

# Israeli Highways Company (Netivei Israel) Manages Geographic Knowledge with ArcGIS

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## Netivei Israel: Background

- ❑ "Netivei Israel" is a government-owned company responsible for the planning, development and maintenance of Israel's interurban road network as well as railway development.
- ❑ The Company manages traffic over more than 7,000 km of roads, 1,200 bridges and tunnels and tens of thousands of traffic lights and lighting points.
- ❑ The economic value of the transportation infrastructure under the Company's responsibility is estimated at more than 20 billion USD.

# Core Components of Geographic Knowledge

- ❑ **Highways infrastructure**
- ❑ **Maintenance**
- ❑ **Traffic control**
- ❑ **Accidents**
- ❑ **Inventory**
- ❑ **Projects**
- ❑ **Planning**
- ❑ **Cadaster**

# Geographic Knowledge in Numbers

- ❑ **247 feature classes**
- ❑ **8,513,912 features**
- ❑ **151,717 attachments**
- ❑ **359 users**
- ❑ **1,334,468 transactions in 2015**



# Approach

- ❑ **Centralized storage and management**
- ❑ **Knowledge dissemination by organizational GIS portal**
- ❑ **Configurable and metadata driven**
- ❑ **Ease of management**
- ❑ **User Experience**
- ❑ **Personalization**
- ❑ **Extensibility**

# Implementation

- ❑ **MS Windows Server 2012 OS**
- ❑ **MS SQL Server 2012 Database**
- ❑ **ArcGIS Server Enterprise Advanced 10.3**
- ❑ **GIS Portal (developed with ArcGIS JavaScript API)**
- ❑ **ArcGIS Server Basic 10.3 Geodatabase**
- ❑ **ArcGIS Desktop**

# System Architecture



End User

## GIS Portal

Presentation Engine

Metadata Engine

Interfaces Engine

ArcGIS Server Enterprise 10.3

ArcGIS Server Basic 10.3

MS SQL Server 2012

## Configurable and Metadata Driven System

- ❑ Behavior of every object (layer, field, attachment, tool, interface) is defined by its metadata and is highly configurable by changing the metadata only
- ❑ The system supports separation between physical data and user presentation of data. System manager can easily create multiple user-oriented views of physical data by configuring metadata only
- ❑ Extensibility – the knowledge database may be extended endlessly with new objects



## Ease of Management

- ❑ The system is managed by user-friendly web-based management application
- ❑ System management does not require in-depth knowledge of underlying ESRI software
- ❑ System manager can easily adapt the system to changing users requirements, without a need for DBA or programmer and without intervention to underlying ArcGIS infrastructure
- ❑ Flexible metadata driven interfaces engine provides painless integration capability. Today the system is integrated with 24 various systems

# User Experience

- ❑ User interface inspired by Bauhaus “Less is More” principle: it is intuitive and not overloaded
- ❑ Familiar UI elements are used – search bars, table filters etc.
- ❑ User does not need to know GIS to operate the GIS
- ❑ No need for extensive training



# GIS Portal

## GIS Portal front end

Quit | Hello miri shmiri



Search bar

Search selector

Save As Picture State Manager Print Clean Selection Help

I want to search for...

