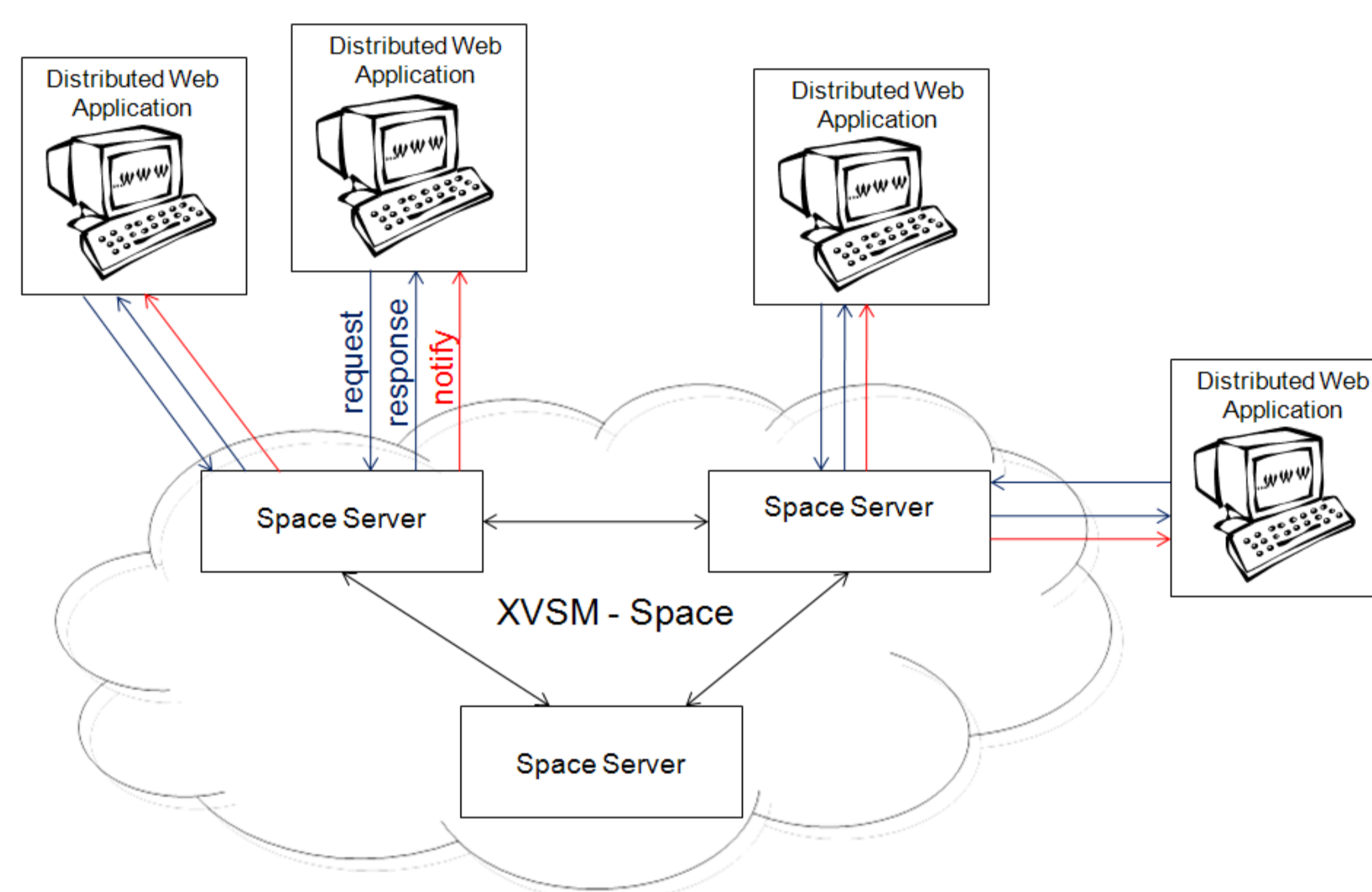


Motivation

- Multi-user participative web applications create new challenges concerning coordination, performance and scalability
- Space based middleware systems (e.g. XVSM) address these issues but are not focused on applications running in a web browser environments
- **Solution:** Combining XVSM with web 2.0 technology

