IMAGINING EMERGENT METADATA, REALIZING THE EMERGENT WEB

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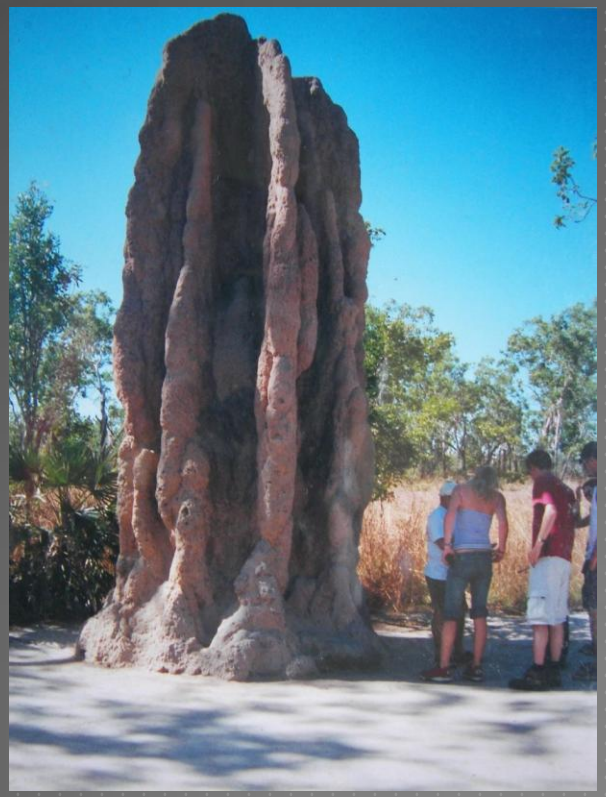
WHAT IS EMERGENCE?

- Independent Agents Interacting
- Agents following relatively simple rules
- New levels of complexity EMERGE in the system
- Organizes spontaneously, without intelligent control

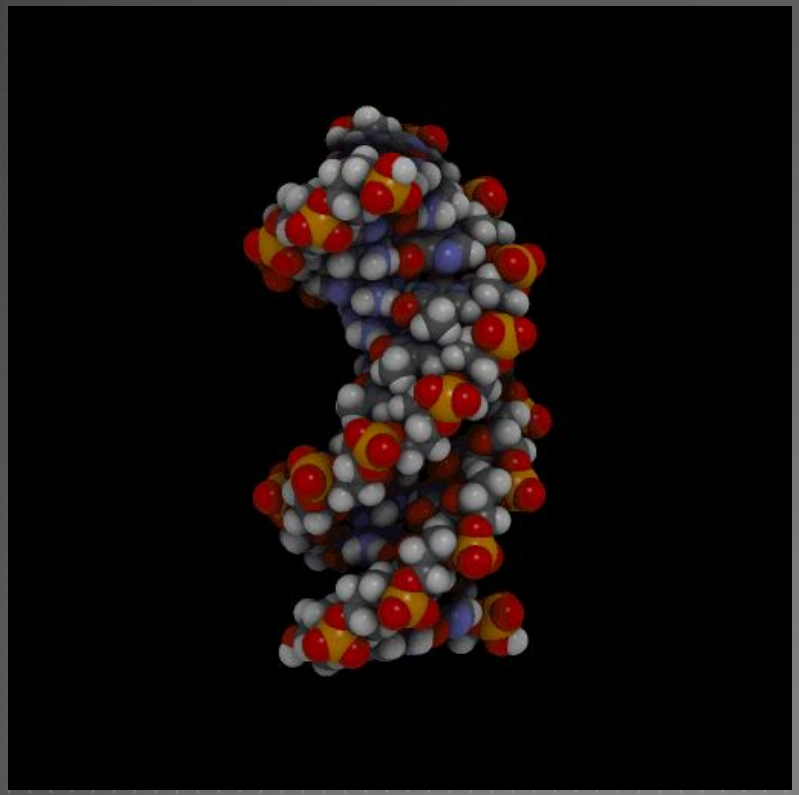
EXAMPLES OF EMERGENCE



Complex behaviours by creatures of relatively low intelligence working in concert (such as social insects)

Flickr image created by Ian Armstrong

EXAMPLES OF EMERGENCE (CONTINUED)



Genetic Expression (genotype becoming phenotype)

HOW DO WE KNOW IT'S EMERGENCE?

