

Automated Build & Testing; A case study @ Xeikon

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Automated Build & Testing; A case study @ Xeikon

■ Agenda

- **Introduction**
 - Xeikon
 - DFE
 - **Technology & Lifecycle**
- Xeikon Build & Test Process
 - Overview
- Xeikon Build Environment (XBE)
 - Intro & How
 - What did we learn
- Xeikon Automated Testing or Xeikon Doyle
 - Intro & How
 - What did we learn
- XBENET (web portal)
- What's Next.

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Intro; Xeikon Key Product Features

- **Web-fed Digital Colour Presses**
 - One Pass Duplex™
 - High Productivity
 - High Print Quality and stability
 - Flexibility in substrates and sizes
 - 130 ppm (duplex colour mode)
- **Digital Front-Ends**
 - Integrated Graphic Arts Workflow
 - Robust & Powerful RIP
 - Variable Data (PPML)
- **Toner and Developers**
 - Proprietary formulations, delivering very high image quality.



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Intro; Xeikon at a Glance

- **Organisation:**
 - Headquarters in Lier, Belgium
 - Toner Manufacturing Plant in Heultje, Belgium
 - Sales and Service Subsidiaries in US, Japan, and in European Countries
 - 250 people worldwide, 1/3rd in Research and Development
 - Part of the Graphic Systems Group of Punch (Ca. 2800 people worldwide, in 22 plants over 8 countries & ca. € 170 Million in 2002)
- **Xeikon in the field:**
 - Strong customer base with ca. 1500 installations, producing + 200.000 A4 sheets per month/average, including very high volume production sites
- **Xeikon Turnover: ca. €45 Million in 2003 (est.)**



MEMBER OF THE
PUNCH
GROUP

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Product; DFE

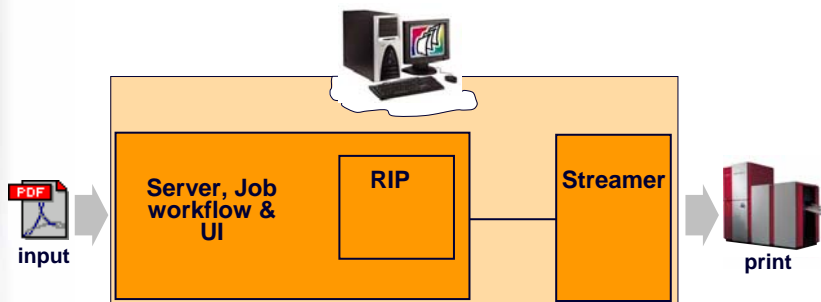
- Digital Front End (DFE) in his most plain form
 - in : PostScript, PDF, TIFF, JPEG, ...
 - out : Real-time bitmap data over a fiber channel to the digital press [8 (color planes) x 44 Mega pixels (4 bit) per sec.]



- *Nightly Build & test has been enabled on DFE*

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Product; Definition Digital Front-End (DFE)



- | | | |
|--|---|---|
| <ul style="list-style-type: none"> ■ Job workflow <ul style="list-style-type: none"> ■ Preflight, Imposition, Preview, Render, ...) ■ Job & System mngmnt. ■ Archive/backup ■ History mngmnt ■ Print mngmnt | <ul style="list-style-type: none"> ■ PS, PDF, PPML, IPDS ... interpretation ■ Render options ■ Color mngmnt. ■ color separation ■ compression to RTP | <ul style="list-style-type: none"> ■ Ready to Print (RTP) data storage ■ merging objects & pages ■ Print options ■ impositioning, step&repeat |
|--|---|---|

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Product; IntelliStream 3

The Most Advanced Front end for Production Digital Printing



Zeikon is the 1st to introduce
PPML v2.1
Zeikon supports both
PPML & PPML/VDX



Components Features

Hardware: Dual Intel Pentium 4 (2,8Ghz) with Windows 2000 based platform

Different input channels & protocols

Open to all formats: PostScript, PDF, EPS, TIFF, JPEG, PPML, PPML/VDX, Zip, ...

Pre-flight

Impress imposition

Adobe PostScript RIP & Load balancing

Reusability of pre-ripped objects

Printing with extensions for last-minute adjustments on a dedicated streamer board.

Administration and Accounting tools

Archiving & Restore of jobs and Ready to Print IntelliPacs

...

Target high-speed engine's:

All Zeikon DCP presses & Nipson 8000 Black&White press



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Product; Technology

- Microsoft Windows 2000
- Languages & IDE
 - C++ (Visual Studio)
 - Java (JBuilder)
 - C sharp (Visual Studio)
 - legacy C (Visual Studio)
- Merant PVCS Version management
- Merant PVCS Tracker Change Management
- Zeikon XBE (Zeikon Build Environment)
- Zeikon Doyle (Zeikon Test Environment)
- Current code base exist of about 8.000 folders, 50.000 files and takes approx. 8 hours to build everything from scratch.

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Product; Prod. Lifecycle



Figure 1. V-model of software testing

■ Specifications process

- Product Requirements, Product-, Functional and Design Specifications (inc. UML), Reviews, etc ...

