United States Patent Application Publication	20250267341
Kind Code	A1
Publication Date	August 21, 2025
Inventor(s)	Hamilton; Brian et al.

INFERENTIAL GENERATION OF CUSTOMIZED DIGITAL DATA STREAMS WITH SUPPLEMENTAL CONTENT IDENTIFIED PRIOR TO AND/OR DURING STREAMING

Abstract

Methods of digital content generation according to an aspect of the invention include the steps of receiving a request for content to supplement a first digital content piece that is being or will be streamed to one or more user digital data devices; inferring a type (if not identity) of the first digital content piece and identifying one or more supplemental digital content pieces to supplement it; and, using that/those supplemental content piece(s) to customize the first digital content piece upon delivery to user devices in specific locales.

Inventors: **Hamilton; Brian (Fairfield, CT), Lamego; Vini (São Paulo, BR), Staley; Trent (Washougal, WA), Heyman; Kent (Bradenton, FL)**

Applicant: **Cast Iron Media LLC** (Irvington, NY)

Family ID: **1000008627952**

Appl. No.: **19/066699**

Filed: **February 28, 2025**

Related U.S. Application Data

parent US continuation-in-part 18350034 20230711 PENDING child US 19066699
us-provisional-application US 63391293 20220721

Publication Classification

Int. Cl.: **H04N21/81** (20110101); **G06Q30/0273** (20230101); **H04N21/234** (20110101)

U.S. Cl.:

Background/Summary

[0001] This application is a continuation in part of U.S. patent application Ser. No. 18/350,034, filed Jul. 11, 2023, entitled "Inferential Generation of Customized Digital Data Streams," which claims the benefit of U.S. Patent Application Ser. No. 63/391,293, filed Jul. 21, 2022, entitled "Inferential Generation of Customized Digital Data Streams," the teachings of all of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] A portion of the disclosure of this patent document contains material which is subject to copyright protection. The copyright owner has no objection to the facsimile reproduction by anyone of the patent document or the patent disclosure, as it appears in the Patent and Trademark Office patent file or records, but otherwise reserves all copyright rights whatsoever.

[0003] The invention pertains to the generation of digital data and, more particularly, to the customization of digital data streams. The invention has application, by way of non-limiting example, in the streaming of sports events and other live and pre-recorded content for viewing nationally or regionally on mobile phones, set top boxes and other end user devices.

[0004] Customized content delivery has been an objective of content publishers and desire of content consumers since the advent of broadcast television. Viewing audiences had to satisfy themselves with changing channels and, more recently, surfing them, as a means of scratching the itch. On-demand digital content delivery brings the promise of consumer-driven content customization, though, for now, it has simply made channel surfing a multidimensional experience.

[0005] Content distributors have fared somewhat better when it comes to customization of broadcast and, more recently, streamed content. Early broadcast television, though nationally produced, was distributed on a local basis by affiliate stations who injected content into or over the national network feed before broadcasting it over towers to a local audience. In this "linear" approach, affiliates use demographic studies, surveys (e.g., Nielson ratings) and the like, to discern the broad outlines of its customer's wants and needs and to customize the national feeds accordingly.

[0006] The rise of the "set top" box and, more recently, the content delivery app has given distributers unprecedented access to viewer data. Whether through cookies, customer databases or otherwise, "digital" programming as it is called makes it possible deliver video streams that are modified to appeal to individual consumer wants and needs, leapfrogging the statistical targeting of linear programming.

[0007] Data privacy laws, however, increasingly restrict the ability of content publishers that collect viewer data, e.g., through app registrations and the like, to share it with the distributors who are charged with customizing content streams for delivery. This can be remedied through consolidation of content production and distribution; however, that has not proven a recipe for long-term industry growth.

[0008] An object of this invention is to provide improved systems and methods for the generation of digital data and, more particularly, to the customization of digital data streams.

[0009] A related object is to provide such systems and methods as are suited for the customization of streamed sports events and other live and pre-recorded content.

[0010] A further related object of the invention is to provide such systems and methods as execute with improved efficiency and consume less energy.

SUMMARY OF THE INVENTION

[0011] The foregoing are among the objects attained by the invention, which provides in some

aspects methods of customized streamed digital content generation. The methods can be used in connection with distribution of digital content, e.g., by content distribution networks or content insertion servers.

[0012] Thus, methods of digital content generation according to an aspect of the invention include the steps of receiving a request for a second digital content piece to supplement a first digital content piece being streamed to a user digital data device; determining a source of the first digital content piece and a locale of the user digital data device; inferring a type of the first digital content piece from the source of the first digital content piece and from a time for delivery of the first digital content piece to the user digital data device; selecting a digital content piece from among a plurality of digital content pieces, each of which is associated with one or more locales; and, transmitting, as the second digital content piece, the selected digital content piece or a reference thereto for delivery to the user digital data device in connection with the first digital content piece.

[0013] Further aspects of the invention provide methods of digital content generation, e.g., as described above, in which the request for the second digital content piece is received from any of a content distribution network, a content insertion server or a user digital data device.

[0014] Still further aspects of the invention provide methods of digital content generation, e.g., as described above, in which the step of selecting from among the plurality of digital content pieces is based on at least the locale of the user digital data device and the time for delivery of the first digital content piece to the user digital data device.