- No organizing intelligence can be identified
- Outcomes can only be predicted through SIMULATION
- Simulations cannot be compressed
- Outcomes exert constraints over the individual agents

WHY IS THIS IMPORTANT?

- Emergent phenomena cause systems to
  - SELF-ORGANIZE
  - Organize from the bottom up
  - Generate outcomes that cannot be predicted through ordinary means
  - Operate outside of traditional reductionism

WHAT COULD THIS MEAN FOR INFORMATION SYSTEMS?

- Information systems that:
  - SELF-ORGANIZE
  - Operate outside the limitations of human design
  - "Self repair" shortcomings in original configuration
  - Respond to change DYNAMICALLY
  - Respond to change without human intervention

WHY METADATA?

- Metadata, in one form or another:
  - Lies at the heart of all modern information systems
  - Allows for interoperability
  - Allows for searchability
  - Forms the basis of MACHINE SEMANTIC systems

WHAT ABOUT METADATA NEEDS TO CHANGE

- Metadata units need to interact with each other
- Metadata units need room to be more machine-centric
- Metadata units need to be ontology-agile

HOW CAN WE MAKE THESE CHANGES?

- Use tools like bots, browsers, and evaluators to cross-pollinate Metadata units
- Recreate Metadata units as code with encapsulated Metadata tags
- Create room in Metadata schemas for tags reflecting non-human organizing principles
- Allow Metadata units to dynamically reference external ontologies
  - Actively (as software)
  - By proxy (cross-pollination)

WHY HASN'T THIS BEEN DONE ALREADY?

- Digital technology defies the physical
  - Items can exist anywhere on a network
  - Items just need to be linked digitally
  - Extensive, offsite resources can be easily referenced
  - Moving from resource to resource happens at near light-speed
- Artificial processing and evaluation are now more sophisticated
- Digital resources need less direct human oversight
- Processes can be automated easily

CROSS-POLLINATION

- Simpler
- Uses less computing power
- Could be implemented using multiple mechanisms
- More realistic in the short term
- Would probably rely heavily on user navigation

CROSS-POLLINATION

- Browsing tools would act as catalysts
- As users moved from one item to another:
  - Browsers could make changes to level 2 and 3 tags
  - Evaluate tags for retention
  - Metadata agents would interact by proxy

METADATA AS SOFTWARE

- Allows for direct interactions
- User navigation less important
- More potential for novel connections/channels to Emerge

METADATA AS SOFTWARE

- Metadata would exist as information within small programs
- These programs could interact
- These programs could run on a shared network or the internet

DEFINING OUR TERMS

- Metadata files are AGENTS
- AGENTS contain data in FIELDS
- Each discrete piece of data in a FIELD is a TAG

METADATA TAGS SET IN LEVELS

- Level 1: regular, base level
- Level 2: identical to level 1 but generated through navigation
- Level 3: tags employing machine-semantic metadata

LEVEL 1

- Will often be assigned by a human cataloger
- Designed to be machine readable and human semantic
- Not meant to be edited by mechanical agency

LEVEL 2

- Uses the same tag content as Level 1 tags
- Meant to be assigned/edited by mechanical rather than human agency

LEVEL 3

- Tag content meant to be machine semantic only
- Might be human readable/semantic but doesn't have to be
- Meant to be assigned/edited by mechanistic agency

AGENTS CAN BE FILE GESTALTS

- With digital technology files can be split up
- Level 1 tags could be local
- Level 2 and 3 tags could be linked from a remote server

