

Research to Reality

William Ribarsky
Remco Chang

University of North Carolina at Charlotte



Some Tools in Use that Were Developed at the SouthEast RVAC

- The SRVAC developed several tools and capabilities for complex problem-solving and analysis, typically with large-scale data.
- The tools support exploration, discovery, insight-gathering, knowledge-building, that often involve uncertain or misleading data.
- These tools are general and can be used by companies, in the CCI Directorate programs, and by several of the Centers of Excellence.



Jigsaw

- Problem - Helping analysts and investigators explore and understand **large collections of reports and data**
- Solution - **Integrated, interactive views** of report entities that highlight connections between items of interest and permits exploration to discover new connections
- Impact – used at **PNNL** and the **Seattle Police Dept.**



Jigsaw

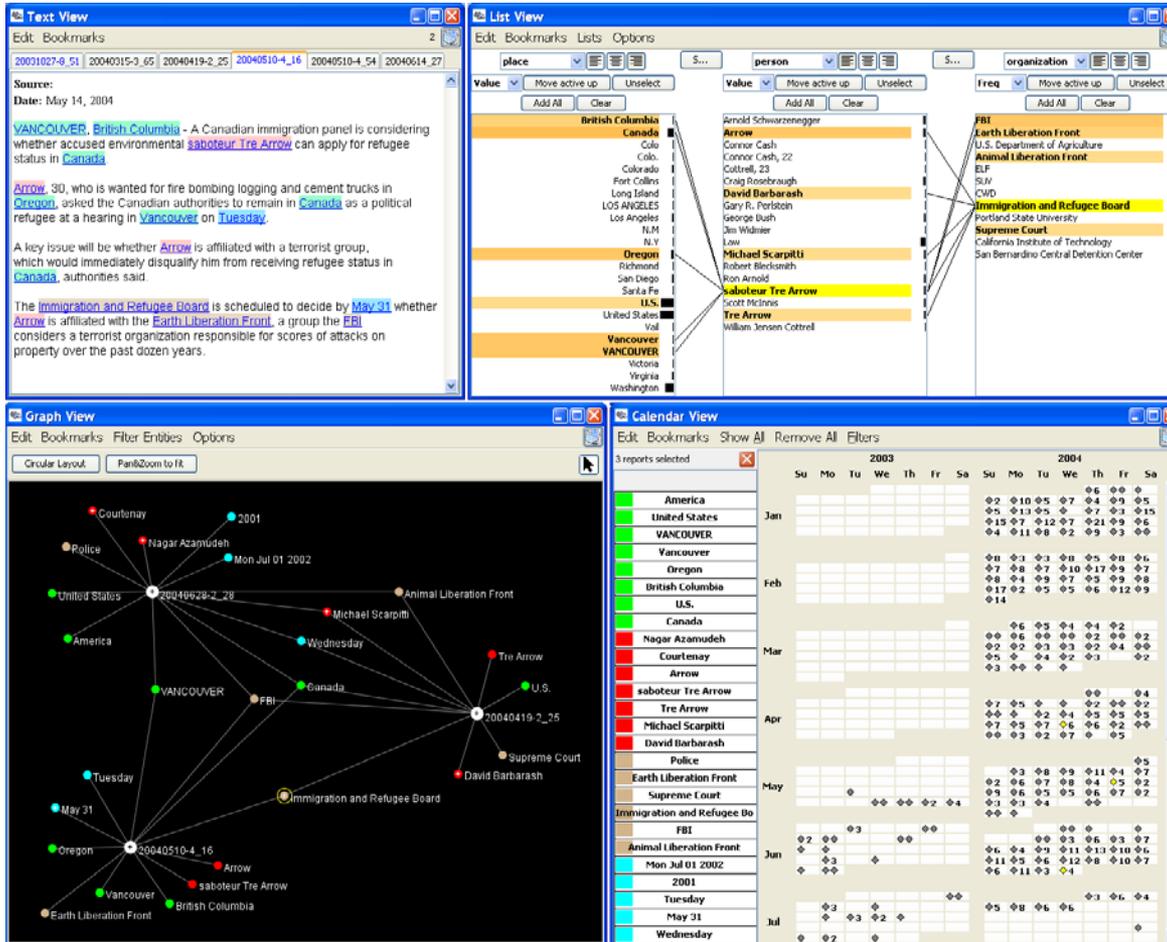
A sample of Jigsaw's document and entity views.

Upper left: Document View. Displays the text and entities of a selected document.

Upper Right: List View. Lists of the different entities with connections between them

Lower Right: Calendar View shows temporal patterns across the documents.

Lower Left: Graph View. Provides a semantic graph representation of documents (white circles) and the entities contained within them (colored circles).

