

# Software Proficiencies and Research

This document aims to provide a summary of the areas of research, training and my general level of proficiency within Java, Kotlin, Android and cloud technologies. The below corresponds to a concise summary of the contents of collated research contained within the 'Research' folder in this repository.

## Java SE

Top Level	
Class	Abstract Class
Interface	Enum
Nested Types	
Types	Local Class Inner Class Static Nested Class Anonymous Class Lambda Expressions Method Reference
Members	Permitted Members Access to Outer Scopes Shadowing Final or Effective Final
Nesting Principles	Memory Depiction Instantiation From External Scopes
Static Nested Class	
Effective Top Level Class	
Internal Memory Depiction	
Permitted Access to Outer Scopes	
Instantiation From External Scopes	
Anonymous Class	
Header / Body Syntax	
Anonymous Object	
Extended Class	
Inline Implementation	
Access to Outer Scopes	
Lambda Expression	
Purpose / Intended Use	
Functional Interface	
Parameters / Body Syntax	
Zero Parameters	
Multiple Parameters	
Explicit Parameters	
Implicit Target Type	
Access to Outer Scopes	
Enum	
<b>Declaration / Definition</b>	Header / Body Syntax Enum Constants Enum Constructor Memory Composition
Enum	
<b>Instantiation</b>	Declaration Referencing Restrictions
Blocks	
Permitted Usage	
Permitted Members	
Unpermitted Members	
Initialisation Blocks	
Initialisation Blocks	
Labelled Blocks	
Class	
<b>Declaration / Definition</b>	Header / Body Syntax Access Modifiers Memory Composition Static Non-Static Overloading Overriding Shadowing Fields Instance Class Constants Constructors Default No Argument Super Constructor Constructor Chaining Initialisation Blocks non-Static Static
Methods	Signature Parameter List Parameter Type [ByValue] Primitive Arrays VarArgs Object Variable Interface Variable Method Ref. Lambda Expression Ambiguity Scope / Access Covariant Return Type
Extending	Compatibility
Interface Implementation	Single Multiple Generic
<b>Instantiation</b>	Declaration Allocation Initialisation Variable Referencing Member Referencing Garbage Collection
Interface	
<b>Declaration / Definition</b>	Header / Body Structure Syntax Memory Composition Implicit Access Modifiers Members Permitted Unpermitted Fields Constants Only Methods Abstract Static Default Extending Multiple Inheritance non-Static Members Aggregation Non-Ambiguity Non-Clashing Consolidation
<b>Class Implementation</b>	Abstract Method Implementation Abstract Method Aggregation No Ambiguity
<b>Interface Variables</b>	Polymorphism Anonymous Objects Compatibility
<b>Types</b>	Normal Functional Semantic Annotation
Arrays	
Declaration / Allocation / Initialisation	Utility Methods Sorting Collection Conversion Searching
Utility Classes System java.util.Arrays	Copying Comparison
Annotations	
Declaration Elements	Types Annotation [Predefined] Annotation Type [Custom] Container Annotation Type Meta-Annotations Type Annotation
Deployment Single Multiple / Repeated	

Static / non-Static Memory

Component	Static Memory	non-Static Memory
Memory Composition	Permitted Members	Permitted Members
Memory Depiction	Static Member Initialisation	Permitted Referencing
Memory Depiction within nested components	Static Member Default Values	Default Values
Memory Scope	Static Member Referencing	Nested Components
Memory Properties	Permitted Referencing	Nested Referencing
Internal Composition	Nested Components	Outer Scope Referencing
Location	Nested Referencing	Shadowing
	Outer Scope Referencing	
	Shadowing	

Exceptions

Checked / unchecked	try-catch-finally
Chained exceptions	try-with-resources
Catch / specify requirement	RuntimeException
Throwable	Error
Exception	

Pipelines / Streams

Aggregate Operations:	Laziness
Source	Interference
Intermediate Operations	Aggregate Operators v Iterators
Terminal / Reduction Operations	Collection Traversal
Ordering	Low Level Operation
	Side Effects

Generics

Application	Generic Interface
Class	Declaration
Interface	Header / Body Syntax
Constructor	Interface Type Parameters
Method	Local Type Parameters
	Extension and Type Pass Up
	Aggregation, Override and Overload
	Multiple Inheritance
	Generic / Non-Generic Inheritance
	Non-Ambiguity
	Interface Consolidation
	Multiple Inheritance / Extension / Implementation

