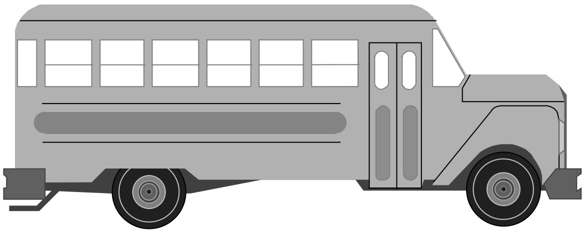

Components Need Software Bus Middleware

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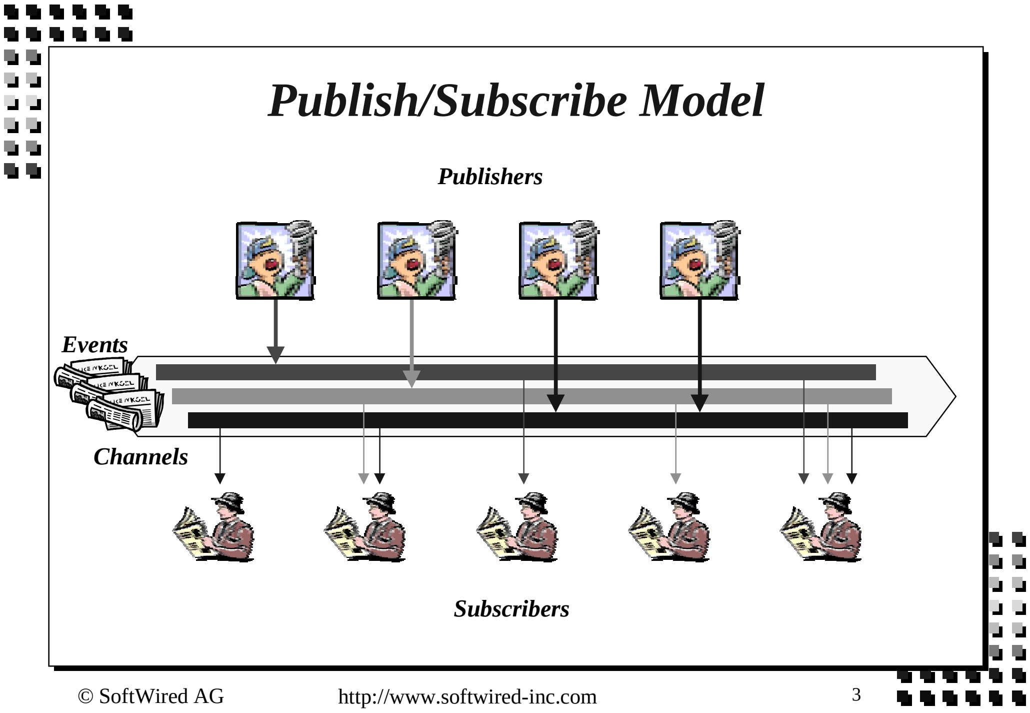
What is a Software Bus?

- **Middleware: sits between operating system and application software**
- **Much like a hardware bus, but in software :-)**
- **Allows flexible exchange of information between distributed components**
- **Synonyms: Object Bus, Information Bus, Event Service, Publish/Subscribe**
- **Unlike: Message Queues, TP Monitors, ORBs**