■ Product process

- Every day a Nightly Build & Test of latest baseline has been carried out at the RnD lab.
- At regular periods in time an internal milestone release is made and send to QA or even Beta (latest phase) for verification and qualification.
- Finally, release for QA & production

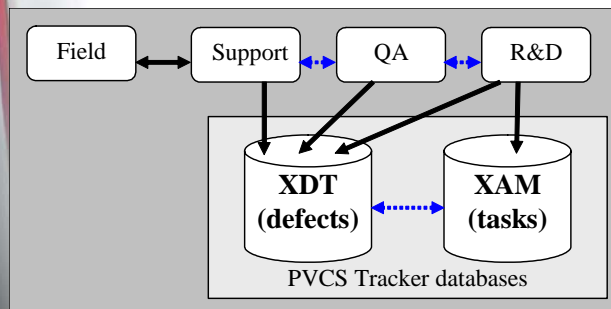
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Product; Product Lifecycle

■ Change Management

- XDT (Xeikon Defect Tracking)
 - Input from R&D, QA, Support and Field
 - Release notes are currently extracted out the database per milestone iteration.
- XAM (Xeikon Assignment Management)



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■ Introduction

- Xeikon
- DFE
- Technology & Lifecycle

■ **Xeikon Build & Test Process**

■ Overview

■ Xeikon Build Environment (XBE)

- Intro & How
- What did we learn

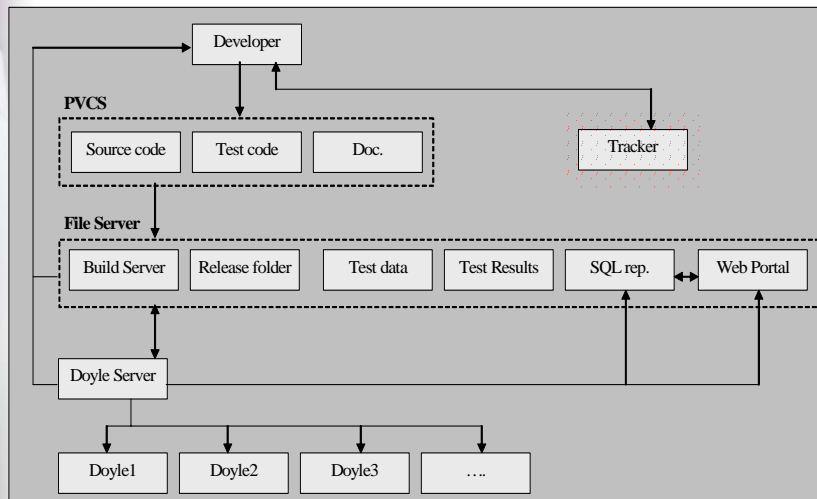
■ Xeikon Automated Testing or Xeikon Doyle

- Intro & How
- What did we learn

■ XBENET (web portal)

■ What's Next.

Overview



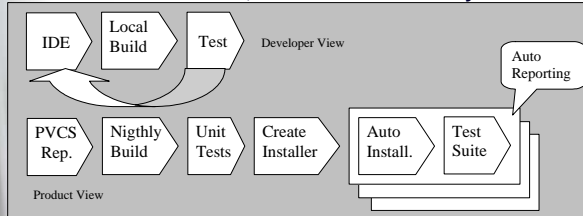
Overview; What ?

■ R&D Development Process

- Version Control (PVCS)
- Build via XBE (Korn scripts)
- Unit testing

- Manual & Nightly Build + installer package creation + CD-Rom creation
- Regression unit testing
- Automatic Installation
- Build Verification Test (BVT or called Doyle) on multiple systems & configurations
- Reporting via email or portal
- After R&D Build Verification Test, release to QA (Milestone's or Final)

■ QA Verification, Qualification & finally a Product Verification Test (PVT)



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Overview; What ?

■ Build

- Local Build
- Master Release

■ Testing

- Functional system tests (Acceptance)
 - off-line
 - on-line
 - Variations
 - Different configuration's
 - Different certified platforms / OS

- Unit tests

■ Reporting

- Mail
- XBENET (intranet web portal)

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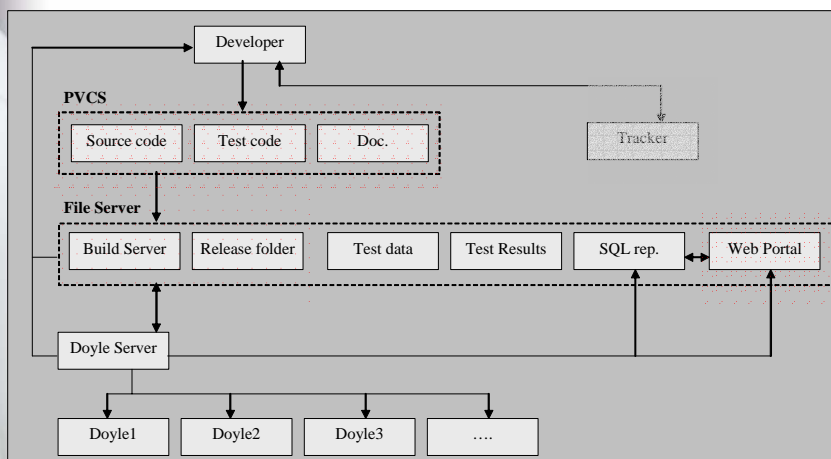
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Overview



