Web Architecture

Version 5.0

Wyyzzk, Inc.

Topics

- Basic Web Architecture
- Client Architectures
- Server Architectures
- Trade-offs
- AJAX and LAMP

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Basic Web Architecture

- The basic web architecture is client/server.
  - A web browser runs on the client
    - Internet Explorer
    - Netscape
  - A web server runs on the server
    - IIS
    - Apache
  - The client and server communicate using the http protocol

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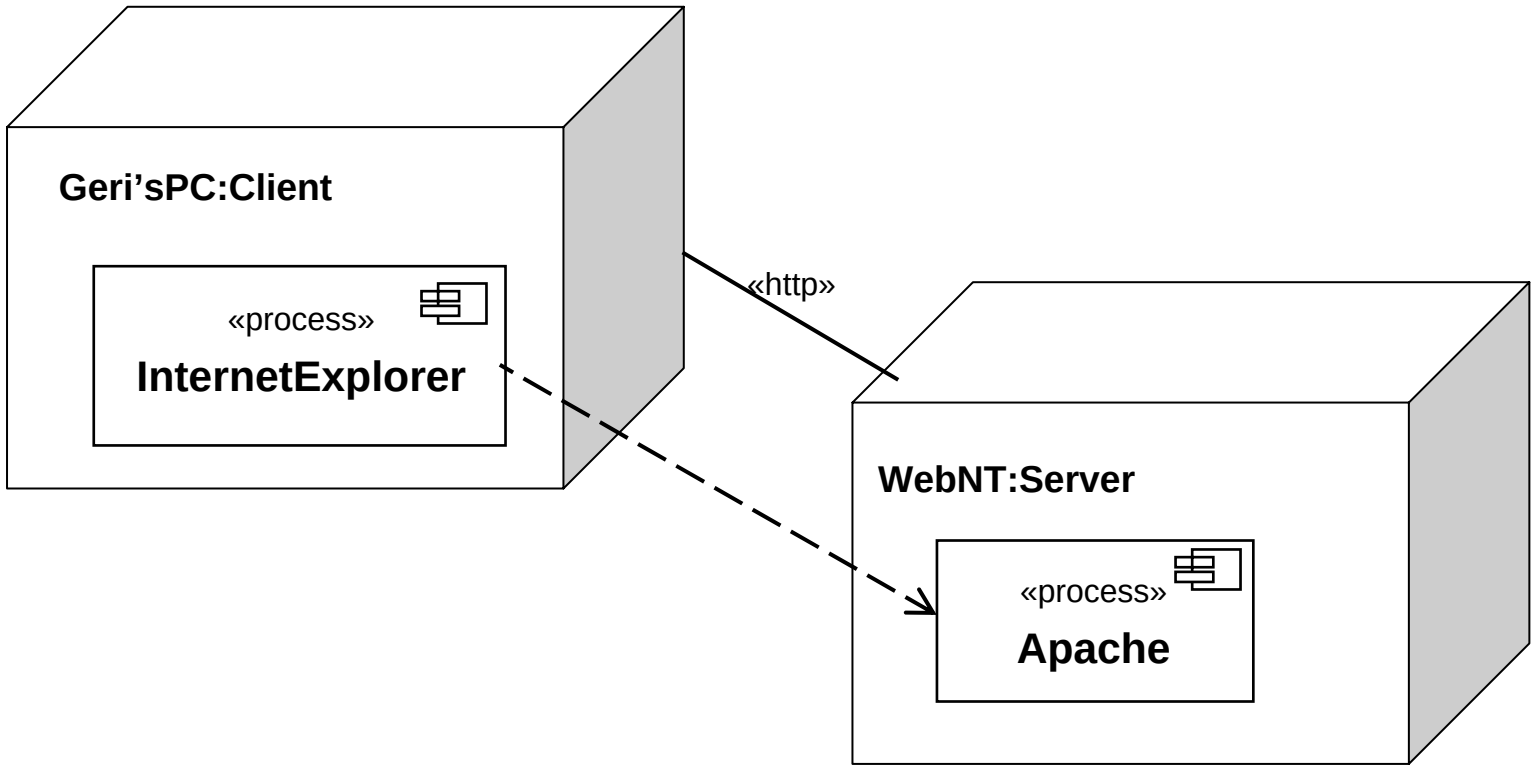
Basic Web Architecture



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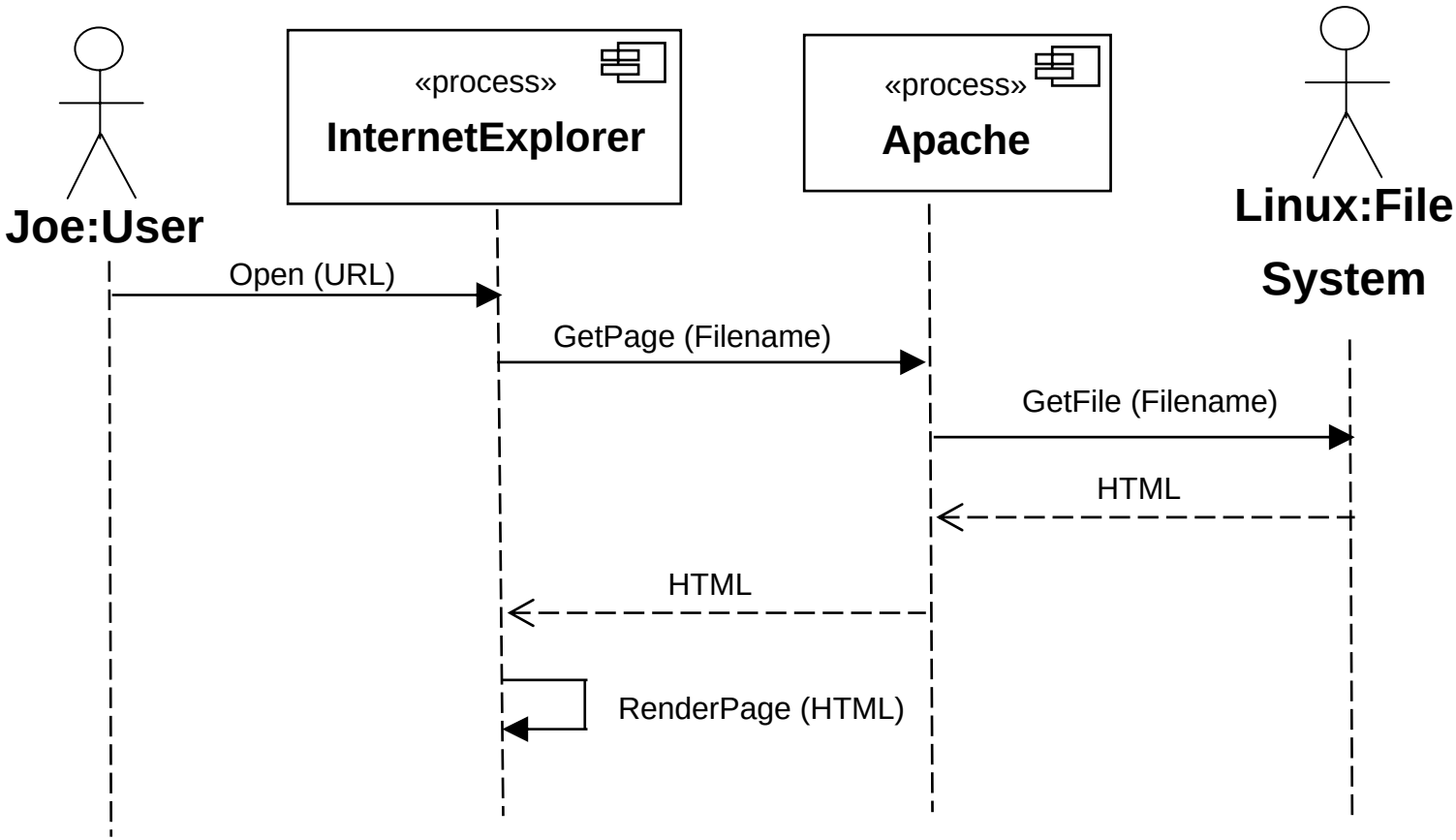
Basic Web Architecture



