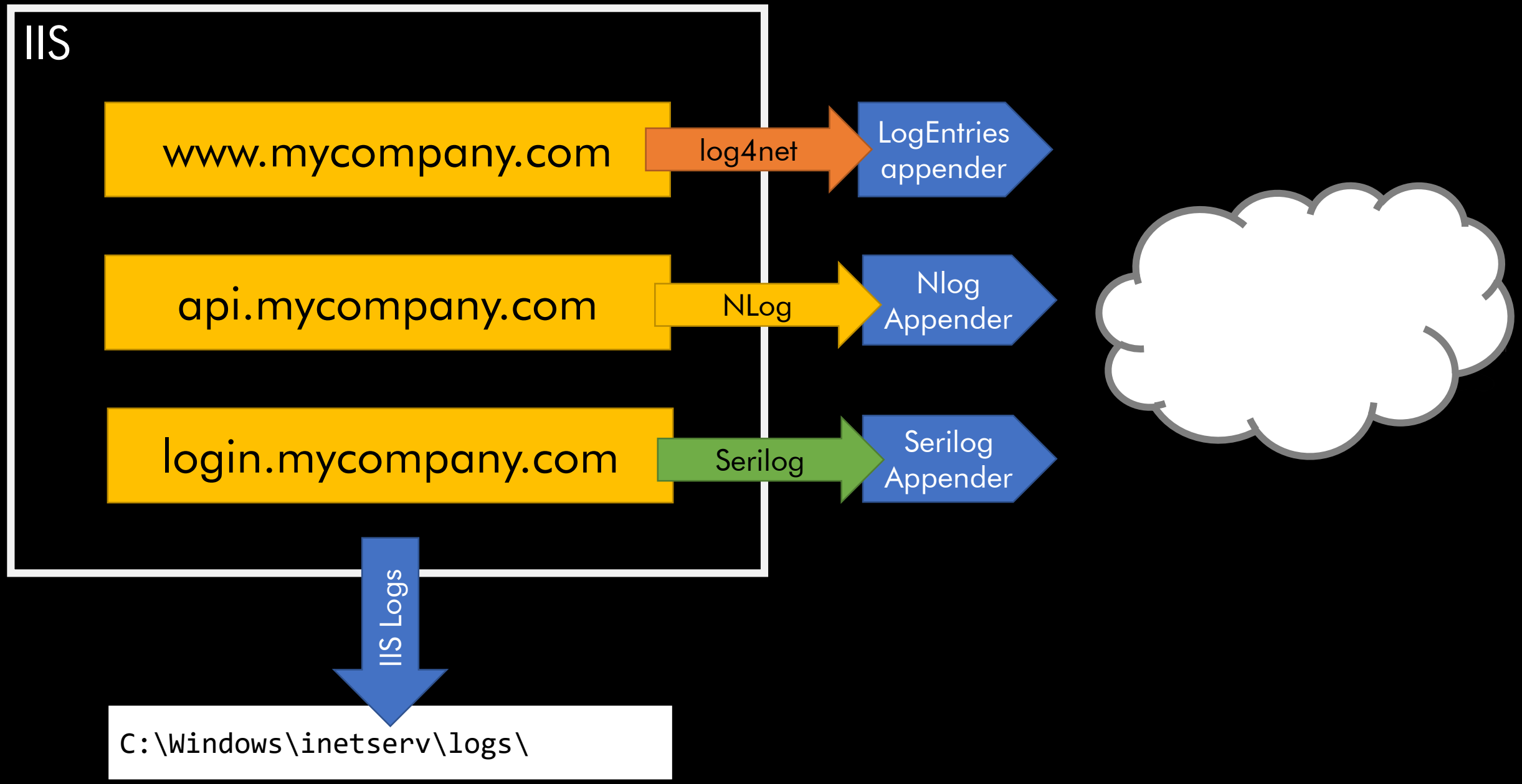
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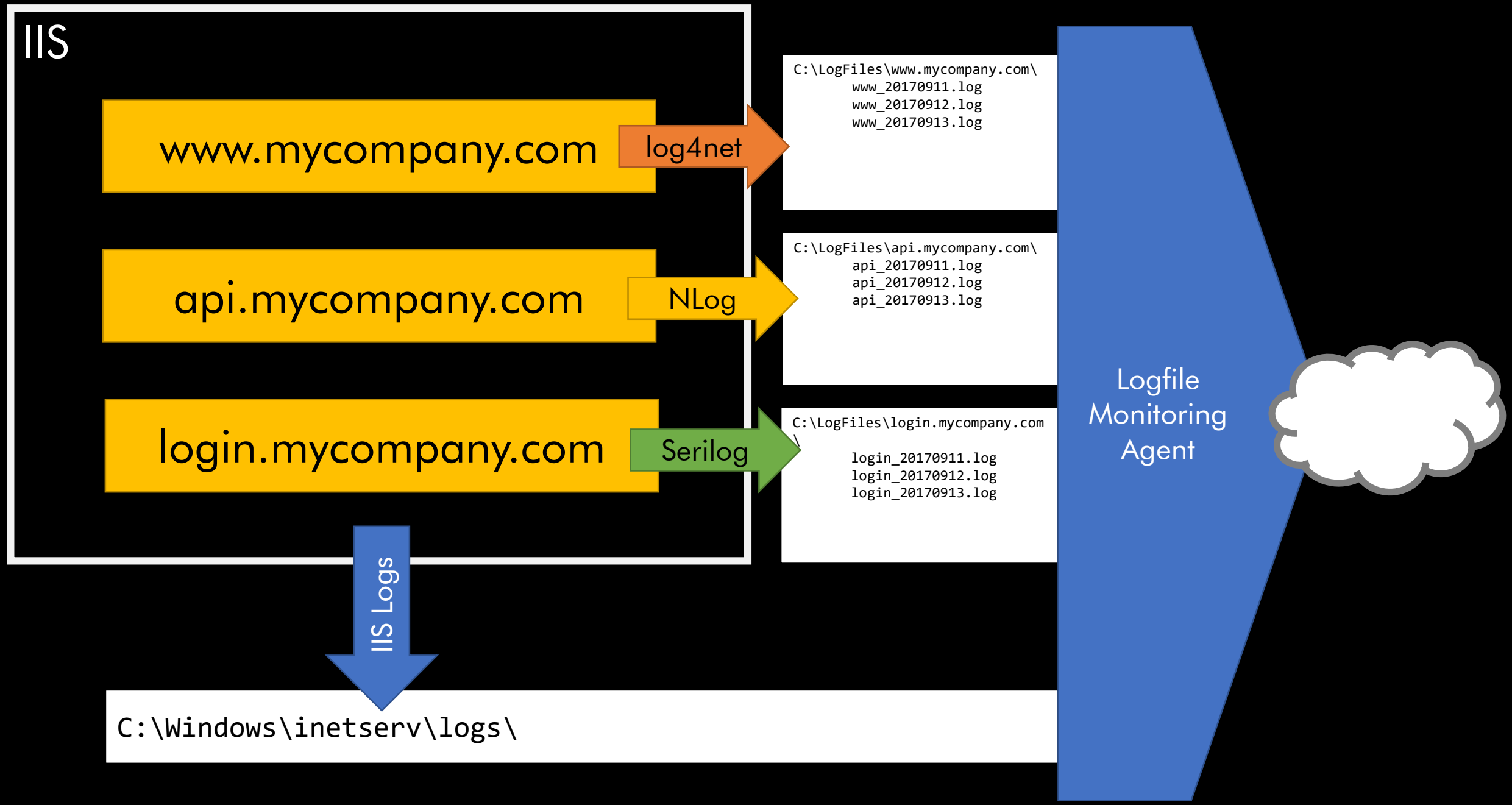
