WHITESTEIN
Technologies

Agents in a J2EE World

Stefan Brantschen

Goal and Outline

Goal

Present how J2EE EJB application servers can be the basis to build reliable and scalable agent-based business applications that are compatible and “interface-able” with current “non-agent” systems and technologies.

Outline

1. Agents’ Challenges in the “Real IT World”
2. A “State of the Art” Technology: J2EE Application Servers
3. Application Server Based Agent Platform
4. Summary

About Us

Whitestein Technologies

- ***Founded:*** 1999
- ***Focus:***
  - Whitestein strongly believes that agent technologies will be among the ***key concepts*** of future software systems and network infrastructure.
  - But clearly in combination with non-agent technologies.
- ***Organization:*** 45+ people
  - Zurich, Switzerland: Competence Center
  - Bratislava, Slovakia: Development Center
  - Sophia Antipolis, France: R&D Center
- ***Activity areas:*** Industrial Research, Product & Solution Development, Consulting
- Parallel ***strategic paths*** in agent field:
  - ***horizontal:*** platforms & tools
  - ***vertical:*** projects (communication & networks, e-finance & e-commerce, logistics)

Agents' Challenges in the "Real IT World"

Agents' Challenges in the "Real IT World"

Status

- ***Market perception:*** agent technologies are ***at the threshold*** between research and industrial use
- Surveys and conferences show that only few successful ***business applications using software agent technologies*** have been implemented yet on a larger scale
  - → comparable to object-oriented technologies in the late eighties and early nineties
- Also object-oriented concepts and technologies did not "take off" before ***robust platforms, tools, and methodologies*** became available
  - → outside the research, prototyping, and evaluation labs (universities, companies)
  - → useful "in the trenches" of the day-to-day IT business
- In the ***real IT world***, also agent technologies are not (and will not) be used for their "sheer beauty"
  - → needed are better solutions for real problems – ie. solutions that provide customer value and generate business revenue
  - → ***management & marketing view:*** "don't sell agent technologies – sell solutions"
- ***IT department view:*** however, our experience shows that the ***IT guys do want to know*** what technology and products are behind a solution!

Agents' Challenges in the "Real IT World"

Challenges

So, in practice software agent technologies are being confronted with the "day-to-day IT reality" – just like all new IT concepts and technologies.

- ***Installed base*** of heavy load, mission critical systems and networks

  → *necessary for operational business – "hands-off – no experiments, please!"*

- Application development ***cannot start on "green field"*** (from scratch)

  → *in contrary: existing applications and systems must survive longer than ever → extension*

- ***Corporate IT strategies*** define (and confine) a set of approved products and technologies

  → *hard to "break in" for new types of concepts, technologies, and products*

- ***Corporate IT experience and know-how*** for operations and development

  → *other new technologies like Web services or new versions of current products are already challenging*

- ***Large investments*** in today's and yesterday's technologies need to be protected

  → *new technologies must add and extend existing systems*

Agents' Challenges in the "Real IT World"

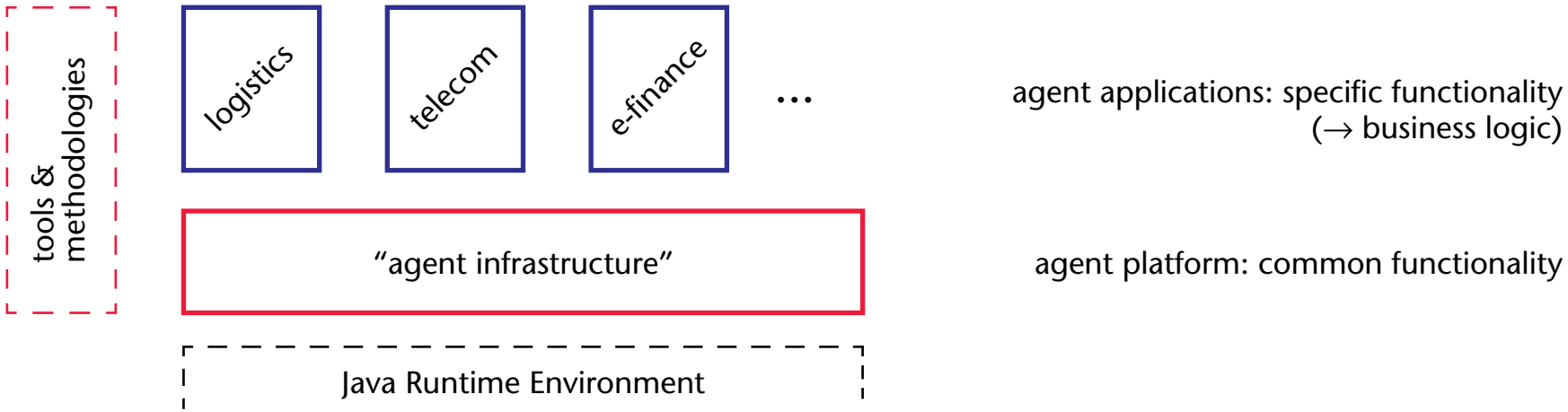
Challenges (cont.)