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Client Architectures

- There are 3 basic types of client architectures:
  - Thin
    - html pages, web browser
  - Thick
    - ActiveX, applet, Java script, other client scripts
  - Web Delivery
    - sharing objects

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Thin Client

- This is essentially what we have just described.
  - The web browser is only responsible for getting and displaying html pages.
  - The only processing on the client is with browser add-ins
    - wav, gif, Word, pdf
  - Generally there is no state
    - cookies let us get around that

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Browser Add-ins

- Web browsers only know how to display html
- If a person requests some other kind of file, the browser has to give that file to another program to render.
- This is done with a registry and add-ins
- This is a simple way to add functionality to the browser

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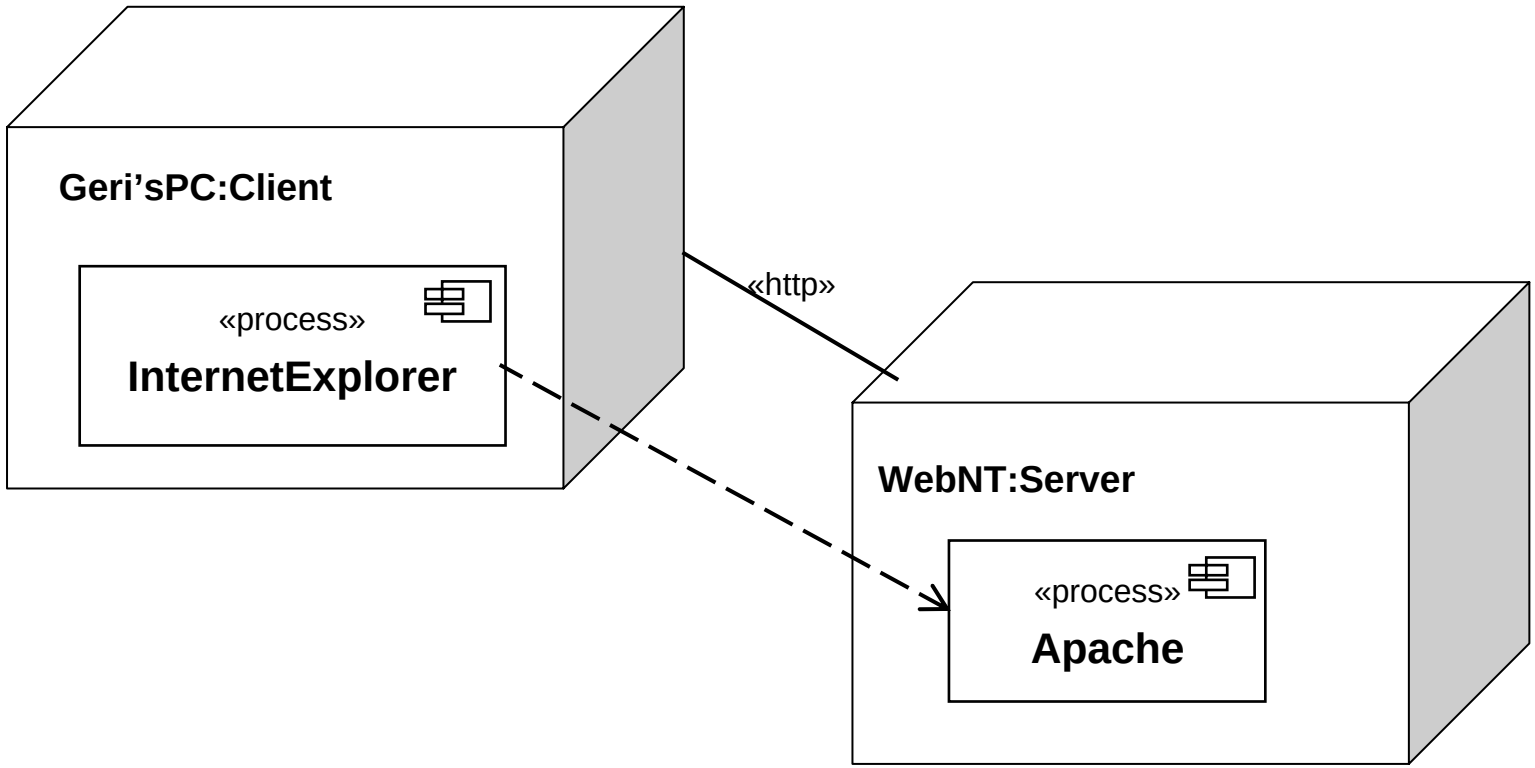
Thin Client



