



Leveraging Information and Network
Technology...



Translating DATA to INFORMATION to KNOWLEDGE

Wednesday

M

Radioa

A ship
radioactive cargo

boats

Pirates in small
speedboats at

Pirates are preparing to hijack a ship carrying
radioactive cargo.



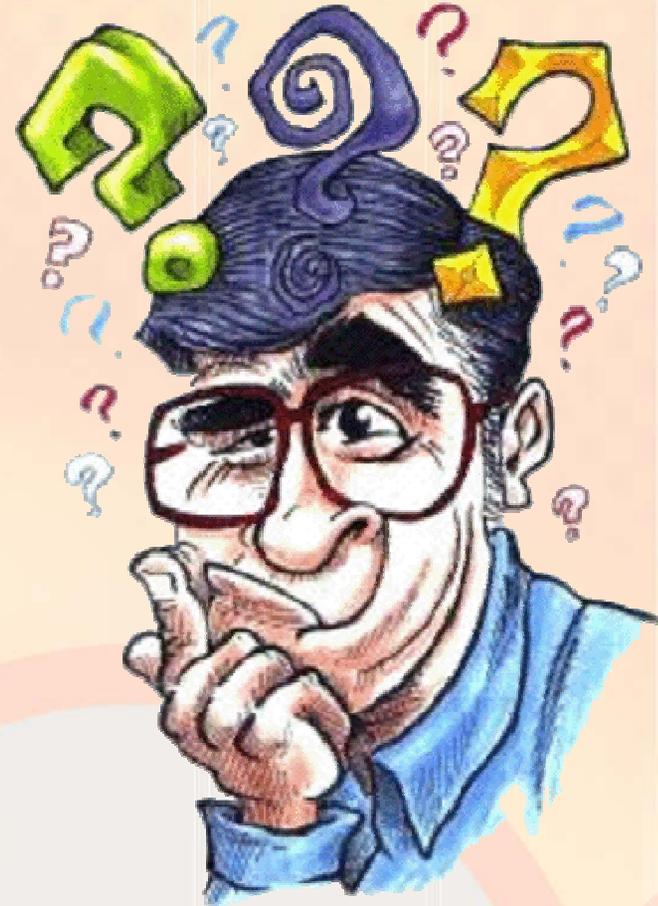
Uncertainty Management

~~Eliminate uncertainty?~~

Impossible!

Reduce uncertainty?

Still possible!



101001010100111101000010010111010010110100101101010101011101000041100101010100

Decide First, then Justify

.A young lady
with a
moustache?

A young
lady?

... an old
woman?

... or a man
with a
moustache?



Eye

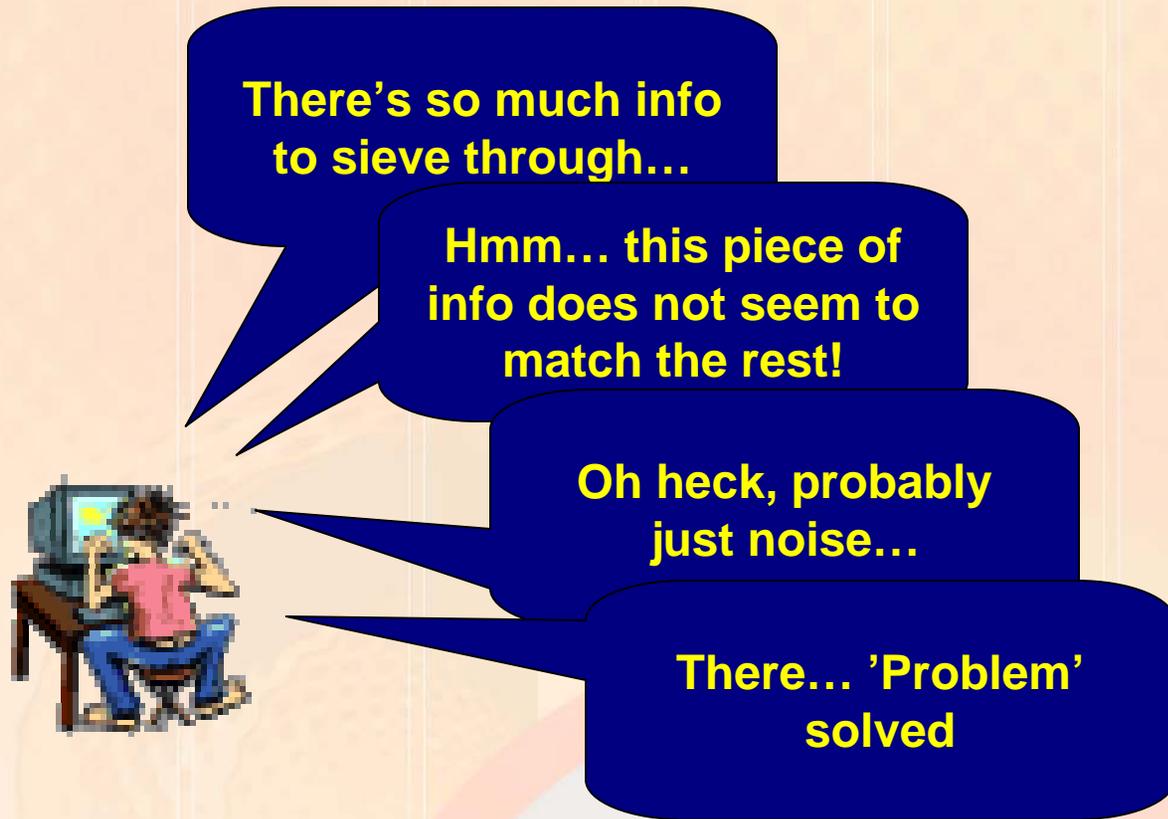
Nose

Moustache

Nose

Mouth

Anticipating Surprises??

