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TESTING & QA REPORT

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0 Document Control

0.1 Document History

Version No.	Date	Summary of Changes and Reason for Issue	Associated Change CWO, CP, CCN or Peak Reference
1.0	29/01/2021	Approved for release	N/A

0.2 Review Details

Mandatory Review	
Role	**Name**
Horizon Audit Team	Fujitsu

0.3 Associated Documents (Internal & External)

Reference	Version	Date	Title	Source
COM/MGT/REP/4161	Latest	Latest	Expanded Table of Contents for the Testing & QA Report	Dimensions
COM/MGT/REP/4168	Latest	Latest	SDLC Report	Dimensions

0.4 Abbreviations

Abbreviation	Definition
APADC	Automated Payment - Advanced Data Capture
APOP	Automated Payment Out-Pay
BAL	Branch Access Layer
BAU	Business As Usual
BCMS	Branch Change Management System
BEX	Belfast EXit
BMX	Branch Access Monitor via JMX
BRA01	Bracknell Fujitsu Office
BRDB	Branch Database
BRSS	Branch Database Standby Server
CBA	Counter Business Application
CDP	Common Digital Platform
CIT	Component Integration Test Environment
CTR	Counter
CTT	Counter Transaction Type
CWS	Collections Web Service

DEV	Development
DR	Disaster Recovery
E2E	End to End
EBMS	Europe Business Management System
EPOSS	Electronic Point Of Sale System
FSC	Forward Schedule of Change
GDC	Global Delivery Centre
GWS	Generic Web Services
HBS	Horizon Business Server
HIH	Horizon Integration Hub
INT	Integration Test Environment
LST	Live System Test Environment
MDM	Master Data Management
NCR	Suppliers of Self Service Kiosk hardware and associated application
PODG	Post Office Data Gateway
POL	Post Office Limited
POLSAP	A POL financial system
RAID	Risks, Assumptions, Issues, Dependencies
RDDIV	Reference Data Delivery Interim Verification
RDDOV	Reference Data Delivery Outlook Systems Group Verification
RDDPL	Reference Data Delivery Pseudo LIVE
RDDT	Reference Data Delivery Terminal Verification
RDT	Reference Data Test Environment
RPOS	Remote Point of Sale
SDLC	Software Delivery Life Cycle
SME	Subject Matter Expert
SOAPUI	Test tool
SSK	Self Service Kiosk
SV&I	Solution Validation and Integration test environment
T&V	Test and Validation organisation within Fujitsu
TRR	Test Readiness Review
TWS	Tivoli Workload Scheduler
UAT	User Acceptance Testing

0.5 Glossary

Term	Definition
BEX Project	Project to migrate all systems out of the Fujitsu Belfast data centres
HORIce	A tool used to interrogate the Branch Database for certain reports
Hot Fixes	Software patches
JIRA	Software delivery and project management software platform

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REFDATA	Reference Data used by the Horizon application
Service Improvement	Activity to make an improvement to how the service is delivered

0.6 Changes Expected

Changes

0.7 Accuracy

Fujitsu endeavours to ensure that the information contained in this report is accurate but, while every effort is made to ensure the accuracy of such information, it accepts no liability for any loss (however caused) sustained as a result of any error or omission herein.

0.8 Information Classification

The author has assessed the information in this document for risk of disclosure and has assigned an information classification of FUJITSU CONFIDENTIAL. This report is also subject to the Information Distribution statements in Section 8.

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1 Executive Summary

The purpose and scope of this report is to explain the current Fujitsu application Testing & QA approach. This Testing & QA Report explains the current processes, procedures and controls that Fujitsu operate to manage the testing of Horizon and to support Horizon's systems and applications. The report explains the different environments and shows how each environment supports the end-to-end Software Delivery Life Cycle.

On 20 August 2020, POL requested an audit of Horizon by sending a letter to Fujitsu titled "Horizon Audit". Following a number of discussions between POL and Fujitsu, it was agreed by POL that Fujitsu would prepare a set of reports on key topic areas identified by POL.

The spirit of the discussions between POL and Fujitsu was to share content that would allow both organisations to confirm the efficiency of the current ways of working together, and to identify ways to make meaningful improvements. Fujitsu believe in collaboration and welcome constructive suggestions from POL.

This report explains the current Fujitsu Testing & QA approach ("Testing & QA Report"). It follows the "Expanded Table of Contents for the Testing & QA Report" (COM/MGT/REP/4161) which was shared with POL on 01 December 2020.

This Testing & QA Report covers the Test activities and complements the "SDLC Report" (COM/MGT/REP/4168), which covers the lifecycle from Requirements to Release.

The current Fujitsu Testing & QA process, with the associated test rigs, used as part of the full SDLC, provides a high quality test service for the validation of changes for a safe deployment into LIVE.

Testing & QA and been the topic of numerous collaborative discussions between POL and Fujitsu over the years and during recent meetings. Fujitsu and POL recognise that there are constraints imposed by using the current approach and that there is a need for both POL and Fujitsu to focus on improvements. A compilation of recommendations for improvement arising out of these meetings has been collated into a single list (set out at Appendix D to this report) so that POL and Fujitsu can work jointly to improve the Testing & QA capabilities. The recommendations should be prioritised and the most relevant ones actioned as promptly as possible.

Fujitsu has endeavoured to ensure that the content of this report is correct as at the date of issue. Fujitsu reserve the right to make changes to the way we work in the ordinary course of its operations and business without obligation to update this report. POL should verify the position with Fujitsu before relying upon any information or content from this report, as well as bearing in mind the requirements set out in "Information Distribution" at Section 8 below.

The author has assessed the information in this report for risk of disclosure and has assigned an information classification of FUJITSU CONFIDENTIAL. This report is also subject to further Information Distribution statements at Section 8 in this report.

POL is invited to comment on this report to seek any additional clarifications it needs. Fujitsu will endeavour to respond to any comments or clarifications requested and may, if it deems necessary, provide an updated version of this report.

Fujitsu welcome the opportunity to provide this report.

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2 Purpose & Scope

The purpose and scope of this report is to explain the current Fujitsu application Testing & QA approach. This Testing & QA Report explains the current processes, procedures and controls that Fujitsu operate to manage the testing of Horizon and to support Horizon's systems and applications, consistent with Fujitsu's obligations set out in the Horizon Contract. The report explains the different environments and shows how each environment supports the end-to-end Software Delivery Life Cycle.

POL is invited to comment on this report to seek any additional clarifications it needs. Fujitsu will endeavour to respond to any comments or clarifications requested and may, if it deems necessary, provide an updated version of this report.

Fujitsu welcome the opportunity to provide this report and looks forward to a constructive dialogue with POL.

3 Background & Introduction

On 20 August 2020, POL requested an audit of Horizon by sending a letter to Fujitsu titled "Horizon Audit". Following a number of discussions between POL and Fujitsu, it was agreed by POL that Fujitsu would prepare a set of reports on key topic areas identified by POL.

The spirit of the discussions between POL and Fujitsu was to share content that would allow both organisations to confirm the efficiency of the current ways of working together, and to identify ways to make meaningful improvements that would enhance the working relationships and hopefully ensure a better experience for the POL branches and their postmasters. Fujitsu believe in collaboration and welcome constructive suggestions from POL.

This report explains the current Fujitsu Testing & QA approach ("Testing & QA Report"). It follows the "Expanded Table of Contents for the Testing & QA Report" (COM/MGT/REP/4161) which was shared with POL on 01 December 2020.

This Testing & QA Report covers the Test activities and complements the "SDLC Report" (COM/MGT/REP/4168), which covers the lifecycle from Requirements to Release.

As a general comment, Fujitsu is only one supplier involved in the overall delivery of end-to-end services to POL in relation to Horizon. The Horizon application also relies on the working partnership between POL and its chosen partners – such as Verizon, Computacenter and Atos – as well as external service providers such as banks and affiliated organisations. This applies to both the IT systems and the operational processes in Horizon.

Although every effort has been made to avoid confusing jargon in this report, the very nature of this aspect of the service delivered to POL necessitates the use of many acronyms and phrases that may need expanding upon to ensure the correct understanding. Fujitsu accepts that further explanation may be necessary and encourages POL to seek these clarifications.

The topic of Testing & QA is a current open and active topic that results in continued communications between POL and Fujitsu. This report aims to collate those interactions and communications in order to provide a common baseline for any future discussions.

