

# 虛擬測試，精準上市 - Rational Test Workbench 讓測試非難事

陳家豪 Max Chen  
台灣 IBM 軟體事業處  
Rational 軟體技術顧問

**2014 IBM 開發者大會**  
**開發速戰，行動速決!**



# 議程

- 我們面臨的品質管理挑戰
- **IBM 自動化測試與服務虛擬化解決方案**
- 持續測試的基礎：服務虛擬化
- 客戶實際案例參考
- 總結

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# IBM DevOps : 通過軟體驅動創新的產品和軟體持續交付方法

企業通過持續的軟體交付能力，抓住市場機會，縮短獲得客戶回饋的時間。

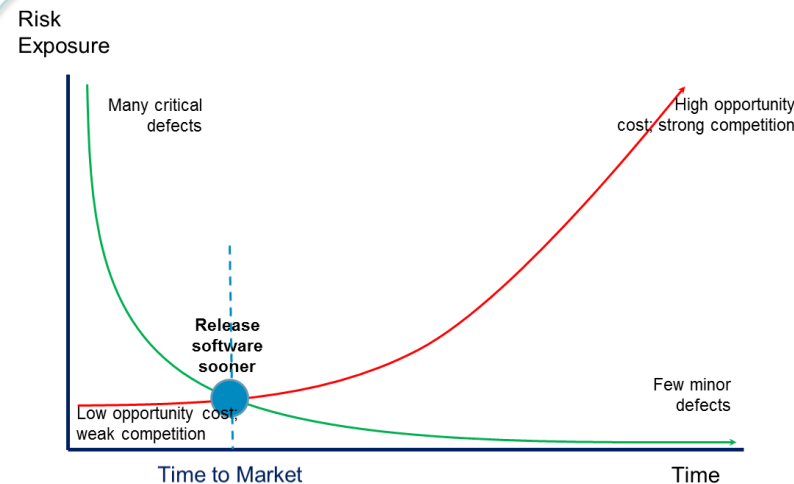
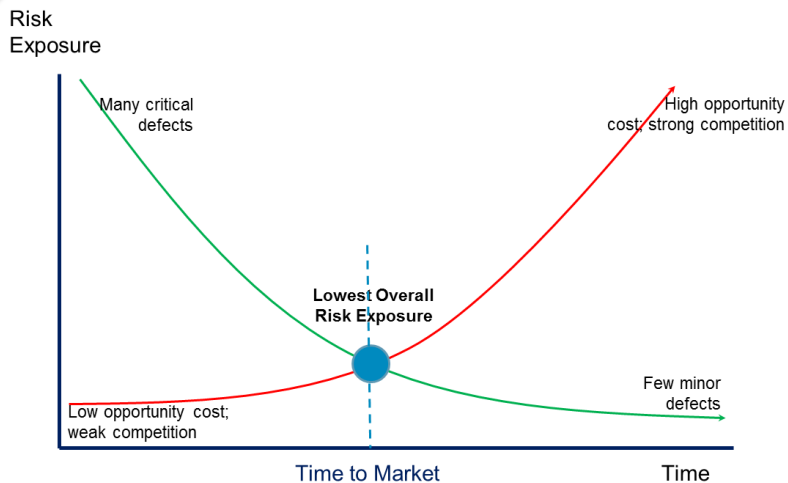
加快軟體的交付  
更快地實現價值

