科技部資訊安全技術研發專案計畫

『系統測試計畫書』

System Testing Plan Document

適用於物聯網之數位鑑識與分析雲端平台

106-2221-E-182 -003 -

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2018/05/15

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版次變更記錄

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| --- | --- | --- |
| **版次** | **變更項目** | **變更日期** |
| 1.0 | 第一版 | 2018.05.10 |
| 2.0 | 第二版 | 2018.05.15 |
|  |  |  |

1. **緒論 (Introduction)**

物聯網是一個發展快速、多元且複雜的網路環境，其涉及物件、網路、運算模式、系統平台等之多元性。面對發展快速的全球物聯網的技術與創新應用，人們面對這波可能改變我們生活型式的創新科技，給予高度的期待。然而，這個科技雖然帶來了便利性與自動化，卻也可能帶來新的資訊安全威脅與風險，甚至新型態的電腦犯罪模式。由於物聯網所產生之數據/數位證據非常複雜、多元、分散以及多重來源等，使得物聯網數位鑑識面臨很多挑戰，因此如何在物聯網環境建構一個安全且信任的數位鑑識服務環境目前尚未被廣泛被討論。

本整合型計畫為三年期計畫，主要希冀建立一個安全、信任、犯罪可追蹤與鑑識之「適用於物聯網之數位鑑識與分析雲端平台」，以期針對物聯網提供一個完善的犯罪偵防以及數位鑑識與分析的雲端服務。本計畫共分為四個子計畫分別，包括：(1) 子計畫一「IoT 數位鑑識區塊鏈：物聯網數位證據信任鏈之設計與建置」：此子計畫主要建立IoT 數位證據保存與取證之區塊鏈，以確保IoT 數位證據之完整性(Integrity)、正確性(Accuracy)、一致性(Consistency)與適法性(Compliance)；(2) 子計畫二「IoT 之數位證據視覺化與輕量化鑑別之設計」：此子計畫將設計與實作數位證據視覺化與安全之查詢機制，將可以提供鑑識人員更容易辨識之界面與達到安全之數位鑑識分析；(3) 子計畫三「匿蹤犯罪源點網路鑑識」：此子計畫將提出一個零路由器儲存需求的單一封包網路匿名犯罪源頭鑑識方法，讓執法者將可利用單一封包準確地鑑識匿名攻擊來源；(4) 子計畫四「以無線定位技術之犯罪嫌疑人移動足跡分析與鑑識」：此子計畫將利用物聯網結合雲端計算技術，設計被動式觀察系統，供第一線調查人員和研究者去鑑識、調查並預測犯罪嫌疑人於室內環境的移動軌跡，並且可以達到犯罪行為預防。

圖1. 子計畫模組互動示意圖

**匿蹤犯罪源點網路鑑識模組**

**無線定位技術之犯罪嫌疑人移動足跡分析與鑑識模組**

**數位證據視覺化模組**

**IoT數位鑑識區塊鏈模組**

**數位鑑識、分析、犯罪偵防及追蹤之雲端服務平台**

本整合型計畫之各子計畫間模組互動如圖1所示，由子計畫一所支援之數位鑑識區塊鏈模組用於保全數位證據；子計畫二所開發之數位證據視覺化與安全之查詢模組，將可提供數位證據視覺化效果，並確保子計畫所產生之資料不會因為鑑識人員查詢而外洩，侵害數位證據之機密性或使用者隱私；子計畫三匿蹤犯罪源點網路鑑識模組將經由子計畫二所開發之模組查詢子計畫一所產 生的相關數位證據，並將可利用單一封包準確地鑑識匿名攻擊來源；子計畫四無線定位技術之犯罪嫌疑人移動足跡分析與鑑識模組將根據子計畫三模組鑑識之結果，鑑識與調查並預測犯罪嫌疑 人於室內環境之移動軌跡。如此，鑑識人員可以經由本整合型計畫所開發之雲端服務平台保全數位證據，當鑑識人員因某些任務需要查詢相關數位證據，亦不影響其他數位證據之機密性與隱私。再者，可以使用本雲端服務平台不僅追蹤匿名攻擊來源，並可以調查犯罪嫌疑人於室內環境之 移動軌跡。因此，本整合計畫所開發之雲端服務平台將提供物聯網一個完善的數位鑑識、分析、 犯罪偵防及追蹤工具。依據本系統將進行各子模組整合測試[2, 3]、接受測試(Acceptance Testing)及系統壓力測試(System Stress Testing)：

1. 數位鑑識區塊鏈模組(Digital Forensics Blockchain Sub-module，DFB-SM)：包括數位鑑識區塊鏈產生模組與數位鑑識區塊鏈驗證模組。
2. 數位證據視覺化模組(Visualization for Digital Evidences Sub-module，VDF-SM)：包括折線圖之視覺化模組、圓餅圖之視覺化模組、路線圖之及Google地圖之視覺化模組。等
3. 匿蹤犯罪源點網路鑑識模組(Network Forensics for Anonymous Crime Sources Sub-Module，NFACS-SM)：包括匿蹤犯罪源點網路鑑識之資料產生模組、匿蹤犯罪源點網路鑑識之資料傳輸模組與匿蹤犯罪源點網路鑑識之資料接收模組。
4. 無線定位技術之犯罪嫌疑人移動足跡分析與鑑識模組(Analysis and Identification of Mobile Trail of Suspects Sub-module，AIMTS-SM)：無線定位技術之犯罪嫌疑人移動足跡之資料產生模組、無線定位技術之犯罪嫌疑人移動足跡之資料傳輸模組與無線定位技術之犯罪嫌疑人移動足跡之資料接收模組。
   1. 測試目的 (Scope of Testing)