Publish/Subscribe Model

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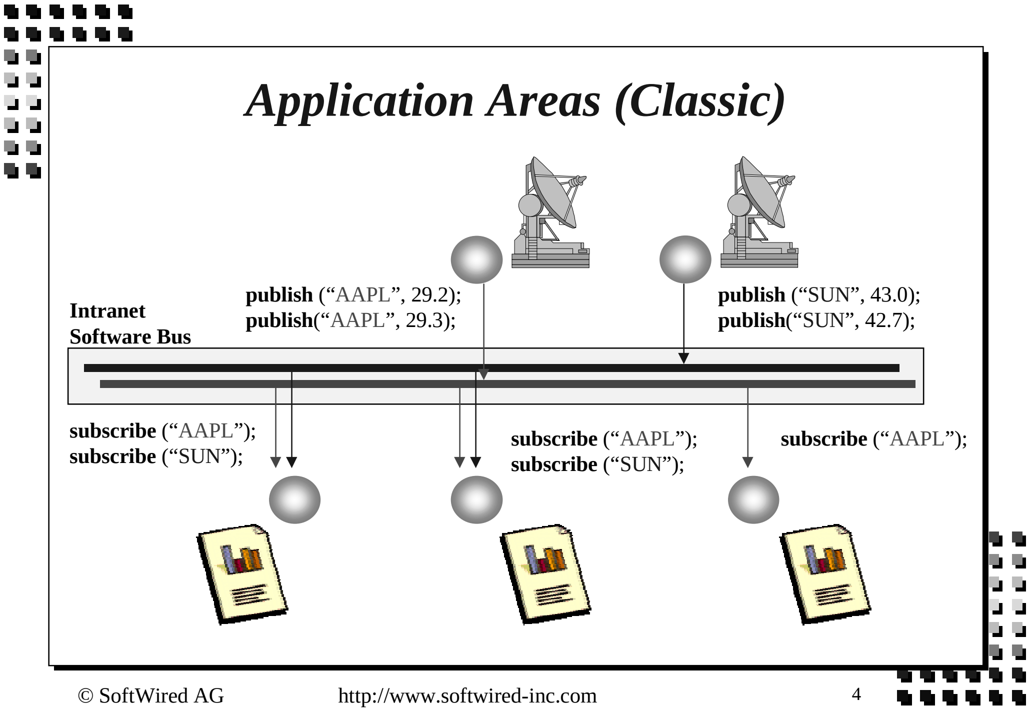

Application Areas (Classic)

publish ("AAPL", 29.2);
publish("AAPL", 29.3);

publish ("SUN", 43.0);
publish("SUN", 42.7);

subscribe ("AAPL");
subscribe ("SUN");

subscribe ("AAPL");
subscribe ("SUN");

subscribe ("AAPL");

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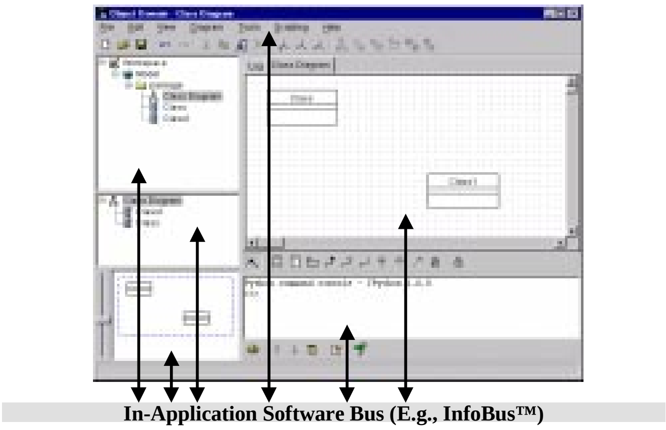
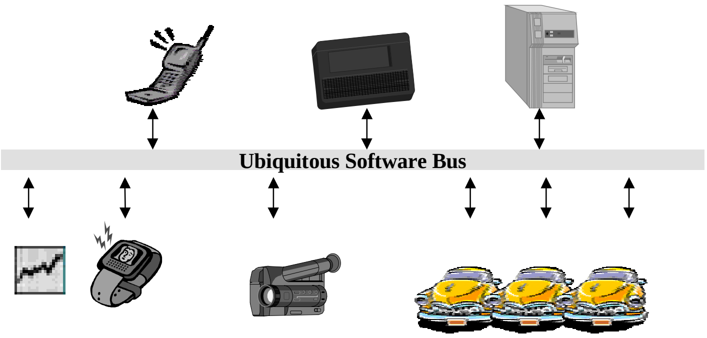
Application Areas (Today)

- Electronic Business, system integration, stand-alone applications: e.g., Lotus eSuite™