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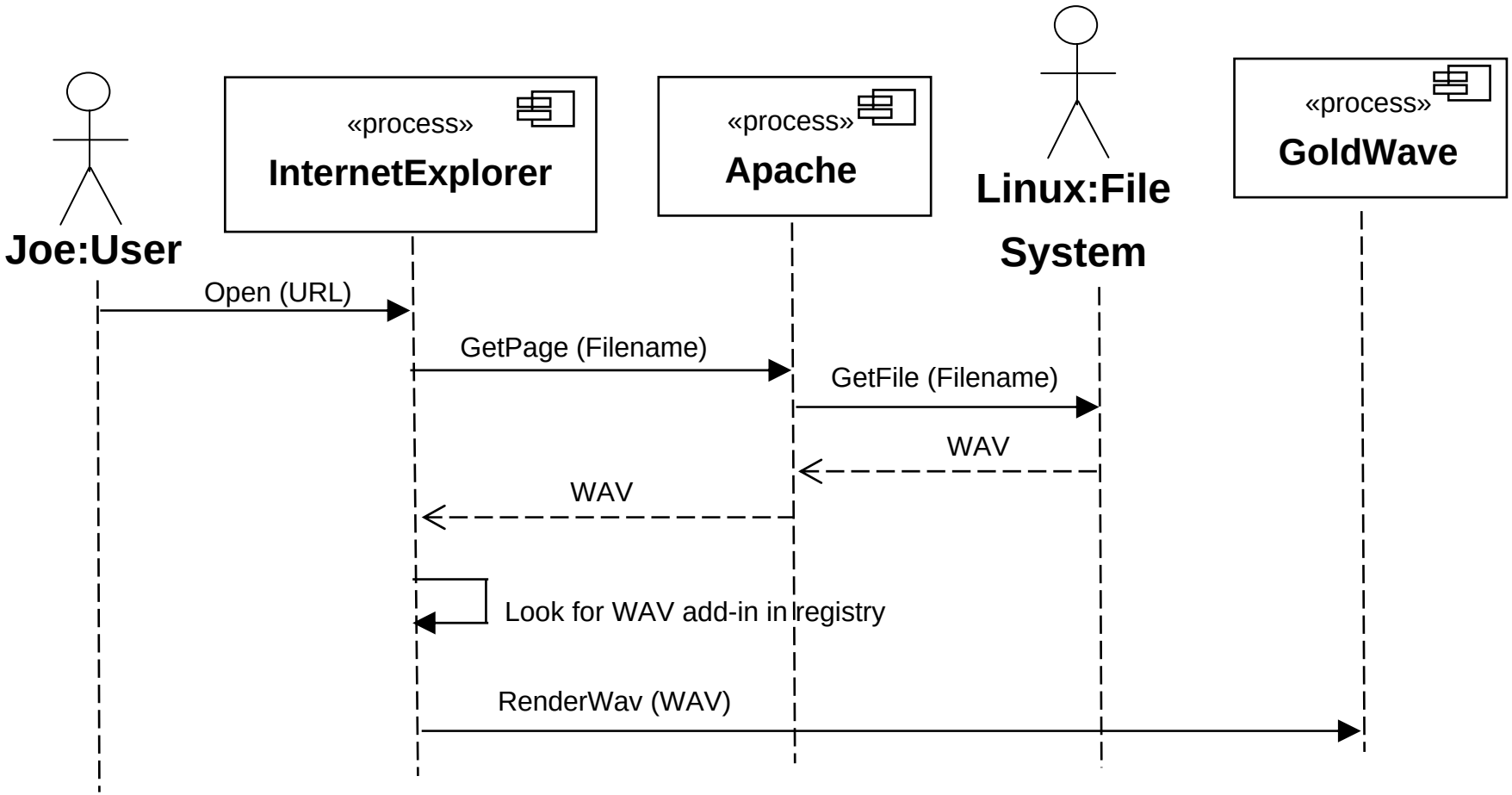
Add-ins



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Cookies

- A cookie is a file on the client computer which stores information for a particular web session
  - a web session is a series of communications between the client and the server
- During a web session, the web server creates a cookie and sends it to the web browser with the requested page
  - The web browser sends the cookie back to the server with every page request in the current web session.

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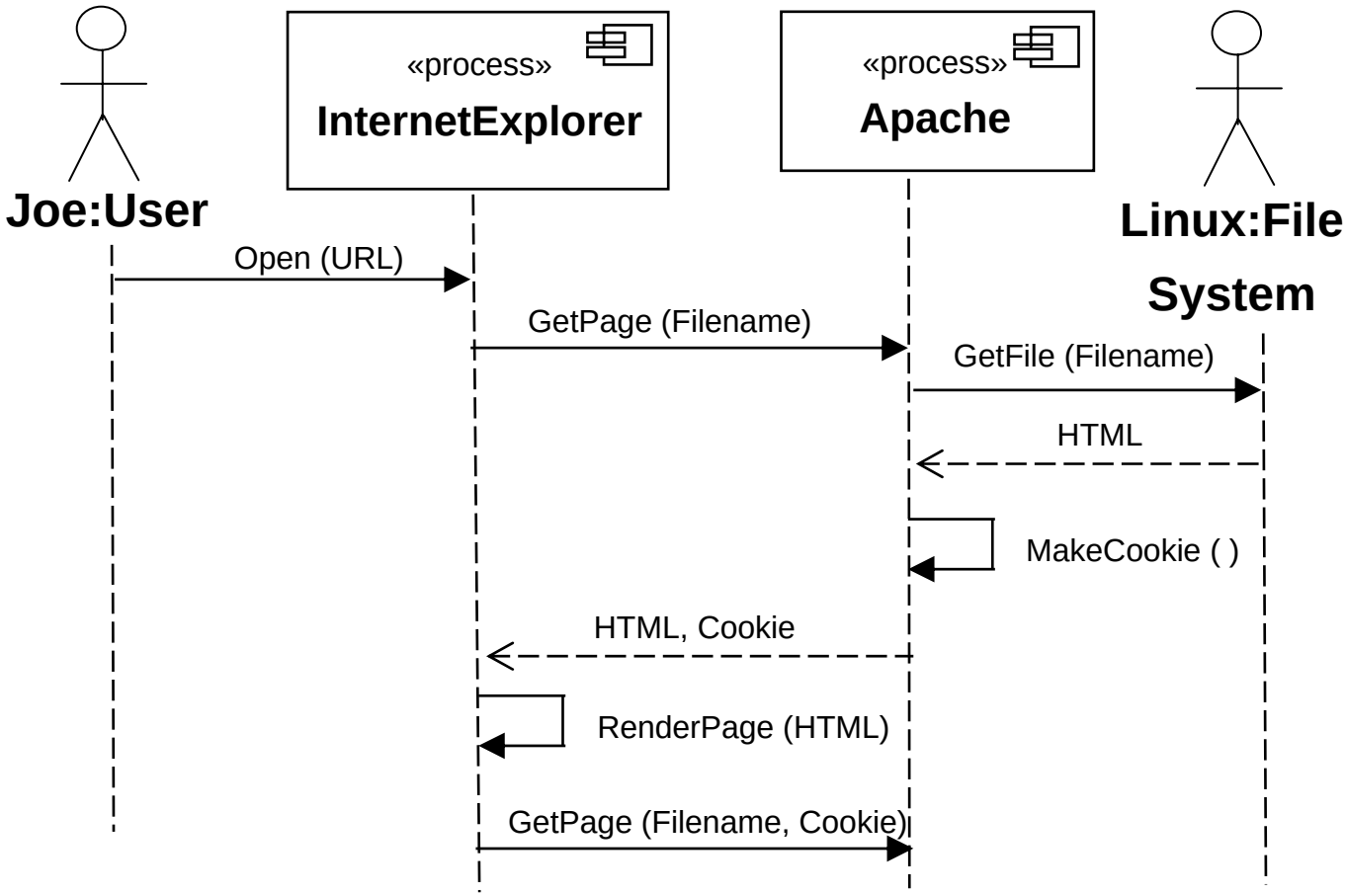
Cookies



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Cookies

- Some users turn off cookies, so they are not created or used
  - state information could be passed on the URL instead
  - this is fine as long as the user doesn't delete the information in the URL

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Thin Client

- Advantages
  - good security
    - the only code running on the client is code installed by the user
  - simple to create
- Disadvantages
  - performance
    - every bit of information needed is on the server and has to be requested
  - many users “turn off” cookies
    - state handling can be awkward and tedious

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Thick Client

- A thick client is the same as a thin client with some extra pieces
  - applets
  - Java script
  - ActiveX
  - other client script
- Now we have more processes running on the client.

