PORT AND CONTAINER SECURITY APPLICATION

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GENERAL

M2C technology will be used by AZ Global Research & Engineering Ltd. to build the system that will include port basin map, incoming and outgoing sea vessels, container terminals, sensitive objects within the port's perimeter and another special zones, roads and another objects as specified by the customer. It will be possible for the customer to "zoom-in" into any of the given objects to see status of the objects that it contains. It will be capable also to import 1B processing level satellite radar or multispectral images, to interface with GIS and databases, to run sophisticated models, including visual, and to support uncommon data formats for alphanumeric, graphical and multimedia data.

DEFAULT SYSTEM FUNCTIONALITY

AZ GLOBAL RESEARCH & ENGINEERING LTD. proposes as a starting point to offer to the customer the system that will provide the following functionality.

1. Real time monitoring of location and other related data

   It is assumed that monitored objects are equipped with active sensors that somehow send data about their status time to time. The standard procurement system monitors incoming notification messages through standard MS Outlook Express e-mail client. At this time the system is pre-set to monitor messages in CLS NovaCom format, but another formats are also possible. Messages shall be of alpha-numeric character, and are expected to carry, among other data, object's (container, boat, ship, patrol car) ID, coordinates or location, and status-specific information.

   By design system operates asynchroneously, e.g. – reacts immediately to the new portion of external data. If it will be deemed necessary more sophisticated asynchroneous input listener will be included in procurement.

2. Visualization.
   a. Every object of the system (road, car, container, container terminal, ship) by default includes, among other features, image, engineering drawing, and associated reference to "live" video stream sources. For the purposes of operation in emergency, night, bad weather, etc. conditions it will be highly desirable to use this feature to bring up 3D numerical model of the specific object and its surround rather than bringing in only video stream from the field. Among others the following shall be considered:
      i. Local "live" video stream may, and probably will, be obscured by dust and smoke in the case of accident. It will be much easier for the operation manager to plan disaster response if he/she will be able to see the visualization of the area of accident before it has happened, with location of the possible obstacles, approach roads, sources of additional danger (fuel tanks, hazmat storages, etc.) or installations requiring priority protection.

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ii. Local video stream may be cut off by power loss or due to damaged connection, leaving the center of operations de-facto "blind"
iii. Finally, 3D visualization may include viewpoints that are physically inaccessible for "live" video, like, for instance, underwater piping of the oil terminal or underground oil tanks in the area of the accident.

AZ GLOBAL itself does not provide the software that may address these issues. System architecture of the program that will be procured however includes an option for running 3D visualization application within AZ Global procurement, as separate process, thus opening an opportunity to use sophisticated 3D visualization packages.

3. Integrated situation display with layered object representation. User will be able to see and review:
   a. The map of the port with of the markers indicating location of the vessels, with marked sensitive objects, roads, terminals and other components of the system. The color of the marker corresponds to the type and conditions of the component.
      i. For instance, the vessel that is known as the one that has no potential hazards on board, and does not violate the fairwater limits, it is marked green;
      ii. The vessel that may be considered as potential danger will be marked yellow;
      iii. The law enforcement vessel at normal conditions will be marked blue, and so on.
   b. Individual containers
   c. System supports zoom-in / zoom-out functionality. This means that if user selects an object on the map of the port, plan of this object is brought up to the principal status display. If selected object contains another objects, these may be selected and brought up. For instance, if user operates with the map of the port and system receives intrusion message from the sensor attached to the container somewhere in container terminal area, User's actions are as follows:
      i. Select container terminal. Enlarged plan of the terminal is brought up. It contains the area in, say, storage, from where message was generated. System highlights the area automatically.
      ii. Select this area. The plan of the area is enlarged and location of the container is highlighted.
      iii. Select this location. All data, that are available for the container (type, origin, claimed content, date of delivery, etc.) are brought to the operator's screen together with container design, location of the sensors and container picture. If 3D visualization is also available, the operator is able to give the directions to the response team and provide them with near-real-life pictures of the area.
   d. Response action may be launched (with full information support, including images, approach roads, floorplans and all available data about the container origin and cargo) in less than a minute after receiving the warning message.
   e. Special areas. Areas that are restricted for access, or may contain security, public safety or public health threats, or are impacted by accident, or are a subject of

special attention for any other reason, will be marked on the map by distinct color. For instance:

i. The terminal that may contain security threats will be framed in yellow polygon;
ii. The area of oil storage tanks at the oil terminal will be framed by black (or any other color – User can chose) polygon;
iii. Restricted area where access violation is detected will be framed by orange polygon;
iv. Area that is impacted by an accident is marked red, and so on.