AGENTS FOR THE WEB

- Should probably be stored in offsite indexes/networks
- Similar to keyword indexes used by search engines now
- This would keep even Level 1 tags from being modified unscrupulously

FOCUSING ON SUBJECT TAGS

- At this time I have chosen to focus on subject heading tags
- Some navigational tags are also part of Level 3
- Probably the easiest place to identify useful effects

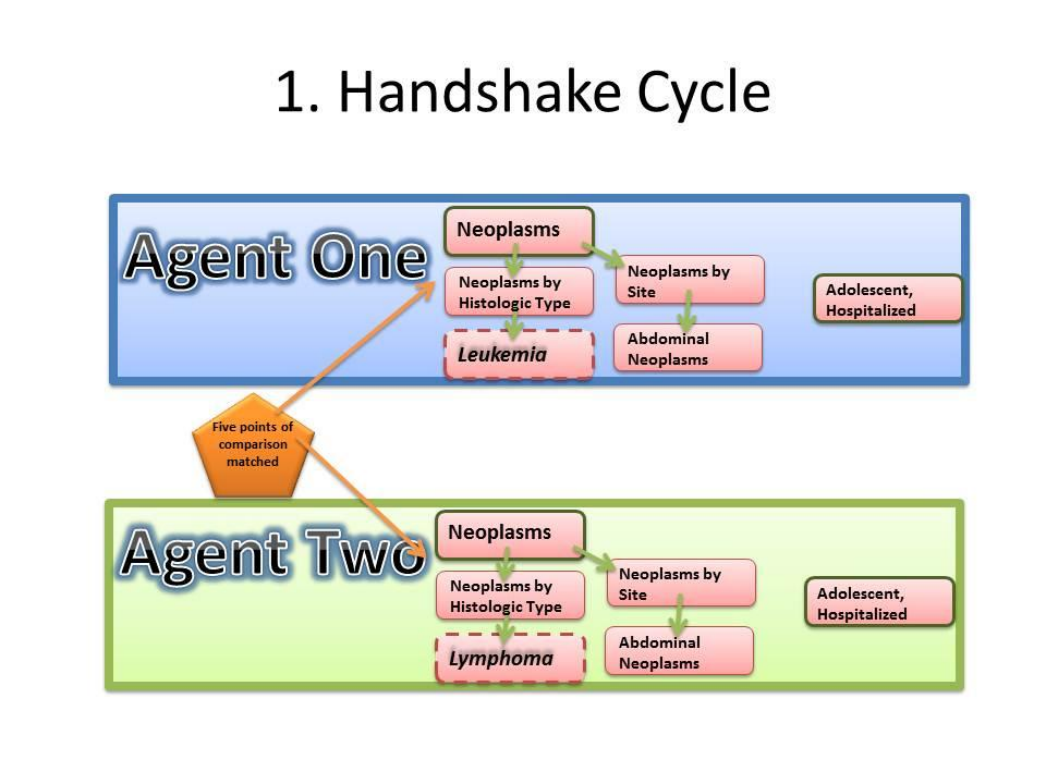
WALKING THROUGH CROSS-POLLINATION

- Takes place in three cycles
- Should probably be catalyzed by a browsing agent
- On the web process would need to be anonymized and transparent

