Annex F- Land Title Registration System (LTRS)

The Bermuda Government is seeking proposals for a new, modern **Land Title Registration System (LTRS)**. This system must replace the existing infrastructure with a robust, secure, and internationally compliant solution. The LTRS must integrate seamlessly with existing Bermuda Government Information Systems (GIS) and network architecture.

Technical and Systems Requirements

Data Model and Structure

The LTRS must implement a data structure that adheres to the **Land Administration Domain Model (LADM)** (ISO 19152:2012) for international standards and future extensibility.

- **Core Entities:** The system must maintain core data entities: **Parcel**, **Strata**, **Lease**, **Legal Entity (Party)**, and **Instrument**.
- **Data Attributes:** The system must capture the following specific attributes:
    - **Parcel Particulars:** Legal Description, Metes and Bounds, Appurtenances, Location of Property, Title status, Crown Land status, and Current Boundary Dispute flags.
    - **Proprietorship and Encumbrance Entries:** Entry Number, Entry Instrument, Entry Text, and Terminate Instrument/Text details.
    - **Instrument:** Instrument Number, Status, Start Date (Lodgment Date and time), Signed Date, Payment Date, and Summary.
- **Instrument Coding:** The system must support the structured coding of Instruments, including the existing custom formats:
    - `RJ-[Agreement Date Started|yyyy][Agreement Unique Number|6]` for Judgement Instruments (Judgement Register).
    - `LR-[Agreement Date Started|yyyy][Agreement Unique Number|6]` for Mutation Instruments. That is all Land Registry applications
    - `DR- Agreement Date Started|yyyy][Agreement Unique Number|6] for Deed Registry Applications.`
- **Immutable Data Anchoring:** The system must offer a mechanism, such as **blockchain-based hashing/fingerprinting**, to create a verifiable, tamper-proof record of every land title and transaction, providing an end-to-end audit trail.

Security and Network

The system must operate within the existing Bermuda Network architecture, including Virtualized Servers.

- **Deployment:** Must be deployable on the existing Bermuda Network and Virtualized Server infrastructure.
- **Protocol Security:** Access from the Web Server to the application via a Landfolio Application Programming Interface (API) (Internet Information Services - IIS) and

Landfolio Back Office (IIS) must be secured using Hypertext Transfer Protocol (HTTP) 80 and Hypertext Transfer Protocol Secure (HTTPS) 443 protocols.

- **Database:** The system must use **SQL Server 2016 Web Edition** or a compatible version as the Database Server.
- **Database Structure:** The database must support separate instances or schema for Landfolio Production, Landfolio Staging, and SharePoint data.
- **Authentication:** Authentication must integrate with the existing **Domain Server** and **Domain controller**.
- **Access Control:** The application must support distinct, defined roles for **role-based access control**, including Receptionist, Cashier, Scanner, Registry Clerk, GIS Editor, Chief Surveyor, Registry Officer, and Portal User.
- **Multi-Factor Authentication (MFA):** Payment and Customer Service Portals must mandate MFA (e.g., Google, Microsoft, or magic link sign-in) for all authenticated users (Attorneys, Agents, and Landowners) accessing sensitive data or initiating financial transactions.
- **Self-Sovereign Identity (SSI) Readiness:** The system architecture should be prepared to integrate with future SSI solutions to reduce reliance on centralized identity storage and mitigate fraud risk.
- **Encryption and Segregation:** Must utilize **Secure Sockets Layer/Transport Layer Security (SSL/TLS)** encryption for data transmission. Customer support records and payment histories must be logically segregated with strict, fine-grained access controls.

System Requirements

Workflow Management

The system must utilize a **Business Process Model and Notation (BPMN) 2.0-compatible workflow engine** to enforce standardized and auditable transaction processes.

- **Workflow Definition:** The system must support the definition, execution, and tracking of multiple, distinct instrument workflows:
    - Bermuda Judgement Instrument Workflow.
    - Bermuda Mutation Instrument Workflow.
    - Bermuda Non Registered Instrument Workflow.
    - Bermuda Regular Instrument Workflow.
- **Branching and Decisions:** Workflows must allow for branching based on decisions, such as *Proceed* or *Missing Documents*.
- **Automated Actions:** The system must enable automated actions and status updates based on triggers, including:
    - Updating `Instrument.Status` to *In Process* upon adding a new instrument.
    - Updating `Instrument.Status` to *Cancelled* and setting `Instrument.End Date = Today` upon cancellation or failure to submit outstanding documents within a specified period.

    - Setting a Trigger action closed date +5 working days for submitting outstanding documents.
    - The ability to Delete: All Open Actions upon cancellation.
- **Ad Hoc Tasks:** Ad Hoc tasks and processes must be supported within workflows.
- **Automated Service Level Agreement (SLA) Tracking:** The system must allow the definition and tracking of time limits for each workflow step and generate alerts when a task approaches its deadline.

GIS Integration

The LTRO currently manages land parcel data using ESRI geographic information system (GIS) application ArcMap 10.5. This version is significantly outdated and in time, will no longer be supported. ArcGIS Pro is a modern, high-performance GIS platform used for data management. We anticipate that the new LTRS system will be able to integrate with ArcGIS Pro software.

- The LTRS system must be able to link title data, as recorded in registry with the parcel data layer, as maintained using ArcGIS Pro (or equivalent) in Cadastre. The link between registry and cadastre being the parcel ID. Updates to the parcel layer must be in real-time once map edits have been posted.
- The LTRS must support the full lifecycle of document handling and integration with the existing Geographic Information System (GIS) infrastructure.
    - **GIS Migration:** The system must be able to migrate the existing GIS infrastructure, specifically **ArcGIS Server 10.5** and **ShapeSync**.