Monitored area includes port basin and neighboring waters, e.g. if accidental or at-will waste or oil dump is detected, correspondent oil slick may also be included in the monitoring.

f. Buildings. Each building in the port area may be included into monitoring as long as there is data source at this building. The same as for another aerial objects approach applies.
g. Weather data. Direct feed of weather data for the given region from NOAA or another sources will be supported. In the case of active or dangerous weather conditions in the monitored region the map of the region will be framed with the contour of the correspondent color.
h. For each vessel or another object in the system the User will be able to bring up:
    i. Its "raw" data, e.g.-geographical coordinates, ID, crew, owner, etc.
    ii. Its "status" data, for instance – vessel's technical conditions, status in regard to permits and conducted activity, its proximity to bad weather or restricted areas, in the case of oceanographic data – anticipated fish availability, etc.
    iii. Historic charts of the object's parameters, like catch or location of the specific vessel
    iv. Map or engineering drawing of the object, like enlarged map of the ocean current, or vessel's blueprint, or weather map;
    v. Image of the object
    vi. Multimedia data stream (or 3D visualization from arbitrary viewpoint, if available) from the object, static visual data in the case-specific format, or another object-specific data in the separate window

    All these data may be displayed in the separate windows, or User may bring up raw data and status panels to the left and to the right of the map, or data may be overlaid on the map (overlay text color is white).
i. User may also define what kind of objects have to be displayed on the situation display, effectively reflecting traditional GIS layered data representation.

4. Object display.

    User is able to bring up enlarged blueprint, map or engineering drawing of any object in the system instead of the system's situation display. Notwithstanding which object is displayed User still can monitor raw data and status data of another objects in the system. For instance, if certain ocean current is displayed at the principal panel, User may still watch change of the raw data for specific vessel, and monitor status of specific zone in the ocean.
5. Use of satellite images.

System supports importing of georeferenced satellite images, and automatically applies images to the map. Use of radar satellite images allows to detect illegal vessels and oil slicks in the area. Combining of the record of the vessel movement that is automatically kept by the system to the radar image of the area will allow to single-out ships that are illegally dumping oil and waste in the port's neighboring waters.