在速度、成本、品質和風險中  
取得平衡  
提高創新能力

縮短回饋客戶  
的時間  
改善客戶體驗



# 業主的期望：更好 – 更便宜 – 更快



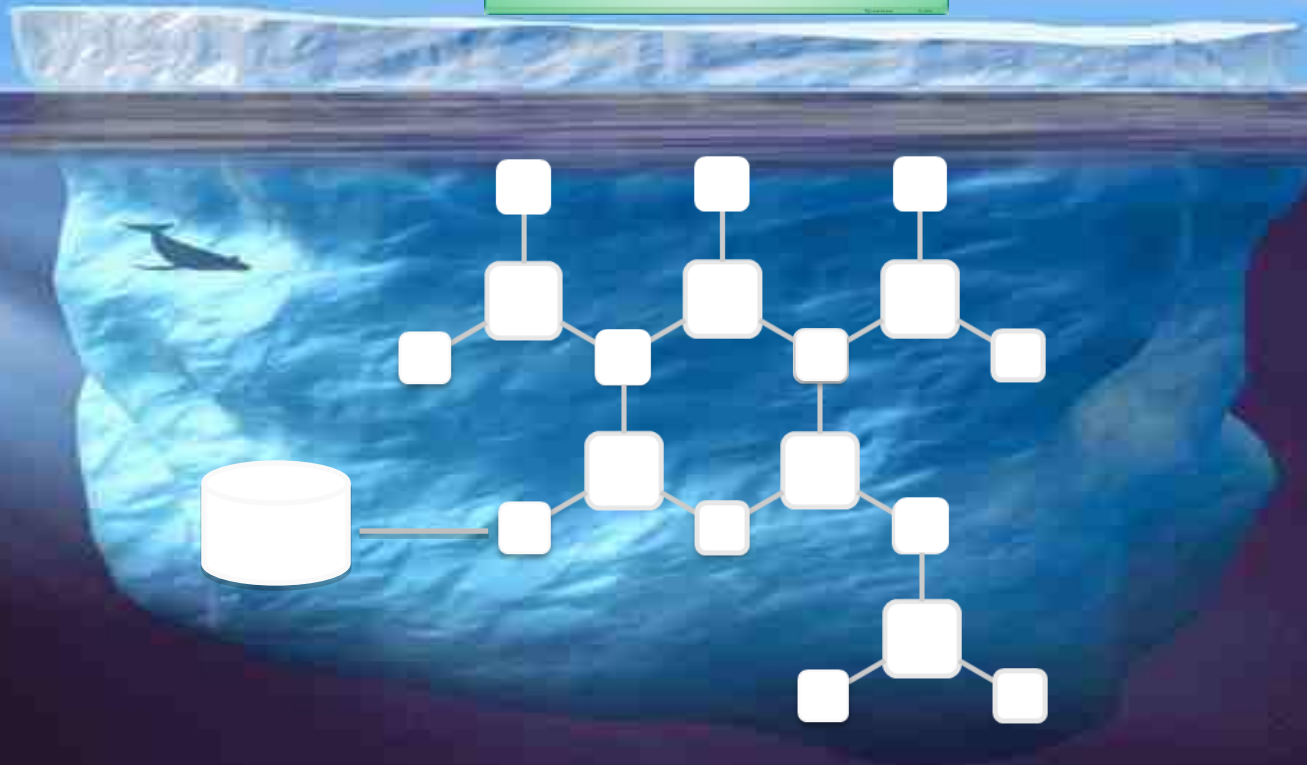
## 過去

- 組織尋求一個速度、成本和風險的平衡點
- 開發團隊不若今日那麼“敏捷”；然而測試團隊似乎人力、時間永遠都不夠
- 軟體品質差強人意

## 今日

- 組織要求團隊要能夠更快速地交付高品質的軟體
- 開發團隊變得愈來愈“敏捷”；測試團隊仍然抱怨人力、時間永遠都不夠
- 軟體品質仍舊不佳

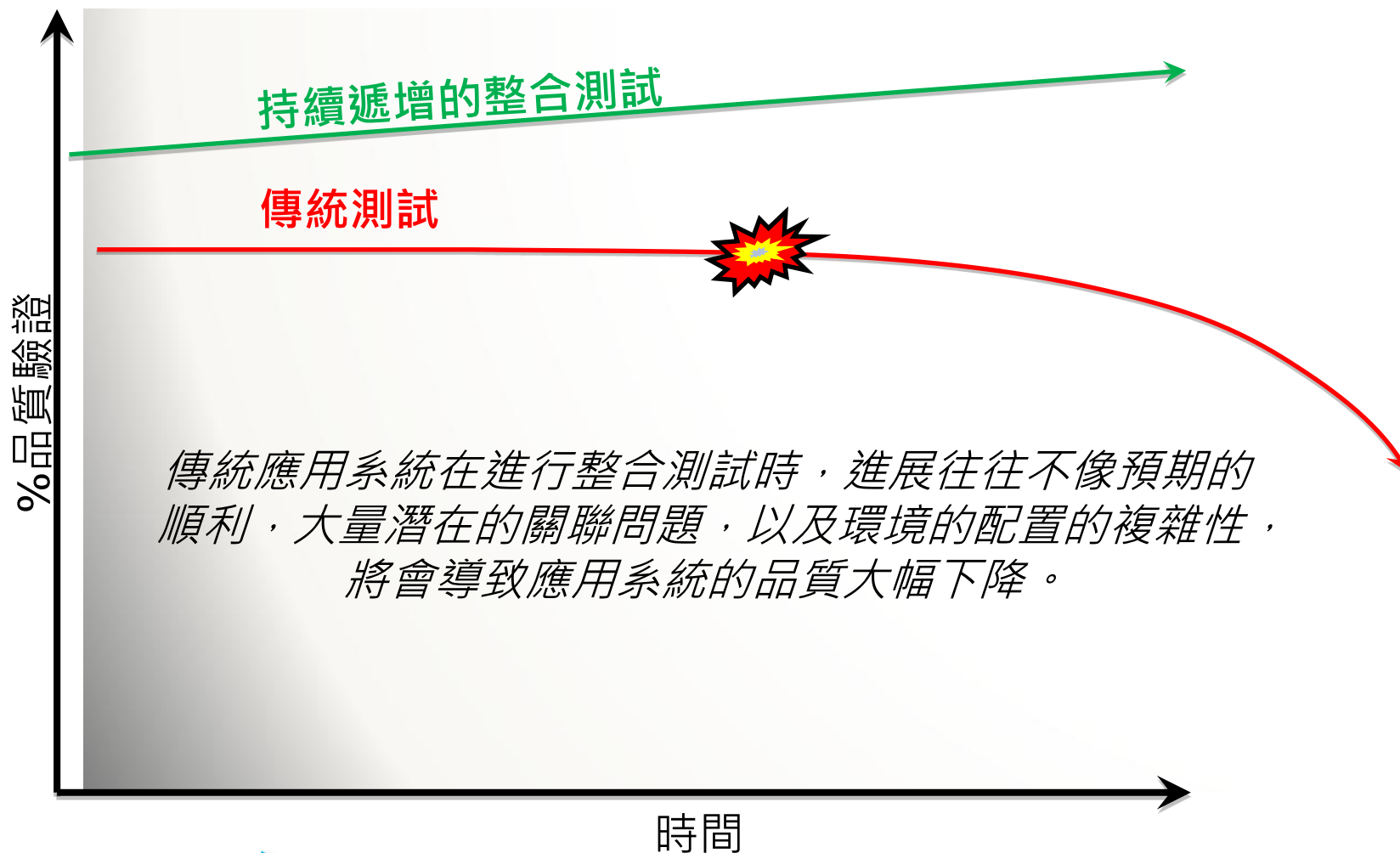








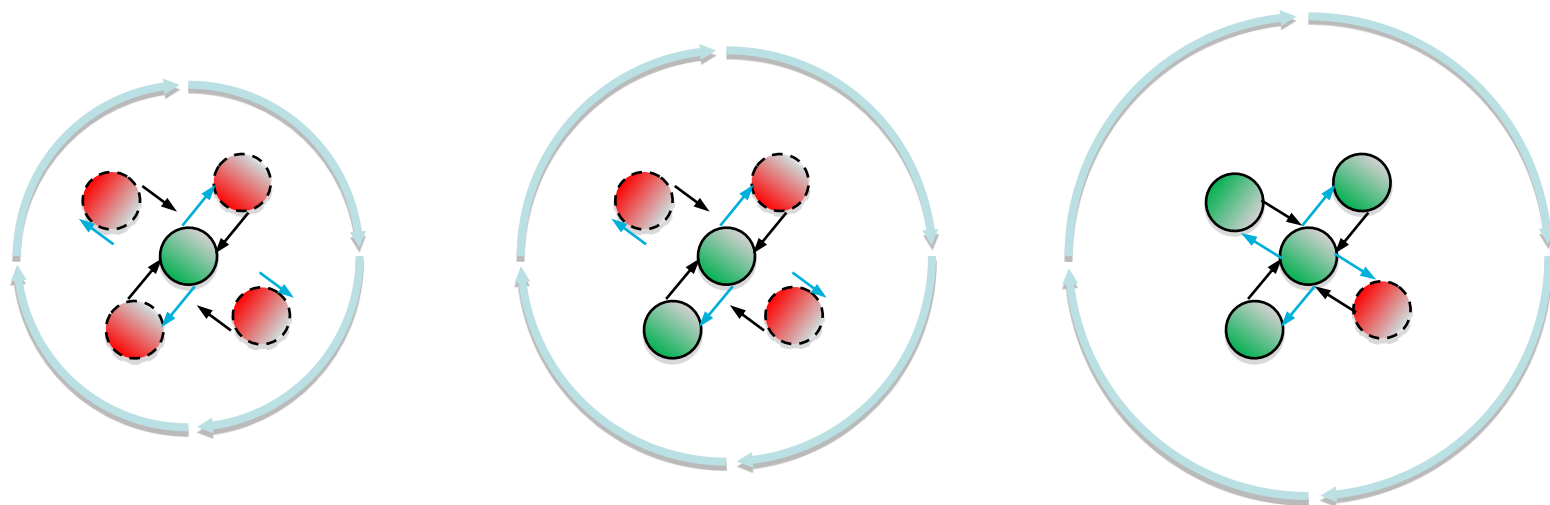
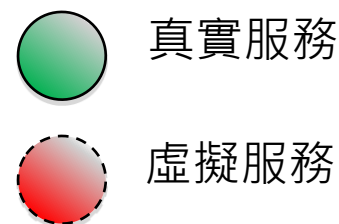
# 傳統測試方法的問題



我們需要的是**自動化**、**持續化**和**虛擬化**

# 持續遞增的整合測試概念

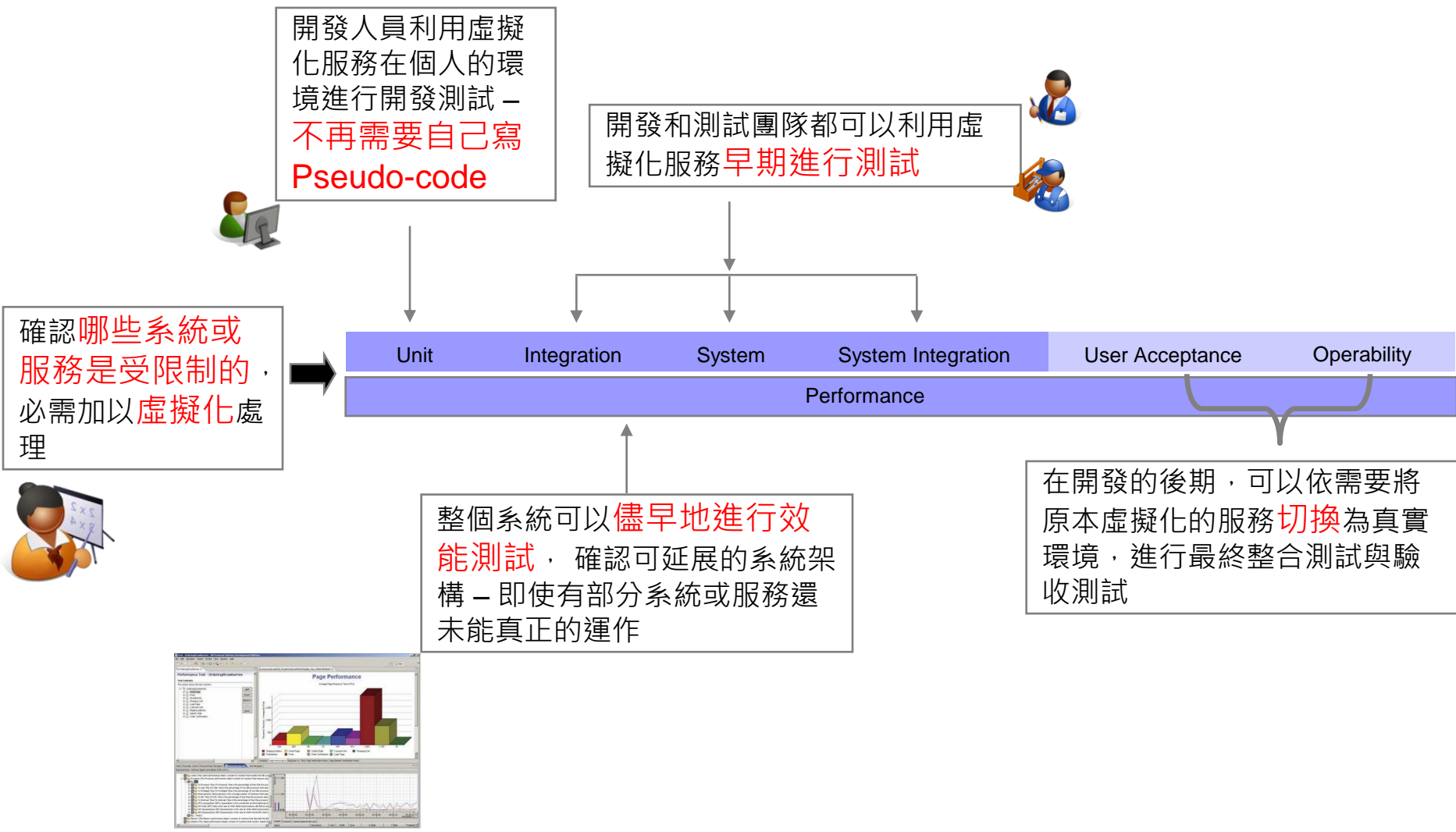
- 各個元件或服務通過受控管的、以優先順序的方式**逐步的**加入到**持續驗證測試的週期中**
- 尚未開發好的元件或服務能夠通過**虛擬化的方式**參與整個測試



