Architecture Katas

Autumn 2023

Neal Ford
Thoughtworks
Director / Software Architect / Meme Wrangler
http://www.nealford.com
@neal4d

Kickoff event

Introduction

Where did this idea come from?

archkatas.herokuapp.com

Architectural Katas | Home | About | Rules | Contribute | Invite | Lead | Join | Contact

Architectural Katas

"How do we get great designers? Great designers design, of course." --Fred Brooks

"So how are we supposed to get great architects, if they only get the chance to architect fewer than a half-dozen times in their career?" --Ted Neward

Do one! »

Where did this idea come from?

About

The Architectural Katas started as a presentation workshop by Ted Neward. They've taken on a life of their own.

Learn more »

Rules

Doing an Architectural Kata requires you to obey a few rules in order to get the maximum out of the activity.

Read rules »

Contribute

New Kata problems/proposals are always welcome.

Send ideas »

Invite

Want an experienced Architectural Kata moderator to run the workshop at your place of business?

Lead

Want to run the Architectural Katas yourself? There's only a few things you need to know before you do.

Join

Want to find a group near you that's running the Architectural Katas?

...and then...

http://fundamentalsofsoftwarearchitecture.com/katas/

Not Secure — alsofsoftwarearchitecture.com

fundamentalsofsoftwarearchitecture.com

Architectural Katas Updated Fundamentals of Software Architecture Images Architectural Katas Fundamentals of Software Architecture List of Architecture Katas

Architectural Katas

inspired by Ted Neward's original Architectural Katas

```
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Great designers design,
of course."
                        Fred Brooks

"So how are we supposed to get great architects, if
they only get the chance  to architect fewer than
a half-dozen times in their career?"

                       Ted Neward
```

About

Architectural Katas are intended as a small-group (3-5 people) exercise, usually as part of a larger group (4-10 groups are ideal), each of whom is doing a different kata. A Moderator keeps track of time, assigns Katas (or allows this website to choose one randomly), and acts as the facilitator for the exercise.

Each group is given a project (in many ways, an RFP–Request For Proposal) that needs development. The project team meets for a while, discovers requirements that aren't in the original proposal by

...and then...

oreilly.com

O'REILLY®

LIVE ONLINE TRAINING

Architectural Katas

Topic: Software Development

Late 2020…

NEAL FORD

October 20, November 17 & December 3, 2020

10:00am – 12:00pm EST

This course has ended.

What you'll learn Instructor Schedule

New information after 10/20 kickoff:

Meet the SME

Joshua Yellin

Outdoor adventurer passionate about helping startups succeed. Josh loves exploring how cutting-edge technologies can be used for social and environmental good, particularly in finding out the full extent of what artificial intelligence can do for the environment.

wildlife.ai

Using artificial intelligence to accelerate wildlife conservation

Wildlife.ai

Conservation

Community

Education

Biodiversity Crisis

~1 million species face extinction (*IPBES, 2019)*

Conservation practitioners need accurate & real time information

Images by Sami Kizilbash and Matthew Chauvin

Wildlife.ai Projects

Koster Seafloor Observatory

Pepeketua ID

Wild About AI

Nesher Bari

Wildlife Watcher

Image by Head Office students **(NZ)**

Local Challenge

Global Impact

Multi-species monitoring

Real-time ecosystem health

Open-source community

Community Success

Community success

jupyter

GBIF
Global Biodiversity Information Facility

W&B

zenodo

iNaturalist

EDGE IMPULSE

FiftyOne

Thanks!