Fujitsu has endeavoured to ensure that the content of this report is correct as at the date of issue. This report has been prepared with the input of numerous Fujitsu individuals and attribution of any statements made in this report should be made to Fujitsu only. In preparing this report, the authors have collectively characterised and summarised many internal Fujitsu documents. They have also described processes and procedures which have been established over many years and may not be in written form. Many of the documents, processes and procedures described in this report are continuously updated and Fujitsu reserve the right to make changes to the way it works in the ordinary course of its operations and business without obligation to update this document. POL should verify the position with Fujitsu before relying upon any information or content from this document in the future as well as bearing in mind the requirements set out in "Information Distribution" at Section 8 below.

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4 Testing & QA

4.1 Testing Overview & Approach

Fujitsu has a Test and Validation (T&V) organisation who are the main providers of testing resource. Fujitsu also has a corporate testing process within the Fujitsu Europe Business Management System (EBMS). This includes a Testing Policy, Organisational Testing Strategy and Testing Methodology.

- The Testing Policy states the expectations Fujitsu has for the way testing will be conducted.

- The Organisational Testing Strategy defines the high level test approach to be adopted for all programmes and projects.

- The Testing Methodology supports the Testing Policy and Organisational Testing Strategy by identifying the supporting testing methods to facilitate achieving the defined goals.

The EBMS testing process provides document templates which the Post Office Account (POA) has implemented where appropriate.

For POA this testing process impacts Solution Validation and Integration (SV&I) Testing and Live System Testing (LST).

Development (DEV), Component Integration Testing (CIT) and Integration Testing (INT) all form part of the Development phase of the Software Delivery Life Cycle and follow their own processes.

Section 4.5 describes in detail the environments used on POA. A summary is provided below:

- DEV – Used for developing code and performing Unit testing and code review. There is an environment located in BRA01.

- CIT – An extension of the DEV environment based in BRA01 where components of code can be Integrated for the first time e.g. Counter, Branch Access Layer (BAL) and Branch Database (BRDB).

- INT - Used for packaging and testing the deployment of the code baselines and the regression path of those baselines that make up change to individual platforms, which in turn make up a release.

- SV&I – Used to test change from a solution perspective bringing together many components of a change for the first time to validate the full requirements of a change.

- LST – Used to support the LIVE environment focussing on the patching and maintenance of the individual components that make up the Horizon solution.

- RDT – Used to validate the REFDATA associated with the Horizon solution with the associated tooling.

4.2 Defining the Test Approach

The Test Approach on POA is risk-based where changes are analysed by Subject Matter Experts (SME) and as a result, tests, including regression tests, are derived.

The Horizon changes fall mainly into two streams: "Major" release or "Project" releases; and "Maintenance" releases.

Major releases are those derived from POL Change Requests, which typically impact multiple platforms. These go through the full SDLC and all test environments:

- Test Planning

- Test Preparation

- Test Execution

  o Including defect management

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- Reporting/Monitoring
- Test Completion

Maintenance releases are incremental updates to the LIVE environment.

4.2.1   Test Planning

At this stage, based on the details of the change, the required test environments will be identified. If the change will follow the Major release path then Test Plans for DEV/CIT/SV&I/LST will be produced describing what will be tested as part of a change for that test environment.

The key sections are:

- The scope of testing – both in and out of scope features
- RAID items
- Environment description with any constraints
- Test tools to be used
- Test resource
- Test schedule
- Requirements traceability.

These plans will use the POA document template and are subject to the document management process for review and approval using Dimensions.

Test Planning will also involve attendance by key test resources at impacting and planning sessions to assess the change against current workload.

An example Test Plan can be found in document reference TST/SOT/HTP/4072 which has been shared with POL separately.

4.2.2   Test Preparation

Test preparation is where the Test team prepare for the testing activities.

4.2.2.1   Test Environment Preparation

The Test environments each have their own purpose and capability and the environments may need specific preparation activities. For example, the SV&I environment is the first environment that has a working Tivoli Workload Scheduler (TWS). TWS manages jobs that run at certain times during the day (e.g. reconciliation of Counter data). TWS has a customised configuration as SV&I is not identical to LIVE.

Test environment preparation follows a process of understanding the change and also the activities that need to be completed during the preparation phase.

4.2.2.2   Test Cases

The SME for each area of change uses all relevant documentation (requirements/designs), design review sessions and ad hoc conversations to determine what Test Cases need to be generated to validate the change and test the agreed business requirements.

Test Cases will then be written as test scripts detailing:

- The definition of what is being tested
- Step by step process describing:
  - Data input
  - On screen messages
  - Keystrokes

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- Expected results
- Test data / cards / branches / pinpad combinations.

4.2.1.3   Test Readiness Review

For Major releases, a Test Readiness Review (TRR) will be performed, and chaired, by the Test Lead with assistance from some of the other delivery leads. The TRR will gather all relevant information to confirm that the Test phase is ready to accept the change and start test execution.

Each point will be assigned a "RAG" (Red Amber Green) status where: Green indicates the point is complete; Amber indicates the point has a plan to "Go Green"; and Red indicates that the point requires actions to plan.

A risk-based approach will be used to determine which activities are "showstoppers" to the process and which activities have enough containment to move forward.

An example TRR mail can be found in Appendix A – Example Test Readiness Review mail.

4.3   Utilisation of environments (within the Change & Software Delivery Lifecycle)

The following diagram represents the current Horizon Software Delivery Lifecycle. The Test environments are highlighted as "blue" for context.
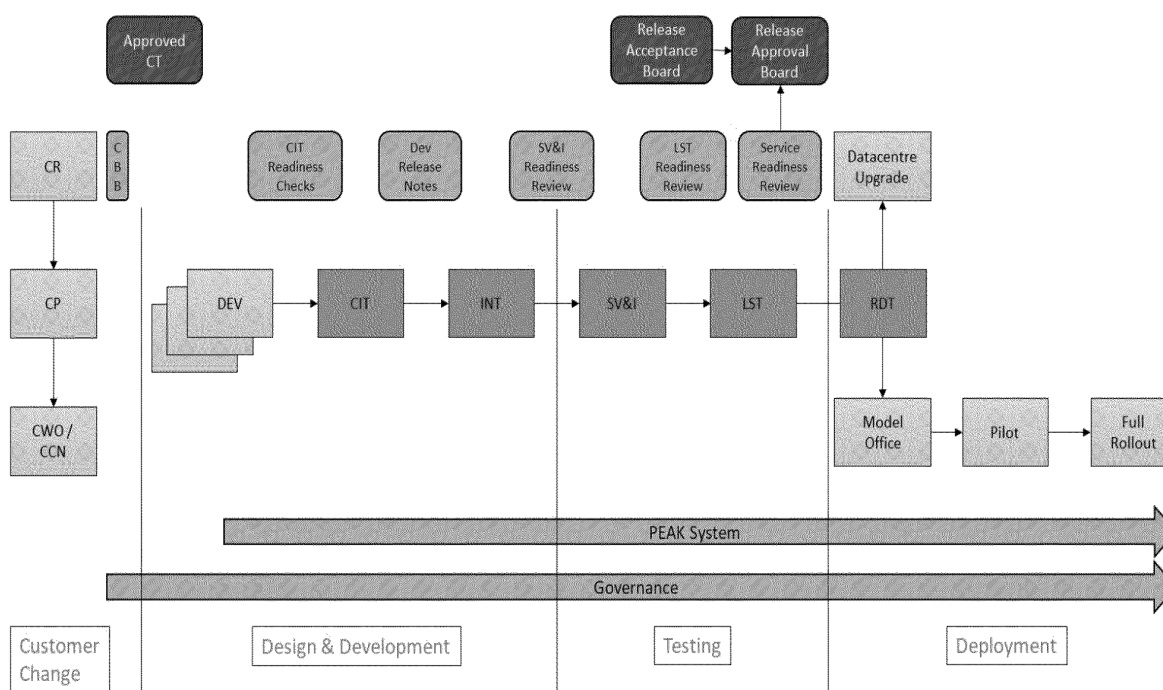
4.4   Major & Maintenance Release Flow

The Horizon changes fall mainly into two streams: (1) "Major" release or "Project" releases; and (2) "Maintenance" releases.

Major releases are those derived from POL Change Requests typically impacting multiple platforms. These go through the full SDLC and all test environments.

