

Reusable Knowledge-Based Agent Services at Aberdeen

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<http://www.csd.abdn.ac.uk/research/agentsgroup>



Effort converging from 4 sources

- ◆ Agents at Aberdeen
<http://www.csd.abdn.ac.uk/research/agentsgroup>
- ◆ AKT (Advanced Knowledge Technologies)
<http://www.aktors.org>
- ◆ CONOISE (Constraint Oriented Negotiation in Open Information Services Environments)
<http://www.conoise.org>
- ◆ Agentcities deployment project
<http://www.agentcities.org/EUNET>



Services at the "Aberdeen Agency"

- ◆ Component services of the "Granite Nights" evening planner application
 - constraint-satisfaction scheduler agent
 - user-profiler agent
 - information-providing agents for Aberdeen entertainments (pubs, restaurants, cinema)
 - evening arranger agent
- ◆ Services providing information on Aberdeen CS dept
 - people
 - publications
- ◆ Aberdeen WeatherAgent



Why deploy?

- ◆ If we don't, who will?
- ◆ Try to use existing – rather than invent new...
 - agent platforms / ACLs (FIPA)
 - ontologies (RDFS, DAML, ...)
 - content formats (XML, RDF, ...)
- ◆ Proving ground for research agendas, including:
 - coalition (re)formation through negotiation
 - Semantic Web services
 - semantic profiling & personalisation
- ◆ Training for new personnel