Department of Conservation
Te Papa Atawhai

OCEAN DATA FACTORY SWEDEN

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

SUBAK

Protecting our natural treasure
Wild for Taranaki

TOI FOUNDATION

UNIVERSITAS GOTHOBURGENSIS 1891

TARANAKI MOUNGA
He Kawa Ora – Back to Life

MAZDA FOUNDATION

Meet the Judges

Jacqui Read

Jacqui Read, an internationally recognized software and enterprise architect with over 13 years of industry experience, is the author of *Communication Patterns: A Guide for Developers and Architects* and founder of Read the Architecture, an innovation hub providing architecture consultancy and training services. She specializes in helping businesses large and small create and enhance architecture practices, construct evolutionary architectures, and untangle and extract value from data and knowledge. Jacqui also runs software architecture katas for teams and companies, teaches public and private workshops, and speaks at international conferences on topics such as architecture decisions, technical communication, and architecture practices. Her professional interests include collaborative modeling, knowledge management, DDD, and socio-technical architecture. Outside of work she enjoys gardening and attempting to strum her ukulele and sing at the same time. Her website is Jacquiread.com.

Lesley Cordero

Lesley Cordero is currently a Staff Engineer at The New York Times. She has spent the majority of her career on edtech teams as an engineer, including Google for Education and edtech startups. She is primarily focused on platform engineering and reliability management, specifically in the observability space. Lesley also has experience building and leading teams, and is also an experienced conference speaker.

Tod Golding

Tod Golding is a cloud applications architect who has spent the last seven years immersed in cloud-optimized application design and architecture. As a global SaaS lead within AWS, Tod has been a SaaS technology thought leader, publishing and providing SaaS best practices guidance through a broad set of channels (speaking, writing, and working directly with a wide range of SaaS companies). Tod has over 20 years of experience as an architect and developer, including time at both startups and tech giants (AWS, eBay, Microsoft). In addition to speaking at technical conferences, Tod also authored Professional .NET Generics, was a columnist for Better Software magazine, and is currently writing *Building Multi-Tenant SaaS Architectures* for O'Reilly.

The Process

structural design in architecture

requirements | use cases | story cards | DDD event-storm output | ?

reliability
performance
security
scalability
deployability
elasticity

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security
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Your Architectural Kata is...

Going Going Gone!

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availability reliability performance

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availability reliability performance scalability

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availability reliability performance scalability elasticity

scalability:

elasticity:

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availability reliability performance scalability elasticity (security)

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concurrency

availability reliability performance scalability elasticity (security)

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component identification

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Your Architectural Kata is...

Going Going Gone!

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Going Going Gone!

the “entity trap”

auctions

items

bids

Your Architectural Kata is...

Going Going Gone!

the “entity trap”

Your Architectural Kata is...

Going Going Gone!

the “entity trap”

Your Architectural Kata is...

Going Going Gone!

the “entity trap”

Your Architectural Kata is...

Going Going Gone!

workflow approach

create auction ⟶ find auction ⟶ sign up ⟶ watch auction ⟶ place bid

Your Architectural Kata is...

Going Going Gone!

workflow approach

Your Architectural Kata is...

Going Going Gone!

actor/action approach

bidder

auctioneer

system

Your Architectural Kata is...

Going Going Gone!

actor/action approach

bidder

auctioneer

system

view live video stream

view live bid stream

place a bid

Your Architectural Kata is...

Going Going Gone!

actor/action approach

bidder

auctioneer

system

view live video stream
view live bid stream
place a bid

enter live bids into system
receive online bid
mark item as sold

Your Architectural Kata is...

Going Going Gone!

actor/action approach

bidder

view live video stream
view live bid stream
place a bid

auctioneer

enter live bids into system
receive online bid
mark item as sold

system

start auction
make payment
track bidder activity

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bidder

view live video stream
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auction session

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✓start auction
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auction session

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Judges Criteria

Clarity of narrative, organization, and supporting documentation

Narrative and Organization

A narrative tells the story of the architectural solution

nar·ra·tive

/ˈnerədiv/

noun

a spoken or written account of connected events; a story.

Narrative and Organization

A *narrative arc* a literary term for the path a story follows. It provides a backbone by providing a clear beginning, middle, and end of the story

https://github.com/TheJedis2020/arch_katas_2020

- Prelude
- The Vision
- The Final Video Presentation
- Business Requirements
- The Strategy
- The Architecture
- Sequence Diagrams
- Architectural Desision Records (ADRs)

https://github.com/miyagis-forests/farmacy-food-kata

Requirements

This section contains the requirements, distilled from the provi
the interview with the PO, Kwaku Osei, but also with some assu
main drivers for the design decisions in this proposal.

