Impact of the Internet on Software Development

The Importance of World-Wide Web Infrastructure

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What does “World-Wide Web” mean?

The Project

- Collaboration on a Global Scale

The Protocols

- URI, HTTP, HTML

The Applications

- Clients and Servers
- Browsers, Agents, Proxies, Gateways

The Information

- For every topic, no matter how obscure, there exists at least one fanatic with the undying need to tell you all about it.

Impact of the Internet

IMPACT: an impelling or compelling effect

- Enabling new technology
- Changing the social context
  - the way people think
  - the assumptions that they make
  - the limitations that they perceive

The Internet? Or just the Web?

- Cables and Computers
- Information
- or Both?

Impact of the Internet on Software

Enabling New Technology

- Software Distribution
- Remote Interaction
  - End-user Feedback to Developers
  - Developer Feedback to End-users
- Collaborative Development

Changing the Social Context

- Simplicity and Extensibility as primary design principles
- Collaborative Development on a Global Scale

Collaborative Development

Requires:

- **Warm Bodies**
- **At least one common goal**
  - **but not all goals are held in common**
- **Communication**
  - **Public: one to all, recorded for later review**
  - **Private: one to few**
- **Shared Information Space**
  - **Access to past communication**
  - **Access to past and current development products**
- **Coordination**
  - **to make all of the above easier**

Impact of the Internet on Collaborative Development

- **Millions of Warm Bodies to choose from!**
- **Many goals held in common**
  - **Easy to find people when working on a global scale**
- **E-mail for Communication**
  - **Public: mailing list, archived in Hypermail**
  - **Private: off-list mail**
- **The Web is a Shared Information Space**
  - **Access to past communication**
  - **Access to past and current development products**
- **Coordination**
  - **... oops**

The Apache HTTP Server Project

Apache Group

- **Formed in February '95**
- **9 Founding Members (all end-users)**

Common Goal

- **To provide a public, secure, efficient and extensible server which provides HTTP services in sync with the standards.**

Current Status

- **#1 Server (30% market share / 50,000 hosts)**
- **~20 active developers (8 founders)**
- **Hundreds of contributors**

The Apache HTTP Server Project

E-mail Communication

- **Developer mailing list (1000 msg/month)**
- **Private mail**

Shared Information Space

- **Machine in Bay Area**
  - **FTP and HTTP servers**
  - **Logins for major developers**
- **Public area for distributions, Developer area for work-in-progress**

Coordination

- **Voting (on patches, releases, strategy, etc.)**

Apache: Secrets of Our Success

User -driven Development

- **The End-Users are the Developers**
- **Core developers act as Quality Control**
- **System designed for Extensibility (API)**

Rapid Response to User Needs

- **Public support line (newsgroup)**
- **Problem -> Patch, typically less than a day**
- **Web-based Distributions**

Blistering Production of New Features

- **Unlimited supply of ideas (good and bad)**

Is this a fair test of Collaborative Development?

What is Missing?

Support for Coordination

Apache succeeds in large part due to the unusual expertise of its user/developers.

- **all Internet experts**
- **capable of compiling, installing software**

Keeping track of progress and potential conflict has required a deluge of communication (E-mail).

Submitting changes and building releases are time-consuming, manual processes.

Difficult to browse the current software state.

What is Needed?

Global Software Engineering Environment

gSEE must be:

- **Cognizant of distributed environment**
  - **No dependence on continual connectivity or synchronous communication**
  - **Robust in the face of attack or partial shutdown**
- **Unrestrained scalability (up and down)**
- **Extensible wherever/whenever possible**
- **Easy to use (hypermedia-based)**
- **Accessible to Users**
  - **current and potential users**
  - **read-only and writable**

The Importance of WWW Infrastructure

The WWW is Accessible to Users

A browser on every desktop is not good enough!

We want a hypermedia support system in every OS

- **True extensibility (not just plug-ins)**
- **Universal availability**

What it will require:

- **Well-defined operations for gSEE activities (PUT , version control, signed applets, etc.)**
- **Robust prototypes to drive the standards**
- **Time and Resources**

Advantage: Collaborative Development is Addictive