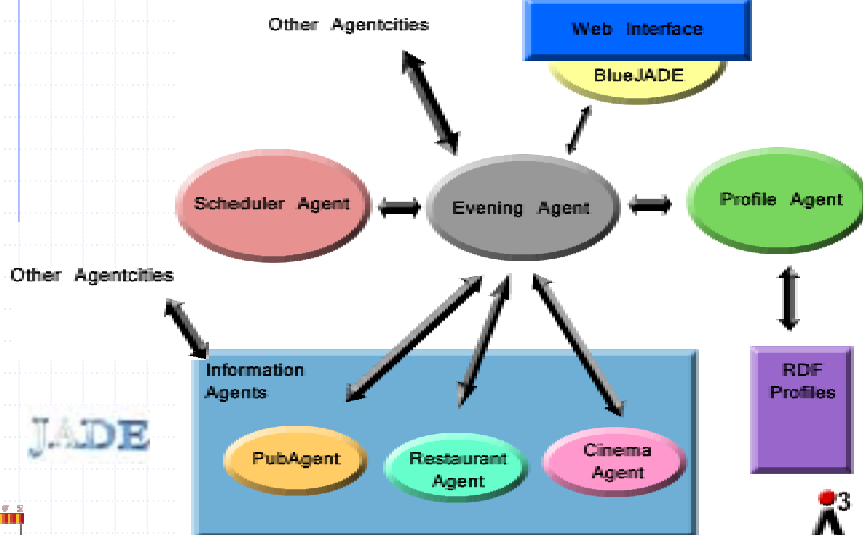


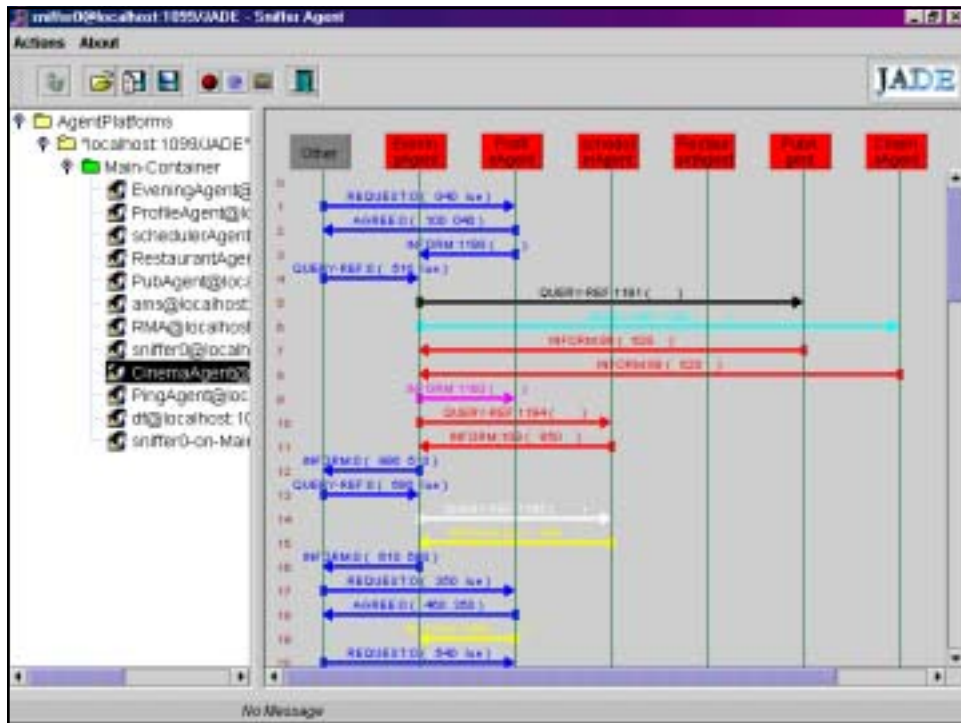
"Knowledge-based" services

- ◆ "Granite Nights" evening service
 - scheduling via **constraint-satisfaction**
 - **learning** of semantic user profiles
- ◆ Semantic Web content standards
 - RDF where possible
 - DAML+OIL where necessary
 - OWL eventually...
- ◆ RDF query-by-example
 - queries are pure-RDF
 - compiled to RDQL
 - variables, inequalities permitted



Granite Nights - architecture





Granite Nights – input page

Granite Nights – output page



Granite Nights Results

Here is the plan for your evening:

Time	Place	Duration
18:00	Estaminet 8 Littlejohn Street Aberdeen Scotland AB10 1FF	1 hour(s) 0 minutes
20:30	Pianist, The @ U G C Cinema Queens Link Leisure Park Links Road Aberdeen Scotland AB24 5EN	2 hour(s) 30 minutes
22:45	In Remembrance 2-4 King Street Cardrigate Aberdeen Scotland AB24 5UE	1 hour(s) 0 minutes



Dynamic info source (cinemas)



Cinema details

You searched for U G C Cin
Aberdeenshire

U G C CINEMA ABERDEE
QUEENS LINK LEISURE PAR
LINKS ROAD, ABERDEEN
AB24 5EN

Tel: 0870 1550502

[View website](#)

Films showing

B Mile (15) [Film Review](#)
FRI, SAT, SUN, MON, TUES, WE
9:00PM, ...

Pianist, The (15)
FRI, SAT, SUN, MON, TUES, WE



```

<s: Shows rdf: ID="ugc_Pi ani stThe">
  <s: ti me>
    <s: ShowSchedul eCol lecti on>
      <s: consi stsOf><s: ShowSchedul e>
        <s: startTI me>
          <c: Cal endarDate><c: cal endarDate>
            <c: Date>
              <c: dateDayOfWeek
                rdf: resource="cal #Thursday" />
              <c: year>2003</c: year>
              <c: month>1</c: month>
            </c: Date>
          </c: cal endarDate><c: cal endarTI me>
            <c: TI me>
              <c: format rdf: resource="cal #24h" />
              <c: ti meHour>20</c: ti meHour>
              <c: ti meMI nute>20</c: ti meMI nute>
            </c: TI me>
          <c: locati on rdf: resource="ci nemas#ugc" />
          <s: descri ptI on>Certi fi cate: 15</s: descri ptI on>
          <s: show>
            <s: Ci nemaPerformance rdf: ID="Pi ani stThe">
              <s: ti tI e>Pi ani st, The</s: ti tI e>
  
