Bluetooth™, or a cellular communications protocol, such as a third generation (3G) communications protocol or long term evolution (LTE).

[0045] The web application 462 may enable the user device 404 to render and cause the display of a website and interact with the website. Examples of the web application 462 include a web browser and the web application 462 may permit a user to supply log in credentials to a document collaboration and management website and access one or more document directories of folders. Further, the web application 462 may enable the user, for example, via a website, to navigate between folders or directories for which the user has at least viewing privileges, for example, based at least in part on the user's credentials. In addition, the web site may provide the user with the option of uploading or transmitting a document to be included in a folder or to be shared, commented upon or annotated by the user or one or more other collaborators. Further, the web application 462 enables the user to select any one of a plurality of versions of a document and view a generated underlay associated with the document version, an overlay showing users annotations or an originally uploaded document in native file format. It is noted that the underlay and the overlay may be of a different file format than the originally uploaded document.

[0046] Action performed by the user in interacting with a website may cause the web application 462 to send requests to the computing resource service provider 410 or its entities. The requests may be application programming interface (API) function calls that are executed by the computing resource service provider 410. For example, when a user annotates a document version and saves the annotated version, the web application 462 may cause an API function call to be made that indicates the annotations to the computing resource service provider 410 or its entities. In some embodiments, the web application 462 may not be fully synchronous and may not cause a request to be made based on any action taken by the user. For example, as the user annotates a document the web application 462 may not relay the annotations synchronously as they are made by the user and may instead only relay the annotations when the user saves the document or the annotations or, alternatively, every time interval.

[0047] As shown in FIG. 4, the user device 404 is further equipped with a document management and collaboration application 464. The document management and collaboration application 464 may be executable instructions (for example, that are stored on a non-transitory computer-readable storage medium on the user device 404 or coupled to the user device 404) that when executed by a computer system of the user device 404 enable user interaction with the document sharing and collaboration functionality provided by the

computing resource service provider 410. As with a web application-based or a browser-based interface, the document management and collaboration application 464 enables the user to supply log in credentials and access one or more document directories or folders. The user may also interact that document management and collaboration system 406 provided by the computing resource service provider 410 by, for example, uploading a document to one or more folders, deleting a document from one or more folders, annotating an underlay for a document, viewing an overlay including annotations, among others). The document management and collaboration application 464 may provide a mechanism for utilizing any document collaboration and management resources and functionalities that is independent of the web application 462.

[0048] The document management and collaboration application 464 includes a synchronization client 466 that communications with the front-end system 412 and the document management and collaboration system 406. The synchronization client 466 may send or transmit requests on behalf of the user or based at least in part on the user's actions or interactions with the document management and collaboration system 406. For example, if the user navigates through one or more folder, annotates an overlay or instructs that a document is to be uploaded, the synchronization client 466 sends messages or requests to that effect to the front-end system 412 or the document management and collaboration system 406. The front-end system 412 or the document management and collaboration system 406 may, in turn, process and attempt to satisfy the requests. The synchronization client 466 may cause requests to be sent either synchronously or asynchronously in relation to a user's action. For example, if a user who is an administrator of an organization changes the permission privileges of a second user using a functionality provided by the document management and collaboration application 464, the synchronization client 466 may make a request (such as an API function call) synchronously in relation to the change of permission privileges made by the administrator.

[0049] The synchronization client 466 attempts to ensure that consistent views are maintained on the user's end and on the computing resource service provider's 410 end. Thus, the synchronization client 466 may also receive requests from the computing resource service provider 410 that affect the system view accessible to a user. The exchange of message, which may be API-configured function calls, results in a consistent view by the user of the system and the satisfaction of user requests. For example, when a user loses viewing privileges for a document, the synchronization client 466 of the user's device 404 receive a

message to that effect and the document management and collaboration application 464 may cause the document to be dropped from the user's view.

[0050] FIG. 5 shows an example of directory structure in accordance with at least one embodiment. A directory 502 may be maintained by a managed directory service and may be associated with an organization, which may, in turn, have one or more directories 502. As shown in FIG. 2, the directory 502 is shown to include one or more folders 504 (singularly referred to herein as folder 504). Further, a folder 504 may include one or more subfolders 506 that are nested within the folder 504. As may be recognized, a subfolder 506 may further include one or more nested subfolders. A folder 504 may be a file structure within the directory 502 and, in some embodiments, the security or permission privileges associated with the folder 504 may apply to documents 508 within the folder 504 or subfolders 506 that are nested within the folder 504.

[0051] A folder 504 may retain one or more documents 508 (singularly referred to herein as document 508). As described with reference to FIG. 5, a document may include a plurality of document versions 510. A document version 510 may be one revision of a document 508 or a subsequent version or revision of an existing document including, for example, user modifications and changes. Further, the permission or security privileges provided with respect to a document may apply to the plurality of document versions 510 associated with the document 508. Each document version 510 may have a plurality of representations including a native document 512, an underlay 514 and an overlay 516. The native document 512 may be an originally uploaded document (for example, in a file format compatible with a productivity suite). An underlay 514 may be a portable representation of the native document 512 that may be rendered on a user device utilizing a web application or a document management and collaboration application. The techniques described herein may apply to any portable representation that may utilize a common format that is independent of application software, hardware or operating system and may encapsulate a complete description of a fixed layout of the document. In addition, an overlay may be a representation of annotations made by users and collaborators. For example, an overlay may include a representation of highlights or text commentary.

[0052] It is noted that more than one document versions 510 may include the originally uploaded document as the native document 512. Although as described with reference to FIG. 5, a document 508 includes a plurality of versions 510, whereby each version 510 may include a plurality of representations, as used in various contexts herein, a document may be any one of the versions or any one of the representations. For example, as used herein a user