Using Behavior Templates To Design Remotely Executing Agents For Wireless Clients

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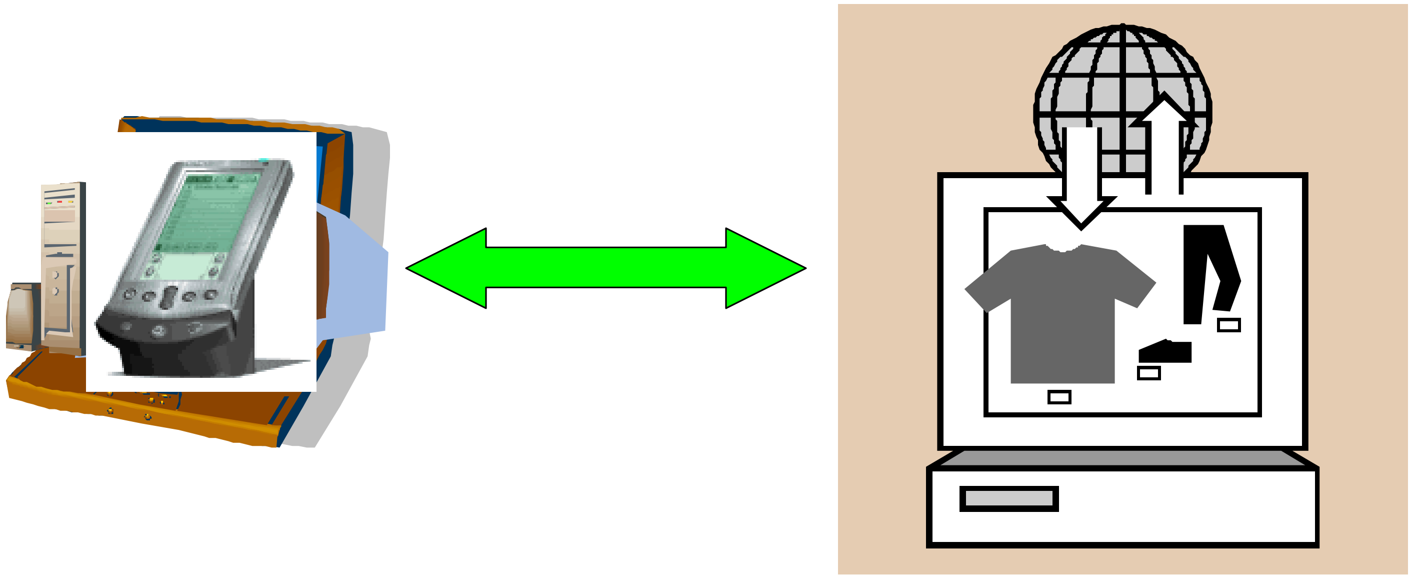
Motivating Scenario



Problem

- Wireless clients are diverse, varying in:
  - Network Bandwidth
  - Network Reliability
  - Graphical Display
  - User requirements
- Web services are not flexibly customizable
  - Scenario: Wireless E-Commerce

Outline

- Previous Approaches
- Design Goals
- Solution – ReAgents
- Architecture
- Behavior Library
- Experiments
- Conclusions