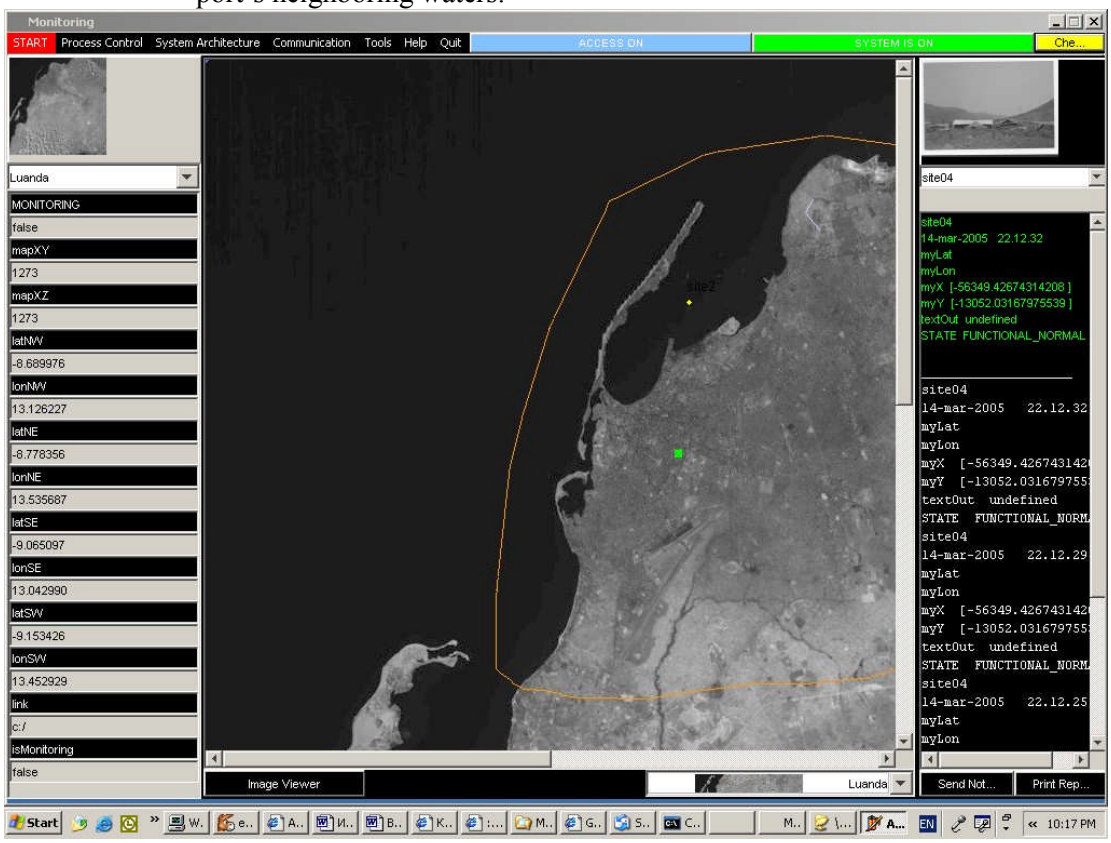

Figure 1. Luanda (Angola) port and neighboring area monitoring. Satellite image (10m. resolution) is used as aerial map. One ship in the harbor is marked yellow. Both raw data and status panels are visible.

6. Notification.

As soon as parameters of any object in the system start approaching to pre-set margins, or example sea vessel approaches the margin of the restricted zone, or total catch of the monitored fleet approaches or surpasses the quota, the system automatically generates the notification an sends correspondent messages to pre-set list of recipients. For instance:

a. If 6-coordinate vector (location + velocity) is such that there is a risk that this particular vessel may exit port's fairwater, warning signal will be generated;
b. If sensor system of control-environment hazmat container or storage will transmit data that point to drift to potentially unsafe situation, notification will be sent, and so on.

7. Modification of the system

   The system supports wide variety of system modification options:

   a. Adding object to the system. If new vessel enters the area, or is detected using satellite imagery or using other means, it may be added to the system. Same applies to new restricted areas (military exercises, for instance), to ocean currents (like eddies in the Gulf of Mexico), etc.
   b. Removing objects from the system
   c. Changing the object's area. In the case if restricted area configuration has to be changed for whatever reason, the operator may simply draw new area on the screen using computer mouse
   d. Including or excluding existing object in the overall modeling. For instance, if there are several fishing vessels in the area that carry different national flags, the ships from the foreign country may be excluded from the national quota calculation, etc.

   None of these modifications requires system restart.

8. Modelling.

   Each object of the system has built-in modeling capability. These models may be used to predict development of fire or any other accident, to estimate resources to coupe with specific accident, etc. Results of the modeling are reflected in the status panel of the main situation display. Results of modeling may be presented in graphical or alphanumeric form.

   It is possible that certain models (like dispersion models for radiation release) already exist, possibly written in Fortran or another programming language. The system will support running such model as well, as a separate computation process.

   User may switch between alternative models without system restart.

9. Support for planning and management

   The system may be used for off-line analysis of "what if" situations, like changing the parameters of the fishing area, possible impact of adverse weather, impact of the certain restriction, etc.

10. Data access

    a. Incoming ("raw") data.
       i. System may receive data in automated regime from external sensors for any object in the system.
       ii. System may receive data (alphanumeric and graphical) for any object from external GIS
       iii. User may open incoming data panel for editing, and change data manually
       iv. User may import, create and edit images and maps/blueprints for any object in the system using built-in capabilities
    b. Output ("status") data

