Managing Linear Assets with Oracle EAM

Arunkumar Kaliappan
Senior Principal Product Manager
EBS Product Management

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Linear Asset Management
Agenda

1. Linear Asset Management
2. Value Proposition
3. Target Industries & Business Requirements
4. Key Solution features, Use-cases
5. GIS Integration Architecture
6. Additional Resources
7. Early Adoptor Program
Linear Asset Management

New feature in E-Business Suite release 12.2.4

Enables asset maintenance for Spatially located assets

Integral feature of Oracle EAM that enables GIS Systems Integration seamlessly

Improves visual management for maintenance by Map based actions
Value Proposition
Linear Asset Management – Value Proposition

- Support for tracking linear asset system’s properties and elements for maintenance reference
- Model asset networks and relationships
- Integrated GIS System & seamlessly and manage the geographic asset maintenance
- Work planning and execution with linear details capture
- Improved Costing and Multi-asset work execution features for handling dynamic field requirements
Linear Asset Management

• Target Industries
  • Oil & Gas
  • Utility
  • Infrastructure Assets
Linear Asset Network – Pipeline System

Linear Asset Details:

Natural Gas Pipeline System – 0 to 500 Miles

Properties:
- Gathering Lines: 18" Dia, 700 PSI Pressure
- Transfer Lines: 42" Dia, 1000 PSI Pressure
- Distribution Lines: 20" Dia, 100 PSI Pressure

Elements / Discrete Assets:
- Production Wells
- Storage Tanks
- Pumping Station
- Processing Plant
- Compressor Station

Commercial, Residential Consumers
Linear Asset Network – Water Utility

### Intake
- **Properties**
  - Pipe Line Diameter: 5"
  - Line Pressure: 100 PSI
  - Flow Rate: 30 l/min

- **Elements**
  - Fencing
  - Boundaries

- **Discrete Assets**
  - Submersible Pumps
  - Jet Pumps

### Treatment
- **Properties**
  - Pipe Line Diameter: 7"
  - Line Pressure: 80 PSI
  - Flow Rate: 20 l/min

- **Elements**
  - Level Indicator

- **Discrete Assets**
  - Filtration Units
  - Tanks

### Distribution
- **Properties**
  - Pipe Line Diameter: 4"
  - Line Pressure: 50 PSI
  - Flow Rate: 10 l/min

- **Elements**
  - Manholes
  - Inspection Points

- **Discrete Assets**
  - Shut-off Valves
  - Pressure Regulator
  - Metering Devices
Linear Asset Network - Roads

Linear Asset Details:

IN278 Road Segment – 0 to 9 Miles

Properties:
- Speed Limit 40 : 0 to 1 Mile
- Speed Limit 60 : 4 to 6 Mile & 8 to 9 Mile
- Speed Limit 80 : 1 to 4 Mile & 6 to 8 Mile

Elements:
- Mile Markers – 3 (@ 3,6 and 9 Mile points)
- Street Lights – 2 (@ 5,8 Mile points)

Asset Relations:
- Intersecting with ‘NY440’ @ 2.89 Mile point
- Deployed Asset ‘Toll Plaza’ @ 4.5 Mile point
Linear Asset Management – Key Business Requirements

• Utilize GIS system attributes for maintenance planning and work initiation
• Improve Asset and Work Order Visualization on Spatial Map
• Enable Map as the central component of linear asset maintenance for tracking
• Establish and Maintain 2-way communication between GIS & Maintenance applications
Key Features – Linear Asset Management
Linear Asset Management

Solution Overview: Leverage eAM functionality and add Linear Features

EAM with Linear Support
- Linear Segments, Reference, Attributes, Elements
  - Enhance Work Order, Costing

GIS System (ESRI, Oracle Spatial)

Changes to Capitalized Asset Depreciation

Purchasing
- WO Materials, Reqs Linked to WO & Workflow
- Product & Maint WO
- Project / Task, WO Costs
- Service Request Linked to WOR / WO

T&A
- Transactions Costs Updates
- WO Updates, Catalogs
- Employees & Skills
- Employee Posting Integration
- Chart of Accounts
- Depreciable Assets
- Maintainable Assets

Projects
- Time Entry
- WO Billing

Service
- UI Integration For setup, Work Execution
- ESRI Rest API Integration

Customers

Mfgr.