System Overview

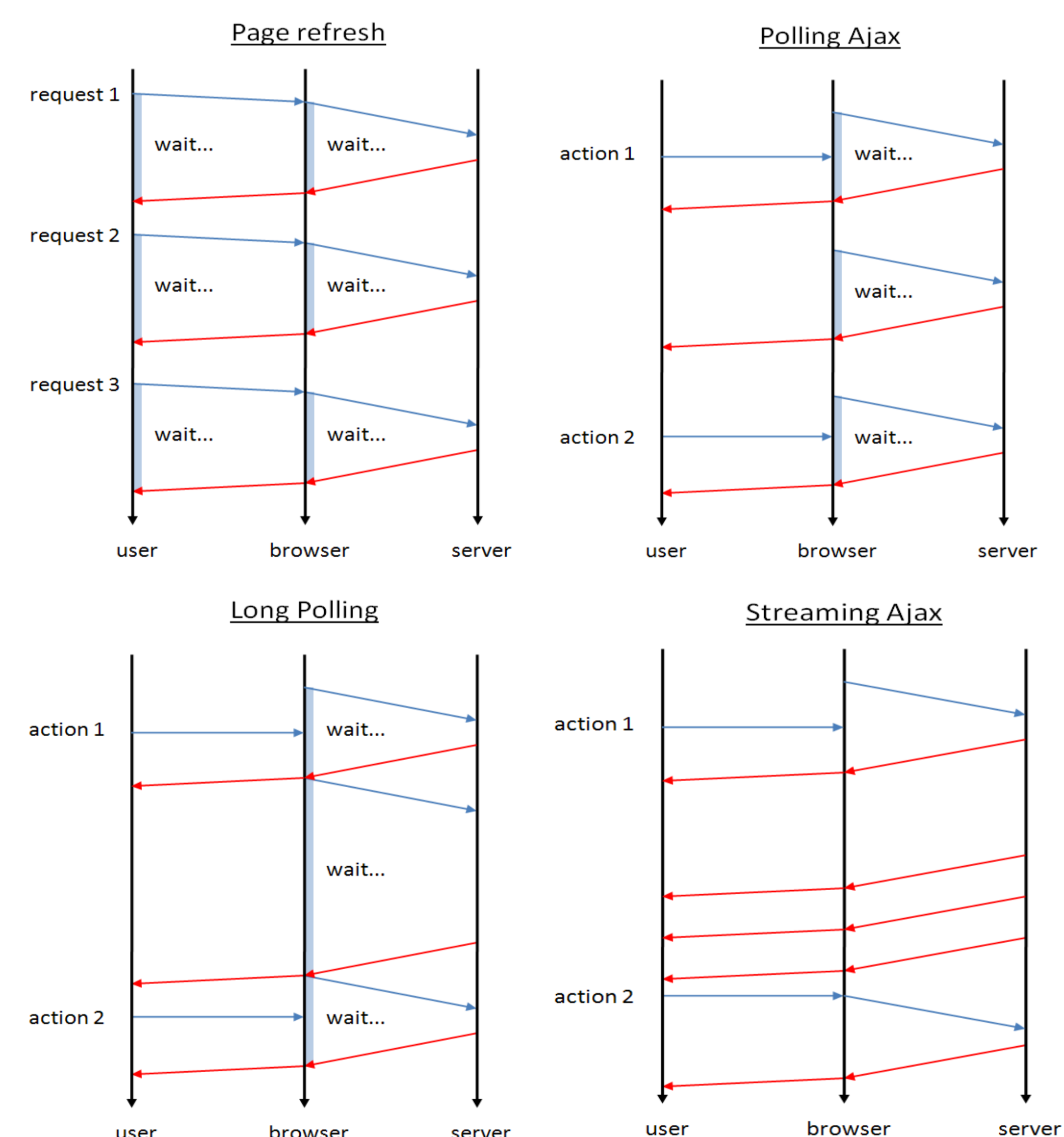
- Distributed web applications coordinating each other through a common space
- Bidirectional communication between the web application and the space server (server initiated event notification)
- Space replication over different space servers



Server Side Information Push

The HTTP protocol was designed to support client initiated information pull. The idea of a server sending data to the client on its own was not thought of. However, there are four different workarounds to transport data from the server to the web browser:

- Manual, user initiated page refresh (no change in client software, completely synchronous)
- Ajax Polling (partially asynchronous, delay vs. overhead)
- Long Polling (lower latency, connection build up/tear down)
- Ajax Streaming (best performance, compatibility issues)