Build; Origin

- **Origin**
 - Need for one corporate version control & build environment
 - Multiple systems were available
 - MS source Safe
 - Perforce
 - Rational clear case
 - File based system
 - Increase Freq. of End to End builds, no manual steps involved
 - Developer Focus → Product Focus
 - Solo ad-hoc solutions (difficult to manage, too many levels, cyclic dependencies,...)
 - No synchronization between groups
 - Only developer knew how to build
 - Strict project structure
 - Reproducible
 - Usable with a single command (standard)

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Build; Origin (cont.)

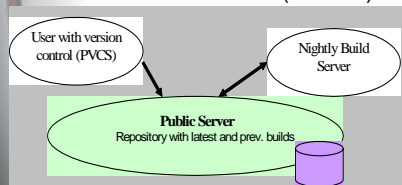
- **Origin (Cont.)**
 - Compliant with IDE environment.
 - Repeatability (CMM level 2 of configuration Management)
 - No coarse monolithic approaches
 - User independent builds that allow prev. rebuilds (back in time)
 - All compilers, SDK's, tools needed to build are available on the XBE server.
 - Allow support for multiple baselines (multiple projects can exist besides each other)
 - Uniform Reporting
 - etc ...
- **Result**
 - Finally opted for Merant PVCS with an accompanied build environment (InterSolv), renamed as XBE (Xeikon Build Environment)
 - Best cost / performance ratio compared with other tools.

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Build; Technology

Process

- XBE is based on korn shell scripts (MKS toolkit).
- Command line driven allow easy scripting (cross platform).
- Every XBE component uses a baseline, and so every project refers to released projects by means of “setver” project file, inc build environment.
- Automatic in sync with the main trunk.
- After testing, developers check in their code, users can label their project separately (increased label no.).
- Any label change causes an automatic nightly rebuild and initiates the entire build and test flow.
- Finally an automated installer and CD-ROM package is made.
- The log data is archived with their resp. label and the result is mailed to the subscribers (owners) and exposed on the intranet web portal.



Build, XBE Build Example

setver baseline project file for a e.g. “Hot Folder” component

```

■ #
■ # Cross platform dependent projects.
■ #
■ . xbe_use XBECFG XBECFG 0001 ${XBEIXBECFGXBECFG0001}
■ . xbe_use XBEROOT XBEROOT 0005 ${XBEIXBEROOTXBEROOT0005}
■ . xbe_use COMMON GCL 0029 ${XBEICOMMONGCL0029}

■ #
■ # Win32 specific specific projects
■ #
■ . xbe_euse COMPILERS MSVC 060099 ${XBEICOMPILERSMSVC060099}
■ . xbe_euse IDES MSDEV 060004 ${XBEIIDESMSDEV060004}
■ . xbe_euse TOOLS PVCSVM 0606 ${XBEITOOLSPVCSVM0606}
■ . xbe_euse TOOLS MKSNT 070001 ${XBEITOOLSMKSNT070001}
■ . xbe_euse TOOLS ROBO 0154 ${XBEITOOLSROBO0154}
■ . xbe_euse TOOLS STAMPVER 0140 ${XBEITOOLSSTAMPVER0140}
■ . xbe_euse TOOLS KDOC 0001 ${XBEITOOLSKDOC0001}
  
```

Build; XBE Build Examples

■ Build

■ local

- xbe_login <project> <subprojects>
- xbe_build // builds project based on a baseline
- xbe_label // notifies buildserver to be ready for master build.
- ...

■ Build Server

- Calls every night “xbe_autorelease” of the main deliveries (inc update dependency tree)