- So, these days, IT managers, system administrators, and developers have ***strong opinions*** of what they want to expect from a new key technology.
- Industry-grade platforms and tools ***must deliver:***
  - basic product ***quality:*** reliability and failover, performance and scalability, security;
  - business ***functionality:*** transactions, persistence, sessions;
  - system administration ***functionality:*** eg. configuration and diagnostic tools;
  - ***migration*** and ***extension*** capabilities for existing systems;
  - ***integration*** and ***interfaces*** with/to current systems (today's ***and*** yesterday's technologies!);
  - ***re-use*** of people's know-how and experience, ***re-use*** of organizational and administration procedures, tools;
  - adherence to ***current industry standards.***
- Also valid for agent platforms – in spite of all new promising concepts and techniques.

Agents' Challenges in the "Real IT World"

The Importance of Agent Infrastructures

- Experience has taught us: complex, maintainable, and successful business systems need ***well-engineered platforms and infrastructures***.



- ***Separate*** common platform functionality from business logic and data.
- ***Re-use*** of generic functionality across systems and applications.
- Reliability and performance – continuously ***improved through product cycles/versions.***
- Standard and tested ***ways of "doing things"*** in system development and maintenance.

A “State of the Art” Technology – J2EE Application Servers

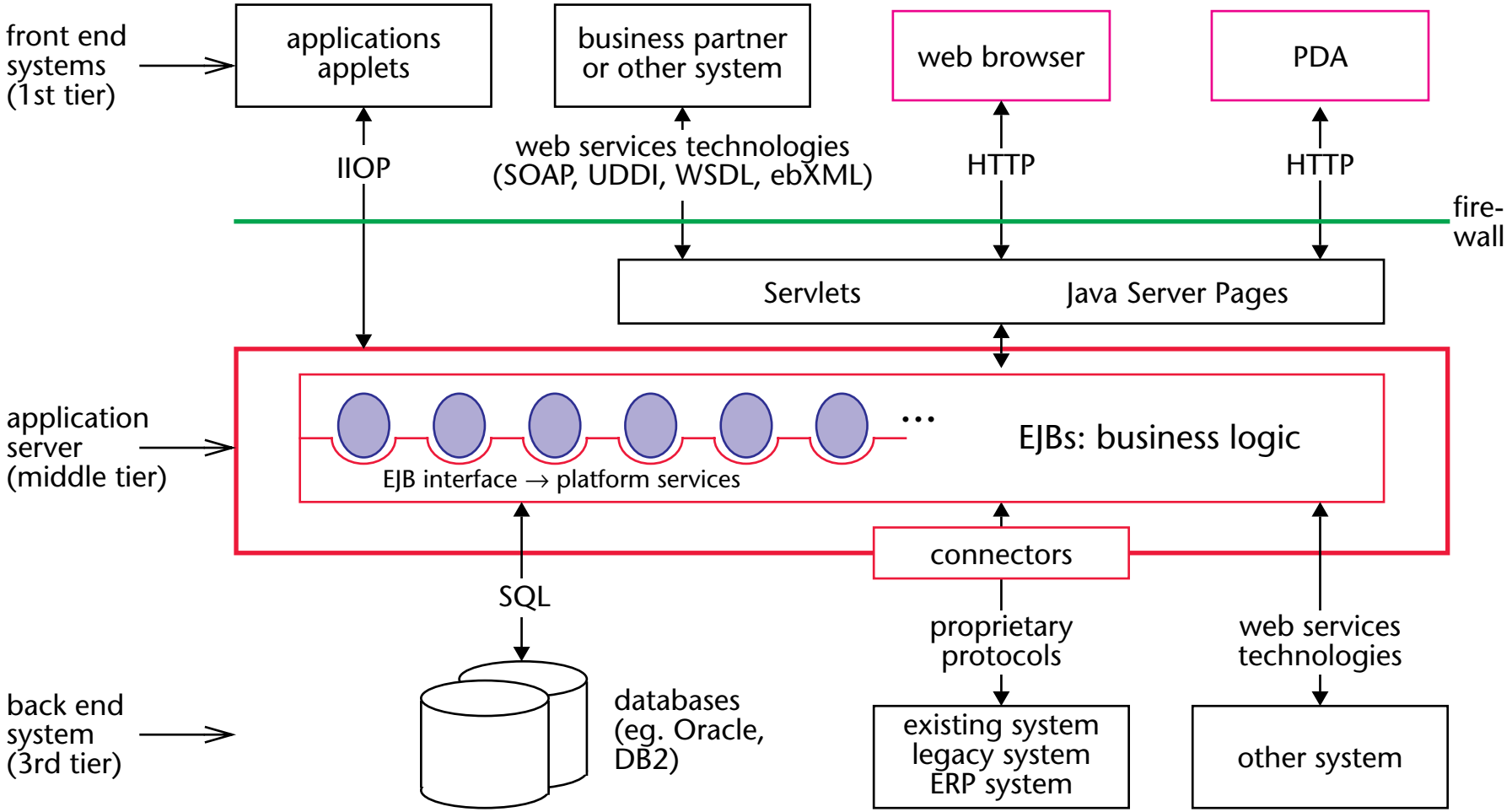
J2EE Application Servers – Overview

- Application servers are at the core of many ***modern business applications***, eg. for e-commerce.
- ***Product examples:*** WebSphere, WebLogic, iPlanet, HP-AS, HP Total-e-server, Oracle 9i AS, JBoss.
- AS = platform for "EJBs": ***Enterprise JavaBeans*** – highly portable ***software components.***
- Enterprise JavaBeans are a Java industry standard (J2EE).
- EJB application servers are "CTMs" – ***Component Transaction Monitors***, a hybrid of:
  - TP monitors, eg. CICS, TUXEDO
  - distributed object technologies, eg. ORBs (CORBA), DCOM, Java RMI
- Application servers:
  - implement a ***robust standardized component model (EJB)*** to enable developers to easily create and deploy maintainable, complex high-performance business systems;
  - provide an ***infrastructure to automatically manage*** transactions, object distribution, concurrency, security, persistence, failover, load balancing/clustering, and resources;
  - are capable of handling ***huge loads*** and ***mission-critical work***.