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Maintenance releases are focussed changes for individual components that make up the Horizon solution e.g. Counter, BAL, and BRDB.
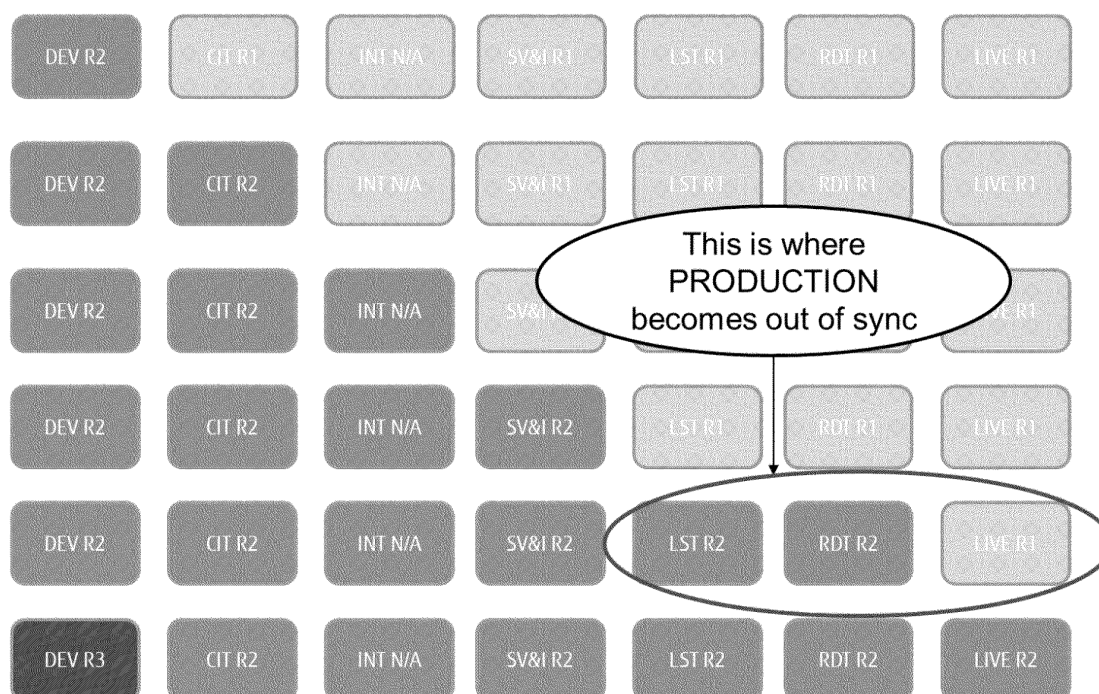
These releases go through a subtly different process where changes "skip" the SV&I environment but get "topped up" once a month. "Topped up" is the process whereby any changes that were deployed, tested and signed off by LST are delivered back into the SV&I environment. These include Maintenance releases, security patches and Hot Fixes.

The following diagram (4.4.A) represents the flow of a Major release in context to the Test environments.

Each row represents the next step in the progression of a release through the environments.

R1/R2/R3 are fictitious release numbers. Green represents delivery of new change to an environment. Pink shows where change is yet to be deployed. Red starts the cycle again. So, in diagram 4.4.A below, we can see that new release "R2" starts in Dev, then moves to CIT, then moves to INT etc.

The overlay bubble comment relates to the point in time where we do not have an environment which is representative of LIVE as RDT and LST have the new release deployed ready to go to LIVE. At this point, environments become out of sync with LIVE. The POL Live Service team is aware of this (see Recommendation 1).

4.4.A – Major release deployment flow

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This diagram 4.4.B represents a Maintenance release deployment flow.

The Maintenance release is shown as a "point" release and uses the same colour scheme as described for Major releases above.

Again, each row represents the next step in the progression of a release through each environment. The overlay bubble comment highlights the sequence of deployments which "misses" out SV&I as per the current process.

4.4.B – Maintenance release deployment flow
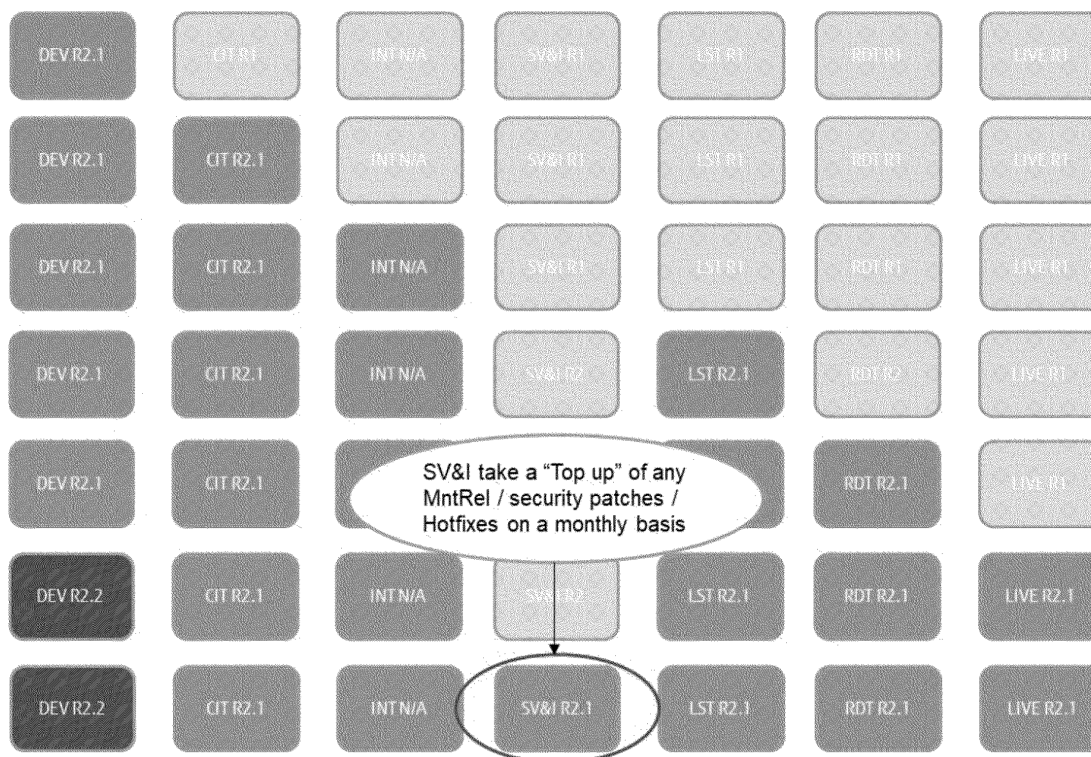
4.4.1 Test automation coverage

4.4.1.1 Counter Business Application (CBA) Test Tool

The CBA test tool is an in-house developed tool that was originally used by the Development team as a way of simulating Counters to verify changes.

The Test team use this tool to automate tests across each area of functionality to formulate a regression test pack which shows a stable Counter delivery, but would also "seed" data into the Data Centre for those apps to consume, which enables a wider set of tests to be performed.

For each Major release there is potential for Counter changes and therefore enhancements to the CBA test tool. If a change to the CBA test tool forms part of that release it would follow the SDLC for the relevant environments (and the Testing process where appropriate).

The approach for this area of testing is to run the current test pack against a new version of the Counter as part of the testing cycle. The tests are run, failures are investigated, defects are raised and changes are made to the tests, if needed, to get an outcome which is a "clean" run of passes and therefore a known state.

Note: Testing of REFDATA is a POL responsibility. REFDATA is fundamental to the operation of the CBA. See Recommendation 13 in Appendix D.

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A joint review by Fujitsu and POL is currently underway of the CBA test tool, test pack and process output as part of CWO0223.

4.4.1.2   SOAPUI

Although POL and Atos are responsible for testing the NCR Self-Service Kiosk hardware and application, Fujitsu have responsibility for testing the interface of the SSK to the Horizon solution.

SOAPUI is the tool used to simulate these SSK messages across the Fujitsu interface. A regression pack has been formulated and is run when specific changes are made to the Fujitsu interface or as part of a wider solution regression pack.

This tool and scripts are used across the CIT/SV&I & LST test environments.

4.5   HNG Test Environments

4.5.1   Component Integration Test (CIT) environment

The Component Integration Test environment (CIT) is used by the Fujitsu Development team. It was initially in place to integrate the Counter Business Application with the Data Centre BAL/BRDB to ensure a stable Counter/Data Centre interface.

The environment capability has now been increased to cover more services.

This environment does not have:

- Tivoli Workload Scheduler (TWS) so batch scheduling cannot be tested
- Estate Management capability
- REFDATA Supporting systems
- Any Computacenter software distribution.

The environment components are physically located in the BRA01 office. The team that manage and use this environment are located in the Fujitsu GDC India Bangalore office and BRA01.

4.5.1.1   Scope

The current scope of testing is to validate Counter/BAL changes in isolation with the flexibility of incorporating changes swiftly as and when issues arise.

The testing is driven by JIRA where the testers allocate verification test(s) for the changes delivered by the development team.

Elements of the testing process used in SV&I are being implemented for CIT including expanded resource in the UK to give focus to testing with representative hardware/peripherals.

4.5.1.2   External Users/Use cases

There are currently no external users of this environment.

4.5.1.3   External End points & Simulated services

There are no external end points. Counters are simulated along with the branch peripherals.