       User may review and chart status data by object

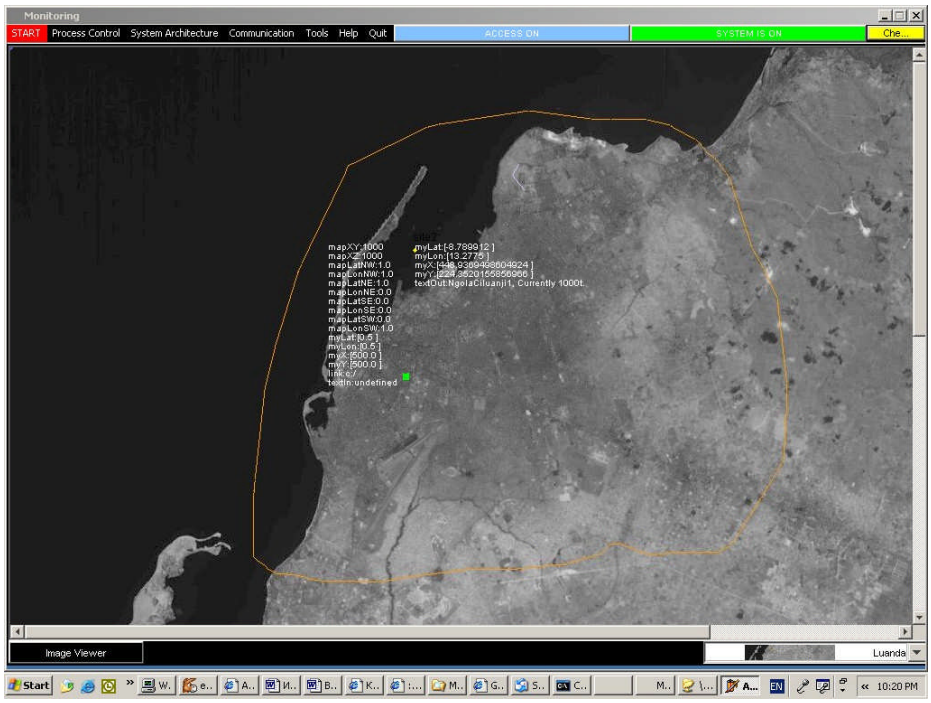

Figure 2. Current data of the vessel in the port, Raw and status panels are hidden.

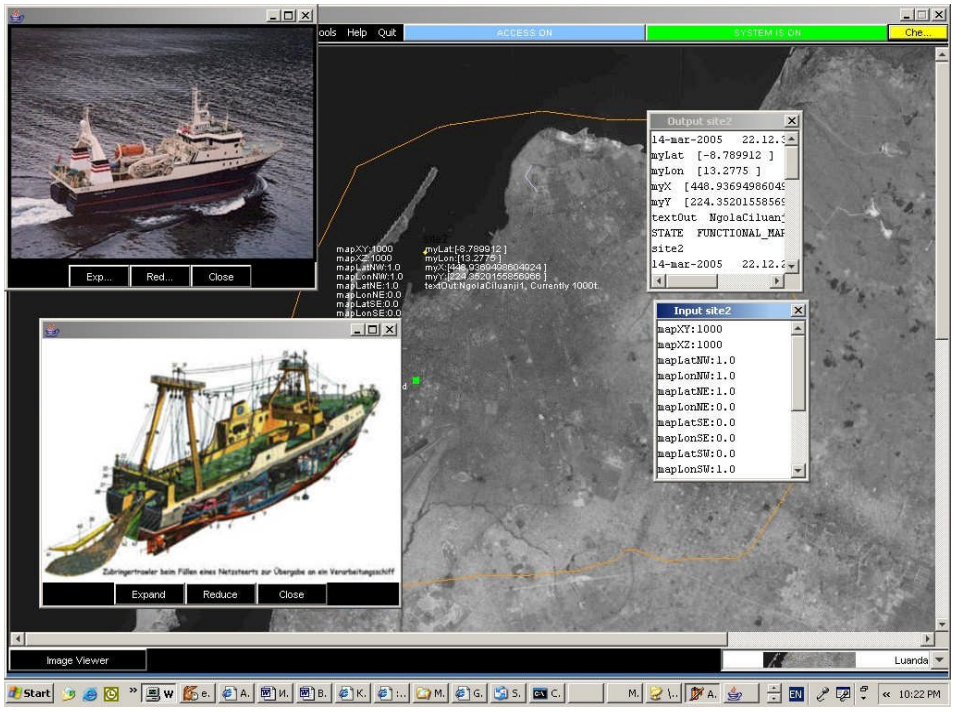

Figure 3. Current and historic data displayed together with ship's engineering drawing and multimedia data stream.

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c. Remote data access
    i. System automatically supports static web site with controlled access, that presents current and historic "raw" and "status" data together with the latest situation display.
    ii. System also supports remote "client" applications, that may run in distant locations, like remote fishery pier or even remote harbor.
d. Access management

    Remote "client" locations and static web sites may be added, removed, connected to the system or disconnected from the system on the go.

11. Operation control

    User is able to change system update rate, pause or re-launch monitoring and modeling, change text and background colors, and reset standard system settings.

HARDWARE REQUIREMENTS

System may be operated in Windows-2000, Windows-XP or Linux (tested for Red Hat 9.2) environments on the PC computer with Pentium-III or Pentium-IV processors, 128-256MB RAM, and requires about 100GB disk space, including installation of Java-2 (JDK 1.4.2 and JAI 1.1). System requires monitor resolution better than 600X400 pixels and was only briefly tested for Windows 9X environments.

PROCUREMENT OPTIONS

AZ Global can consider two principal procurement options:

1. Overall license
    a. AZ Global will license the customer to use our proprietary M2C Builder © software package, and will supply a set of prototype objects for design (container, container ship, terminal, storage, aerial map, etc.).
    b. Our customer will receive 1-2 day training on building port applications using these prototypes
    c. Customer will use licensed software to build as many port security systems as he/she needs or can afford.

    This option will require our Customer to maintain small team (2-3) engineers to build the systems for specific ports.
2. AZ Global will build systems for the customer on demand.

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