[0015] In related aspects, the invention provides methods, e.g., of the type described above, in which the step of selecting from among the plurality of digital content pieces additionally includes making that selection based on the source of the first digital content piece and/or the time of delivery of the first digital content piece to the user digital data device.

[0016] In related aspects, the invention provides methods, e.g., as described above, in which the plurality of digital content pieces from which the aforesaid selection is made are segmented (or pooled) based on content type and locale.

[0017] Yet still further aspects of the invention provide methods of digital content generation, e.g., as described above, wherein the type of the first digital content piece is inferred without user-specific information other than a source from which the first digital content piece was requested, a time of the request and a locale of the user digital data device.

[0018] Yet still further aspects of the invention provide methods of digital content generation, e.g., as described above, including selecting multiple digital content pieces from among a plurality of digital content pieces and stitching together those multiple selected digital content pieces for transmission as the second digital content piece.

[0019] Other aspects of the invention provide a system for customized digital content delivery having a first content server, a second content server, a content distribution server that is coupled for communication with each of the first content server and the second content server, and a user digital data device that is coupled for communication with the content distribution server. In such a system, the content distribution server streams to the user digital data device a first digital content piece generated by the first content server, and the second content server operates in accord with a method for content generation, e.g., as described above.

[0020] Thus, for example, according to some aspects of the invention, the second content server receives a request for a second digital content piece to supplement the first digital content piece being streamed to the user digital data device, identifies the first content server as a source of the first digital content piece and determines a locale of the user digital data device, infers a type of the first digital content piece from the source of the first digital content piece and a time for delivery of the first digital content piece to the user digital data device, selects a digital content piece from among a plurality of digital content pieces, each of which is associated with one or more locales, and transmits the selected digital content piece or a reference thereto as the second digital content piece for delivery to the user digital data device in connection with the first digital content piece.

[0021] Further related aspects of the invention provide a system, e.g., as described above, wherein the first content server and the content distribution server are one in the same and/or co-housed with one another. Conversely, in other related aspects of the invention, the second content server and the content distribution server are one in the same and/or co-housed with one another.

[0022] Still further aspects of the invention provide methods of customized digital content generation including steps of [0023] A. prior to making a first digital content piece available for simultaneous streaming to one or more user digital data devices, selecting one or more supplemental digital content pieces based on (i) a source of the first digital content piece, (ii) a time when the first digital content piece is scheduled to be available for streaming to at least a requesting one of the user digital data devices and (iii) identities of one or more locales to which the first digital content piece is to be streamed, and generating an ID associated with the one or more selected supplemental digital content pieces, [0024] B. with a distribution server that is coupled for communications with (i) a first content server that is the source of the first digital content piece and (ii) a second content server that is coupled by way of a network to the one or more user digital data devices, performing the following steps at or after the time when the first digital content piece is scheduled to be available for streaming to at least the requesting one of the user digital data devices: [0025] (i) directing streaming of the first digital content piece from the first content server to a requesting one of the one or more user digital data devices, and [0026] (ii) in response to a marker or other indicator encountered in the first digital content piece while it is being streamed to the requesting user digital data device, directing a request for a second digital content piece to the second content server, where that request includes the ID, [0027] C. responding to the request for the second digital content piece by [0028] (i) determining a locale of the requesting user digital data device, and [0029] (ii) selecting, as the second digital content piece, a said supplemental digital content piece that is associated with the ID and with the locale of the requesting user digital data device, and [0030] D. with the distribution server, customizing streaming of the first digital content piece to the requesting user digital data device by inserting into such stream for delivery to that user digital data device a stitching together of the first digital content piece and the supplemental digital content piece.

[0031] Related aspects of the invention provide methods, e.g., as described above, wherein step (A) includes [0032] inferring a type of the first digital content piece from the source of the first digital content piece and from the time when the first digital content piece is scheduled to be available for streaming to at least the requesting one of the user digital data devices, [0033] selecting, as the supplemental digital content piece, a digital content piece from among a plurality of digital content pieces, where selection is based on the source of the first digital content piece, the type of the first digital content piece and on the one or more locales to which the first digital content piece is to be streamed.

[0034] Still further related aspects of the invention provide methods, e.g., as described above, wherein step (C)(ii) includes responding to a lack of a said supplemental digital content piece that is associated with the ID and with the locale of the requesting user digital data device by [0035] inferring a type of the first digital content piece from the source of the first digital content piece and from a time of the request for the second digital content piece, [0036] selecting, as the second digital content piece, a digital content piece from among a plurality of digital content pieces, each of which is associated with one or more locales, where selection is based on the source of the first digital content piece, the type of the first digital content piece and on the locale of the requesting user digital data device.

[0037] Yet still further related aspects of the invention provide methods, e.g., as described above, wherein step (C)(ii) includes responding to a lack of a said supplemental digital content piece that is associated with the ID and with the locale of the requesting user digital data device by selecting the second digital content piece via an automated auction with real-time bidding.

[0038] Still yet further related aspects of the invention provide methods, e.g., as described above,

wherein step (A) includes [0039] inferring a type of the first digital content piece from the source of the first digital content piece and from the time when the first digital content piece is scheduled to be available for streaming to at least the requesting one of the user digital data devices, and [0040] selecting, as the supplemental digital content piece, a digital content piece from among a plurality of digital content pieces, where selection is based on the source of the first digital content piece, the type of the first digital content piece and on the one or more locales to which the first digital content piece is to be streamed, and

where step (C)(ii) includes responding to a lack of a said supplemental digital content piece that is associated with the ID and with the locale of the requesting user digital data device by [0041] inferring a type of the first digital content piece from the source of the first digital content piece and from a time of the request for the second digital content piece, [0042] selecting, as the second digital content piece, a digital content piece from among a plurality of digital content pieces, each of which is associated with one or more locales, where selection is based on the source of the first digital content piece, the type of the first digital content piece and on the locale of the requesting user digital data device.

