CHANGE HEALTHCARE

(now a part of UnitedHealth Group)

Enabling Faster Time-to-Market for a Public HealthTech Enterprise with Agile Test Automation

CASE STUDY

MANTRA LABS

CX CONSULTING

PRODUCT ENGINEERING

TECHNOLOGY MODERNIZATION

CHANGE HEALTHCARE

Founded in 1996, NucleusHealth solutions (now Change Healthcare, part of UnitedHealth Group) is a **Teleradiology** company offering Enterprise Imaging Solutions for improving patient care by providing fast & secure access to diagnostic quality images, using any web enabled device. UHG is the largest healthcare company globally by revenue, serving 130 million people world.

TESTING REQUIREMENTS

Nucleus Health's **cloud-based medical image sharing platform** (Nucleus.io) was built with modular solutions offering digital image streaming, diagnostic & clinical viewing, and archiving — for **healthcare organizations**.

Key Challenges

1 **SCALABILITY**

The Platform must be able to support a high number of concurrent users.

2 **FAIL OVER CONTROL**

Application should behave functionally correct under very high loads with stable Failover capability.

3 **EFFICIENCY & RELIABILITY**

Platform must scale rapidly to meet the business goals of supporting a larger user base & multiple formats with minimal page navigation response time.

SOLUTION

Mantra Labs used agile testing techniques for delivering **continuous process improvement** in the software development lifecycle.

An independent testing, verification and validation cycle addressed the full range of QA issues.

Testing Components

1 **Functional**
Smoke, Sanity, & Black-box testing to verify features against client's specifications.

2 **Integration**
Identify integration errors between test units, early feature and sub-system integration tests.

3 **GUI**
Capture & relay tests, Model-based tests; Verify all navigations, data integrity & usability.

4 **Regression**
Progressive testing & test case prioritization to protect against constant code modification.

5 **Automation**
Automated test cases & modules to resolve defects with greater velocity and repeatability.