- Functional requirements
- Quality attribute requirements, aka architecture characteris

Architecture

Here you find the documentation of the software architecture th
requirements.

As a starting point, there's a context diagram that gives an over
we called the *Farmacy Food System*, which is the scope of this

ADRs

The linked ADRs below record the main architecture decisions re
context and rationale.

- ADR 001 - Microservice style
- ADR 002 - Payment gateway

https://github.com/lookfwd/archkata

Jiakaturi

Overview

Vision

Goals and Opportunities

Use Cases

Architecture Characteristics

Design Constraints

High-Level Architecture

Mid-Level Architecture

Milestones

ADRs

Completeness of solution

Completeness of Solution

Identification of supporting architecture characteristics

Architecture Characteristics

Architecture characteristics form the foundational aspects of the architecture and are required for proper trade-off analysis and decision making

- ☑ Scope
- ☑ Justification

https://www.developertoarchitect.com/downloads/worksheets.html

https://www.developertoarchitect.com/lessons/lesson112.html

Architecture Characteristics Worksheet

System/Project: _____

Architect/Team: _____ **Date:** _____

Candidate Architecture Characteristics

performance	data integrity	deployability
responsiveness	data consistency	testability
availability	adaptability	abstraction
fault tolerance	extensibility	workflow
scalability	interoperability	configurability
elasticity	concurrency	recoverability

others: _____

_____

_____

a, b denotes characteristics that are related; some systems only need one of these, other systems may need both

Top 3	Driving Characteristics	Implicit Characteristics
☐	1. _____	feasibility (cost/time)
☐	2. _____	security
☐	3. _____	maintainability
☐	4. _____	simplicity
☐	5. _____	
☐	6. _____	Others Considered
☐	7. _____	_____
		_____
		_____
		_____

Instructions

- Identify no more than 7 driving characteristics.
- Pick the top 3 characteristics (in any order).
- Implicit characteristics can become driving characteristics if they are deemed *structural* concerns.
- Add additional characteristics identified that weren't deemed as important as the list of 7 to the *Others Considered* list.

Created by Mark Richards, DeveloperToArchitect.com

Notifications Capability

Architectural characteristics

- Elasticity.
- Fault tolerance.
- Plugin support.

Jiakaturi

1. Enable Discovery - Agility

The customer experience in acquisition channels (mobile, web and even SMS) must be seamless. This requires custom experimentation and optimization. The architecture must provide ways to capture customer behaviour with comprehensive analytics and support A/B testing. It's a plus if it can also provide rich experiences like smart recommendations powered by AI/Machine Learning. Those features must be immediatelly available on pay-as-you go basis, instead of requiring significant upfront investments in development or technology.

2. Affordable DevSecOps - Viability

The startup must be able to implement the architecture given budget and time constraints. More specifically this is framed as an integration project where solutions from Software as a Service (SaaS) vendors are integrated using minimal software development. The architecture must be able to be built by delivering features that address the most immediate growth pain points of the business. Complex features that require custom software development must be postponed to as late as possible.

Diagrams – types, level of detail, and completeness

Diagrams

An effective architecture picture is worth more than a 1,000 words. Architecture represents topology, which benefits from visual representations.

"The goal of a diagram is to convey a clear and shared understanding of the architecture"

- Neal Ford

Diagrams

An effective architecture picture is worth more than a 1,000 words. Architecture represents topology, which benefits from visual representations.

component diagrams

context diagrams

Diagrams

An effective architecture picture is worth more than a 1,000 words. Architecture represents topology, which benefits from visual representations.

user journey diagrams

sequence diagrams

Diagrams

An effective architecture picture is worth more than a 1,000 words. Architecture represents topology, which benefits from visual representations.

system-level diagrams

deployment diagrams

Diagrams

An effective architecture picture is worth more than a 1,000 words. Architecture represents topology, which benefits from visual representations.

user interface mockups

System Component Diagram

Farmacy Food
(Customer Web Application)
Web application that customers use to interact with the system. Includes sign up, login, profile, settings, payment methods, subscriptions, feedbacks, advices and recommendations

Farmacy Food
(Customer Mobile Application)
Similarly like Web, this is a Mobile application that customers use to interact with the system.