4.5.1.4   Interfaces to Third Parties

There are no interfaces to POL third parties.

4.5.1.5   Testing from a Counter perspective

There is currently no use of physical Counter/peripherals from the Fujitsu GDC India Bangalore office due to a constraint imposed by GDPR/PCI. However, all Counter variants and peripherals can be simulated.

4.5.2   Integration (INT) environment

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The Integration environment is a "technical" rather than "functional" test environment with servers based in the BRA01 office.

In this instance, the technical testing relates to how a packaged piece of code is proven to be delivered successfully onto a Data Centre platform and the regression steps for this package. There is no functional test capability in this environment.

The resources are based in BRA01 and the Fujitsu GDC India Bangalore office.

4.5.2.1   Scope

This environment is used for packaging and testing the deployment of the code baselines that make up changes to individual platforms which make up a release.

Each baseline needs a particular ordering and verification to determine how the change is best delivered to the individual platforms in the Data Centre.

Some baselines come with accompanying deployment steps/details which need formulating and packaging along with code.

The environment is made up of servers with the different operating systems representative of the LIVE environment. Integration has at least one instance of each Data Centre platform type. They are on a co-ordinated rig and in cases where a product is deployed to multiple platforms they are tested together.

4.5.2.2   External Users/Use cases

This is an "unmanaged" environment. It does not have any platforms located in the Belfast Data Centres. It is used specifically by the Integration Team with members based in the UK and our Fujitsu GDC India Bangalore office.

4.5.2.3   External End points & Simulated services

This environment does not have any external end points or simulated services. Its purpose is to test the delivery of code rather than Horizon functionality.

4.5.2.4   Interfaces to Third Parties

This environment has no interface to third parties.

4.5.2.5   Testing from a Counter perspective

This environment does not have Counter testing capability. Its purpose is to test the delivery of code rather than Horizon functionality.

4.5.3   SV&I environment

The Solution Validation and Integration environment has been specifically tailored / designed to support functional testing to validate customer business requirements for project related change.

It is representative of LIVE in that it has many of the capabilities that operate in the LIVE environment: "Real" Counter and peripheral hardware supplied and managed by Computacenter, with Verizon managed Branch networking integrated with a fully managed Data Centre and real interfaces to third parties – albeit with test end points.

It is used by many user groups and is seen as the "busiest" of test environments servicing multiple requests on a regular basis.

The resources that make up this test team are all based in the UK.

4.5.3.1   Scope

The purpose of SV&I is to provide an environment that can test change from a solution perspective bringing together many components of a change for the first time.

It has a Counter estate based in BRA01 (Fujitsu Test) and Winnersh (Atos Test) interfacing with a Belfast Data Centre. This Counter estate is representative of LIVE for hardware and Branch networking including peripherals (Scanner/PinPad/weighscales/printers etc.)

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It is the first environment where TWS changes are implemented. TWS run scheduled jobs to replicate the processing of data through many Data Centre components with reconciliation processes which consolidate the data for onward processing to external POL systems.

Its capabilities and constraints include:

- Data Centre components fully managed Monday-Friday (this refers to all code deliveries)
- TWS schedules running Monday-Friday
- PODG, GWS and HBS Services
- Representative hardware
- Customised REFDATA delivery mechanism
- Simulated end points with other systems
- External endpoint connectivity
- Extends to Winnersh (Counters)
- No clustered BRDB
- Not scaled to LIVE
- No BRSS platform
- No HORIce capability
- Usage managed by a Forward Schedule.

This highlights a number of areas that have been discussed between POL and Fujitsu where improvements can be considered. See Recommendations in Appendix D.

4.5.3.2   External SV&I Users/Use cases

Over a number of years the SV&I environment has proved capable of supporting other user groups' testing and development activities to enable better utilisation of its resources to support POL change.

The current user groups and their typical activities are described in the following table:

User Group	Description of usage
Atos	• Path of a transaction / data from the Fujitsu "Boundary" to POL third parties including Banks / Online services and also POLSAP • Testing of NCR changes to the SSK, using physical SSK • Support of Computacenter testing Build changes / patches • POL UAT – Hosting and / or performing • Integration Testing of CDP changes • REFDATA changes - APADC (Automated Payment Advanced Data Capture) / new products
NCR	• Develop changes to their SSK application using SV&I (interface to HBS) as a stub
Accenture	• Supporting Atos testing
Ingenico	• Providing integration to environments to support the testing of PCI changes
HIH Project	• Multiple test environments integrated with SV&I (INT 1 & 2, Performance, RPOS) • Accessed by POL team in Moorfields • Focus on end-to-end testing

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	• More recently Performance Testing
Horizon Development Teams	• Test fixes prior to formal delivery (under guidance from the SV&I support team)

These user groups are all managed using a simple Forward Schedule of Change workbook which is updated on a weekly basis where details of who is using the environment and for what purpose are noted. This includes details of any scheduled outages (maintenance release top ups, DR rehearsals) that may impact the access or availability to these groups.

There is also a local Support Guide used by all users that describes how the environment is supported and how user groups can raise observations, request evidence etc. See document reference TST/SYT/PRO/3862 (currently v0.3), which has been shared with POL separately.

4.5.3.3 External End points & Simulated services

In order to validate some of the Horizon functionality/requirements it is necessary to simulate a number of POL's other third party end points to provoke responses or send information.

The detail of these external endpoints and simulated services can be found in Appendix B – External Endpoints.

4.5.3.4 Interfaces to Third Parties

SV&I is the only environment that is used to connect externally and this is only relevant for Atos/POL testing of Payment and Banking changes.

Where third parties have a Test end point, these are managed via requests to the SV&I Rig Support team to implement a change to a configuration file where a "switch" is made to change from the use of a simulator for traffic to the desired Test end point.

4.5.3.5 Testing from a Counter perspective

The approach to the testing of Counter Business Application changes in this environment follows the approach detailed in section 4.2.

The Counter estate has the following configuration capabilities:

• Single Counter outlets

• Multi Counter outlets

• Multi language

• Counter Training Office

• Global Office.

The Counters are not managed by the Computacenter software distribution tool. This allows for the flexibility, during a Test phase, to make rapid deliveries of the application as and when required. Additionally, the Computacenter compliance check is not enabled in order to further support this approach.

Note. The compliance check is a tool that Computacenter use to determine which is the most valid version of the CBA and if "new" versions are deployed for Test purposes. This check will remove that version and rollback to what it believes is the most valid.

4.5.4 LST environment

The Live System Test environment is in place to support the LIVE environment, focussing on the patching and maintenance of the individual components that make up the Horizon solution.

As part of the SDLC, this is represented best in Section 4.4 where these changes by-pass the SV&I environment.

For Project change, LST is used primarily to rehearse the deployment/migration activities with the same tooling/teams and process that would be used for LIVE.

The resources that make up this team are based in the UK and our Fujitsu GDC India Bangalore office.

4.5.4.1   Scope

The LST environment is a representation of the LIVE environment with Counter and peripheral components located in the BRA01 offices and the Data Centre capability in the Belfast Data Centre. There is DR capability for Counters at the Fujitsu Stevenage office.

Monitoring of the supporting Data Centre systems is done using the Systems Management Monitoring toolset to look for new expected and unexpected events/alerts. Checks are also made on the systems that manage how the Counter estate is monitored when branches and Counter positions within branches are added or removed (Estate Management database and Branch Change Management System (BCMS)). BAL / BMX logs are also checked.

The following list gives a high-level view of the LST environment capability:

- Data Centre platforms fully integrated
- Data Centre components managed 24/7
- TWS schedules running 24/7
- Real Counters / peripherals
- Counters managed by Computacenter
- Formal REFDATA delivery mechanism
- Simulated end points with other systems
- No external endpoint connectivity
- Clustered BRDB environment
- PODG and HBS services
- Scaled where appropriate
- BRDB Standby Server (BRSS)
    - Goldengate replication from BRDB
- HORIce – Software Support Centre tooling
- Independent systems monitoring by SMC team
- Subject to full change control.

4.5.4.2   External Users/Use cases

User Group	Description of usage
HIH Project	• Test Environments integrated with LST • Accessed by POL team in Moorfields • Focus on end-to-end testing • More recently Performance Testing

4.5.4.3   External End points & Simulated services

LST simulates all external end points. Appendix B – External Endpoints provides further detail.

4.5.4.4   Interfaces to Third Parties

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The only external interface is to Postcode Anywhere to be able to run tests that require address information.

4.5.4.5 Testing from a Counter perspective

The Counter estate in LST has the capability of testing with the following configurations based on the specific requirement for the change and what is required to be tested in the LIVE estate:

- Single Counter outlets
- Multi Counter outlets
- Multi language
- Counter Training Office
- Global Office
- Computacenter monthly patch testing
- Computacenter build and regression testing with current LIVE Counters
- HBS/PODG services.

