# Esri Federal User Conference

GIS: The Geographic Approach for the Nation



# Using ArcGIS for Intelligence Analysis

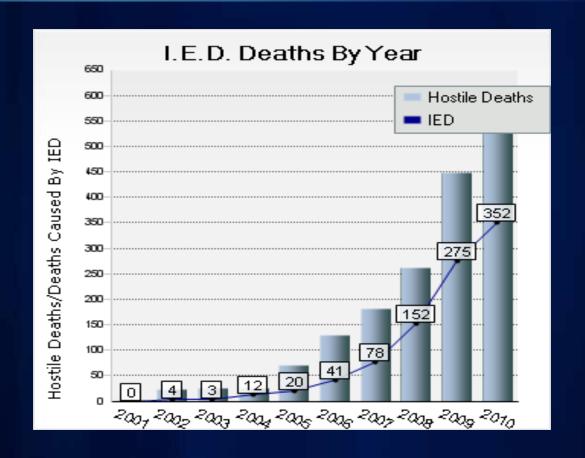
Tony Mason
Suzanne Foss
Vinh Lam



#### Agenda

- Background
- Concepts of Using ArcGIS for Intelligence Analysis
- Pattern of Life Analysis
- Scenario based demonstration
- Conclusions
- Q&A

## The Improvised Explosive Device threat



60% (~2200) of Operation Iraqi Freedom casualties 90% (~1100) of Operation Enduring Freedom casualties

#### **ArcGIS** countering the threat

- ArcGIS is used as an integral part of Pattern Of Life analysis
- ArcGIS renders critical geospatial intelligence for the reporting and prediction of social network and cell behavior
- Exploitation of a cell's network enables a commander with the tools to get 'Left of Boom' (Proactive vice Reactive)



#### **ArcGIS** as an Intel Analysis tool

- Geospatial reference of the battlespace
- Situational Awareness viewer via a thorough and updated Common Operational Picture
- Trend Analysis tool for geographically relevant data through the compilation of shared databases between analysts
- Medium to fuse spatial and temporal data fostering Pattern of Life analysis.

#### **Pattern of Life**

- Identification of an person's day to day interactions with their environment.
  - Family and Associates
  - Frequented locations
  - Personal habits
- Pattern of Life can be used to predict a person's behavior based on habit or schedule.
- ArcGIS enhances Pattern of Life analysis by providing a geospatial reference of person's movements.

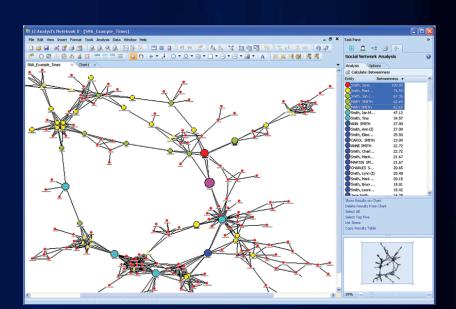
## **Pattern of Life Analysis**

# Pattern of Life Analysis is the fusion of Link Analysis and Geospatial Analysis



#### **Link Analysis**

- Link Chart as a common visualization of the relationships between data entities.
- Link charts describe entities (e.g. 'person', 'building')
- Labelled and symbolized by type, and show the "links" between entities via a series of annotated lines.
- Clusters or significant nodes identify points of interest