本研究團隊所規劃之數位鑑識、分析、犯罪偵防及追蹤之雲端服務平台的測試計畫，乃依據需求規格書[1]進行整合測試的相關計畫與內容。在確認系統整合前，本研究團隊先確認所有子模組皆可單獨正確運作無誤。於此，本研究團隊著重於整合系統測試 (Integration Test)、接受度測試 (Acceptance Test)及系統壓力測試(System Stress Testing。在整合測試中，本研究團隊將各子計畫所開發之模組進行整合，並測試它們之間的運作關係是否正確的。在接受度測試中，本研究團隊採使用測試案例與 use case 鎖定測試的範圍。在系統壓力測試中，測試平台伺服務器當接受多個HTTP POST Request代表查詢要求，所需要之處理時間。本文件內容將依據系統並希望透過此文件的規劃與實踐，達到順利執行與系統整合之目的。

* 1. 接受準則 (Acceptance Criteria)

本測試計畫需要滿足下列的測試接受準則：

1. 在數位鑑識、分析、犯罪偵防及追蹤之雲端服務伺服器端，整合數位鑑識區塊鏈模組、數位證據視覺化模組及匿蹤犯罪源點網路鑑識之資料接收模組，且能正常運作相關模組。
2. 數位鑑識、分析、犯罪偵防及追蹤之雲端服務伺服器端能與使用者所使用之裝置間交換資料，且各個功能可以正常運作。
3. 數位鑑識區塊鏈產生模組須能正常執行產生區塊鏈之功能，且能儲存於伺服器端之資料庫中。
4. 數位鑑識區塊鏈驗證模組須執行驗證區塊鏈之正確性與有效性的功能，且能顯示驗證之結果。
5. 數位證據視覺化模組能依照使用者所提出之需求，正常執行不同之視覺化功能。
6. 匿蹤犯罪源點網路鑑識之資料產生模組能正常執行犯罪源點網路鑑識之資料產生的功能。
7. 匿蹤犯罪源點網路鑑識之資料傳輸模組能正常執行傳送犯罪源點網路鑑識之資料的功能。
8. 匿蹤犯罪源點網路鑑識之資料接收模組能正常執行接收犯罪源點網路鑑識之資料的功能。
9. 無線定位技術之犯罪嫌疑人移動足跡之資料產生模組能正常執行產生無線定位技術之犯罪嫌疑人移動足跡之資料的功能。
10. 無線定位技術之犯罪嫌疑人移動足跡之資料傳輸模組能正常執行傳送無線定位技術之犯罪嫌疑人移動足跡之資料的功能。
11. 無線定位技術之犯罪嫌疑人移動足跡之資料接收模組能正常執行接收無線定位技術之犯罪嫌疑人移動足跡之資料的功能。
12. 各項參數及數據在各模組與資料流中能正確的傳遞。
13. 測試程序需要依照本測試計畫所訂定的程序進行，所有測試結果需要能符合系統需求規格書預期測試結果方能接受。
14. **測試環境 (Testing Environment)**

為方便描述，首先定義下列符號。

表1. 符號描述

|  |  |
| --- | --- |
| 符號名稱 | 符號描述 |
| DFACP | 用於表示主系統，代表物聯網之數位鑑識與分析雲端平台。 |
| DFB-SM | 用於表示數位鑑識區塊鏈模組，代表DFB子系統模組。 |
| VDF-SM | 用於表示數位證據視覺化模組，代表VDF子系統模組。 |
| NFACS -SM | 用於表示匿蹤犯罪源點網路鑑識模組，代表NFACS子系統模組。 |
| AIMTS -SM | 用於表示無線定位技術之犯罪嫌疑人移動足跡分析與鑑識模組，代表AIMTS子系統模組。 |
| EIR | 用於表示外部介面需求(External Interface Requirement) |
| IIR | 用於表示內部介面需求(Internal Interface Requirement) |
| UIR | 用於表示使用者介面需求(User Interface Requirement) |

物聯網之數位鑑識與分析雲端平台進行測試的環境描述如圖2，IoT設備經由無線/有線環境傳送封包，無線定位技術之犯罪嫌疑人移動足跡分析與鑑識模組/匿蹤犯罪源點網路鑑識模組會產生相關資訊並傳至物聯網之數位鑑識與分析雲端平台，數位鑑識區塊鏈產生模組產生區塊鏈資訊後儲存於數位鑑識資料庫。當數位鑑識人員/調查人員使用行動裝置/電腦進行查詢時，當數位鑑識區塊鏈驗證模組驗證無誤之後，經由數位證據視覺化模組呈現查詢之結果。