```

Static info source (restaurants)

Restaurant Agent

```
<res: Restaurant rdf: about="#lombarda">
  <res: name>La Lombarda</res: name>
  <res: averageMealDuration>2
  </res: averageMealDuration>
  <res: address>
    <add: Address rdf: about="rest#lombardaaddr" />
  </res: address>
  <res: atmospheres
    rdf: resource="res#CasualAtmosphere" />
  <res: atmospheres
    rdf: resource="res#RelaxedAtmosphere" />
  <res: caterings rdf: resource="res#ALaCarte" />
  <res: caterings rdf: resource="res#HomeDelivery" />
  <res: facilities rdf: resource="res#SmokingFacility" />
  <res: typeOfCuisine
    rdf: resource="res#ItalianCuisine" />
</res: Restaurant>
```



RDF Query-by-Example



- ◆ Principle: query RDF using RDF
- ◆ If users can read RDF descriptions, they can write patterns that match RDF descriptions
- ◆ Example: "get all pubs serving Guinness beer"

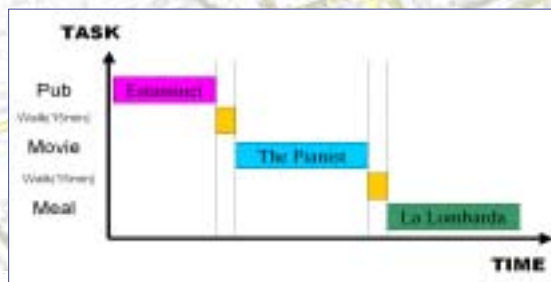
```
<q: Query>
  <q: template>
    <p: EnglishPub>
      <p: servesBeer
        rdf: resource="beertypes#guinness" />
      </p: EnglishPub>
    </q: template>
  </q: Query>
```



Scheduling agent

Scheduler Agent

- ◆ Convert RDF to Prolog representation
- ◆ Uses Sicstus Jasper to interface Prolog and Java
- ◆ Uses Constraint Logic Programming over finite domains to schedule evening
- ◆ Coordinates within map of Aberdeen used for location constraints



Profile agent

- ◆ Stores user preferences in RDF files
- ◆ Adaptive profiling techniques will be deployed in a future version

```
<ep: User>
  <ep: name>pedwards</ep: name>
  <ep: pword>gnes</ep: pword>
  <ep: preferences>
    ci nemas: [ fi l m="LOTRTheTwoTowers" ]
    restaurants: [ cui si ne="Thai Cui si ne" ]
    pubs: [ serves="boddi ngtons" ]
  </ep: preferences>
</ep: User>
```

The AKT project

- ◆ Large UK initiative; 5 Universities
 - Aberdeen, Edinburgh, Open, Sheffield, Southampton (lead)
- ◆ 6-year project to develop "whole life-cycle knowledge management tools & techniques"
- ◆ One current activity: bootstrapping the UK academic Semantic Web
 - AKT Academic Reference Ontology
 - RDF triples harvested by macros from websites of leading UK CS Universities, and EPSRC
 - Currently 3 million+ triples
 - Next phase: compelling applications!



AKT infrastructure: high-level view

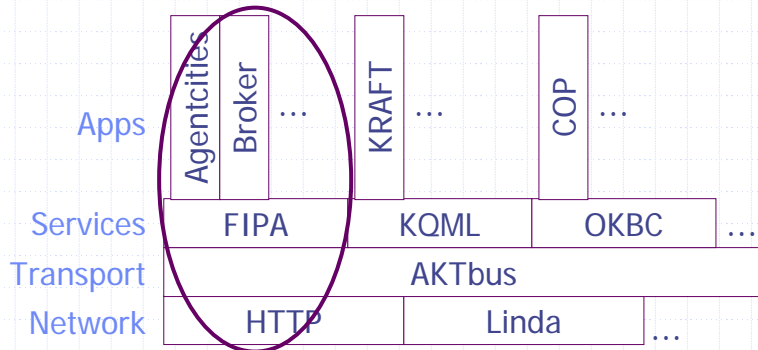
e.g.

