# Digital Solutions 2019 v1.2

## IA3 assessment instrument

### Project - folio (25%)

#### Assessment objectives

This assessment instrument is used to determine student achievement in the following objectives:

1. recognise and describe key elements of an application, components of data exchange systems, and data security processes

2. symbolise and explain data interface, structures and specifications; data flow relationships within and between systems; and digital methods of exchanging data

3. analyse a data exchange problem and information related to data security

4. determine data exchange system requirements, a security strategy for data, and prescribed and self-determined criteria

5. synthesise information and ideas to determine selected data, algorithms and coded components of data exchange solutions

6. generate components of the data exchange solution

7. evaluate impacts, coded components and a data exchange solution against prescribed and self-determined criteria to make refinements and justified recommendations

8. make decisions about and use mode-appropriate features, written language and conventions for a technical audience.

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| **Subject** | Digital Solutions | **Instrument no.** | IA3 |
| **Technique** | Project – folio | | |
| **Unit** | Unit 4: Digital impacts | | |
| **Topics** | Topic 1: Digital methods for exchanging data  Topic 2: Complex digital data exchange problems and solution requirements  Topic 3: Prototype digital data exchanges | | |
| **Conditions** | | | |
| **Duration** | Up to 6 weeks | | |
| **Mode** | Multimodal | **Length** | Length:   * 6-8 A3 pages * 1-2 A4 pages of code with annotations * 1-2 minute demonstration of the functionality of the data exchange solution by video recording |
| **Individual / group** | Individual | **Other** | * The reference list and appendixes are not included in the page count. * Schools implement authentication strategies that reflect QCAA guidelines. |
| **Resources available** | * Computers * Internet * Stimulus (technical specifications) | | |
| **Context** | | | |
| Queensland is home to some of the most dangerous fauna in the world. Concerned Queensland residents in high-risk urban bushland pockets would like an application that can document and share their dangerous creature sightings with other registered users in their areas. The local CSIRO are interested in funding and administering this application, as they believe the reporting and documenting of these cases could assist with wildlife preservation and research. | | | |
| **Task** | | | |
| Read the technical specifications (stimulus material) and then present a proof of concept for a new application for dangerous animal tracking. The new application must:   * Let client-side users to connect to a server, and securely upload and access shared data * Server-side management including API use, and serialisation of client data on requests   Document use of the Digital Solutions problem-solving process in responding to the problem and generate a component of the data exchange solution.  The technical specifications provide further details about requirements for the new application. | | | |
| **To complete this task, you must:** | | | |
| **Part 1 – Research and investigation**   * recognise and describe key elements of   + a data exchange application   + components of data exchange systems   + data security processes * symbolise using mind maps and one or more of constructed sketches, annotated diagrams, images or screenshots * explain   + data interface, data structures and data specifications   + digital methods of exchanging data * analyse the data exchange problem to identify   + the data structures, including data input and output requirements   + data exchange methods * determine data exchange system requirements * evaluate against prescribed and self-determined criteria the most suitable process for exporting and importing data between the two digital systems.   **Part 2 – Data exchange solution**   * symbolise using mind maps and one or more of constructed sketches, annotated diagrams, images or screenshots * explain   + data flow relationships within and between systems   + programming features and ideas using annotated code segments   + algorithms communicated in pseudocode * determine prescribed and self-determined criteria * synthesise data, algorithm and coded component ideas to generate a data exchange solution that stimulates the exchange of data between two digital systems; the solution will receive data in one format and programmatically transform it into another format for sharing/displaying * evaluate the   + accuracy of code after testing and identify errors and actions to make improvements   + digital data exchange solution against prescribed and self-determined criteria   + functionality, useability and efficiency of the components of the digital solution * make refinements and justified recommendations for current and future improvements.   **Part 3 – Impacts**   * recognise and describe key elements of   + risks associated with storing and accessing data   + digital security strategies, including authentication and encryption strategies * analyse a data security problem to identify risks to   + the system   + data security and privacy * determine a security strategy for data * evaluate against prescribed and self-determined criteria the impact of data transmission on personal, social and economic needs * recommend an appropriate strategy to increase data security. | | | |
| **Stimulus** | | | |
| See Technical specifications | | | |
| **Checkpoints** | | | |
| □ Term 3 Week 2: Submit data requirements, identification of algorithms and some code and user interface | | | |
| □ Term 3 Week 4: Complete draft submission | | | |
| □ Term 3 Week 6: Final submission | | | |