NUCLEUS IMAGE EXCHANGE
HOW IT WORKS

MEDICAL IMAGE SHARING

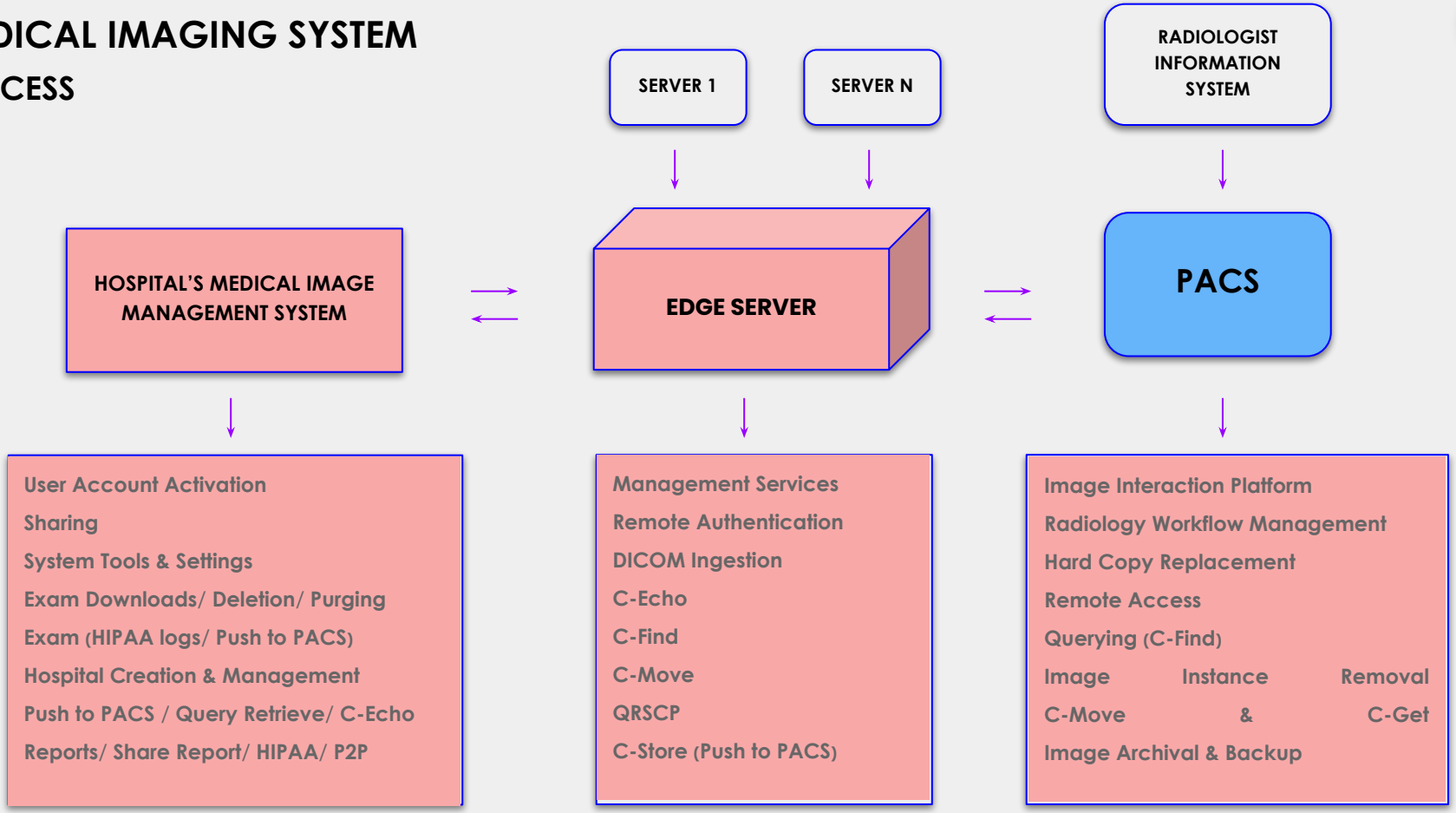
The **release process** for medical images was brimming with security related-risks since images (X-Ray, MRI, and PET scans, etc.) were created & released across multiple systems, while being purposefully kept 'out-of-reach' from a host of **unauthorised users**.

WHAT IS PACS?

The medical practitioner responsible for acquiring & interpreting such medical images is a '**Radiologist**' — while the system they rely on for storage, access & retrieval of a patient's medical images is called '**PACS**' *or* Picture Archiving and Communication System.

MEDICAL IMAGING SYSTEM

PROCESS



TESTING AREAS

TESTING PROCESS

We used **Federated Architecture** to ensure near-perfect scaling, and **true load & data isolation** between different tenant organizations.