[0043] The foregoing and other aspects of the invention are evident in the discussion that follows, the drawings and in the claims.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0044] A more complete understanding of the invention may be attained by reference to the drawings, in which:

[0045] FIG. **1** depicts a system and method for content generation and delivery according to the invention;

[0046] FIG. **2** is an overview flowchart of a process according to the invention;

[0047] FIGS. **3** and **4** depict first and second screens, respectively, of a user interface of a scheduler in a system according to the invention;

[0048] FIG. **5** is a flow chart of steps executed by live event worker functionality in a process according to the invention;

[0049] FIG. **6** is a flow chart of steps executed by scheduler worker functionality in a process according to the invention; and

[0050] FIG. **7** depicts the identification of supplemental content prior to streaming in a system and method of FIG. **1**.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

Architecture

[0051] FIG. **1** depicts a system **10** for customized digital content delivery according to a practice of the invention. The system **10** includes a first content server **12**, a second content server **14**, and a content distribution server **16** that is coupled for communication with each of the first content server **12** and the second content server **14**. At least one and, typically, many (e.g., tens, hundreds, thousands or more) user digital data devices are coupled for communication with the content distribution server **16**. Three such user digital data devices **18** are shown in the drawing, labelled, "user device #**1**," "user device #**2**," and "user device #**3**," respectively. Likewise, though only a single first content server **12** and distribution server **16** are shown in the drawing, in practice, a second content server **14** as described below may me arranged to work with multiples of those devices.

[0052] Illustrated first content server **12** is a video server of the type known in the art suitable for delivering video directly or indirectly (e.g., via a content distribution network) to user digital data devices **18**. Although a network-class video server in the illustrated embodiment, in other

embodiments the server **12** may comprise any other digital data device of the type known in the art (e.g., workstation, desktop computer, portable computer, or so forth) suitable for so delivering such video. Regardless, such video server or other digital data device is adapted in accord with the teachings hereof for operation in the role of the first content server **12**.

[0053] Illustrated second content server **14** generates supplemental digital content pieces, typically, videos, in response to requests received from the distribution server **16** and/or user digital data devices **18**, as discussed more fully elsewhere herein. The server **14** may comprises a video server or other digital data device of the type known In the art as adapted in accord with the teachings hereof.

[0054] As used with respect to the illustrated embodiment, "digital content piece" refers to streamed video, audio or other digital content (including, by way of non-limiting example, live sports or other entertainment events, pre-recorded such events, and so forth) and time-wise segments such streamed content (e.g., a one-minute video segment within an hour-long streamed video program, or so forth). In some embodiments, one or more segments of a digital content piece can be downloadable, e.g., for time-limited consumption or otherwise.

[0055] Distribution server **16** streams digital content pieces generated by first and second content servers **12**, **14** to user digital data devices **18**. Where those content pieces come from alternate ones of those servers, the server **16** can also stitch them together for continuous streaming. The server **16** may comprise a content delivery network, an ad or other content insertion server, or other suitable digital data device, all of the type known in the art as adapted in accord with the teachings hereof. The distribution server **16** may be coupled for communications with each of the first and second content servers **12**, **14** via the Internet or other network, combination thereof, or other communications medium per convention in the art as adapted in accord with the teachings hereof. Though not illustrated here, in some embodiments, the distribution server **16** is integral to either of the first or second content servers **12**, **14** or otherwise co-housed therewith.

[0056] User digital data devices **18** support the consumption of digital content pieces, e.g., videos, by their respective users (not shown). These may be dedicated devices (such as, for example, set-top boxes), general purpose devices (such as, for example, mobile phones, laptop computers, desktop computers, running browsers, apps or otherwise to facilitate such consumption) or other digital data devices of the type known in that art, as adapted in accord with the teachings hereof), suitable for requesting such content from servers **12**, **14** and/or **16** and presenting it to their respective users, all per convention in the art as adapted in accord with the teachings hereof. The user digital data devices **18** may be coupled for communications with the distribution server **16** via the Internet or other network, combination thereof, or other communications medium per convention in the art as adapted in accord with the teachings hereof.

Operation

[0057] In operation, a user digital data device **18** (e.g., user device #**1**) issues a request for streamed content (a/k/a, a digital content piece) from first content server **12**. See FIG. **1**, Step A. The discussion below focuses on response of the system **10** to that request, which is referred to as a request for a "first" or "requested" digital content (piece), and particularly on customization of the content streamed to that user digital data device device in response to that request based, e.g., on the locale of the user digital data device, the source of the requested content and time.

[0058] It will be appreciated that the teachings below are equally applicable to the customization of streams of content by system **10** to the other user digital data devices (e.g., user device #**2**, user device #**3**) in response to requests independently issued by them at the same or different times for the same or different content, though, in those instances, such customization is based on the respective locales of those other user digital data devices, the respective sources of the content requested by them and the respective times.