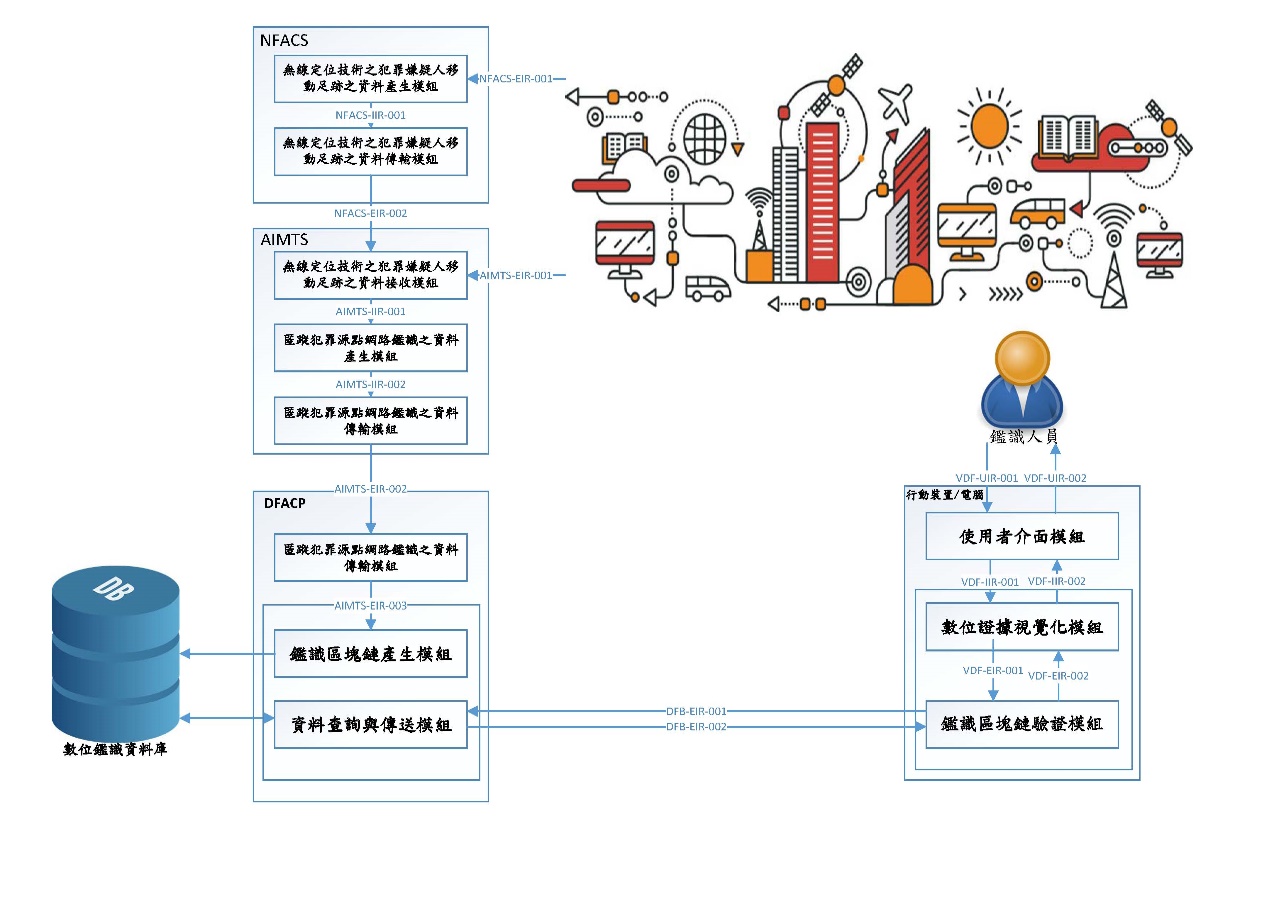


圖2. 物聯網之數位鑑識與分析雲端平台測試環境架構圖

* 1. 硬體規格 (Hardware Specification)

依據圖2測試環境架構圖內容，進行測試之硬體規格說明，如下列所示：

1. 端末使用者

* NB：Windows 8.1
* CPU：Intel Core i5 1.7GHz
* RAM：4GB

1. 物聯網之數位鑑識與分析雲端伺服器：

* CPU：Intel Core i7-650 3.2 GHz
* RAM：4 GB
* 硬碟空間：500GB
  1. 軟體規格 (Software Specification)

依據圖2測試環境架構圖內容，測試環境之軟體規格說明，如下列所示：

1. 物聯網之數位鑑識與分析雲端伺服器：包含數位鑑識區塊鏈產生模組及資料傳送模組。

* 作業系統：Windows 10 Professional Version 64 bits
* 網頁伺服器：Apache Server 2.4.9
* 網站開發語言：PHP 5.5
* 資料庫與管理套件：MySQL 5.6.17與PHPMyAdmin 4.1.14

1. 數位鑑識區塊鏈模組

* 應用程式開發語言：Python

1. 數位證據視覺化模組

* 應用程式開發語言：Python
  1. 測試資料來源 (Test Data Sources)

由各個輔助觀測節點所觀測到之某一犯罪嫌疑人之封包摘要，包含Time、嫌疑人之MAC、觀測節點MAC、RSSI、IP，部份犯罪嫌疑人的紀錄如下，詳細資料如附錄。

|  |
| --- |
| 08:00:00.001460,RA:00:01:02:03:00,RA:00:03:06:09:41,-96,140.135.12.1  08:00:00.002581,RA:00:01:02:03:00,RA:00:03:06:09:3E,-92,140.135.12.1  08:00:00.003702,RA:00:01:02:03:00,RA:00:03:06:09:2C,-84,140.135.12.1  08:00:00.004842,RA:00:01:02:03:00,RA:00:03:06:09:30,-90,140.135.12.1  08:00:00.005962,RA:00:01:02:03:00,RA:00:03:06:09:1B,-59,140.135.12.1  08:00:00.007083,RA:00:01:02:03:00,RA:00:03:06:09:2E,-87,140.135.12.1  08:00:00.008203,RA:00:01:02:03:00,RA:00:03:06:09:20,-89,140.135.12.1  08:00:00.009324,RA:00:01:02:03:00,RA:00:03:06:09:01,-79,140.135.12.1  08:00:00.010444,RA:00:01:02:03:00,RA:00:03:06:09:07,-89,140.135.12.1  08:00:00.011565,RA:00:01:02:03:00,RA:00:03:06:09:05,-79,140.135.12.1  08:00:00.015438,RA:00:01:02:03:00,RA:00:03:06:09:30,-90,140.135.12.1  08:00:00.016558,RA:00:01:02:03:00,RA:00:03:06:09:1C,-76,140.135.12.1  08:00:00.017678,RA:00:01:02:03:00,RA:00:03:06:09:1B,-58,140.135.12.1  08:00:00.020259,RA:00:01:02:03:00,RA:00:03:06:09:1C,-76,140.135.12.1  08:00:00.022206,RA:00:01:02:03:00,RA:00:03:06:09:1A,-56,140.135.12.1  08:00:00.023326,RA:00:01:02:03:00,RA:00:03:06:09:1C,-76,140.135.12.1  08:00:00.027954,RA:00:01:02:03:00,RA:00:03:06:09:25,-96,140.135.12.1  08:00:00.029821,RA:00:01:02:03:00,RA:00:03:06:09:38,-87,140.135.12.1  08:00:00.030941,RA:00:01:02:03:00,RA:00:03:06:09:37,-86,140.135.12.1  08:00:00.032061,RA:00:01:02:03:00,RA:00:03:06:09:19,-62,140.135.12.1  08:00:00.033182,RA:00:01:02:03:00,RA:00:03:06:09:4C,-95,140.135.12.1  08:00:00.034303,RA:00:01:02:03:00,RA:00:03:06:09:24,-94,140.135.12.1  08:00:00.035423,RA:00:01:02:03:00,RA:00:03:06:09:05,-79,140.135.12.1  08:00:00.036544,RA:00:01:02:03:00,RA:00:03:06:09:39,-89,140.135.12.1  08:00:00.037684,RA:00:01:02:03:00,RA:00:03:06:09:01,-79,140.135.12.1 |