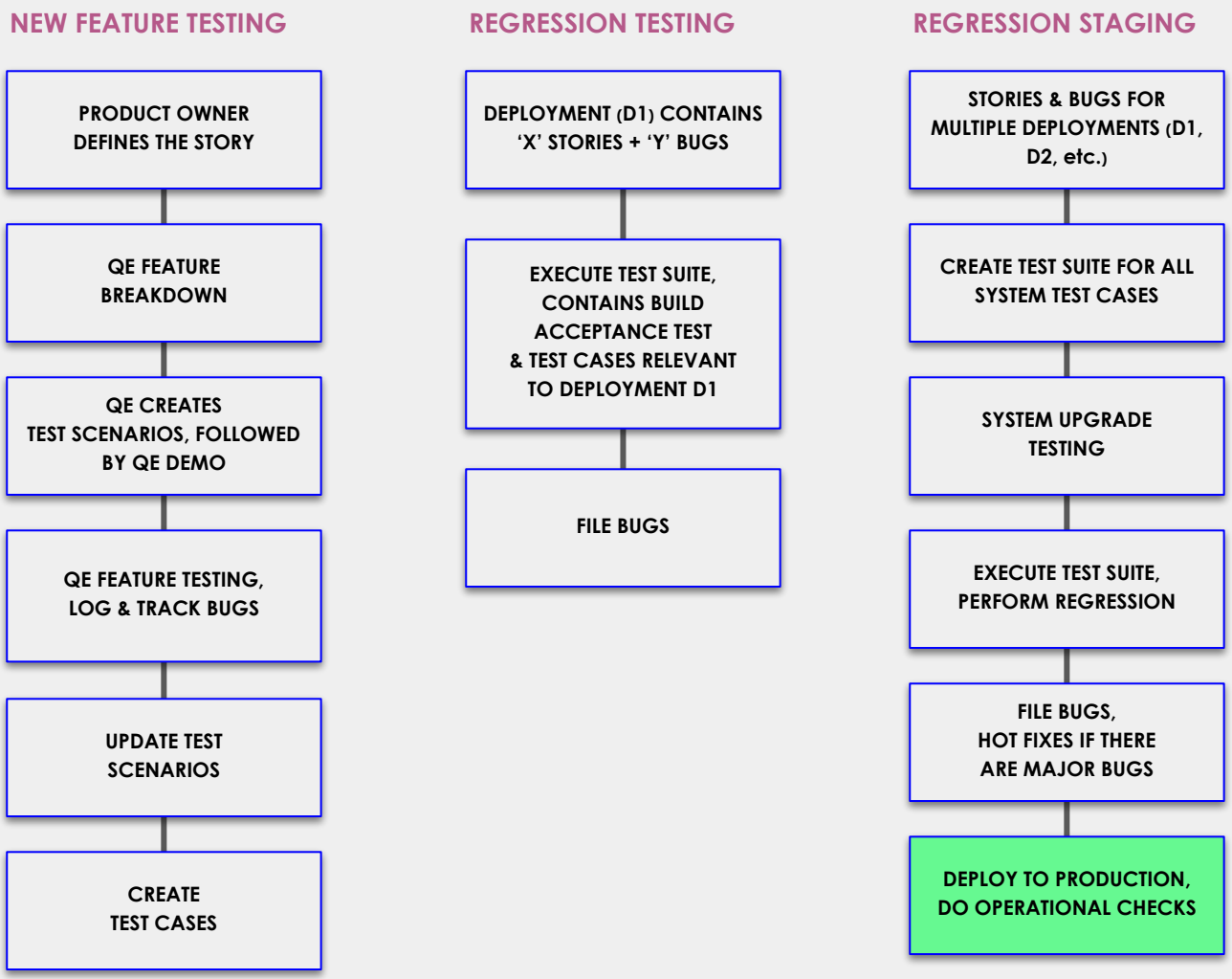
The federated architecture consisted of a number of deployments and a central set of components called 'Central'.

Central stored global information like lists of organizations & users, and provided a centralized messaging service.

NUCLEUS IMAGE EXCHANGE MODULES

1. Clinical Viewer
2. Edge Server Services
3. Active Directory
4. HL7 Messages
5. CORS
6. Exam Management
7. Downloads
8. Sharing
9. System Administration
10. Organization Administration

PROCESS FLOW



NEED FOR TEST AUTOMATION

The entire cycle of **bug detection** in the UI, API and Server Loads involved one week of regression manual efforts.

By automating tests, techniques like **Stochastic Tests** could be applied to detect bugs and reduce the overall cycle time.

Test Automation Tools

1. Test automations were written in Javascript, using the **Node.js** package 'TestCafe'.

2. **TestCafe** performed true automated testing by using a proxy between the code and browser.