[0059] Returning to the discussion above, the request of Step A is issued per convention in the art, e.g., using adaptive HTTP-based protocols or otherwise. The request is fielded by the first content

server **12**, which initiates streaming the requested content piece via the distribution server **16**, again, per convention in the art as adapted in accord with the teachings hereof. Step B. Markers within (or otherwise associated with) the requested content piece identify time-wise segments (or intervals) that are opportunities for insertion of custom or other content into the stream per convention in the art as adapted in accord with the teachings hereof. Those skilled in the art will appreciate that the format and mode of communication of those markers (e.g., whether inline, out-of-band, or otherwise) is dependent on the streaming protocol and is otherwise within the ken of those skilled in the art in view of the teachings hereof.

[0060] The distribution server **16** directs the streamed, requested content piece to the requesting user digital data device **18** for presentation thereby to its respective user, all per convention in the art as adapted in accord with the teachings hereof. Steps C and D. In some embodiments, the server **16** caches all or a portion of the streamed content piece for use in responding to future requests for the same piece by other user digital data devices **18**.

[0061] When the distribution server **16** encounters a marker, marker-pair or other indicator of an insertion opportunity in the content piece being streamed to the user digital data device **18**, it generates a request to the second content server **14** for a supplemental piece of digital content. Step E. In the illustrated embodiment, the request by the distribution server **16** in Step E is generated in just-in-time fashion—e.g., typically, hundreds of milliseconds or less before the supplemental content piece is to be stitched into the stream of the requested content piece being sent from the distribution server **16** to the user digital data device **18**.

[0062] The supplemental content request issued in Step E includes an indicator of the locale of the requesting user digital data device **18**. This can be an actual location name (e.g., city/state), an IP address or some other designator from which the location of the device **18** can be estimated at least at the regional or state level of granularity and, preferably, at least at the city level of granularity. The supplemental content request can also include the identity of the source of the content piece being streamed to the user digital data device **18**. In some embodiments, the latter can be the identity of the first content server **12**, though, it can also be the identity of the broadcaster, digital channel and/or website/portal from which the first content piece emanates. The supplemental content request can also include a time associated with that content piece, e.g., a time the piece is scheduled to be streamed to the user digital data device (which, in view of the just-in-time nature of the illustrated system **10**, equates with the time the request of Step E is generated by the distribution server **16** and received by the second content source **14**). Transmission of such a supplemental content request, whether in accord with the aforesaid protocol or otherwise, is within the ken of those skilled in the art in view of the teachings hereof.

[0063] Systems according to the invention customize streams to the user digital data device by inferring the type (if not the specific identity) of content requested by the user digital data device **18** without user-specific information other than a locale of that device **18**, a source from which the first digital content piece was requested, and a time of the request. This is advantageous in that it permits generation of a customized second digital content piece by the second content server **14**, without running afoul data privacy laws that increasingly restrict the ability of content sources (e.g., first content server **12**) or distributors (e.g., distribution server **16**) to share data regarding the user of digital data device **18**.

[0064] Upon receipt of the supplemental content request, the second content server **14** infers at least the type (which can be the identity) of the requested content piece—i.e., the piece that is being streamed to the user digital data device **18** from the first content server **12**. Step F.

[0065] In the illustrated embodiment, this is done through use of a look-up table that correlates content sources (as received with the supplemental content request) and times (as received with the supplemental content request or otherwise acquired by the second content server **14**) with content types and/or, optionally, names of specific content pieces. By way of illustrative example, the second content server **14** can infer, in Step F, that a first content piece streamed to a user digital

device **18** in Massachusetts at 7 pm on a Monday night from the broadcaster NBC is a live baseball game or, for example, more particularly, a game between the Giants and the Braves. In some embodiments, the user digital data device locale indicator (as received with the supplemental content request) is also necessary for such look-up. The generation of such a look-up table, e.g., using information published by broadcasters and other content sources, is within the ken of those skilled in the art in view of the teachings hereof—though, it will be appreciated that other techniques (e.g., probing a feed from the first content source **12**) for determining the type (if not also the identity) of the requested content piece from information supplied in the supplemental content request is also with the ken of those skilled in the art.

[0066] In Step G, the second content server **14** selectively identifies from among a plurality of digital content pieces contained in an onboard or remote storage device **20**—each of which pieces is associated with one or more locales and, optionally, one or more classes of content—a supplemental video content piece that can be used by server **16** to customize the stream delivered to the requesting user digital data device **18**. In the illustrated embodiment, this can be done through use of a look-up table that correlates the type (if not identity) of the requested digital content piece (as determined in Step F), the estimated locale of the user digital data device **18** (as received with the supplemental content request) and, in some embodiments, (i) the identification of the source of the first digital content piece (as received with the supplemental content request) with an identifier of a supplemental content piece to be returned, if at all, to the distribution server **16** for stitching into the stream to the user digital digital data device **18**, and/or (ii) other parameters to be used by the second content server in identifying such supplemental content for return to the distribution server.

[0067] Such a look-up table, the generation of which is within the ken of those skilled in the art in view of the teachings hereof, can specify for example that, for a certain type of requested digital content piece being streamed to a user digital data device **18** in a certain locale, a specific supplemental content piece for that locale (or a piece selected from a specific class of supplemental content pieces for that locale) should be returned to the distribution server **16** for inclusion in that stream.