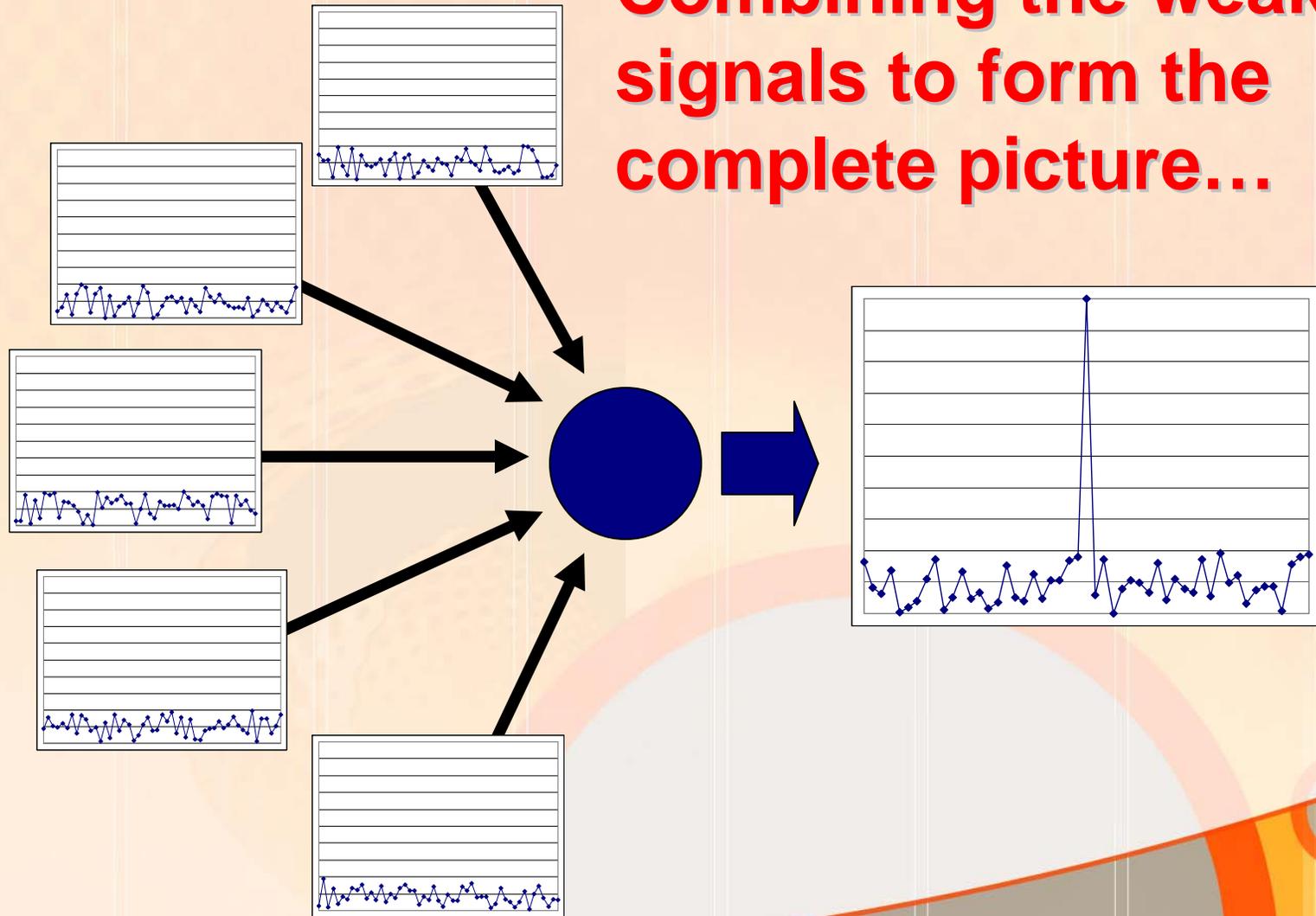


Press the <> button



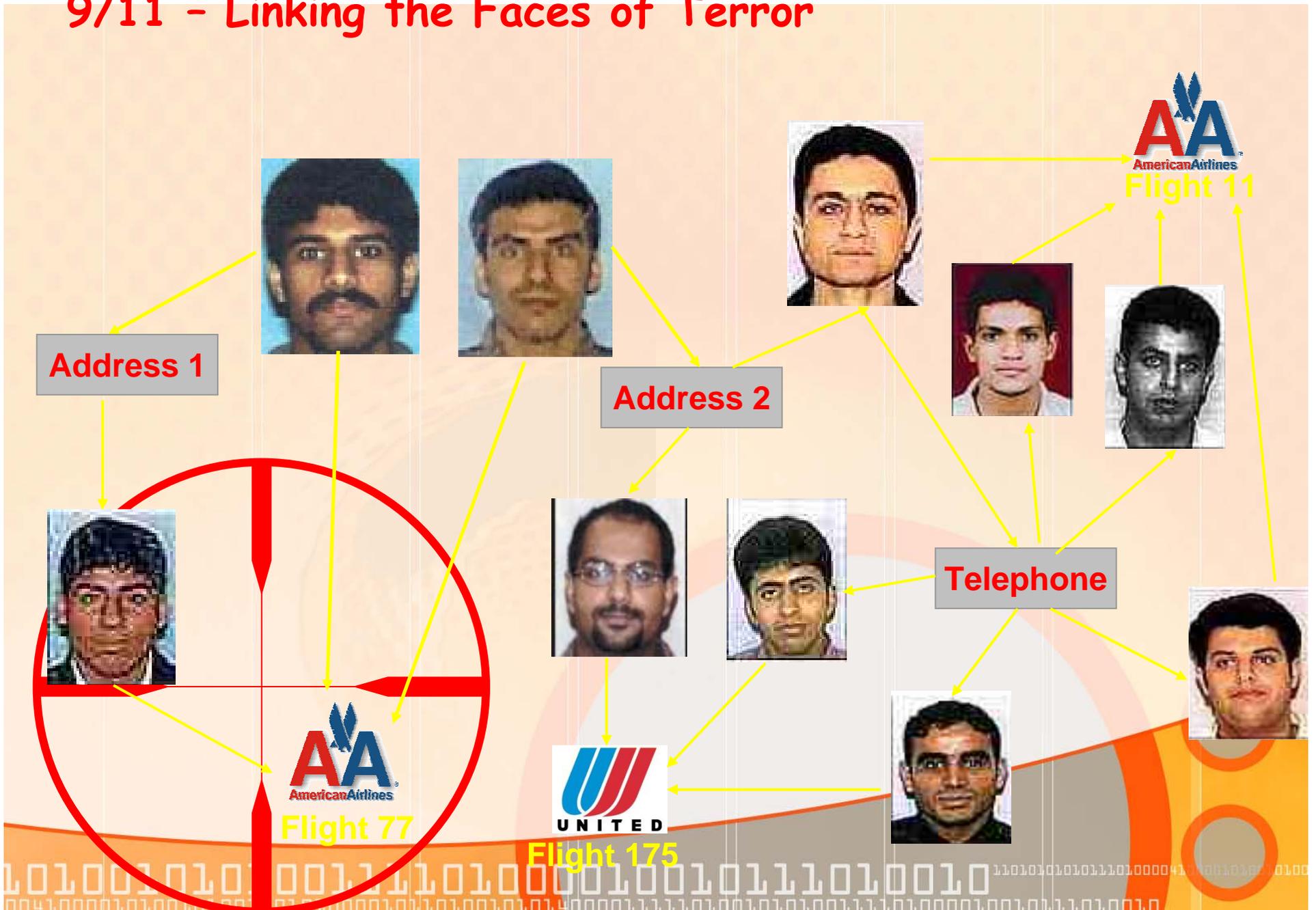
Weak Signals Detection

Combining the weak signals to form the complete picture...



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9/11 - Linking the Faces of Terror



9/11 - Linking the Faces of Terror



FEDERAL BUREAU OF INVESTIGATION

Synopsis: Information regarding flight training by Middle Eastern males.

Details: SA [REDACTED] Chief Pilot, Oklahoma City Division, advised that he has observed large numbers of Middle Eastern males receiving flight training at Oklahoma airports in