Full text search

Full text search

Address search

XY Search

Section

Highway km

Section by junctions

Deadly

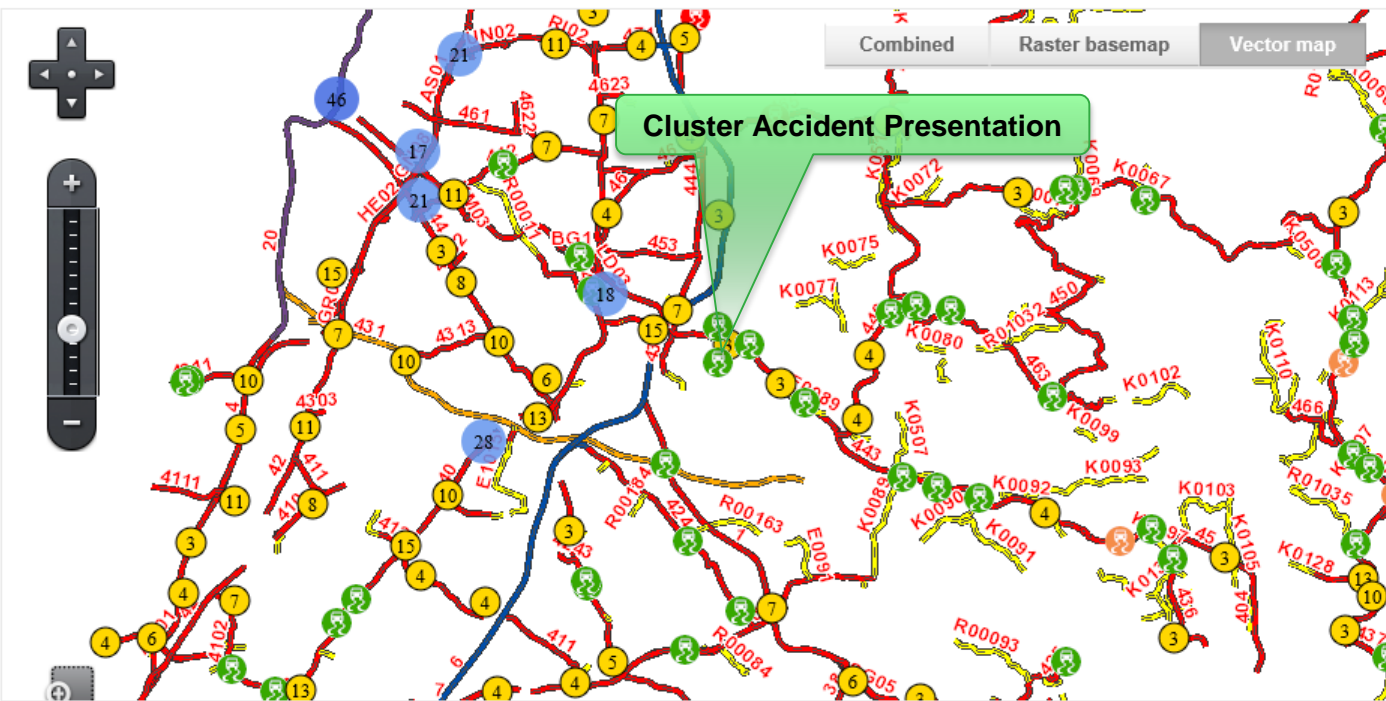
Serious

Minor

The new road network

Add layer

Cluster Accident Presentation



x: 196895 | y: 650812 | Scale: 1:250,000 | Basemap: 2015

Legend

# GIS Portal

## Tools repository



Quit | Hello miri shmiri

Save As Picture State Manager Print Clean Selection Help ?

I want to search for...