持續遞增的整合測試



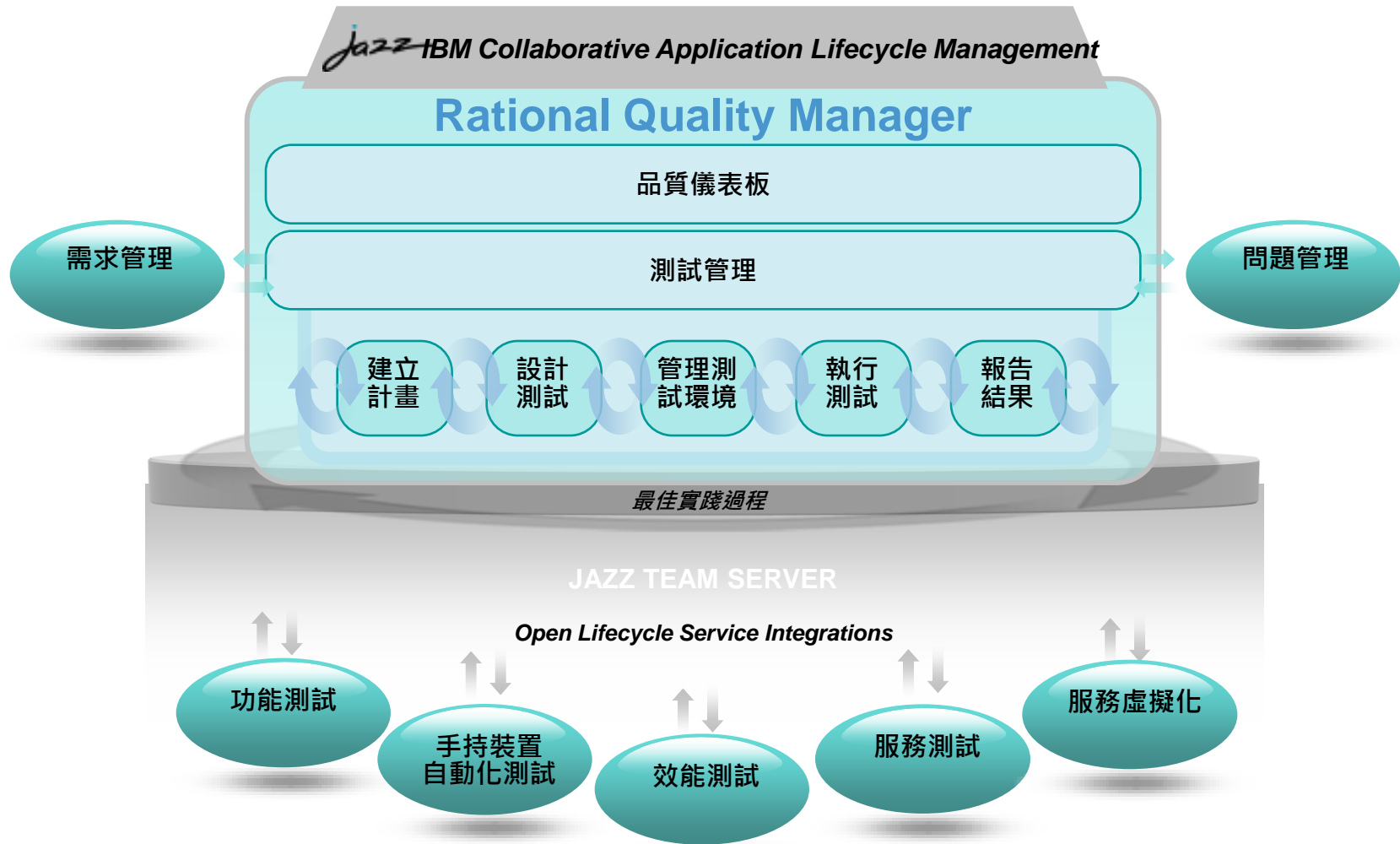
# 測試自動化與服務虛擬化將是加快整個SDLC的關鍵！



# 議程

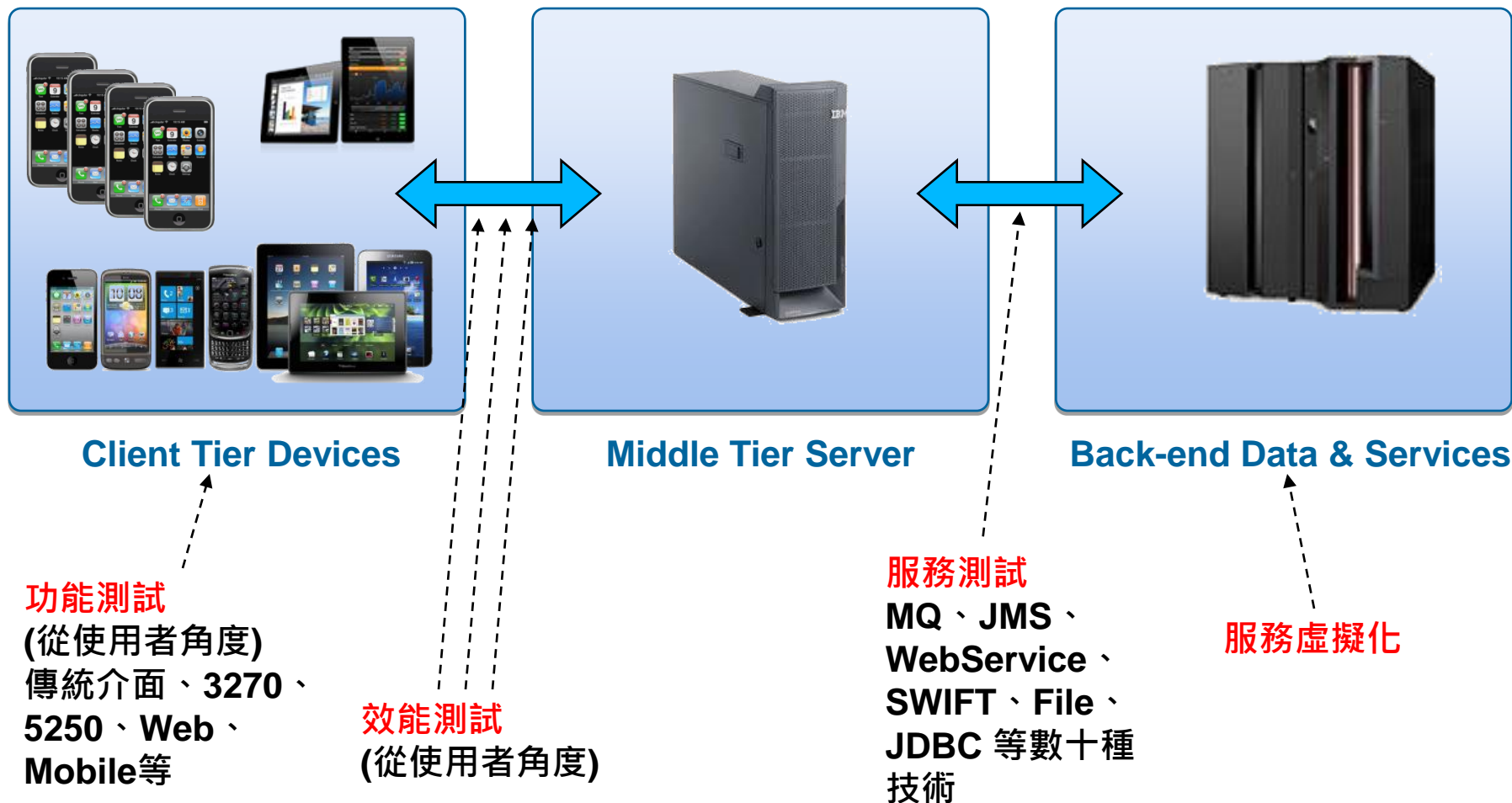
- 我們面臨的品質管理挑戰
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# IBM Rational 軟體測試管理解決方案