Previous Approaches

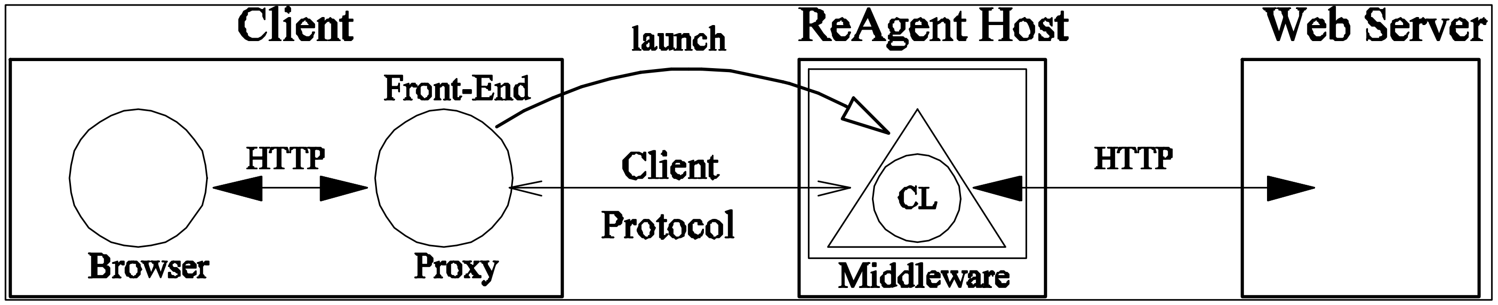
- Network-based
  - Active Networks
- Server-based
  - WAP (Wireless Application Protocol)
- Intermediary-based
  - Web Proxies
  - Mobile Agents

Design Goals

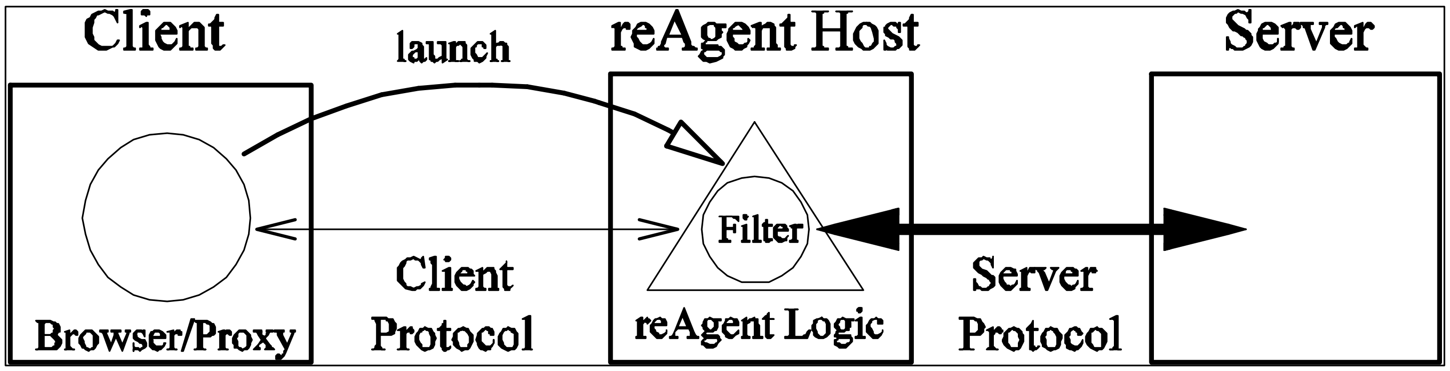
- The ideal customization solution will be:
  - Flexible enough to handle user needs
  - Transparent to servers (deployable)
  - Easy to program and understand
  - Efficient when used

Solution: ReAgents

- ReAgents – Remotely Executing Agents
  - Contain Customizing Logic (CL)
  - "One-shot" mobility to ReAgent host
  - Behavior-based development