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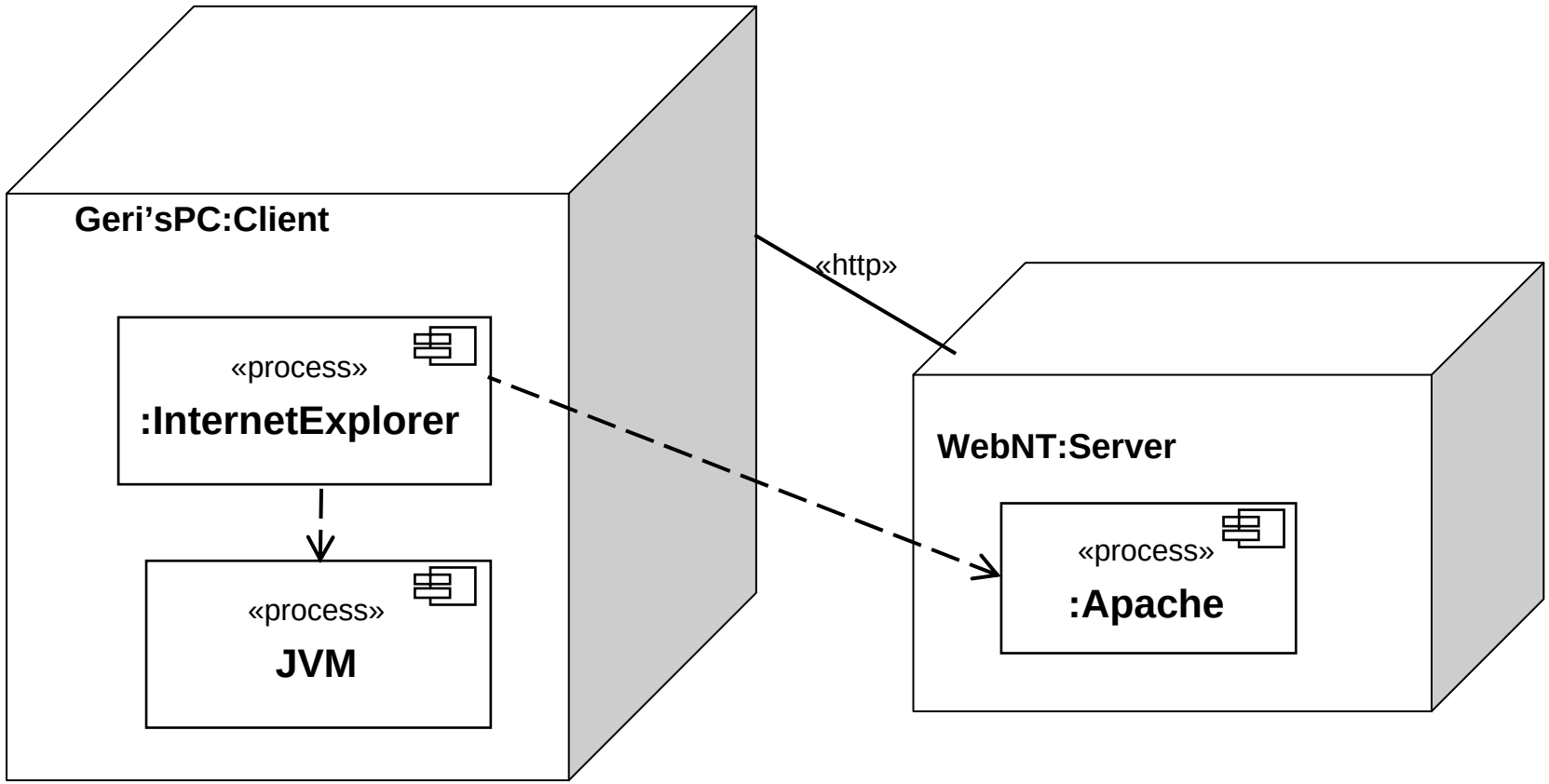
Thick Client



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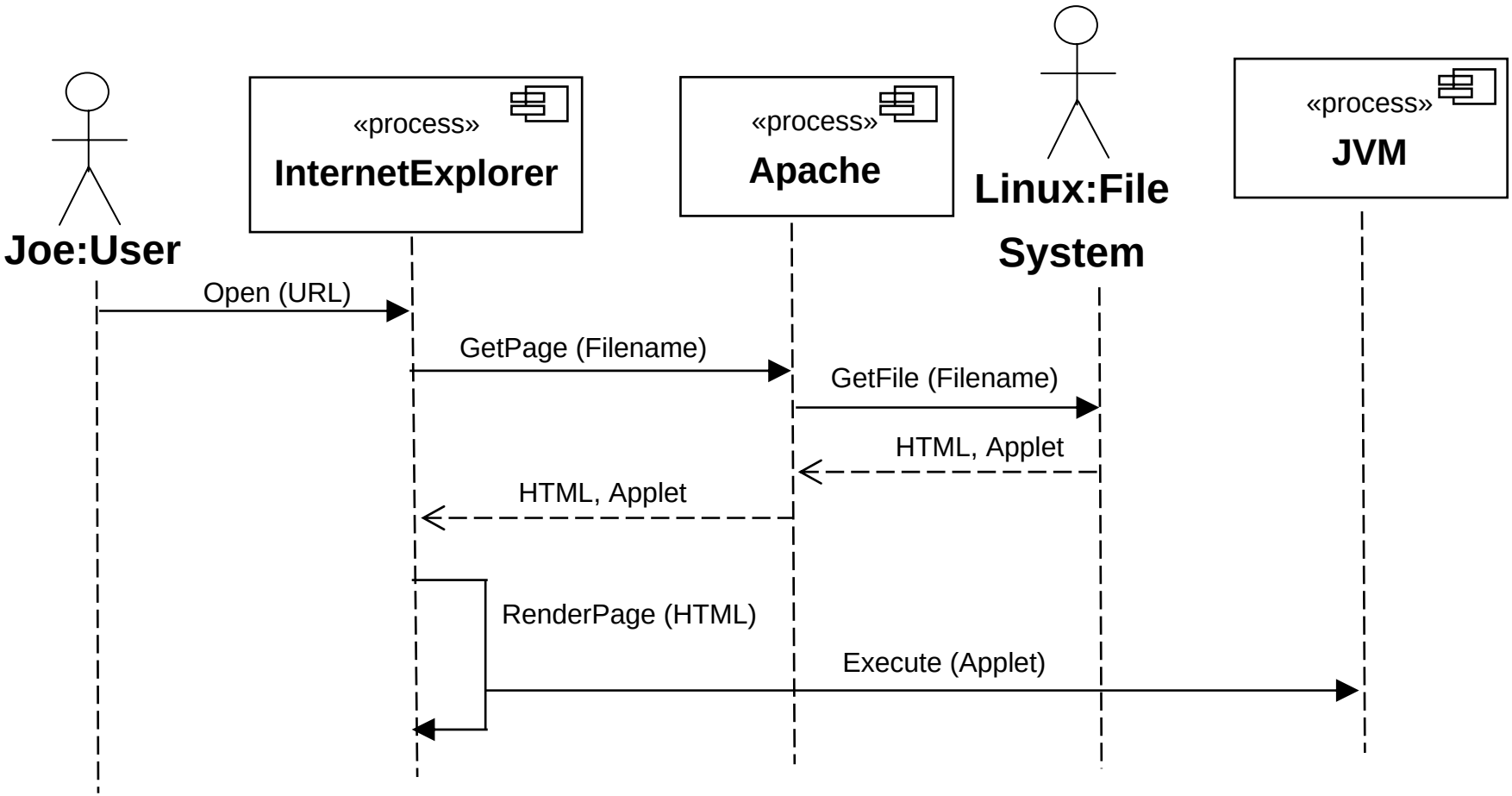
Thick Client



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Thick Client

- Advantages
  - performance
    - this will run faster than the thin client
  - state handling
    - there are more options for state handling
- Disadvantages
  - security not as tight
    - code from server is downloaded to run on client
    - user may not know or trust the source of the code

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Web Delivery System

- A web delivery system can be essentially a thin or medium client
  - We add the ability to pass objects between the client and the server.