recent months. SA [REDACTED] states this is a recent phenomenon and may be related to planned terrorist activity. SA [REDACTED] speculates that light planes would be an ideal means of spreading chemical or biological agents.



Flight 77



Flight 175



9/11 - Linking the Faces of Terror

FEDERAL BUREAU OF INVESTIGATION



Name: Zakarias Moussaoui

Arrested 16 August 2001

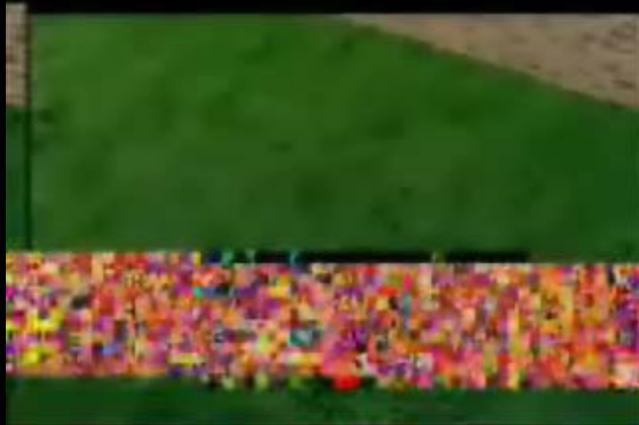
Address



“showed little interest in learning to take off or land”

“large aircraft could be used as a weapon”







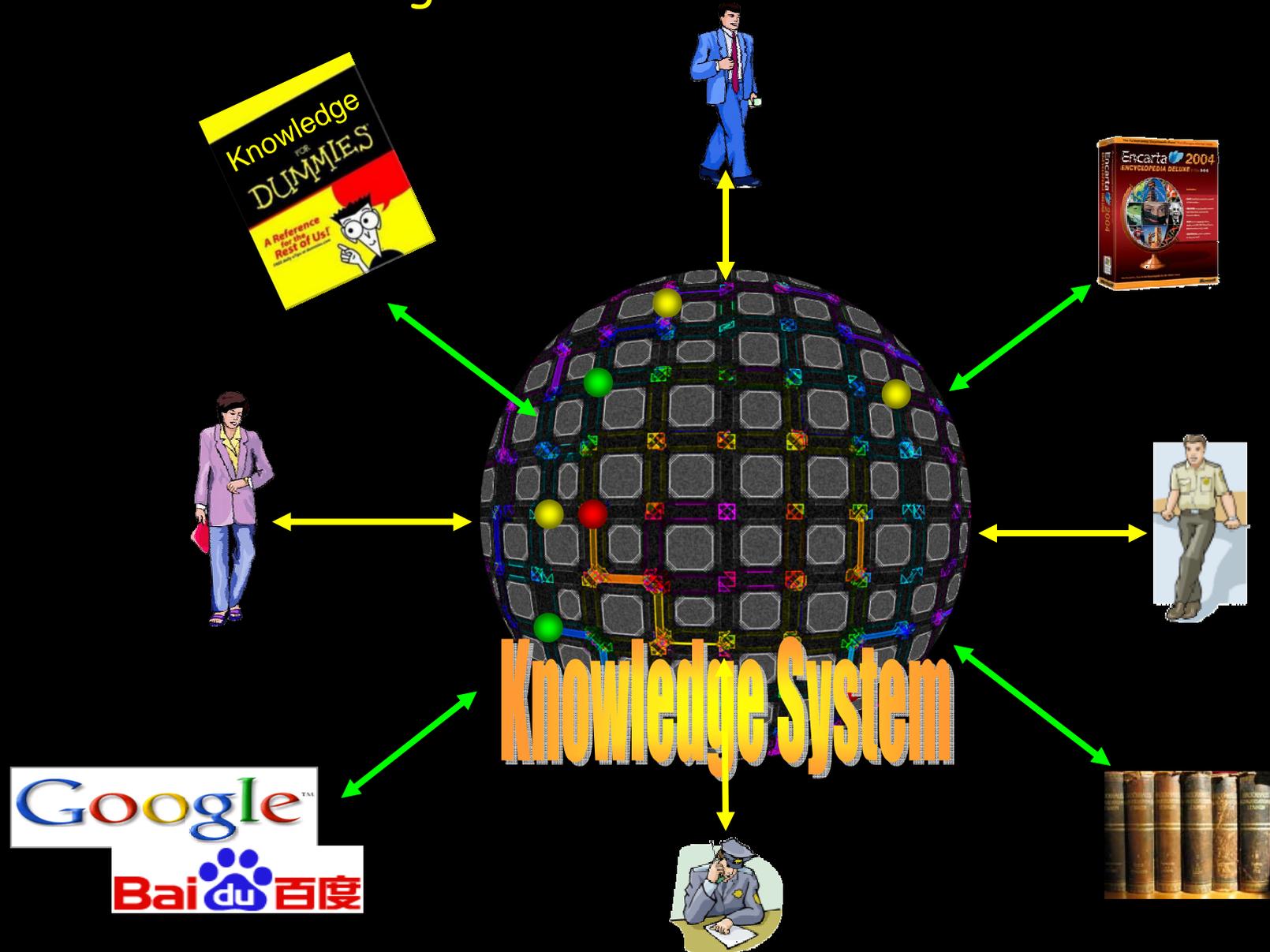
“Know to see” or “See to know”?