經由上列資料計算得到的犯罪嫌疑人移動軌跡，包含 Time、嫌疑人之MAC、 IP及(x, y)，部份犯罪嫌疑人的紀錄如下，詳細資料如附錄。

|  |
| --- |
| 08:00:10,RA:00:01:02:03:00,140.135.12.1,(19.708589,19.916560)  08:00:20,RA:00:01:02:03:00,140.135.12.2,(24.158189,19.005637)  08:00:30,RA:00:01:02:03:00,140.135.12.3,(4.672225,25.494640)  08:00:40,RA:00:01:02:03:00,140.135.12.4,(7.862586,28.279530)  08:00:50,RA:00:01:02:03:00,140.135.12.5,(20.348902,16.919484)  08:01:00,RA:00:01:02:03:00,140.135.12.6,(19.063817,30.147895)  08:01:10,RA:00:01:02:03:00,140.135.12.7,(19.708589,19.916560)  08:01:20,RA:00:01:02:03:00,140.135.12.8,(18.734863,24.184574)  08:01:30,RA:00:01:02:03:00,140.135.12.9,(20.969376,50.661135)  08:01:40,RA:00:01:02:03:00,140.135.12.10,(35.607115,27.020182)  08:01:50,RA:00:01:02:03:00,140.135.12.11,(39.983358,43.253613)  08:02:00,RA:00:01:02:03:00,140.135.12.12,(23.182552,18.266364)  08:02:10,RA:00:01:02:03:00,140.135.12.13,(33.273331,7.260040)  08:02:20,RA:00:01:02:03:00,140.135.12.14,(26.912152,39.385229)  08:02:30,RA:00:01:02:03:00,140.135.12.15,(11.887645,41.578153)  08:02:40,RA:00:01:02:03:00,140.135.12.16,(26.797431,43.198617)  08:02:50,RA:00:01:02:03:00,140.135.12.17,(32.981844,51.334821)  08:03:00,RA:00:01:02:03:00,140.135.12.18,(30.372871,45.768401)  08:03:10,RA:00:01:02:03:00,140.135.12.19,(27.600457,44.259295)  08:03:20,RA:00:01:02:03:00,140.135.12.20,(23.867709,44.838517)  08:03:30,RA:00:01:02:03:00,140.135.12.21,(31.628935,47.584422)  08:03:40,RA:00:01:02:03:00,140.135.12.22,(26.799740,44.200260)  08:03:50,RA:00:01:02:03:00,140.135.12.23,(14.551845,47.107121)  08:04:00,RA:00:01:02:03:00,140.135.12.24,(18.683174,45.485091)  08:04:10,RA:00:01:02:03:00,140.135.12.25,(24.433889,41.281691)  08:04:20,RA:00:01:02:03:00,140.135.12.26,(30.522948,43.304689)  08:04:30,RA:00:01:02:03:00,140.135.12.27,(3.551200,36.432774)  08:04:40,RA:00:01:02:03:00,140.135.12.28,(17.658256,34.520439)  08:04:50,RA:00:01:02:03:00,140.135.12.29,(20.862325,29.038029)  08:05:00,RA:00:01:02:03:00,140.135.12.30,(21.808673,33.856673)  08:05:10,RA:00:01:02:03:00,140.135.12.31,(19.955050,31.494445)  08:05:20,RA:00:01:02:03:00,140.135.12.32,(12.859679,34.287258) |

1. **測試時程、程序與責任 (Testing Schedule， Procedure， Responsibility)**
   1. 測試時程 (Testing Schedule)
2. 時程

|  |  |
| --- | --- |
| 測試項目 | 時間 |
| 數位鑑識區塊鏈模組整合測試  ( Integration Test ) | 2018/05/01~2018/05/03 |
| 數位鑑識區塊鏈模組接受度測試  ( Acceptance Test ) | 2018/05/04~2018/05/06 |
| 數位證據視覺化模組整合測試  ( Integration Test ) | 2018/05/02~2018/05/04 |
| 數位證據視覺化模組接受度測試  ( Acceptance Test ) | 2018/05/05~2018/05/07 |

1. 查核

|  |  |
| --- | --- |
| 測試項目 | 時間 |
| 數位鑑識區塊鏈模組整合測試  ( Integration Test ) | 2018/05/07 |
| 數位鑑識區塊鏈模組接受度測試  ( Acceptance Test ) | 2018/05/08 |
| 數位證據視覺化模組整合測試  ( Integration Test ) | 2018/05/08 |
| 數位證據視覺化模組接受度測試  ( Acceptance Test ) | 2018/05/09 |

* 1. 測試程序 (Testing Procedure)

由程式開發人員進行整合測試，並且修正錯誤。再者，由相關聯的模組程式開發人員進行查核。當完成各個模組整合後，由程式開發以外的人員執行接受度測試，並由程式開發人員查核與除錯。

* + 1. 整合測試(Integration Testing)

使用案例(Use Case)如下圖3所示，數位鑑識區塊鏈模組主要測試數位鑑識區塊鏈產生模組與數位鑑識區塊鏈驗證模組，主要檢驗數位鑑識區塊鏈產生模組是否能正常執行產生區塊鏈之功能，且能儲存於伺服器端之資料庫中。再者，檢驗數位鑑識區塊鏈驗證模組是否能執行驗證區塊鏈之正確性與有效性的功能，且能顯示驗證之結果。數位證據視覺化模組主要測試使用者介面模組、資料查詢與傳送模組及視覺化模組。主要檢驗數位證據視覺化模組是否能依照使用者所提出之需求，正常執行不同之視覺化功能。