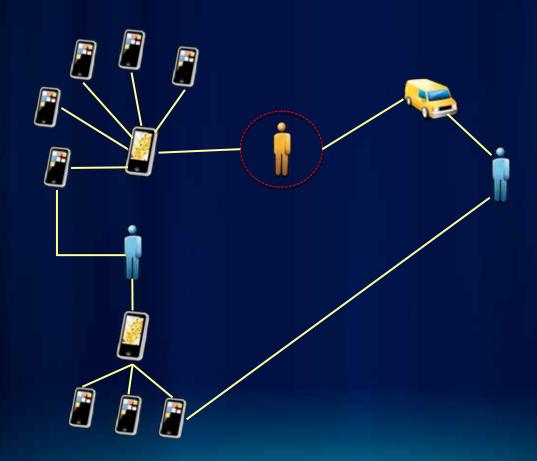
**Start with one Contact of Interest** 



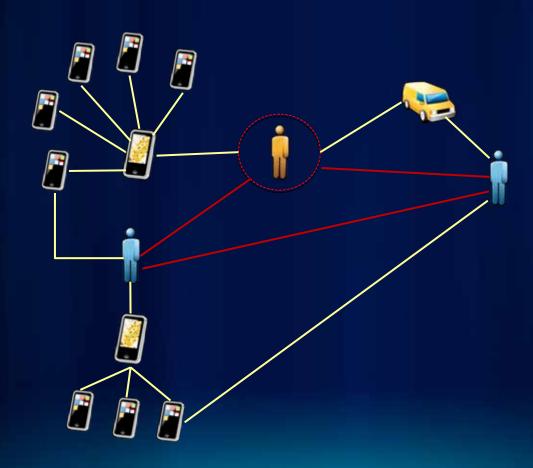
#### **Link Analysis shows new Contacts of Interest**



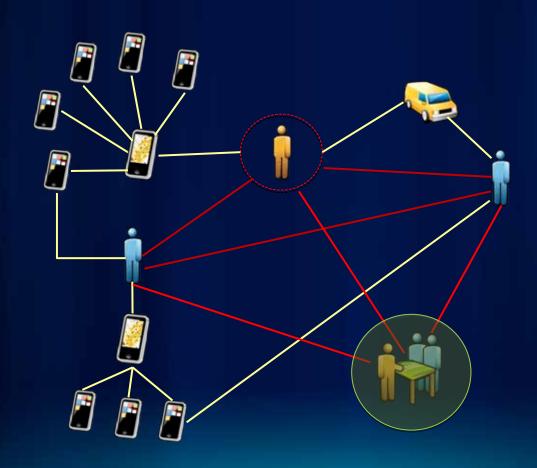
**Link Analysis of new Contacts shows a connection** 



#### **Draw conclusions from relationships**



#### **Prediction of Pattern of Life leads to interception**



#### **Geospatial Analysis Considerations**

- Too much data to map
  - If all link chart information were mapped the analyst would be overwhelmed with useless visual information
  - Key points of interest are mapped
    - (e.g. cell phone data, places visited, frequency of visits, etc.)
- Using GIS to understand entity relationships
  - Geo-processing tools allows analysts to manipulate and extract underlying data and display it geospatially

# **Geospatial Analysis Considerations**

# Too much data to map



# **Geospatial Analysis Considerations**

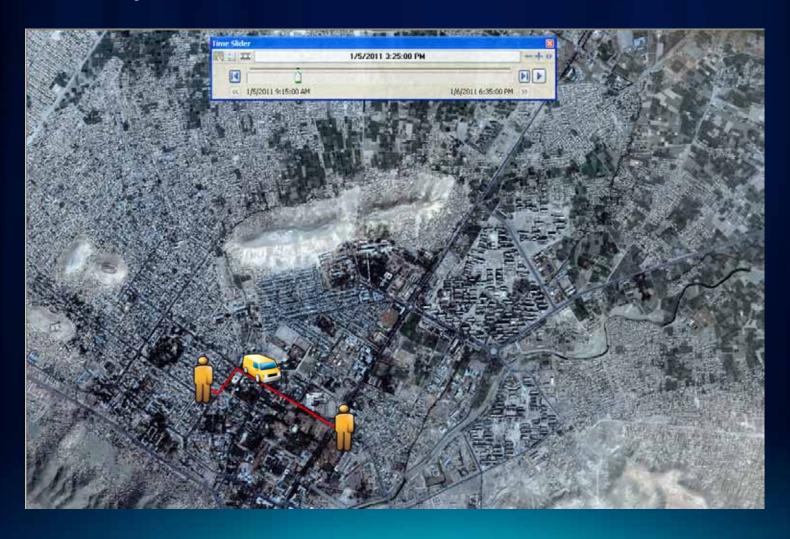
# **Geo-processing brings order to chaos**