Mischievous?



How Knowledge-Based Systems can Help?

Information Management ... and Collaboration

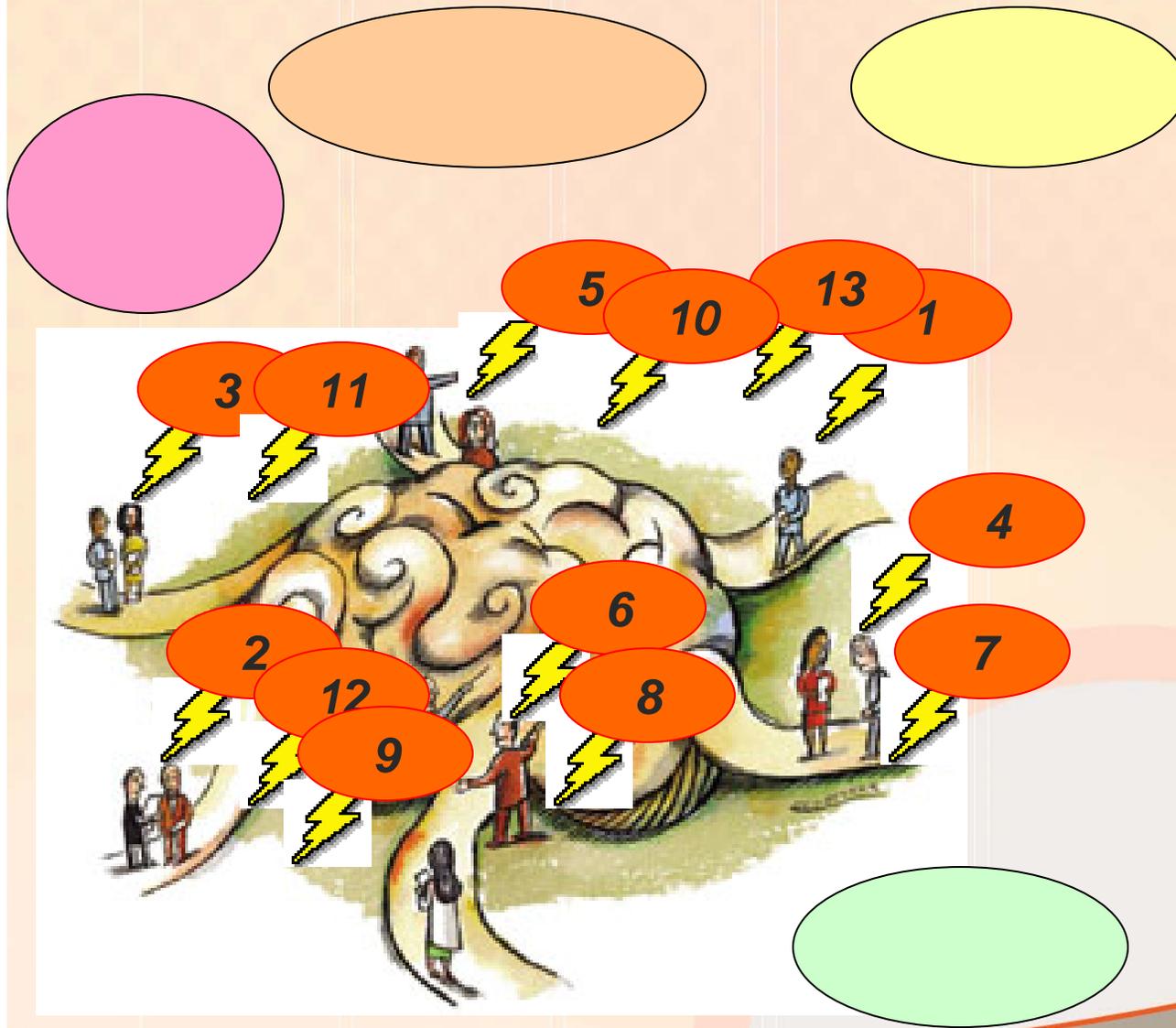




UNBIASED COLLABORATION

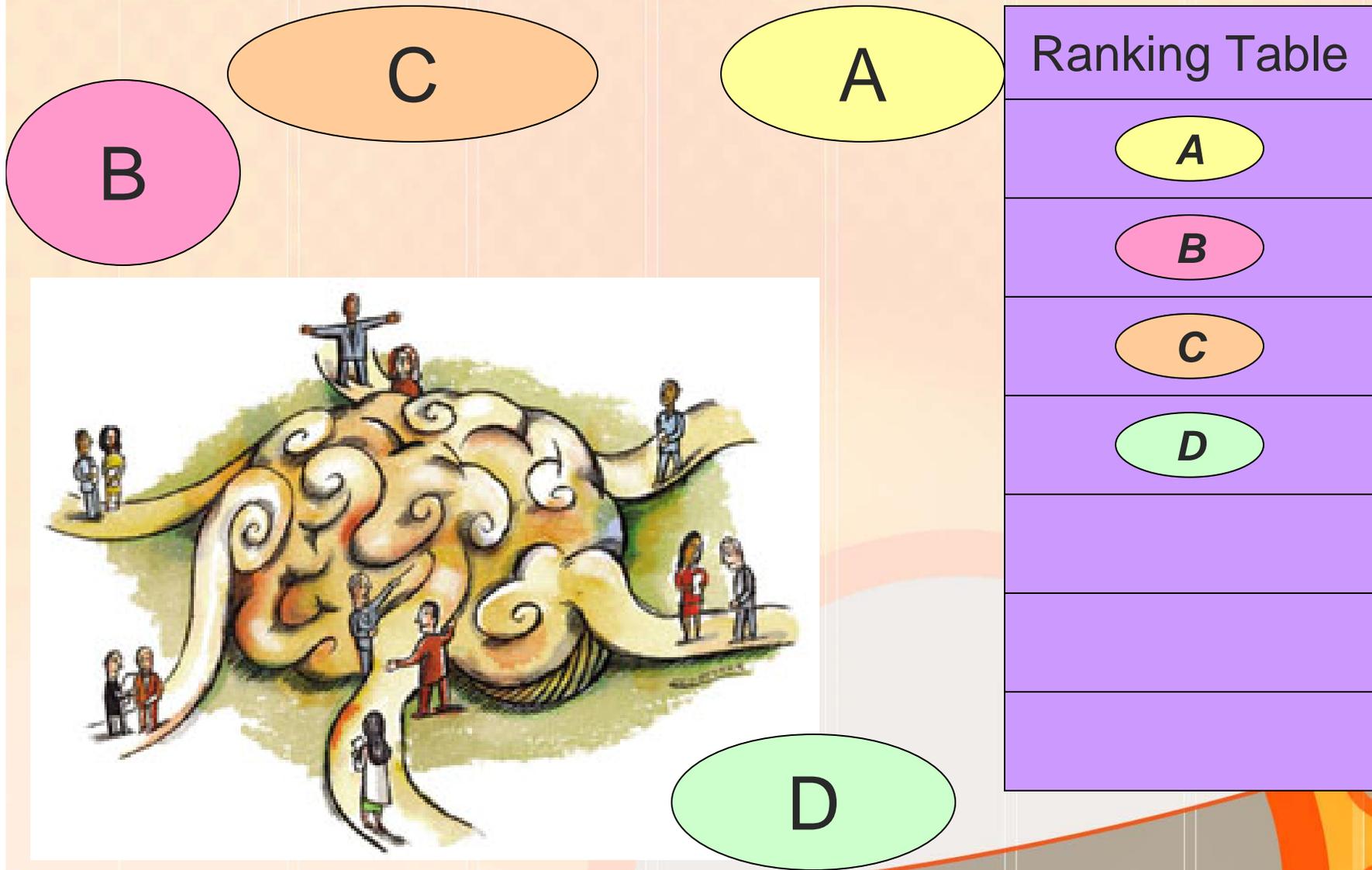


Hypothesis Generation and Ranking



Ranking Table

Hypothesis Clustering and Ranking



Hypothesis Ranking Revision