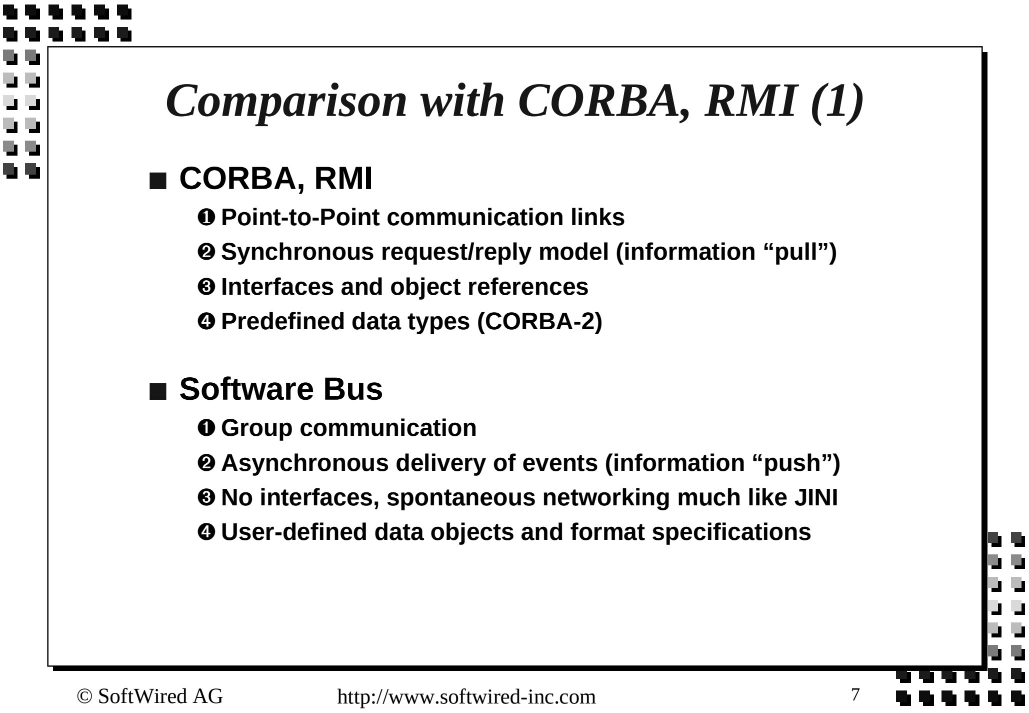


Application Areas (Future)

- Interconnect appliances, board computers, ...



- Infrared, Satellite, Paging, GPS-Data, ...



Comparison with CORBA, RMI (1)

- ■ CORBA, RMI
  - ❶ Point-to-Point communication links
  - ❷ Synchronous request/reply model (information “pull”)
  - ❸ Interfaces and object references
  - ❹ Predefined data types (CORBA-2)
- ■ Software Bus
  - ❶ Group communication
  - ❷ Asynchronous delivery of events (information “push”)
  - ❸ No interfaces, spontaneous networking much like JINI
  - ❹ User-defined data objects and format specifications