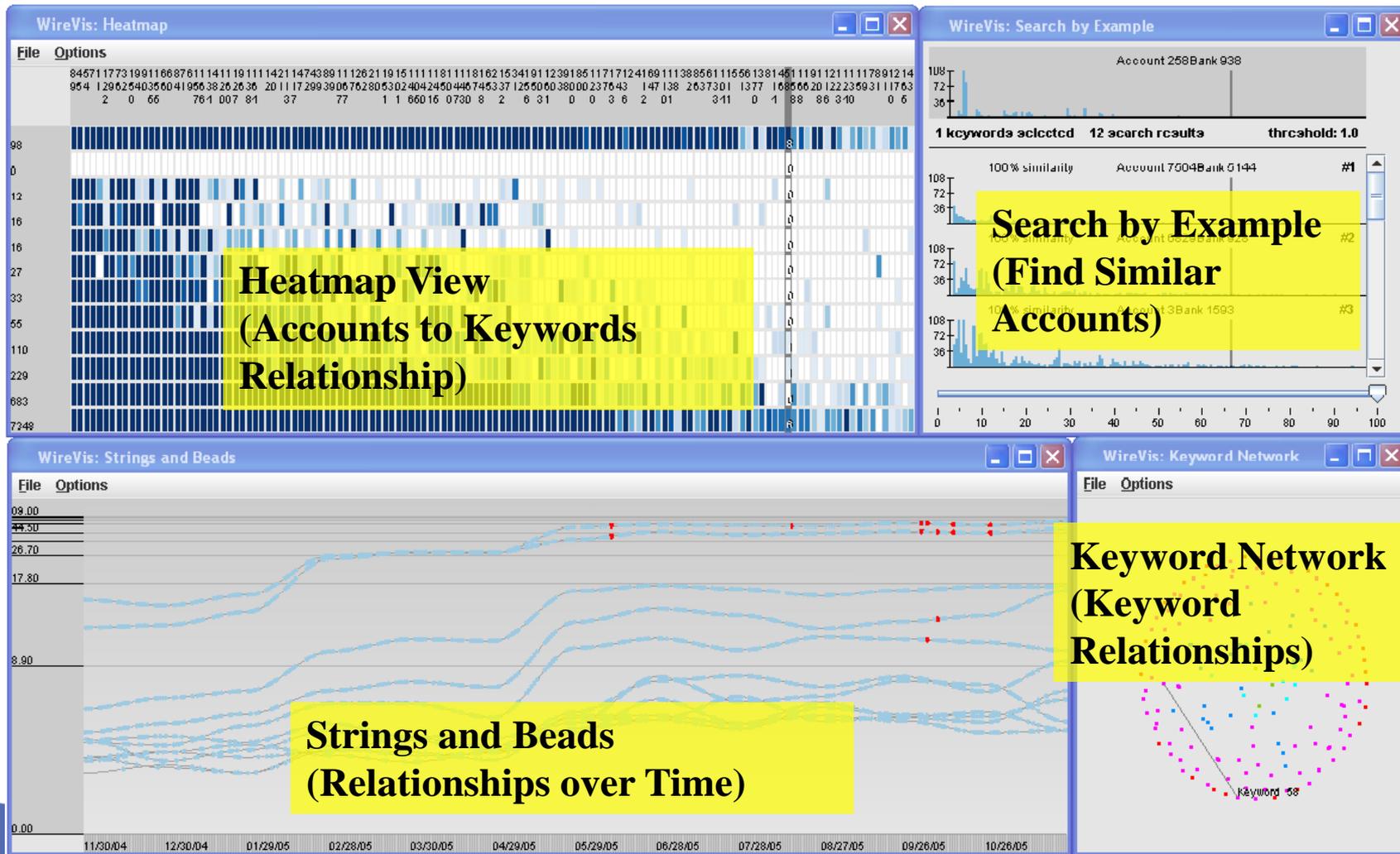


WireVis: Financial Transaction Analysis

- This work is supported in part by **Bank of America**. (Significantly wider deployment to other banks and bank analysts now under discussion.)
- Current practice is to do database **queries** filtered by keywords, amounts, date, etc. and investigate using spreadsheets.
- This process is inadequate and inefficient because it is **difficult to be exploratory** using query methods (especially for very large transactional databases). Patterns of interest (e.g., fraud or risk) will change in **unpredictable** ways,, and analysts cannot see **patterns over longer time periods**.