Inventory

Suppliers

HR

AP

GL

AR

FA

Property

GIS Data Storage

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Linear Asset Management
Asset Definition Enhancements

Features

- Enhance EAM Asset data model to support Linear Assets definition, setup
- New setup entities for Linear assets modeling
- Linear Asset Workbench for entering and tracking Linear Asset Details
Linear Asset Management

Work Execution Enhancements

Features

• Capture Linear Details during work order execution
• Enhanced Work Order screens
• Multiple Asset Work Order – UI, Functionality Enhancements
Linear Asset Management
GIS Integration Enhancements

Features

• Improved Visualization of Asset on Map, Work Order on Map
• Enhanced data interaction between GIS Systems (Oracle Spatial / ESRI / Custom) and EAM
• New Map Actions such as
  – Dynamic Segmentation of Asset
  – Locate linear data
  – Locate by Base Map data
  – Locate by GIS Area
Asset Route Enhancements

• Improved support for Multiple Asset Work orders feature

• Flexibility in Asset Route management for Cost distribution and Quality results capture

• Work Order asset route can be created/modified on need basis without changing the asset route definition
Asset Route Enhancements

Setups

‘Manage Asset Route’ page allows us to setup the Cost Distribution %, Sequence and Work Order Route functionalities
Asset Route Enhancements

Work Execution

Create, Transact Multiple Asset Work Order by creating Dynamic Work Order Route

![Work Order Route Details]

<table>
<thead>
<tr>
<th>Work Order</th>
<th>Asset Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM_WO_ASR2</td>
<td>Fork Lift Daily Maintenance</td>
</tr>
</tbody>
</table>

- [ ] Allow Route Updates at Work Order
- [ ] Route cost allocated equally
- [ ] Route Details Modified at Work Order

- [ ] Enable cost % updates at Work Order
- [ ] Enable Route Assets Quality Results

**Route Details And Cost Distributions**

- [ ] Add Asset to Route
- [ ] Delete Assets

<table>
<thead>
<tr>
<th>Select Seq Number</th>
<th>Asset Group</th>
<th>Asset Group Description</th>
<th>Asset Number</th>
<th>Asset Description</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Fork Lifts</td>
<td>Fork Lift Asset Group</td>
<td>FL1030</td>
<td>Fork Lift 1030</td>
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<td></td>
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<td>Fork Lift Asset Group</td>
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<tr>
<td></td>
<td>Fork Lifts</td>
<td>Fork Lift Asset Group</td>
<td>FL2010</td>
<td>Fork Lift 2010</td>
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<tr>
<td></td>
<td>Fork Lifts</td>
<td>Fork Lift Asset Group</td>
<td>FL2020</td>
<td>Fork Lift 2020</td>
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<tr>
<td></td>
<td>Fork Lifts</td>
<td>Fork Lift Asset Group</td>
<td>FL2030</td>
<td>Fork Lift 2030</td>
</tr>
</tbody>
</table>
Costing Enhancements

• Update Asset Number on Released / Transacted Work Orders

• Enhancement to the Asset Route Cost Distribution process

• Improved asset cost drill-down - including asset route work order details

• Ability to view asset cost roll-up value, based on user-defined relationship type
Costing Enhancements

- Create ‘Relationship Type’ for linking assets
- Useful for modeling Asset Networks and get Cost Information based on that
Costing Enhancements

- User-defined Asset Relationships provides a powerful feature for grouping and viewing asset network costs.
Use-Cases Overview – Asset on Map

- Locate Asset by Asset Details (EBS Data)
- Locate Asset by GIS area (Radius, Polygon)
- Locate Linear Data on Asset
Locate Asset by Asset Details (EBS Data)
Locate Asset by GIS Area

- Locate Assets in a GIS Area
  - Search pipes passing in a radius of 2 Miles area drawn near the pipe asset 10023602
  - Search pipes passing in a polygon area (County)
Locate Asset by GIS Area
Locate Linear Data on Asset

- Locate Properties (EBS or ESRI events) on Linear Asset
  - View 40mm thickness pipe segments on Pipe asset IN278
  - View Virtual Tags on pipe asset 10023602
Locate Asset by Linear Data
Use-Cases Overview – Work on Map

• Initiate/Locate work based on
  – Dynamic Segment of Asset
  – Linear Attributes
  – Reference Points
  – Base map properties

• Track Work from Map-viewer
Initiate/Locate work based on Dynamic Segment

- Initiate / Locate Work using absolute measures for asset IN278
  - Fix a Pipe-Leak at 5.62mile
  - Select a segment between 2.4miles to 4.2miles for Repair Work
Initiate Work by dynamic segment, reference point
Initiate Work by dynamic segment, reference point
Initiate/Locate work based on Linear Attributes

- Initiate Work Using Asset Linear Attributes
  - A portion of pipe with 80mm dia needs to be replaced
Initiate Work based on Linear Attributes data
Initiate/Locate work based on Base Map Data

• Locate Work Using Base Map Property
  – There is Joint Sealing performed on Asset IN278 near “Sunrise Hill Park, NY 11746”@ end gate of the park
Initiate Work based on Base Map data
GIS Integration Architecture
Understanding Linear Geometry

• Unlike Discrete asset which can be visualized by a point geometry as in latitude/longitude coordinate \((x, y)\), Linear assets needs a line geometry which is a series of latitude/longitude coordinates \((x_1, y_1, x_2, y_2, ... x_n, y_n)\) to visualize it on the map.

