NANYANG TECHNOLOGICAL UNIVERSITY

Energy Research Institute @ NTU

ERIAN MG Cloud Services Report

Zhu Yuanbo

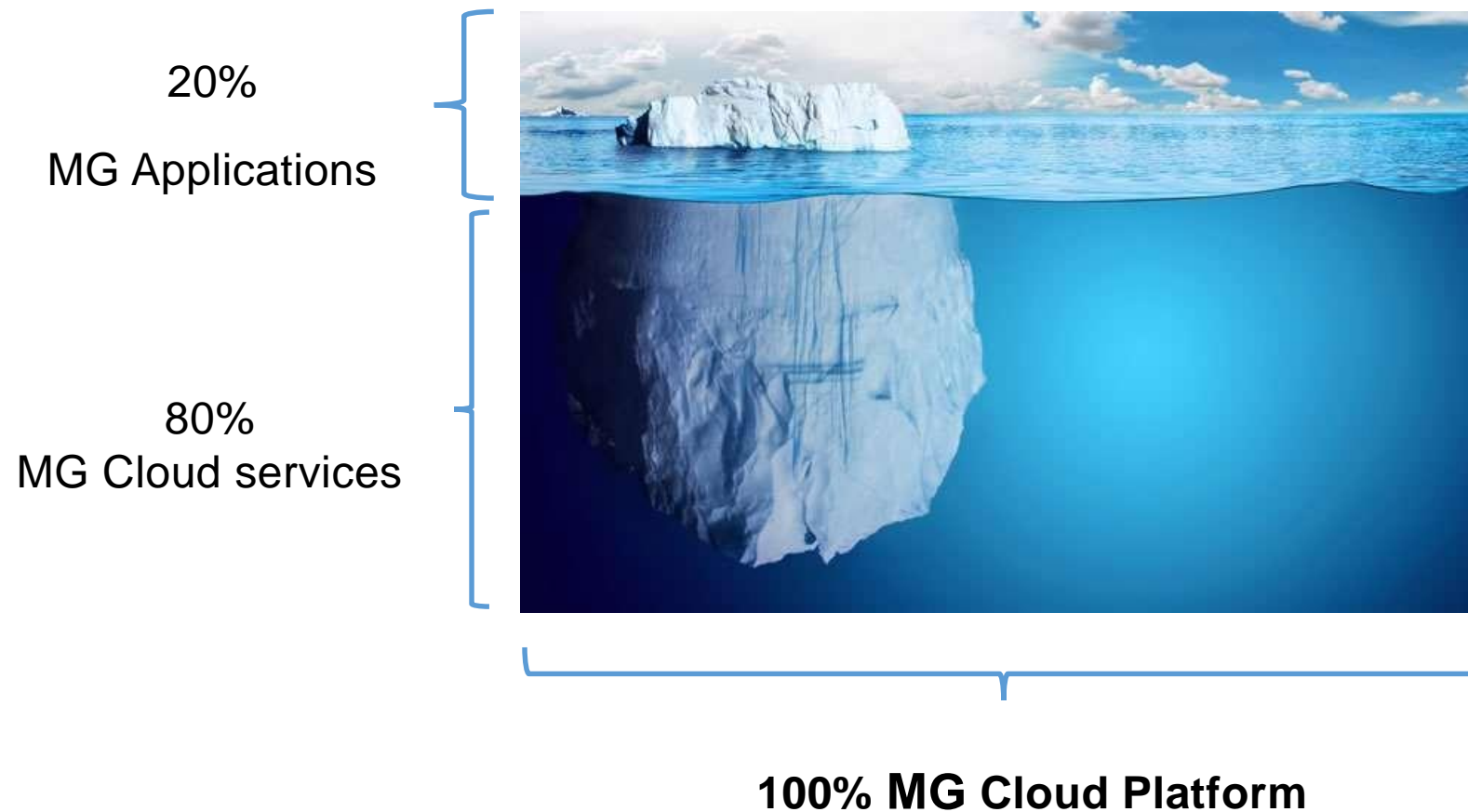http://erian.ntu.edu.sg

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ERIAN MG Cloud Services

20%

MG Applications

80%
MG Cloud services

100% MG Cloud Platform

Platform Features

Distributed Architecture

Optimized Middleware

Security

Automation

Distributed Architecture
Load balance, real-time scheduler
Resource allocation

Optimized Middleware
High performance and High availability. Scalability

Secured system
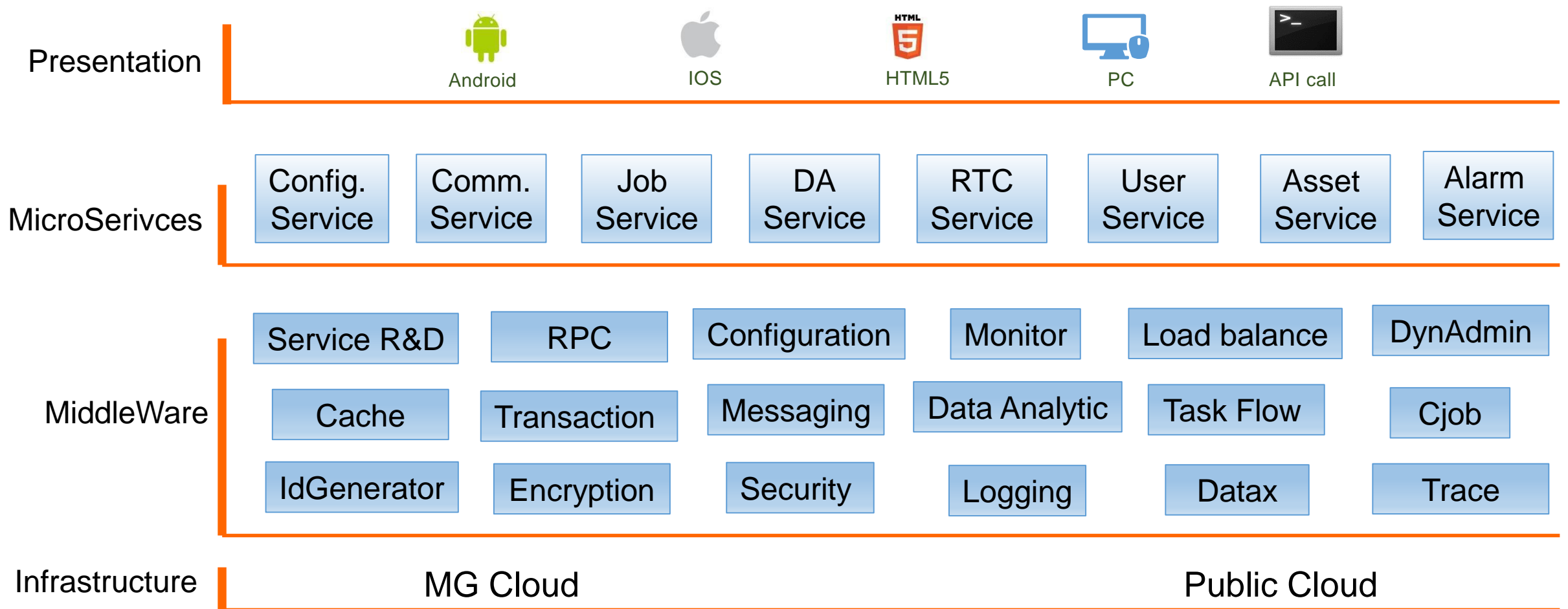Flexible authentication and authorization. Data encryption

Automation
Fully customizable and automatize from services release, test and maintenance