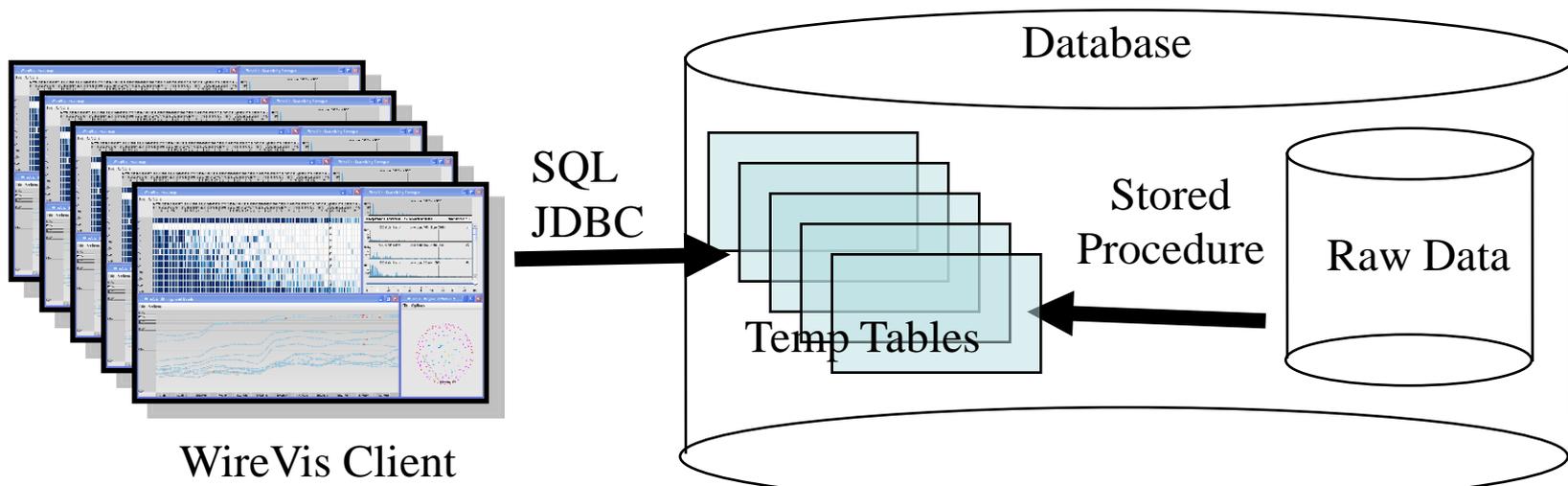


WireVis: Financial Transaction Analysis System Overview



WireVis: Integrated with Full Transaction Database

- Scalability
 - We have connected to the data warehouse at Bank of America with **10-20 millions of records**, for wire transactions alone, over the course of a rolling year (13 months).
- High Impact
 - WireVis was deployed as a beta at WireWatch.
 - This **interactive visual analytical** approach has caused a change in the way some BoA analysts think about tools.



EventRiver: Exploratory Multimedia Analysis

- Tools to attack the 95% of the digital world that is unstructured multimedia.
- Automated analysis tightly coupled with exploratory capability

The screenshot displays the EventRiver interface. On the left, a news player shows a CNN broadcast with the headline "CNN MESSAGES OF TERROR?". Below the video, a snippet of text is visible, discussing Bin Laden's message and the bombing in Lebanon. The interface includes a "News Box" with a table of items and an "Evidence Box" with a table of themes.

Save	Significance	Length	Time	Date
<input type="checkbox"/>	397	4:58	09:34	08/15/06
<input type="checkbox"/>	381	3:00	22:39	08/15/06
<input checked="" type="checkbox"/>	374	5:42	17:38	08/15/06
<input type="checkbox"/>	213	2:37	10:05	08/15/06

Themes	Interestingness	Channel
<input type="checkbox"/> LADEN, OSA...	374	CNN
<input type="checkbox"/> LADEN, OSA...	381	CNN
<input checked="" type="checkbox"/> PAKISTAN, C...	213	CNN