[0068] To continue the above example, such a look-up table can specify that, in response to a supplemental content request received at 7 pm in connection with streaming a live baseball game from NBC to a user digital data device **18** in Massachusetts, a premium video advertisement (or a URL or other reference thereto) for a New England auto dealer (or an advertisement selected at random or otherwise from a premium class of advertisements for that same or another New England merchant) should be returned to the distribution server **16** for insertion in that stream.

[0069] On the other hand, that same look-up table can specify that no such supplemental video should be returned to the distribution server **16** when such a supplemental content request is received at 7 pm in connection with streaming that same type of content (i.e., live baseball or other sports game) from NBC to a user digital data device **18** in Atlanta (e.g., where the live game between the Giants and Braves is being played at the time of the request). Alternatively, in such an instance, the look-up table could specify return of a sub-premium video advertisement (or URL or other reference thereto) or an advertisement selected at random or otherwise from a sub-premium class of advertisements is to be returned to the distribution server **16** for insertion in that stream.

[0070] Once a supplemental digital content piece has been identified, the second content server can retrieve it (or its URL or other reference thereto), via an index search or otherwise, from the store **20**, which can be segmented (or pooled) based on content type, supplemental content class (e.g., premium, sub-premium and so forth) and/or locale, all by way of non limiting example. In some embodiments, the second content server pre-fetches supplemental content pieces for which URLs or other references have been retrieved—so that content can be returned to the distribution server in Step H in lieu of the URLs or other references. This can be particularly advantageous for sub-premium-class or other content for which those URLs or other references point to remote and/or

third-party servers. In the event those URLs or other references are broken (e.g., are invalid, refer to improper content or otherwise), the second content server repeats Step G to find an alternate piece of supplemental content.

[0071] If the supplemental digital content piece identified by the second content server **14** in Step G is not of sufficient duration to occupy a time interval, if any, specified by the distribution server **16** in the supplemental content request (or, conversely, a default such interval), the second content server **14** can repeat Step G in order to identify additional supplemental digital content pieces which are stitched together by server **14** to occupy that time interval, all as is within the ken of those skilled in the art in view of the teachings above.

[0072] Of course, the examples above are illustrative only and non-limiting. Thus, for example, in some embodiments, the second content server **14** delivers video other than advertisements in response to requests received from the distribution server **16**. In still other embodiments, the specific advertisement (or other supplemental video content) or class from which such advertisement (or other supplemental video content) is selected is segmented other than via premium and sub-premium classifications, all as is within the ken of those skilled in the art in view of the teachings hereof.

[0073] In Step H, the second content server **14** returns to the distribution server **16** the supplemental content piece identified in Step G, if any. And, in Step I, the distribution server **16** stitches the supplemental digital content piece, if any, returned (or identified by URL or otherwise) by the second content server **14** in Step G into the stream being delivered to the requesting user digital data device **18** for presentation to the user thereof. If no such supplemental content piece (or identifier) is returned in Step H, the distribution server **16** can make requests to other content sources (not shown) for insertion content or can utilize default content (whether supplied by the first content server **12** or otherwise) for such purpose.

Alternative Architectures

[0074] Discussed above is an architecture and method for customized digital content delivery utilizing a server-side content insertion model. In alternative embodiments, a client-side content insertion model can be used instead or in addition. Those alternative embodiments may or may not include a distribution server **16** and, in case they do not, the requested content piece is streamed directly from the first content server **12** to the requesting user digital data device **18**. Moreover, in those embodiments, the requests of Step G and responses of Step H are made by and to the user digital data device **18** directly, all as is within the ken of those skilled in the art in view of the teachings hereof.

[0075] Additional information regarding practice of the invention is provided FIGS. **2-6**.

[0076] FIG. **2** is an overview flowchart of a process according to the invention. It enables rapid, accurate, and economically viable delivery of content in ambiguous environments where details of origin are unknown. It's features include: [0077] Allows the system to identify the content source without any additional work/information from the content provider [0078] System segments data into smaller chunks of indexed data to optimize response time [under 600 ms] [0079] The data segmentation and inventory forecast allows the platform to automatically scale its internal services to optimize the response time. [0080] Each data segment ensures that campaigns are delivered only within the scheduled inventory during a live program, increasing product value [0081] Reduce waste of impressions and Increase the profitability of the content provider.

[0082] FIGS. **3** and **4** depict first and second screens, respectively, of a user interface of a scheduler in a system according to the invention.

[0083] FIG. **5** is a flow chart of steps executed by live event worker functionality in a process according to the invention.

[0084] FIG. **6** is a flow chart of steps executed by scheduler worker functionality in a process according to the invention.

Identifying Supplemental Content Before Streaming

[0085] Discussed above are architectures and methods for digital content customization in which, for example, distribution server **16** customizes a first digital content piece requested by a user digital data device from a first content server by stitching into it a supplemental digital content piece identified by (and received from) a second content server in just-in-time fashion—i.e., when a marker, marker-pair or other indicator of an insertion opportunity is encountered by the distribution server **16** in the first digital content piece in the midst of streaming that piece to the requesting user digital data device.

[0086] FIG. **7** depicts adaptations of those architectures and methods in which the supplemental digital content piece is identified earlier than that and, more particularly, prior to the first digital content piece being made available for streaming to the requesting (and other) user digital data devices. Thus, for example, where the first digital content piece is a live sports event, e.g., a baseball game, the previously discussed architecture and methods provide for identifying the supplemental digital content piece in the midst of the first digital content piece being streamed to the requesting user digital data device. The adaptations discussed below, on the other hand, provide for identifying that supplemental digital content piece before the sports event becomes available for streaming—whether in live or pre-recorded format—to at least the requesting (if not also the other) user digital data devices. In some embodiments, by way of example, such identification is performed an hour, a day, a week, a month or even more before the sports event becomes so available for streaming (live or pre-recorded) to any requesting user digital data device.