## Techniques and Data Structures

## Dynamic Programming

1D  
2D  
Top-Down  
Bottom-Up / Tabulation

Divide and Conquer  
Greedy  
Backtracking  
Path / Level Tracking  
Sliding / Dynamic Window  
Binary Search  
Big O (Time / Space)

Linked List  
Stack  
Queue  
Deque  
Heap

Min Heap  
Max Heap  
Priority Queue

## Recursion

Recursive Method Structure  
Preprocessing  
Postprocessing  
Base / Ongoing Case  
Call Tree  
Tail Recursion

Hash Table / Map  
Prefix Array  
Suffix Array  
Disjoint Set / Union Find

## Graphs / Trees

Binary Tree  
Binary Search Tree  
Balanced Binary Search Tree  
Minimum Spanning Tree  
n-ary Tree  
Trie

## Graph / Tree Traversal

Directed      BFS / DFS  
Undirected      preOrder  
Acyclic      inOrder  
Edge List      postOrder  
Adjacency List

## Multithreading / Concurrency

## Interface

Runnable  
Callable  
Future  
Lock  
Condition  
ExecutorService  
    ThreadPoolExecutor  
    FixedThreadPool  
ScheduledExecutorService  
    ScheduledThreadPool  
BlockingQueue<E>  
ConcurrentMap<K,V>

## Class

Thread  
ReentrantLocks  
Semaphore  
Executors  
CountDownLatch  
CyclicBarrier  
AtomicInteger  
ConcurrentHashMap<K,V>  
Exchanger<V>  
PriorityBlockingQueue<E>  
PriorityBlockingQueue<E> with Comparable Element

## Fork / Join

Class  
ForkJoinPool  
RecursiveAction  
RecursiveTask<V>  
Sequential v Parallel (via Fork / Join)

## Serial v Parallel

Mergesort  
Find Sum  
Streams

## States

Livelock  
Deadlock

## Techniques

Synchronisation Blocks  
Wait / Notify  
Volatile Memory  
Object Locks  
Object Locks with Conditions  
Producer / Consumer

## Packages

Management / Organisation  
Naming Conventions  
Referencing

Importing Static Members  
Import Wildcards  
Importing Top Level Components

## SOLID Principles

Single Responsibility  
Open-Closed  
Liskov Substitution  
Interface Segregation  
Dependency Inversion

## Infrastructure

JDK  
    SE: Standard Edition  
    EE: Enterprise Edition  
    ME: Micro Edition  
JRE / JVM  
    JIT Compiler  
        CLASSPATH  
        Source Directory  
        Java API Library  
Class Loaders  
    Bootstrap  
    Extension  
    System / Application  
Memory Allocation  
    Heap  
    Stack  
    Program Counter

## Miscellaneous

final      instanceof  
null      .equals()  
super      .hashCode()  
this  
Constructor Chaining  
Local Reference  
Method Argument / Return  
Statements / Expressions / Blocks  
Composition      Hierachy  
Types      Concatenation  
Composition v Aggregation

## Spring

## Projects

Spring Boot      Spring Batch / Integration  
Spring MVC      Spring Security  
Spring Validation      Spring Security For OAuth  
Spring Data      Spring Security Authorisation Server

## Bean Declaration / Definition

via XML  
via Annotation  
via Bean Method (@Bean)  
via Component Scanning (@Component)  
via Configuration Classes (@Configuration)

## Dependency / Bean Injection

via Constructor  
via Setter  
via Field  
via Autowiring

## Spring Initializr

Project Creation / Structure  
    Source Code  
    Resources  
    Test  
    application.properties  
    application.yml  
Starter Dependency Selection