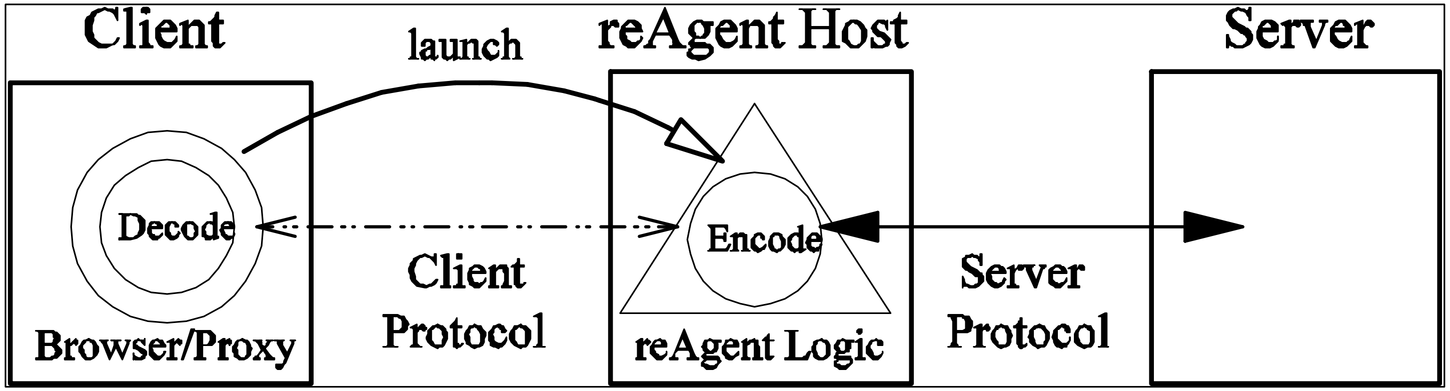


Behavior: Filter



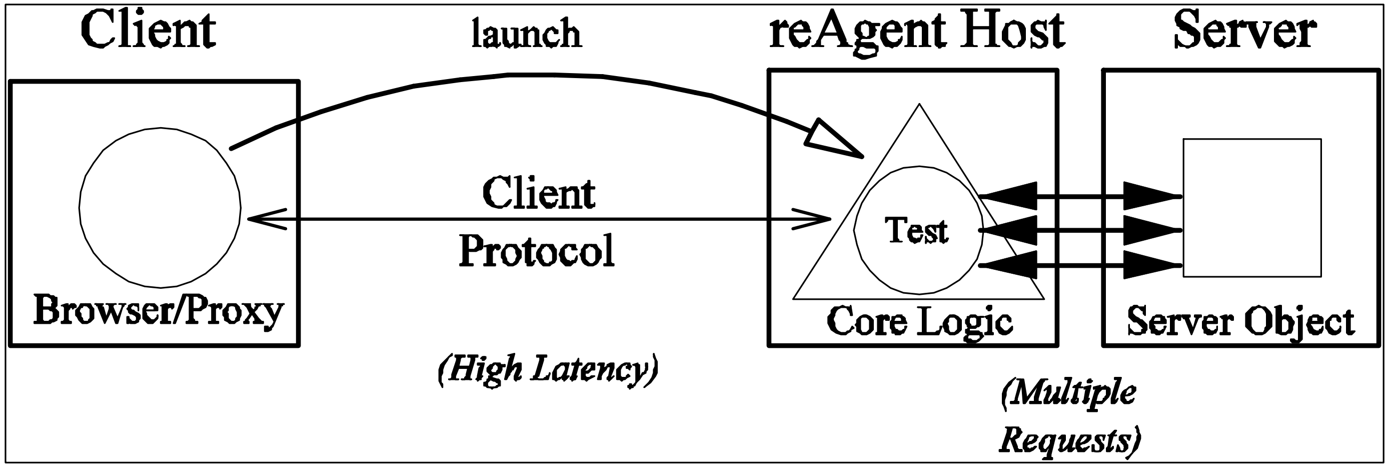
- Reduces server data to client specifications
- Customizing Logic: Data-reducing algorithm
- Sample Application: Low-bandwidth filtering