→ ***Application servers are the benchmark.***

A State of the Art Technology

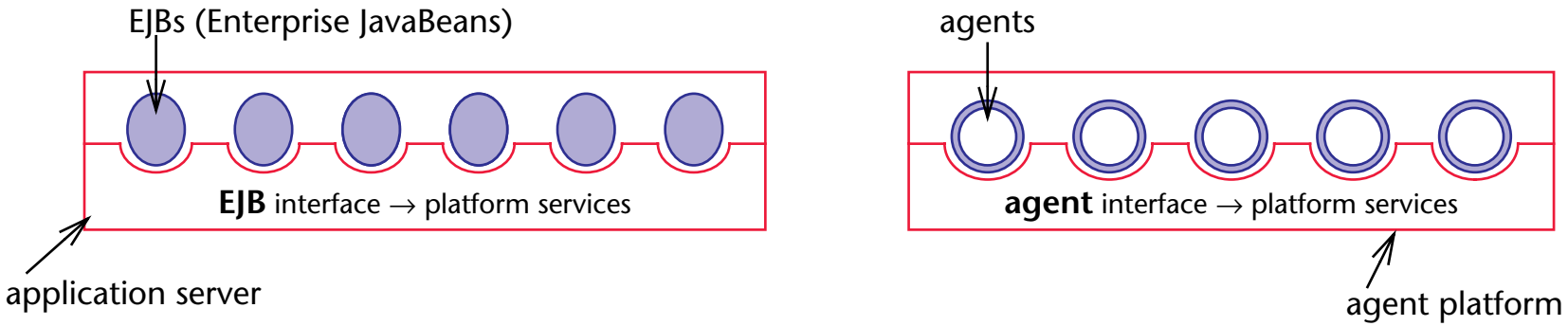
Application Server in Action



Application Server Based Agent Platform

Application Server Based Agent Platform

Application Servers vs. Agent Platforms



- ❒ On a ***system-level:*** basic ***similarity*** between application servers and agent platforms.
- ❒ Application servers provide a great deal of the ***system-level functionality*** of an agent platform.

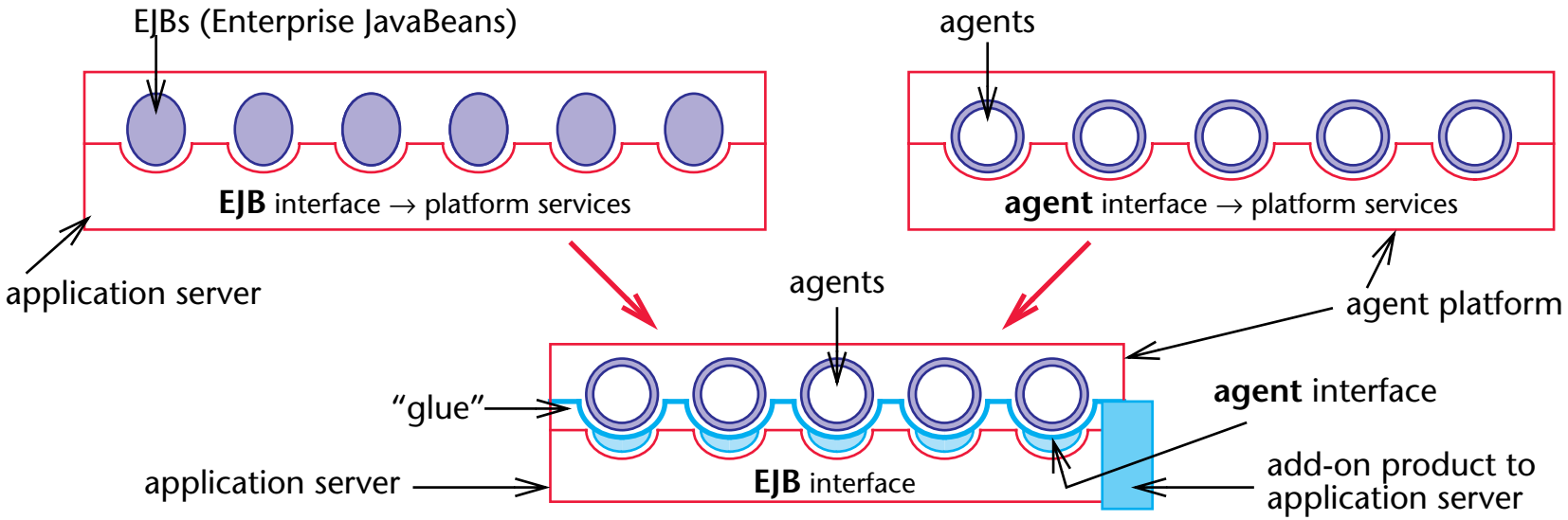
→ ***Approach:*** use the application server's:

- features and services;
- stability, performance, scalability, interfaces, resource management

to build an ***agent platform for business applications.***

Application Server Based Agent Platform

Application Servers vs. Agent Platforms (cont.)