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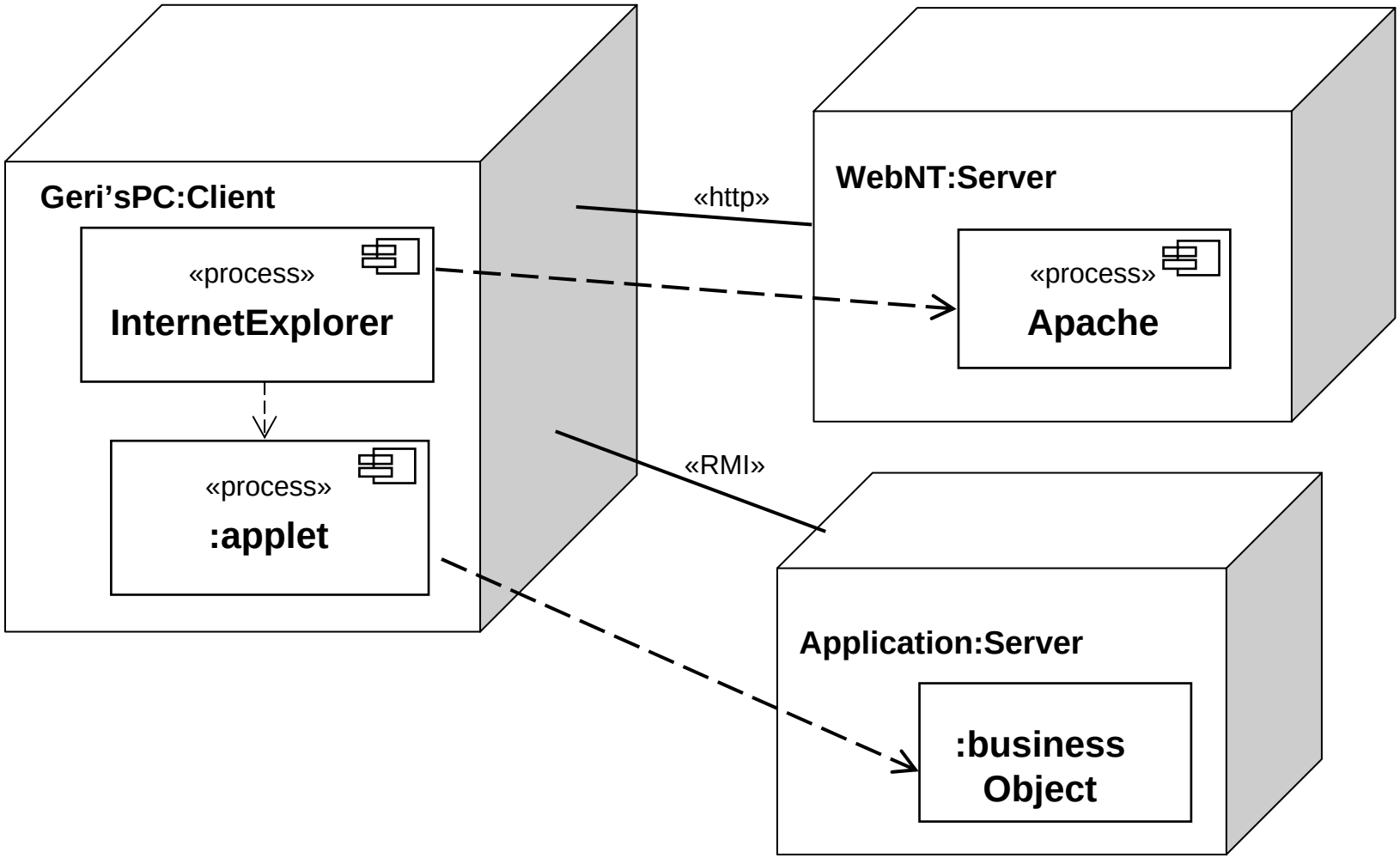
Web Delivery System Architecture



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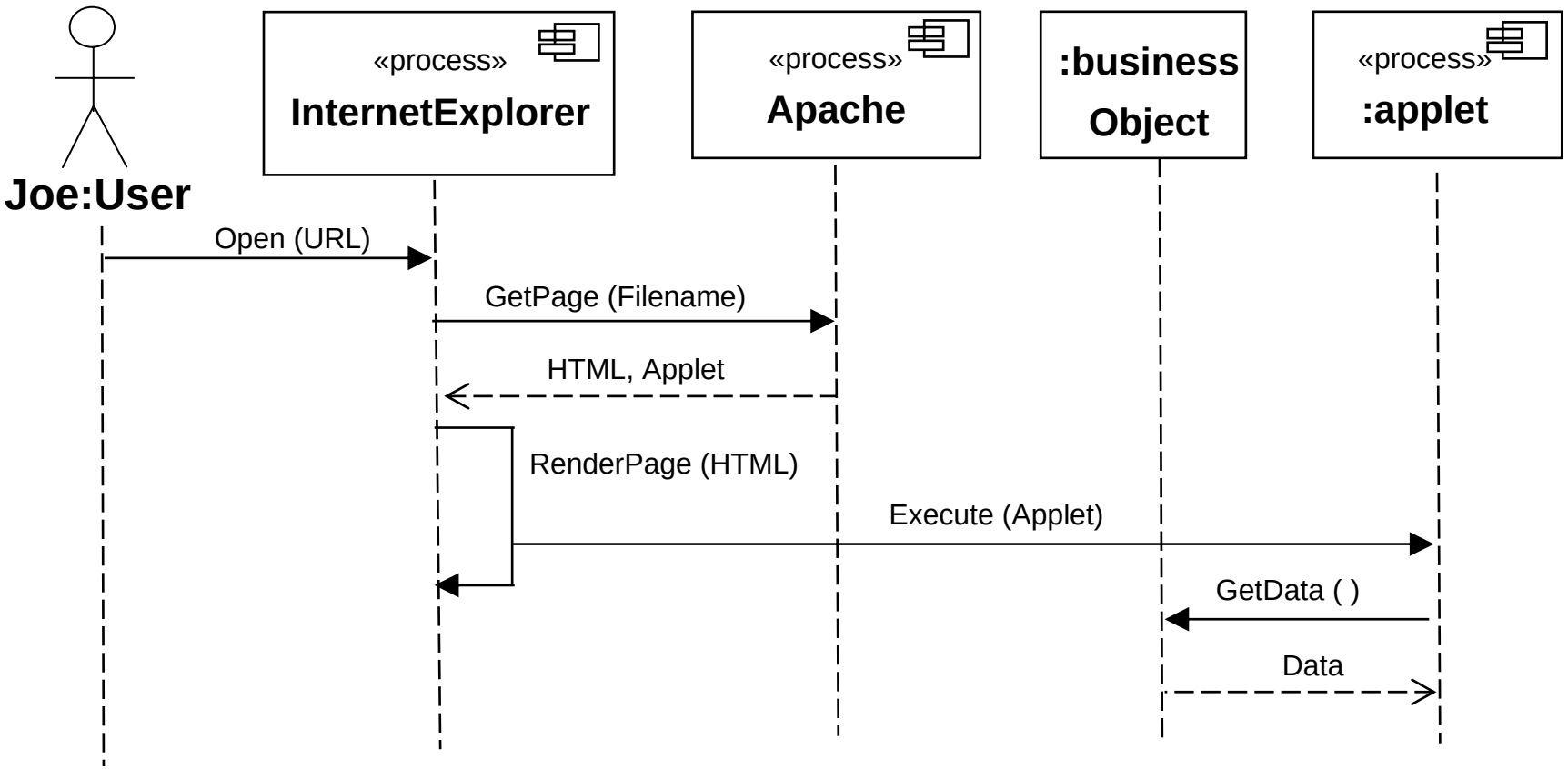
Web Delivery System