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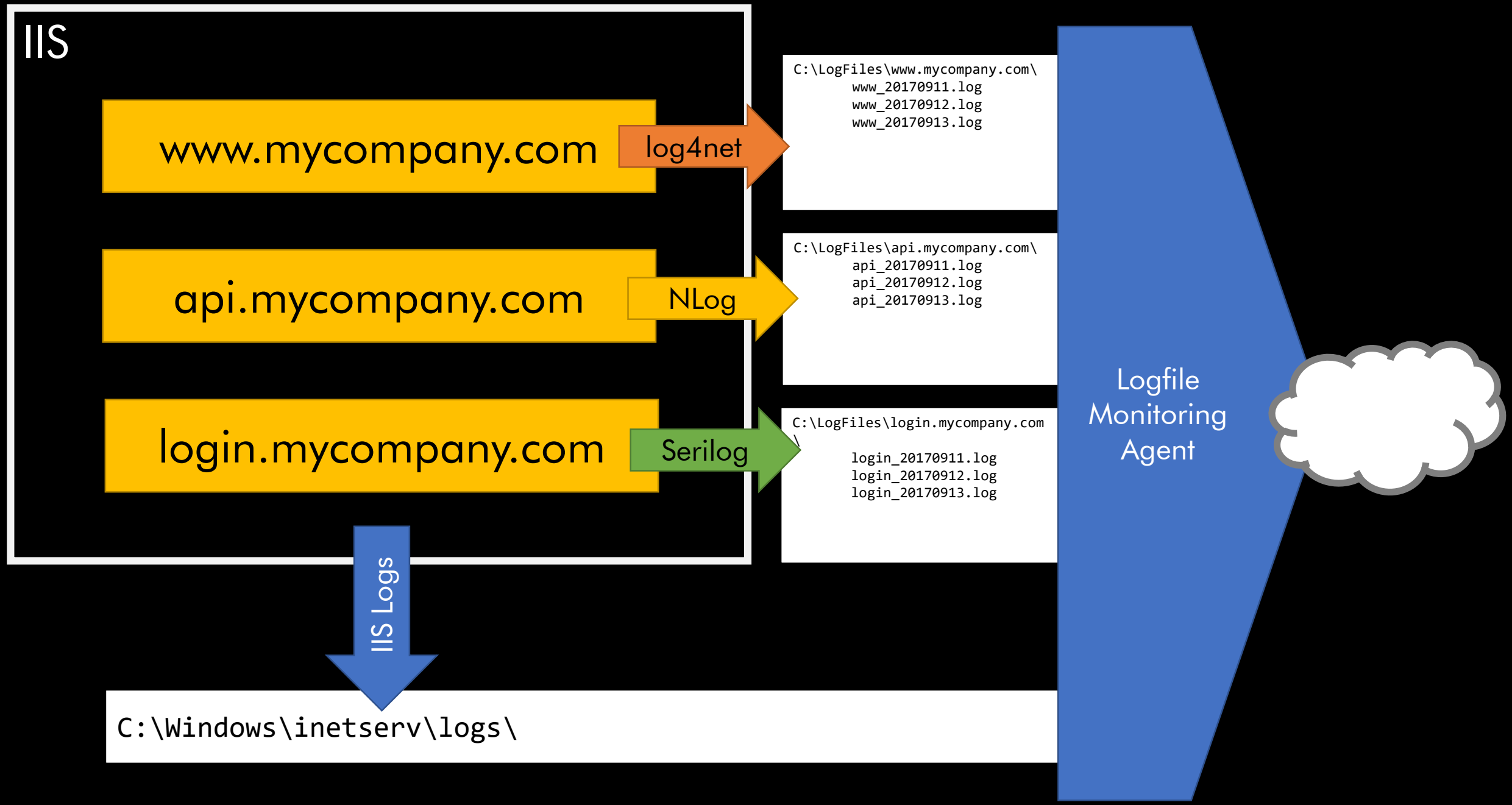
Logfile Monitoring