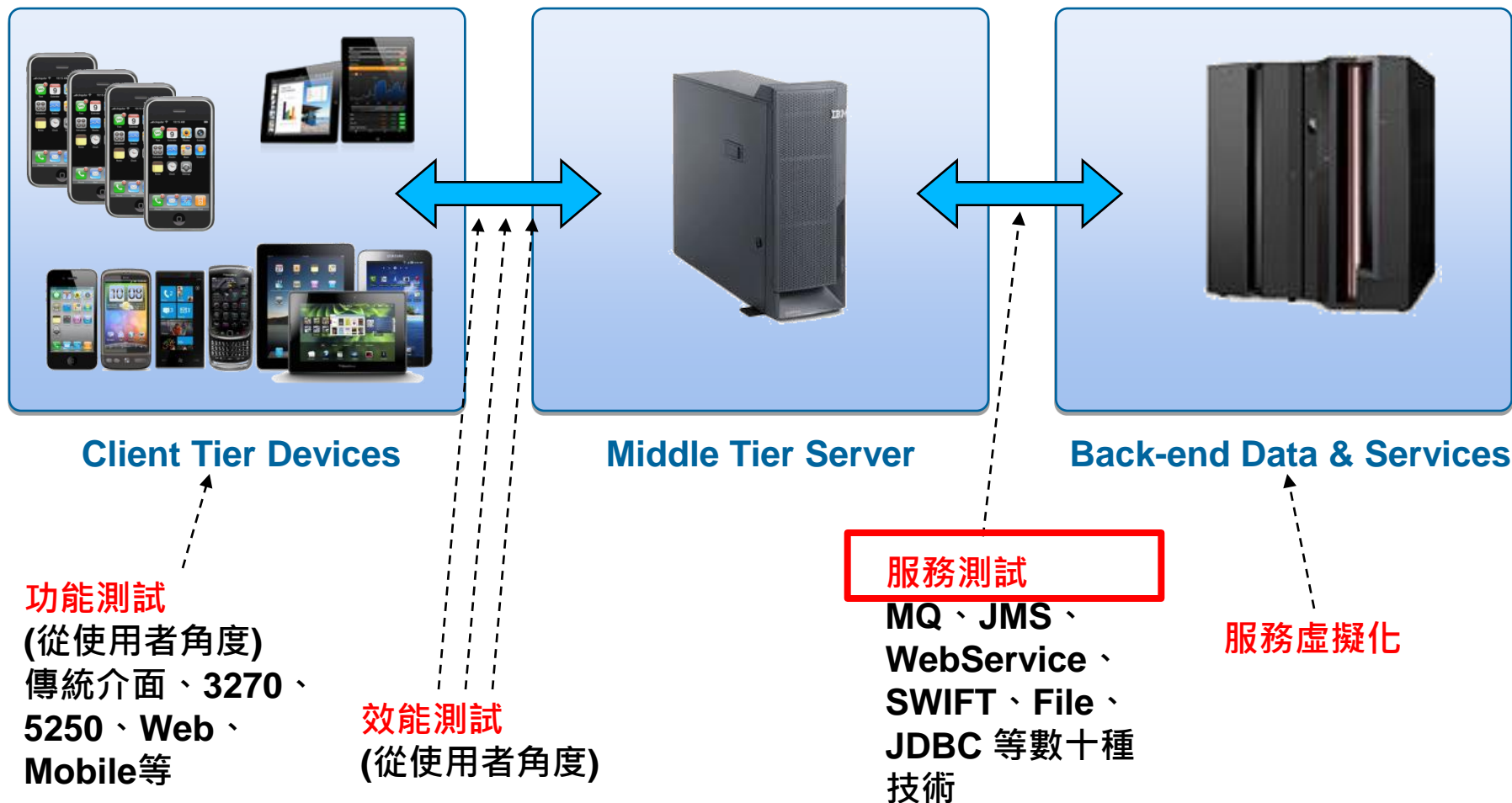
# IBM Rational Test Workbench (RTW)

涵蓋度最高的End-to-End測試



# IBM Rational Test Workbench (RTW)

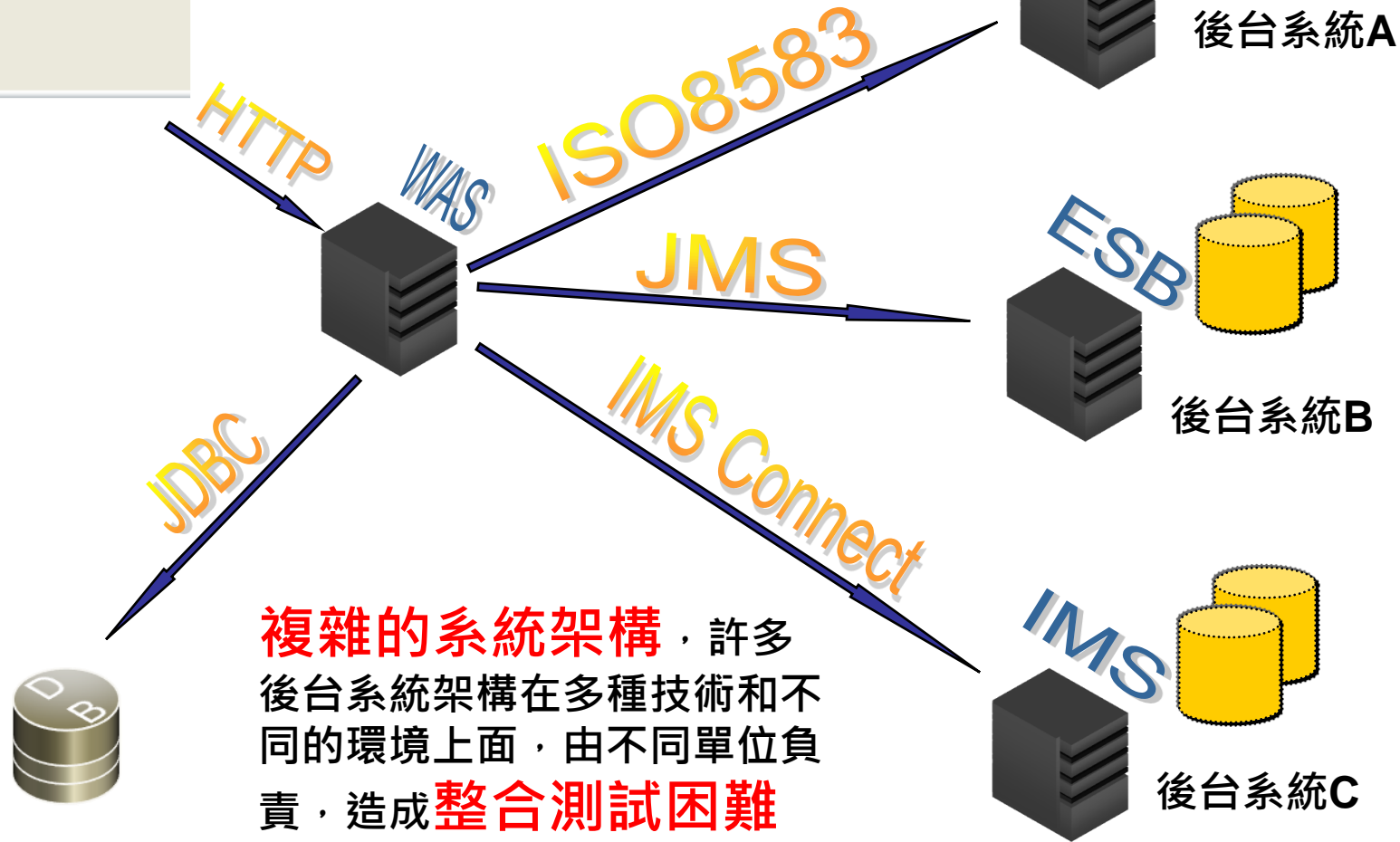
涵蓋度最高的End-to-End測試



# 採用各種異質技術的複雜系統



用戶端



**複雜的系統架構**，許多後台系統架構在多種技術和不同的環境上面，由不同單位負責，造成**整合測試困難**





# 領先業界的支援環境和技術

## Messaging Protocols

- ActiveMQ
- CICS (CTG, DPL)
- Email (SMTP, IMAP)
- Files
- FIX
- FTP/S
- HTTP/S (MIME, DIME & Chunked)
- **JDBC**
- **JMS** (JBoss et al)
- IBM WebSphere **MQ**
- **IMS** (IMS Connect, type1&2)
- Java RMI
- JBoss MQ
- SAP IDoc, BAPI, RFC & XI/PI
- Software AG's IB & IS
- Solace
- Sonic MQ
- **TCP/IP, UDP/IP**
- **TIBCO** Rendezvous, Smart Sockets & EMS
- WAS SIBus
- Custom

## SOA, ESB, Others

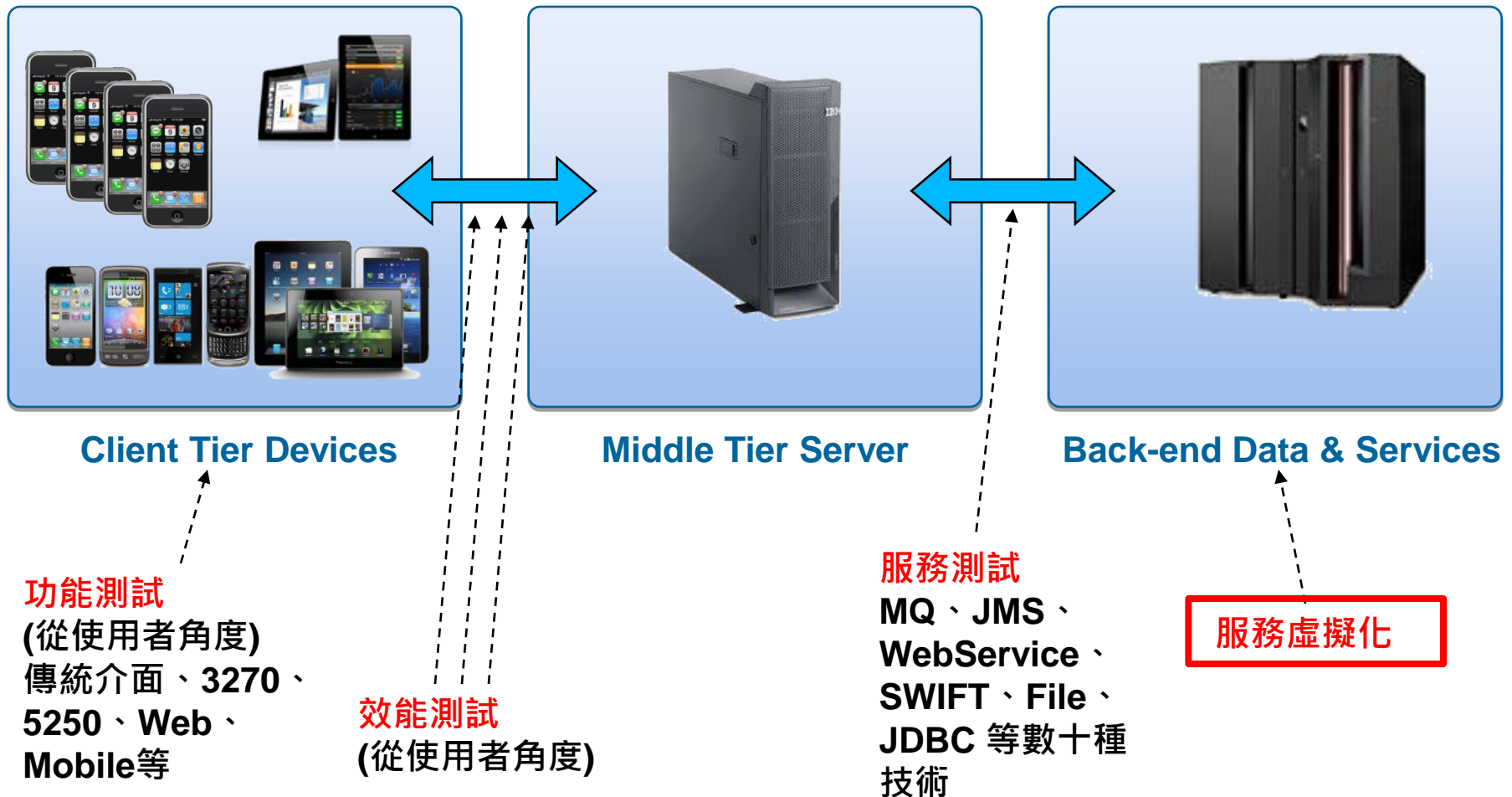
- CentraSite
- Oracle Fusion
- Optim
- SCA Domain
- Software AG IS, BPMS
- Sonic ESB
- System Z (CICS and IMS)
- TIBCO ActiveMatrix
- Tivoli Monitoring
- Tivoli CAM
- UDDI
- **Web Services**
- WebSphere RR
- WebSphere Application Server
- WebSphere Message Broker
- **WSDL**
- **WADL**
  