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| **Criterion** | **Marks allocated** | **Result** |
| **Retrieving and comprehending**  Assessment objectives 1, 2 | 6 |  |
| **Analysing**  Assessment objectives 3, 4 | 7 |  |
| **Synthesising and evaluating**  Assessment objectives 5, 6, 7 | 8 |  |
| **Communicating**  Assessment objective 8 | 4 |  |
| **Total** | 25 |  |
| **Authentication strategies** | | |
| * Students will provide documentation of their progress at indicated checkpoints. | | |
| * Students must acknowledge all sources. | | |
| * Students must submit a declaration of authenticity. | | |
| * The teacher will collect copies of the student response and monitor at key junctures. | | |
| * The teacher will conduct interviews or consultations with each student as they develop the response. | | |
| **Scaffolding** | | |
| Your response must include:   * headings that organise and communicate the iterative phases of the Digital Solutions problem-solving process * source referencing, using the school’s in-text referencing style * four A3 pages presenting research and investigations, including sample code on one A4 page (Part 1 — Research and investigation) * three A3 pages presenting the web application, including sample code on one A4 page (Part 2 — Data exchange solution) * one A3 page on impacts (Part 3 — Impacts). | | |

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# Stimulus

## Technical specifications

### Identification

CSIRO are interested in funding an application to allow registered users to log their encounters or sightings with dangerous Queesland fauna. A proof of concept is required to demonstrate the planning and data transfer functionality of this new application. The client-side application will:

* Allow users to record information about a wildlife encounter
* use a live geolocator API to mark sighting location
* upload a tagged fauna encounter event to a centralised web server
* request live serialised or rendered data of other resident encounters

The server-side component will:

* record and manage tagged data using appropriate data structures and data storage techniques
* research sightings where possible using the QLD Government's WildNet API
* include, or link to, relevant WildNet API research research in resident requested sightings
* listen and deliver live data upon request via both serialised and rendered formats
* securely authenticate users via session variables and hashed passwords
* generate reports, delivering these in formats for both print and web readability.

The proof of concept involves:

* developing a low-fidelity prototype of the application for local residents.
* generating the data exchange component that simulates exchange of data between digital systems. The solution will receive data in one format and programmatically transform it into another format for sharing and displaying.
* evaluating impacts and making recommendations for improving data security during transfer.
* developing a video to demonstrate data transfer functionality.

### Interactions

Proto-personas have been developed for potential users of the web application (see Figure 1 below).

###### Figure 1: User profiles for the new web application

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| --- | --- |
|  | Costas   * Lives in Cairns * Area prone to taipans, crocodiles, Irukandji and cassowaries * Has a large property close to a rainforest area and wants to help preserve the local ecology |
|  | Freya   * Lives halfway between Brisbane and the Gold Coast on an acreage and is a scientist for the CSIRO St Lucia branch. * The area she lives in is prone to redback spiders, brown snakes, and (offshore) great white sharks. * Studied ecological sustainability and looking to map patterns and trends of fauna from the data acquired. |
|  | Wayne   * Wayne is 18 years old and works full time in Mackay * Wayne likes driving his ute and fishing. He isn’t a big environmentalist but if he sees a big crocodile or box jellyfish he likes to share his find online. |

### Component Specifications

#### Data

The new application must:

* Make use of publicly available APIs from
  + A geolocator API, suggested:  
    <https://www.mapbox.com/api-documentation/>
  + Wildnet Data  
    <https://data.qld.gov.au/dataset/qld-wildlife-data-api>
  + The WildNet data is free, but the suggested Mapbox API requires a free signup for a public API key. It is suggested that you avoid sharing identifying details if signing up.

The client-side application must:

* Allow users to authenticate, and store their passwords using a secure hash algorithm.
* Record relevant data about the dangerous fauna
  + Type of animal (e.g. “snake”, “spider”, “crocodile”, “shark”)
  + A brief field for user comments or notes
  + Location GPS co-ordinates
  + Automatic date time stamp upon submission
* Access existing data from other user sightings in their choice of format:
  + Serialised (JSON)
  + Rendered HTML via a web browser

The server-side application must:

* Store user sighting data
* Supplement the sighting data with any related, relevant research or information acquired from the WildNet API.
  + If the information is brief, it could be appended to the users sighting report
  + If the information is exhaustive, a link to the information could be appended instead
* Serve the recorded data to a registered user upon request via their preferred format – via web render or serialised string
* Develop reports for print or web format, viewable on request by CSIRO employees, that includes:
  + a static image of Queensland superimposed with all sighting location markers
    - This request requires the use of the location API service

#### User interface / experience

The new web application must:

* be browser independent, responsive and / or adaptive
* allow users to access data in their preferred formats where possible (JSON vs HTML)
* provide administrator back end functionality from a web interface
* allow administrators to download reports in print or web formats
* provide suitable timeout or disallowed authentication messages on failure of requested resources

#### Code

The new application must include:

* an algorithm to retrieve, process and display the data from the API’s
* server-side code to:
  + listen, record and append user fauna encounter data
  + develop media ready reports in varying formats on-demand
  + deliver live client-side data in serialised or rendered formats
  + hash and match password information and manage session variables
* client-side code to:
  + listen for changes in geolocation and update GPS position
  + display live data that will be logged on trigger event
  + render requested data in a format desired by the client
* efficient and accurate code.