Agent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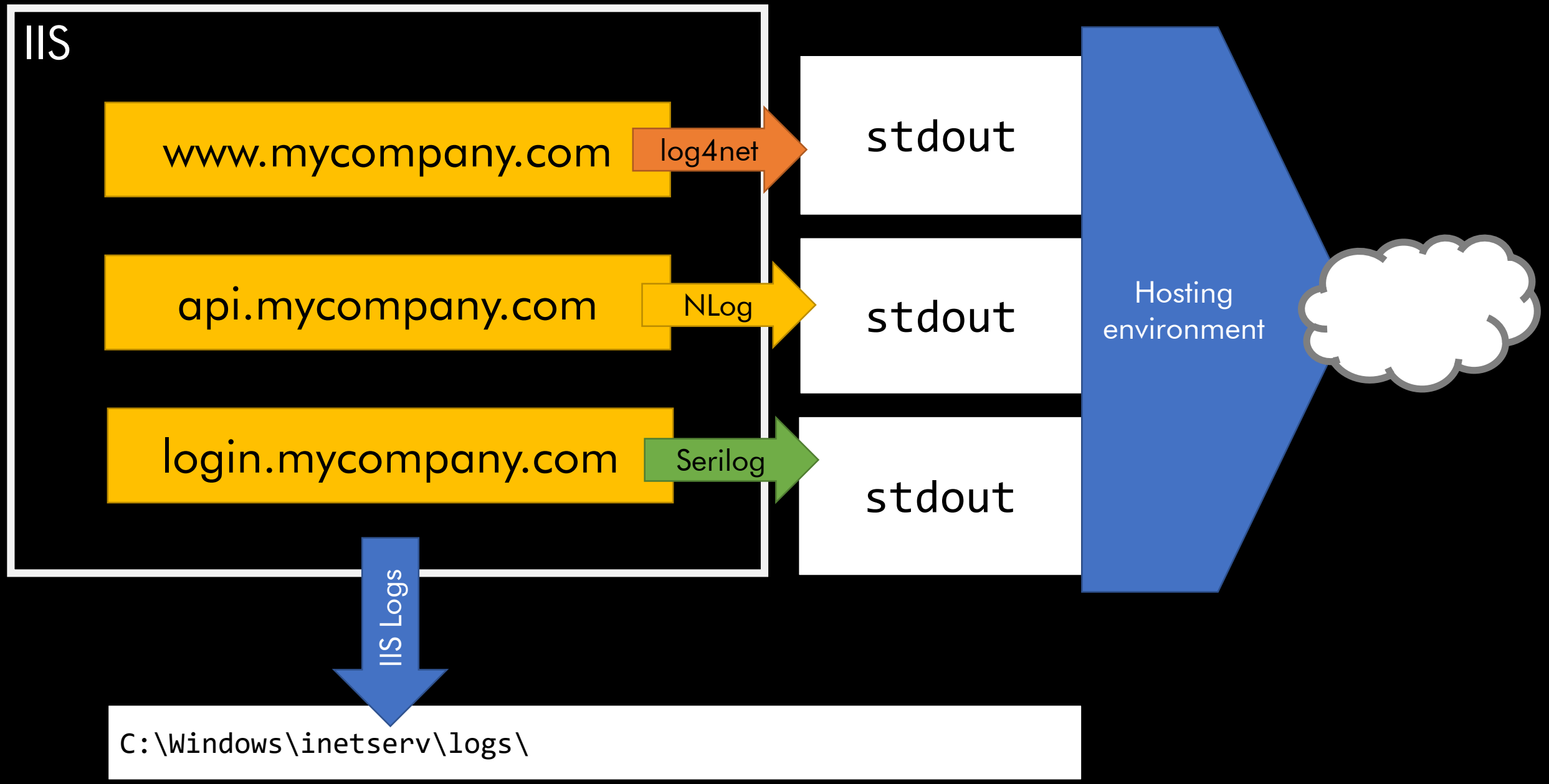
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