FIPA and the Internet Revolution

Want to win $10,000? This presentation will tell you how!

Phil Buckle and Rob Hadingham
9 September 1999
What is the Internet Revolution?

• **Everything connected**
  — Universal L3 protocol, IP

• **Innovation at the Edge**
  — The core too, but emphasis at the edge

• **Everything communicating ... not yet!**
  — No universal language of discourse
  — Computers don’t understand people, yet
  — Computers don’t understand content, yet
Current Trends

E-Business

E-Technology

E-Services
Future

- A universal communicative language, ACL
- A universal content language, XML/RDF
- Increased machine understanding

Leading to:

- Collaboration and competition on a global scale
Carrier Issues

Wholesale / Re-sale
- bit pipes
- proactive management
- QoS guarantees
- commodity
- lower risks & margins

Retail
- getting & keeping customers
- service bundles
- loyalty programs
- branding
- higher risks & margins
Key Needs

• Infrastructure
  — Service deployment in zero time
  — Architecture for evolution upgrade without mass orchestration

• New Services: Communication
  — Human to Human
    – minor need for live contact between two or more individuals
  — Human to archive
    – Growing market of direct access
  — Machine to machine
    – Essential societal support functions
    – Monitoring proper functioning of people & properties
Software - how will it change?

• Shorter development and deployment times needed
• Smarter software needed
• Smaller projects needed
• Dividing the problem is key
• Never time to get the software right

The solutions:

• Components, re-use, and advanced Object Technology
• AI and Heuristic techniques
• Distribution and parallel processing

Together, these lead to:

• **Autonomous Agent technology**
Encapsulation of software ‘smarts’
Autonomous *components*
Speech-act communications (ontology based)
Peer-to-peer (*not* client-server)
Glue technology/framework
Toolbox of capabilities
Collaboration / co-operation

Applications:
Negotiation (e.g. SLA’s)
Mediation (e.g. multimedia content adaptation)
Personal assistants (e.g. Meeting Scheduling)
... *anything* which requires some smart assistance!

*Can be:*
Small or big
Static or mobile
Smart or dumb
Long- or short-lived
Agent Standards

- **OMG (Object Management Group)**
  - RFI for Agent Technology
  - MASIF

- **DARPA CoABS**
  - Knowledge Querying and Manipulation Language (KQML-2) - an inter-agent messaging language

- **Agent Society**

- **FIPA**
FIPA - Foundation for Intelligent Physical Agents

• Started in December 1996
  — commitment to develop and publish international standards for agents, covering the *external behaviour of generic technologies* or components of agent systems

• Established as a not-for-profit organisation registered in Switzerland

• Currently 50+ member organisations from 11 countries
  — members include: IBM, Siemens, Hitachi, Lucent, CSELT, France Télécom, BT, Nortel Networks, Sun, Fujitsu, Imperial College, UMBC, NTT, Alcatel, Motorola, NHK, HP, Nokia, Sonera plus many others
FIPA Process

• Open process
  — Similar to MPEG and DAVIC
  — Low-cost membership
  — Documents produced by meetings are made public
  — Comments and review invited from the agent community at large
  — Contributors are invited to attend meetings even if not members

• Standard’s Published
  — FIPA97 v1 published October 1997
  — FIPA97 v2 and FIPA98 v1 published October 1998
  — FIPA97 v3, FIPA98 v2 and FIPA99 v1 to be published October 1999
FIPA’s contributions to Agent Standards

• Middleware support
  — Registration, location services
  — Communication services
  — Portability and mobility
  — Security, authentication etc.

• Agent Communication Language
  — semantics
  — conversation protocols
  — commitments, responsibility etc.
  — etiquette
FIPA’s contributions to Agent Standards

• Inter-working with native software
  — Acting as wrapper of legacy software
  — existing databases
  — domain related expertise

• Agent Human Communication
  — What is to be communicated
    – concepts, manner, style, content related behaviour, emotional sensitivity, etiquette, personal profiles
  — How to communicate
    – device related expertise, rendering
# ACL Communicative acts

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<thead>
<tr>
<th>Accept-proposal</th>
<th>Agree</th>
<th>Cancel</th>
<th>Cfp</th>
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<tbody>
<tr>
<td>Confirm</td>
<td>Disconfirm</td>
<td>Failure</td>
<td>Inform</td>
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<td>Inform-if</td>
<td>Inform-ref</td>
<td>Not-understood</td>
<td>Propose</td>
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<tr>
<td>Query-if</td>
<td>Query-ref</td>
<td>Refuse</td>
<td>Reject-proposal</td>
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<tr>
<td>Request</td>
<td>Request-when</td>
<td>Request-whenever</td>
<td>Subscribe</td>
</tr>
</tbody>
</table>
ACL semantics

• **SL logical framework**
  — extend first order predicate calculus with modal operators
    – $B_i p$ - agent $i$ believes that $p$ is true
    – $U_i p$ - agent $i$ is uncertain of $p$, but believes that $p$ is more likely than $\neg p$
    – $I_i p$ - agent $i$ intends to make $p$ true of the world
  — action definitions
    – $<i, \text{act}>$ - the action \textit{act} performed by agent $i$, with given feasibility preconditions (FP) and rational effect (RE)
    – action operators $\text{Done, Feasible, |, ;}$

• **Example**
  
  $<i, \text{inform( } j, \phi ))>$
  FP: $B_i \phi \land \neg B_i (B_{if} \phi \lor U_{if} \phi)$
  RE: $B_j \alpha$
Example ACL Message Exchange

Agent i requests j to inform it whether Singapore is in the UK:

(request
  :sender i
  :receiver j
  :content
    (inform-if :sender j
                :receiver i
                :content (in Singapore UK)
                :language sl
                :ontology geography)
  :language sl
  :reply-with query-07)

Agent j replies that it is not:

(inform
  :sender j
  :receiver i
  :content (not (in Singapore UK))
  :language sl
  :in-reply-to query-07)
FIPA: Current Activities

• Specifications
  — Architecture
  — Agent Management
  — Message Transport
  — Agent Naming
  — Agent Configuration
  — Agent Communication
    – Abstract ACL syntax
    – Content languages (e.g. XML, RDF, KIF)
  — Nomadic Application Support

• Publicity
  — Meeting Scheduler Application
  — FIPA Application Competition
FIPA Commercialisation Barriers

- FIPA 97 & 98 specs available
- Many ‘closed’ implementations under development (mainly FIPA members)
- Technology ready, framework/platform instances not so ready
- Many interested parties, initial hurdle to application

- Few people have seen inter-operating FIPA applications - tests underway
- No reference implementation
- No validation / verification of FIPA
FIPA Commercialisation Solution - FIPA-OS

- A ‘reference implementation’ of the FIPA open standard for agent interoperability
- OS means Open Source, freely available and modifiable source code (cf Linux)
- Enables adoption of FIPA without the need to implement the specifications
- Assist in validating and evolving FIPA standards

FIPA-OS is a Open Source implementation of FIPA and is available for free.

http://www.nortelnetworks.com/fipa-os for more information.
FIPA-OS Agent Platform

- Software
- Agent
- Agent Management System
- Directory Facilitator
- ACC

Message Transport

IIOP or Voyager

IIOP

FIPA and the Internet Revolution - 9 September - 19
FIPA Application Competition

- Up to US$10000 prize
- To be judged in April 2000
- Members and non-members can enter
- Interoperability extra value, but not essential
- More details from http://www.fipa.org/
Further Information

• **FIPA**

• **FIPA-OS**
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