Overall Architecture

Presentation

Android	IOS	HTML5	PC	API call

MicroServices

Config. Service	Comm. Service	Job Service	DA Service	RTC Service	User Service	Asset Service	Alarm Service

MiddleWare

Service R&D	RPC	Configuration	Monitor	Load balance	DynAdmin
Cache	Transaction	Messaging	Data Analytic	Task Flow	Cjob
IdGenerator	Encryption	Security	Logging	Datax	Trace

Infrastructure

MG Cloud   Public Cloud

MG Cloud: Advanced & Efficiency **Middleware**

|			
Configuration Zookeeper	Service R&D Dubbo	Repository JPA	MQ Kalfa
Distributed Cache	Task flow Activiti	Jobs Quartz	Security Shiro
Data Encryption	Monitoring Javasimon	API Doc Swagger	Distributed transaction
Data Services Spark/Sharding		Distributed IdGenerator	

Configuration

- **ZooKeeper: A Distributed Coordination Service for Distributed Applications**
- Centralized service for
  - – Configuration Management
  - – Locks and Synchronization for distributed systems
  - – Naming service (Registry)
  - – Group Membership
- Features
  - – hierarchical namespace
  - – provides watcher on a znode
  - – allows to form a cluster of nodes
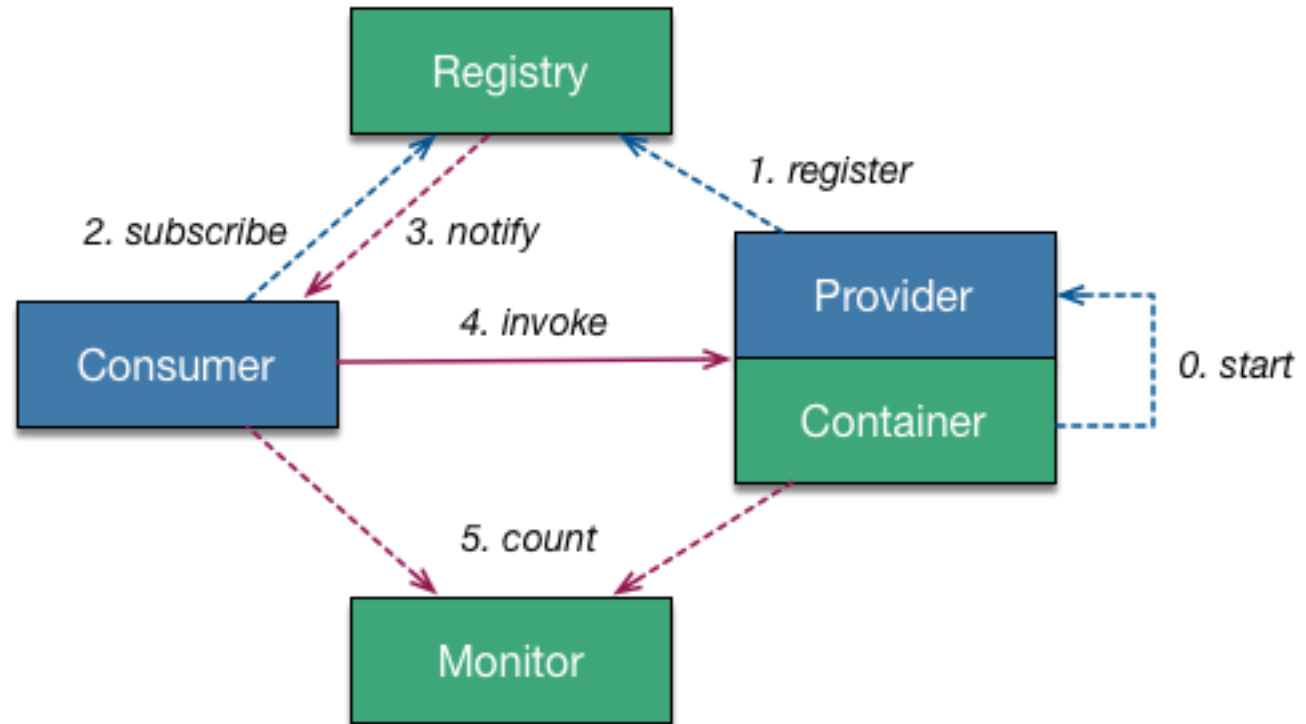- Supports a large volume of request for data retrieval and update
- **https://zookeeper.apache.org**
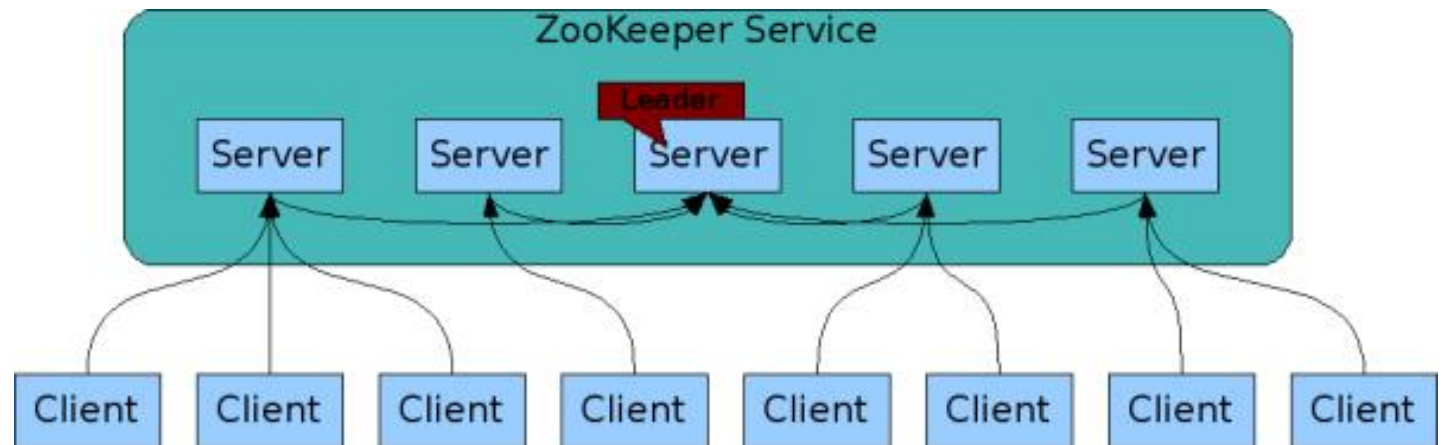
Service Registration & Discovery

Dubbo :