Evidence List



Ranking Table

A
B
C
D

Uncertainty Reduction

~~Hypothesis 1~~

Hypothesis 2

~~Hypothesis 3~~

~~Hypothesis 4~~

~~Hypothesis 5~~

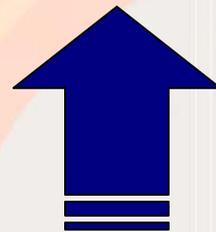
Hypothesis 6

Hypothesis 7

~~Hypothesis 8~~

~~Hypothesis 9~~

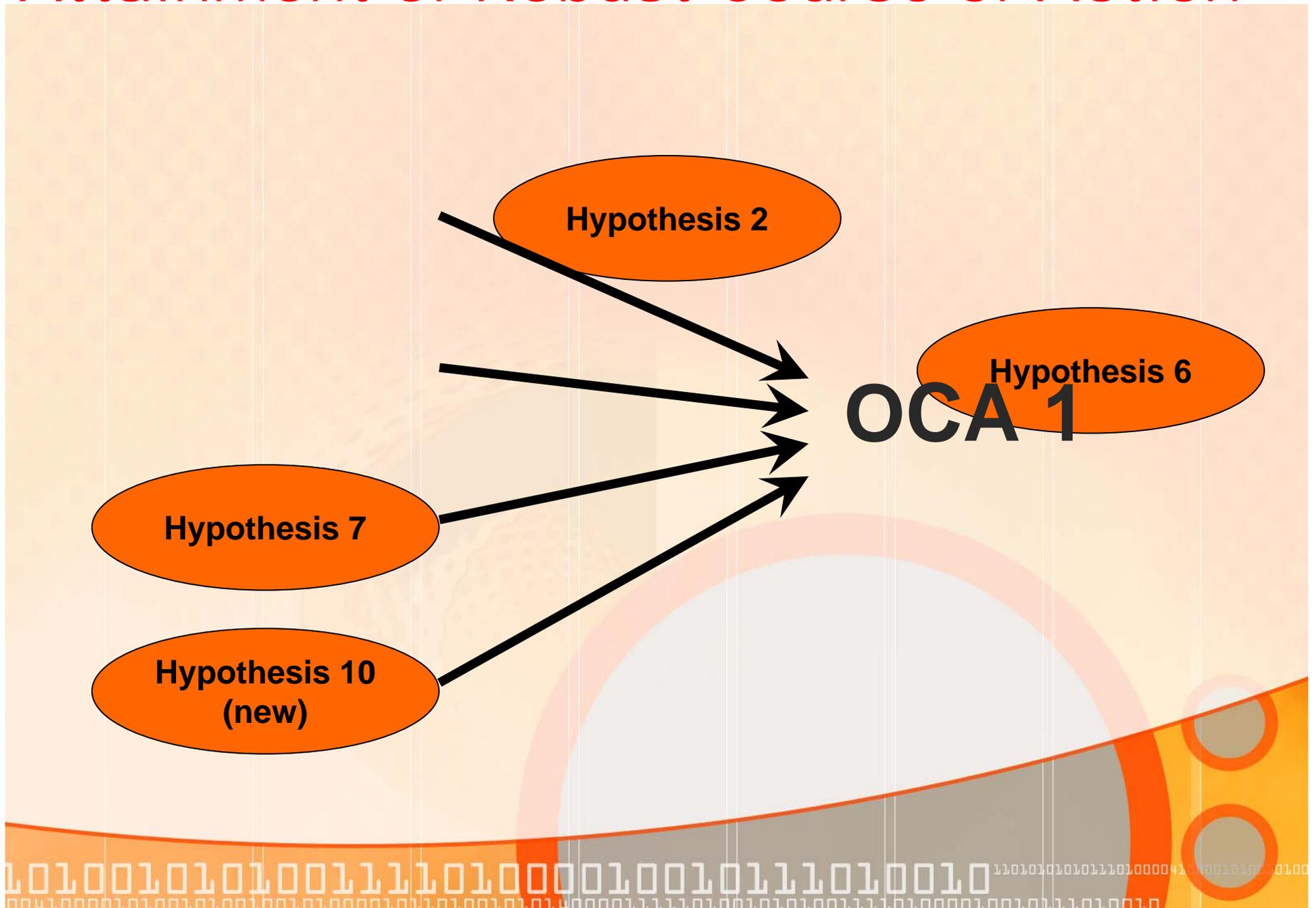
Hypothesis 10
(new)