Build; XBE Build

```
OK: xbe_autorelease for INSTALLERSDOYLE-INTELLISTREAM on NIGHTLYBUILD (20030923_190044) - Message (Plain Text)
-----
From: XE Administrator@xeikon.com
To: johan.peeters@xeikon.com
Cc:
Subject: OK: xbe_autorelease for INSTALLERSDOYLE-INTELLISTREAM on NIGHTLYBUILD (20030923_190044)

The xbe server file of INSTALLERS-INTELLISTREAM_ISWI is updated and the project is labeled.
The release of version 0445 of INSTALLERS-INTELLISTREAM_ISWI is successful.
Release logfile: \\Xeikon39\udrive\xbe\xbe_autorelease\INSTALLERSDOYLE\INTELLISTREAM\20030923_190044\INSTALLERS_INTELLISTREAM_ISWI_0445_xbe_release.log
Deploy logfile: \\Xeikon39\udrive\xbe\xbe_autorelease\INSTALLERSDOYLE\INTELLISTREAM\20030923_190044\INSTALLERS_INTELLISTREAM_ISWI_0445_DeployLog.txt

The xbe server file of INSTALLERSDOYLE-INTELLISTREAM is updated and the project is labeled.
The release of version 0258 of INSTALLERSDOYLE-INTELLISTREAM is successful.
Release logfile: \\Xeikon39\udrive\xbe\xbe_autorelease\INSTALLERSDOYLE\INTELLISTREAM\20030923_190044\INSTALLERSDOYLE_INTELLISTREAM_0258_xbe_release.log

List of succeeded projects for this autorelease
-----
The release of version 0685 of CLIENT-MEXUSCLIENT succeeded. ( veerle.dieltjens@xeikon.com peter.mertens@xeikon.com )
The release of version 0529 of CLIENT-SERVERCONTROLPANEL succeeded. ( veerle.dieltjens@xeikon.com )
The release of version 0046 of INSTALLERS-CALIBRATOR succeeded. ( Bart.tachelet@xeikon.com carl.vanlsacker@xeikon.com )
The release of version 0232 of INSTALLERS-INTELLISTREAMJOBEDITORMAC succeeded. ( peter.mertens@xeikon.com )
The release of version 0445 of INSTALLERS-INTELLISTREAM_ISWI succeeded. ( peter.mertens@xeikon.com bart.tachelet@xeikon.com johan.peeters@xeikon.com peter.somers@xeikon.com carl.vanlsacker@xeikon.com veerle.dieltjens@xeikon.com renaat.vanhende@xeikon.com pjeert.noppen@xeikon.com )
The release of version 0294 of INSTALLERS-JOBEDITORPC succeeded. ( peter.mertens@xeikon.com carl.vanlsacker@xeikon.com )
The release of version 0358 of INSTALLERSDOYLE-INTELLISTREAM succeeded. ( peter.somers@xeikon.com johan.peeters@xeikon.com peter.mertens@xeikon.com carl.vanlsacker@xeikon.com marc.delhouze@xeikon.com bart.wynants@xeikon.com marc.lievens@xeikon.com pjeert.noppen@xeikon.com romy.vanderquack@xeikon.com renaat.vanhende@xeikon.com eik.laurijssen@xeikon.com johan.ville@xeikon.com )
The release of version 0079 of TESTING-DOYDO succeeded. ( johan.ville@xeikon.com )
The release of version 0087 of TESTING-DOYTESTCASECPP succeeded. ( johan.ville@xeikon.com )
```

Build; Benefits

■ Benefits

- Single Source Point for every one, inc build resources.
 - Automated Build Scripts
 - Nightly build while every one is at home.
 - Build should always be successful.
 - Rapid turn-around, faster to pinpoint who breaks the build.
 - Latest deliverable immediately available
 - Enforce a strict framework
 - Automated generated & up-to-date documentation from the source code.
 - Automated installer & CD-ROM package
 - Any release build in the past can be rebuild.
- → *Was well worth the effort and doesn't take much effort to keep it up and running!*

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Build; Shortcomings

■ Shortcomings

- Less User Friendly (command line driven)
- Multiple branches are unfortunately still difficult to manage.
- Only one single view on the base line (PVCS – XBE). No multiple views besides each other.

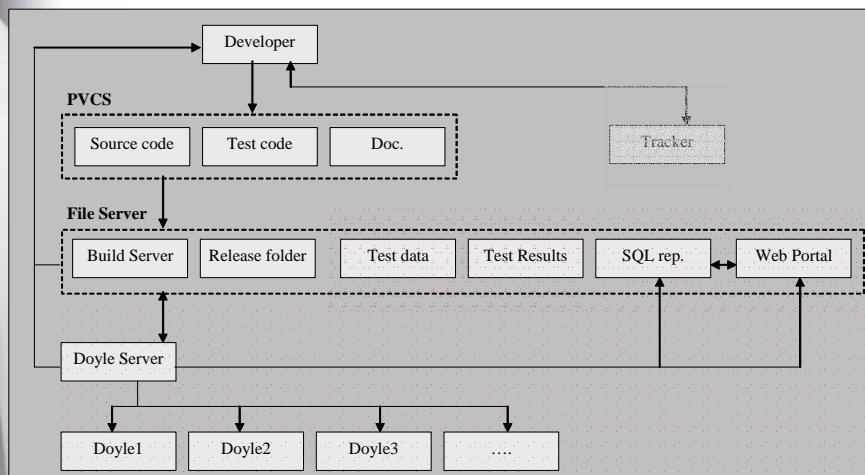
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Overview



Testing; Origin

■ Origin

- Time to release a deliverable to QA took much too long.
- Verification was much too labor intensive and much of the tests are boring repeatable.
- Increase the frequency of the end to end builds & test.
- Less depended on QA team and provide the QA team an useful and predictable release.
- Extend the existing automatic build process with an automatic test process.
- Developer and Tester independent, anybody can carry out the test suites in a predictable way.

Testing; Origin

■ Origin (cont.)

- Automatic installation
- Test multiple configurations, off-line & on-line systems, different platforms & OS's, ...
- Failures can be reproduced much easier.
- Automatic Reporting,
- ...