- high-performance
- JAVA-based
  RPC framework
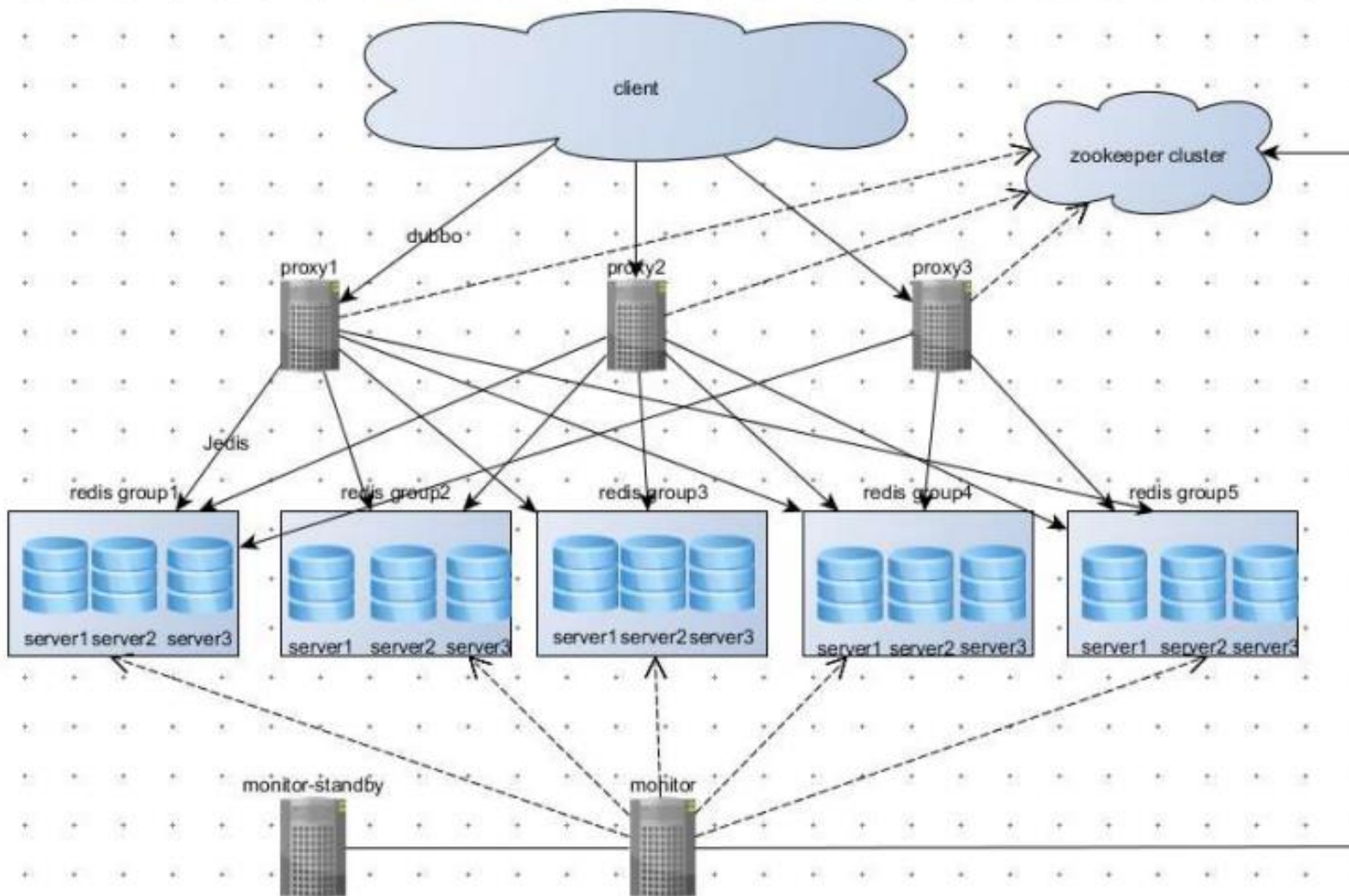- open-sourced by Alibaba.
- RPC: Remote Procedure
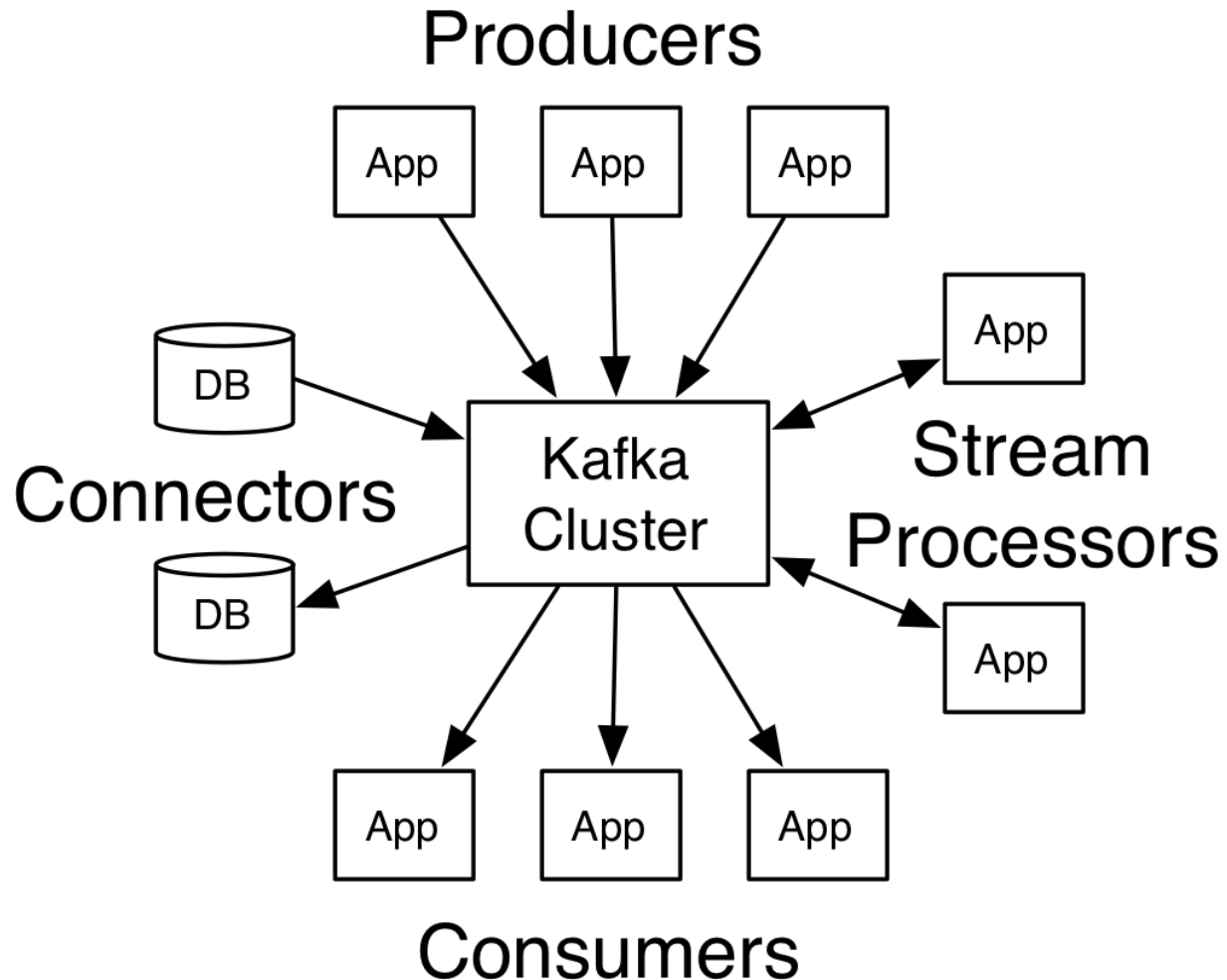 Call
- http://dubbo.io/

Dubbo Architecture

Cache is King – by Steve Souders

- Improve response time in web Apps.
- Configure every layer.
- Protect Systems
- High availability
- Scalability

Kafka - Message Queue

- a distributed publish-subscribe messaging system
- a robust queue that can handle a high volume of data
  - **Reliability**
  - **Scalability**
  - **Durability**
  - **Performance**
- very fast and guarantees zero downtime and zero data loss.
- https://kafka.apache.org
- https://projects.spring.io/spring-kafka/

