

[0049] FIG. 5 illustrates an example user interface displaying a visualization of a data graph, such as a provenance chain. A user may select a node with the data graph (for example, via an input device) to view additional information of the node (features of the node). Furthermore, a user can query or filter on these features. For example, in FIG. 5, a user can query or filter on an entity identifier (stock keeping unit (SKU)) 505, a stage identifier 510 (for example, manufacturing, packaging, and assembly), a supplier identifier 515, and a date range 520. As noted above, in some embodiments, additional features are available for use in querying, filtering, and pivoting that were identified through the expansion process, such as, for example, country of origin, weather, traffic, and the like. Accordingly, using this expanded information, a user can query on a particular country, manufacturing facility, temperature, air quality, employee satisfaction, and the like. Also, in some embodiments, a user can access information regarding the source of particular data included in the provenance chain, such as viewing whether information was included in the original provenance chain or was inferred and a source where the data (inferred or otherwise) was retrieved or generated from (including, for example, details of equipment used to by the source, a location of the source, a certification level of the source, the date the source was last accessed or last updated, an algorithm used to generate the data). For example, when the provenance chain includes temperature information, details regarding the sensors used to detect the temperatures (make or model) and the location of such sensors may be accessible through the provenance chain.

[0050] Accordingly, embodiments described herein create navigable data graphs, such as provenance chains, that, rather than being limited to arbitrary spaces or dimensions that are limited based on direct data recorded for an entity, are dynamic and include expanded information from various, often disconnected, data sources to improve the completeness and usefulness of the data graph to a end user. For example, when a provenance chain relates to a product, an expanded version of this chain generated using the methods and systems described herein may allow a user to not only trace a detected contamination back to source but also identify other products that may have been effected as well as identify causes for the contamination, such as particular weather conditions, working conditions, or the like. In particular, as described above, the systems and methods identify various dimensions that a data graph may be rendered in or related to and collect the information needed to provide such a rendering from one or more data sources. These relationships (dimensions) are stored with the data graph, which allows a user to quickly and efficiently (in terms of computing resource and bandwidth usage) query, filter, pivot, and generally