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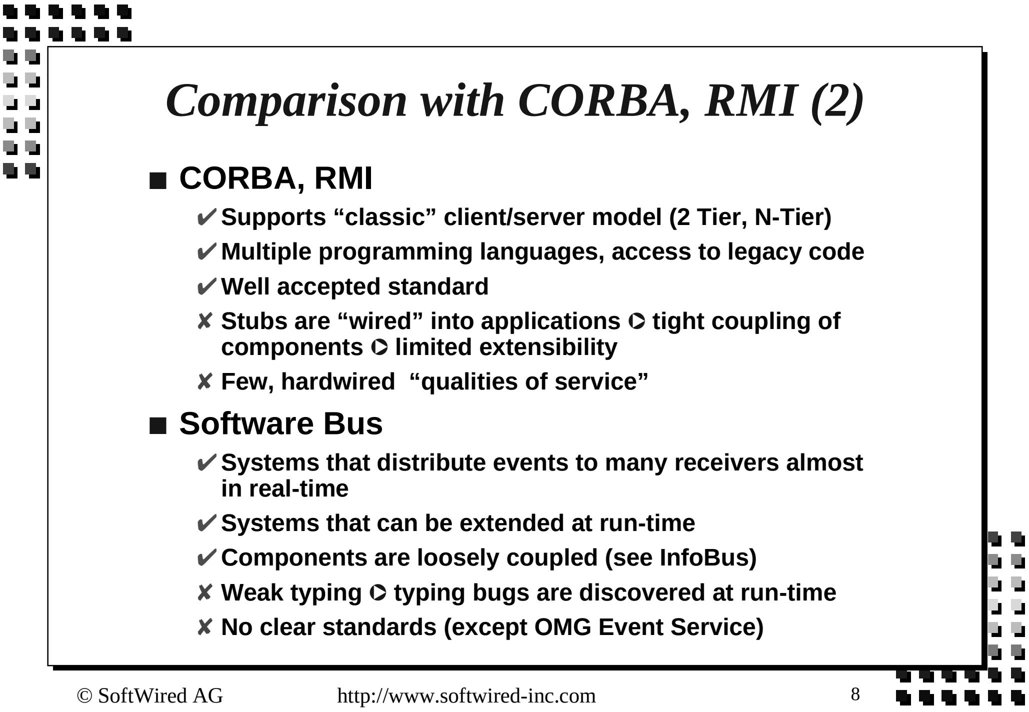

Comparison with CORBA, RMI (2)

- ■ CORBA, RMI
  - ✔ Supports “classic” client/server model (2 Tier, N-Tier)
  - ✔ Multiple programming languages, access to legacy code
  - ✔ Well accepted standard
  - ✘ Stubs are “wired” into applications ➲ tight coupling of components ➲ limited extensibility
  - ✘ Few, hardwired “qualities of service”
- ■ Software Bus
  - ✔ Systems that distribute events to many receivers almost in real-time
  - ✔ Systems that can be extended at run-time
  - ✔ Components are loosely coupled (see InfoBus)
  - ✘ Weak typing ➲ typing bugs are discovered at run-time
  - ✘ No clear standards (except OMG Event Service)

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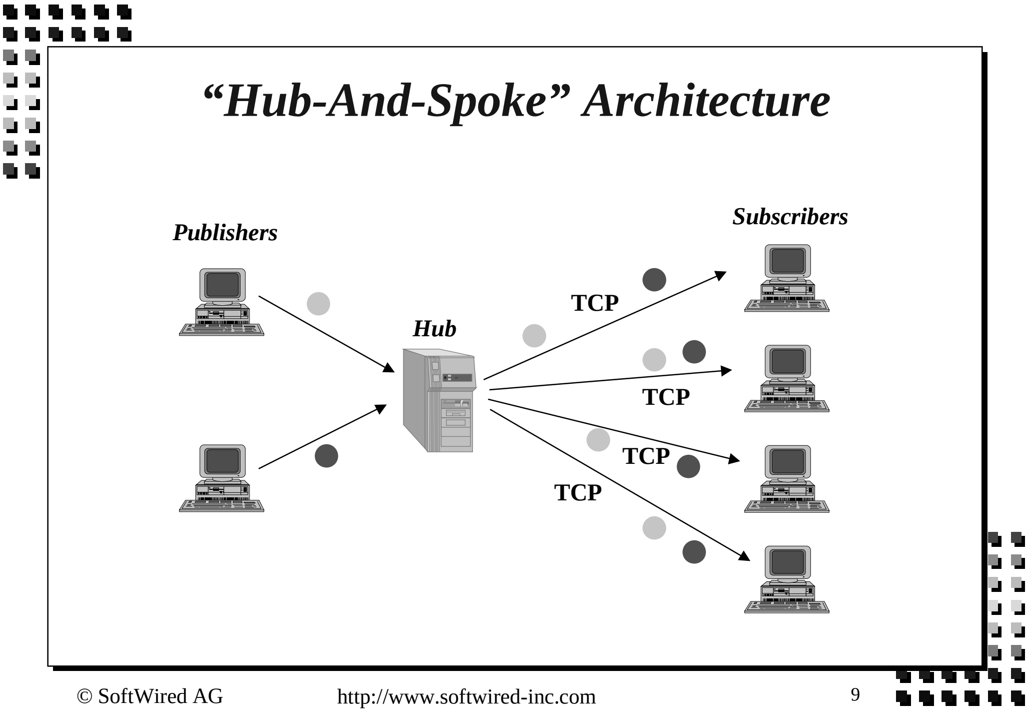