AKT applications layer	KRAFT, I-X, COP
AKT services layer	KOML, FIPA, OKBC
AKT transport layer	HTTP-XML/RDF
Network transport layer	TCP/IP, wireless

Driving principle: KISS (Keep It Small & Simple)

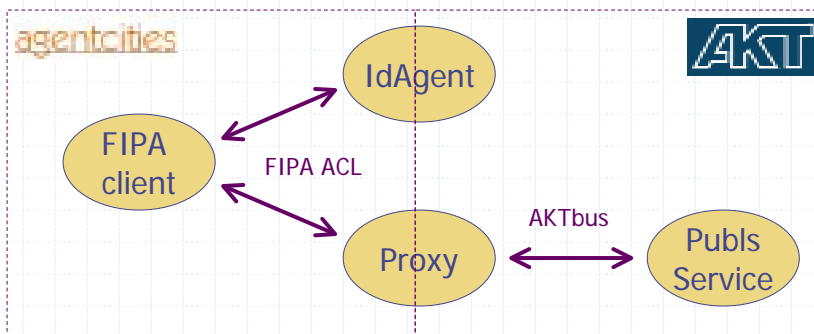


AKT infrastructure



AKT/Agentcities snapshot

- ◆ People (IdAgent): FIPA service, using AKT ontology
- ◆ Publications Service: AKTbus service



AKT/Agentcities samples

1. Query to IdAgent

- [query](#)
- [result](#)



2. Query to Publications service

- [query](#)
- [result](#)



Lessons I

- ◆ Emerging collection of reusable components
 - information agent "shells"
 - scheduler
 - ontologies
- ◆ Existing technologies good enough for "scruffy" communication
 - most useful ontology stuff is in the E-R model (can work at RDFS level)
 - most comms acts are query/inform or request/agree pairs (could just use SOAP...)



Lessons II

- ◆ We need lots of services
 - To feed R&D efforts in creating open, distributed, heterogeneous systems
 - To provide convincing application instances
- ◆ We need close alignment between
 - Agent & Web Services standards (to do tasks)
 - Semantic Web standards (to provide lots of data)
 - Grid standards (to "harden" parts of the net)



Summary

- ◆ Services at Aberdeen for you to use
 - Granite Nights & its components
 - AU CS people & publications
 - WeatherAgent (already used!)
- ◆ Where we're going next
 - Granite Nights -> semantic personalisation
 - CONOISE -> coalition (re)formation, Grid context
 - AKT - use the UKCS SWeb in task-centric apps
 - ◆ Proposal development support
 - ◆ Event arrangement support



Contacts, Credits, Questions

- ◆ Contacts
 - apreece@csd.abdn.ac.uk
 - ggrimnes@csd.abdn.ac.uk
- ◆ Credits
 - Stuart Chalmers (CONOISE)
 - Pete Edwards
 - Mairi McCallum (AKT/Agentcities)

Questions?



Aberdeen WeatherAgent

- ◆ Running since January 2002
- ◆ Repackages UK met office data ...

Aberdeen 5 day forecast

Saturday 7th September	Sunday 8th September	Monday 9th September	Tuesday 10th September	Wednesday 11th September
Day Night	Day Night	Day Night	Day Night	Day Night
Max: 15°C Min: 10°C	Max: 16°C Min: 11°C	Max: 17°C Min: 11°C	Max: 17°C Min: 10°C	Max: 19°C Min: 10°C
59°F 50°F	61°F 52°F	63°F 52°F	63°F 50°F	66°F 50°F

[Close window](#) [Expand site](#) Saturday September 7th 2002 [Map](#)

- ◆ ... against [DAML ontology](#)
- ◆ Key issue was ontology [mapping](#): not unusual