Behavior: Encoder



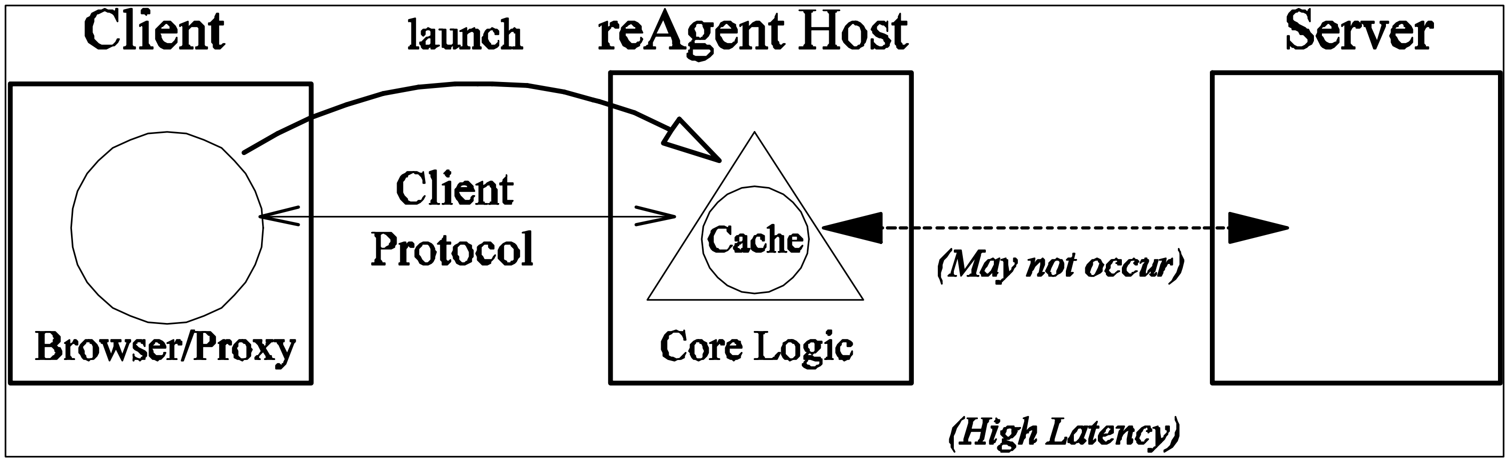
- Transforms data for reverse-transform at client
- Customizing Logic: Reversible data transformation
- Sample Application: Encrypted transfer for privacy

Behavior: Monitor



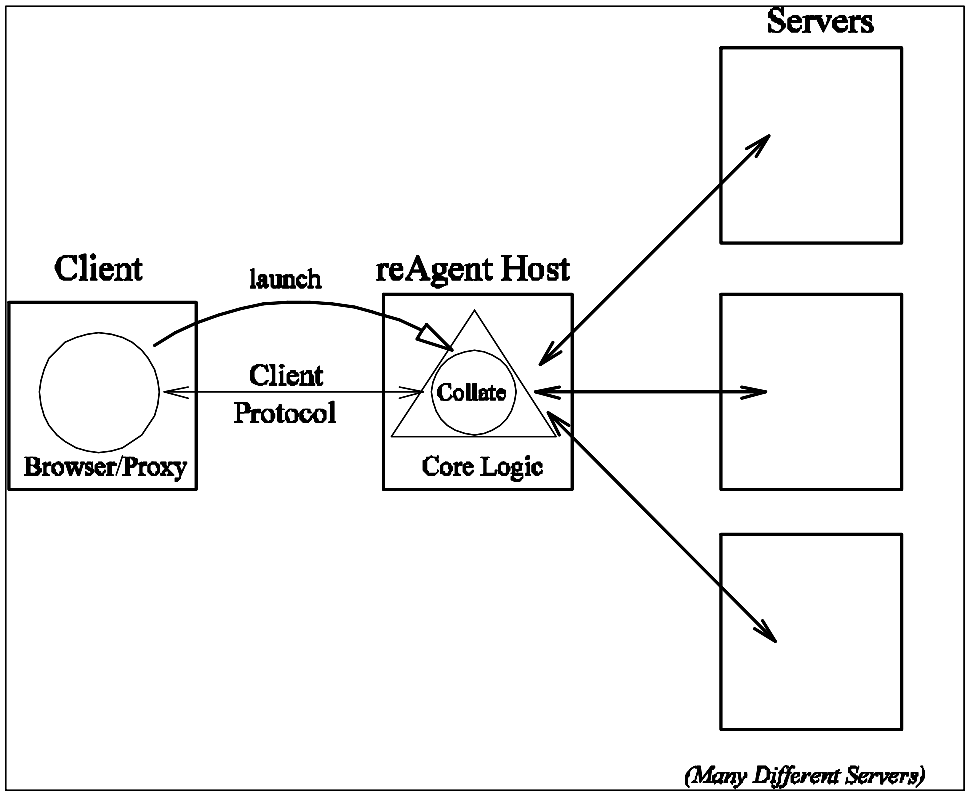
- Polls object on server until desired state is reached, then reacts to state change
- Customizing Logic: Object state test and reaction
- Sample Application: Custom stock trader