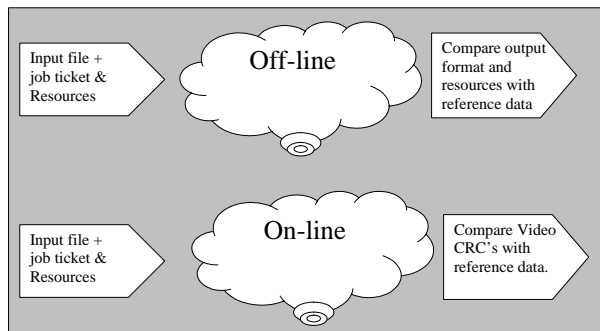
■ Result

- Xeikon "Doyle" Framework

Testing; Doyle

■ Xeikon Doyle Tests

■ used for Acceptance Testing



■ used for Unit Testing

Testing; Doyle Features

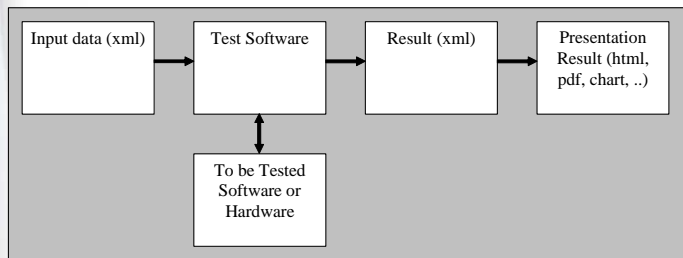


- R&D "Doyle" Testing framework
 - Extend Automatic build with a build verification phase (part of the dependency tree).
 - Unattended installer technology.
 - Support for multiple Test suites that are XML based.
 - Testing
 - End to End testing (Acceptance or Functional Testing)
 - Unit Tests
 - Compare with verification Data
 - Built-in tests.
 - Value's
 - Master reference data (CRC, validated processed jobs, timestamps, ...)
 - View Bitmap Difference for Quick investigation
 - Results are stored on the server and SQL Server DBMS.
 - Reporting
 - Mail
 - WebPortal (pdf via Cognos Impromptu Web Reports)
 - Allow an easy update of the master reference data.
 - Stand-alone Test Tool (Doydo)
 - ...
- QA also uses the same framework for regression tests, can easily created new test suites without programming
- Production (Product verification test & Doyle production regression test)

Testing; Doyle

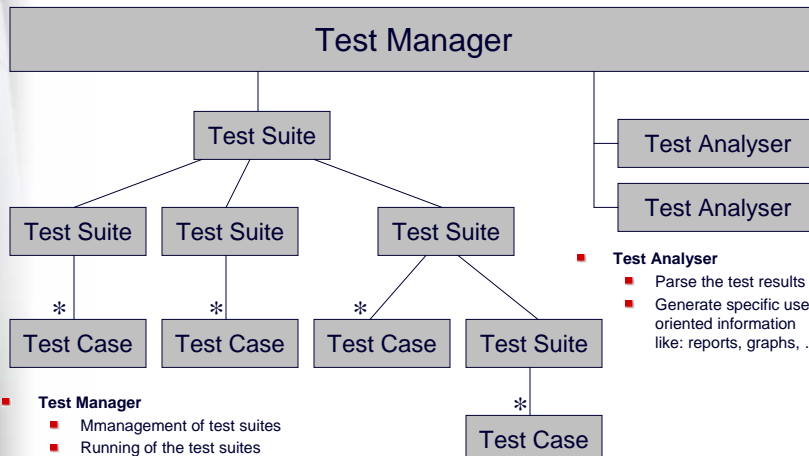
■ Test Framework Overview

- Input: *TestCase.dhtml*



- Output: *Testcase.xml*
- Presentation: *Testcase.html (via XSLT) or Enhanced web report*

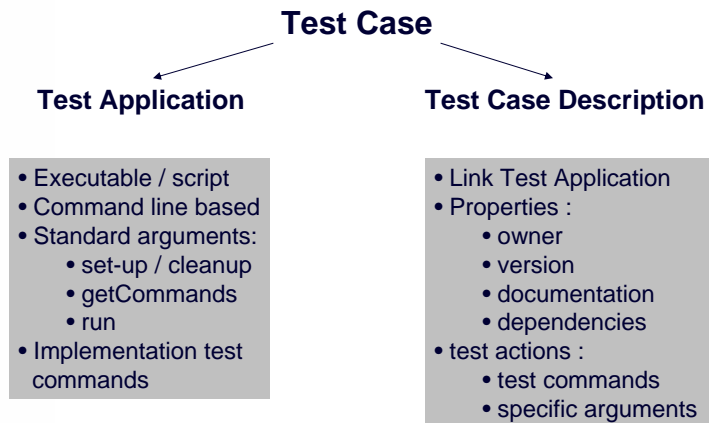
Testing; Doyle Test Manager & Test Analyser



- **Test Manager**
 - Mmanagement of test suites
 - Running of the test suites
 - Collects test results
 - Delegate the test results to the test analysers

- **Test Analyser**
 - Parse the test results
 - Generate specific user-oriented information like: reports, graphs, ...