Behavior

Farmacy Food Android app
Order BFF for Android
Checkout
Payment
Payflow wrapper
Payflow by PayPal
Customer notification
Order processing
Farmacy Food central kitchen
Smart fridge wrapper
Smart fridge mgmt system
Order command
Inventory command
confirm place order
"Thank you for your order 999. It is being processed."
"We received your order. Confirmation code is Xyz"
"Payment for your order 999 was approved."
The interaction with the fridge system API likely requires opening a session using an API Key. After that we can post the order details: confirmation code X (or card number X) to pick up items a, b, c... at fridge Y on this date/time.
Farmacy Food API key
Order details

PAYMENT GATEWAY
EDIETITIAN
IDENTITY
CENTRAL KITCHEN
VENDOR KIOSK
SMARTFRIDGE
GEOLOCATION
CART
PROMOTION
PAYMENT
SUBSCRIPTION
USER
CUSTOMER NOTIFICATION (generic)
ORDER (core)
REVIEW
INVENTORY (core)
MEAL CATALOG
REPLENISH
LOCATION
Via REST API
Via Events
Via Data Replication
Via REST API
U
D
ACL
Conformist
Key:
BC NAME (BC type)
Bounded Context (BC) and Subdomain
Subdomain
Core BC
Partnership (BC Relationship)
Conformist (BC Relationship)
Anticorruption Layer (BC Relationship)
Upstream end of the BC relationship
Downstream end of the BC relationship
Via (mechanism name)
BCs integration mechanism

Architecture decision records – documentation and justification

Second Law of Software Architecture

"*Why* is more important then *how*"

architecture decision records

short text file; 1-2 pages long, one file per decision
markdown, textile, asciidoc, plaintext, etc.

short noun phrase

proposed, accepted, superseded

description of the problem and alternative solutions available (documentation)

decision and justification (the "why")

trade-offs and impact of decision

architecture decision records

Federating the Hub

Context

The AcmeWidgets applications currently utilizes an integration hub to allow internal applications to connect to a

Figure 1 Illustrates the existing scenario

Figure 1 Before new clients added

Not organizations require developers to add new auto-sync types, external and UI.

Consideration:

- Both only need the hub access
- Hub becomes a bottleneck, slows deployment
- application logic may be shared between different types of client applications (e.g., internal and external)

Two options exist.

Dedicated Broker Instances

Using dedicated broker instances creates the architecture shown in Figure 2.

Figure 2. dedicated broker instances

detailed issues in addition:

- **decoupled**: Dedicated broker instances provide better throughput because no message contention exists.

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- **Internal application coupling**: The approach requires changes to the internal client applications to incorporate the new broker. This tight coupling increases development complexity and deployment risk.
- **changes to other** internal broker-related logics: additional changes are likely.
- **Shared broker risk**: A single broker instance introduces a shared point of failure and potential performance bottleneck, affecting all connected applications.

Centralized Broker

Using centralized broker instances creates the architecture shown in Figure 3.

Figure 3. centralized broker

detailed issues in addition:

- **decoupled**: Centralized broker principally creates a throughput bottleneck. However, developers analyzed special-purpose usages and this detailed various problems.
- **Internal application coupling**: Clients still rely on connections and shared broker usage patterns. Changes to the broker logic or to client-side connection logic still impact client broker
- **changes to other** internal broker-related logics: additional changes are likely.
- **Shared broker risk**: A single broker instance introduces a shared point of failure and potential performance bottleneck, affecting all connected applications.
- **Single point**: While centralized broker can be highly resilient, failure affects all connected applications.
- **Complexity**: Increases the logic for transaction isolation, performance tuning, and fault tolerance within a single broker.