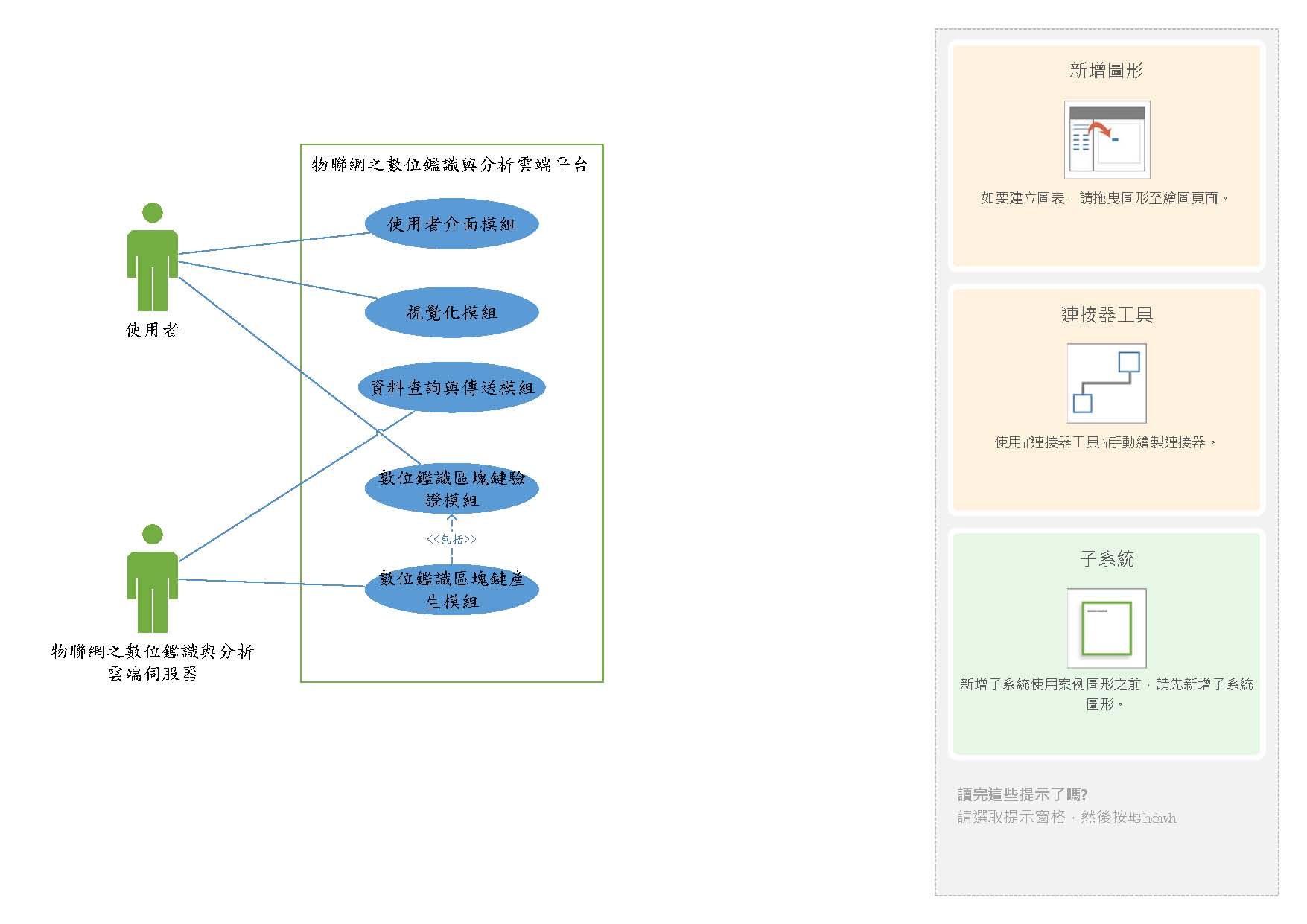


圖3. 物聯網之數位鑑識與分析雲端平台之使用案例

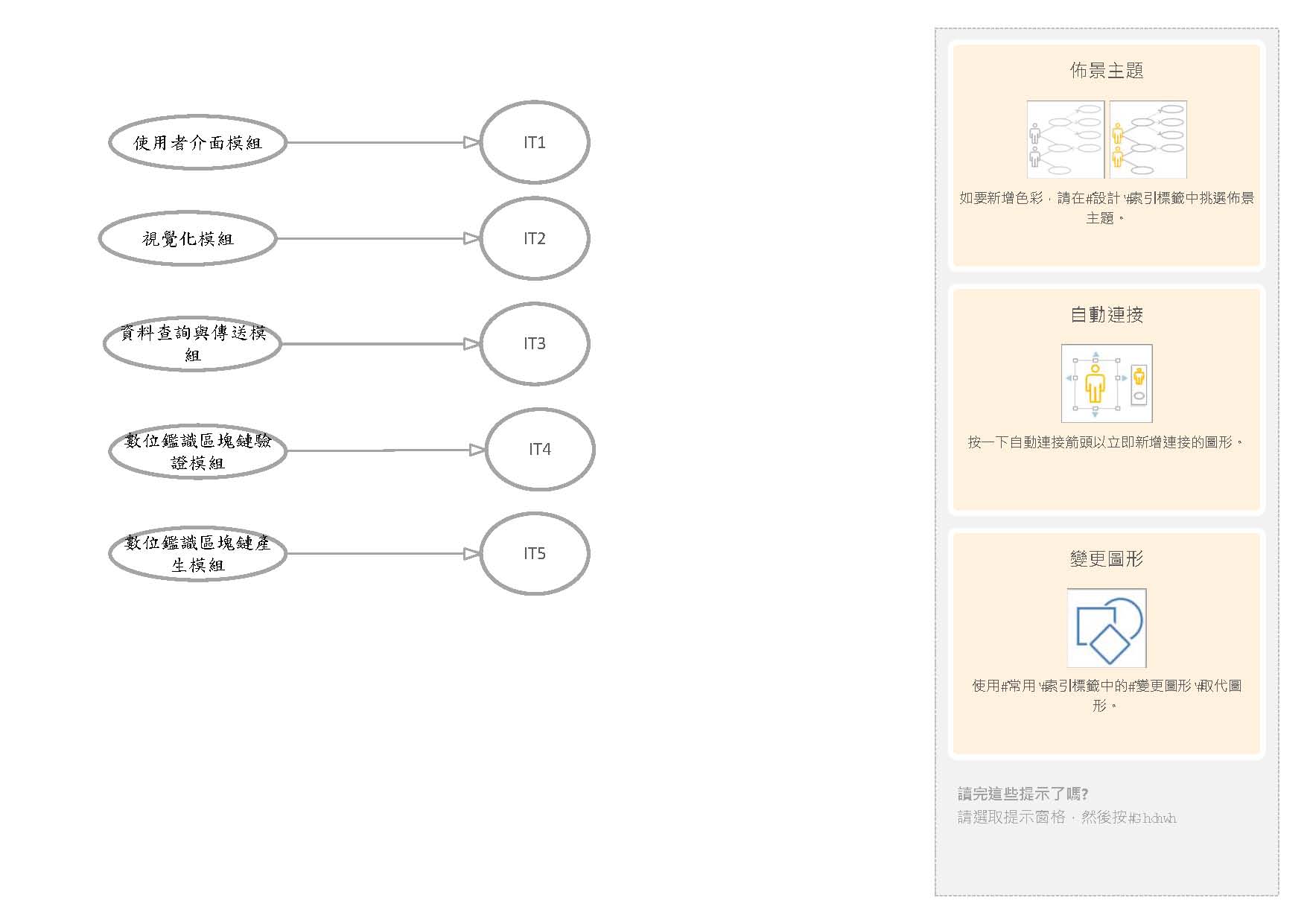


圖4. 物聯網之數位鑑識與分析雲端平台之整合測試

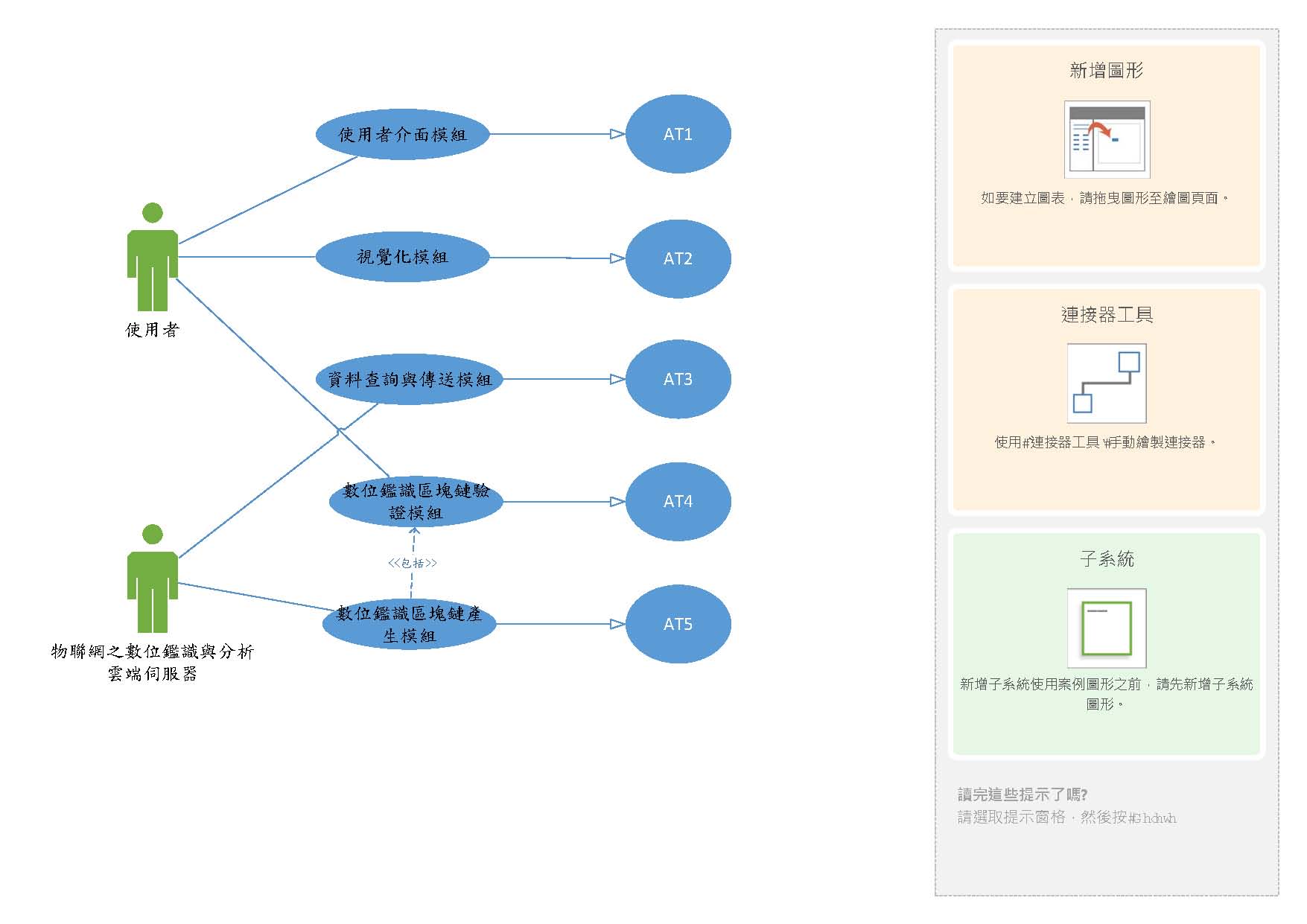


圖5. 物聯網之數位鑑識與分析雲端平台之接受度測試

* 1. 人員職責分配 (Personnel Responsibility Assignment)

表2. 人員職責分配表

|  |  |
| --- | --- |
| Testing Activities | Personnel |
| Acceptance Testing (AT1) | 唐可欣 |
| Acceptance Testing (AT2) | 李奕霈 |
| Acceptance Testing (AT3) | 陳囿精 |
| Acceptance Testing (AT4) | 謝美貞 |
| Acceptance Testing (AT5) | 沈芯羽 |
| Integration Testing (IT1) | 鄔育琳 |
| Integration Testing (IT2) | 黃映榕 |
| Integration Testing (IT3) | 沈芯羽 |
| Integration Testing (IT4) | 林子煒 |
| Integration Testing (IT5) | 陳囿精 |