Activiti : Task Flow

- Battle-tested business process management (BPM) engine for human tasks, service calls and execute those in a certain order.
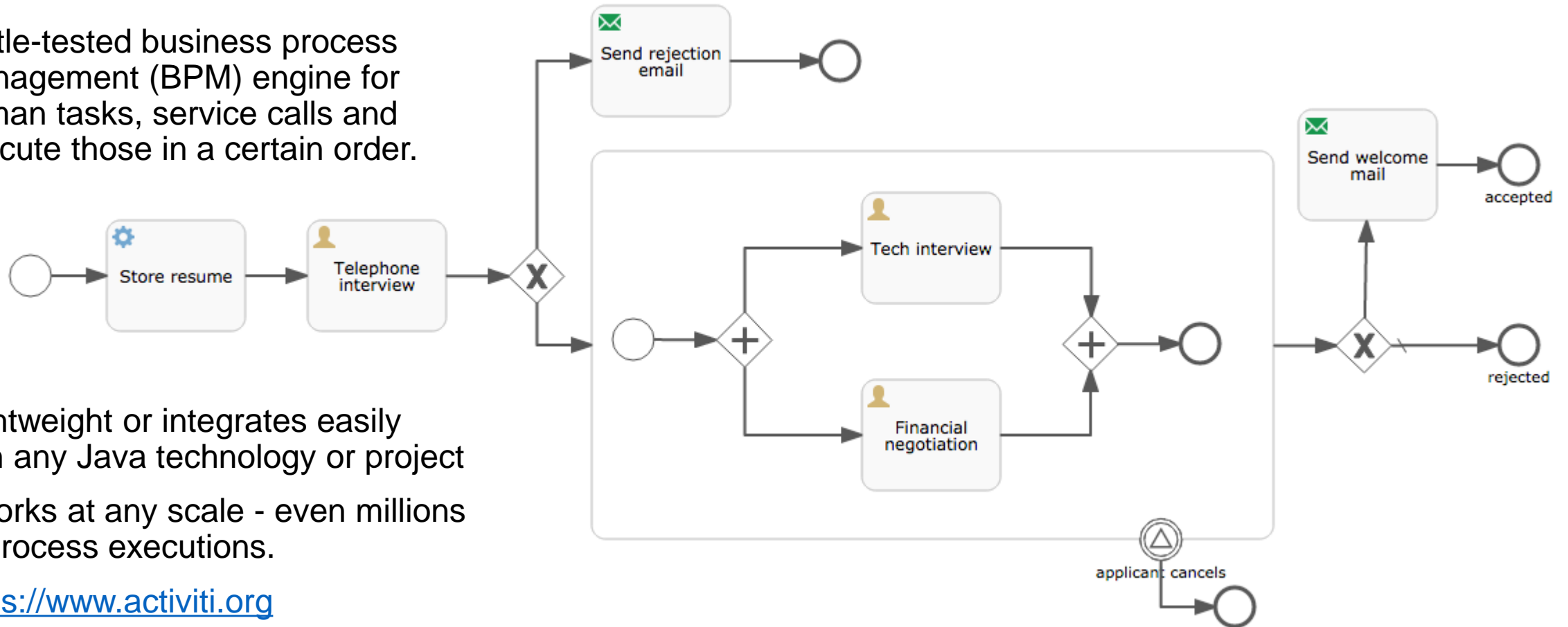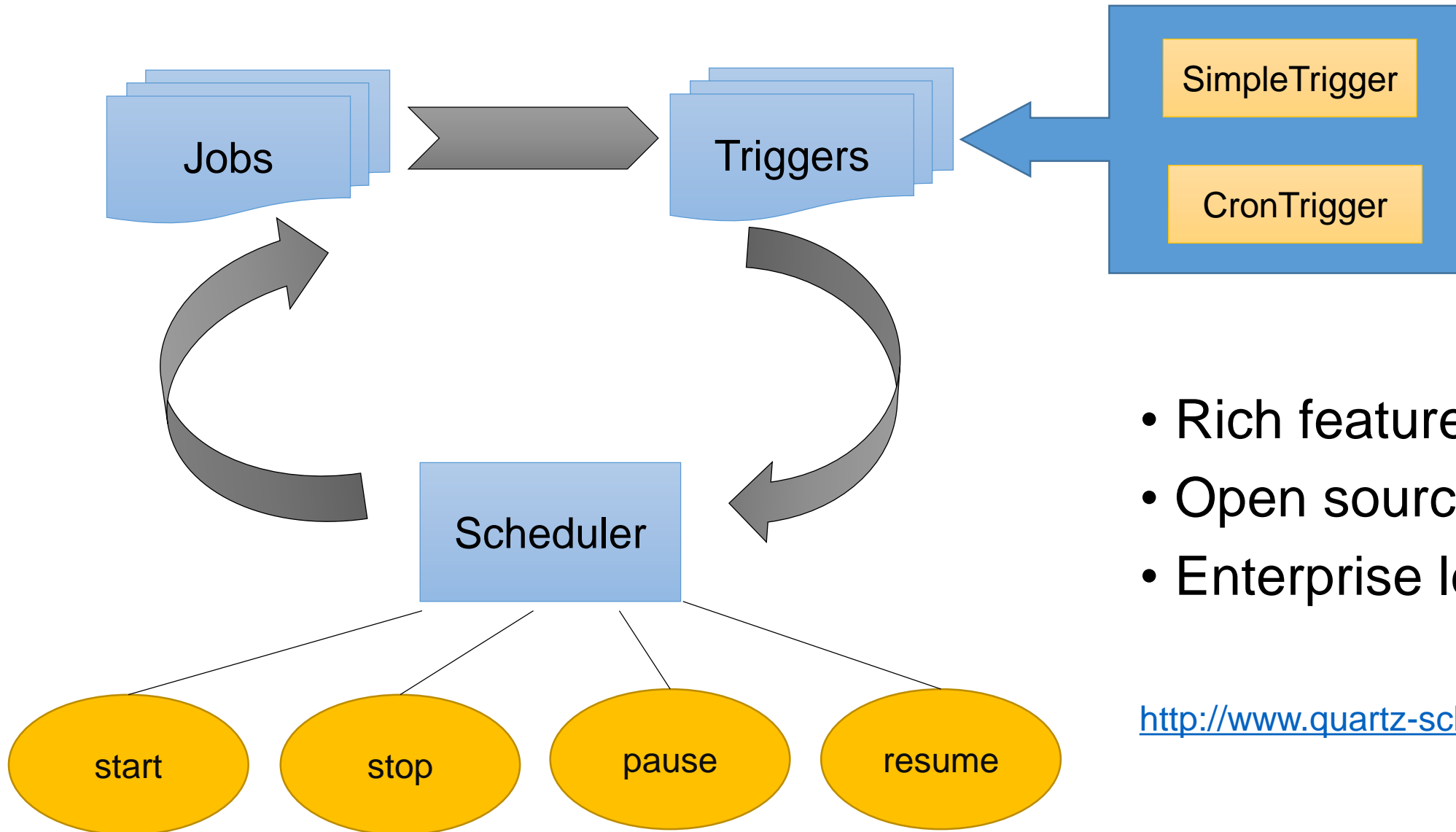
- Lightweight or integrates easily with any Java technology or project