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Web Delivery System

- Advantages
  - performance
    - this will run faster than the thin client
  - state handling
    - there are more options for state handling
- Disadvantages
  - You need control over the clients
  - More complex to implement

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Server Architectures

- There are 2 basic types of server architectures:
  - Thin
    - html pages, web server
  - Thick
    - CGI, database, objects, ASP

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Thin Server

- This is the most basic server
  - The web server is only responsible for getting html pages and returning them to the client.
  - There is no additional server side processing

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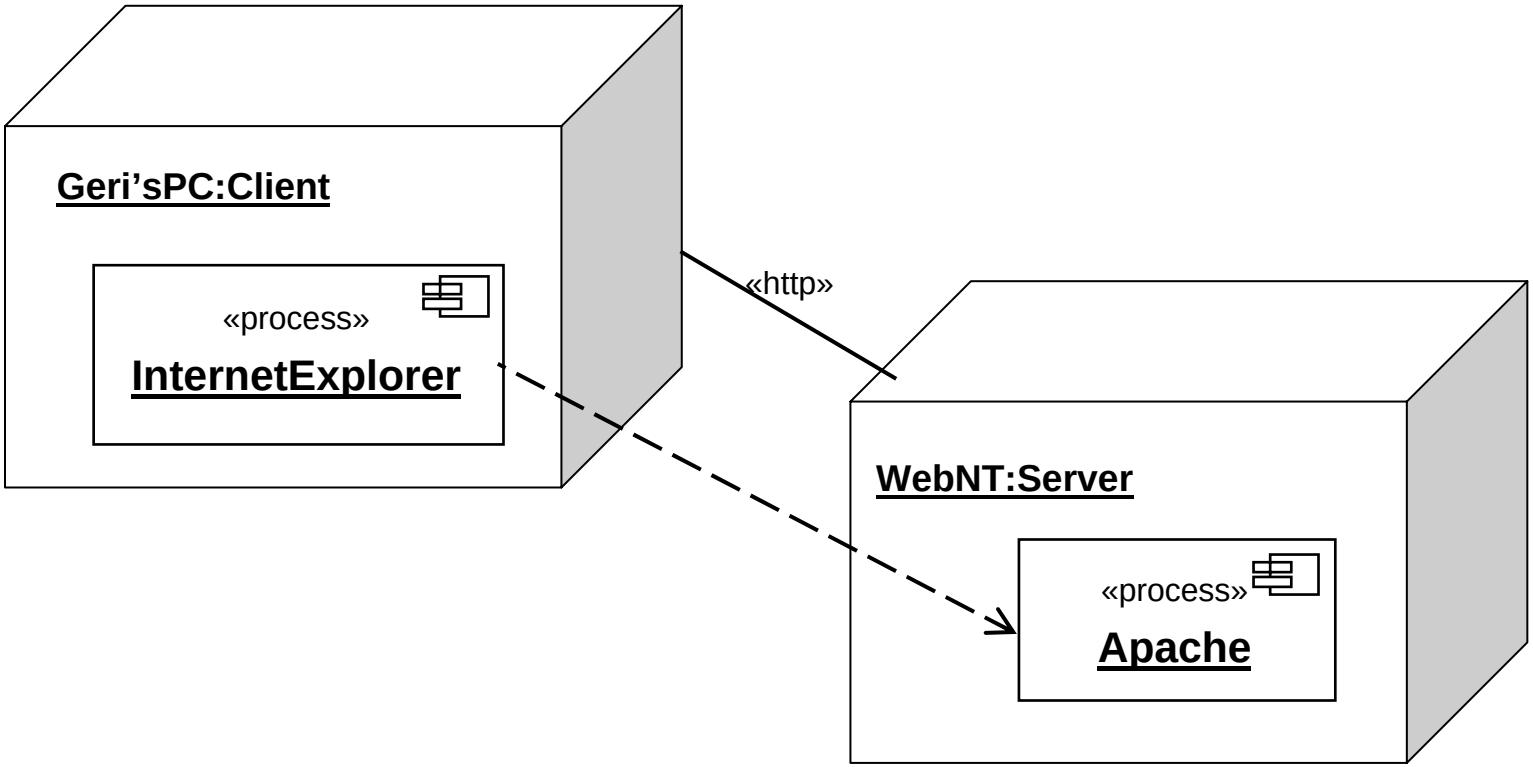
Thin Server