LEVEL 2 EXCHANGES-DYNAMISM

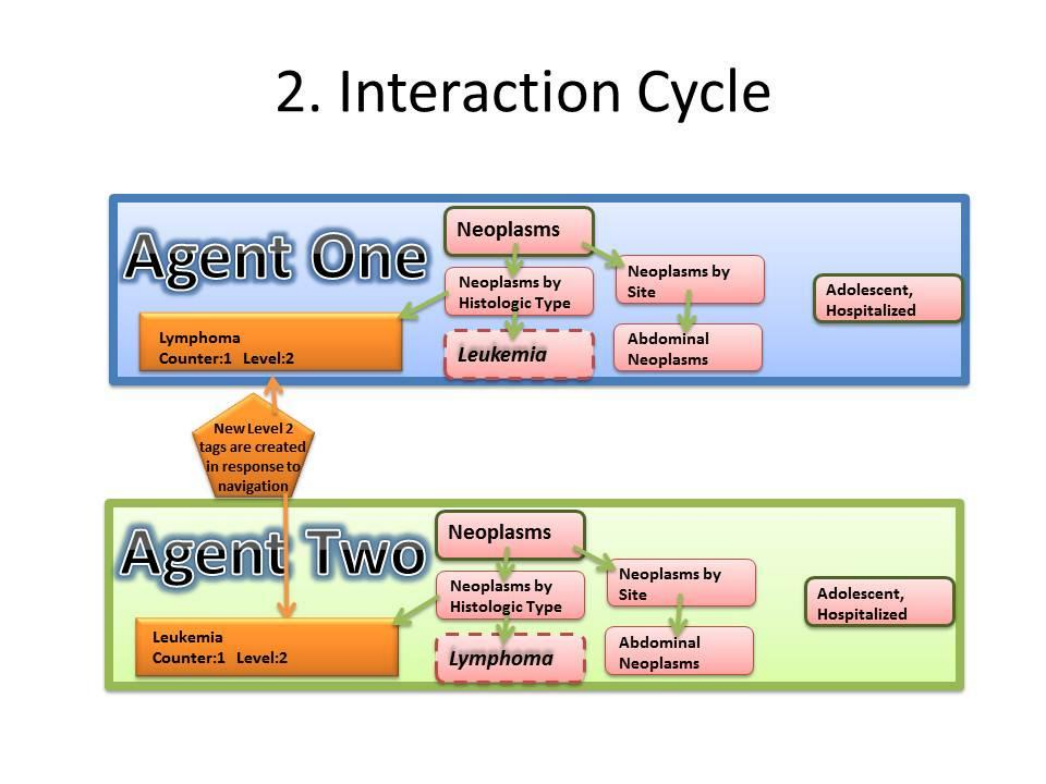
- Designed to augment the Level 1 tags
- May rectify shortcomings in original cataloging
- May help respond dynamically to change
- All Level 2 and 3 tags must keep a counter value

LEVEL 2 HANDSHAKE CYCLE



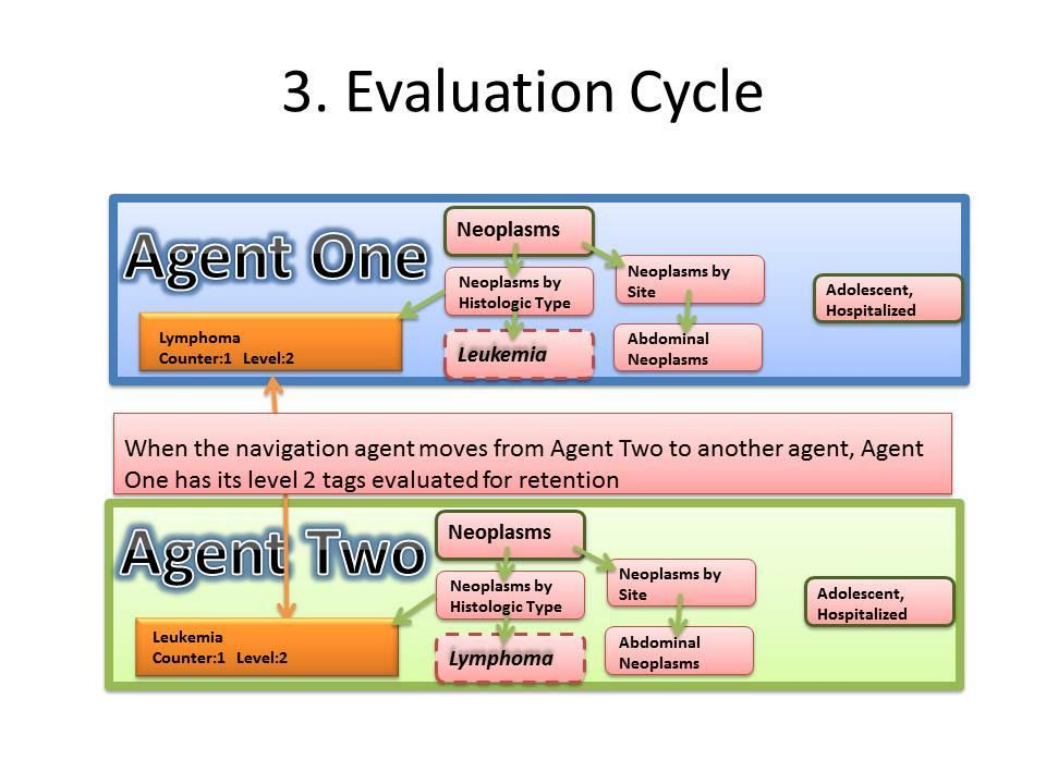
For exchange to take place, there must be a certain threshold of matching tags and time on agent