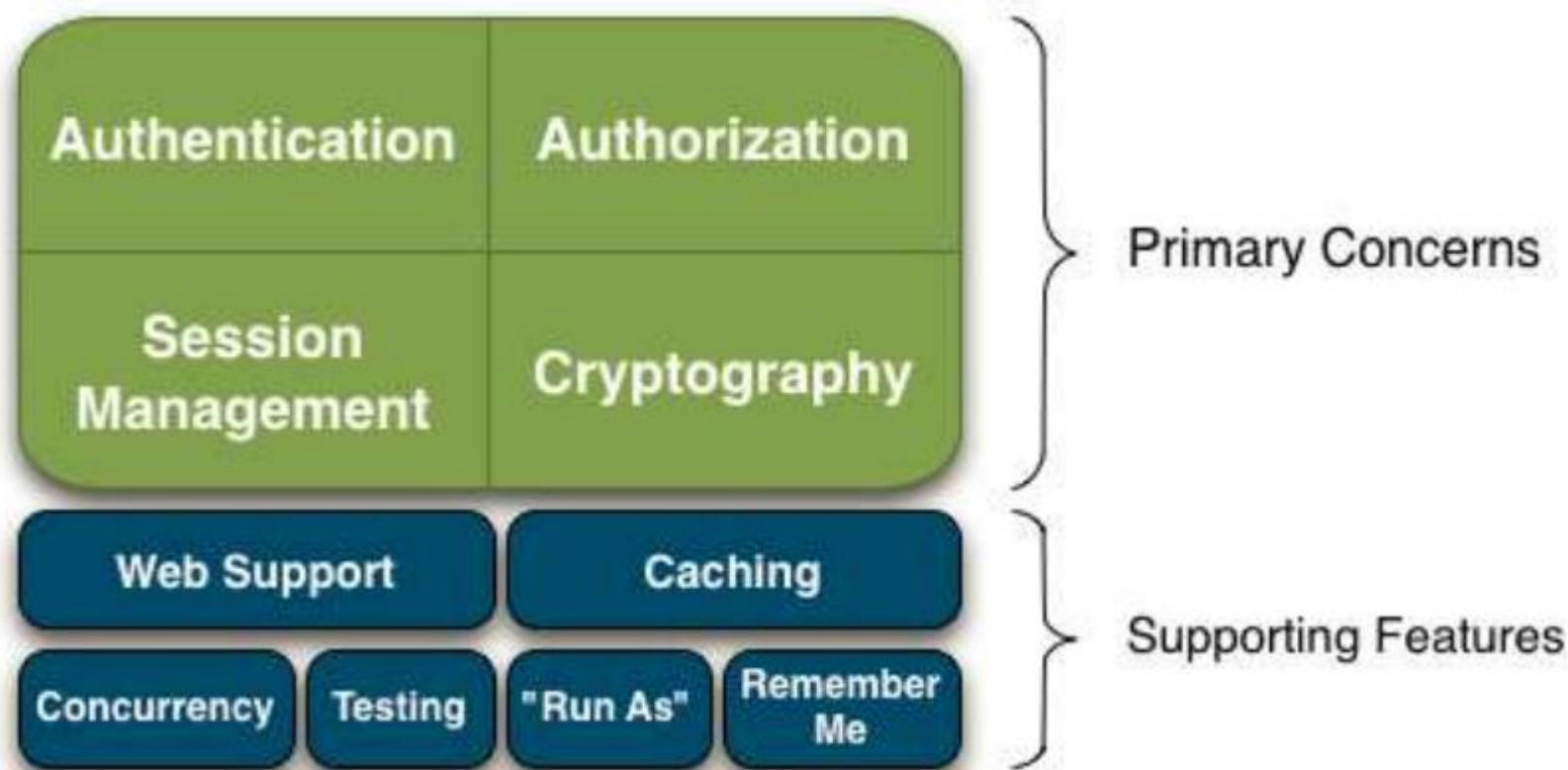- it works at any scale - even millions of process executions.

- https://www.activiti.org

https://spring.io/blog/2015/03/08/getting-started-with-activiti-and-spring-boot

Job Scheduling - Quartz

- Rich features
- Open source
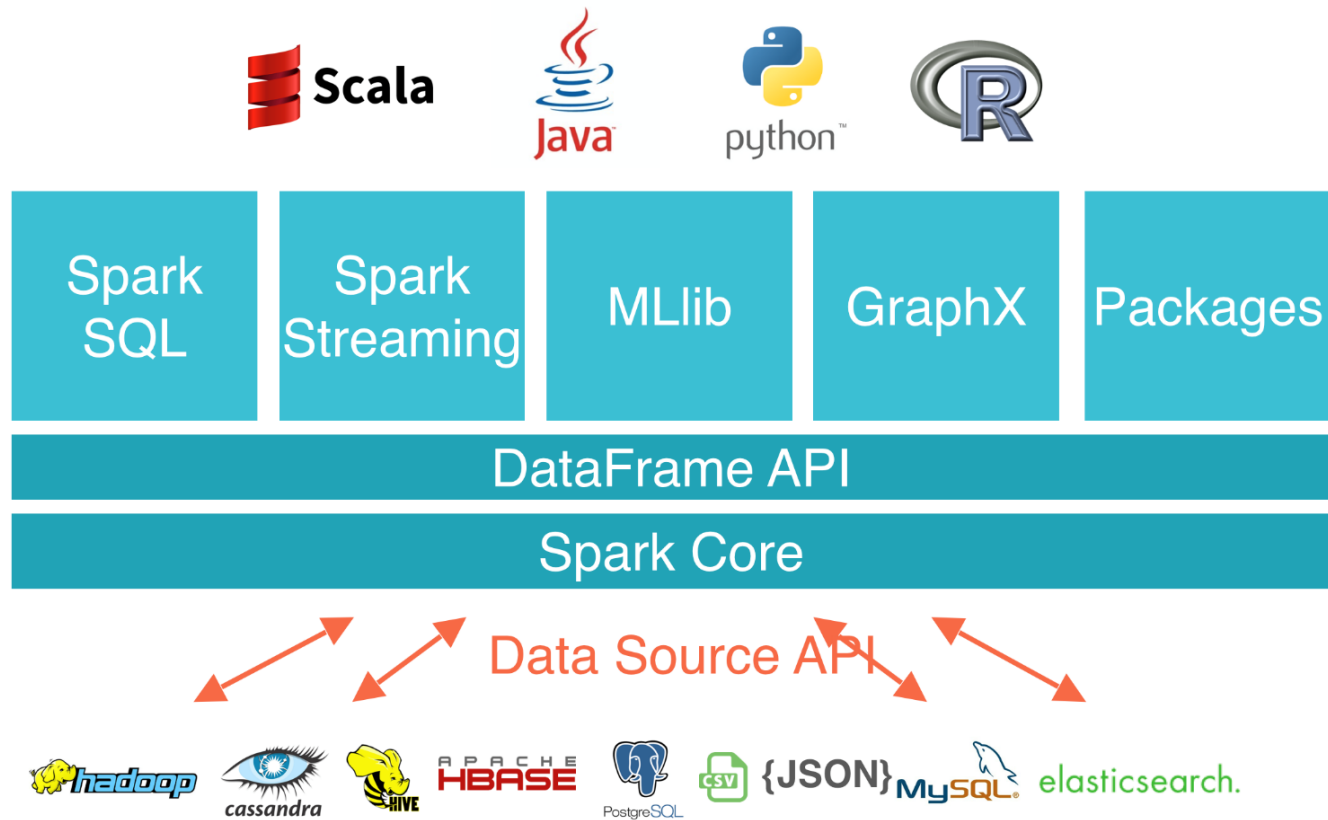- Enterprise level

http://www.quartz-scheduler.org/

Security – Apache Shiro

- Powerful
- easy to use
- fine-grained
- authentication
- authorization
- cache support
- session mgnt
- cryptography

https://shiro.apache.org

Data Analytics – Apache Spark

- High speed
- Easy to use
- Combine SQL, streaming, and complex analytics.
- Run Anywhere
- Abundant Ml Libs