Full text search

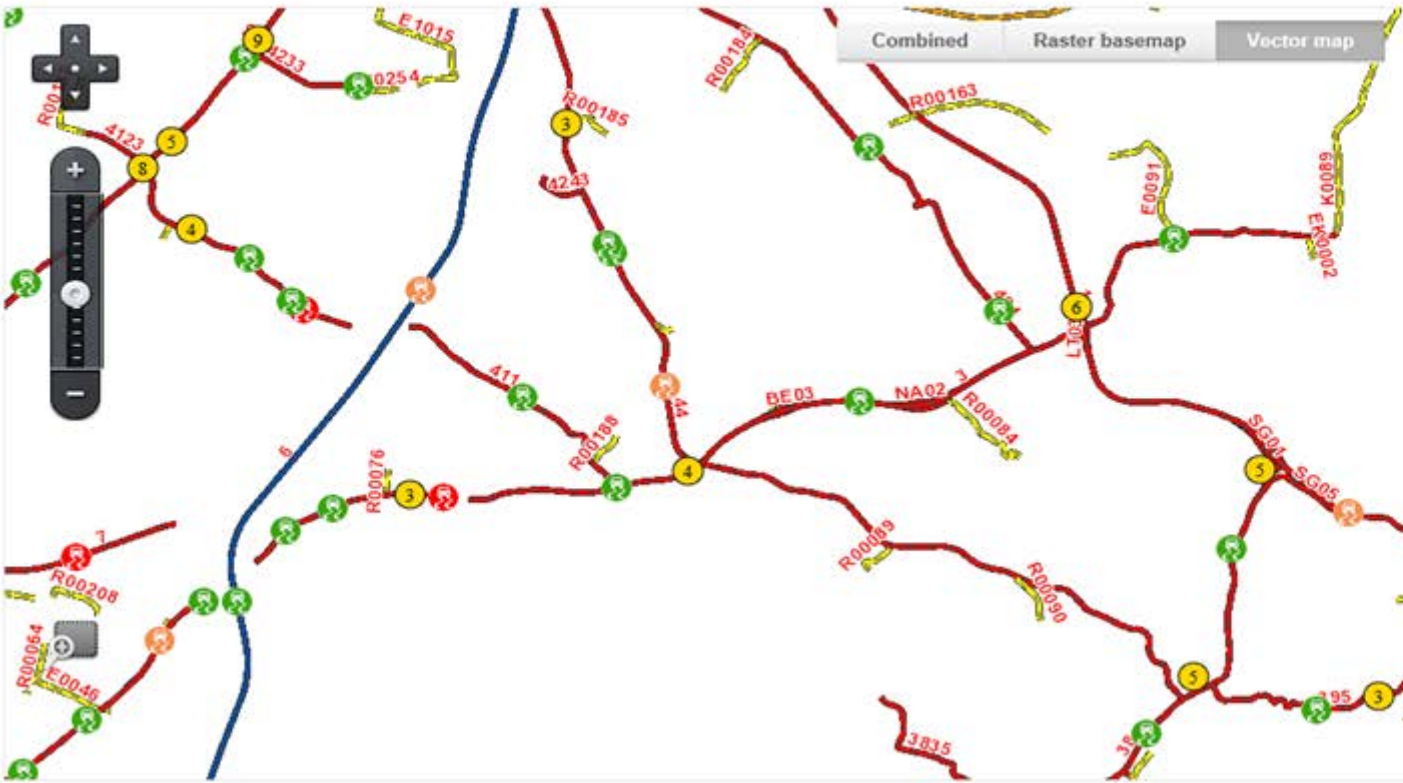
Combined Raster basemap Vector map

Tools

Layers

- Measure
- Virtual Trip
- Data Table
- Draw

- MLH Interface
- Planning
- Require Data
- Contact GIS Team
- SAP Event
- Update SAP Event
- Field Pictures
- Weather
- Vehicle Tracking
- Auto Refresh



x: 203854 y: 641465 | Scale: 1:100,000 | Basemap: 2020 תמה

Legend

# Database Explorer

Intuitive database exploration

Layer Search Bar

Category selector

The screenshot displays the Database Explorer application interface. On the left, a map shows a network of roads with various colored segments and nodes. The map includes navigation controls (a directional pad and a zoom slider) and status information at the bottom: "x: 184262 y: 635797 | Scale: 1:250,000 | Basemap: 20".

On the right, a "Database Explorer" panel is open, featuring a search bar and a list of layers. The search bar contains the text "road" and shows search results including "Grade separations over roads, lanes Israel" and "The new road network". The layer list includes items such as "Blocks km", "Grade separations over roads, lanes Israel", "Essential Roads", "Roads according to service levels", "Functional Locations", "Nodes", "According road segments Responsibility", "The new road network", and "Fuel stations".

Green callout boxes highlight specific features: "Layer Search Bar" points to the search input field; "Category selector" points to the dropdown menu showing "Roads"; "Add layer to map" points to a plus icon in the layer list; and "Display metadata" points to a circular icon next to a layer entry.

At the top of the application window, the menu bar includes "Quit | Hello miri shmiri" and a toolbar with icons for "Save As Picture", "State Manager", "Print", and "Clean Selection".