The GIS platform must be able to:

- Create and manage enterprise geodatabases e.g. create or delete feature classes, feature datasets and tables; edit or copy data in an enterprise geodatabase.
- Manage advanced geodatabase functionality e.g. topologies, attribute rules
- Create and manage traditional and branch versioned data
- Create and modify dimensions
- Perform specialised editing operations e.g. construct polygons from features, planarize polygon features, split lines into COGO lines.
- Perform data validation checks e.g. attribute, event, feature integrity, polygon, polyline, spatial relationship.
- Create, configure and use parcel fabrics
- Create and manage ortho mapping workspaces

Document Management (Registry based)

- **Document Scanning:** Document management functionality must allow users to scan required paper documents.
- **File Attachment and Storage:** The system must support attaching scanned and electronic files to the instrument and storing them in the **SharePoint** repository.

Business Rule and Fee Calculation

The LTRS must implement complex business logic for automated fee calculation and core business operations.

- **Fee Calculation Logic:** The LTRS must implement complex business logic for fee calculation using **Formula Lookups** based on the Instrument Subtype and/or Condition Name.
- **Automated Fee Application:** The system must automatically calculate and apply fees, such as:
    - Standard Registration Fee of $104.00.
    - Variable First Registration of Property Fees based on value bands.
    - Registration of Lease Fees based on value bands.
- **Flexibility for Fee Structure:** The system must be highly configurable to support future policy changes, such as a shift toward low, fixed fees for routine services.

Notification and Indexing

- **Automated Notifications:** The system must generate automated email notifications to the Applicant for both missing documents and cancellations.
- **Indexing Functionality:** The **Indexing step** must enable the addition of parties with their types and the affected parcels to the instrument.
- **Post-Qualification Steps:** The LTRS must support the post-qualification steps, including updating Land Register Entries, and for changes in ownership, scheduling a Transfer Ownership action for each affected parcel.
- **Title Certificate Issuance:** The system must be capable of generating mandatory title certificates with advanced security features that are returned and cancelled upon a sale of the property.

Legal and Security Mechanisms

The system must support specific legal and security features to deliver **indefeasible title**.

- **Title Indemnity Fund:** The system must support the legal framework for a **Land Titles Indemnity Fund** to provide compensation for innocent parties who suffer loss due to property fraud.
- **Caution Mechanism:** The system must allow all persons to note and protect unwritten interests in land by registering a **Caution** on the Title Register, ensuring title certainty.

Payment and Customer Service Portals

Payment Portal (Cashier/Billing Module)

The payment portal must be transactional and integrate directly with the Instrument workflow for accurate, automated fee collection.

- **Centralized Billing API:** The core system must expose a **Billing Module API** capable of real-time, bidirectional secure integration with a third-party payment gateway.
- **Financial Integration:** The system must integrate with government financial systems (Banking and Treasury) to allow collection via various methods: credit cards, debit cards, cheques, and wire transfers.
- **Automated Fee Calculation and Transparency:**
    - The portal must automatically calculate fees based on Instrument Subtype and the valuation band using predefined Formula Lookups.
    - It must provide a detailed breakdown of the registration fee, transfer tax, and any stamp duties before payment is initiated.
- **Consolidated Payment:** The system must enable a user to pay multiple, separate fees (e.g., a registration fee, a search fee, and a stamp duty) in a single, secure transaction.
- **Payment Tracking and History:**
    - All payments must be linked directly to the Instrument ID and record the Payment Date and time.
    - Users must be able to access and print official payment receipts and a full history of all financial transactions within their personalized account dashboard.

Customer Service and Self-Service Portal

The Customer Service Portal must act as the primary 24/7 communication and information hub.

- **Centralized Case Management:**
    - Users must have a single dashboard to view and manage all open and closed support tickets regardless of submission channel (online form, email, or in-person logging).
    - The portal must allow real-time status tracking of all submitted Instruments and support requests.
- **Knowledge Base Integration:**
    - A comprehensive, searchable **knowledge base** (Frequently Asked Questions - FAQs, tutorials, step-by-step guides) must be a prominent feature.
    - The portal should use Intelligent Search (AI-powered or machine learning-driven) to recommend relevant articles ad records (both Deeds and Land Registry) based on user query input.
- **Digital Identity and Account Management:**
    - Authenticated users must be able to update their personal contact details (e.g., mailing address, email) directly, with changes flowing into the core Legal Entity (Party) data model for verification.
    - The portal must enable users to access personal historical data, such as past Instrument submissions and title abstracts.
- **Service Delivery Optimization:**

    - The ticket submission form must be customizable to capture essential upfront information, accelerating the triage process.
    - The system should support **AI Chatbots** for providing instant answers to low-complexity, high-volume questions.
    - The system should support a chat feature and help desk
- **Multichannel Synchronization:** The Customer Service Portal must integrate with back-office communication tools (e.g., internal email or Slack) to ensure real-time synchronization of support tickets and agent responses.

Required System Features

The LTRS should support features that are high-value additions that enhance security, efficiency, and long-term value. These features include;

- **Free/Libre Open-Source Software (FLOSS) Architecture:** Utilizing open-source components eliminates recurring license or royalty fees, significantly reducing the **Total Cost of Ownership (TCO)**.
- **Gateway E-Filing and Remote Access Portal:** This module directly supports external stakeholders like attorneys and banks, streamlining public interactions and enhancing transparency.
- **Esri Partner Solution:** Guarantees seamless, out-of-the-box integration with your existing ArcGIS Server and GIS data layers.
- **Self-Notarization Mechanism:** This function eliminates the need for manual, lengthy notarization processes, accelerating title issuance and simplifying the legal transaction lifecycle.
- **Systematic Land Titling (SLT) Support:** Customizable approval workflows and Digital Signatures can reduce the time required to issue a title from months to days or hours.