http://spark.apache.org/

Simple Monitoring API – Java Simon

- **better control**
- **nanosecond solution**

http://www.javasimon.org

Spring Data - JPA

A generic model for all types of data stores.
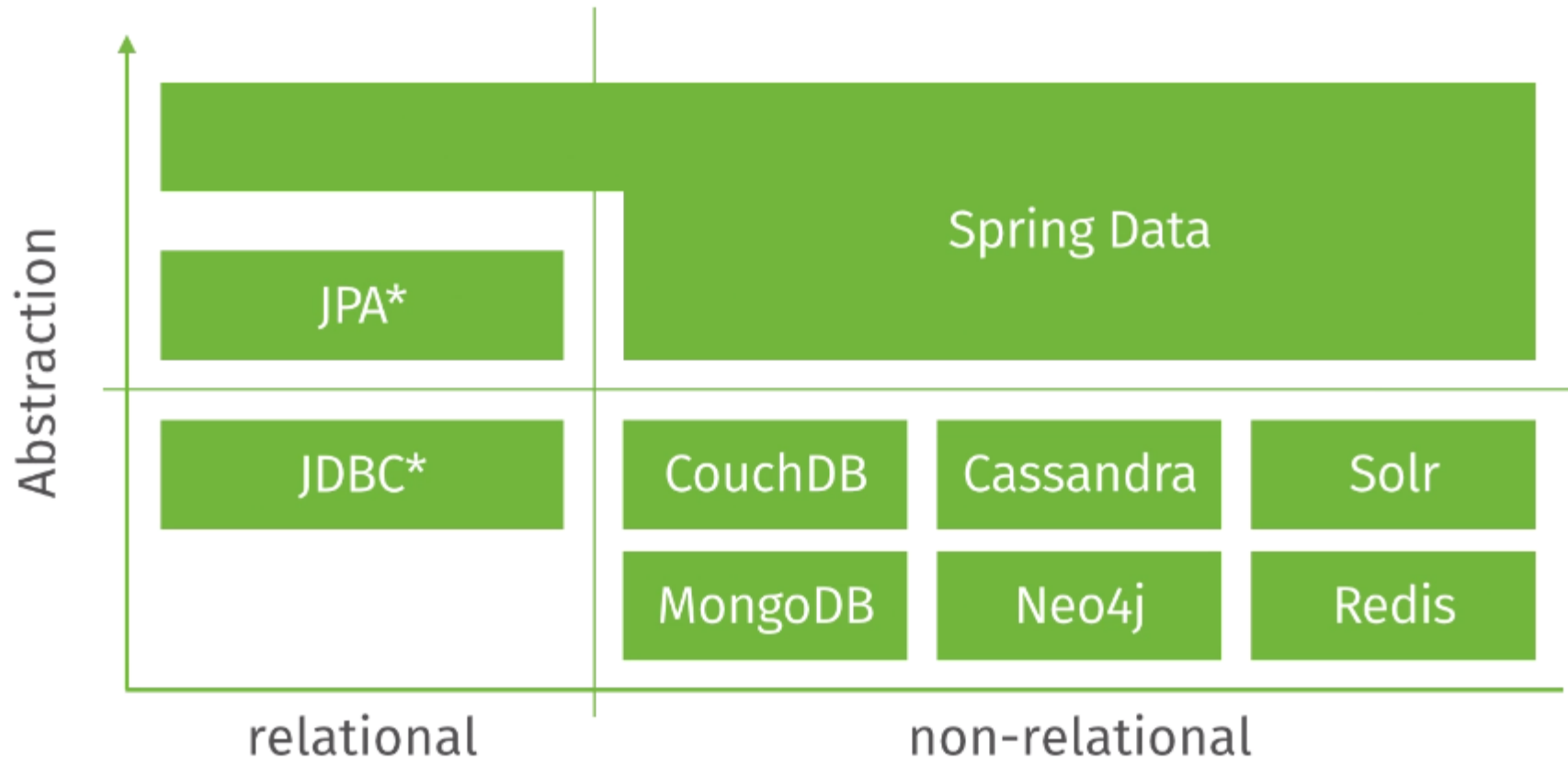
API Documentation Tool - Swagger

https://swagger.io/

MG Cloud Development Framework

Collaboration Layer

Code

1. Google Java Style Guide
2. Google Best practices for modern web development
3. Alibaba SW development manual
4. SQL Style Guide

Scaffold

Maven Plugin
Eclipse plugin
Code template
Project Structure
......

Technical Layer

Transaction	Extension	scheduler	
Config.	Verification	Monitor	Utils
Exception	Logging	i18n	......

＋

idGenarator, Transactions
Distributed Cache/Lock/job
MQ/Security/trace
DynamicAdmin, ……..

Dependency Layer

| Spring framework | Spring MVC | Apache Commons | Junit | JPA hibernate | Logback | ……. |

4.1.8.RELEASE

JDK1.7.0_80

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src/main/java
- com.erian.project.api
- com.erian.project.config
- com.erian.project.domain
- com.erian.project.repository
- com.erian.project.dto
- com.erian.project.service
- com.erian.project.commons
  - constants
  - utils

src/main/resources
- env
- spring
- cache
- jobs
- tasks

src/test/java
- unit test
- functional test

Backend Technical Stack

Presentation

JSP HTML

SpringMVC
- Action
- spring-mvc.xml
- annotation
- servlet

Ajax
- *.js
- Json
- jquery
- Jstl/el

Business

Domain model

service

Spring
- restful
- Quartz
- Email
- annotation
- applicationContext.xml
- Transaction manager
- Spring data jpa
- Ioc

Persistence

dao

JPA - Hibernate
- Annotation **.hbm.xml
- session factory
- Api
- cache

Resource

tables

Database
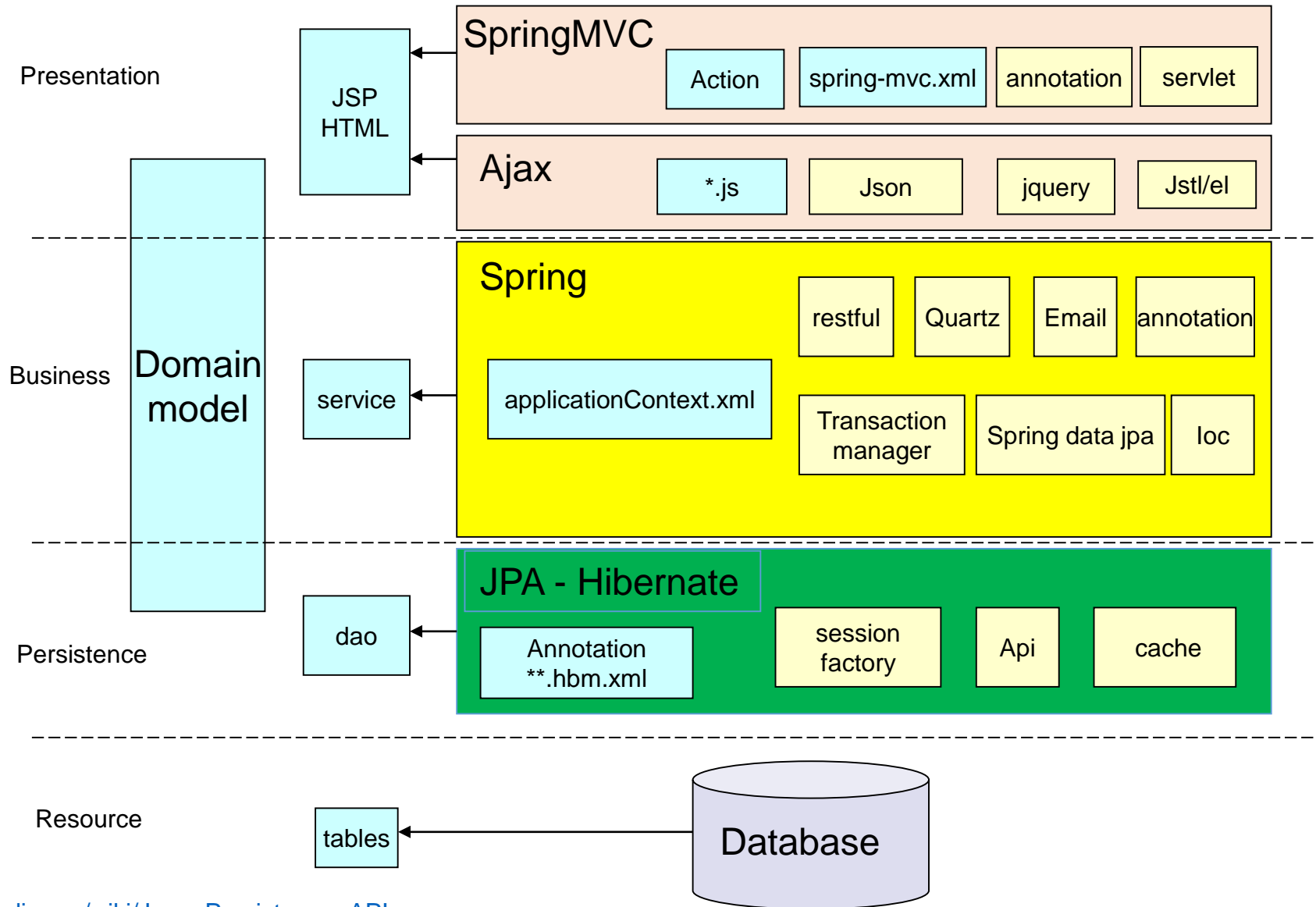
JPA: http://en.wikipedia.org/wiki/Java_Persistence_API
Spring-MVC: http://docs.spring.io/spring/docs/current/spring-framework-reference/html/mvc.html