LEVEL 2 INTERACTION CYCLE



With compatibility established tags are exchanged. Set as Level 2 with a Counter value 1

LEVEL 2 EVALUATION CYCLE

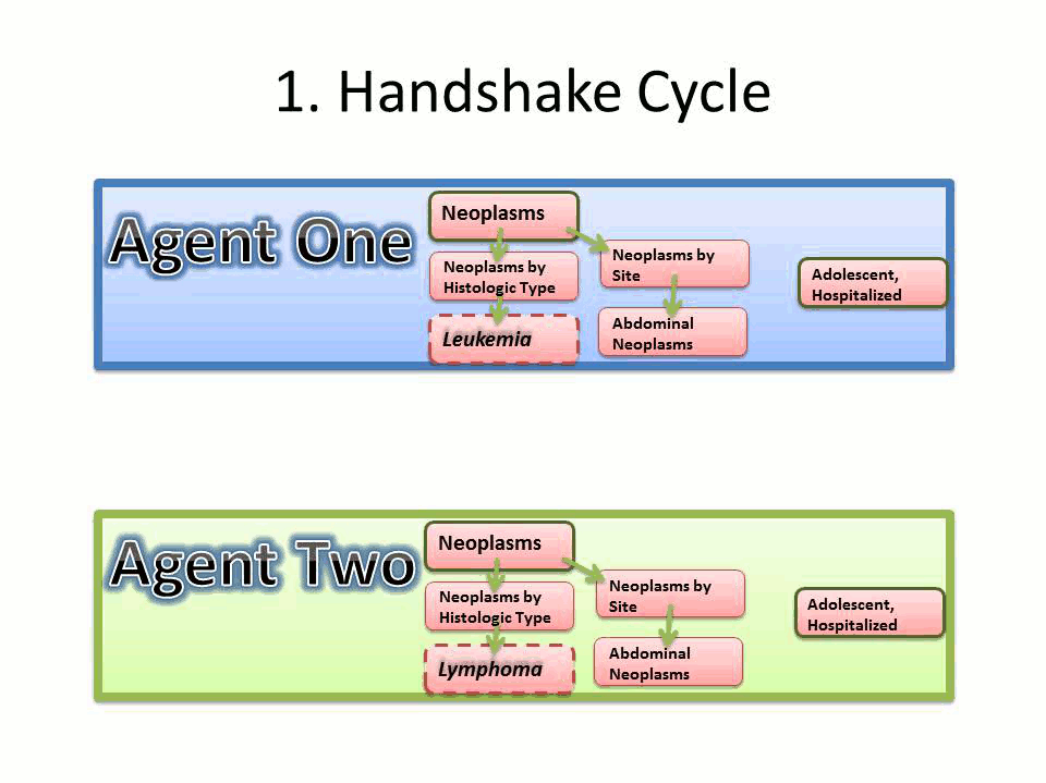


The last part of the cycle evaluates Level 2 tags by counter value for retention

EVALUATION CYCLE

- Uses two types of filter:
  - Survival Of The Fittest (SOTF)
  - Strength Of Weak Ties (SOWT)