“Hub-And-Spoke” Architecture

Publishers

Hub

Subscribers

TCP

TCP

TCP

TCP

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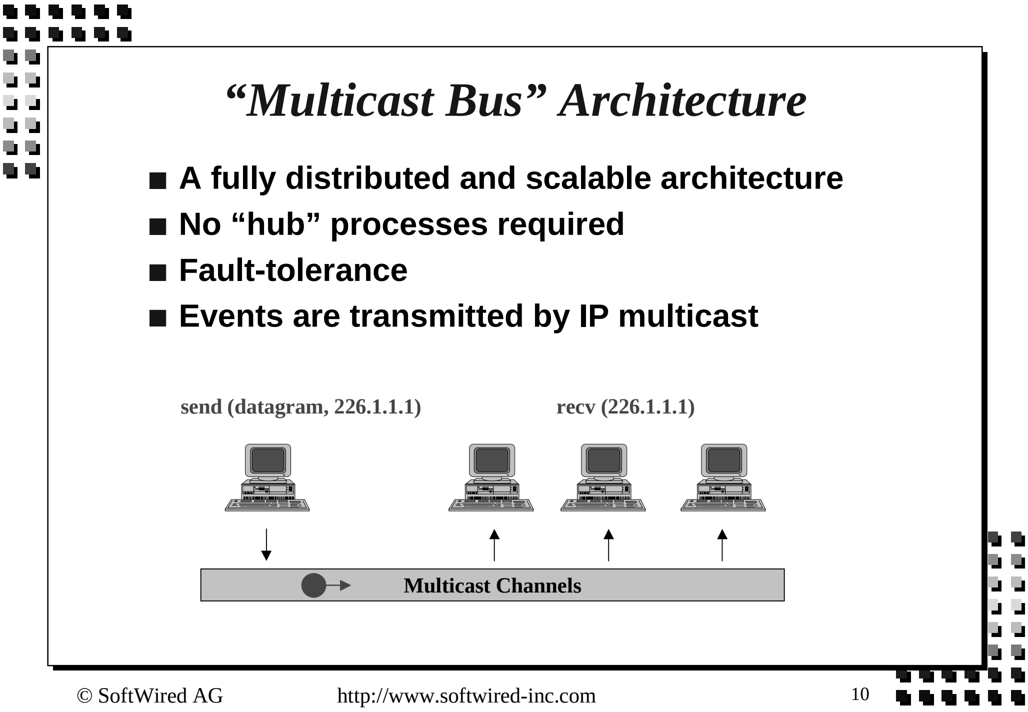

“Multicast Bus” Architecture

- A fully distributed and scalable architecture
- No “hub” processes required
- Fault-tolerance
- Events are transmitted by IP multicast

send (datagram, 226.1.1.1)

recv (226.1.1.1)