1. **測試案例 (Test Cases)**
   1. 整合測試案例 (Integration Testing Cases)
      1. IT1測試案例

目的：

1. 驗證使用案例1。
2. 使用者可以經由使用者介面模組查詢相關數位鑑別資訊。

表3. IT1測試案例

|  |  |  |
| --- | --- | --- |
| Identification | IT1 | |
| Name | 整合至VDF模組 | |
| Tested target |  | |
| Reference |  | |
| Severity |  | |
| Instructions | *Actor actions* | *System responses* |
| 1.使用者輸入查詢資訊 |  |
|  | 2.資料查詢與傳送模組將從數位鑑識資料庫取得相關資訊。 |
|  | 3.數位鑑識區塊驗證模組驗證區塊鏈證據之正確性。 |
|  | 4.系統顯示數位證據之視覺化 |
| Expected result | 1. 依據使用者所輸入之查詢條件顯示數位證據之視覺化。 2. 驗證驗證區塊鏈證據之正確性。 | |
| Cleanup | 清除所有查詢資料與結果 | |

* + 1. IT2測試案例

目的：

1. 驗證使用案例2。
2. 視覺化模組將根據使用者所查詢之條件與驗證結果，產生視覺化之圖形並回傳至使用者介面模組。

表4. IT2測試案例

|  |  |  |
| --- | --- | --- |
| Identification | IT2 | |
| Name | 整合至VDF模組 | |
| Tested target |  | |
| Reference |  | |
| Severity |  | |
| Instructions | *Actor actions* | *System responses* |
|  | 1. 根據使用者所查詢之條件與驗證結果，產生視覺化之圖形。 |
|  | 2. 回傳至使用者介面模組。 |
| Expected result | 1. 將查詢條件與驗證結果產生視覺化之圖形。  2. 回傳至使用者介面模組。 | |
| Cleanup | 清除所有查詢資料與結果 | |

* + 1. IT3測試案例

目的：

1. 驗證使用案例3。
2. 資料查詢模組執行資料查詢與傳送，找出符合查詢條件之相關數位證據並傳送至數位鑑識區塊鏈驗證模組。

表5. IT3測試案例

|  |  |  |
| --- | --- | --- |
| Identification | IT3 | |
| Name | 整合至VDF模組 | |
| Tested target |  | |
| Reference |  | |
| Severity |  | |
| Instructions | *Actor actions* | *System responses* |
|  | 1. 資料查詢模組執行資料查詢。 |
|  | 2.若有符合條件之數位證據，將相關資訊傳送至數位鑑識區塊鏈驗證模組。 |
| Expected result | 1. 當查詢到有符合條件之數位證據，將相關資訊傳送至數位鑑識區塊鏈驗證模組。 | |
| Cleanup |  | |

* + 1. IT4測試案例

目的：

1. 驗證使用案例4。
2. 根據數位鑑識區塊鏈產生模組所產生之數位證據之區塊鏈的相關資訊，數位鑑識區塊鏈驗證模組驗證數位證據之正確性，並傳送驗證結果至視覺化模組。

表5. IT4測試案例

|  |  |  |
| --- | --- | --- |
| Identification | IT4 | |
| Name | 整合至DFB模組 | |
| Tested target |  | |
| Reference |  | |
| Severity |  | |
| Instructions | *Actor actions* | *System responses* |
|  | 1. 根據數位鑑識區塊鏈產生模組，數位鑑識區塊鏈驗證模組驗證數位證據之正確性。 |
|  | 2. 傳送驗證結果至視覺化模組。 |
| Expected result | 1. 驗證數位證據之正確性並傳送驗證結果。 | |
| Cleanup |  | |

* + 1. IT5測試案例

目的：

1. 驗證使用案例5。
2. 根據匿蹤犯罪源點網路鑑識之資料傳輸模組所傳送之資訊，數位鑑識區塊鏈產生模組產生數位證據之區塊鏈的相關訊息。

表5. IT5測試案例

|  |  |  |
| --- | --- | --- |
| Identification | IT5 | |
| Name | 整合至DFB模組 | |
| Tested target |  | |
| Reference |  | |
| Severity |  | |
| Instructions | *Actor actions* | *System responses* |
|  | 1. 匿蹤犯罪源點網路鑑識之資料傳輸模組傳送相關資訊。 |
|  | 2. 數位鑑識區塊鏈產生模組產生數位證據之區塊鏈的相關訊息。 |
|  |  |
| Expected result | 1. 當接收匿蹤犯罪源點網路鑑識之資料傳輸模組所傳送的相關資訊時，數位鑑識區塊鏈產生模組將產生數位證據之區塊鏈的相關訊息。 | |
| Cleanup |  | |

* 1. 接受測試案例 (Acceptance Testing Cases)
     1. AT1測試案例

目的：

1. 驗證查詢流程的使用者案例各項流程是否被使用者所接受。

表6. AT1測試案例

|  |  |
| --- | --- |
| Identification | AT1 |
| Name | 整合至VDF模組 |
| Tested target |  |
| Reference | VDF-UIR-001、VDF-UIR-0022、VDF-IIR-001、VDF-IIR-0022 |
| Severity |  |
| Instructions & Expected result | 1. 依據使用者所輸入之查詢條件顯示數位證據之視覺化。 2. 驗證驗證區塊鏈證據之正確性。 |
| Cleanup |  |

* + 1. AT2測試案例

目的：

1. 驗證視覺化的使用者案例各項流程是否被使用者所接受。

表7. AT2測試案例

|  |  |
| --- | --- |
| Identification | AT2 |
| Name | 整合至VDF模組 |
| Tested target |  |
| Reference | VDF-EIR-001、VDF-EIR-002、VDF-IIR-001、VDF-IIR-002 |
| Severity |  |
| Instructions & Expected result | 1. 將查詢條件與驗證結果產生視覺化之圖形。 2. 回傳至使用者介面模組。 |
| Cleanup |  |