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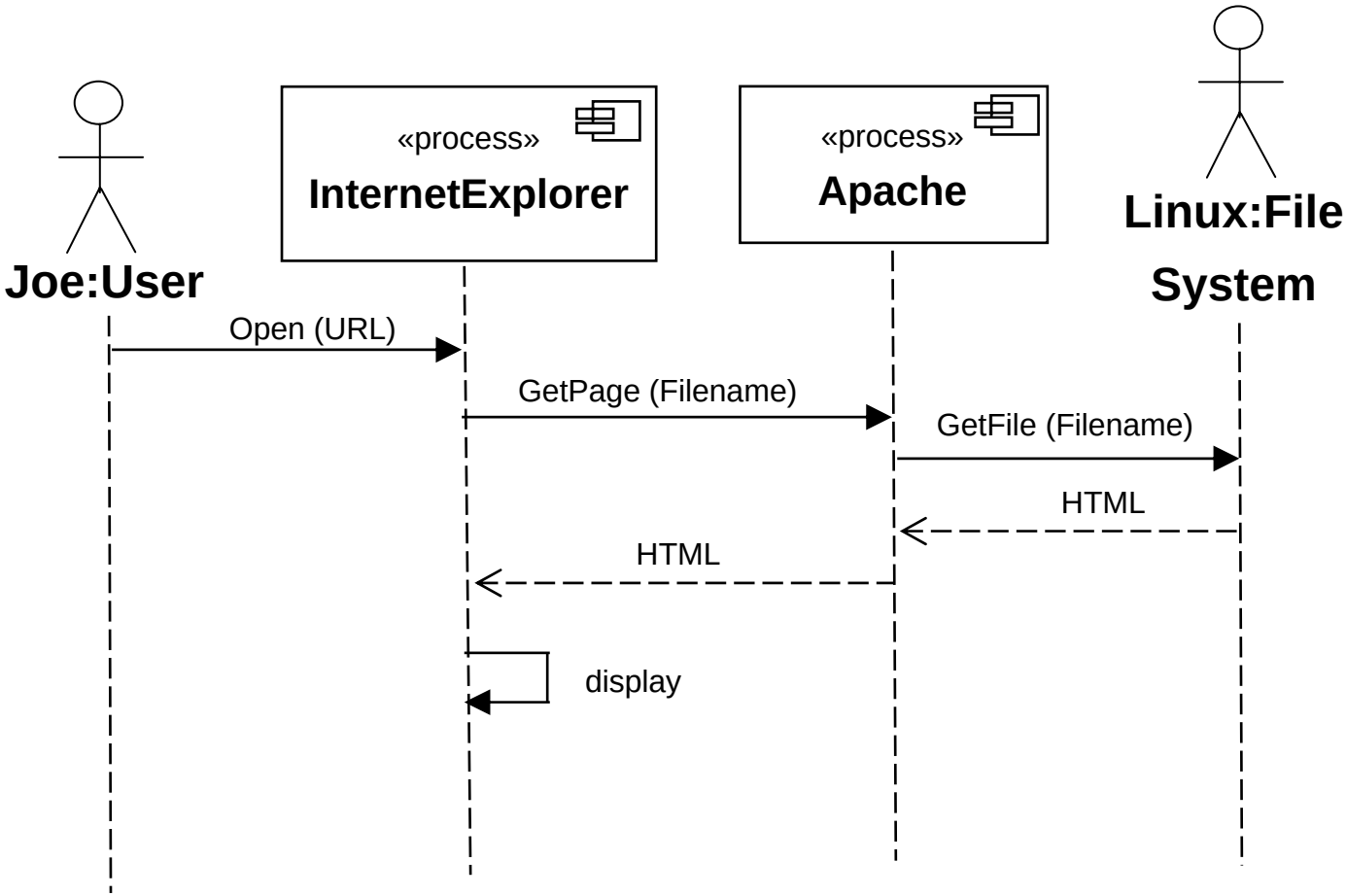
Thin Server



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Thin Server

- Advantages
  - simple to create
- Disadvantages
  - lack of server side processing
  - performance
    - every bit of information needed is on the server and has to be requested
  - many users “turn off” cookies
    - state handling can be awkward and tedious

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Thick Server

- A thick server is the same as a thin server with some extra pieces
  - CGI
  - database
  - objects
  - ASP
- Now we have more processes running on the server.

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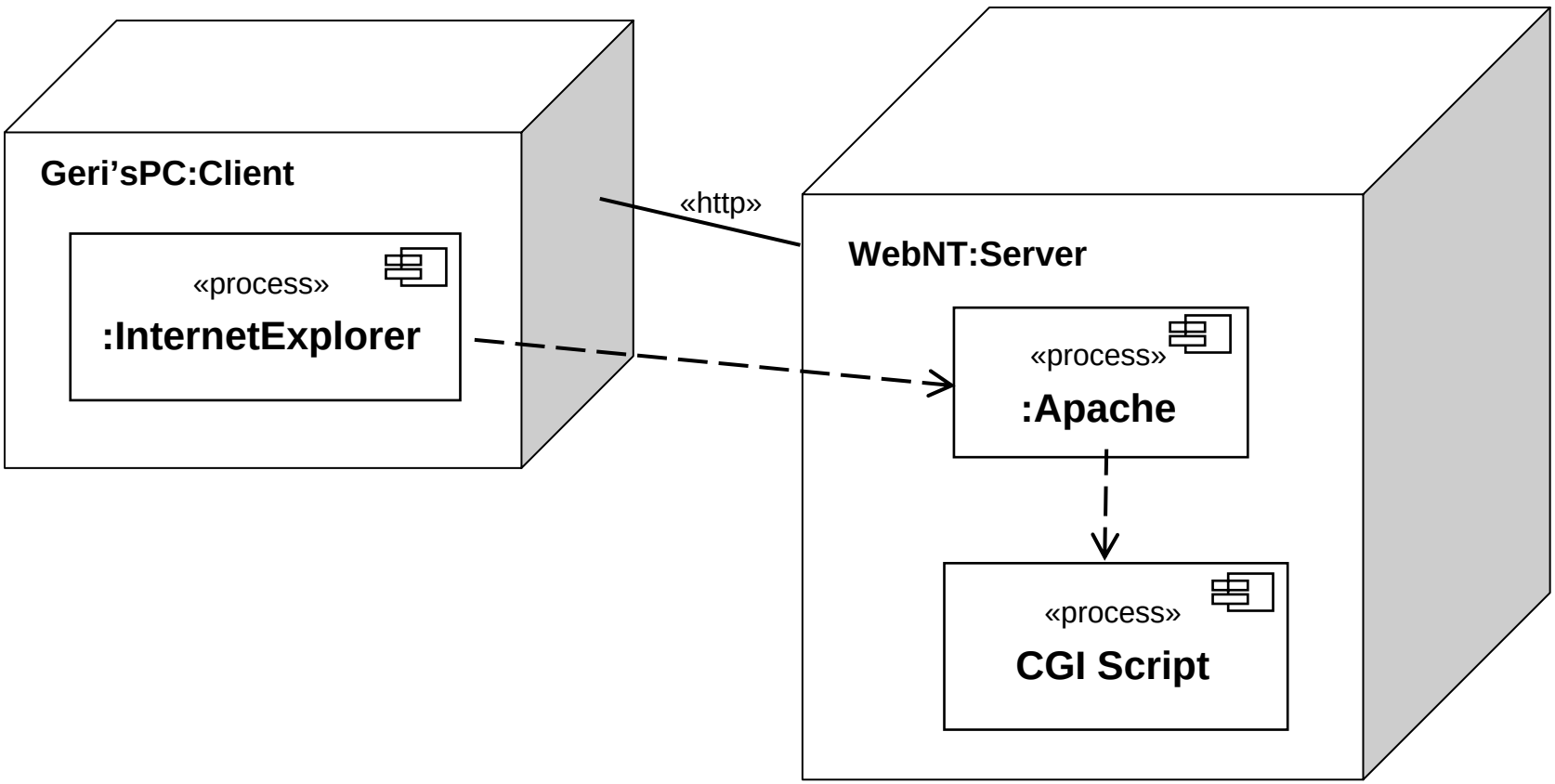
Thick Server