Behavior: Cacher



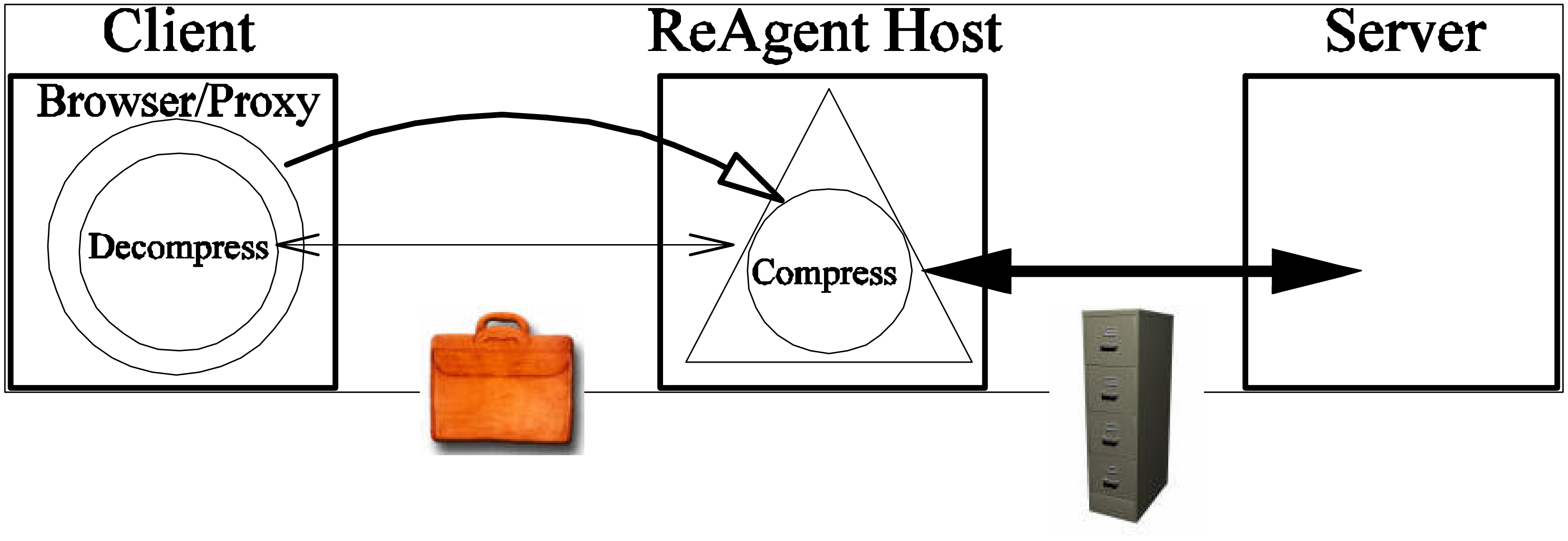
- Bypasses server communication by storing frequently accessed server data close to client
- Customizing Logic: Cache management policy
- Sample Application: Resource-poor client caching