Multicast Channels

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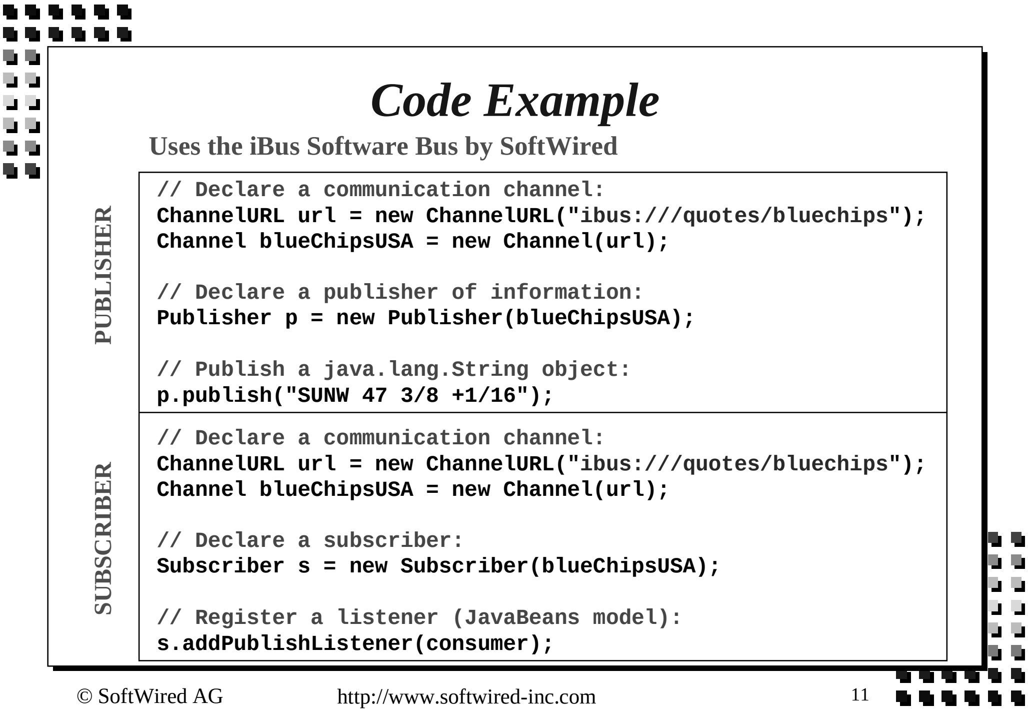

Code Example

Uses the iBus Software Bus by SoftWired

PUBLISHER

```
// Declare a communication channel:
ChannelURL url = new ChannelURL("ibus:///quotes/bluechips");
Channel blueChipsUSA = new Channel(url);

// Declare a publisher of information:
Publisher p = new Publisher(blueChipsUSA);

// Publish a java.lang.String object:
p.publish("SUNW 47 3/8 +1/16");
```

SUBSCRIBER

```
// Declare a communication channel:
ChannelURL url = new ChannelURL("ibus:///quotes/bluechips");
Channel blueChipsUSA = new Channel(url);

// Declare a subscriber:
Subscriber s = new Subscriber(blueChipsUSA);

// Register a listener (JavaBeans model):
s.addPublishListener(consumer);
```

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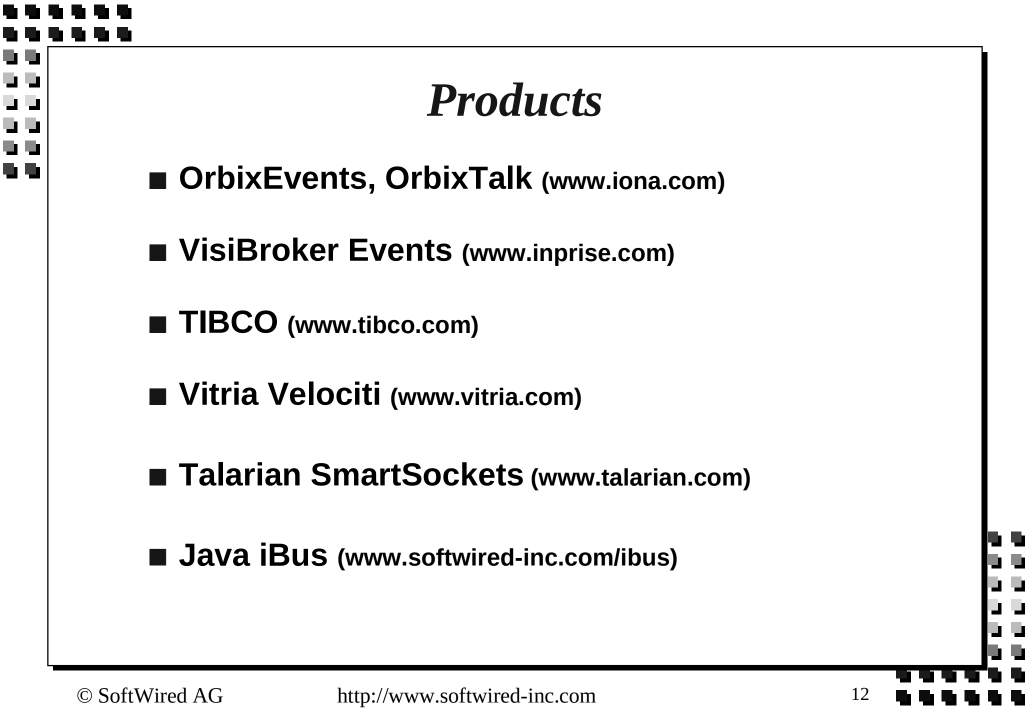