[0087] Operation of system **10** in these regards, i.e., in regard to FIG. **7**, parallels that discussed above in connection with Steps E-H of FIG. **1** except, for example, that those paralleling steps of FIG. **7**—designated E′-H′—occur before streaming has begun and except as otherwise discussed below.

[0088] Turning to FIG. **7**, prior to a digital content piece (here, referred to as the "first digital content piece for consistency) being made available for streaming to the user digital data devices, the first content server **12** can generate a request to the second content server **14** for an ID associated with supplemental digital content piece(s) to be used in customization of the first digital content piece when it is later streamed to one or more of those user digital data devices per Steps B-I.

[0089] Such a request can be made by the first content server **12** with respect to each aforesaid insertion opportunity in the first digital content piece or, alternatively, in connection with selected ones of them, all as is within the ken of those skilled in the art in view of the teachings hereof. The request can be made automatically and/or under operator control by the first content server at a predetermined time interval before the first digital content piece is to be made available for streaming (e.g., one day, one week and so forth), on an ad hoc basis, or otherwise, depending on the demands of the implementation. Generation of such a request is within the capabilities of those skilled in the art in view of the teachings hereof.

[0090] Paralleling the request discussed above in connection with Step E, that of Step (E′) can include user digital data device device locale or locales for which such customization is to be performed, expressed by location name (e.g., city/state), IP address or other designator from which the location of those devices **18** can be estimated, e.g., as discussed above in connection with Step E. The request generated in Step E′ can also include the identity of the source of the first digital data content piece, again, as discussed above in connection with Step E, and the date and time (collectively, "time") at which that piece is to be made available for streaming. The request generated in Step E′ can also include a duration of the insertion opportunity, esp., if it deviates from a norm of, say, 30 seconds, one minute and so forth, associated, e.g., with the first content server and/or the system **10** as a whole.

[0091] Generation and transmission of such a request by the first content server **12** to the second content server **14** is within the ken of those skilled in the art in view of the teachings hereof. And, while the request is said to emanate from the first content server **12**, those skilled in the art will

appreciate that such a request can emanate elsewhere, on behalf of the first content server **12** or otherwise.

[0092] Paralleling Step F, discussed above, upon receipt of the supplemental content request generated in Step E′, the second content server **14** in Step F′ infers at least the type (which can be the identity) of the digital content piece that is scheduled to be streamed to the user digital data devices. This is done in the manner discussed above in connection with Step F, albeit for the content source and scheduled time contained in the request generated in Step E′.

[0093] Paralleling Step G, discussed above, the second content server **14**, in Step G′ selectively identifies supplemental content (or "insertion media") that can be used to customize prospective streaming of the first digital content piece to the user digital data devices. This is done in the manner discussed above in connection with Step G, albeit for that type (if not identity) of the requested digital content piece determined in Step F′, the locale(s) provided in the request generated in Step E′ and, in some embodiments, the identification of the source of the first digital content piece. If the request generated in Step E′ includes multiple locales, the second content server **14** may identify multiple supplemental content pieces for use in customizing prospective streaming of the first digital content piece, each for one or more of those multiple locales.

[0094] Although the second content server **14** can retrieve or pre-fetch the supplemental content piece(s) identified in Step G′ at the time of identification, in the illustrated embodiment that sever **14**, instead, returns an ID associated with that/those content piece(s). Such an identifier can be the URL of (or other reference to) a specific supplemental digital content piece, an encoded table of tuples (e.g., a dictionary) correlating specific URLs (or other references) with specific user digital device locales, or so forth, all as is with in the ken of those skilled in the art in view of the teachings hereof. As will further be appreciated by such persons skilled in the art, a "null" URL (or other reference) can be employed in instances where no supplemental digital data content is identified for a given first digital data content piece and/or locale to which it may be streamed.

[0095] As with Step G, discussed above, if the supplemental digital content piece(s) identified by the second content server **14** in Step G′ is/are not of sufficient duration to occupy a time interval, if any, specified in the request generated in Step E′, the ID generated in Step G′ can reference or otherwise be associated with additional supplemental digital content pieces necessary to occupy that time interval, all as is within the ken of those skilled in the art in view of the teachings hereof.

[0096] In Step H′, the second content server **14** returns to the first content server **12** the insertion media ID generated in Step G′ associated with supplemental content piece(s) identified in that set for use in customizing the first digital content pieces.

[0097] In embodiments that utilize the methodologies of Steps E′-H′ to generate such an insertion media ID in advance of the first digital content piece being made available for streaming to user digital data devices **18**, that ID can be used to customize the first digital content piece, once streaming of it begins to requesting ones of the user digital data devices.

[0098] (If no such ID has been generated for that content piece and/or specific insertion opportunities in it, the system **10** can employ the methodologies discussed above in connection with Steps B-I to customize the requested content piece or, alternatively, an automated auction with real-time bidding of the type known in the arts of "programmatic" ad insertion can be employed for purposes of such customization, all as is within the ken of those skilled in the art in view of the teachings hereof.)