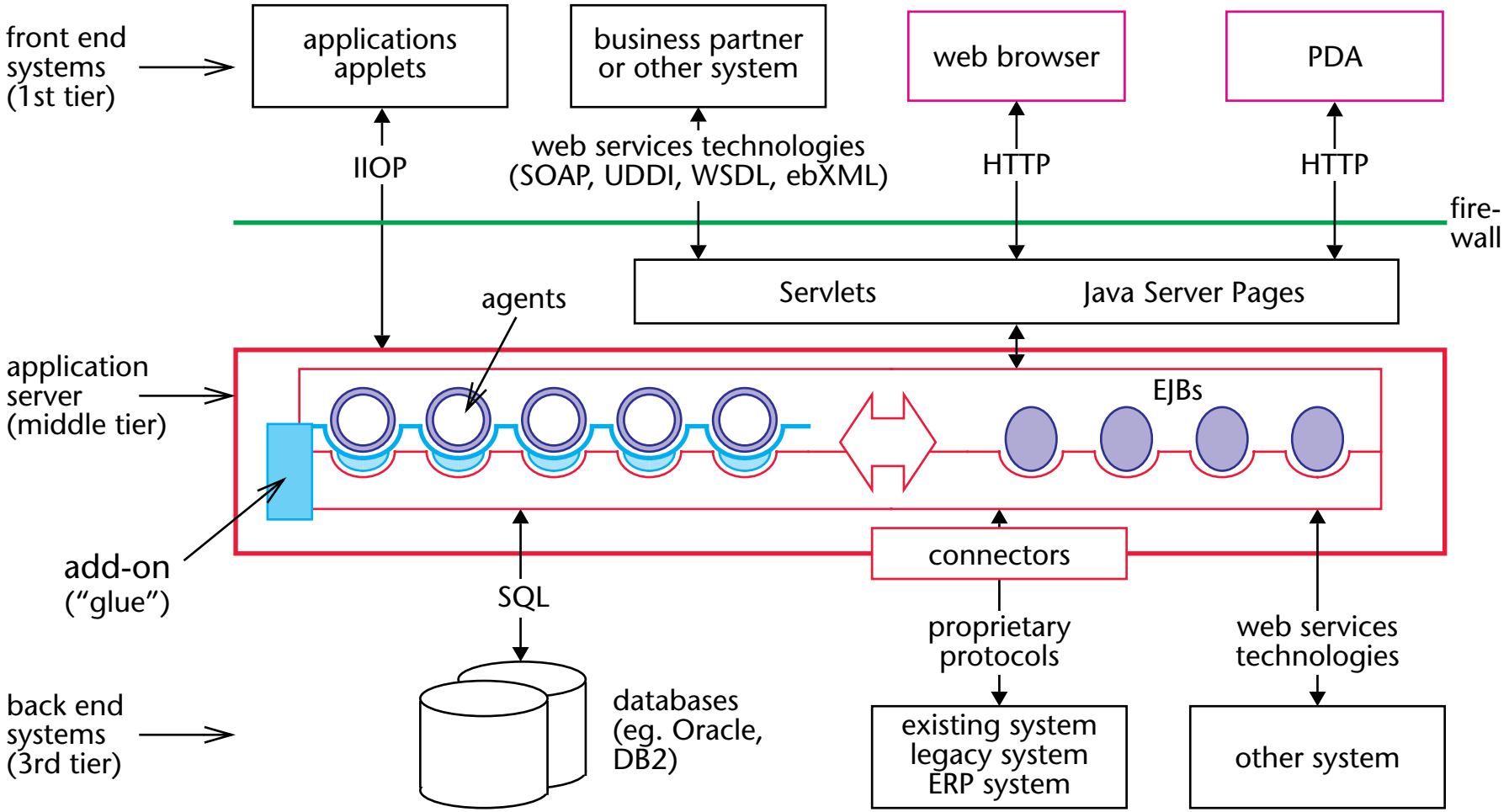


- OK, but ***EJBs are not agents***, eg.:
  - EJBs are reactive elements (not pro-active);
  - EJBs have technical constraints (eg. starting own threads not allowed, no own class loaders);
  - EJBs are technically not separated from each other (share name space);
  - EJBs are not mobile (no serialization).

→ "glue" needed to create agents on the application server.