- BPM
- Databases
- Log Files

## Message Formats

- .Net Objects
- Bytes
- CHIPS
- **COBOL Copybook**
- ebXML
- **EDI** – UN/EDIFACT, ASC X12
- Fedwire
- Fixed Width
- FIX
- Google Protocol Buffer
- HL7
- IATA
- **ISO 8583**
- Java Objects
- JSON
- MIME
- OAG
- OFAC
- **REST** (NASCO, GSMA OneAPI)
- SQL, Stored Procedures
- SOAP
- Software AG Broker Docs
- **SWIFT** (2014)
- TIBCO ActiveEnterprise
- XML (DTD, XSD, WSDL)
- Custom – Built-in, DFDL, API

# IBM Rational Test Workbench (RTW)

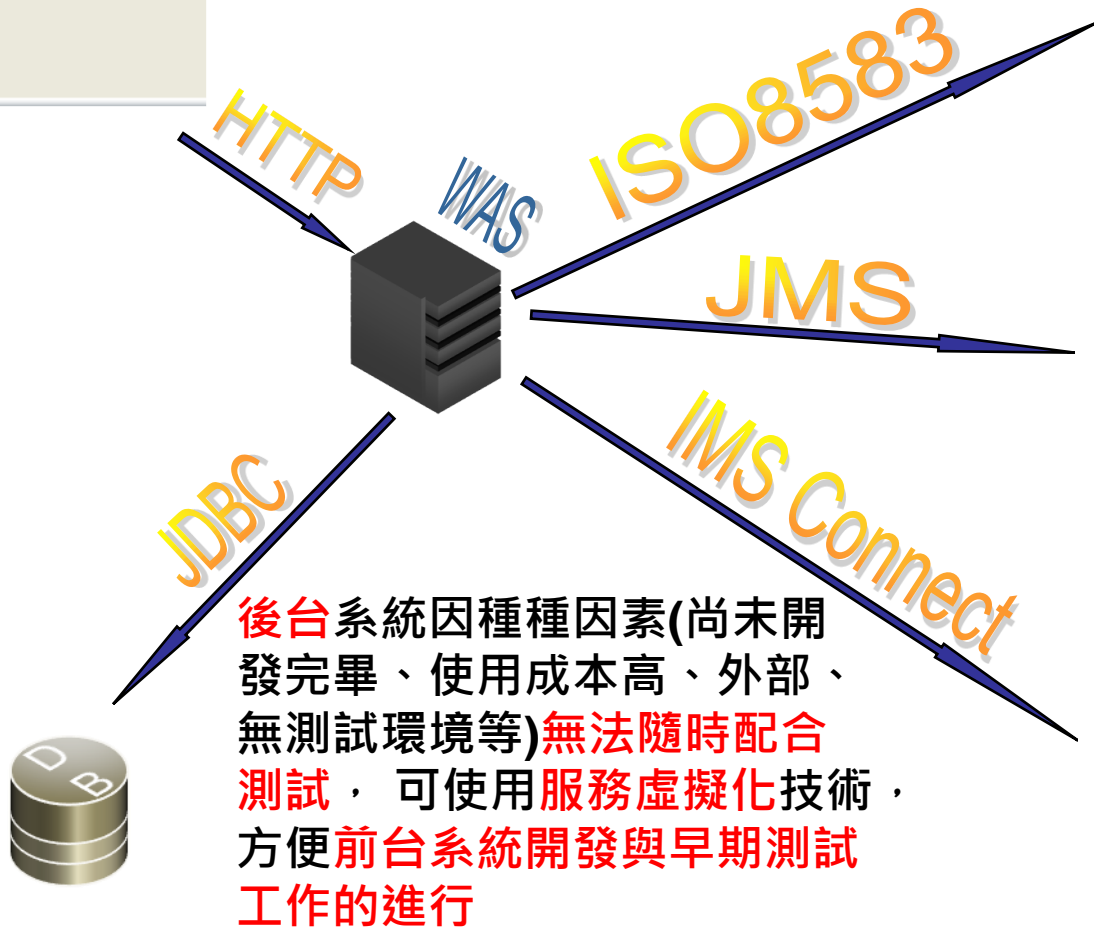
涵蓋度最高的End-to-End測試



# RTW錄製的腳本可轉換為虛擬化服務



用戶端



後台系統因種種因素(尚未開發完畢、使用成本高、外部、無測試環境等)無法隨時配合測試，可使用服務虛擬化技術，方便前台系統開發與早期測試工作的進行



後台系統A  
的虛擬化服務



後台系統B  
的虛擬化服務



後台系統C  
的虛擬化服務

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# 當敏捷受阻於整合測試，整個組織將面臨風險

服務虛擬化技術為持續整合測試提供了可能

## 挑戰

### 1. 延遲的整合測試

整合測試是否在發佈週期的晚期才開始？

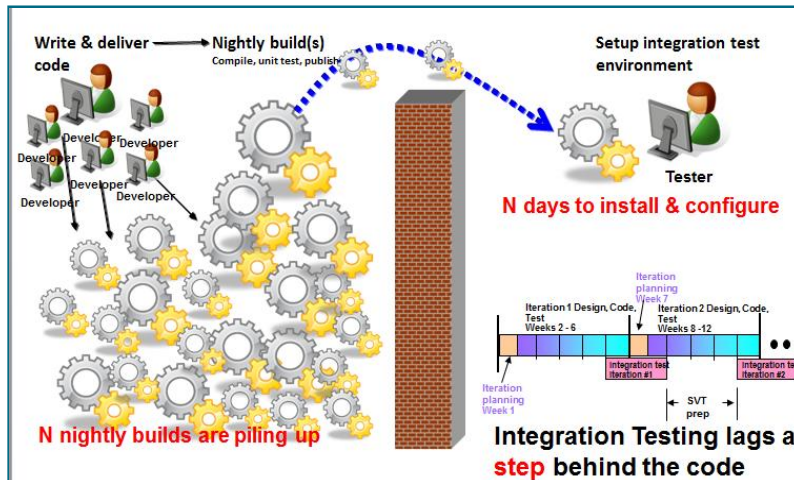
開發人員做了整合驗證嗎？

### 2. 協作

期望測試團隊能夠更好的和開發團隊整合在一起

### 3. 品質

是否對基於每日build的版本，或者是對穩定、可運作程式碼的品質要求做了妥協？



## 解決方案

### 1. 通過服務虛擬化隔離子系統

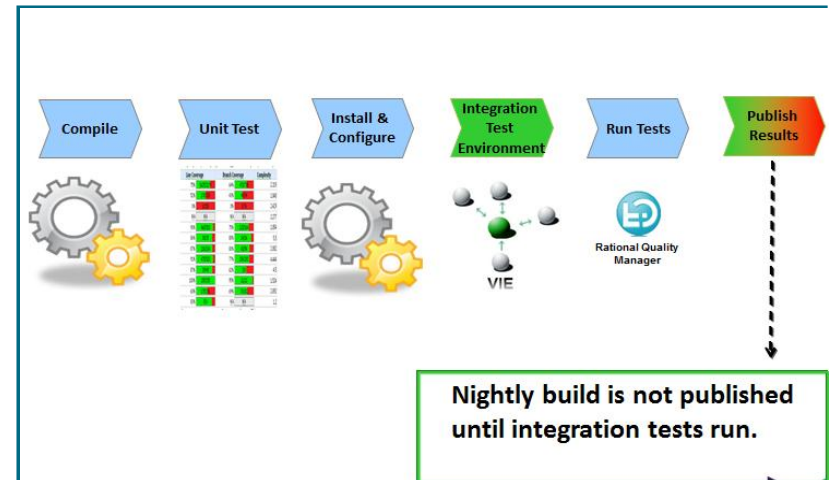
- 服務虛擬化能夠在測試期間模擬整個應用程式或系統
- 開發和測試人員繼續使用他們的開發和測試工具