Behavior: Collator



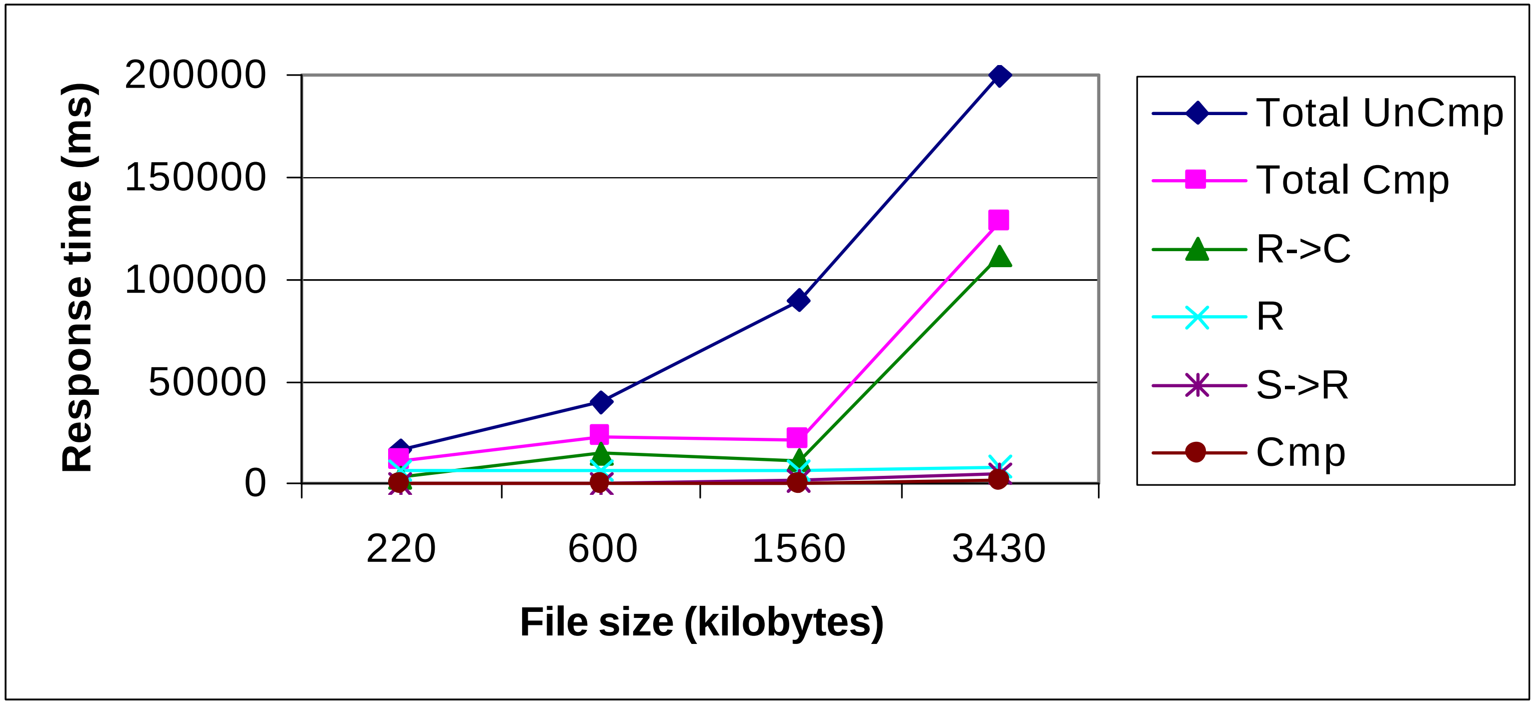
- Sends same request to many servers and merges results
- Customizing Logic: Results-collation algorithm
- Sample Application: Shopping comparison agent