• To leverage linear referencing capabilities linear asset’s geometry would also have third dimension “linear measure” - \((x_1, y_1, m_1, x_2, y_2, m_2, ... x_n, y_n, m_n)\).
  – The start point and end point of the geometry would have start and end measures
  – The intermediate points of the geometry can optionally have measures too.
Understanding Linear Geometry

Blue line is Geometry
(x1, y1, m1, x2, y2, m2, x3, y3, m3, ..., Xn, yn, mn)
Linear Asset Geometry Association

The geometry needs to be associated to Linear Asset Segments to get it visualized on the map.

• Linear Asset Definition
  • Linear Segments

Asset-Geometry Association

Linear Asset’s Segment is mapped to Geometry.

Blue line is Geometry
(x1,y1,m1,x2,y2,m2,x3,y3,m3.... Xn,yn,mn)
Map Integration Options

• The map integration is driven based on the profile CSI:Map Viewer based on which the respective integration would be enabled.

  – **ESRI** – Pure ESRI integration does not need any Oracle Spatial

  – **Oracle Spatial** – Oracle Spatial integration in which user has choice to choose Elocation or Google as Map Layer

  – **Custom GIS with Oracle Spatial** – Customers who already have a GIS other than ESRI and would choose this option. Example: Open Spatial, E-Spatial.
    • User has choice to choose Elocation or Google or custom map(if oracle spatial compatible) as Map Layer
Map Integration Geometry Source

- Depending on the chosen Map integration the geometry would be sourced from respective GIS.
  - **ESRI** – From ESRI
  - **Oracle Spatial** – From EBS EAM System
  - **Custom GIS with Oracle Spatial** – From Custom GIS System
EAM – ESRI Integration Architecture
ESRI Asset integration – What’s there where

- ESRI Route is pulled onDemand to visualize on map using Rest Services
- Rest API on Routeld

- Linear Asset Definition
  - Linear Segments
  - Properties
  - Elements
  - Relationships

Blue line is ESRI ROUTE (x1,y1,m1,x2,y2,m2,x3,y3,m3…. Xn,yn,mn)
### ESRI Integration – Map Manager Setup

#### ESRI Map Manager

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Map Code</td>
<td>NewMapCode</td>
</tr>
<tr>
<td>Map Association Type</td>
<td>Organization</td>
</tr>
<tr>
<td>Organization</td>
<td>EAM</td>
</tr>
</tbody>
</table>

#### Map Extent

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MinX</td>
<td>-8259908</td>
</tr>
<tr>
<td>MaxX</td>
<td>4963428</td>
</tr>
<tr>
<td>MinY</td>
<td>-8186683</td>
</tr>
<tr>
<td>MaxY</td>
<td>4991232</td>
</tr>
<tr>
<td>Wkid</td>
<td>102100</td>
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</tbody>
</table>

#### Map Layers

<table>
<thead>
<tr>
<th>Name</th>
<th>Order</th>
<th>URL</th>
<th>Transparency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layer2</td>
<td>20</td>
<td><a href="http://services.arcgis.com/">http://services.arcgis.com/</a></td>
<td>150</td>
</tr>
<tr>
<td>Layer1</td>
<td>10</td>
<td><a href="http://services.arcgis.com/">http://services.arcgis.com/</a></td>
<td>152</td>
</tr>
</tbody>
</table>

#### Locator Information

- **Locator URL**: http://nws3270058.us.o

#### Route Layer

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route Query</td>
<td><a href="http://nws3270058.us.o">http://nws3270058.us.o</a></td>
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<tr>
<td>Unique Column Name</td>
<td>Routeld</td>
</tr>
<tr>
<td>Geometry To Measure URI</td>
<td><a href="http://nws3270058.us.o">http://nws3270058.us.o</a></td>
</tr>
<tr>
<td>Tolerance</td>
<td>10</td>
</tr>
<tr>
<td>Measure To Geometry</td>
<td><a href="http://nws3270058.us.o">http://nws3270058.us.o</a></td>
</tr>
</tbody>
</table>
ESRI Asset integration – What’s there & Where is it?

- Linear Asset Definition
  - Linear Segments
  - Properties
  - Elements
  - Relationships

- ESRI Route is pulled onDemand to visualize on map using Rest Services

- Geometry Route
  - A Route is geometry Polyline which represents a Road or a Pipe and is uniquely identified by routeld
  - Typical route representation (x1,y1,m1,x2,y2,m2,x3,y3,m3,...,Xn,yn,mn)
  - Linear Reference Routes will have measures in third dimension

Asset-Route Mapping

EBS Linear Asset’s Segment is mapped to ESRI ROUTEID.
Mapping EAM Linear Asset with ESRI Route
EAM – Oracle Spatial Integration Architecture
Oracle Spatial Asset integration – What’s there where?