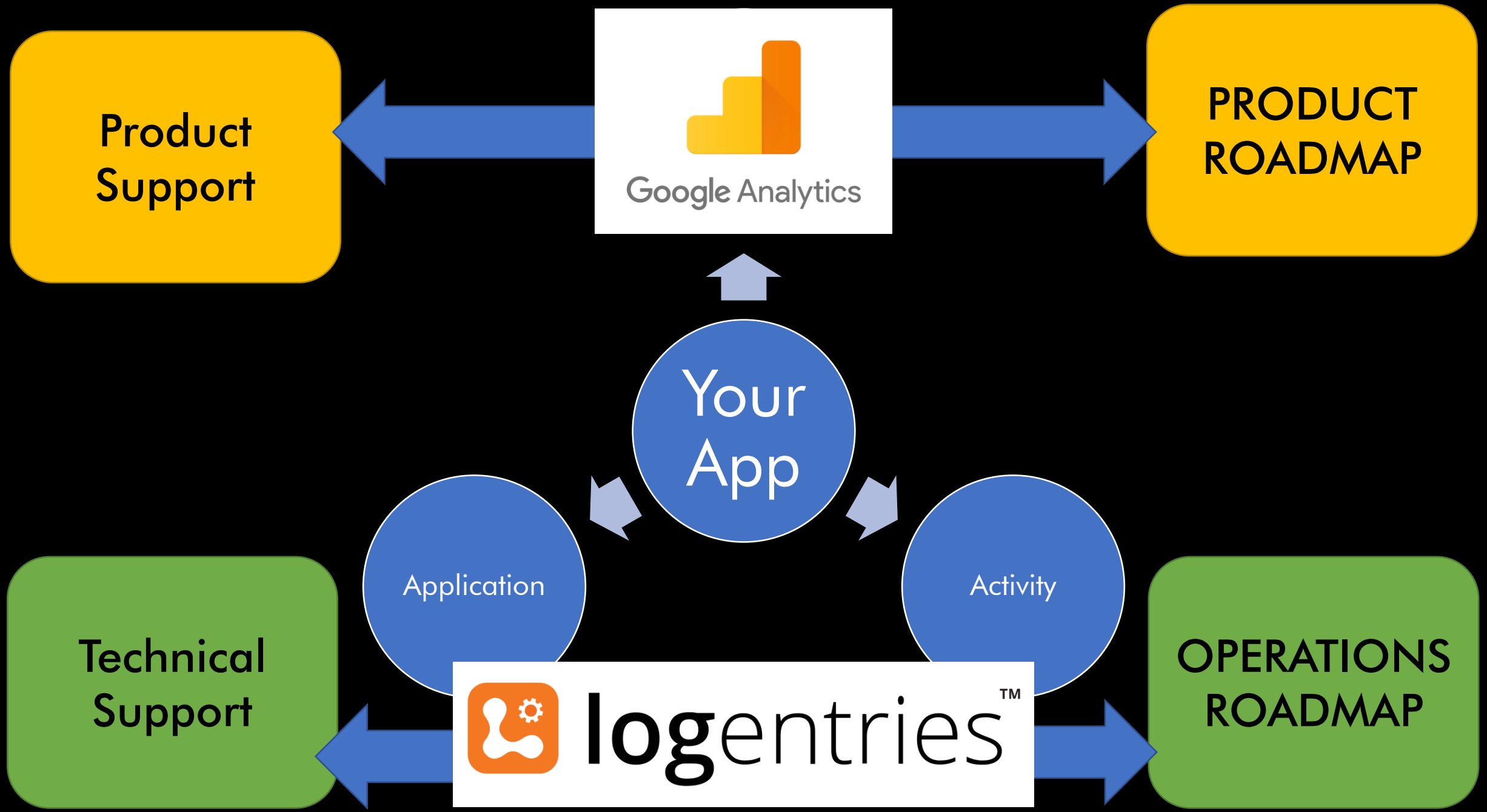
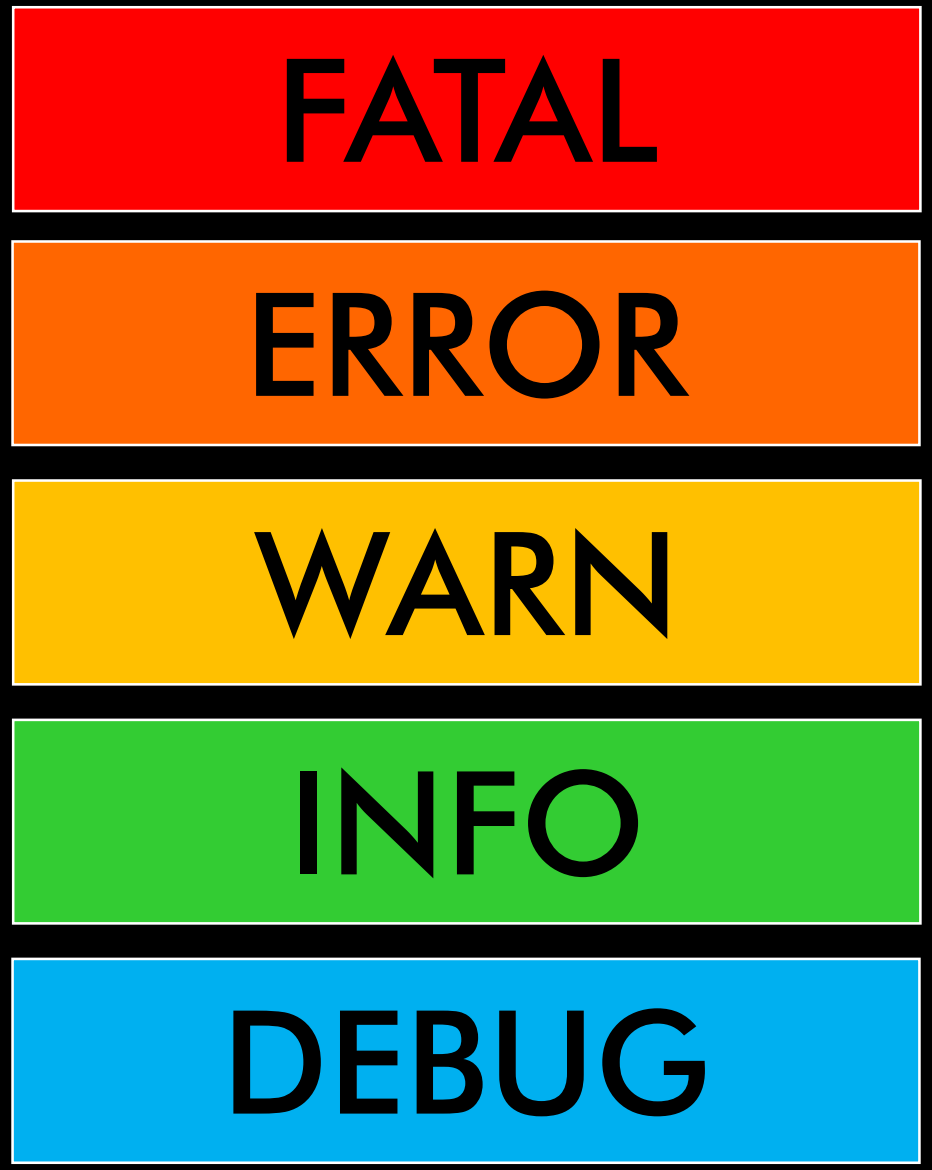
Logging: What?