Experiment



- File transfer time reduced 30-75%

Experimental Results



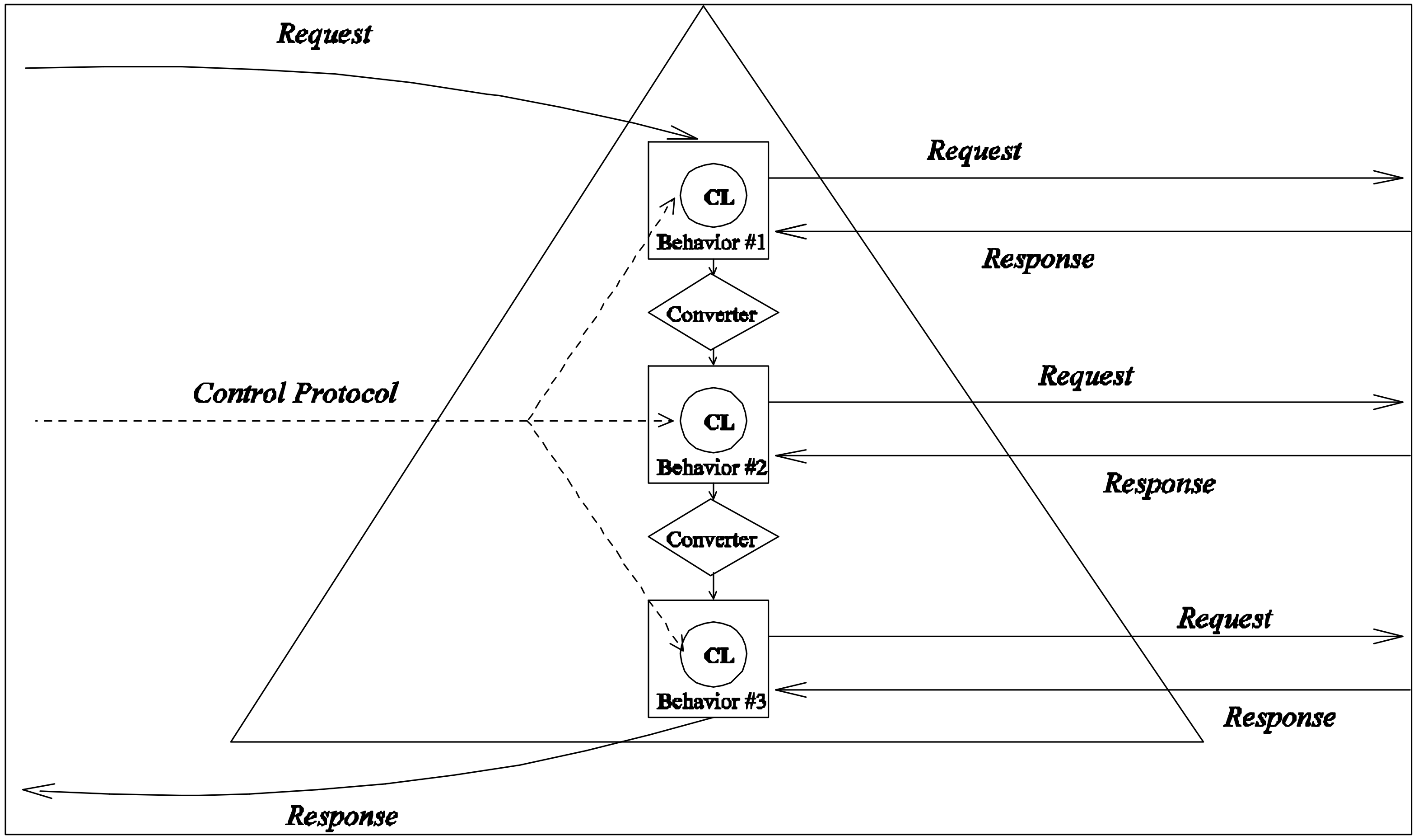
- ReAgent overhead is low
- Overhead scales well as file size increases

Conclusion

- ReAgents customize for wireless clients
  - Flexibly
    - Customizing logic
  - Transparently
    - Server is bypassed
  - Easily
    - One-shot mobility simplifies security and semantics
    - Behaviors provide structured, patterned development
  - Efficiently
    - Results show good performance and scalable overhead

Questions?

ReAgent Architecture



Usage

- ReAgent created by chaining Behaviors
- Behaviors created by instantiating with CL
- Example: Custom Stock Trader

```
ReAgent reagent = new ReAgent();
Behavior m = new Behavior (“Monitor”, “MyPriceWatch.class”);
Behavior t = new Behavior (“Filter”, null);
reagent.addBehavior (m, null);                    (no converter for monitor)
reagent.addBehavior (t, “GenerateStockBuyRequest.class”);
reagent.launch(“middleman.org”);
reagent.process(“GET http://stock.org/viewprice.cgi/?p=GOGL”);
```