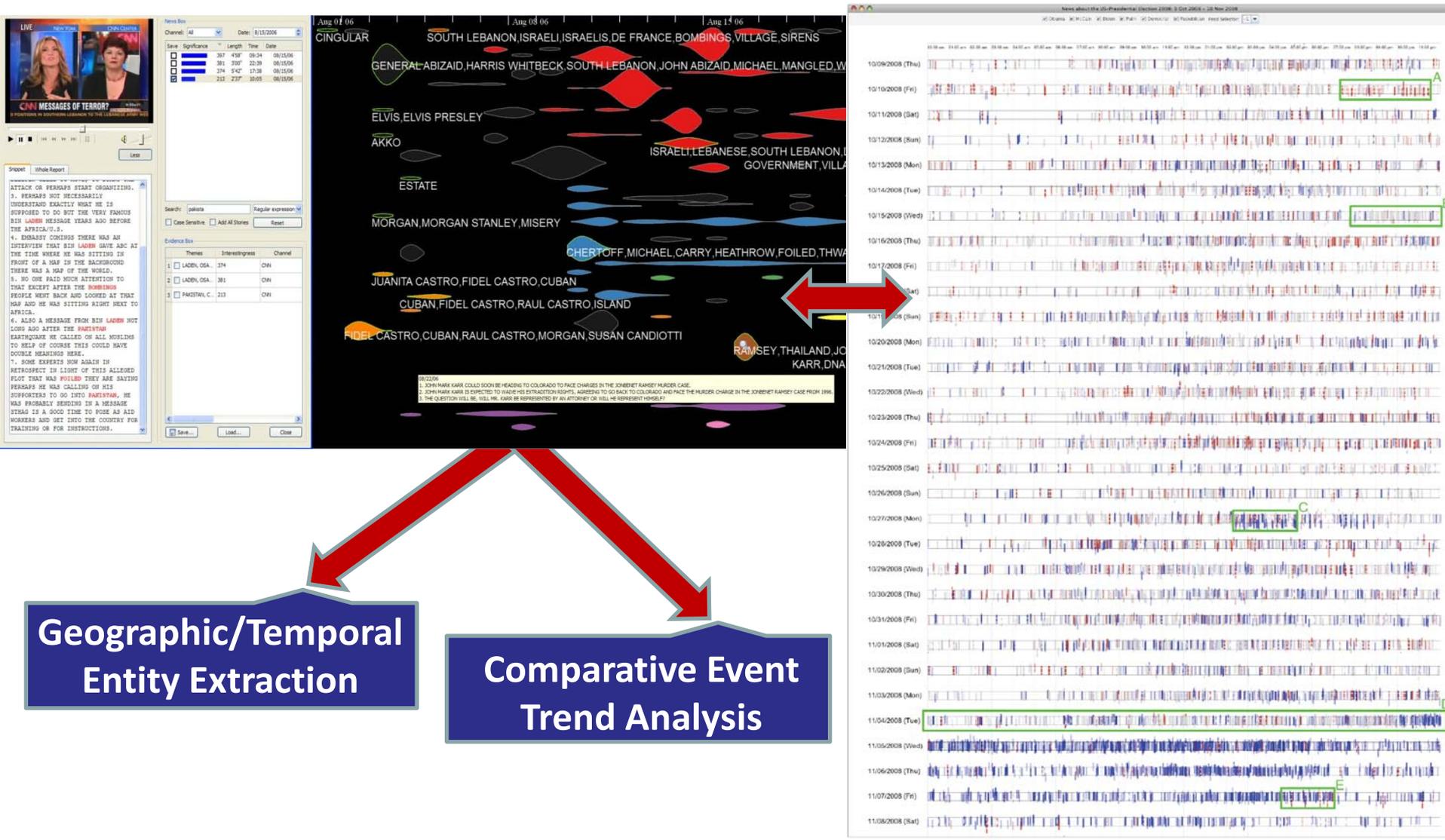
The right side of the interface shows a visualization of multimedia data. The x-axis represents time from August 01, 2006, to August 22, 2006. The y-axis lists various themes and locations. The visualization consists of numerous colored ovals (red, blue, orange, purple) of varying sizes and orientations, representing the distribution and relationships of multimedia content over time. Key themes include "SOUTH LEBANON, ISRAELI, ISRAELIS, DE FRANCE, BOMBINGS, VILLAGE, SIRENS", "GENERAL ABIZAI, HARRIS WHITBECK, SOUTH LEBANON, JOHN ABIZAI, MICHAEL, MANGLED, WESTERN, NAPERVILLE", "ELVIS, ELVIS PRESLEY", "AKKO", "ESTATE", "MORGAN, MORGAN STANLEY, MISERY", "CHERTOFF, MICHAEL, CARRY, HEATHROW, FOILED, THWARTED, YARD, SCOTLAND, GE", "JUANITA CASTRO, FIDEL CASTRO, CUBAN", "CUBAN, FIDEL CASTRO, RAUL CASTRO, ISLAND", "FIDEL CASTRO, CUBAN, RAUL CASTRO, MORGAN, SUSAN CANDIOTTI", and "RAMSEY, THAILAND, JONBENET RAMSEY, BOULDER, KARR, DNA, CUSTODY, MARY LACY, DO".

At the bottom of the visualization, a small text box contains the following information:

08/22/06
 1. JOHN MARK KARR COULD SOON BE HEADING TO COLORADO TO FACE CHARGES IN THE JONBENET RAMSEY MURDER CASE.
 2. JOHN MARK KARR IS EXPECTED TO WAIVE HIS EXTRADITION RIGHTS, AGREEING TO GO BACK TO COLORADO AND FACE THE MURDER CHARGE IN THE JONBENET RAMSEY CASE FROM 1996.
 3. THE QUESTION WILL BE, WILL MR. KARR BE REPRESENTED BY AN ATTORNEY OR WILL HE REPRESENT HIMSELF?