Application Server Based Agent Platform

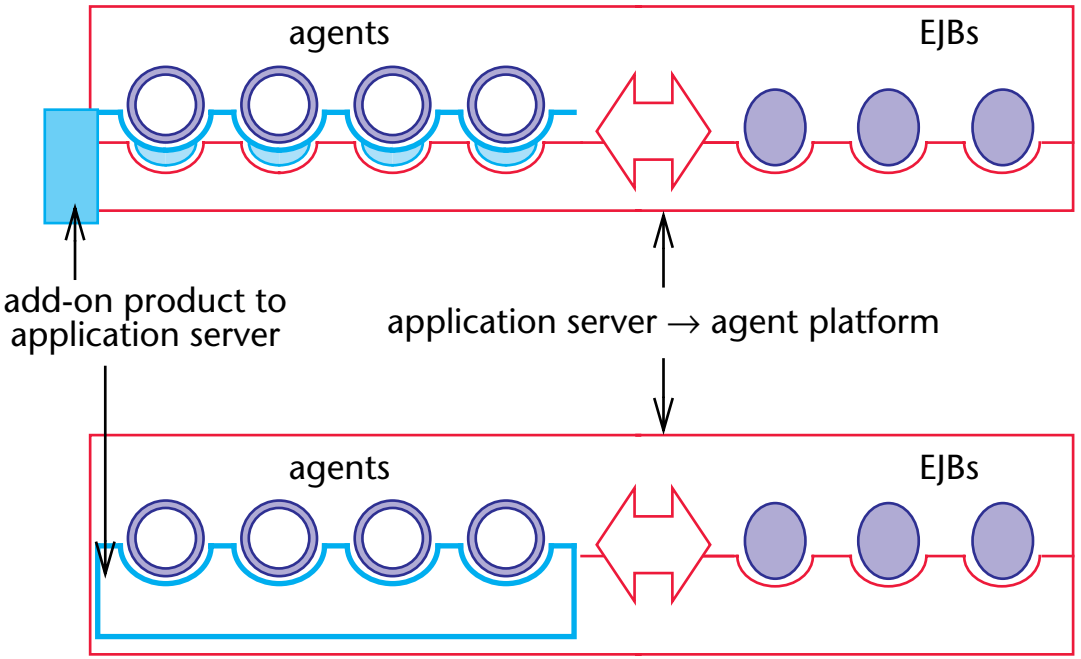
AppServer-based Agent Platform in Action



Application Server Based Agent Platform

Whitestein's Focus

- Whitestein develops ***add-on software products*** for commercial application servers and JBoss.
- Two ***product variants:*** EJB interface, container interface.
- Add-on product turns application server into a high performance agent platform – blended with a "normal" application server → enabling applications based on "***EJBs plus agents***."
- Specific ***AOSE tools*** (plug-ins) for Eclipse and NetBeans planned (AOSE: agent-oriented software engineering).
- Should (small) agent-platforms providers team up in a common effort?!



Application Server Based Agent Platform

Advantages of the Approach

- Build upon ***mature, industry-grade products*** (that are being further developed by its vendor).
- Build upon ***basic quality features*** of the underlying J2EE app server (reliability, performance, …).
- Have the ***needed and proven business functionality*** available (transactions, persistence, …).
- Have ***acceptance*** with regard to corporate IT strategies, investment and know-how protection.
- Adhere to accepted ***standards***.
- Be easily ***integrated*** with existing systems and environments (eg. J2EE Connector Architecture)
- Provide a path to ***enhance and migrate*** current solutions.
- Business systems can be constructed with the ***right mix of conventional and agent technologies.***

Application Focus

- ***Business applications***, ie. type “application server based applications,” eg. in e-commerce.

Summary

Summary

- In practice, ***agent technologies meet an existing IT world:***
  - installed base of business systems, IT strategies
  - professional, industry-grade systems and products
  - accepted standards
- Agent platforms ***clearly need:***
  - the ability of integration with this IT world;
  - to meet expectations regarding business functionality, plus reliability, performance, …
- J2EE EJB application servers:
  - "natively" provide a great deal of the ***system-level functionalities*** needed by an agent platform;
  - have certain ***limitations and constraints*** that need ***require conceptual and technical extensions*** in order to build agent-based business applications.
- Then the application server based agent platform enables agent-based business applications to ***profit*** from the functionality and quality of industry-grade products, and eases integration with the existing "non-agent" world.

Contact

For more information, questions, and comments:

Stefan Brantschen
sbr@whitestein.com

Whitestein Technologies AG
http://www.whitestein.com
Gotthardstrasse 50
CH-8002 Zurich
Switzerland