THE WHOLE LEVEL 2 SEQUENCE



LEVEL 3 EXCHANGES-ATTEMPTING REAL EMERGENT BEHAVIOR

- Using tag types distinct from the Level 1 and 2 tags
- Designed to generate/cultivate unique information channels
- Could be exploited by search and aggregation tools in a variety of ways

SOME POSSIBLE LEVEL THREE TAG TYPES

Ontology: Synonyms for tags from level 1 and 2 drawn from external ontology libraries

Folksonomy: Synonyms for tags from level 1 and 2 drawn from external folksonomy libraries

CrossLink: Links to other Agents that have been the subject of a successful exchange.

References: References from the Agent's Item and from any Agents that have been the subject of a successful exchange.

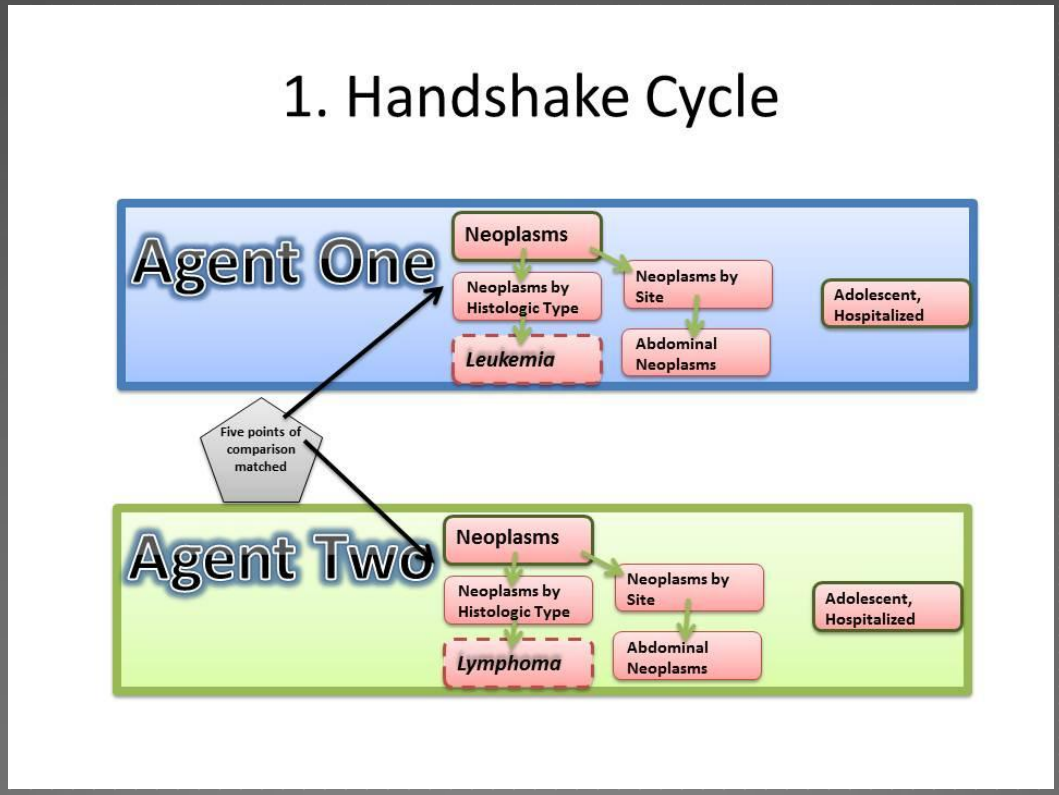
Search: The search terms present in the browsing mechanism at the time of a successful exchange.

Identity: Presents as string. Three separate tags generated. Top three Ontology tags+top three Folksonomy tags as determined by Counter values and random number if too many Counter values are equal.

Path: Presents as string. Three separate tags generated. Top three Reference tags+top three Crosslink tags as determined by Counter values and random number if too many Counter values are equal.