New Evidence

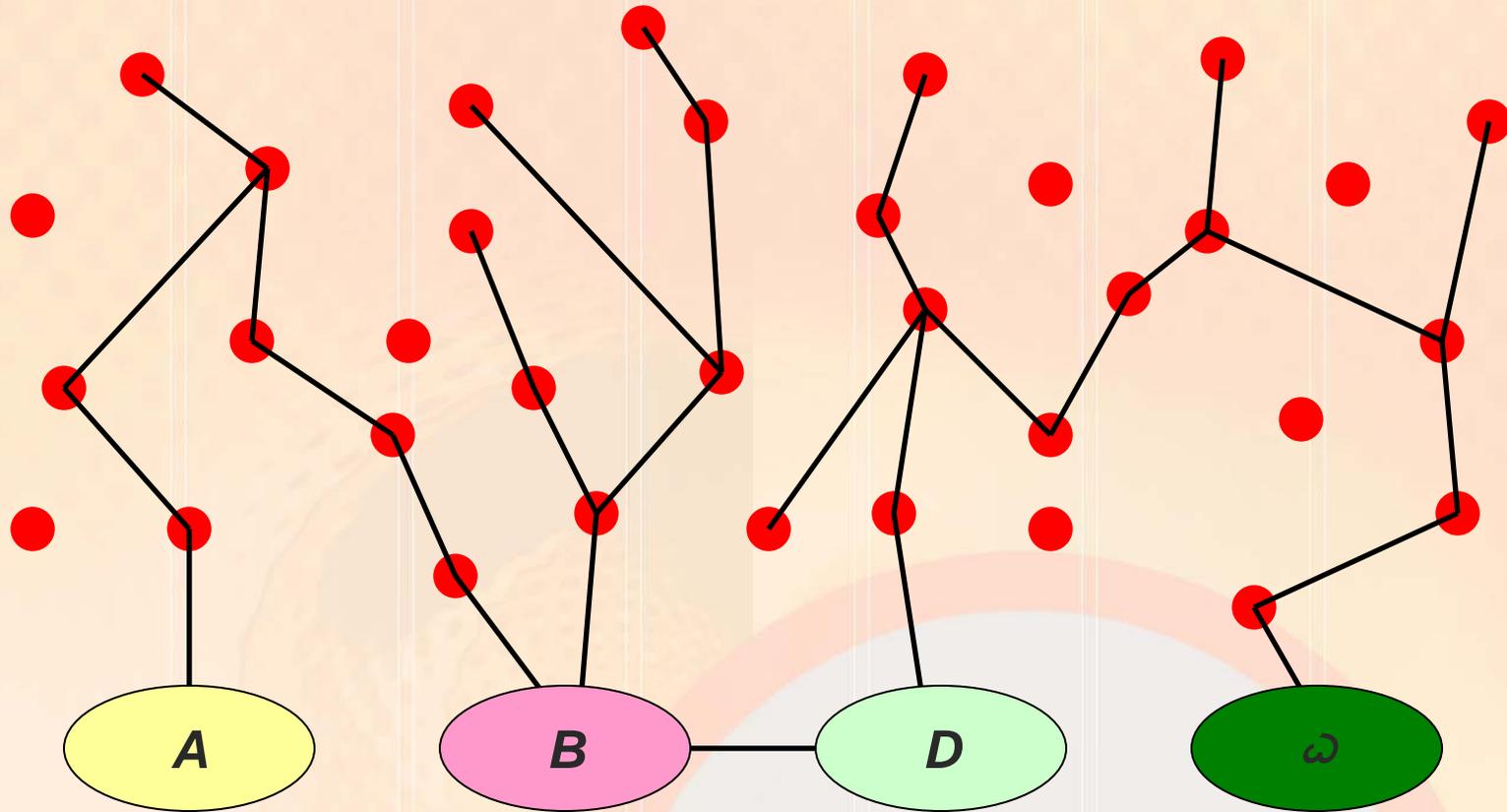


Attainment of Robust Course of Action



Bayesian Belief Network

As evidence comes in, links are generated...