Testing; Test case : code versus data



Testing; Test Case XML description

(IntelliStream\0374\Doyle\TestCaseBenchmark.dtml)

```

<TestCase name="IntelliStream Benchmark">
  <TestApplication location="..\Build\vc60nt\TestCase.exe" />
  <TestDescription owner="pso" version="1.00.1" description="Benchmark test in offline mode">
    <TestComponent projectgroup="InstallersDoyle" project="Intellistream" />
    <TestComponent projectgroup="Installers" project="Intellistream_ISWI" />
    ...
  </TestDescription>
  <TestActions>
    <TestAction name="Setup">
      <TestCommand command="cmdSetup">
        <Arg name="mode" value="offline" type="string" />
      </TestCommand>
    </TestAction>
    <TestAction name="FruitIncludingImages.ps">
      <TestCommand command="cmdJob">
        <Arg name="1Data" value="U:\Doyle\data\Basic\FruitIncludingImages.ps" type="string" />
        <Arg name="1Reference" value="U:\Doyle\Reference\InstallersDoyle\Intellistream\Testcase\Basic\FruitIncludingImages.ps\0008" type="string" />
        <Arg name="1SearchName" value="FruitIncludingImages.ps" type="string" />
        <Arg name="1NbrOfSheets" value="1" type="string" />
        <Arg name="1HotFolderName" value="DoyleHF" type="string" />
        <Arg name="1MaxProcessingTime" type="int" value="200" />
        <Arg name="1ReferenceFilter" value="data files\*.cbm;data files\*.jpg" type="string" />
      </TestCommand>
    </TestAction>
    <TestAction name="Cleanup">
      <TestCommand command="cmdCleanup" />
    </TestAction>
  </TestActions>
</TestCase>

```

Testing; Test Result XML description

(IntelliStream\0374\Doyle\TestCaseBenchmark\XW8000\TestCaseBenchmark.xml)

```
<TestResult name="IntelliStream Benchmark" ref="U:/xbe/...0374/doyle/TestCaseBenchmark.dtml" comments="" machine="doyle-is-on-1">
  <TestResult name="Setup" ref="U:/xbe/...0374/doyle/TestCaseBenchmark.dtml" comments="" machine="doyle-is-on-1">
    <TestCommand command="cmdSetup">
      <Arg name="command" type="" value="" />
      <Arg name="mode" type="string" value="offline" />
      ....
    </TestCommand>
    <Properties startTime="2003-10-13 10:45:03" result="PASS" elapsed="00:00:58.31" />
  </TestResult>

  <TestResult name="FruitIncludingImages.ps" ref="U:/xbe/...0374/doyle/TestCaseBenchmark.dtml" comments="" machine="doyle-is-on-1">
    <TestCommand command="cmdJob">
      <Arg name="1Colors" type="" value="" />
      <Arg name="1Data" type="string" value="U:\Doyle\data\Basic\FruitIncludingImages.ps" />
      <Arg name="1HotFolderName" type="string" value="DoyleHF" />
      ....
      <Arg name="1Reference" type="string" value="U:\Doyle\Reference\Installers\Doyle\IntelliStream\TestCase\Basic\FruitIncludingImages.ps\0008" />
      <Arg name="1ReferenceFilter" type="string" value="data files\*.cbm;data files\*.jpg" />
      <Arg name="1SearchName" type="string" value="FruitIncludingImages.ps" />
      <Arg name="2Data" type="" value="" />
    </TestCommand>
    <Properties startTime="2003-10-13 10:46:02" result="PASS" elapsed="00:01:33.64" />
    <Differences output="\DOYLE-IS-ON-1\Store\JobCollections\Moved\TestCaseBenchmark\doyle-is-on-1_000001"
      reference="U:\Doyle\Reference\...FruitIncludingImages.ps\0008" filter="data files\*.cbm;data files\*.jpg" outputexists="1"
      referenceexists="1" />
  </TestResult>

  ...
</TestResult>
```

Testing; Doyle Test case Report

Doyle result of INSTALLERDOYLE INTELLISTREAM 0372 - Message (HTML)

The HTML message contains script, which Outlook cannot display. This may affect how the message appears.

From: JBE_Administrator@veikon.com
 To: peter.somers@veikon.com; johan.peeters@veikon.com; peter.mertens@veikon.com; carl.vanelsland@veikon.com; marc.delhoute@veikon.com; bart.wynants@veikon.com; marc.levenus@veikon.com; geert.noppen@veikon.com; romy.vandergucht@veikon.com; renaud.vanhende@veikon.com; erik.laursen@veikon.com; johan.ville@veikon.com
 Sent: wo 10/2003 12:12
 Subject: Doyle result of INSTALLERDOYLE INTELLISTREAM 0372

IntelliStream Benchmark

Test case U:/xbe/releases/n/installerdoyle/intelliStream/0372/doyle/TestCaseBenchmark.dtml executed at doyle-is-on-1, 2003-10-08

Operator:
 ControlNumber:
 Type:

Components

Project Group	Project	Version
Installers\Doyle	IntelliStream	0372
Installers	IntelliStream_15W1	0454