Route: Presents as string. Three separate tags generated. Top three Search tags+top three Identity tags as determined by Counter values and random number if too many Counter values are equal.

LEVEL 3 HANDSHAKE CYCLE



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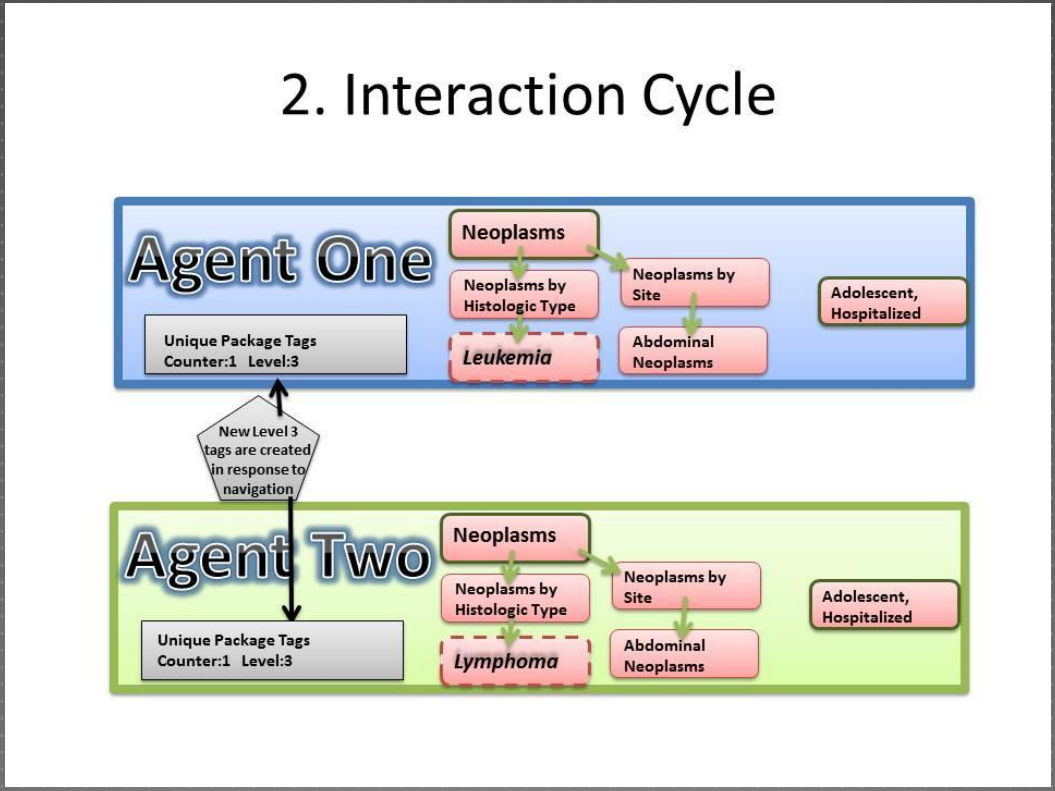