Decision

We chose **centralized broker**.

Status

proposed

Consequences

The internal applications should not have to know from which broker instance the request came from.

Only a single broker connection is needed, allowing for the expansion of additional hub instances with no additional changes.

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architecture decision records

ADR 001: Use the microservice architecture style with containerization

Farmacy Food is a start up company and does not have a sizeable team of experienced developers available. The overarching architecture style for the Farmacy Food system should be simple, easy to create, maintain and **evolve**. Finding developers that can create and evolve the system, as well as tools and frameworks that support the system should not require heaps of money. In other words, Farmacy Food is not in a position to be an *early adopter*, and should hence adopt an established architecture style that supports evolution.

architecture decision records

ADR_004 Use a centralized notification for external communication

Context

There was some confusion around the purpose of the notification component. Specifically, is this component an event bus for **all** communication or is it a shared component for communicating externally.

Decision

We decided to have a dedicated notification system responsible of sending external notification. The reasons include:

selfdriventeam

Overall solution

Overall Solution

The architecture solution describes the overall structure of the system and how it will be constructed

- ☑ Are the architecture characteristics demonstrated in the solution?
- ☑ Is the solution appropriate and feasible given the project constraints?
- ☑ Are the architecture styles selected represented in the solution?

Integration

Feasibility

Agility

Availability

Security

Scalability

Final architecture presentation (semi-finalist)

The Problem

Wildlife Watcher

Wildlife.ai, a charity using AI to accelerate wildlife conservation, wants to build an open-source wildlife camera that gets triggered based on the movement of target animals, identifies the species on the device and reports the observation in near real-time to biologists, enabling more efficient species conservation efforts worldwide.

Users

Users: biologists and nature enthusiasts (hundreds).

Requirements

- ❑ Users should be able to communicate with the camera using a mobile app (to set the cameras on/off and adjust settings without opening the cameras)
- ❑ Users should be able to analyze the videos using common camera trap labelling platforms (Wildlife Insights, TrapTagger or Trapper)
- ❑ Users should be able to publish frames from the videos to iNaturalist for experts to help with the identification of the species
- ❑ Users should be able to easily train edge models. using their own labelled videos, and upload the models to the cameras (maybe using third party services like Roboflow, Edge Impulse or TensorFlow Lite)
- ❑ Users should be able to publish the species occurrences to GBIF using the Camtrap DP, data exchange format
- ❑ Cameras should be able to process the footage on the device and send a small alert message to the users via LoraWan, 3G or satellite.

Additional Context

The camera hardware will be a combination of ultra-low-power microcontrollers (up to 512KB Flash) and interchangeable modules (e.g. optical sensor, IR lights, transceiver module, batteries) enclosed in a watertight and 3D printed enclosure.

The API for the specific camera hasn’t been selected, allowing teams to specify what behavior they might need from the hardware, helping the team choose appropriate hardware.

Contest Details

Dates

- All teams must submit a google form (https://forms.gle/PEvav7egEGyiHMQC8) by Friday, October 20 at 12PM Eastern to participate

- Solutions are due in your GitHub repo by Tuesday, October 31, 11:59PM Eastern

- Semifinalists will be announced at the second event on Tuesday, November 14

- Questions? Email us at katas@oreilly.com

Resources

Wildlife Insights: https://wildlifeinsights.org/
Trap Tagger: https://wildeyeconservation.org/traptagger
Trapper: https://gitlab.com/oscf/trapper-project

Roboflow: https://roboflow.com/
Edge Impulse: https://edgeimpulse.com/
TensorFlow Lite: https://www.tensorflow.org/lite

Global Biodiversity Information Facility : https://www.gbif.org/
CamTrap DP: https://tdwg.github.io/camtrap-dp/

Architecture Katas

Autumn 2023

Neal Ford
Thoughtworks
Director / Software Architect / Meme Wrangler
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Kickoff event