Product Support
Google Analytics
PRODUCT ROADMAP
Your App
Application
Activity
Technical Support
logentries™
OPERATIONS ROADMAP


FATAL
ERROR
WARN
INFO
DEBUG

FATAL

- Application is completely unresponsive
- Multiple users affected with immediate effect
- Immediate attention. Stop what you're doing and look into it.

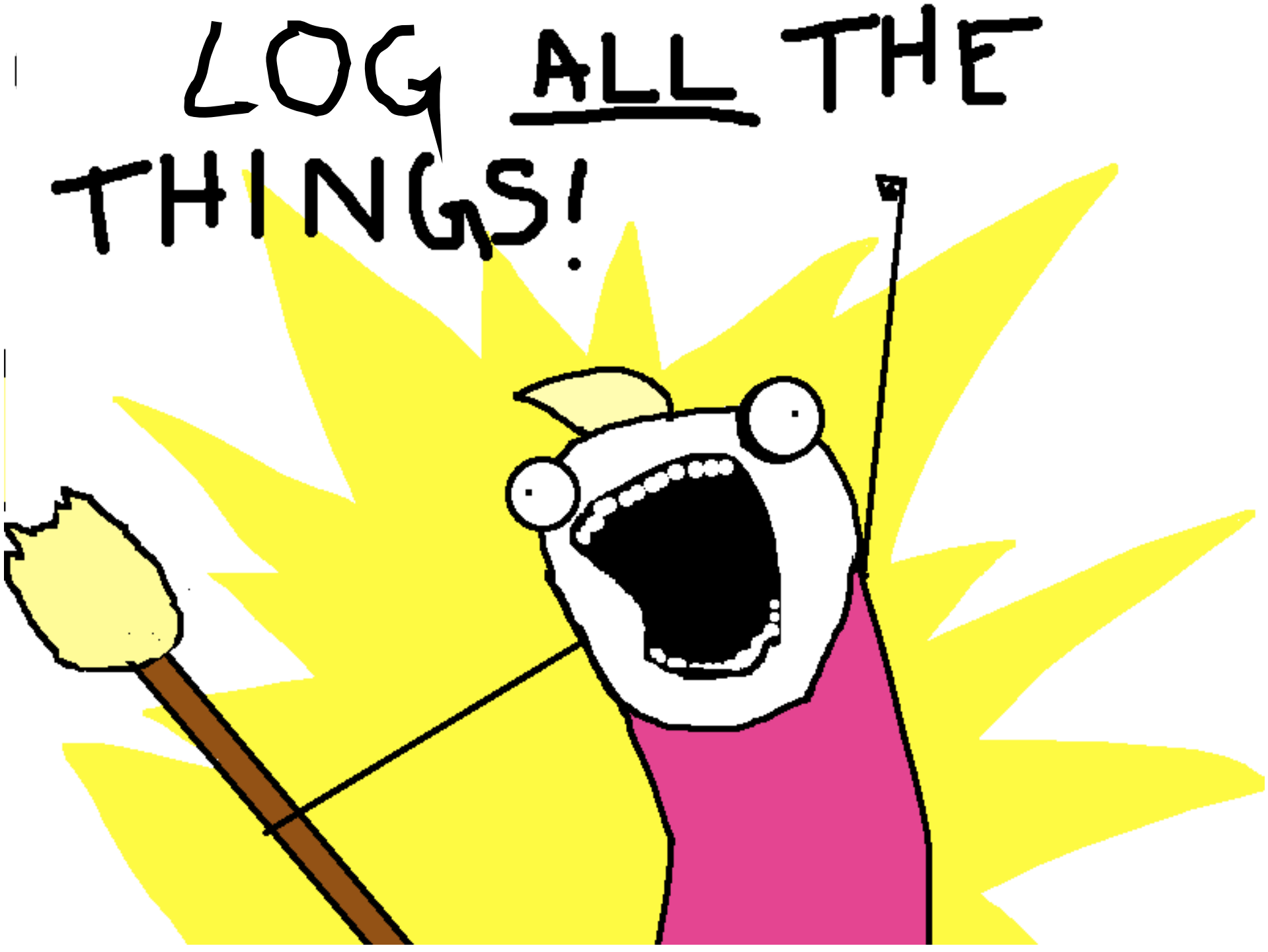
ERROR & WARN

- They *will* happen.
- **ERROR** – one person noticed, maybe?
- **WARN** – nobody noticed but it's still odd.
- Individual messages probably aren't useful

https://universitycompare.com/articles/worst-commuters-sit-next-tube/

INFO

- Everything's fine
- Startup, shutdown, cache recycle
- In a perfect world, INFO is all you'll ever see.



http://hyperboleandahalf.blogspot.co.uk/

wait... all the things?

http://hyperboleandahalf.blogspot.co.uk/


3:17 AM

```
log.Fatal Wake_Me_Up_At_4AM_On_A_Sunday()

Log.Error Apologize_To_User_And_Raise_A_Ticket()

log.Warn  Make_A_Note_In_Case_It_Happens_Again()

log.Info  Everything_Is_Fine_Just_Checking_In()

log.Debug Fill_My_C_Drive_With_Stack_Traces()
```

Adapted from a post by Daniel Lebrero / https://labs.ig.com/logging-level-wrong-abstraction

Exercise 3

Centralised Logging for Hello, World.