### 2. 測試團隊即時協同合作

- 測試環境的構建是基於分鐘級別的而不是數個禮拜

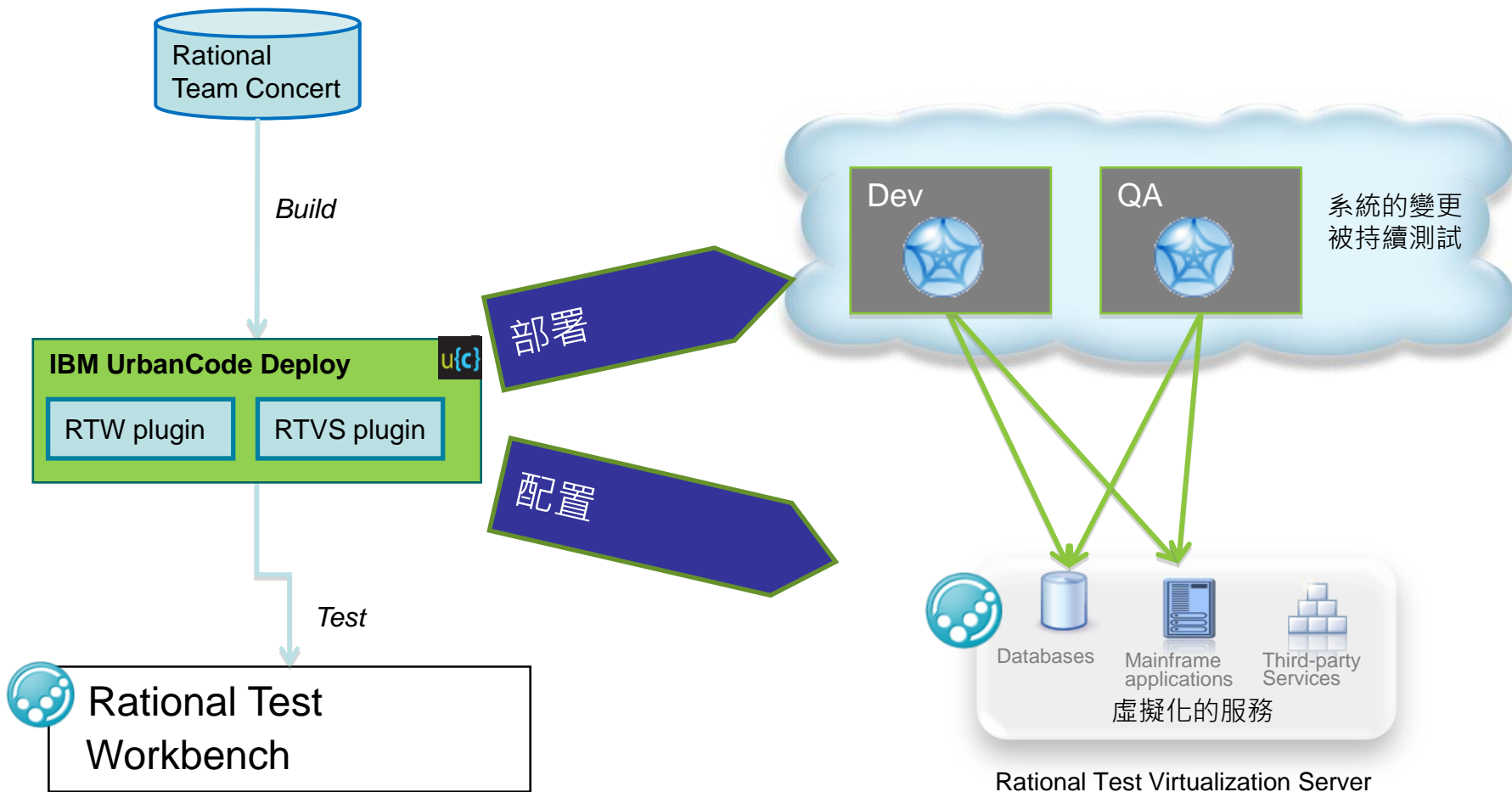
### 3. 基於每日build做持續整合測試

- 綠色的build表示通過了整合測試
- 加速軟體開發生命週期



# 通過服務虛擬化實現持續測試

在類生產環境中自動化的測試和部署



# 議程

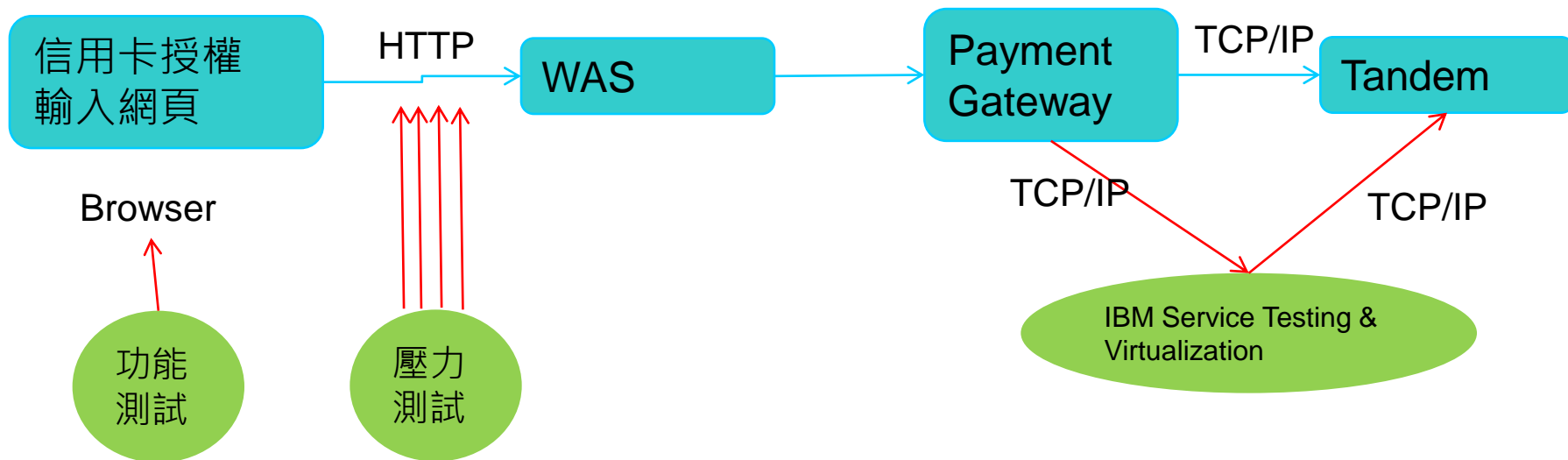
- 我們面臨的品質管理挑戰
- **IBM 自動化測試與服務虛擬化解決方案**
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# 信用卡授權服務測試與虛擬化

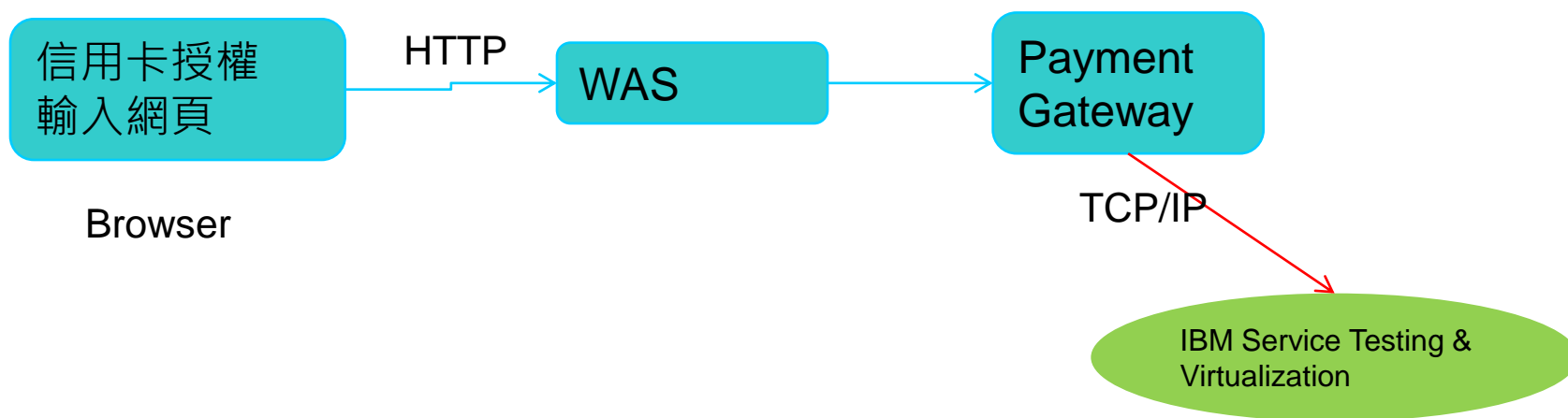
## ■ 重點：

- ▶ 工具進行Tandem後端系統的虛擬化，以便前台測試的進行
- ▶ 工具發送ISO 8583電文，對Tandem後端系統直接進行測試
- ▶ 工具模擬大量使用者使用信用卡授權網頁，進行系統效能測試
- ▶ 工具模擬使用者操作信用卡授權輸入畫面，進行功能測試