## Personalization

- ❑ **User can save state of application at any given moment (create personal workspace)**
- ❑ **The saved workspace includes: layers, searches, filters, redlining, annotations, open screens etc.**
- ❑ **User can further retrieve a workspace. The application will recreate the saved state, displaying layers, applying searches and filters, redlining etc.**
- ❑ **User can share workspace with other users by email (a workspace is sent as a hyperlink)**
- ❑ **Personal workspaces is a very powerful component of system's user experience**

## Extensibility

- ❑ **Crowdsourcing methodology:**  
user are constantly enriching the content with new information: layers, features, attachments, geotagged images etc.
- ❑ **Management application lets system manager to quickly add new services to system repository**
- ❑ **User can upload new attachments (unlimited amount)**
- ❑ **User can email geotagged image to the system.**  
The image is added to geotagged images layer by extracting XY information from image EXIF

## Extensibility Example – Traffic Lights

- ❑ **Traffic lights data is updated by GIS users**
- ❑ **Users employ video log module (a stream of geotagged images captured by special vehicle) for virtual travel along the highway**
- ❑ **When a traffic light is spotted, the user either creates new traffic light in the GIS layer or updates the existing one**



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# Traffic Lights Step 1 – Use Database Explorer

## Find traffic lights layer

Quit | Hello miri shmiri

Save As Picture State Manager

נתבי ישראל  
החברה הלאומית להשקיות תחבורה בע"מ

Full text search

Tools Layers

Regional Maintenance

Early deployment sites

Add layer


All Layers

Search for layer... Inventory

Add	Info	
		Switchboard - Traffic control
		Switchboard - electric lights
		Switchboard - Telecommunications
		Lighting
		Traffic light
		Equipment Hsml- generator
		Electrical equipment - energy control centers
		Acoustic Walls
		Kirot- supported
		Rail traffic lights

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Close



x: 66852 | y: 456210

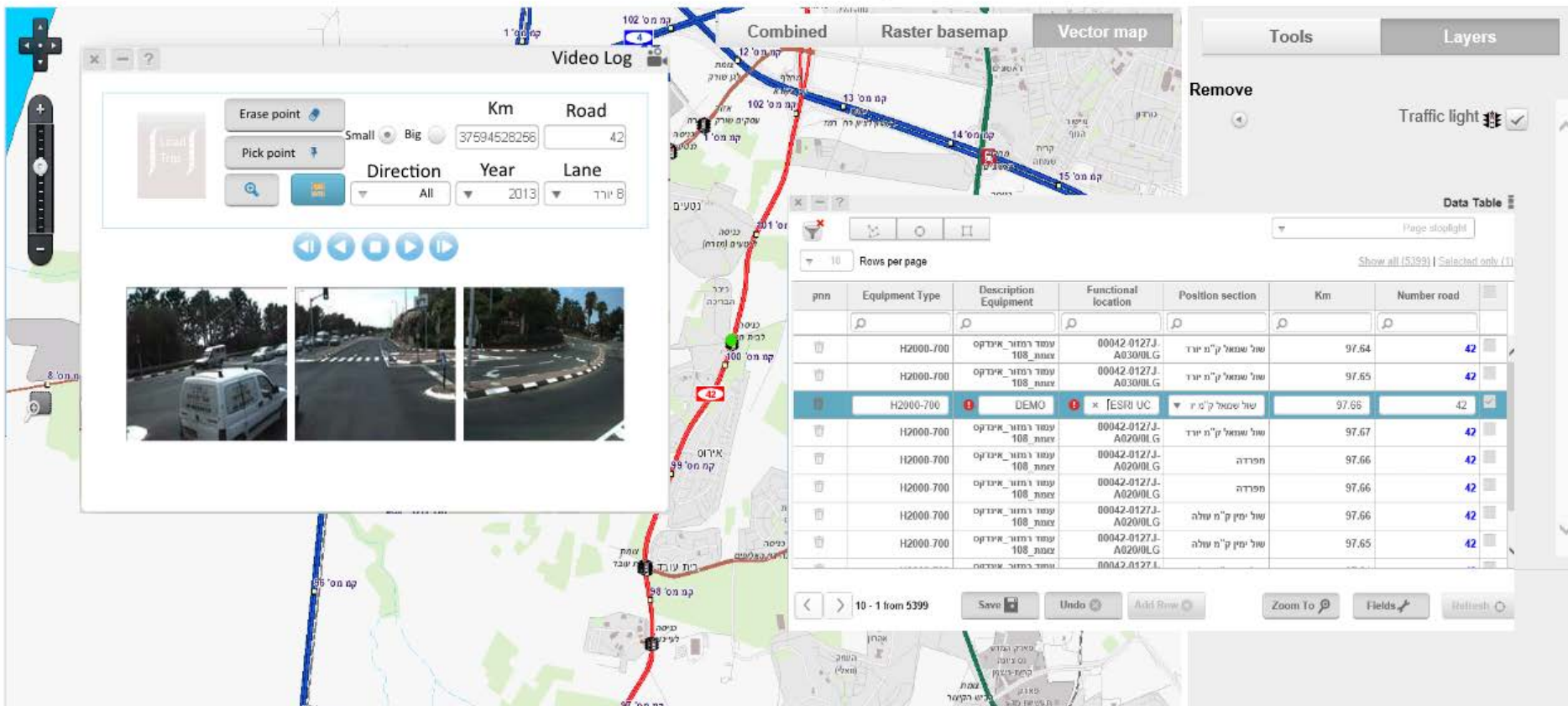
# Traffic Lights Step 2 – Engage Virtual Trip