Discoverability

Exercise 4

Discoverability and Monitoring

Deployment and Configuration

The Twelve-Factor App

12FA #1: Codebase

- One app = one codebase
- Exploit natural domain / process boundaries
- Use revision control

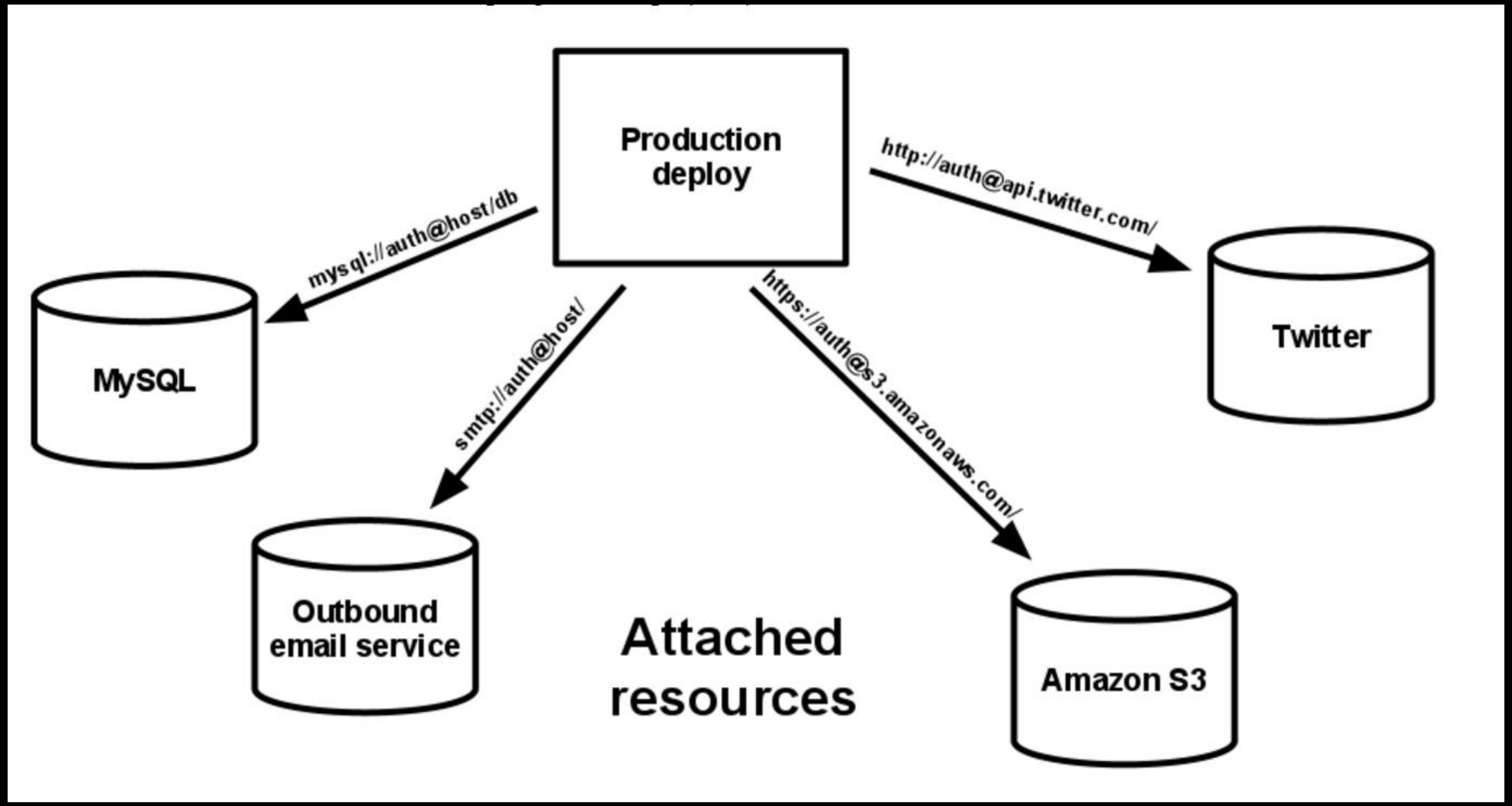
12FA #2: Dependencies

- Explicit
- Declared
- Isolated
- Code dependencies – packaged with your codebase
  - NuGet, Paket, npm
  - Don't assume ANYTHING
    - Except the stuff that's part of the environment
      - Which is the stuff you can assume
        - Because you manage the environment
          - Except the bits you don't
            - Look, dependencies are complicated, OK? :/