EventRiver: Expanded Capabilities

Opinion Analysis



Realizing the Tools

- There is a cost to realizing academic tools...
 - Goals of an academic is often different from that of a client
 - Time to understand each other's language/system/culture, etc...
 - Cost of inertia (“I’ve been doing my job for 20 years and I’ve been fine, why do I have to change?”)
 - Cost of deployment (e.g. for security purposes).



Realizing the Tools

- How to minimize the costs?
 - Close partnership with investigators, analysts. (Need a champion!)
 - Generalization of needs and capabilities
 - Cognitive and reasoning task-based evaluations
 - Development of principles for highly interactive visual analytics systems.
 - Several other tools have been developed and are currently being deployed (UrbanVis, ProbeVis, GTDVis, Image Browser, etc.)



Questions?

www.srvac.uncc.edu

www.viscenter.uncc.edu

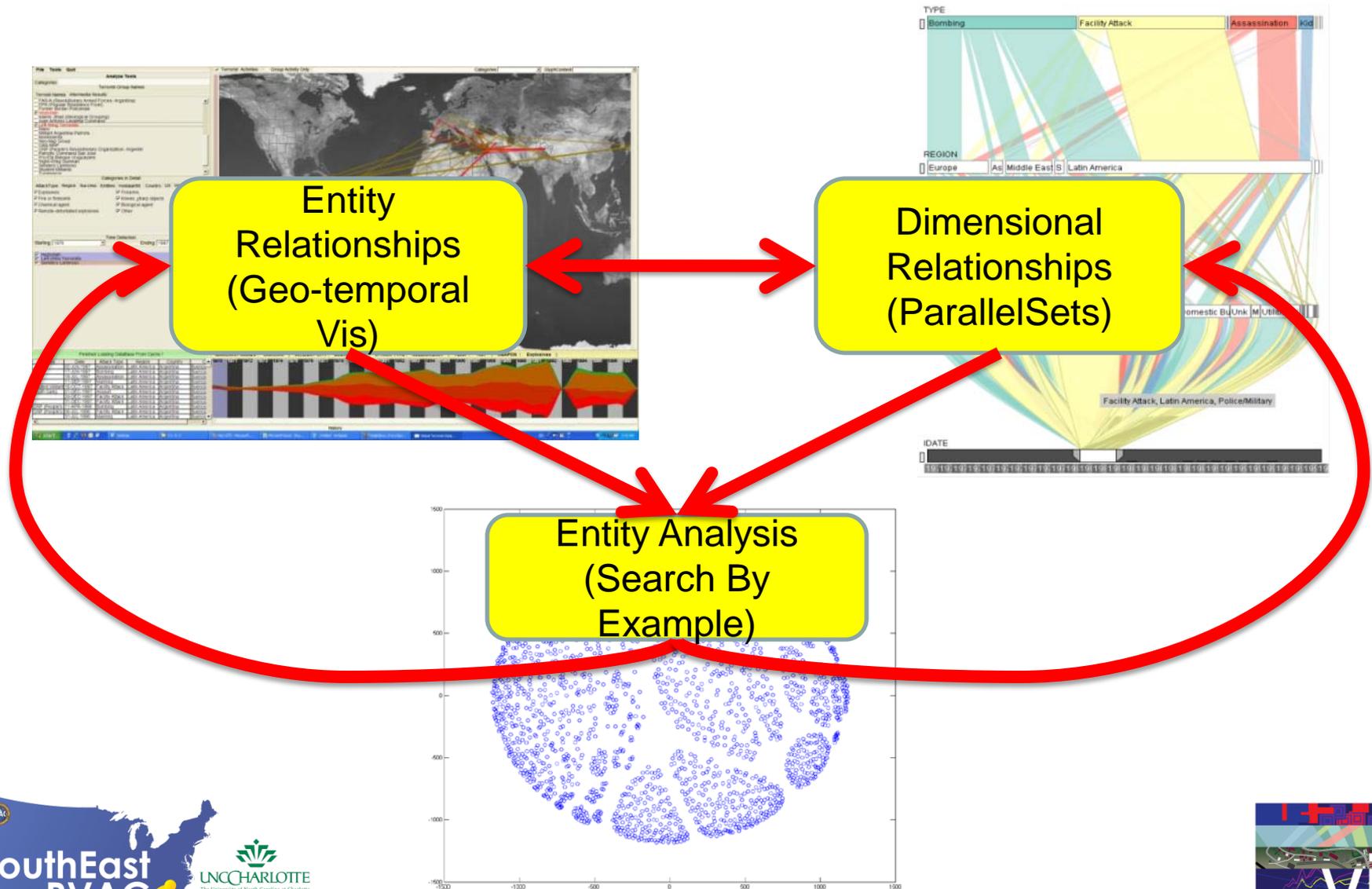


WireVis:

Integrated with Full Transaction Database

- Performance Measurements
 - Data-driven operations such as re-clustering, drilldown, transaction search by keywords require worst case of 1-2 minutes.
 - All other interactions remain real time
 - No pre-computation / caching
 - Single CPU desktop computer
- WireVis is in deployment on James Price's computer at WireWatch for testing and evaluation

Visual GTD Flow Chart



WHO - Terrorist Groups

File Tool Terrorist Activities Group Activity Only Categories [Attack Type] GlyphContent

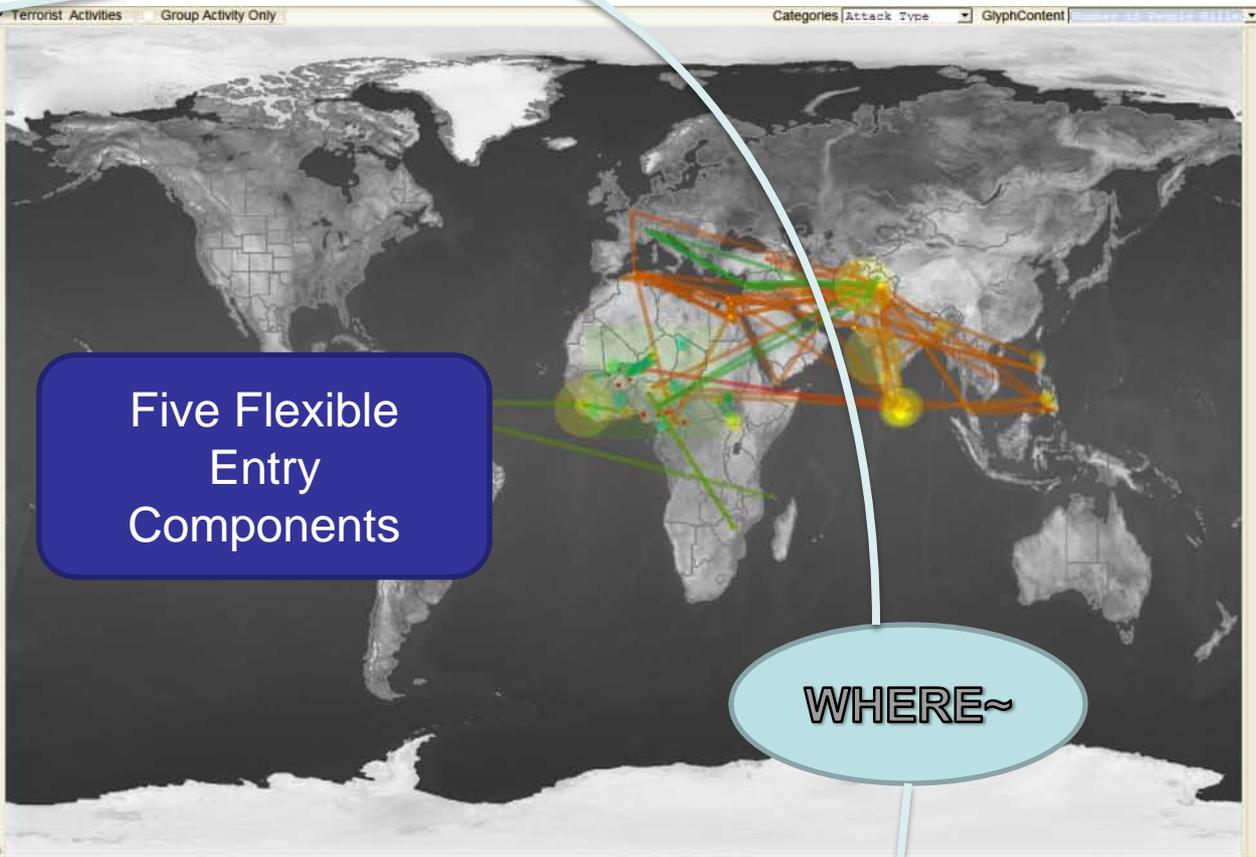
Categories

Terrorist Names Intermediate

- Islamic Legion (allegedly Libyan controlled)
- Ivorian Popular Front
- JVP (Peoples Liberation Front)
- Katap Ethnic Group
- Liberian Rebel Group
- Moslem Radical Youth
- Muslim Militants
- Muslims
- National Liberation front of Chad
- National Patriotic Front
- National Patriotic Front of Liberia
- New Patriotic Party
- Paramilitary Police
- Patriotic Front
- Rebel Military Unit
- Shiite Moslems