GUI Framework Architecture

Client Side

Server Side

Controllers

Configs

Factories

UI Components

Services

Models

Caches

Filters

Custom UI Applications

Custom CSS

Angular/jQuery

Bootstrap

Modern Web Browsers   (Ex. IE9,Firedox,Chome)

DB

Devices

Data Access Framework

Service Framework

APIs

Apache

Tomcat

Nginx(reverse proxy, load balance)
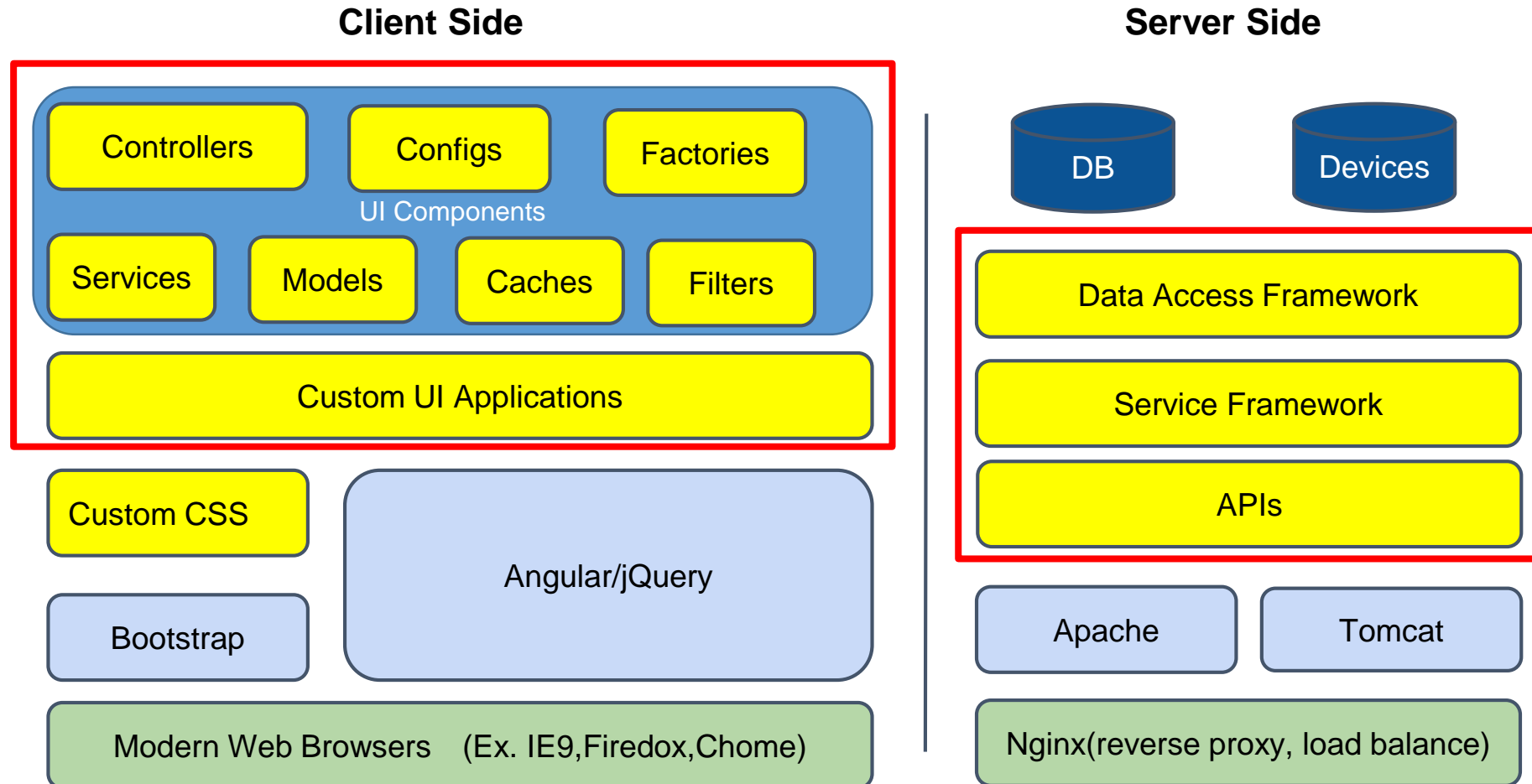
GUI Application Structure
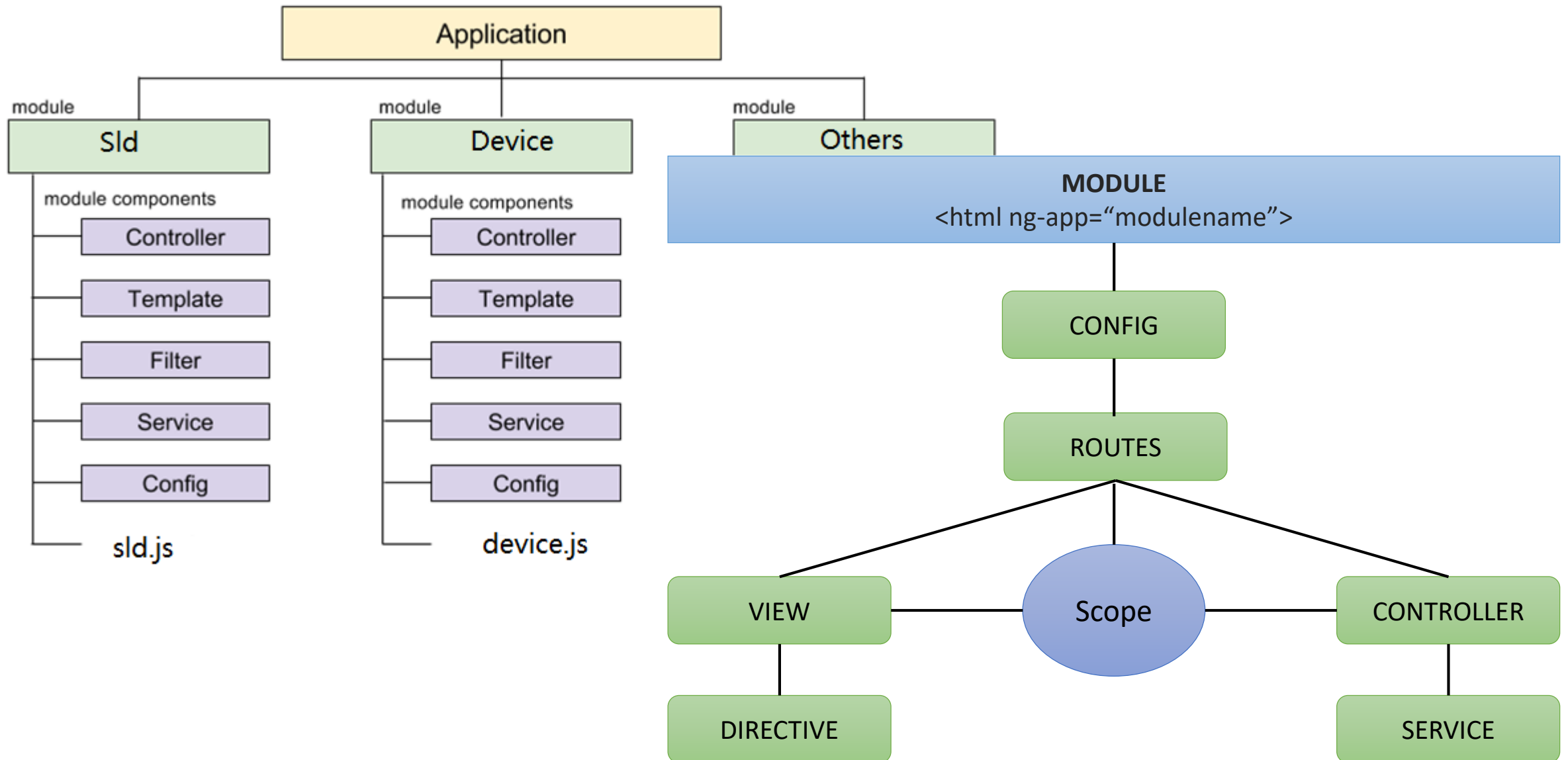
A DEMO DASHBOARD
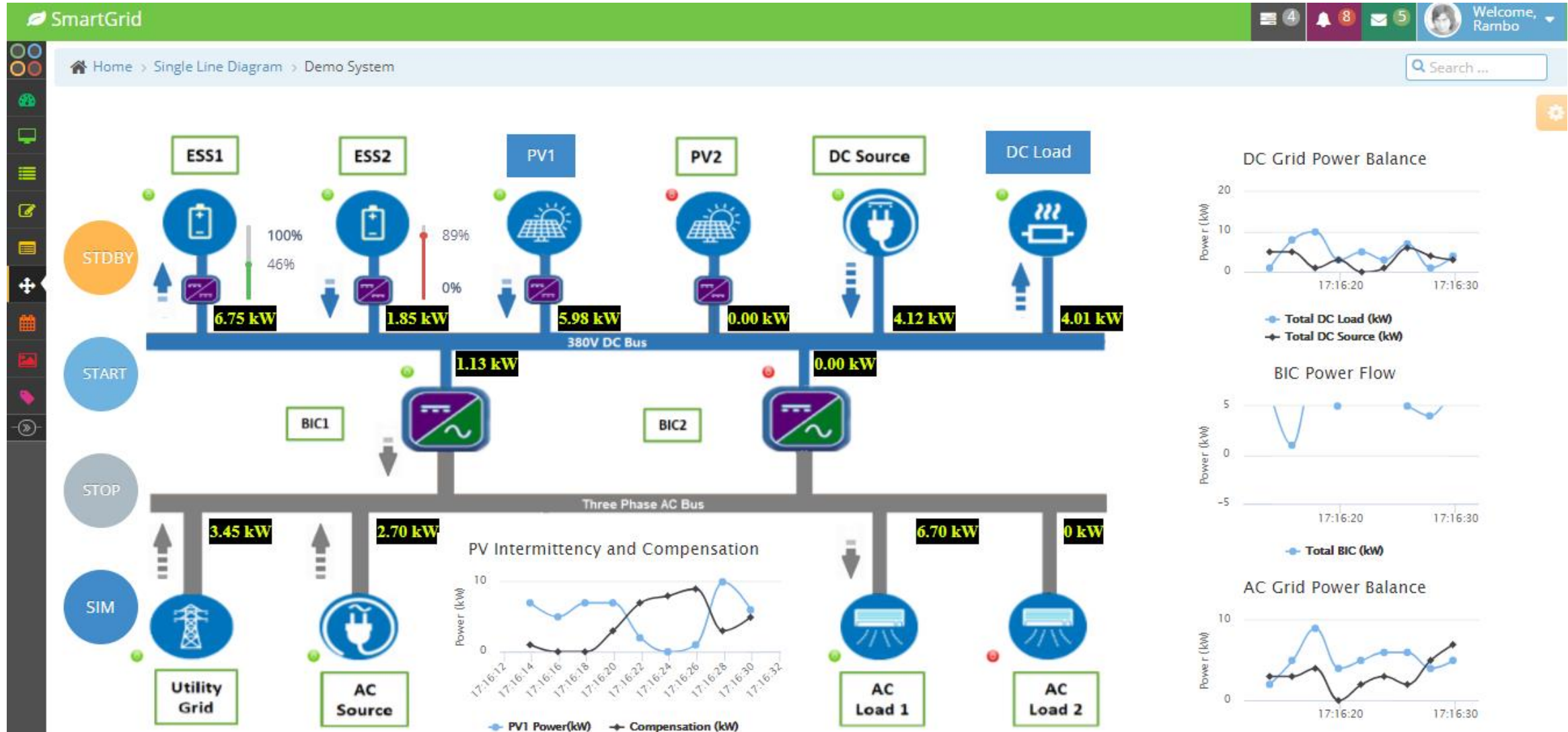
How will user use?

User Case

Clients

app.client.com

REST

4.Start the operation with ERIAN cloud

3. cloud.erian.com/app1

REST

Clients app

ERIAN Cloud

ERIAN
SaaS

2.generate client application

Render
Service

1. visit ERIAN cloud service
   cloud.erian.com

User Integration

Client
APP

REST

REST

Client

Cloud

MG Cloud Gateway

MG
SaaS

Dubbo

- ☐ Customize UI
- ☐ Customize work flow
- ☐ Call exist services
- ☐ Create new services

Config   Comm.   Asset mgnt   Message

Datax   Monitor   Users   ......

MG Cloud Platform

MG-OS Work Plan

Short-term Priority List

- Comm. Service
  - Modbus RTU, Modbus TCP, TCP; (read, write)
  - CANbus – WIP
  - Cache – WIP
  - Message Queue – WIP
- Config. Service
  - REST API to SQL DB
  - Project, Device, Comm. Protocol, Datapoint
  - Datapoints Grouping – Investigating
- Job Service
  - Scheduler – WIP
  - Process Management – Investigating
- GUI prototypes – *Hiring
- DA Service - *WIP

Roadmap

- Single Line Diagram creation tool
  - *SVG
- Performance requirements
  - High availability
  - Scalability
  - Security
  - Speed performance
- Industry Standards
  - IEEE 1547
  - *Etc…
- Comm. Protocol
  - BACnet
  - IEC 61850
  - DNP3

Thank You

http://erian.ntu.edu.sg

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