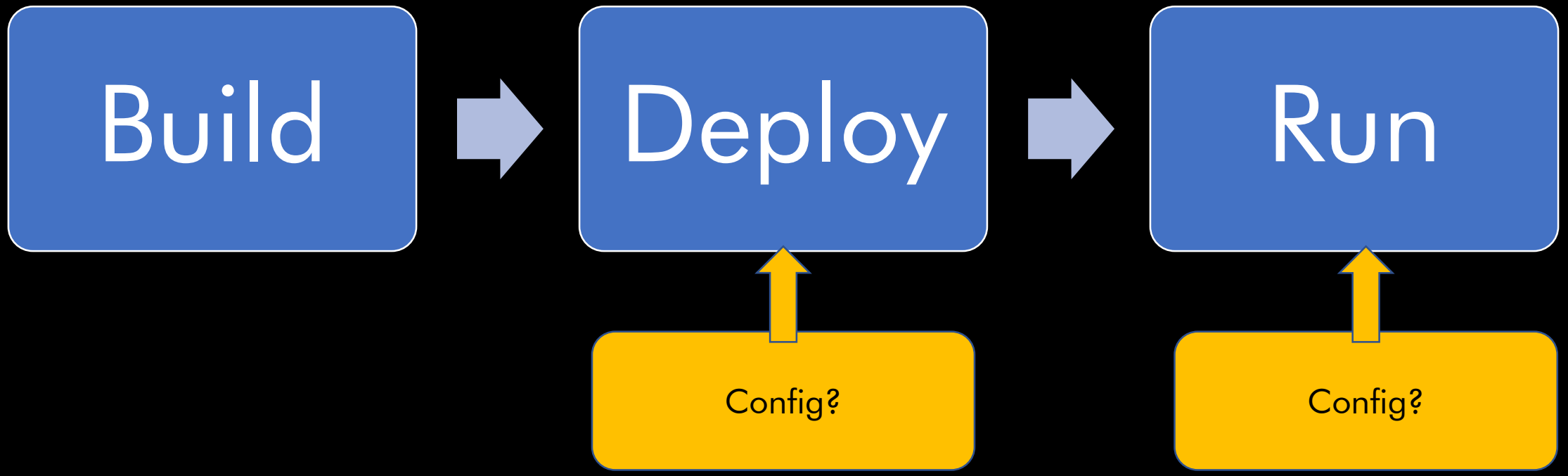
12FA #3: Configuration

1. Constants; hard-coded values; web.config
2. Multiple configurations
    1. Web.Debug.config vs Web.Release.config
    2. Config held in source control
    3. Build pipeline produces configured packages
3. Configuration via deployment
    1. E.g. Octopus Deploy XML transforms
4. Configuration via environment (machine level)
5. Configuration via environment (network level)

12FA #4: Backing Services

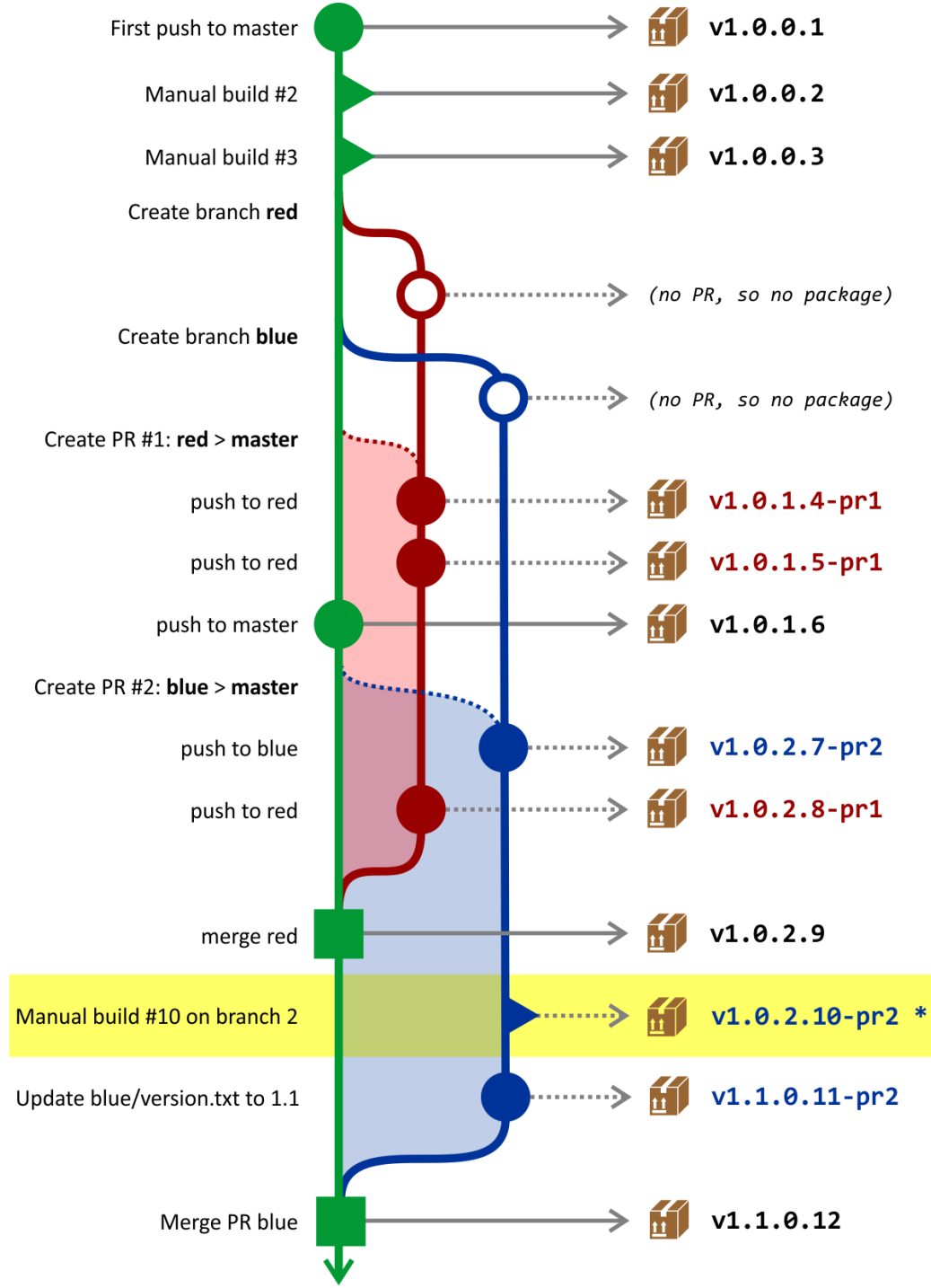


21FA #5: Build, Release, Run



On Builds, Releases and Versioning

- Every release has a unique release number
- Release numbers increase over time
  - Lower numbers are ALWAYS earlier releases
- Incrementing build numbers – 1,2,3,etc
- Datetime stamps – 201709131410, 201709131425
- Semantic versioning