* + 1. AT3測試案例

目的：

1. 驗證資料查詢與傳送流程的使用者案例各項流程是否被使用者所接受。

表8. AT3測試案例

|  |  |
| --- | --- |
| Identification | AT3 |
| Name | 整合至VDF模組 |
| Tested target |  |
| Reference | DFB-EIR-001、DFB-EIR-002 |
| Severity |  |
| Instructions & Expected result | 1. 當查詢到有符合條件之數位證據，將相關資訊傳送至數位鑑識區塊鏈驗證模組。 |
| Cleanup |  |

* + 1. AT4測試案例

目的：

1. 數位鑑識區塊鏈驗證流程的使用者案例各項流程是否被使用者所接受。

表9. AT4測試案例

|  |  |
| --- | --- |
| Identification | AT4 |
| Name | 整合至DFB模組 |
| Tested target |  |
| Reference | DFB-EIR-001、DFB-EIR-002、VDF-EIR-001、VDF-EIR-002 |
| Severity |  |
| Instructions & Expected result | 1. 驗證數位證據之正確性並傳送驗證結果。 |
| Cleanup |  |

* + 1. AT5測試案例

目的：

1. 數位鑑識區塊鏈產流程的使用者案例各項流程是否被使用者所接受。

表10. AT5測試案例

|  |  |
| --- | --- |
| Identification | AT5 |
| Name | 整合至DFB模組 |
| Tested target |  |
| Reference | AIMTS-EIR-003 |
| Severity |  |
| Instructions & Expected result | 1. 當接收匿蹤犯罪源點網路鑑識之資料傳輸模組所傳送的相關資訊時，數位鑑識區塊鏈產生模組將產生數位證據之區塊鏈的相關訊息。 |
| Cleanup |  |

1. **測試結果與分析 (Test Results and Analysis)**
   1. 整合測試案例 (Integration Testing Cases)
2. 整合測試案例結果

|  |  |  |
| --- | --- | --- |
| Test Case # | Results (Pass/Fail) | Comment |
| IT1 | Pass |  |
| IT2 | Pass |  |
| IT3 | Pass |  |
| IT4 | Pass |  |
| IT5 | Pass |  |

* 1. 接受測試案例 (Acceptance Testing Cases)

1. 接受度測試案例結果

|  |  |  |
| --- | --- | --- |
| Test Case # | Results (Pass/Fail) | Comment |
| AT1 | Pass |  |
| AT2 | Pass |  |
| AT3 | Pass |  |
| AT4 | Pass |  |
| AT5 | Pass |  |

**Appendix A： 測試案例 (Test Cases)**

|  |
| --- |
| 08:00:00.001460,RA:00:01:02:03:00,RA:00:03:06:09:41,-96,140.135.12.1  08:00:00.002581,RA:00:01:02:03:00,RA:00:03:06:09:3E,-92,140.135.12.1  08:00:00.003702,RA:00:01:02:03:00,RA:00:03:06:09:2C,-84,140.135.12.1  08:00:00.004842,RA:00:01:02:03:00,RA:00:03:06:09:30,-90,140.135.12.1  08:00:00.005962,RA:00:01:02:03:00,RA:00:03:06:09:1B,-59,140.135.12.1  08:00:00.007083,RA:00:01:02:03:00,RA:00:03:06:09:2E,-87,140.135.12.1  08:00:00.008203,RA:00:01:02:03:00,RA:00:03:06:09:20,-89,140.135.12.1  08:00:00.009324,RA:00:01:02:03:00,RA:00:03:06:09:01,-79,140.135.12.1  08:00:00.010444,RA:00:01:02:03:00,RA:00:03:06:09:07,-89,140.135.12.1  08:00:00.011565,RA:00:01:02:03:00,RA:00:03:06:09:05,-79,140.135.12.1  08:00:00.015438,RA:00:01:02:03:00,RA:00:03:06:09:30,-90,140.135.12.1  08:00:00.016558,RA:00:01:02:03:00,RA:00:03:06:09:1C,-76,140.135.12.1  08:00:00.017678,RA:00:01:02:03:00,RA:00:03:06:09:1B,-58,140.135.12.1  08:00:00.020259,RA:00:01:02:03:00,RA:00:03:06:09:1C,-76,140.135.12.1  08:00:00.022206,RA:00:01:02:03:00,RA:00:03:06:09:1A,-56,140.135.12.1  08:00:00.023326,RA:00:01:02:03:00,RA:00:03:06:09:1C,-76,140.135.12.1  08:00:00.027954,RA:00:01:02:03:00,RA:00:03:06:09:25,-96,140.135.12.1  08:00:00.029821,RA:00:01:02:03:00,RA:00:03:06:09:38,-87,140.135.12.1  08:00:00.030941,RA:00:01:02:03:00,RA:00:03:06:09:37,-86,140.135.12.1  08:00:00.032061,RA:00:01:02:03:00,RA:00:03:06:09:19,-62,140.135.12.1  08:00:00.033182,RA:00:01:02:03:00,RA:00:03:06:09:4C,-95,140.135.12.1  08:00:00.034303,RA:00:01:02:03:00,RA:00:03:06:09:24,-94,140.135.12.1  08:00:00.035423,RA:00:01:02:03:00,RA:00:03:06:09:05,-79,140.135.12.1  08:00:00.036544,RA:00:01:02:03:00,RA:00:03:06:09:39,-89,140.135.12.1  08:00:00.037684,RA:00:01:02:03:00,RA:00:03:06:09:01,-79,140.135.12.1  08:00:00.038804,RA:00:01:02:03:00,RA:00:03:06:09:1C,-76,140.135.12.1  08:00:00.039925,RA:00:01:02:03:00,RA:00:03:06:09:07,-89,140.135.12.1  08:00:00.041045,RA:00:01:02:03:00,RA:00:03:06:09:1E,-82,140.135.12.1  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**Appendix B： 參考資料 (References)**

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