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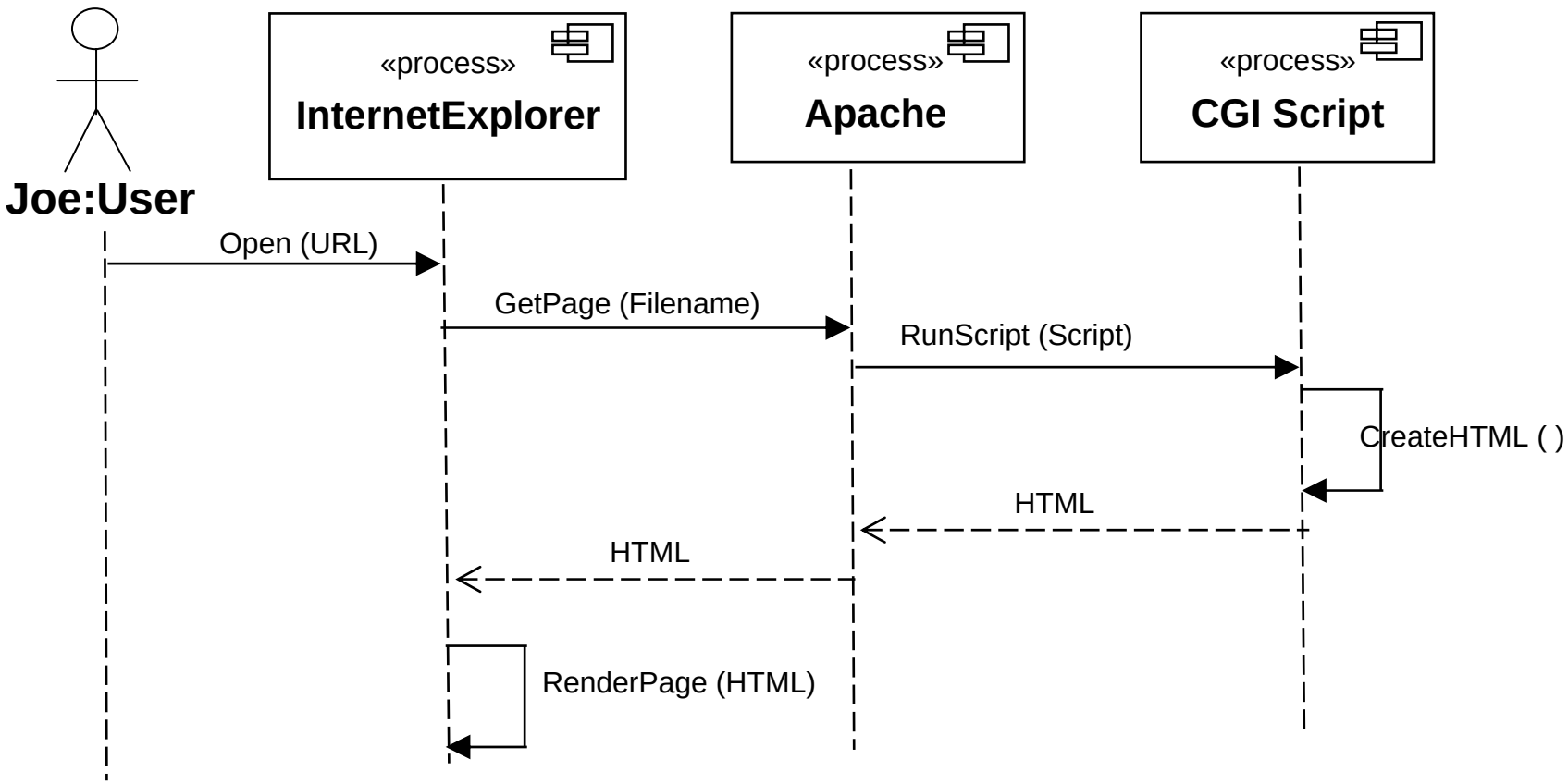
Thick Server



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Thick Server

- Advantages
  - More options for programming applications
  - state handling
    - there are more options for state handling
- Disadvantages
  - more server side processing needed

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Trade-offs

- How do you know which web architecture to pick for your application?
  - Look at the non-functional specification

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Client Trade-offs

- Client trade-offs
  - security
  - performance
  - ease of update

Security

- Are there concerns about virus attacks or hacking?
- Are there concerns about malicious use of someone else's computer?
- Will the people running the client system allow you to run your software on their computer?

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Performance

- How fast must the application run?
- How much interaction is there between the client and the server?
  - Can you reduce the interactions by moving some of the executing code from the server to the client to gain speed?

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Performance

- Do you have large amounts of data to transfer?
  - Can some data be moved from the server to the client to gain speed?
- Do you have any large graphics files that could be made smaller by having an executable run on the client to create and render them?
- Do you have to dynamically update pages based on user input?

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Ease of Update

- Do you have requirements that it must be easy to update software for your customers?
  - How easy will that be if you have code resident on the client system?

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Client Trade-offs Matrix

	Security	Performance	Ease of update
Thin client	best	worst	best
Thick client	good	good	good
Web Delivery	worst	best	worst

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Server Trade-offs

- Server trade-offs
  - data driven content
  - need for application/executable code

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Data driven content

- Do you have to dynamically update pages based on user input?
- Do you have persistent data, some form of database, that has to be incorporated into the pages?
- Do you need to dynamically change pages when persistent data changes?

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Need for executable code

- Are all the pages data, or do you need executable code as well?
  - For example, do you need to implement business rules or algorithms, do processing of data, or control devices?

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Server Trade-offs Matrix

	Data driven	Executable code
Thin server	worst	worst
Thick server	best	best

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AJAX

- Asynchronous JavaScript And XML
  - XHTML (or HTML) and CSS, for marking up and styling information
  - Document object model accessed with a client-side scripting language, such as JavaScript and JScript, to dynamically display and interact with the information presented
  - XMLHttpRequest object used to exchange data asynchronously with the web server. Could also be an IFrame object or dynamically added <script> tags.
  - XML may be used as the format for transferring data between the server and client. Could also be preformatted HTML, plain text, JSON and even EBML. These files may be created dynamically by some form of server-side scripting.

» From Wikipedia, http://en.wikipedia.org/wiki/Ajax_(programming)

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AJAX Pros

- Bandwidth utilization
  - HTML generated within the browser
  - JavaScript calls and actual data come from server
  - Appears to load quickly since payload from server is much smaller in size
  - Small requests to the server, relatively short responses sent back
- Interactivity
  - Executed on the user's machine using document object model methods for fast response
  - Can be used for tasks such as updating or deleting records; expanding web forms; returning simple search queries; or editing category trees.
  - Responsive user interfaces due to the use of DHTML techniques.

» From Wikipedia, http://en.wikipedia.org/wiki/Ajax_(programming)

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AJAX Cons

- Usability: back button and bookmarks
  - Can break the expected behavior of the browser's back button
  - Dynamic web page updates make it difficult for a user to bookmark
- Response-time concerns
  - Without care, users might experience delay in the interface of the web application
  - When an entire page is rendered there is a brief moment of re-adjustment for the eye when the content changes
  - In general the potential impact of latency has not been "solved" by any of the open source Ajax toolkits and frameworks available today
- Search Engine Optimization
  - Search engines do not generally execute the JavaScript code required for Ajax functionality, so the pages cannot be indexed
- Web Browsers
  - Not all web browsers can render AJAX pages

» From Wikipedia, http://en.wikipedia.org/wiki/Ajax_(programming)

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LAMP

- A set of free software often used together in dynamic web applications
  - Linux – operating system
  - Apache – HTTP server
  - MySQL – database
  - PHP/Perl/Python – scripting language
- Pros
  - Free
  - In common use (so lots of resources to help you learn and configure)
  - Server side technologies, so you don't have to worry about what web browser someone is using
- Cons
  - Dynamic pages are generally not indexed by search engines

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Summary

- Basic Web Architecture
- Client Architectures
- Server Architectures
- Trade-offs
- AJAX and LAMP