## Spring Tool Suite

IDE Plugin  
Spring Boot Dashboard

## Configuration

DSL Configuration  
Configuration Properties  
Profiles

<b>Spring MVC Web Application / REST Endpoint</b> Embedded Tomcat Server Thymeleaf Templates		<b>Lombok</b> @Data (Data Class) Getter / Setter Auto Populate	
<b>@Controller</b> <b>@RestController</b> @RequestMapping @GetMapping @PostMapping @PutMapping  RestTemplate ResponseEntity Object Mapping JSON / XML Payload Pagination Cross Origin Resource Sharing Path Variables HATEOAS		<b>Logging</b> @Slf4j Logback	
<b>Testing</b> @SpringBootTest @WebMvcTest @Test		<b>Persistence</b> Spring Data JDBC/JPA/... JdbcTemplate Schema (via *.sql) SpEL	
<b>Dev Tools</b> Auto Restart Auto Refresh No Caching H2 Console		<b>Security</b> User Authentication Security Filter Chains 3rd Party Authentication OAuth2	
		<b>Messaging</b> Asynchronous Brokers JMS RabbitMQ Kafka Push / Pull Models Message Converters Message Header / Payload Message Listeners	
		@Repository @Table @Data @Id @Query  JWT OpenIDConnect Cross Site Request Forgery Client Repositories	
		JMSTemplate RabbitMQTemplate KafkaTemplate	

## XML HTTP REST

<b>XML</b> Purpose Standards XML Document Prologue Elements Tags Attributes Root Siblings Entity Reference Well Formed Comments Namespaces XMLHttpRequest XML Parser XML DOM XPath XSLT XQuery XLink XPointer DTD / XML Schema		<b>HTTP</b> Purpose Properties Connectionless Media Independent Stateless Versions	
		<b>MIME Type</b> Format Components Type Tree / Subtype Suffix Parameters	
		Registration Trees Standards Tree Vendor / Producer Tree Personal / Vanity Tree Unregistered Tree	
		<b>REST API</b> Purpose Client / Server Stateless Uniform Interface Resource Identification: Resource Manipulation: Resource Description:	
		URI GET, PUT, POST, DELETE... Content-Type: application/json	

## Workflows

<b>Continuous Integration &gt; Continuous Delivery / Deployment</b> Low Risk Progress Automation User Feedback		<b>DevOps</b> Purpose Advantages Pipeline Idea > Code > Build > Deploy > Manage > Learn > Idea... Velocity Quality Value Stream Map	
<b>Test Automation</b> Unit Test Suite Regression Test Suite Performance Test Suite			
<b>Scrum</b> Purpose Team / Roles Product Owner Scrum Master Developers Sprint Events / Workflow Plan Development Review Retrospective		<b>Artifacts</b> Product Goal Product Backlog Increment (of Value) Sprint Backlog Sprint Goal Items Plan of Delivery Burndown Chart	
<b>Maven / Gradle</b> Purpose Project Structure *.pom / build.gradle Modules Dependencies Plugins Maven WAR Maven Cargo Build Lifecycle mvnrepository.com Goals / Tasks		<b>TDD</b> Cycle: Red > Green > Refactor > Red... Unit Tests Solution Space Output Space Constraint Certainty / Flexibility Uncertainty Principle Value / Property Testing Test Doubles Dummy Stub Spy Test Patterns Self Shunt Humble Object	