The Counters are managed by the Computacenter software distribution tool in order replicate the mechanism used in LIVE. Additionally the Computacenter compliance check is enabled.

4.5.5 RDT environment

RDT is the Reference Data Test environment. In the Software Delivery Life Cycle it is the final environment before LIVE. This is only in terms of keeping its Counter and Data Centre components up to the most recent versions of code. It is not to test the actual reference data (REFDATA) itself.

4.5.5.1 Scope

This environment has been established to validate the REFDATA associated with the Horizon solution with the associated tooling. This REFDATA is used to "drive" much of the functionality that the CBA can perform but has also been used to deliver "code" e.g. updates to the HBS service.

The following table reflects the various types of REFDATA that are currently processed.

Ref Data (Type)	File type	Data
A	MDM Reference Data (POCL)	- Branch Data - Product Data - Accounting Calendar - POL Clients and Client Accounts - Automated Payment Tokens - Banking Schemes - CTT Mappings - End of Session Prompts - Transaction Prompts
C	APOP Service definition reference data only, EPOSS reference data	
F	Counter specific reference data: Logo bitmaps, or other non-xml data	Various logos and bitmaps
G	HNG-X specific ref data, shared to BRDB and other platforms like CWS	Supports BAU deliverables such as encryption certificates and Generic Web Service definitions
X	Postal Services/Transaction scripts/Menu definition/Miscellaneous other reference	- Pin Pad Reference data - Postal Services

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	data	• Transaction Scripts
		• APADC Scripts
		• Menu Definitions
		• Restricted Product Curricula
		• Logon Curricula
		• Various Other Reference Data Objects, Including:
		   ○ Message Definitions
		   ○ Postal Service Tokens
		   ○ Postal Service Administration Processes
		• POL Delivery Agreements
		• POL Client Accounts

Help data	Online Help Pages accessed by the Counters from the central HBS Server	
FirstRate	Bureau margins / Spot Rates / Branch & Price Profile	
PAF	Postcode Address Data	

RDT has Counter and Data Centre capability. However, its focus is to consume the Data Centre services and verify REFDATA processes correctly to the Counter / Data Centre components.

The Data Centre components are hosted on the same infrastructure as LIVE.

There are 4 streams of work that are hosted within the RDT environment. The first 3 in this list are used by Atos information services, the fourth by Fujitsu.

1. RDDT – Terminal Verification for Reference Data Validation, integrity checking, and automated testing

2. RDDIV – Interim Verification (Code Changes). Each change individually (Product, token menu hierarchy rules scripts)

3. RDDOV - POL Outlook Systems Group verification of full packages of REFDATA

4. RDDPL (Pseudo LIVE REFDATA environment) for the investigation of any Live Reference Data issues.

Some elements of the environment are managed locally e.g. the Tivoli Workload Scheduler that manage the batch processing.

Data Centre components are managed by the Fujitsu Belfast teams, with Counter software being managed by Computacenter.

4.5.5.2   External SV&I Users/Use cases

Outside of Fujitsu resource, the user groups using one or more of the RDT "Streams" are Atos Information Services and Atos Test.

The Atos Information Services Group "key" the REFDATA based on POL requirements which is "fed" into the REFDATA tooling for processing before going through the delivery process.

The Test Team are currently used to generate and test APADC scripts again, before being "fed" into the REFDATA tooling.

4.5.5.3   External End points & Simulated services

LST simulates all external end points. Appendix B – External Endpoints provides further detail.

4.5.5.4   Interfaces to Third Parties

The only external interface is to Postcode Anywhere to be able to run tests that require address information.

4.5.1.5 Testing from a Counter perspective

Each of the four streams has two physical Fujitsu Counters which are both Single Counter Outlets (SCOs). The only peripherals being used are the back office and tally printers to verify REFDATA changes on receipts and reports.

N.B. Atos have a number of Counters:

- 2 SCO in RDDT
- 1 SCO in RDDIV
- 6 SCO in RDDOV.

4.6 Platform differences

Fujitsu maintain a Platform Hardware Instance List (PHIL) which lists the available platforms for LIVE/LST/SV&I/RDT. DEV/CIT/INT are a consolidated entry.

Not all platforms are available in all environments. This is based on the intended use of the environment and the test purpose, and has evolved over years and through numerous changes.

There are a number of recommendations made which refer to opportunities to increase Test environment capability. See section 7.

Appendix C – Environment Platforms shows the differences between the environments at a Data Centre level.

4.7 Transaction types

For Counters to transact, they need the Fujitsu Counter Business Application and REFDATA delivered by POL. They also need the hardware and peripherals.

The REFDATA determines which transactions a Counter can complete. This is based on many factors including geographical location.

The Counter functionality is split into several main areas as defined below. These are further broken down into 82 sub categories, which are not listed here due to the size but can be provided to POL separately, if requested.

- BAC - Branch Accounting
- BAD - Branch Admin
- BDC - Bureau de Change
- BNK - Banking
- BOF - Back Office
- CSM - Cash and Stock Management
- DVLA - DVLA
- ETU - Electronic TopUp
- EUM – Enhanced User Management
- GLB - Shared
- GWS - Generic Web Services
- IOP - In and Out Payments
- PAF - Address Find
- POCA - Card Issuing

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- POS - Postal Services
- RSS - Retail and Stock Sales
- SDB - Settlement by Debit or Credit Card
- SM - Smart Metering.

SV&I is the only environment capable of testing this full set of transactions (see section 4.5.3). CIT/LST/RDT can perform some of these transactions but is limited (see earlier sections).

4.8 Model Office – Live Proving

There is currently no formal engagement with the Model Office team by the Fujitsu Test organisation.

Model Office for LIVE proving is conducted by the POL project team.

5 Formal Audit Reports

POL has commissioned an ISAE3402 audit as well as quarterly PCI Prioritised Approach audits on POA. Both audits examined the topics discussed in this report. Furthermore, POA are periodically requested to contribute to internal Fujitsu corporate audits to support Fujitsu UK in attaining and maintaining a variety of certifications such as ISO27001, ISO9001 and ISO22301.

6 Conclusions

The current Fujitsu Testing & QA process, with the associated test rigs, used as part of the full SDLC, provides a high quality test service for the validation of changes for a safe deployment into LIVE.

It is, however, recognised by both Fujitsu and POL that there are constraints imposed by using the current approach, and that there are areas for improvement. It is therefore acknowledged that there is a need for both POL and Fujitsu to focus on improvements (see Recommendations).

7 Recommendations

Testing & QA has been the topic of numerous collaborative discussions between POL and Fujitsu over the years and during recent meetings. A compilation of recommendations for improvement arising out of these meetings are contained in Appendix D. This list in Appendix D is aimed at collating the various action items into a single list so that POL and Fujitsu can work jointly to improve the Testing & QA capabilities. The recommendations should be prioritised and the most relevant ones actioned as promptly as possible.

8 Information Distribution

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Appendix A – Example Test Readiness Review mail

From: ******@fujitsu.com
Sent: Thursday, September 3, 2020 6:25 PM
To: ******@fujitsu.com ; ******@fujitsu.com; …
Cc: ******@fujitsu.com ; …
Subject: TRR - Test Readiness Review - SV&I - Payment Pilot

Hi All,

As discussed,

Attached here is the TRR output.

TRR Minutes – SV&I - PBS – Payment Pilot
Date: 03/09/2020
Teams
Attendees: (to be confirmed)

NAME	INITIAL	ROLE
******	**	POL Test Manager
******	**	Ingenico
******	**	Solution Architect
******	**	SV&I Test Manager
******	**	LST Test Manager
******	**	SSC
******	**	Integration and Release Manager
******	**	Release Manager
******	**	Solution Arch manager
******	**	Counter delivery Manager
******	**	Solution Arch
******	**	GDC Delivery Manager
******	**	Host delivery manager
******	**	CIT Test manager
******	**	SV&I
******	**	PM Manager

Apologies;

SV&I Environment Readiness

Existing counter –

- Ready – R70.25 ?
- RAM604 need to be plugged in > Emulator, this will not be connected to Axis.