First push to master
v1.0.0.1
Manual build #2
v1.0.0.2
Manual build #3
v1.0.0.3
Create branch red
(no PR, so no package)
Create branch blue
(no PR, so no package)
Create PR #1: red > master
push to red
v1.0.1.4-pr1
push to red
v1.0.1.5-pr1
push to master
v1.0.1.6
Create PR #2: blue > master
push to blue
v1.0.2.7-pr2
push to red
v1.0.2.8-pr1
merge red
v1.0.2.9
Manual build #10 on branch 2
v1.0.2.10-pr2 *
Update blue/version.txt to 1.1
v1.1.0.11-pr2
Merge PR blue
v1.1.0.12

12FA #6: Stateless Processes

- Any persistence has to be in an isolated service
  - Database / data store
    - Memcached
    - Redis
  - Object storage (filesystem share, S3 bucket, cloud)
  - Don't rely on ANYTHING from a previous operation still existing in a future operation
    - No temp files
    - No local storage
    - No sessions
    - No in-memory

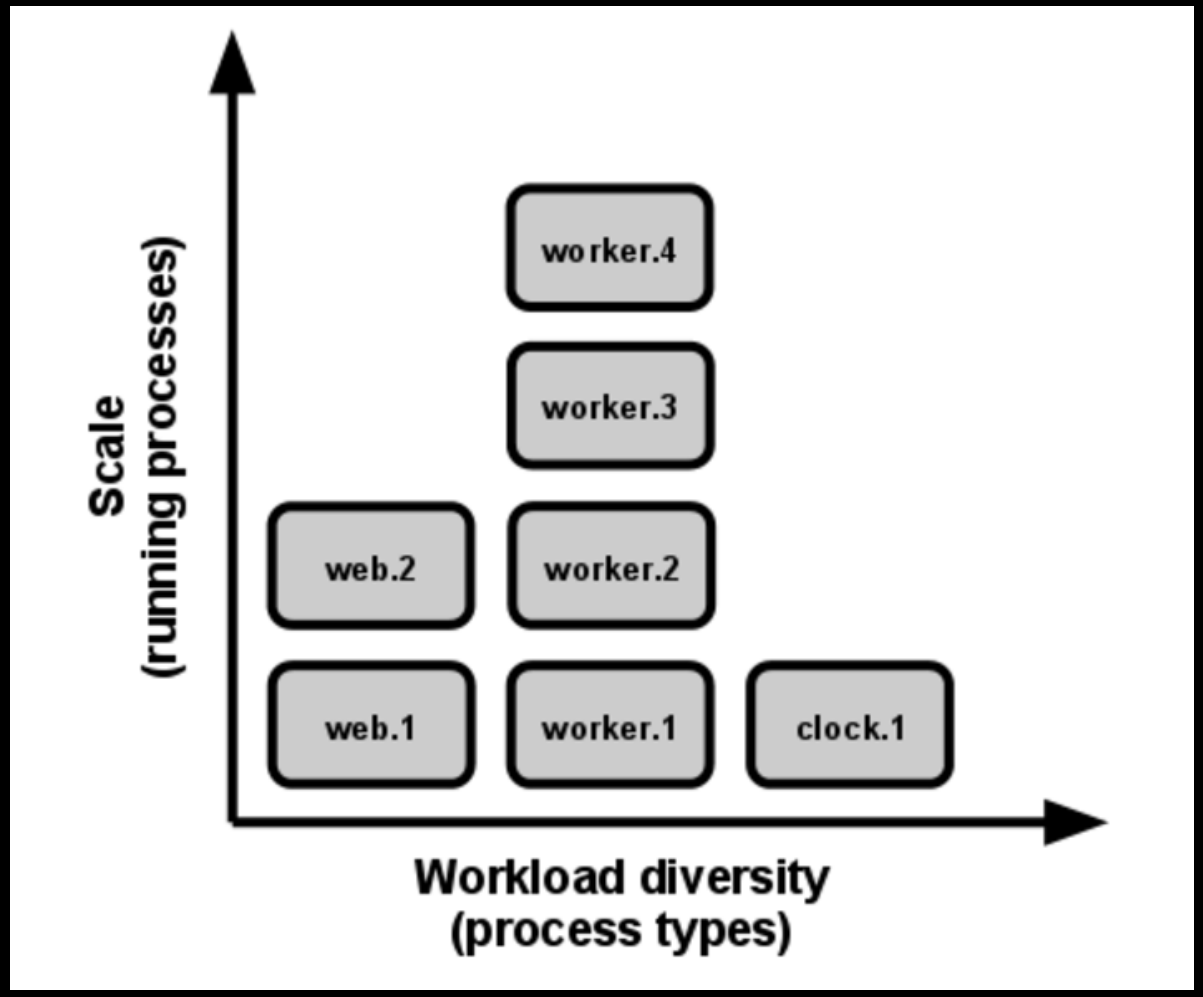
12FA #7: Port Binding

.NET App — Kestrel

Python app — Tornado

Java app — Jetty

12FA #8: Concurrency



12FA #9: Disposability

- Start up FAST
- Shut down GRACEFULLY
  - Stop listening for new requests
  - Finish handling any existing requests
- Consider a crash-only approach

12FA #10: Dev/Prod Parity

- The time gap:
  - A developer may work on code that takes days, weeks, or even months to go into production.
- The personnel gap:
  - Developers write code, ops engineers deploy it.
- The tools gap:
  - Developers may be using a stack like Nginx, SQLite, and OS X, while the production deploy uses Apache, MySQL, and Linux.

12FA #11: Logs are Event Streams

- Log everything to STDOUT
- Let the environment worry about monitoring, aggregating, searching, etc

12FA #12: Admin processes

- Ship your ad-hoc admin scripts
- Make them releases
- Run them using the same environment and configuration as real code

Exercise 5

Going Serverless

Hello, Galaxy!

Hello World at Scale

https://github.com/dylanbeattie/ProgNet2017

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Progressive.NET Tutorials 2017

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