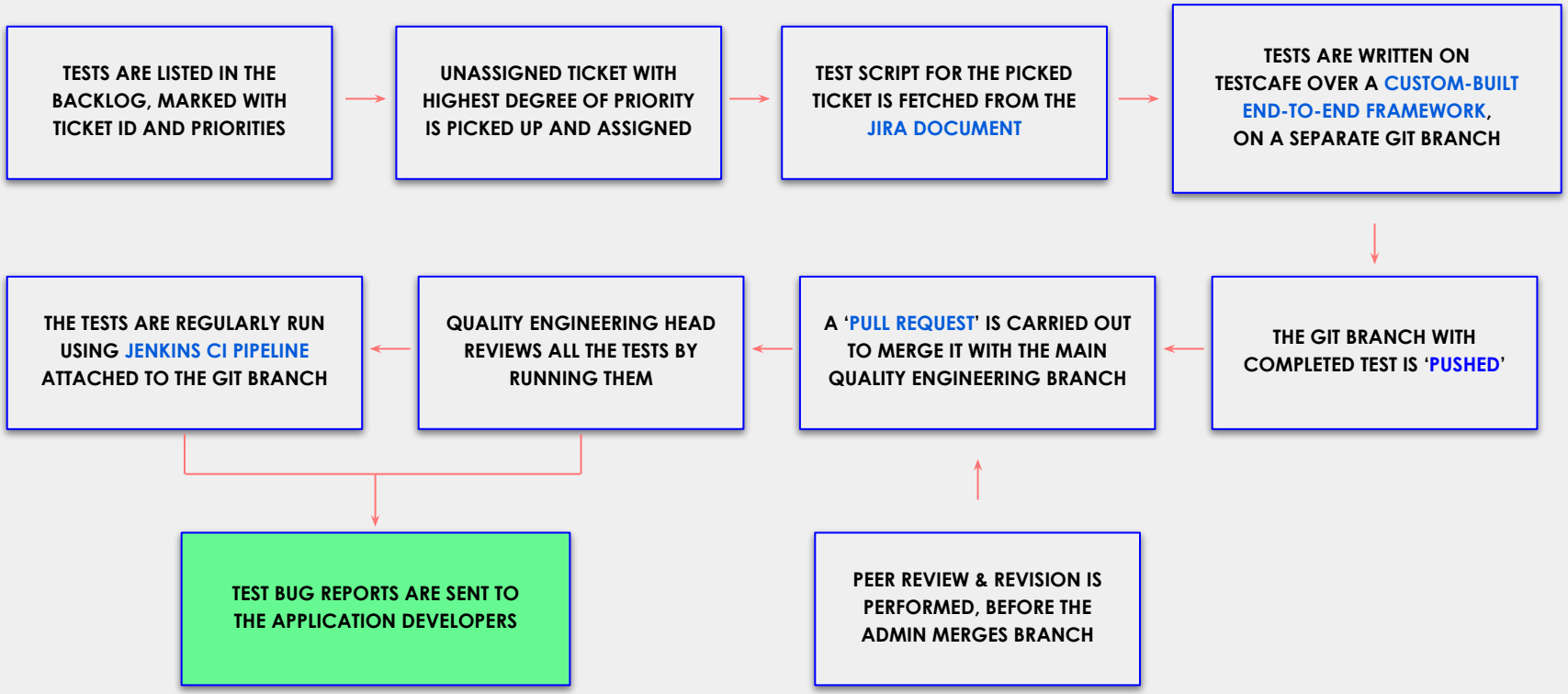
3. The **Jenkins CI pipeline** allowed for the integration & implementation of continuous delivery pipelines.

4. These pipelines ensured that the test codes on **Git Branch** are executed seamlessly.

5. **Databases** - MongoDB
   Platforms - MongoDB, Node.js, Meteor
   Application Servers - Cloud-based Windows Servers
   Supporting Utilities - Chrome Electron-based Workstation Viewers.

TEST AUTOMATION

PROCESS FLOW



KEY RESULTS

309+
TEST CASES CREATED.

60% (12 days > 5 days)
OVERALL REDUCTION IN REGRESSION CYCLE TIME

20,000+
CONCURRENT USERS.

60-65%
MORE BUGS DETECTED BEFORE RELEASE CYCLE.

CLIENT'S VIEW

> The Team carries professional competency to understand the complex medical domain. Their in-depth testing and intuitive suggestions are helping us improve our platform. The resources are very dedicated and it's a pleasure interacting with them.

Sushil Sedhain
(Manager)

Digital products, brands, and experience.

Key Domains

Healthcare, BFSI, Consumer Internet

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Thank You

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