[0099] Thus, for example, the insertion media ID can be transmitted to the distribution server **16**, along with the first digital content piece (and its "markers"), in Step B, in response to a request for that piece for a requesting such user device. See, FIG. **1**.

[0100] That insertion media ID can also be included—e.g., along with the indicator of the locale of the requesting user digital data device and the identity of the source of the content piece being streamed, as discussed above in connection with Step E—in the just-in-time request generated by the distribution server **16** in Step E for supplemental content to insert into the first digital content

piece in the midst of streaming.

[0101] Moreover, in lieu of the mechanisms discussed above to infer the type (if not identity) of the first digital content piece and to identify supplemental video content based on that type as well as on the identity of the source of the first digital content piece and the locale of the requesting user digital data device **18**, that insertion media ID can be used in Step G to retrieve a supplemental digital content piece directly—i.e., based on a URL (or other reference) contained in that ID, e.g., in combination with the locale of the requesting user digital data device **18**, all as is within the ken of those skilled in the art in view of the teachings hereof—and to return that supplemental piece to the distribution server **18** in Step H.

[0102] In instances where the insertion media ID includes a "null" URL (or other reference) of the type described above, or if a non-null URL (or other reference) does not resolve to an existing or accessible supplemental content piece, the second content server **14** can utilize the mechanisms discussed above in connection with Steps F-G to infer the type (if not identity) of the first digital content piece and to identify supplemental video content based on that type, along with the identity of the source of the first digital content piece and the locale of the requesting user digital data device **18**. Alternatively, in such instances, the second content server can utilize an automated auction with real-time bidding of the type known in the art of "programmatic" ad insertion to identify such a supplemental content piece, as is within the ken of those skilled in the art in view of the teachings hereof.

[0103] Described herein are systems and methods meeting the objects set forth above. It will be appreciated that the embodiments shown in the drawing and described above are merely examples of the invention, and that other embodiments incorporating changes thereto also fall within the scope of the invention, of which we claim:

Claims

1. A method of customized digital content generation, comprising A. prior to making a first digital content piece available for simultaneous streaming to one or more user digital data devices, selecting one or more supplemental digital content pieces based on (i) a source of the first digital content piece, (ii) a time when the first digital content piece is scheduled to be available for streaming to at least a requesting one of the user digital data devices and (iii) identities of one or more locales to which the first digital content piece is to be streamed, and generating an ID associated with the one or more selected supplemental digital content pieces, B. with a distribution server that is coupled for communications with (i) a first content server that is the source of the first digital content piece and (ii) a second content server that is coupled by way of a network to the one or more user digital data devices, performing the following steps at or after the time when the first digital content piece is scheduled to be available for streaming to at least the requesting one of the user digital data devices: (i) directing streaming of the first digital content piece from the first content server to a requesting one of the one or more user digital data devices, and (ii) in response to a marker or other indicator encountered in the first digital content piece while it is being streamed to the requesting user digital data device, directing a request for a second digital content piece to the second content server, where that request includes the ID, C. responding to the request for the second digital content piece by (i) determining a locale of the requesting user digital data device, and (ii) selecting, as the second digital content piece, a said supplemental digital content piece that is associated with the ID and with the locale of the requesting user digital data device, and D. with the distribution server, customizing streaming of the first digital content piece to the requesting user digital data device by inserting into such stream for delivery to that user digital data device a stitching together of the first digital content piece and the supplemental digital content piece.

2. The method of claim 1, wherein step (A) includes inferring a type of the first digital content

piece from the source of the first digital content piece and from the time when the first digital content piece is scheduled to be available for streaming to at least the requesting one of the user digital data devices, selecting, as the supplemental digital content piece, a digital content piece from among a plurality of digital content pieces, where selection is based on the source of the first digital content piece, the type of the first digital content piece and on the one or more locales to which the first digital content piece is to be streamed.

3. The method of claim 1, wherein step (C)(ii) includes responding to a lack of a said supplemental digital content piece that is associated with the ID and with the locale of the requesting user digital data device by inferring a type of the first digital content piece from the source of the first digital content piece and from a time of the request for the second digital content piece, selecting, as the second digital content piece, a digital content piece from among a plurality of digital content pieces, each of which is associated with one or more locales, where selection is based on the source of the first digital content piece, the type of the first digital content piece and on the locale of the requesting user digital data device.

4. The method of claim 1, wherein step (C)(ii) includes responding to a lack of a said supplemental digital content piece that is associated with the ID and with the locale of the requesting user digital data device by selecting the second digital content piece via an automated auction with real-time bidding.

5. The method of claim 1, wherein step (A) includes inferring a type of the first digital content piece from the source of the first digital content piece and from the time when the first digital content piece is scheduled to be available for streaming to at least the requesting one of the user digital data devices, and selecting, as the supplemental digital content piece, a digital content piece from among a plurality of digital content pieces, where selection is based on the source of the first digital content piece, the type of the first digital content piece and on the one or more locales to which the first digital content piece is to be streamed, and step (C)(ii) includes responding to a lack of a said supplemental digital content piece that is associated with the ID and with the locale of the requesting user digital data device by inferring a type of the first digital content piece from the source of the first digital content piece and from a time of the request for the second digital content piece, selecting, as the second digital content piece, a digital content piece from among a plurality of digital content pieces, each of which is associated with one or more locales, where selection is based on the source of the first digital content piece, the type of the first digital content piece and on the locale of the requesting user digital data device.