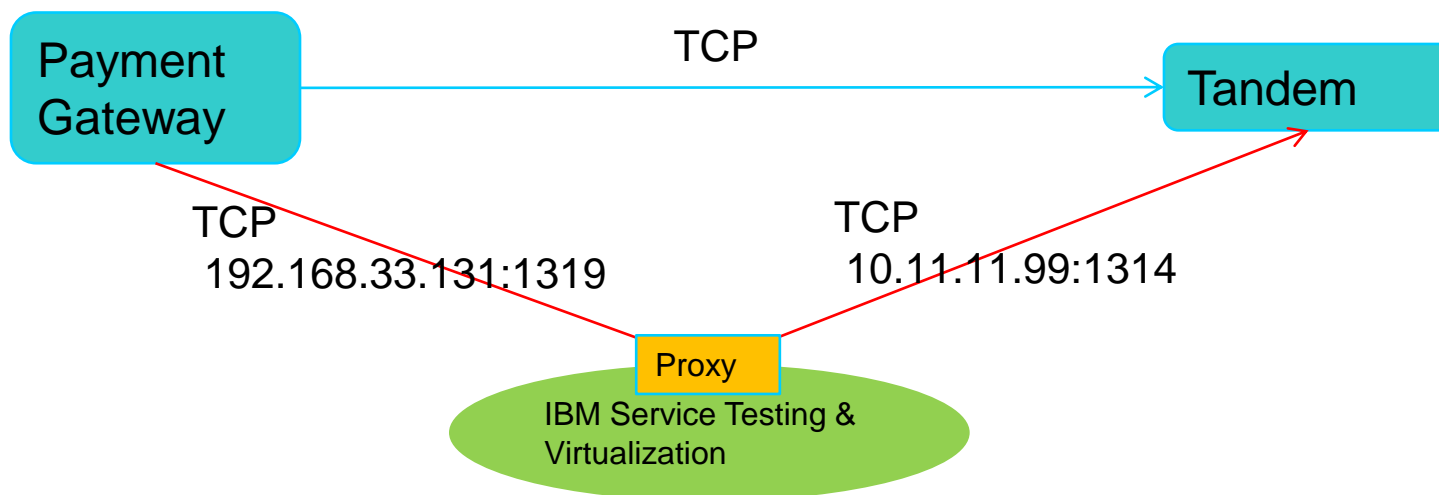
# 信用卡授權服務虛擬化

- 重點：
  - ▶ 工具進行Tandem後端系統的虛擬化，以便前台測試的進行



# 進行Tandem虛擬化的前置作業

- 在IBM Proxy設定中，加上一筆forward到Tandem (10.11.11.99:1314)的設定
- Payment Gateway修改設定，原本直接指向Tandem，改成指向Proxy的forward設定(192.168.33.131:1319)
- IBM工具如果不進行任何處理，原本的工作機制一切如常，不受影響





# 啟動錄製，取得收送Tandem的電文格式與內容

Tandem SIT - IBM Rational Integration Tester

File Edit Project Tools Window Help

Event Monitors

Enabled	Monitor Name	Color
<input checked="" type="checkbox"/>	CreditCardAuth	

Events View

Showing 2 of 2 events

#	Type	Time Stamp	Source	Description
1		16:45:22.456	CreditCardAuth	263 bytes received from ...
2		16:45:23.267	CreditCardAuth	229 bytes sent to 172.21....

Body Header

Body Message	Value
(Message)	Process Children
data (ByteArray) [ISO 8583]	Expanded Content
ISO8583_POC (Message)	Process Children
Base24_Header (Message)	Process Children
Header_Start (String)	ISO
ProductIndicator (Long)	2
ReleaseNumber (Long)	50
Status (Long)	0
Originator (Long)	7
Responder (Long)	0
MTI_Version (Long)	0
MTI_MessageClass (Long)	2
MTI_MessageFunction (Long)	0
MTI_MessageOrigin (Long)	0
ProcessingCode_003 (String)	000000
AmountTransaction_004 (Double)	100000
TransmissionDatetime_007 (Date-Time)	1970-03-03T16:44:29.000Z
SystemsTraceAuditNumber_011 (String)	041752

傳送和接收 ISO8583電文的格式和資料都直接被剖析出來

<No Test Cycle> Anonymous 83MB / 512MB

# 將錄製內容產生成虛擬化服務Stub

利用工具去設定Stub的回應邏輯，無論是單純或複雜的邏輯皆可做

Stub

Use a Stub to provide replacement behavior for existing or unavailable services. Stubs can be used directly or from within Test Suites.

Events | Behavior | Properties | Logging | Documentation

Event	Guard	Description
CreditCardAuth		

Input | Business Logic | Output

Message Header	Action
(Message) rcvdTimestamp (Date-Time)	

Message Body	Action
(Message) data (ByteArray) [ISO 8583] ISO8583_POC (Message) Base24_Header (Message) Header_Start (String) ProductIndicator (Long) ReleaseNumber (Long) Status (Long) Originator (Long) Responder (Long) MTI_Version (Long) MTI_MessageClass (Long) MTI_MessageFunction (Long)	ISO 2 50 0 7 0 0 2 0

設定過濾條件，可以僅僅針對特定類型的電文進行虛擬化處理，不符條件的仍送往真實環境

# 將錄製內容產生成虛擬化服務Stub (cont.)

快速設定: 某些Response欄位內容必須根據Request欄位內容回應

Stub

Use a Stub to provide replacement behavior for existing or unavailable services. Stubs can be used directly or from within Test Suite

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Events Behavior Properties Logging Documentation

Event Guard Description

CreditCardAuth

Input Business Logic Output

Message Header Action

(Message)

rcvdTimestamp (Date-Time)

Inbound (Boolean) true

Message Body Action

MTI\_MessageClass (Long)

MTI\_MessageFunction (Long)

MTI\_MessageOrigin (Long)

ProcessingCode\_003 (String)

AmountTransaction\_004 (Double) AmountTransaction\_004

TransmissionDatetime\_007 (Date-Time)

SystemsTraceAuditNumber\_011 (String) SystemsTraceAuditNumber\_011

TimeLocalTransaction\_012 (Time) TimeLocalTransaction\_012

DateLocalTransaction\_013 (Date) DateLocalTransaction\_013

DateCapture\_017 (Date) DateCapture\_017

PointOfServiceEntryMode\_022 (String)

PointOfServiceConditionCode\_035 (String)

ble)

11 (String)

TimeLocalTransaction\_012 (Time)

DateLocalTransaction\_013 (Date)

DateSettlement\_015 (Date)

AcquiringInstitutionIdentificationCode\_032 (String)

Track2Data\_035 (String)

RetrievalReferenceNumber\_037 (String)

00000000001

4563010008444705=1910

%%SystemsTraceAuditNumber\_011%%

%%TimeLocalTransaction\_012%%

%%DateLocalTransaction\_013%%

%%DateCapture\_017%%

00000000001

4563010008444705=1910

%%RetrievalReferenceNumber\_037%%

# 啟動Stub，虛擬化服務啟動！

The screenshot displays the IBM Rational Integration Tester interface. On the left, the 'Test Execution' pane shows a project tree with 'Logical' > 'INPG' > 'CreditCardAuth' > 'Stubs' > 'CreditCardAuthStub' selected. The 'Task Monitor' pane shows a table with one task: 'CreditCardAuth/CreditCardAuthStub' with a progress of 3 and a status of 'Ready'. The 'Console' pane shows the test execution log, which is highlighted with a red box. The log indicates that the test passed successfully after 1 iteration.

Type	Task	Progress	Status
	CreditCardAuth/CreditCardAuthStub	3	Ready

服務被呼叫次數

```
[03/03/2014 5:22:41.424 PM] [Debug] Instance 2: Tag write: SystemsTraceAuditNumber_011 (041757)
[03/03/2014 5:22:41.424 PM] [Debug] Instance 2: Tag write: TimeLocalTransaction_012 (17:21:48.000Z)
[03/03/2014 5:22:41.424 PM] [Debug] Instance 2: Tag write: DateLocalTransaction_013 (1970-03-03Z)
[03/03/2014 5:22:41.424 PM] [Debug] Instance 2: Tag write: DateCapture_017 (1970-03-03Z)
[03/03/2014 5:22:41.424 PM] [Debug] Instance 2: Tag write: RetrievalReferenceNumber_037 (100002041757)
[03/03/2014 5:22:41.424 PM] Instance 2: Message Case:using schema "Bytes" - Message validation passed
[03/03/2014 5:22:41.424 PM] [Debug] Instance 2: Tag read : AmountTransaction_004 (100000)
[03/03/2014 5:22:41.424 PM] [Debug] Instance 2: Tag read : SystemsTraceAuditNumber_011 (041757)
[03/03/2014 5:22:41.424 PM] [Debug] Instance 2: Tag read : TimeLocalTransaction_012 (17:21:48.000Z)
[03/03/2014 5:22:41.424 PM] [Debug] Instance 2: Tag read : DateLocalTransaction_013 (1970-03-03Z)
[03/03/2014 5:22:41.424 PM] [Debug] Instance 2: Tag read : DateCapture_017 (1970-03-03Z)
[03/03/2014 5:22:41.424 PM] [Debug] Instance 2: Tag read : RetrievalReferenceNumber_037 (100002041757)
[03/03/2014 5:22:41.471 PM] Instance 2: Send Output:using schema "Bytes" (2) - Send message
[03/03/2014 5:22:41.471 PM] [Passed] Instance 2: 1 iteration(s) completed successfully
Logging summary: Info (0), Warnings (0), Errors (0)
Overall status:SUCCESSFUL
[03/03/2014 5:22:41.846 PM] Instance 3: Initializing...
[03/03/2014 5:22:41.846 PM] Instance 3: Using environment: Tandem SIT
[03/03/2014 5:22:41.846 PM] Instance 3: - - - Starting main steps - - -
```

# 正式部署：使用Web App管理虛擬化服務

Firefox

Authorization Result Tandem SIT - Rational Test Control Panel

localhost:7819/RTCP/#Vie:CTBC/Tandem SIT

Google <Ctrl+K>

最常用瀏覽 Mozilla Taiwan 新手上路 常用網站

Rational. Test Control Panel Home | Scheduling | Agents | Results | VIE | Library | Administration jsmith Help IBM.