PBS Migrated Counter -

- R70.30 – Sprint 3
  - Release Notes are not ready
    - WSPOS Package needs to be uninstalled
    - John Hickman's instructions needs to be captured

  - TPV – Should be Automatic (Need to check with ******) – In LST it should be tested automatically.
    - Currently it is sorted manually in SV&I

- SI-19 PINPAD to be used
  - 53 New PINPADs C3 (SI-19) are received (SV&I and LST)
  - Migration of the PINPAD from RAM604 to C3 (SI18/19)
    - Downgrade script is not ready for SI-18 /SI-19 – to RAM604
      - Constraint for testing migration of the PINPAD.
  - 20 PINPADs – SI18 old lot
    - Action : ****** need to send the cabling for the LLT tool.
      - LLT tools is there to make it to RAM604

- Acceptance Env (Ingenico) – SV&I
  - Environment sorting needs to be done as previously the environment was mapped to Integration Env. – Key action
  - Mike – to ensure provisioning on the acceptance env.

  Integration – Development only
  Certification env. – Accreditation env.
  Pre-Production –?

- ICC Test Cards are ready

- R70.30 – Sprint 5 version – ETA 04/09

Backend -
  R20.11 – To be installed – Done

  R20.92 – Sprint 5 – Baseline packages to be installed – 04/09
    RM to confirm the position of release

  PODG network connectivity to ingenico – Done

  CC Firewalls – ETA 07/09 – S

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Task	Suggested deliverable (i.e. doc name, statement etc.)	Team	Owner	Notes	Estimated Completion Date	Impact	RAG Status
What is the current status of the Testing in SV&I?	Statement	Test	SV&I Test Manager	80 % complete, as expected.			
What are the code components for delivery for this cycle? Is there anything new or is it just PEAK fixes?	List of deliverables from the development teams	DEV	Development Manager from UK/SMG/FCIL/CSREFDATA	Host – 04/09 Morning Counter – 04/09 Sprint 5			
CIT testing What testing has/is being done?	Discussion to understand how the CIT testing went. Report showing the scope v the results of tests.	DEV	Development Manager/CIT Test Analyst	Jira's/bugs open – # informal fixes delivered) Test Status: % - Sprint 4 functionality is breaking. -Sprint 5 – Remaining			
Is the testing data available for re use from CIT? When is it scheduled for delivery to SV&I? What REFDATA?	Statement	SSC REFDATA	SSC REFDATA – Technical Specialist	MSG ref. data is delivered.			
Does SV&I need to take a REFDATA reset? Has any TEST ONLY DATA been used and is being managed in the appropriate folder.	Statement	SSC REFDATA	SSC REFDATA – Technical Specialist	MSG ref. data is delivered.			
What is the current delivery status of these components? What has been delivered? Depending on the results of #2	Statement as to the delivery status into Dimensions and whether they are on target	DEV	Development Manager from UK/SMG/FCIL/CSREFDATA				
What is the progress of the deliverables through Integration? Is there any risk to the current dates	List of deliverables compared to that in item 2	INT	Integration Manager				
What are the documentation deliverables for this release. Including Support guides	List of document references for each change updated via the Development deliverables spreadsheet and their status (DRAFT/APPROVED)	DEV	Development Manager	R70.30 – Release notes needs be updates. Risk: Other documents which ****** is tracking , this Risk is accepted earlier.			A

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Are there any additional deliverables for this release? Top-up's, and another month Security patches	Statement of the release content. For any Maintenance Release signed off by LST the deployment plan is made available to verify any "exceptional" baselines.	INT/RM	Major Release Manager/Integration Manager.	Top ups are moved to Oct.		
Build from Integration Date at the very least	List of release specific baselines. Report of failures	INT	Integration Manager			
Deployment Plan available for review. Date at the very least	Statement	RM	Major Release Manager	Deployment Plan – May need slightly modified for LST, some questions are open. Okay for SV&I.		
Is the counter going to be deployed using BIGFIX?	Statement/Updated process and timescale	INT	Integration Manager	NA	NA	NA
Does the test tool require a new version at this Cycle/Release	Statement	DEV	Development Manager	-CBA Test Tool – Need delivery - C3 Simulator (Robust)		
Are the baselined requirements available for the changes relevant for this release?	Statement	POL	POL Test Manager	## testable Requirements - ## – SV&I tests - Others – Ingenico or may fall for SV&I. Action on Steve E to come back.		
Have all the HLTP's been produced and formally reviewed?	TST/SOT/HTP/????	Test	SV&I Test Manager	Test Approach is approved		
Are SV&I Test Resources are available for the planned test execution?	Statement	Test	SV&I Test Manager	Resources are planned		
Is SV&I Test preparation complete?	Test Scripts in QC	Test	CM	80 % complete		
Are datacentre deployment resources available?	Statement	Test/UNIX/NT	SV&I Test Manager	Resources are aligned		
Are resource available to deploy the counter element of Test Rigs?	Statement	Test	SV&I Test Manager	Resources are aligned		
Have the defect triaging meetings been arranged?	Statement	Test	POL Test Manager	QFP arranged		

A.O.B

Appendix B – External Endpoints

Correct as at: 14 December 2020

LIVE		SV&I	LST	RDT
Banking_Payments				
LINK		Simulated/3rd Party	Simulated	N
CAPO		Simulated/3rd Party	Simulated	N
SANTANDER		Simulated/3rd Party	Simulated	N
GlobalPay	Payment Files (inc. AMEX)	Simulated/3rd Party	Simulated	N
Epay	ETU confirmation	Simulated/3rd Party	Simulated	N
TES User	TES Transactions	Y	Y	N
POL	Reconcilliation Reports / TES Reports	Simulated/PODG	Simulated/PODG	N
CFS	POLSAP load file	Simulated/PODG	Simulated/PODG	N
CDP	Sanitised EMIS	Simulated/PODG	Simulated/PODG	N
On_Line Services				
Credence	CWS - Branch Full detail PODG	Daemon running	Y	N
Royal mail	CWS - Branch Lookup / Space	REFDATA from PODG	REFDATA from PODG	N
PostCode Anywhere	BWS - Postcode Lookup	3rd Party	3rd Party	3rd Party
Quadrient (Neopost)	BWS - Postal Delivery data	3rd Party	3rd Party	N
CAPO	BWS - Card Activation	Simulated/3rd Party	Simulated	N
DVLA	DWS - License Data	Simulated/3rd Party	Simulated	N
First Rate	GWS	Simulated/3rd Party	Simulated	Simulated
Health Lottery	GWS	Simulated/3rd Party	Simulated	Simulated
National Express	GWS	Simulated/3rd Party	Simulated	Simulated
Home Phone DVLA	GWS	Simulated/3rd Party	Simulated	Simulated
Settlement_Logistics_APOP				
POL				RDT use PODG capability as a means to transfer from LIVE to FJS Corporate evidence, reports, NBS Service details for LIVE supporting
FRTS				
AP Clients				
APOP Clients				
Other Clients	These end points are for the PODG solution to send files to. In SV&I/LST test routes have been established to simulate the various route "definitions" to mimic how the different file types are distributed. The Yellow items are feeds into the Horizon solution and although the capability to test is there, these are not tested as a matter of regression only when changes have been made that we are informed need testing or rgeression testing via change process			
Arrow				
Royal Mail				
CREDENCE				
POL				
CFS				
CWC				
Ingenico				
Wincor Nixdorf				
ForgeRock				
Royal Mail	Track and Trace	XCS Emulator	XCS Emulator	
COGENT	AEI	3rd Party	N/A	
POL	TWS	Test W/S	Test W/S	
REFDATA				
TfS	Branch Data - PODG	XCS	XCS	Y
MDM	Help and REFDATA			Y
GDC	JAR Files	SV&I / LST consume the output of all these deliveries as a weekly REFDATA fileset		Y
FRTS	Spot Rates and margins			Y
SSC/DEV	PODG Routes and other config			Y
APOP Client	Retail prices			Y
HBS				
Ingenico DC	Smart Metering	Test Service	Test Service	N
CDP	CDP Data	3rd Party	4th Party	N
British Gas	Smart Metering	Test Service	Test Service	N
HIH	Smart Metering and basket settlement	Understand that the HIH service has been ceased (from a Test perspective), however the connectivity is still there		N
Estate Management_Support				
Customer Services	Service Level Reports	N	Y	N
SSC	Estate Management Reporting via HORICE	N	Y	N
POL	Postshop/Payzone Branch Configs	N	Y	N
SSC	Branch Data	N	Y	N
Agent Portal	for querying	N	Y	N
Retail Integrators	CSR Validation	N	Y	N
BCMS	Estate Configuration	Y	Y (10 Dys Full Cycle)	N