Baye's Rule of Probability

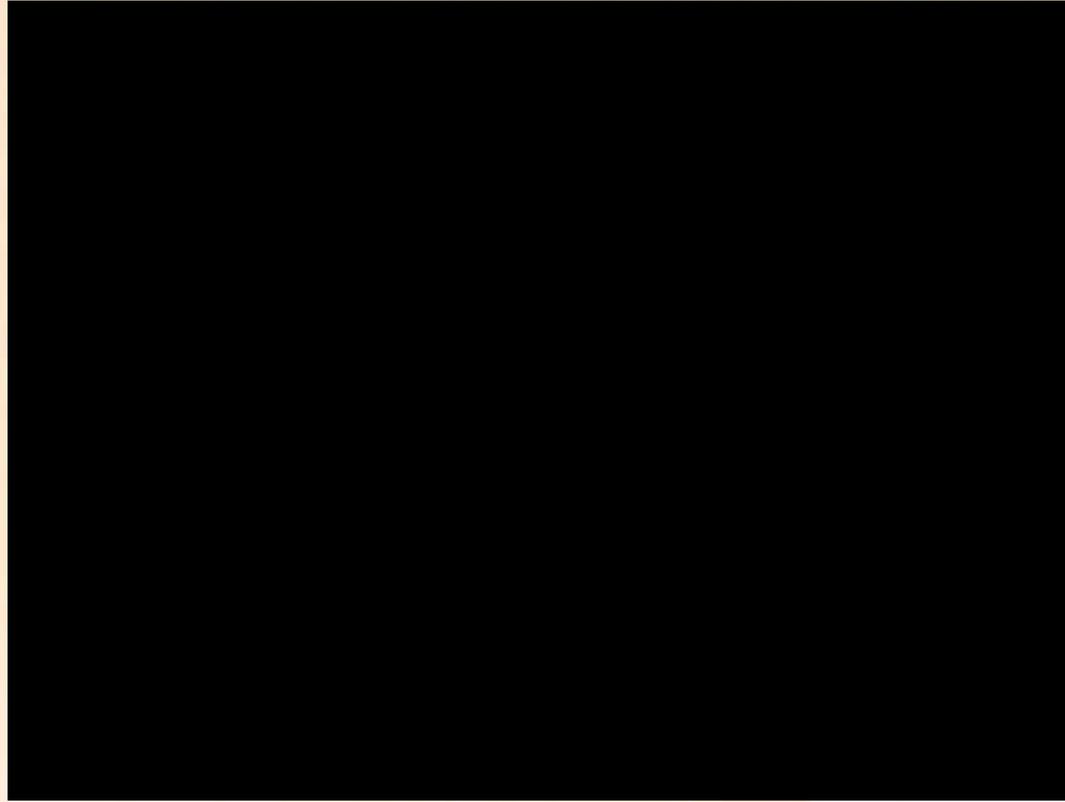
$$P(H/E) = \frac{P(E/H) P(H)}{P(E)}$$

H = Hypotheses

E = Evidence to be collected

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Countering Deception

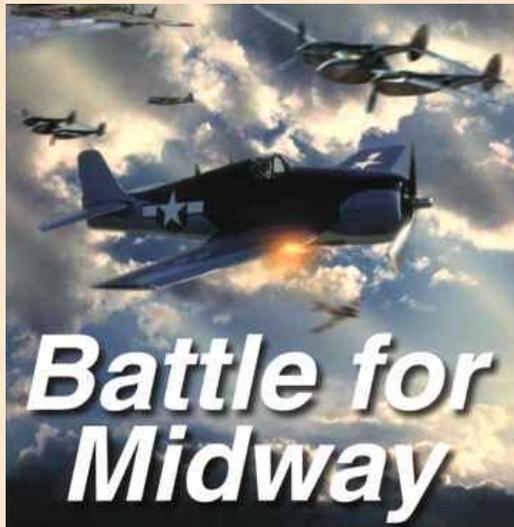


$P(E/H)$ vs $P(E/\text{not } H)$

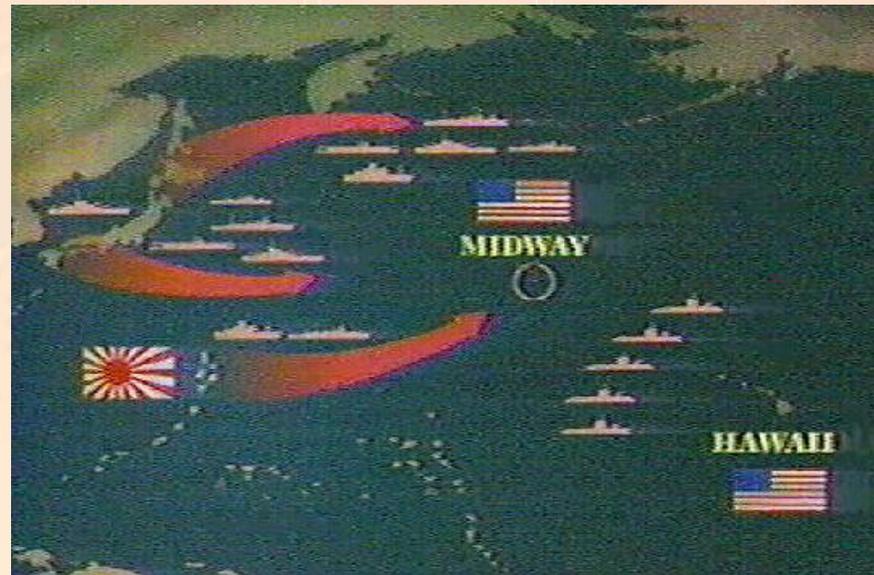
Competing Hypothesis



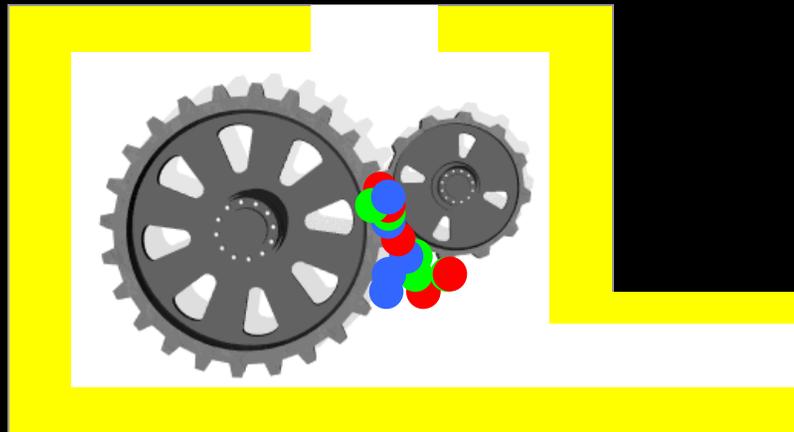
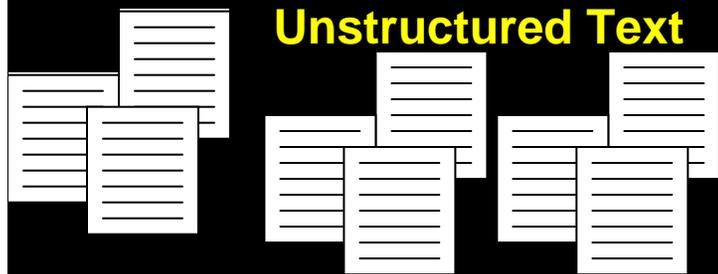
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Midway Revisited: Detecting Deception by Analysis of Competing Hypothesis