6. A method of customized digital content generation, comprising A. prior to making a first digital content piece available for simultaneous streaming to one or more user digital data devices, selecting one or more supplemental digital content pieces based on (i) a source of the first digital content piece, (ii) a time when the first digital content piece is scheduled to be available for streaming to at least a requesting one of the user digital data devices and (iii) identities of one or more locales to which the first digital content piece is to be streamed, and generating an ID associated with the one or more selected supplemental digital content pieces, B. with a distribution server that is coupled for communications with (i) a first content server that is the source of the first digital content piece and (ii) a second content server that is coupled by way of a network to the one or more user digital data devices, performing the following steps at or after the time when the first digital content piece is scheduled to be available for streaming to at least the requesting one of the user digital data devices: (i) directing streaming of the first digital content piece from the first content server to a requesting one of the one or more user digital data devices, and (ii) in response to a marker or other indicator encountered in the first digital content piece while it is being streamed to the requesting user digital data device, directing a request for a second digital content piece to the second content server, C. responding to the request for the second digital content piece by (i) determining a locale of the requesting user digital data device, and (ii) alternatively selecting, as the second digital content piece, (a) a said supplemental digital content piece that is associated

with an ID, if any, included with the request, and with the locale of the requesting user digital data device, and (b) from among a plurality of digital content pieces, each of which is associated with one or more locales, where selection is based on the source of the first digital content piece, a type of the first digital content piece and on the locale of the requesting user digital data device, D. with the distribution server, customizing streaming of the first digital content piece to the requesting user digital data device by inserting into such stream for delivery to that user digital data device a stitching together of the first digital content piece and the supplemental digital content piece.

7. The method of claim 6, wherein step C(ii) includes selecting the second digital content piece in accordance with C(ii)(a) a designated number of times for a combination of each ID and locale and, thereafter, selecting the second digital content piece in accordance with C(ii)(b).

8. A method of customized digital content generation, comprising A. prior to making a first digital content piece available for simultaneous streaming to one or more user digital data devices, selecting one or more supplemental digital content pieces based on (i) a source of the first digital content piece, (ii) a time when the first digital content piece is scheduled to be available for streaming to at least a requesting one of the user digital data devices and (iii) identities of one or more locales to which the first digital content piece is to be streamed, and generating an ID associated with the one or more selected supplemental digital content pieces, B. with a distribution server that is coupled for communications with (i) a first content server that is the source of the first digital content piece and (ii) a second content server that is coupled by way of a network to the one or more user digital data devices, performing the following steps at or after the time when the first digital content piece is scheduled to be available for streaming to at least the requesting one of the user digital data devices: (i) directing streaming of the first digital content piece from the first content server to a requesting one of the one or more user digital data devices, and (ii) in response to a marker or other indicator encountered in the first digital content piece while it is being streamed to the requesting user digital data device, directing a request for a second digital content piece to the second content server, C. responding to the request for the second digital content piece by (i) determining a locale of the requesting user digital data device, and (ii) alternatively selecting, as the second digital content piece, (a) a said supplemental digital content piece that is associated with an ID, if any, included with the request, and with the locale of the requesting user digital data device, (b) a content piece selected via an automated auction with real-time bidding, D. with the distribution server, customizing streaming of the first digital content piece to the requesting user digital data device by inserting into such stream for delivery to that user digital data device a stitching together of the first digital content piece and the supplemental digital content piece.

9. The method of claim 8, wherein step C(ii) includes selecting the second digital content piece in accordance with C(ii)(a) a designated number of times for a combination of each ID and locale and, thereafter, selecting the second digital content piece in accordance with C(ii)(b).

10. A method of customized digital content generation, comprising A. with a distribution server that is coupled for communications with (i) a first content server that is the source of a first digital content piece and (ii) a second content server that is coupled by way of a network to one or more user digital data devices, performing the following steps at or after a time when the first digital content piece is scheduled to be available for streaming to at least a requesting one of the user digital data devices: (i) directing streaming of the first digital content piece from the first content server to a requesting one of the one or more user digital data devices, and (ii) in response to a marker or other indicator encountered in the first digital content piece while it is being streamed to the requesting user digital data device, directing a request for a second digital content piece to the second content server, B. responding to the request for the second digital content piece by (i) determining a locale of the requesting user digital data device, and (ii) alternatively selecting, as the second digital content piece, (a) a said supplemental digital content piece that is associated with an ID, if any, included with the request, and with the locale of the requesting user digital data device, (b) any of (i) a content piece selected via an automated auction with real-time bidding and (ii) from

among a plurality of digital content pieces, each of which is associated with one or more locales, where selection is based on the source of the first digital content piece, a type of the first digital content piece and on the locale of requesting user digital data device, C. with the distribution server, customizing streaming of the first digital content piece to the requesting user digital data device by inserting into such stream for delivery to that user digital data device a stitching together of the first digital content piece and the supplemental digital content piece.

11. The method of claim 10, wherein the ID is generated prior to the time when the first digital content piece is scheduled to be available for streaming to at least the requesting one of the user digital data devices.

12. The method of claim 10, wherein the ID is associated with one or more supplemental digital content pieces selected based on (i) the source of the first digital content piece, (ii) the time when the first digital content piece is scheduled to be available for streaming to at least the requesting one of the user digital data devices and (iii) identities of one or more locales to which the first digital content piece is to be streamed.