Make a virtual trip along the highway until you spot a traffic light

The screenshot displays a virtual trip simulation interface. The main map shows a blue route starting from a point labeled '1' and ending at '17'. A red route is also visible, starting from '100' and ending at '102'. The map includes labels for various locations and distances, such as '102 מ'ס', '13 מ'ס', '14 מ'ס', '15 מ'ס', '16 מ'ס', '17 מ'ס', '100 מ'ס', '98 מ'ס', '97 מ'ס', '96 מ'ס', and '8 מ'ס'. The interface includes a 'Video Log' window with a 'Small' and 'Big' view toggle, a 'Pick point' button, and a 'Video Log' button. The video log shows three frames of a virtual trip: a white van driving on a road, a view of a traffic light, and a view of a road intersection. The interface also includes a 'Tools' panel with a 'Remove' button and a 'Layers' panel with a 'Traffic light' layer selected. The bottom status bar shows the coordinates 'x: 616922 | y: 770536', the scale 'Scale: 1:3,000,000', and the basemap year 'Basemap: 2020 מפה'. The legend is also visible at the bottom right.

# Traffic Lights Step 3 – Edit Data

## Add and edit traffic light feature



The screenshot displays a GIS application interface. On the left, there is a navigation toolbar with a crosshair and a vertical scale bar. The main map area shows a street network with a red line indicating a specific road. A 'Video Log' window is open, showing three video thumbnails of traffic scenes. A 'Tools' panel on the right includes a 'Remove' button and a 'Traffic light' feature toggle. A 'Data Table' is visible, listing traffic light features with columns for ID, Equipment Type, Description, Functional location, Position section, Km, and Number road. The table contains several rows, with one row highlighted in blue.

ID	Equipment Type	Description	Functional location	Position section	Km	Number road
	H2000-700	עמוד רמזור אינדקס 108 עמדת	00042-0127.J-A0300LG	שול שמואל ק"מ יורד	97.64	42
	H2000-700	עמוד רמזור אינדקס 108 עמדת	00042-0127.J-A0300LG	שול שמואל ק"מ יורד	97.65	42
	H2000-700	DEMO	[ESRI UC]	שול שמואל ק"מ יורד	97.66	42
	H2000-700	עמוד רמזור אינדקס 108 עמדת	00042-0127.J-A0200LG	שול שמואל ק"מ יורד	97.67	42
	H2000-700	עמוד רמזור אינדקס 108 עמדת	00042-0127.J-A0200LG	חפורה	97.66	42
	H2000-700	עמוד רמזור אינדקס 108 עמדת	00042-0127.J-A0200LG	חפורה	97.66	42
	H2000-700	עמוד רמזור אינדקס 108 עמדת	00042-0127.J-A0200LG	שול יתכן ק"מ עולה	97.66	42
	H2000-700	עמוד רמזור אינדקס 108 עמדת	00042-0127.J-A0200LG	שול יתכן ק"מ עולה	97.65	42

# Benefits

- ❑ **Accessible geo-knowledge across organization**
- ❑ **Knowledge preservation – everything is stored in a central database**
- ❑ **Users motivation – GIS portal is both powerful and simple to use. This motivates users to use the system and enrich the context**
- ❑ **Knowledge availability means Efficiency**

**Thank you!**