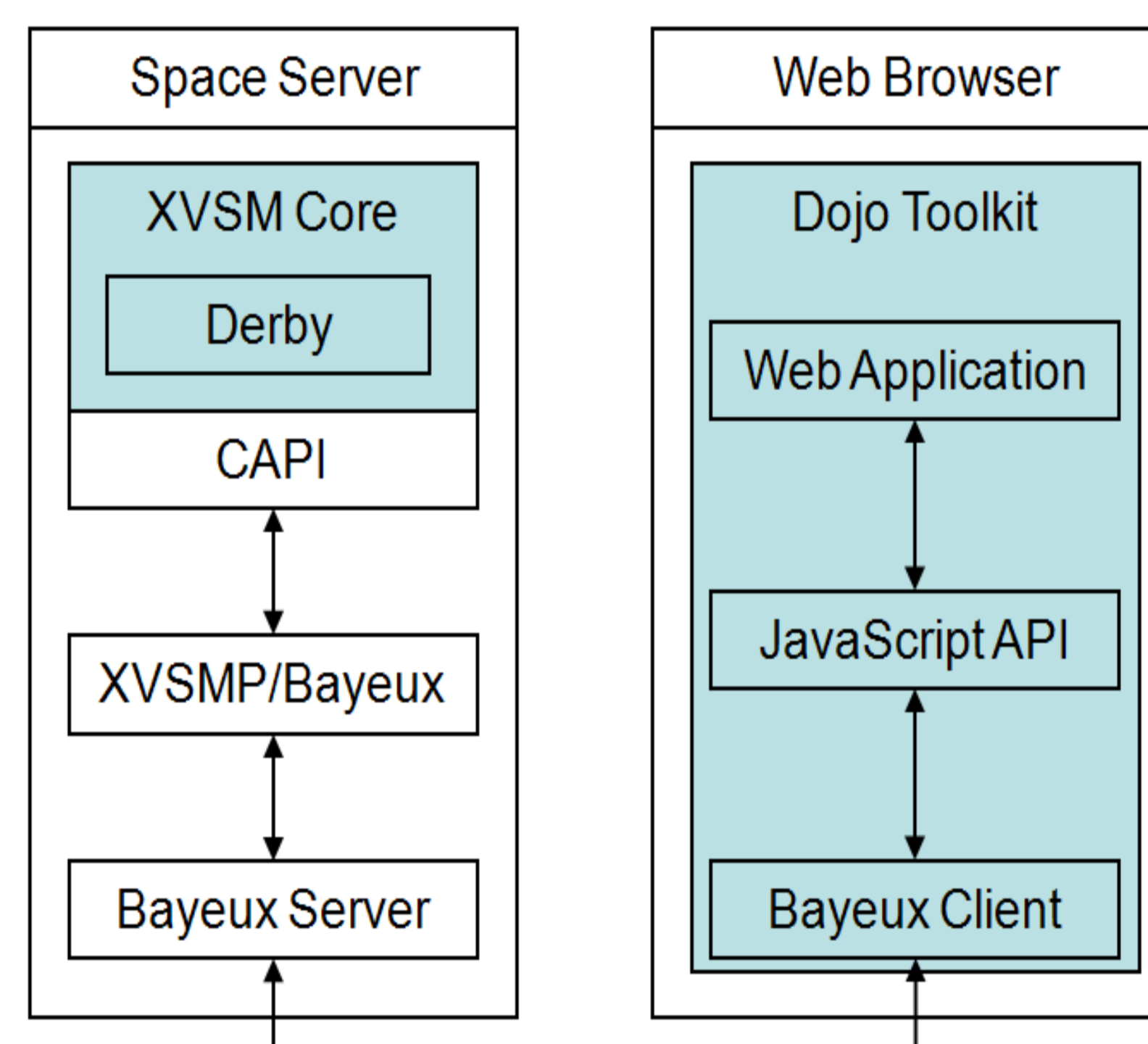
Components

Space Server

- Bayeux Server handles communication
- XVSM/Bayeux connects the Bayeux server with the XVSM Space
- The Core API (CAPI) provides methods to manipulate the space

Web application

- Bayeux as transport mechanism
- JavaScript API sends/retrieves messages through the Bayeux Client
- The web application calls the methods of the JavaScript APIs
- Dojo Toolkit provides the Bayeux Client and GUI features



Advantages

- No software distribution, installation or maintenance necessary
- Available on every web browser enabled device
- Decoupling of application logic and communication
- Low message delivery latency and reduced communication overhead
- Scalability through space server replication
- Not affected by security restrictions (e.g. firewall)

Output of this thesis

- Protocol regulating the XVSM - web application communication
- XVSM Server implementation
- JavaScript API for easy web application development
- 2 Examples of use (Chat System, Space Monitoring Application)

Future Work:

- Caching and Offline Operations
- JavaScript Space Implementation

Related Publications

[1] Eva Kühn, Johannes Riemer and Lukas Lechner: XVSM/Bayeux: A protocol for scalable space based computing in the web. *16th IEEE International Workshops on Enabling Technologies: Infrastructure for Collaborative Enterprises*, June 2007.

[2] Eva Kühn, Johannes Riemer, Richard Mordinyi and Lukas Lechner: Integration of XVSM spaces with the web to meet the challenging interaction demands in pervasive scenarios. *Ubiquitous Computing and Communication Journal. Special Issue on Coordination in Pervasive Environments*, 2008.