## Kotlin

Class			Collections		
<b>Declaration / Definition</b>		<b>Data Class</b>	List Map Set  Mutable / Read-Only Casting  <b>Extension Functions</b>  .filter() .any() .map() .all() .mapNotNull() .none()  .find() .associate() .first() .associateBy() .firstOrNull()  .count() .flatten() .partition() .flatMap() .groupBy() .zip .groupingBy() .zipWithNext() .maxBy() .minBy()  .getOrPut() .sortByDescending()		
Constructors Primary Secondary Init Block	Properties Member Functions	Purpose Creation Built-In Implementations .toString() .equals() / == .hashCode() .copy() .println() .component1()...  Copying Destruction Declarations			
Extension Interface Implementation Delegation (by) Operator Overloading					
<b>Properties</b>		<b>Enum Class</b> <b>Sealed Class</b> <b>Nested / Inner Class</b>			
Backing Field get() set() value field Lazy lateinit val var Default value Delegation (by)		<b>Generics</b>  Classes Interfaces Functions Extension Functions			
<b>Extension Properties</b>		Type Arguments / Parameters Bound / Unbounded Nullable / non-Nullable			
Creating Referencing Receiver (via this)					
Language			Objects		
History Purpose Java / JVM Interoperability Java Interpretation Java Equivalents	OOP / Functional Styling Statically Typed Concision Modules / Packages Top Level	equals() / == / === Constants Pairs  <b>Types</b>  Type Inference is / as / as? .let()  Type Casting Smart Casting ?  Unit / Nothing val / var Any	<b>Access Modifiers</b>  private internal protected public  <b>Conditionals</b>  Expressions Comparisons when if-else chain Type Checking Ranges Enum Pairs  <b>Strings</b>  Templates Multiline Data Type Conversion Concatenation  <b>Exceptions</b>  Structure / Form / @Throws try catch Assignable Function Wrappers .require()		
<b>Loops</b>			@JvmName @JvmStatic @JvmOverloads @JvmField		
			<b>Common Library Functions</b>  .takeIf() .use() .withLock() .takeUnless() .with() / .run() .apply() / .also() .repeat()		
			<b>Common Annotations</b>  @JvmName @JvmStatic @JvmOverloads @JvmField		
<b>Nullable / non-Nullable</b>					
Purpose Safe Call	Elvis Operator non-Null Assertion !!				
Language	Java / Kotlin Interoperability via Annotation via Explicit Type Specification via Intrinsic Checks NPE Safety Platform Types				
Functions			Sequences		
Top-Level Member	Anonymous Local	Extending Overriding	Purpose Stream Equivalent Collection Alternative  Intermediate Operations Terminal Operations  Lazy Yield  .asSequence() .generateSequence()		
<b>Forms</b>		<b>Member References</b>			
As Variable As Parameter As Return	Named Parameters Default Arguments Function Expressions	Bound / Unbound			
<b>Function Types</b>		<b>Extension Functions</b>			
Implicit / Explicit	nullable / non-nullable	Purpose Creating Managing  Limitations Invocation from Java infix			

## Lambda Expressions

Purpose	Trailing Lambda		
Structure { }	Destruction Declaration		
Chained Statements (Functional Styling)	.run()		
<b>Forms</b>	<b>Return Control</b>	<b>Parameters</b>	<b>Lambda (with Receiver)</b>
As Variable	via Labelling	None	Purpose
As Argument	Whole Function	Blanked _	Structure / Difference
As Return		Single / it	Extension Function / this
As Run / Invocation		Multiple	

## Android

## Android Studio

<b>Project Structure / Files</b>		<b>UI</b>	
Source Code	Gradle	Layout XML	Composable
Resources	Manifest File	LinearLayout	CoordinatorLayout
Libraries	APK file	FrameLayout	AppBarLayout
		ScrollView	CollapsingToolbarLayout
<b>UI / Layouts</b>	<b>Emulation</b>	Padding/Margin	Blueprints
Code Editor	USB Direct	Weighting	Layout Inflation
Design Editor	AVD	Gravity	Layout Nesting
		Themes	Collapsing Toolbar
<b>Architectures</b>	Intents	AppBar	Scrolling Toolbar
MVC	Broadcasts	Toolbar	Material Design
MVI	Services		
MVVM	Work Manager		
		<b>Activity</b>	
<b>Views</b>		Lifecycle State / Methods	Save / Restore State
TextView	Radio Button/Groups	Lifecycle (Visibility)	Bundle
Button	Floating Action Button	Lifecycle (Foreground)	Device Rotation
Checkbox	Toast		
Chip/Groups	Snackbars	<b>Multiscreen</b>	
Spinner	View Groups	Fragments	FragmentContainerView
		Fragment Lifecycle	Actions
View Binding	Compose	Navigation Component	Safe Args / Directions / Args
View Models	Live Data	Navigation Graphs	Back Stack
View Model Factories	Mutable Live Data	Navigation Host	
View Model Provider	Data Binding	Navigation Controller	

## Cloud

## Architectures

<b>Monolith</b>		<b>Compute Models</b>	
Advantages		On-Prem	FaaS
Disadvantages		IaaS	SaaS
		PaaS	
<b>Microservices</b>		<b>Cloud Service Providers</b>	
Advantages		Amazon	
Disadvantages		AWS	
Characteristics		AWS Elastic Beanstalk	
Inter-Communication		AWS Lambda	
Request / Response		Microsoft	
Event Driven		Azure	
Event Messaging		Microsoft Windows Azure	
Event Streaming		Azure Functions	
Design Patterns		Google	
Backend-for-frontend (BFF)		Google Cloud / GCP	
Entity and Aggregate		Google App Engine	
Service Discovery		Google Cloud Functions	
Adapter		IBM	
Design Anti-Patterns		IBM Cloud	
		IBM Cloud Code Engine	
<b>Serverless</b>		Oracle	
Advantages		Heroku	
Disadvantages		VMWare	
Abstraction Chain			