### References

* Queensland Government 2018, Queensland Wildlife Data API,   
  <https://data.qld.gov.au/dataset/qld-wildlife-data-api>
* Mapbox 2018, Mapbox API documentation,  
  <https://www.mapbox.com/api-documentation/>

Instrument-specific marking guide

Criterion: Retrieving and comprehending

### Assessment objectives

1. recognise and describe key elements of an application, components of data exchange systems, and data security processes

2. symbolise and explain data interface, structures and specifications; data flow relationships within and between systems; and digital methods of exchanging data

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| **The student work has the following characteristics:** | **Marks** |
| * accurate and discriminating recognition and discerning description of key elements of an application, components of data exchange systems, and data security processes * adept symbolisation and discerning explanation of data interface, structures and specifications; data flow relationships within and between systems; and digital methods of exchanging data. | 5-6 |
| * appropriate recognition and description of key elements of an application, components of data exchange systems, and data security processes * competent symbolisation and appropriate explanation of data interface, structures and specifications; data flow relationships within and between systems; and digital methods of exchanging data. | 3-4 |
| * variable recognition and superficial description of elements of an application, components of data exchange systems, or data security processes * variable symbolisation and superficial explanation of aspects of data interface, data flow relationships or digital methods of exchanging data. | 1-2 |
| * does not satisfy any of the descriptors above. | 0 |

Criterion: Analysing

### Assessment objectives

3. analyse a data exchange problem and information related to data security

4. determine data exchange system requirements, a security strategy for data, and prescribed and self-determined criteria

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| **The student work has the following characteristics:** | **Marks** |
| * insightful analysis of the data exchange problem and relevant information related to data security to identify the data structures, data exchange methods, risks to data and code components * astute determination of data exchange requirements, security strategy for data, code for the data conversion program and essential prescribed and self-determined criteria. | 6-7 |
| * considered analysis of the data exchange problem and relevant information related to data security to identify the data structures, data exchange methods, risks to data and code components * logical determination of data exchange requirements, security strategy for data, code for the data conversion program and effective prescribed and self-determined criteria. | 4-5 |
| * appropriate analysis of the data exchange problem and information related to data security to identify the data structures, data exchange methods, risks to data and code components * reasonable determination of data exchange requirements, security strategy for data or code for the data conversion program and some criteria. | 2-3 |
| * makes statements about aspects of the data exchange problem, data structures, data exchange methods, risks to data or code components * vague determination of some data exchange requirements, security strategy for data and some criteria. | 1 |
| * does not satisfy any of the descriptors above. | 0 |

Criterion: Synthesising and evaluating

### Assessment objectives

5. synthesise information and ideas to determine selected data, algorithms and coded components of data exchange solutions

6. generate components of the data exchange solution

7. evaluate impacts, coded components and a data exchange solution against prescribed and self-determined criteria to make refinements and justified recommendations

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| **The student work has the following characteristics:** | **Marks** |
| * coherent and logical synthesis of relevant information and ideas to determine selected data, algorithms and coded components of data exchange solutions * purposeful generation of efficient components of the data exchange solution * critical evaluation of impacts, coded components and a data exchange solution against essential prescribed and self-determined criteria to make discerning refinements of code and astute recommendations justified by data. | 7-8 |
| * logical synthesis of relevant information and ideas to determine data, algorithms and coded components of data exchange solutions * effective generation of components of a data exchange solution * reasoned evaluation of impacts, coded components and the digital data exchange solution against effective criteria to make effective refinements of code and considered recommendations justified by data. | 5-6 |
| * simple synthesis of information or ideas to determine data, algorithms and coded components of data exchange solutions * adequate generation of components of the data exchange solution * feasible evaluation of impacts, coded components and a digital data exchange solution against some criteria to make adequate refinements of code and fundamental recommendations justified by data. | 3-4 |
| * unclear combinations of information or ideas to determine data, algorithms or coded components of data exchange solutions * superficial evaluation of impacts, or the digital data exchange solution, against criteria. | 1-2 |
| * does not satisfy any of the descriptors above. | 0 |

Criterion: Communicating

### Assessment objectives

8. make decisions about and use mode-appropriate features, written language and conventions for a technical audience

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| **The student work has the following characteristics:** | **Marks** |
| * discerning decision-making about, and fluent use of   + written and visual features to communicate about a solution   + language for a technical audience   + grammatically accurate language structures   + referencing and project conventions. | 3-4 |
| * variable decision-making about, and inconsistent use of   + written and visual features   + suitable language   + grammar and language structures   + referencing or project conventions. | 1-2 |
| * does not satisfy any of the descriptors above. | 0 |