Products

- ■ **OrbixEvents, OrbixTalk (www.iona.com)**
- ■ **VisiBroker Events (www.inprise.com)**
- ■ **TIBCO (www.tibco.com)**
- ■ **Vitria Velociti (www.vitria.com)**
- ■ **Talarian SmartSockets (www.talarian.com)**
- ■ **Java iBus (www.softwired-inc.com/ibus)**

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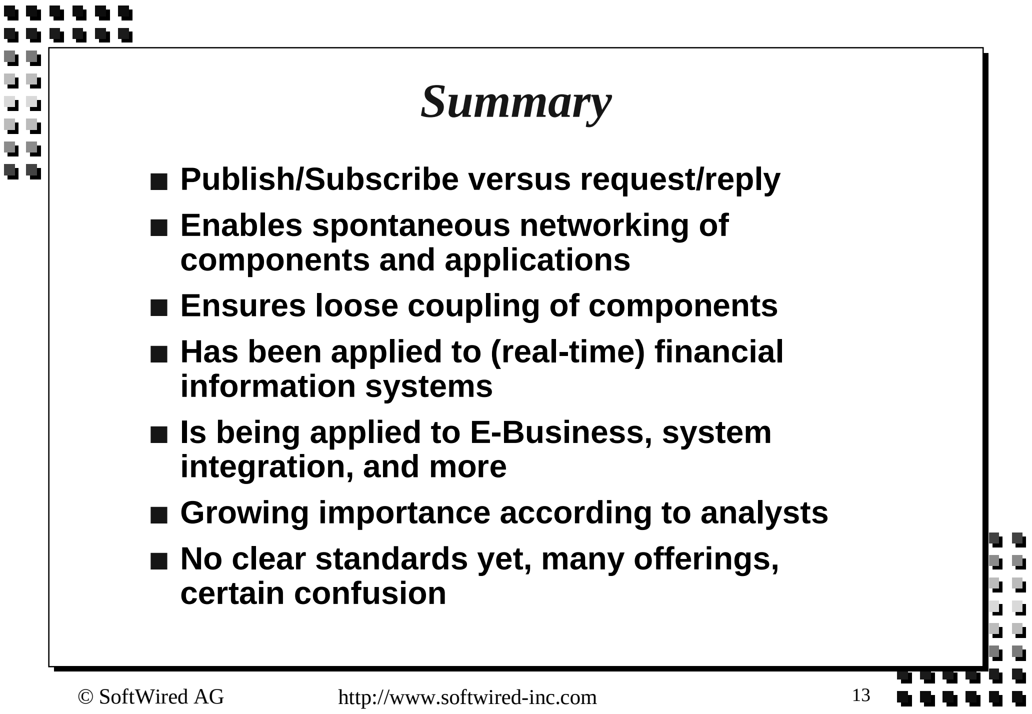

Summary

- **Publish/Subscribe versus request/reply**
- **Enables spontaneous networking of components and applications**
- **Ensures loose coupling of components**
- **Has been applied to (real-time) financial information systems**
- **Is being applied to E-Business, system integration, and more**
- **Growing importance according to analysts**
- **No clear standards yet, many offerings, certain confusion**

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