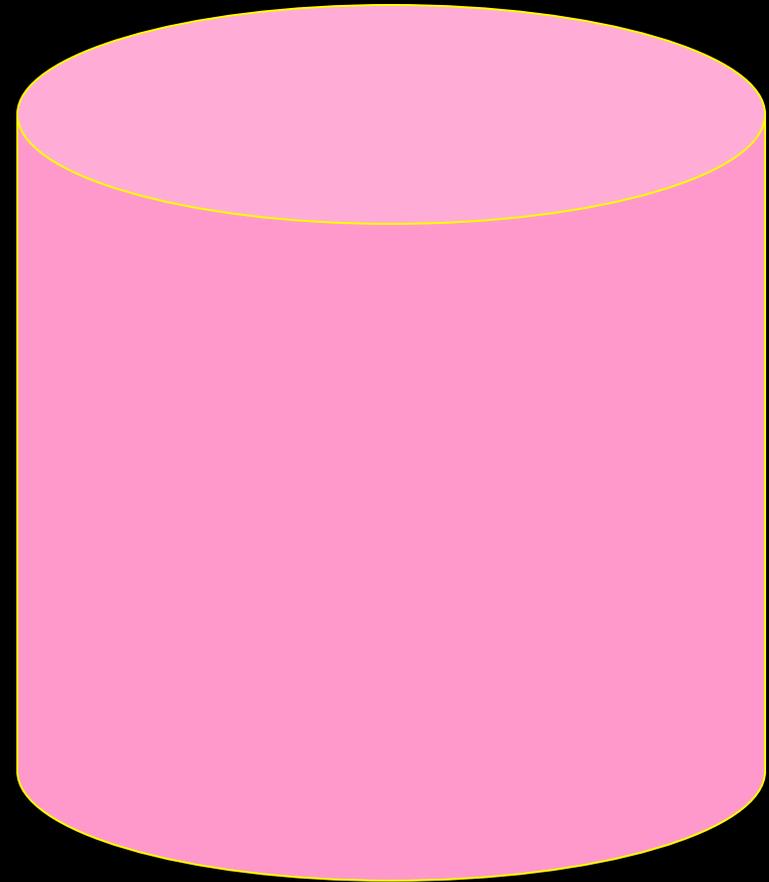


Evidence Extraction and Link Discovery



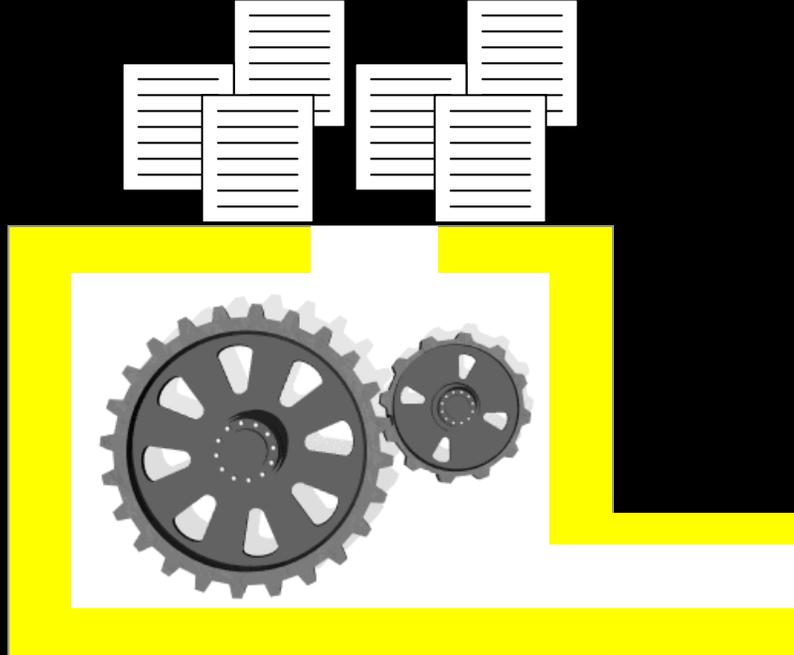
Evidence Extractor

Evidence Bin



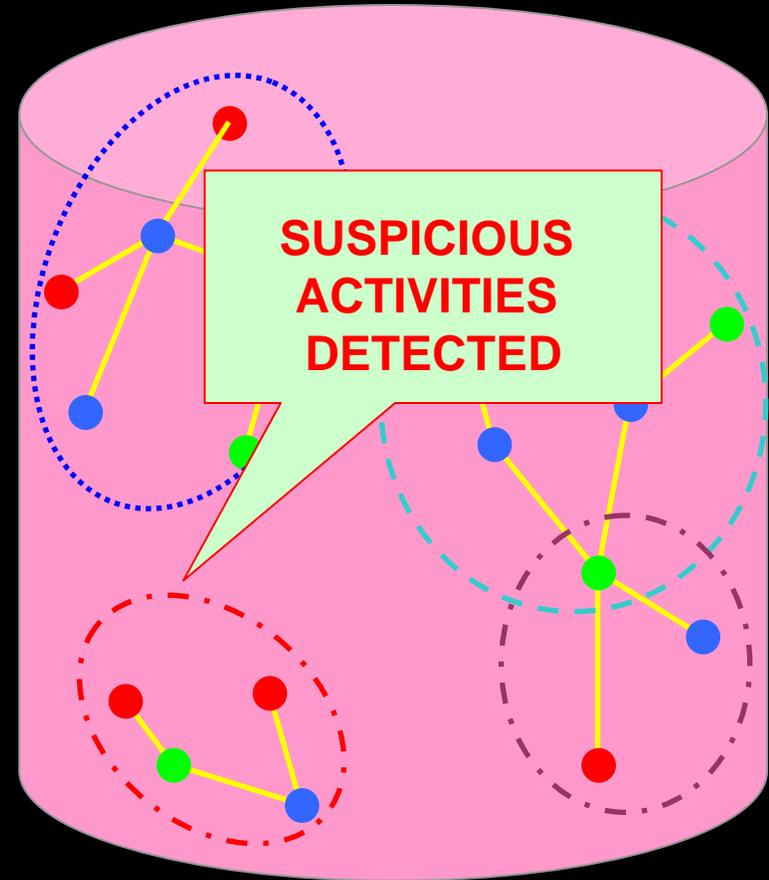
Evidence Extraction and Link Discovery

Unstructured Text



Evidence Extractor

Evidence Bin



Combining Proof Evidence...
Analysing Patterns....

Cynefin Domains

Complex Un-order
C&E coherent in retrospect

Hidden Order
C&E discoverable

Probe
Sense
Respond

Sense
Analyse
Respond

Act
Sense
Respond

Sense
Categorise
Respond

Chaotic Un-order
No perceivable C&E

Visible Order
C&E obvious

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Human Analysts – The “heartware” of Intel Architecture



Ruthless Curiosity

**You Make the
Difference!!!**



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