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Outgoing Connections						
Application		**Platform**	**3rd party endpoint**	**SV&I**	**LST**	**PROD**
FMCV		GWS	First Rate	SV&I		First Rate
FMCC		GWS	First Rate	SV&I		First Rate
DVLA_VED		GWS	DVLA	SV&I		DVLA
DVLA_DDI		GWS	DVLA	SV&I		DVLA
DVLA_CTC		GWS	DVLA	SV&I		DVLA
HPBB		GWS	HomePhoneBroadBand	SV&I		HomePhoneBroadBand
HLTY		GWS	HealthLottery	SV&I		HealthLottery
NEXP		GWS	NationalExpress	SV&I		NationalExpress
PO_CACT		GWS	BankofIreland	SV&I		
BKAC		BWS	PostcodeAnywhere	SV&I	LST	PostcodeAnywhere
PGDD		BWS	NeoPost	SV&I	LST	NeoPost
PCAI		BWS	JPMorgan	SV&I		
DVLA		DWS	DVLA - bart	SV&I		
CDP		HBS	Accenture	SV&I		
SMS		HBS	Brtitish Gas	SV&I		
BFCS		CWS	PostcodeAnywhere	SV&I	LST	
Debit Card		DEA	GlobalPay	SV&I		GlobalPay
ETU		DEA	Epay	SV&I		Epay
A&L		NAA	Santander	SV&I		Santander
CAPO		NAC	JP Morgan	SV&I		CAPO
LINK		NAL	VocaLink *	SV&I	* (VocaLink make the connection to the agent)	LINK
Sterling Commerce/Connect Direct		CDG201	JPMorgan	SV&I		
AEI		FLG/PLG **	Thales/gemalto	SV&I	** FLG apps were never migrated to PLG in SV&I	
Counter/PINPAD		Counter	Ingenico - PBS	SV&I		
Debit Card pay file		DGE	Global Pay	SV&I		

Incoming Connections via NRP						
Application	**Input Device**	**Platform/Estate**	**3rd Party**			
BFCS	Web App	CWS	Royal Mail Group	SV&I		Royal Mail Group
RTS	Workstation based test tool	HBS	NCR, Various locations including London, Peterborough, Atlanta, India, Philippines	SV&I		
RTS	SSK	HBS	NCR, London	SV&I		
Horizon Estate	Counter	Horizon	ATOS	SV&I		
RTS	SSK	HBS	ATOS	SV&I		
Horizon Estate	Counter	Horizon	Verizon	SV&I		
Horizon Estate	Counter	Horizon	ComputaCenta	SV&I		
Horizon Estate	Counter	Horizon	HIH team Finsbury	SV&I		
Horizon Estate	Counter/RP devices on existing branches	Horizon	HIH team Finsbury	SV&I	LST	
Horizon Estate	HIH Devices	Horizon	HIH team Finsbury	SV&I	LST	
Horizon Estate	Counter	Horizon	Ingenico	SV&I		

Incoming not via NRP		**Platform**				
Debit Card Emis files	Batch	DGE	Global Pay	SV&I		

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Appendix C – Environment Platforms

Correct as at: 14 December 2020

Platform	LIVE	RDT	LST	SV&I	INT	CIT	DEV	Rationale
ACA	Y	N	N	N	N	N	N	Shared
ACD	Y	N	Y	Y	Y	Y	Y	
ACDv2	Y	N	Y	Y	N	N	N	Not Required - DEV
ARCv2	Y	N	Y	Y	Y	Y	Y	
AUWv2	Y	N	Y	Y	Y	Y	Y	
AWS	Y	N	Y	Y	Y	Y	Y	
BALv2	Y	N	Y	Y	Y	Y	Y	
BCD	Y	N	Y	Y	N	N	N	Not Required - DEV
BDA	Y	N	Y	Y	N	N	N	Not Required - DEV
BDBv2	Y	N	Y	Y	Y	Y	Y	
BDSv2	Y	N	Y	Y	Y	Y	Y	
BMXv2	Y	N	Y	Y	Y	Y	Y	
BPLv2	Y	N	Y	Y	Y	Y	Y	
BRSv2	Y	N	Y	Y	Y	Y	Y	
BSLv2	Y	N	Y	Y	Y	Y	Y	
BSLv4	Y	N	Y	Y	N	N	N	Not Required - DEV
BSM	Y	N	Y	Y	Y	Y	Y	
BSMv3	Y	N	Y	Y	N	N	N	Not Required - DEV
BSS	Y	N	Y	Y	Y	Y	Y	
BSW	Y	N	Y	Y	N	N	N	Not Required - DEV
BWS	Y	N	Y	Y	Y	Y	Y	
CACv3	Y	N	Y	Y	Y	Y	Y	
CANv2	Y	N	Y	Y	N	N	N	Not Required - DEV
CAS	Y	N	Y	Y	N	N	N	Not Required - DEV
CDGv2	Y	N	Y	Y	Y	Y	Y	
CDSv2	N	N	Y	Y	N	N	N	Not Required - DEV
CDSv3	N	N	Y	Y	N	N	N	Not Required - DEV
CONv2	Y	N	N	N	Y	Y	Y	Shared
CWS	Y	N	Y	Y	Y	Y	Y	
DATv2	Y	N	Y	Y	Y	Y	Y	
DCMv2	Y	N	Y	Y	Y	Y	Y	
DEAv2	Y	N	Y	Y	Y	Y	Y	
DGEv2	Y	N	Y	Y	Y	Y	Y	
DGIv2	Y	N	Y	Y	Y	Y	Y	
DNP	Y	N	Y	Y	Y	Y	Y	
DNS	Y	N	Y	Y	Y	Y	Y	
DWS	Y	N	Y	Y	Y	Y	Y	
DXC	Y	N	Y	Y	Y	Y	Y	
DXI	Y	N	N	N	N	N	N	Not Required - DEV
DXT	Y	N	N	N	N	N	N	Not Required - DEV
EAS	Y	N	Y	Y	Y	Y	Y	
EASv2	Y	N	Y	Y	Y	Y	Y	
ECS	Y	N	Y	N	N	N	N	Not Required - DEV
EDS	Y	N	Y	Y	Y	Y	Y	
EDSv2	Y	N	Y	Y	N	N	N	Not Required - DEV
EES	Y	N	Y	Y	Y	Y	Y	
EESv2	Y	N	Y	Y	N	N	N	Not Required - DEV
EFS	Y	N	Y	Y	Y	Y	Y	
EMD	Y	N	Y	Y	Y	Y	Y	
EMDv2	Y	N	Y	Y	N	N	DEV	Not Required - DEV
EMM	Y	N	Y	Y	Y	Y	Y	
EMMv2	Y	N	Y	Y	N	N	N	Not Required - DEV
EPM	Y	N	Y	Y	Y	Y	Y	
ERP	Y	N	Y	Y	Y	Y	Y	
ESS	Y	N	Y	N	Y	Y	Y	Not Required - PD
ESSv2	Y	N	Y	Y	N	N	N	Not Required - DEV
EST	Y	N	Y	Y	Y	Y	Y	
EUI	Y	N	Y	Y	Y	Y	Y	
FRG	N	N	Y	N	Y	Y	Y	Emulator
FSS	Y	N	Y	Y	N	N	N	Not Required - DEV
GWS	Y	N	Y	Y	Y	Y	Y	
HBSv2	Y	N	Y	Y	Y	Y	Y	
HSM	Y	N	N	N	N	N	N	Not Required - DEV
IPSv2	Y	N	N	N	Y	Y	Y	