TestResult Summary

Type	PASS	FAIL	UNRESOLVED	Total
Number	8	0	0	8
Number %	100	0	0	100
Time				
Time %				

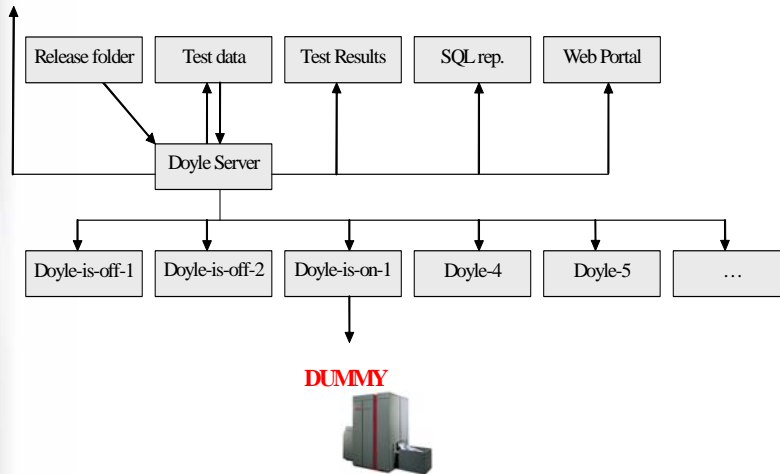
TestResult Details

ID	Name	Status	Time	Elapsed	Comments
1	Setup	PASS	21:59:02	00:00:58.31	
2	FruitIncludingImages.ps	PASS	21:59:57	00:01:32.68	
3	ThinkingInYourOwnWay.pdf	PASS	22:01:34	00:02:06.35	
4	SPML - OldMobile	PASS	22:04:28	00:01:42.60	
5	Q - PE_Imag_Sanitar - Australia 8 pg	PASS	22:06:22	00:01:28.92	
6	Q - PDF_Imag_Grey - NO-50deutscheSatzung-272-373	PASS	22:08:01	00:01:20.92	
7	Q - PE_Imag_VDF_Aaym - 14800_Kunden_C_3k	PASS	22:09:33	00:04:59.38	
8	Cleanup	PASS	22:11:57	00:00:29.31	

Log file: doyle0215312.log

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Testing; Doyle Test Configuration



Testing; Test suites

- **Test Suites Type's and behavior**
 - XML based.
 - Type's
 - Acceptance
 - Basic
 - Configuration Specific
 - Benchmark Test Suite (performance)
 - Customer job verifications (productivity)
 - Unit Tests
 - Per Component 1, 2
 - Behavior
 - Plain
 - Random
 - Stress (repeat for x hours)



Testing; Web Portal

Default - Microsoft Internet Explorer

Address: http://xbenet/

XBENET Home Reports Links Search
Documents Releases Test Data Software Libraries 3rd Party Software

Reports

- DTR Project Version Result Prompt : Detailed testreport, prompts for project, version(s) and resulttype(s).
- IntelliStream Results Overview : IntelliStream nightly test result overview with drill through capabilities (grey background).
- IntelliStream Benchmark Results : IntelliStream benchmark test results with drill through capabilities.
- VersionTestactionTimeCompare : Testactiontime compare report, prompts for project, platform and 2 versions.
- Advanced... : Takes you to your Cognos Upfront.td>

The icon in the lowerleft corner of each report allows you to view (and save) the report in excel format

Links:

[DTR Project Result Prompt](#) → Gaudi → Codec → v03

[IntelliStream Results Overview](#)

[IntelliStream Benchmark Results](#)

[VersionTestActionTimeCompare](#)

Testing: Benefits

■ Benefits

- Automated Build Verification Test
- Nightly test while every one is at home.
- Rapid turn-around time, pinpoint much faster the origin of the problem.
- Strict framework
- Test systems are used much more effectively
- Easy reproducibility
- Release process to QA is much more reliable.
- Has eliminated the need to have an R&D integration team
- Benchmarking comparison between different versions
- Used by production with same reference.
- → It was also achievable and well worth the effort but takes more effort to keep it up and running!

Testing Shortcomings

■ Shortcomings

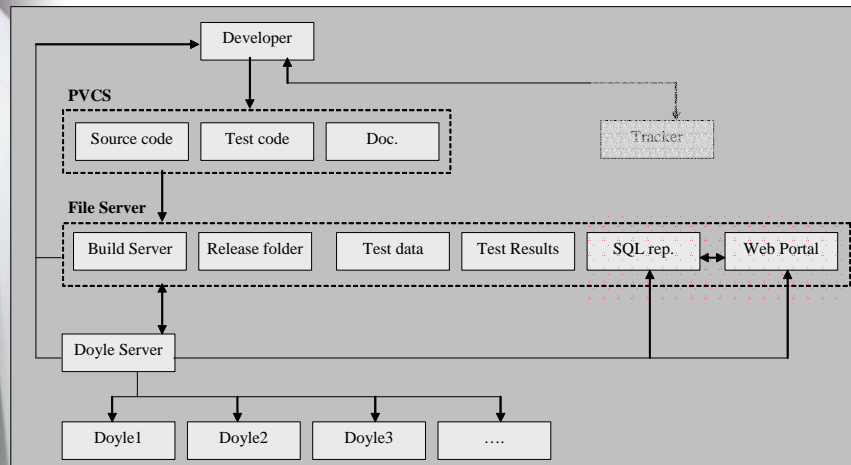
- Updating the reference data is quite easy, it still takes some time and changes happen over time.
 - Unit testing is still poor due to huge amount of legacy.
 - Still no full coverage.
 - No GUI testing.
- → *Tests don't prove the absence of bugs. However perfection isn't the only point at which you get paid back for a good (Build verification Test) BVT.*