• Linear Asset Definition
  • Linear Segments
  • Properties
  • Elements
  • Relationships
• EAM Oracle Spatial Route
Spatial Route – EAM’s Geometry Management Tool
Oracle Spatial – Map Manager Setup
Oracle Spatial Asset integration – What’s there where?

- Linear Asset Definition
  - Linear Segments
  - Properties
  - Elements
  - Relationships
- EAM Geometry Spatial Route

Asset-Route Mapping

EBS Linear Asset’s Segment is mapped to Spatial Route
Mapping EAM Linear Asset with Spatial Route
EAM – Custom GIS Architecture
Oracle Spatial Asset integration – What’s there & Where is it?

- Linear Asset Definition
  - Linear Segments
  - Properties
  - Elements
  - Relationships

CUSTOM API HOOK

SDO Geometry (Oracle Spatial Format)
Mapping EAM Linear Asset with Custom Spatial Route

<table>
<thead>
<tr>
<th>Details</th>
<th>Measure UOM</th>
<th>From Measure</th>
<th>To Measure</th>
<th>Length</th>
<th>Active Start Date</th>
<th>Active End Date</th>
<th>Flexfields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Custom Spatial Route</td>
<td>Mile</td>
<td>100</td>
<td>200</td>
<td>100</td>
<td>20-May-2014</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**EAM Asset with Route Mapping - Options**

- It's not necessary to map individual EAM asset to each geometry route. Customers have options to choose the mapping based on size of route and how they want to view/manage/maintain the asset.

<table>
<thead>
<tr>
<th>Mapping Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Asset to One Route</td>
<td>Create a single Linear Asset Segment and map to a ESRI routeid without giving measure values, so the asset maintains complete route.</td>
</tr>
<tr>
<td>One Asset to Many Routes</td>
<td>Create multiple Asset segments and map to different ESRI routelds, so the single asset maintains many GIS routelds.</td>
</tr>
<tr>
<td>Many Assets to One Route</td>
<td>Create Asset’s Segment and map to a routeld with Measure values also entered, so the asset is eligible to maintain only that part of the GIS route. Example: An pipe ESRI route 1000212 is 100km, same routeld can be mapped to Assets A1,A2 with measure values - Asset A1 maintains 1000212 for 1-50km - Asset A2 maintains 1000212 50-100</td>
</tr>
</tbody>
</table>
User-defined Tool Bar Support in Map Workbench

• Support for User-defined Tool Bar on Map Viewer Visualization

• Provides a basis for extension for meeting business specific requirements around Asset on Map and Work on Map features

• The custom action needs to be mapped to a custom PL/SQL API, which needs to respond with an output in a specific format as desired by Oracle to plot it on map.

• Examples
  – View My Service Requests
  – View Customers
  – View Today’s My Critical Work
User-defined Tool bar

<table>
<thead>
<tr>
<th>Reference Methods</th>
<th>Properties</th>
<th>Element Types</th>
<th>Relationship Types</th>
<th>Asset Statuses</th>
<th>Icons</th>
<th>Line Styles</th>
<th>Map Managers</th>
</tr>
</thead>
</table>
| Create Map Toolbar
* Indicates required field

- Toolbar Code: My Critical Work
- Active Start Date: 10-Aug-2014
- Toolbar Type: ASSET

 Toolbar Name
Active End Date

API: 1001_ASSET_ACTIVITY
User-defined Tool bar Support in Map Workbench
Linear Asset Management – Solution Highlights

- Support for different integration options based on customer’s existing / preferred Spatial Solution
- User-defined Setups that represent the terminology & practice varied each business functions
- Fully leverages existing EAM features with additional linear-specific functionality
Additional Resources

- Oracle University Recordings

- MOS Community Documents
  - 1455369.1 & 1455888.1
Linear Asset Management (LAM) EAP

Now accepting applications!

• Work with Oracle Product Development on implementing LAM for your business
• Create a Collaborative team that includes your Systems Integrator, Oracle Account Management, Oracle Support and Oracle Product Development
• Receive LAM Training
• Give direct feedback to Oracle Development on LAM to influence future releases
• Ensure successful go-live with regular conference calls with EAP Collaborative team
• Contact Lenore.Siegler@oracle.com for more information
EAP Member Benefits

Customer Benefits

• Direct feedback into Development and be able to better prioritize implementation issues.

• Work with a focused team of Oracle experts to ensure a smooth product implementation.

***THIS IS NOT A REPLACEMENT FOR SUPPORT***