Home > VIE > CTBC > Tandem SIT

Show Agents Domain: CTBC

Name	Satisfied by	Handled	Since reset	Status
8583 _Com				
8583_Send1	Live system			

Stub

Stub	Version	Documentation
PoC_Stub	1.0	
S-CreditCardAuth	2.0	
S-CreditCardAuthNoFilter	3.0	
S-Raw	4.0	
Stub2	5.0	
Stub3	6.0	
Stub4	7.0	
Stub5		
Tandem_CreditCardAuth		

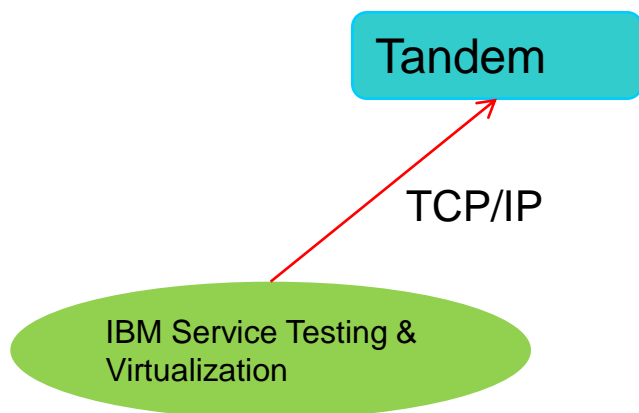
No ent.

一鍵切換真實環境和虛擬化服務，不用再去搞Pseudo-code了



# 信用卡授權服務測試

- 展示重點：
  - ▶ 工具發送ISO 8583電文, 對Tandem後端系統進行測試



# 將錄製內容產生成服務測試腳本

The screenshot displays the Test Factory interface. On the left, a tree view shows the project structure under 'Logical' > 'INPG' > 'CreditCardAuth' > 'Tests' > 'MyTest'. The main window shows the test script for 'NPG/CreditCardAuth/MyTest' with the following steps:

- Initialize**
- Test Steps**
  - Function: Run "randomNumber=Math.floor(Math.random() \* (1000000)) "
  - Send Request:using schema "Bytes" via "TCP\_Tandem"
  - Receive Reply:using schema "Bytes"
- Tear-down**

# 將錄製內容產生成服務測試腳本 (cont.)

## 編輯發送的request ISO8583電文內容



### Publish

Publish a message and wait for a response to be received. This can then be validated accordingly.

The interface shows a configuration window with the following details:

- Transport: 010 TCP\_Tandem
- Formatter: Byte Array

Message	Value
Base24_Header (Message)	Process Children
Header_Start (String)	ISO
ProductIndicator (Long)	2
ReleaseNumber (Long)	50
Status (Long)	0
Originator (Long)	7
Responder (Long)	0
MTI_Version (Long)	0
MTI_MessageClass (Long)	2
MTI_MessageFunction (Long)	0
MTI_MessageOrigin (Long)	0
ProcessingCode_003 (String)	000000

A red callout box points to the 'ReleaseNumber' value of 50, containing the text: 錄製取得的測試資料，可以設定成參數化，生成大量資料邏輯測試或壓力測試

# 將錄製內容產生成服務測試腳本 (cont.)

編輯欲驗證回傳的response ISO853電文內容

Receive Reply using schema "Bytes" [INPG/CreditCardAuth/MyTest]

Receive Reply

Receive and validate a response to the request you have sent.

Config | Filter | Assert | Store

Reply to: Send Request 1 | Formatter: Byte Array

Message	Value	
DateLocalTransaction_013 (Date)	1970-02-24Z	<input checked="" type="checkbox"/>
DateSettlement_015 (Date)	1970-02-24Z	<input checked="" type="checkbox"/>
AcquiringInstitutionIdentificationCode_032 (String)	000000000001	<input checked="" type="checkbox"/>
Track2Data_035 (String)	4563010008444705=1910	<input checked="" type="checkbox"/>
RetrievalReferenceNumber_037 (String)	100002041629	<input checked="" type="checkbox"/>
AuthorizationIdentificationResponse_038 (String)	831315	<input checked="" type="checkbox"/>
ResponseCode_039 (String)	00	<input checked="" type="checkbox"/>
CardAcceptorTerminalIdentification_041 (String)	99100002	<input checked="" type="checkbox"/>
AdditionalDataPrivate_048 (String)	8220188800016 00000000	<input checked="" type="checkbox"/>
CurrencyCodeTransaction_049 (String)	901	<input checked="" type="checkbox"/>
ReservedPrivate_063 (String)	& 0000200048! C000026 132 32535 7 1	<input checked="" type="checkbox"/>

Actions

# 將錄製內容產生成服務測試腳本 (cont.)

允許透過scripting進行其他邏輯處理

The screenshot displays the Test Factory interface. On the left, a tree view shows a project structure under 'Logical' with folders for 'INPG', 'CreditCardAuth', 'Stubs', 'Tests', and 'CreditCardAuthRe'. The 'MyTest' test is selected under 'Tests'. The main window shows the 'Test' configuration for 'INPG/CreditCardAuth/MyTest'. The test steps are: 'Initialize', 'Test Steps', and 'Tear-down'. The 'Test Steps' section contains three actions: 'Function:Run "randomNumber=Math.floor(Math.random() \* (1000000))"', 'Send Request:using schema "Bytes" via "TCP\_Tandem"', and 'Receive Reply:using schema "Byt...'. The first action is highlighted with a red box. A red arrow points from this box to the configuration dialog for the 'Function Run' step. The dialog shows the function name 'Function Run "randomNumber=Math.floor(Math.random() \* (1000000))"', the language 'ECMAScript', and the script code: 

```
randomNumber=Math.floor(Math.random() * (1000000))
```

# 執行對後端Tandem系統的測試腳本



類型	作業	進度	狀態
	Step1/IMS_Tx/AddTest/AddTest	100%	已完成

主控台

```
<已終止> Step1/IMS_Tx/AddTest/AddTest  
[2014年08月22日 下午2:36:12.501] 接收回覆:"Data" 使用網目 "IMS Connect Message" - 訊息驗證通過  
[2014年08月22日 下午2:36:12.504] 傳送要求:"Data" 使用交易 "IVTNO" 使用網目 "IMS Connect Message" 透過 "IMSCconnect"  
[2014年08月22日 下午2:36:12.546] 接收回覆:"Data" 使用網目 "IMS Connect Message" - 訊息驗證通過  
[2014年08月22日 下午2:36:12.550] 傳送要求:"Data" 使用交易 "IVTNO" 使用網目 "IMS Connect Message" 透過 "IMSCconnect"  
[2014年08月22日 下午2:36:12.598] 接收回覆:"Data" 使用網目 "IMS Connect Message" - 訊息驗證通過  
[2014年08月22日 下午2:36:12.600] 傳送要求:"Data" 使用交易 "IVTNO" 使用網目 "IMS Connect Message" 透過 "IMSCconnect"  
[2014年08月22日 下午2:36:12.658] 接收回覆:"Data" 使用網目 "IMS Connect Message" - 訊息驗證通過  
[2014年08月22日 下午2:36:12.665] 傳送要求:"Data" 使用交易 "IVTNO" 使用網目 "IMS Connect Message" 透過 "IMSCconnect"
```

# 議程

- 我們面臨的品質管理挑戰
- **IBM 自動化測試與服務虛擬化解決方案**
- 持續測試的基礎：服務虛擬化
- 客戶實際案例參考
- 總結

# 結論

- 透過將IT資源虛擬化，去**消除**開發和測試的**種種限制**
- 只須花費**少許成本**，就能夠真實地模擬開發和測試環境
- 讓您能夠快速地**測出問題**，並深入問題的根源 (root cause)
- 搭配應用程式虛擬化，您能建立自動化迴歸測試套件，去**減少測試生命週期的時間**，並且**增進測試的覆蓋度與品質**
- 應用程式虛擬化可以完全融合到軟體開發生命週期 – **在整個開發和測試的生命週期中提供好處**





# QUESTIONS

[www.ibm.com/software/rational](http://www.ibm.com/software/rational)



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