Automated Build & Testing; A case study @ Xeikon

■ Agenda

- Introduction
 - Xeikon
 - DFE
 - Technology & Lifecycle
- Xeikon Build & Test Process
 - Overview
- Xeikon Build Environment (XBE)
 - Intro & How
 - What did we learn
- Xeikon Automated Testing or Xeikon Doyle
 - Intro & How
 - What did we learn
- **XBENET (web portal)**
- What's Next.

Overview



XBENET

■ XBENET (intranet web portal)

- Documentation repository
 - Consult requirement, specification, release notes, etc ...
 - Consult generated documentation
- Reports repository
 - Defect Tracker
 - Assignment Tracker
 - Build
 - Doyle
- Misc.
-

XBENET

Name	Modified	Size	Owner
PS_intellStream_3_60_V2.doc	8/07/2003 8:56:50	2886144	ipe
Notes	25/08/2003 16:01:46		
PS_intellStream_3_60_V1.doc	31/10/2002 17:50:28	101376	ipe
RN_DefectFixes-153.60.01.R326.xls	26/11/2002 16:34:20	29160	ipe
RN_DefectFixes-153.60.02.R277.xls	1/01/2003 15:47:10	25960	ipe
RN_DefectFixes-153.60.04.R307.xls	25/02/2003 15:09:00	31744	ipe
RN_DefectFixes-153.60.05.R320.xls	25/02/2003 15:00:32	26112	ipe
RN_DefectFixes-153.60.06.R326.xls	26/02/2003 13:33:38	18432	ipe
RN_DefectFixes-153.60.07.R332.xls	7/03/2003 12:43:10	21504	ipe
RN_DefectFixes-153.60.08.R340.xls	14/03/2003 17:38:14	18432	ipe
RN_DefectFixes-153.60.09.R348.xls	21/03/2003 12:19:56	22016	ipe
RN_DefectFixes-153.60.10.R353.xls	31/03/2003 8:41:22	29936	ipe
RN_DefectFixes-153.60.11.R368.xls	11/04/2003 10:55:06	47616	ipe
RN_DefectFixes-153.60.SummaryMetrics.xls	30/07/2003 15:55:58	24576	ipe
RN_DefectFixes-153.60.12.R379-R3031.xls	28/04/2003 9:25:36	10944	ipe
RN_DefectFixes-153.60.12.R379-R3033.xls	14/05/2003 11:22:40	15872	ipe
RN_DefectOutstanding-153.60.12.R379-R3033.xls	16/05/2003 10:14:06	46592	ipe
RN_intellStream_3_60_Errata.pdf	16/05/2003 10:37:08	121179	ipe
TD_intellStream_3_60_V1.doc	16/05/2003 17:28:32	2756608	ipe
TD_intellStream_3_60_RestoreCD-Specificati...	15/05/2003 15:43:40	2641408	ipe
TD_intellStream_3_60_Errata_Addendum_V1.rtf	16/05/2003 10:35:36	1149519	ipe
TD_intellStream_3_60_HowToCreateDoyleTest...	7/07/2003 11:42:12	111616	ipe
TD_intellStream_3_60_JPM-Plugin-general-us...	10/04/2003 11:45:14	1841664	ipe
TD_intellStream_3_60_JPM-Plugin-interface-s...	16/05/2003 13:31:24	49664	bw
TD_intellStream_3_60_JPM-Producer-Specifi...	01/05/2003 15:20:48	455680	bw
TD_intellStream_3_60_RestoreCD-Specificati...	10/04/2003 14:54:05	415332	ipe
TD_intellStream_3_60_RestoreCD-Specificati...	15/05/2003 15:43:48	2641408	ipe
TD_NpisonProblemListQA-IntellStream-V1.doc	26/08/2003 12:26:46	171000	ipe

What's next

■ Our next steps

- Increase unit tests efforts
- Increase coverage of both unit and acceptance tests.
- Introduce Doyle test for field testing
- Integration with our defect tracking and assignments software application.
 - Follow up automatic & accurate defect and assignment per initiated build.
 - Automatic defect generation.
- Improve reporting & web portal reports.
- Improve branching strategy
- ...

Links

- **Useful Links:**

- See also Martin Fowler Articles about Continuous Integration:
<http://martinfowler.com/articles/continuousIntegration.html>

Q&A

- www.xeikon.com