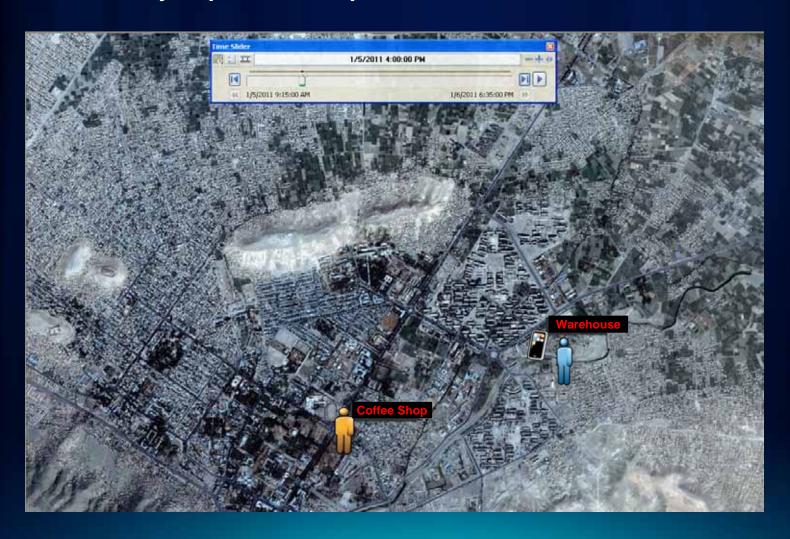
#### **GIS Pattern of Life Analysis**

- GIS provides the Where and When to the Who
- GIS allows the analyst to visualize an entities proximity, pattern, and history
- Multiple entities can be linked together
- Multiple feature layers can be combined into one layer representing a social network of entities

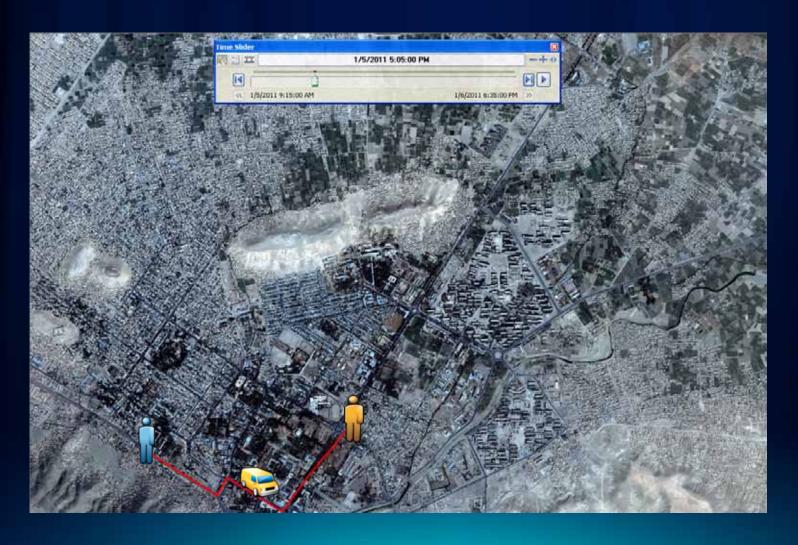
#### **Show potential routes**



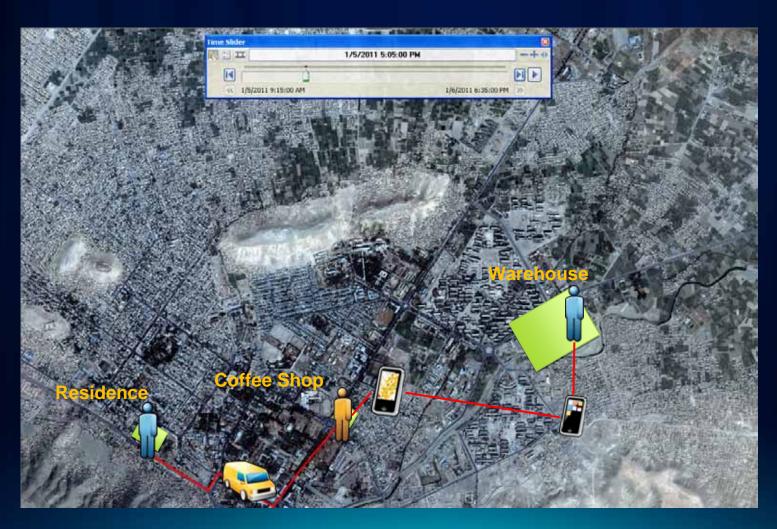
#### **Proximity of persons suspects have called**