Categories in Detail

AttackType	Region	Success	Entities	Hostac	Sit.	Country	US	Weapon
<input checked="" type="checkbox"/>	Assassination	<input checked="" type="checkbox"/>	Bombing	<input checked="" type="checkbox"/>				
<input checked="" type="checkbox"/>	Facility Attack	<input checked="" type="checkbox"/>	Hijacking	<input checked="" type="checkbox"/>				
<input checked="" type="checkbox"/>	Kidnapping	<input checked="" type="checkbox"/>	Maiming	<input checked="" type="checkbox"/>				
<input checked="" type="checkbox"/>	Assault	<input checked="" type="checkbox"/>	Mass Disruption	<input checked="" type="checkbox"/>				
<input checked="" type="checkbox"/>	Arson							



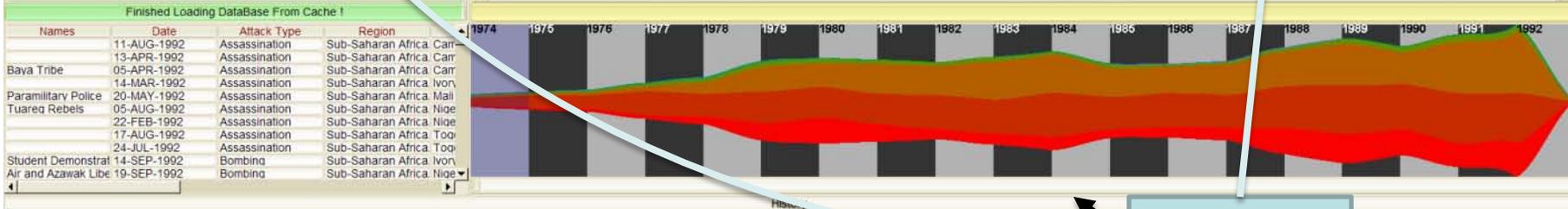
Five Flexible Entry Components

What

Starting: 1974 ShoeBox

- Islamic Legion (allegedly Libyan controlled)
- JVP (Peoples Liberation Front)
- Liberian Rebel Group
- Moslem Radical Youth
- Muslim Militants
- Muslims
- National Liberation front of Chad
- National Patriotic Front
- National Patriotic Front of Liberia
- New Patriotic Party
- Patriotic Front
- Rebel Military Unit
- noters
- Shiite Moslems
- Sudan Peoples Liberation Armv
- Tuareo Guerrillas
- Tuareo Rebels
- Tuareo Separatists
- Tuareos
- Zaghawa ethnic group

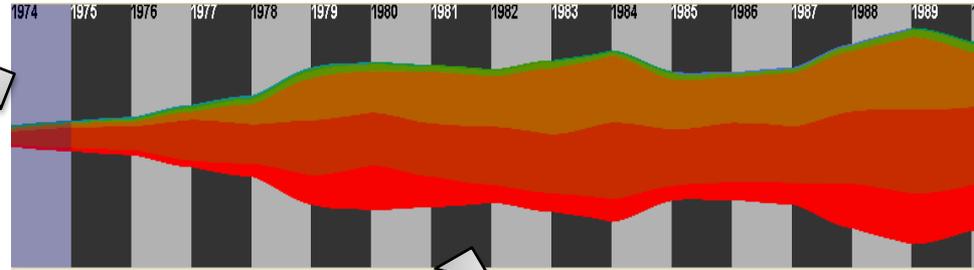
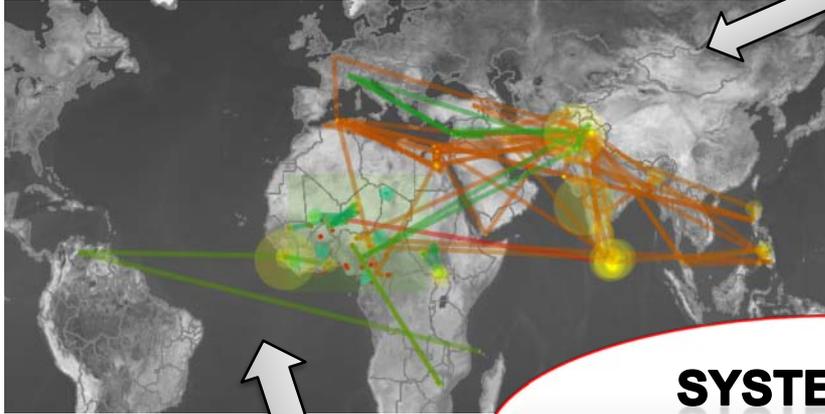
WHERE~



WHEN



**ENTER SYSTEM BY
SINGLE OR MULTIPLE
SELECTIONS**



**SYSTEM WILL
SUPPLY SPECIFIC
INFORMATION**

AttackType	Region	Success	Entities	HostageSit.	Country	US	Weapon
Assassination				<input checked="" type="checkbox"/> Bombing			
Facility Attack				<input checked="" type="checkbox"/> Hijacking			
Kidnapping				<input checked="" type="checkbox"/> Maiming			
Assault				<input checked="" type="checkbox"/> Mass Disruption			
Arson							