## Docker

<b>Core</b>		<b>Container</b>	
docker-server	docker-compose	Resource Segmentation	
docker-client	dockerHub	Start / Stop	
		Status / Monitoring	
<b>Image Build</b>		Logging	
DockerFile	docker-compose	Communication Channels	
Base Image	docker-compose.yml	Environment Variables	
Dependencies	Build Context	Exiting	
Startup Command	Build Cache		
Development	Networking	<b>Image</b>	
Production	Port Mapping	File System	
	Restart Policy	Startup Command	
	Volumes		

Kubernetes	
<b>Cluster</b>	
Control Plane	cloud-controller-manager kube-controller-manager kube-apiserver kube-scheduler etcd
Node(s)	kubelet k-proxy Container Runtime Docker Engine CRI-O Containerd Mirantis Container Runtime
Objects	Configuration: *.yaml Pod Deployment Pod Template StatefulSet ReplicaController Volume PersistentVolume PersistentVolumeClaim Secret Service ClusterIP NodePort Load Balancer Ingress
	Label Selector System Environment Variables Role Based Access Control
<b>Cluster Administration:</b>	kubectl kubeadm minikube
<b>Controller(s)</b>	Node Controller Job Controller Endpoints Controller Service Account Controller Token Controller
<b>Cloud Integration</b>	CI / CD Workflow Local > GitHub > Test Suite > DockerHub > Cloud Service Provider Travis CI .travis.yml Cloud Service Provider Configuration Integration Account Verification Environment Variables Logs / Monitoring Declarative / Imperative

## Research Materials

Please find a summary of the primary resources used to conduct the research and study of the subject areas listed above:

### Primary Online Resources

Java SE	Oracle Java Tutorials	<a href="https://docs.oracle.com/javase/tutorial/index.html">https://docs.oracle.com/javase/tutorial/index.html</a>
	Oracle Java API	<a href="https://docs.oracle.com/javase/8/docs/api/index.html">https://docs.oracle.com/javase/8/docs/api/index.html</a>
Kotlin	Online Documentation	<a href="https://kotlinlang.org/docs/home.html">https://kotlinlang.org/docs/home.html</a>
Android	Online Documentation	<a href="https://developer.android.com/">https://developer.android.com/</a>
Spring	Online Documentation	<a href="https://docs.spring.io/spring-framework/docs/current/reference/">https://docs.spring.io/spring-framework/docs/current/reference/</a>
Kubernetes	Online Documentation	<a href="https://kubernetes.io/docs/home/">https://kubernetes.io/docs/home/</a>
Docker	Online Documentation	<a href="https://docs.docker.com/">https://docs.docker.com/</a>

### Udemy Courses

Docker and Kubernetes: The Complete Guide  
 Java Spring Tutorial Masterclass – Spring Framework 5  
 Java Programming Masterclass  
 Design Patterns in Java  
 Concurrency, Multithreading and Parallel Computing in Java  
 Java Memory Management  
 Java Application Performance and Memory Management  
 Java Reflection  
 The Complete Oracle SQL Bootcamp  
 Dynamic Programming and Data Structures  
 Test Driven Development

### Coursera Courses

Kotlin for Java Developers by JetBrains

### Bibliography

Java The Complete Reference	8th Ed.	Herbert Schildt	Oracle Press
Java Cookbook	4th Ed.	Ian F Darwin	O'Reilly
Android Development	3rd Ed.	Dawn and David Griffiths	O'Reilly
Spring in Action	6th Ed.	Craig Walls	Manning
Cloud Native Java	1st Ed.	Josh Long and Kenny Bastani	O'Reilly
Pro Git	2nd Ed.	S.Chacon B.Straub	Apress
Design Patterns	1st Ed.	E.Gamma R.Helm R.Johnson J.Vlissides	Addison Wesley
Clean Architecture	1st Ed.	R.C.Martin	Prentice Hall
Clean Craftsmanship	1st Ed.	R.C.Martin	Prentice Hall
The Clean Coder	1st Ed.	R.C.Martin	Prentice Hall