#### **Common Routes**



#### **Meeting locations**



# **Scenario Based Demonstration**

Suzanne Foss Vinh Lam

#### The Scenario

- Report of significant increase in IED casualty rates
- Analyze IED incident data
- Narrow search area for smuggled IED materials
- Analyze suspect daily activities
- Analyze suspect phone call patterns
- Investigate suspect social network with link analysis
- Analyze new suspects' daily activities
- Predict next meeting time and location
- Reduce the IED threat in the area

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## The Scenario Recap

- Analyze IED incident data
  - Data visualization
    - Spatially visualize
    - Different symbology
    - Graphs
  - Link documents to incidents
  - Automation using models

#### The Scenario Recap

- Narrow search area for smuggled IED materials
  - Geoprocessing
    - Spatial analysis
      - Proximity between data locations
      - Quickly analyze with varying distances

#### **The Scenario**

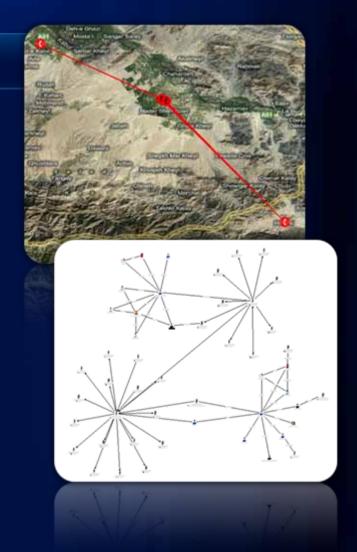
- Analyze suspect daily activities
  - Temporal analysis
    - Study suspect activities daily, weekly, monthly, etc.
      - Identify patterns
      - Identify non-normal behavior

#### The Scenario

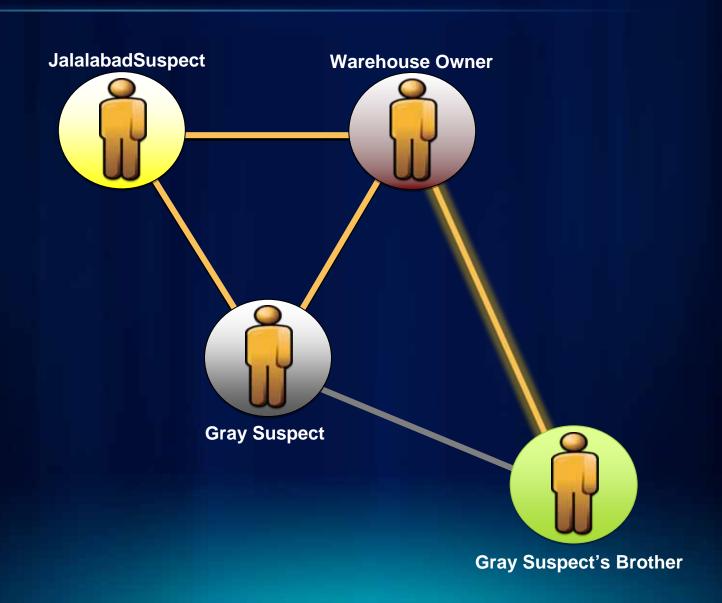
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#### **Section Wrap-up**

- Call Data & Pattern of Life
  - Gray Suspect using second phone to make calls
- Link analysis
  - Gray Suspect's discovered phone calls only to Jalahad and Pakistan warehouse owner
  - Expansion of call link data illuminates connection between warehouse owner and Gray Suspect's brother



Additional pattern of life analysis needed to confirm where the network comes together



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# Conclusion

#### Results

- Entire threat is eliminated simultaneously
  - Identification of spatial and temporal relationships leads to predictive analysis.
- Post mission analysis
  - Current database can be queried against data collected from mission completion.



#### Summary

 Pattern of Life analysis leverages geospatial analysis and link analysis

Fusion of spatial and temporal data

Template based approach

#### **Pattern of Life Template Summary**

#### What is in it?

- Sample data
  - IED incidents
  - Supporting IED materials
  - Suspects' pattern of life
  - Suspects' phone calls

- Tools
  - Create data graphs
  - Proximity analysis
  - Temporal analysis
  - Coincidence analysis
  - Share data with i2

# Questions