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ISW	Y	N	N	N	N	N	N	Not Required - DEV
KMNv2	Y	N	Y	Y	Y	Y	Y	
KSN	N	N	Y	N	Y	Y	Y	Decommissioned
KSNv2	Y	N	Y	Y	N	N	N	Not Required - DEV
KVM	Y	N	N	N	N	N	N	Not Required - DEV
LMFv2	Y	N	Y	Y	N	N	N	Not Required - DEV
LLXv2	N	N	Y	Y	N	N	N	Emulator
MSW	N	N	Y	N	N	N	N	Not Required - DEV
NAAv2	Y	N	Y	Y	Y	Y	Y	
NACv2	Y	N	Y	Y	Y	Y	Y	
NALv2	Y	N	Y	Y	Y	Y	Y	
NCS	Y	N	Y	N	N	N	N	Not Required - DEV
NCP	Y	N	Y	N	N	N	N	Not Required - DEV
NDM	Y	N	Y	Y	Y	Y	Y	
NDS	Y	N	Y	Y	N	N	N	Not Required - DEV
NIPv2	Y	N	N	N	N	N	N	Not Required - DEV
NPC	Y	N	Y	N	N	N	N	Not Required - DEV
NPCv2	Y	N	Y	N	N	N	N	Not Required - DEV
NPSv2	Y	N	Y	Y	N	N	N	Not Required - DEV
NRP	Y	N	Y	N	N	N	N	Not Required - DEV
NSS	Y	N	Y	Y	N	N	N	Not Required - DEV
NTS	Y	N	N	N	N	N	N	Not Required - DEV
OVM	Y	N	Y	Y	Y	Y	Y	
OVS	Y	N	Y	Y	Y	Y	Y	
OVT	N	N	Y	N	N	N	N	Not Required - DEV
OWS	Y	N	Y	Y	Y	Y	Y	
PAN	Y	N	N	N	Y	Y	Y	Shared
PLG	Y	N	Y	Y	Y	Y	Y	
PRG	N	N	Y	N	Y	Y	Y	Decommissioned
RAW	Y	Y	N	N	N	N	N	Not Required - RDT
RBW	Y	Y	N	N	N	N	N	Not Required - RDT
RBAv2	Y	Y	N	N	N	N	N	Not Required - RDT
RDM	Y	N	Y	Y	Y	Y	Y	
RGEv2	Y	Y	N	N	N	N	N	Not Required - RDT
RGIv2	Y	Y	N	N	Y	Y	Y	
RGW	Y	Y	N	N	Y	Y	Y	
RHBv2	Y	Y	N	N	N	N	N	Not Required - RDT
RL1v2	Y	Y	N	N	Y	Y	Y	
RL2v2	Y	Y	N	N	N	N	N	Not Required - RDT
RL3v2	Y	Y	N	N	N	N	N	Not Required - RDT
RL4v2	Y	Y	N	N	N	N	N	Not Required - RDT
ROW	Y	Y	N	N	N	N	N	Not Required - RDT
RSHv2	Y	Y	N	N	Y	Y	Y	
RTWv2	Y	Y	N	N	N	N	N	Not Required - RDT
RXSv2	Y	Y	N	N	N	N	N	Not Required - RDT
SPD	Y	N	Y	Y	Y	Y	Y	
SPN	Y	N	N	N	Y	Y	Y	Spreadsheet
SPNv3	Y	N	Y	N	N	N	N	Infrastructure
SSCv2	Y	N	Y	Y	Y	Y	Y	
SSN	Y	N	Y	Y	Y	Y	Y	
SSNv2	Y	N	Y	Y	N	N	N	Not Required - DEV
SRG	N	N	Y	N	Y	Y	Y	
SSW	N	N	Y	N	Y	Y	Y	
SUB	Y	N	Y	Y	N	N	N	Not Required - DEV
SVT	Y	N	N	N	N	N	N	Appliance
SYSv2	Y	N	Y	Y	Y	Y	Y	
SYSv3	Y	N	Y	Y	N	N	N	Not Required - DEV
TEM	Y	N	Y	Y	Y	Y	Y	
TEMv2	Y	N	Y	Y	N	N	N	Not Required - DEV
TWSv2	Y	N	Y	Y	Y	Y	Y	
VNSv2	Y	N	Y	N	N	N	N	Not Required - DEV
XCS	N	N	Y	Y	Y	Y	Y	Emulator
XCSv2	N	N	Y	Y	N	N	N	Emulator
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Appendix D – Master Recommendations List

We set out below the list of Recommendations, the majority of which have been the topic of conversations between POL and Fujitsu over the years and during recent meetings. This Report presents an opportunity to collate all of the action items into this single list so that POL and Fujitsu can work jointly to improve the Testing & QA capabilities. Recommendations should be prioritised and the most relevant ones actioned as promptly as possible.

Ref	Recommendation	Additional Notes
1	Review options to ensure there is always a test environment representative of the LIVE environment	• As described in section 4.4 above, there are times when there is no single environment which is at the LIVE version of code / REFDATA. This poses a risk of issues being found in LIVE with no guaranteed Test rig available to retest/verify the issue. Although this situation rarely exists for more than 2 weeks, consideration is needed to build/support a dedicated replica of the LIVE environment.
2	Review options to keep the SV&I environment "in step" with LST/RDT even when monthly security updates/maintenance releases/Hot Fixes are being deployed	• As described in the SV&I environment section above, the SV&I environment is not "in step" with LST/RDT as monthly security updates/maintenance releases/Hot Fixes do not get deployed until ~1 month after they have been signed off by LST. • Increase the rig capability so that all change can be managed through the full SDLC e.g. additional BALs, clustered databases, full Estate Management capability. • Plan for all change to go through the full SDLC.
3	Review options to extend SV&I support hours – perhaps to 24/7	• SV&I's ability to replicate LIVE is decreased as there is no out of hours/weekend support. TWS schedules are not run at the weekend and the rig is effectively shut down. • The LST environment currently has a fully functioning TWS schedule and is supported 24/7. • SV&I would be an addition to this.
4	Review options to provide counters/peripherals within the CIT environment	• Early testing of Counter changes in the CIT environment are restricted because physical Counters/peripherals are not available to the GDC India development team. • Implement a CIT UK team where this capability could be established. • Implement full testing in the SV&I environment.
5	Review and agree options to enhance the scope of the CIT solution capability	• Early testing of change is not always possible in the CIT environment because it lacks solution capability e.g. no TWS schedules run, environment is not "managed", not all end points are simulated. • Fund a review to determine what this better capability looks like. • Implement full testing in the SV&I environment.
6	Review viability and value in creating a test environment able to truly simulate LIVE levels of activity	• If any non-functional testing is required, there is no dedicated environment scaled to a LIVE level. • Build/support a dedicated replica of the non-functional test environment. • Scale up SV&I on a change by change basis.
7	Review SV&I to identify options for less conflict of use and hence higher throughput of testing	• This is a topic of regular discussion between POL and Fujitsu. • There are multiple user groups using the SV&I environment and we have seen instances of project timescales being impacted due to clashes with maintenance schedules (downtime). • Build an environment reflective of the needs of the current non-Fujitsu user groups.
8	Expand scope of Counter regression testing to always include Atos	• Some sets of functionality are not regression tested e.g. APADC, APOP due to dependency on Atos. • Atos is not regularly involved in the Counter regression test phase. • POL to engage with Atos for every release to confirm whether there is scope for additional effort.
9	Review the approach to impacting/testing to include how defects are managed in terms	• A specific defect retesting cycle is not always included when planning testing in SV&I. This is done partly to improve the view of the downtime required to maximise throughput through the environment.

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	of time and effort	• An ad hoc approach to delivering fixes is used. This impacts the ability to plan remaining test tasks.
10	Update the roles and responsibilities of all involved parties	• Clarify the roles and responsibilities of POL third parties who directly impact Fujitsu – e.g. Atos/Computacenter. • Knowledge sharing from Atos/Computacenter/Verizon/POL Model Office.
11	Review the number/variety of Branch configurations (including Global Office/CTO and the different languages) to determine what the availability requirements are	• The number/variety of Branch configurations (including Global Office/CTO and the different languages) are not available on a consistent basis. • Fujitsu and POL to engage with POL and POL third parties - Computacenter/Verizon.
12	Investigate options with GlobalPayments UK to supply "Test" files for Fujitsu processing	• GlobalPayments UK do not supply "Test" files for Fujitsu processing. This became a caveat for 20.92 and at present will not change for 20.94 • POL should engage GlobalPayments so that this gap is filled.
13	Enhance Fujitsu visibility of Atos REFDATA testing and output results	• There are potentially changes to Counter functionality made via the BAU REFDATA process (by Atos) which Fujitsu do not have sight of which affect the maintenance of existing tests. (An example would be APADC scripts).
14	Review and improve interaction with Model Office	• Review interaction with Model Office. Although Model Office / LIVE Proving is a POL responsibility, this activity has "dwindled" to the point of being invisible as part of a delivery process. • Task(s) added to plans for engaging Model Office through the "journey" and sharing information about the changes to determine whether a LIVE proving task would add value.
15	Review the OBC19 process and the delivery of route definitions and their other configurable items to ensure appropriate test coverage	• OBC19 does not currently apply for PODG route definitions going into test environments, leaving the potential for gaps in test capability. • It is already agreed that any PODG route associated with a change will form part of projects going forward and NOT rely on the OBC19 process.
16	Clarify the "boundary" to Fujitsu testing specifically relating to the Counter estate hardware (including peripherals)	• Clarify the "boundary" to Fujitsu testing. The SV&I / LST environments use a Counter estate made up of Computacenter Counter hardware (including peripherals) and have tested with this setup for many years. However, that has built an expectation that Fujitsu have the latest versions of hardware and that that is what is tested which leads to confusion. • A formal RACI should be created to determine the scope of testing for Fujitsu highlighting potential gaps.
17	Conclude the Service Improvement activity to produce a full list of the transactions Fujitsu is able to test	• Work is already underway and being tracked in weekly meetings.
18	POL to input to the list with the applicable findings from the audit they commissioned with EDGE at the start of 2019	• Duplication is likely but maintaining a consolidated list would be preferred.

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