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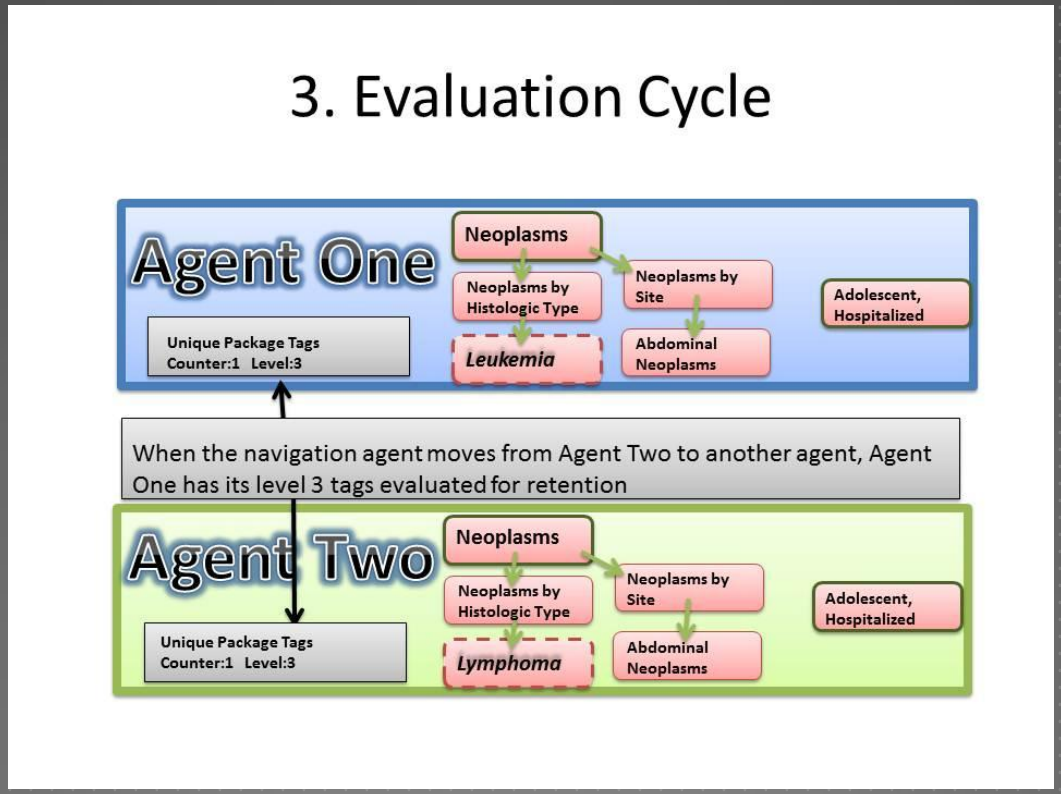
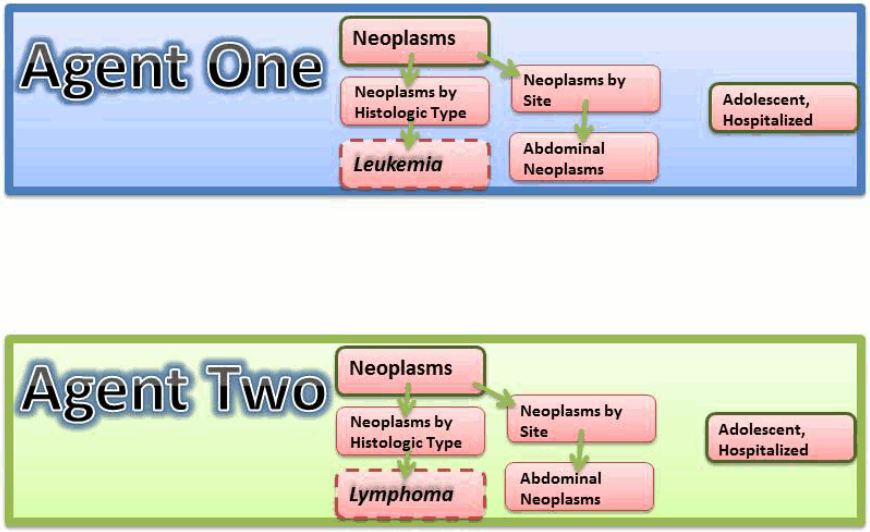
LEVEL 3 EVALUATION CYCLE



The last part of the cycle evaluates Level 3 tags by counter value for retention

LEVEL 3 PUTTING IT ALL TOGETHER

1. Handshake Cycle



NEXT STEPS

- Determine if the idea has utility through simulation
- Use an emergence simulator like NetLogo (if possible)
- If these tools are inadequate, create a proprietary simulation methodology

WHAT ARE WE LOOKING FOR

- Useful adaptations to navigation or other environmental changes
- The appearance of novel channels or networks in the form of linking and navigational pathways

QUESTIONS?