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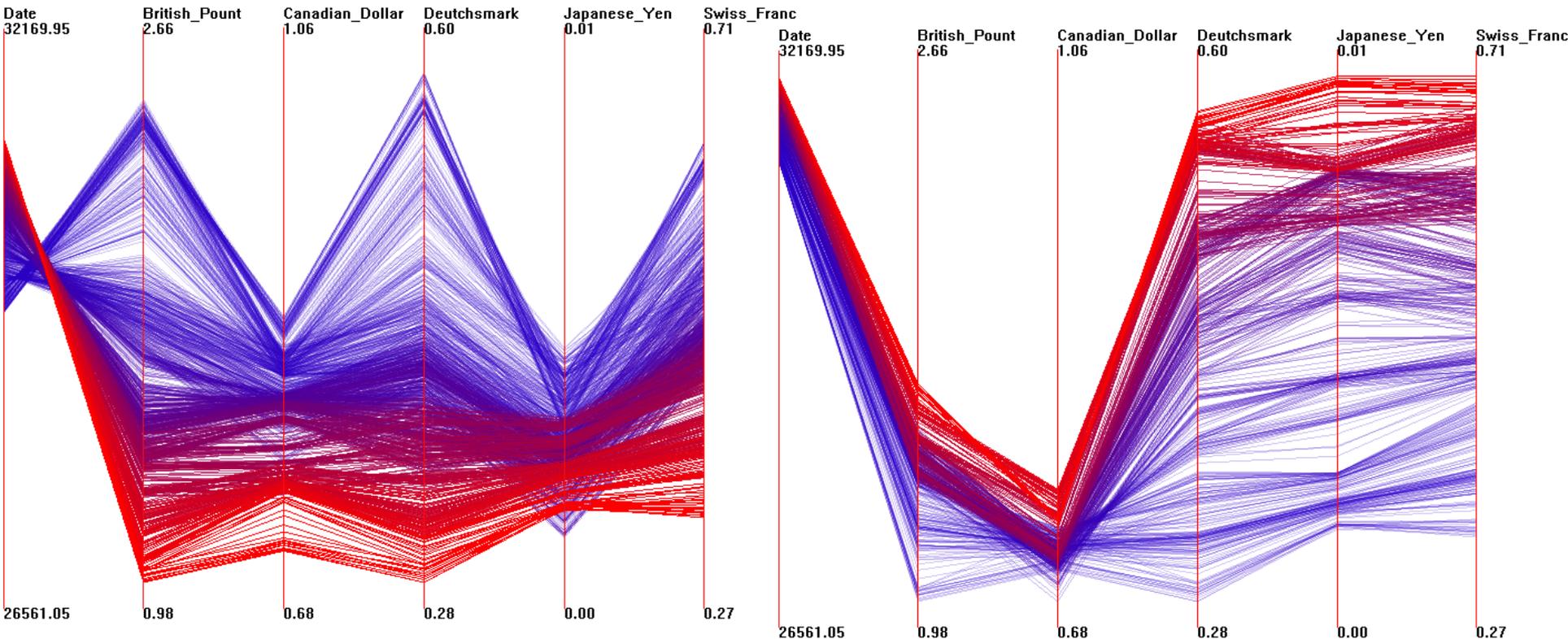
Drilldown to Original Info

Names	Date	Attack Type	Region
	11-AUG-1992	Assassination	Sub-Saharan Africa. Can
	13-APR-1992	Assassination	Sub-Saharan Africa. Can
Baya Tribe	05-APR-1992	Assassination	Sub-Saharan Africa. Can
	14-MAR-1992	Assassination	Sub-Saharan Africa. Ivor
Paramilitary Police	20-MAY-1992	Assassination	Sub-Saharan Africa. Mali
Tuareq Rebels	05-AUG-1992	Assassination	Sub-Saharan Africa. Niqe
	22-FEB-1992	Assassination	Sub-Saharan Africa. Niqe
	17-AUG-1992	Assassination	Sub-Saharan Africa. Toq
	24-JUL-1992	Assassination	Sub-Saharan Africa. Toq
Student Demonstrat	14-SEP-1992	Bombing	Sub-Saharan Africa. Ivor
Air and Azawak Libe	19-SEP-1992	Bombing	Sub-Saharan Africa. Niqe



CENTER

Example 2: Time Series Animation



Exchange rates into USD for British Pound and Deutschemark decreased dramatically from 1980 August to 1985 Jan.

Exchange rates into USD for Deutschemark, Japanese Yen, and Swiss Franc increased dramatically from 1985 Feb. to 1987.