Petitioner's Demonstratives

Datavant, Inc., *Petitioner*, v. Vigilytics LLC, *Patent Owner*

IPR2024-00307, -00311, -00381, and -00382

U.S. Patent Nos. 9,965,651, 10,109,375, 10,886,012, and 9,665,685

April 3, 2025 Oral Hearing

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DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Datavant Exhibit 1026
Datavant v. Vigilytics
IPR2024-00307

Grounds

The ’685 Patent

Ground 1 – Evenhaim (All Claims)

Ground 2 – Evenhaim and Settimi (All Claims)

Ground 3 – Dick, Landi, and Murphy (All Claims)

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Grounds

The ’012, ’375, and ’651 Patents

Ground 1 – Evenhaim and Murphy (All Claims)

Ground 2 – Evenhaim, Settimi, and Murphy (All Claims)

Ground 3 – Dick, Landi, and Murphy (All Claims)

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Overview

Token Matching

- Searching a database using a token (i.e., “an identifier associated with an individual”) as a query term.

Patient Minimums to Preserve Privacy

- User Side: Requiring a minimum number of patients/tokens in the query.
- Data Server Side: Requiring a minimum number of patients, tokens in the results.

Privacy-Preserving Rule

- Disallowing repeated targeting of the same individuals within a predetermined time period.

Claim 7 of the ’685 Patent

[7.a] A system comprising: a computing device comprising: a memory configured to store instructions; and a processor to execute the instructions to perform operations comprising:

[7.b] receiving a request from a user device for medical information that characterizes a group composed of multiple individuals

[7.c] from a set of de-identified medical data representing pre- or post-encounter characteristics of the individuals,

[7.d] wherein the request contains identifying data for each member in the group of multiple individuals;

[7.e] producing a request token for each individual included in the group of individuals;

[7.f] comparing the request tokens to tokens associated with the de-identified medical data to find matching tokens;

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Claim 7 of the ’685 Patent

[7.g] producing the requested medical information

[7.h] with the identity of the individuals being unattainable from the produced medical information

[7.i] without the individuals in the group having authorized production of such medical information that characterizes the group;

[7.j] and providing the produced medical information to report the characteristics of the group of individuals

[7.k] absent authorization from the individuals in the group of individuals identified in the request containing identifying data.

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Claim 7 of the ’375 Patent

User Side Minimum

[7.c] wherein the request for healthcare information is sent to an encryption server that is configured to determine if the number of individuals in the request is at least a defined minimum number of individuals

Data Server Side Minimum

[7.g] [produced health care information …] is based on a minimum number of matched tokens

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Claim 7 of the ’012 Patent

Data Server Side Minimum

[7.g] the healthcare information being produced based on a minimum number of matched tokens

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Claim 7 of the ’651 Patent

Data Server Side Minimum

[7.g] [comparing the request tokens to … find matching tokens] and to determine whether the group includes at least a minimum number of individuals to be included in a report in response to the request

Privacy-Preserving Rule

[7.h] wherein the minimum number of individuals are selected according to at least a privacy-preserving rule that disallows same individuals to be included within a defined period of time

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Introduction

Grounds 1 and 2 (Evenhaim (with Settimi and/or Murphy))

- **Token Matching**
  - Both Evenhaim and Settimi tokenize patient information using hash functions.
  - Evenhaim describes searching a database for specific patients.
  - Settimi's centralized database identifies patient records only by tokens.
- **Using Minimums**
  - Evenhaim describes applying minimums on the user and data server sides.
  - Murphy also describes using minimums.
- **Privacy-Preserving Rule**
  - Murphy describes disallowing repeated searches for the same patient groups within a predetermined period of time.

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Introduction

Ground 3 (Dick, Landi, and Murphy)

- **Token Matching**
  - Both Dick and Landi describe centralized databases.
  - Dick describes searching a database for specific patients.
  - Landi provides specifics on using, in the centralized database, encrypted IDs (tokens) in place of identifying information.
- **Using Minimums and Privacy-Preserving Rule**
  - Murphy describes both using minimums and disallowing repeated searches for the same patient groups within predetermined period of time.

The ’651 Patent: De-Identification

- “Health Insurance Portability and Accountability (HIPAA)” regulations. EX1001, 4:40-45.
  - Patient authorization or de-identification to release protected health information (PHI). *Id.*
- De-Identification
  - “generates tokens … using the [] personally identifiable information.” EX1001, 6:59-7:5.
  - “[T]okens 202 correspond to persons treated by healthcare providers but do not reveal the identities of the treated individuals.” EX1001, 5:9-12.

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Pet., 3, 25; POR, 3-5. (All cites to the briefs and EX1001 pertain to the ’651 Patent IPR. Slides 60-66 contain correspondence tables for the other IPRs).

The ’651 Patent: Tokenization

- Generally in the Field
  - “The basics of tokenization are straightforward. … [T]he data is converted into a token which is a globally unique, randomized representation of the real [information].” EX1011, 31.
- The Specification
  - “creates each token by applying a token generator 314 that encrypts the personably identifiable information of each group member.” EX1001, 6:34-38.
  - May use “one or more encryption techniques …, for example hash functions and other methodologies.” EX1001, 7:2-5.

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Pet., 3-4; Reply, 20, 23.

The ’651 Patent: Tokenization

- **Claim Construction**
  - Token: “An identifier associated with an individual that does not reveal the identity of the individual.” Pet., 8.
    - Patent Owner *does not dispute* claim construction of “token.” POR, 8-9.
  - No construction offered for tokens requiring ***irreversible encryption***.
    - The specification’s mention of irreversible vs. discussion of encryption.
      - “[T]he report generator 328 [] process[es] the requested de-identified data 208 in a way that leaves it irreversibly de-identified.” EX1001, 7:12-19.
      - “[T]oken generator 314 [] encrypts the personally identifiable information of each group member.” EX1001, 6:34-38.

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Pet., 3-4, 8; POR, 7-9; Reply, 5; Sur-Reply, 19.

The ’651 Patent: Centralized Database

- “[D]e-identified data server 318 stores records of de-identified data and corresponding tokens 320 obtained from source sites 138 such as pharmacies, …. Each token obtained from the source sites 138 may have been created using the same token generator 314 used by the encryption server 312, or using any other means that generates the identical token for the same personally identifiable information.” EX1001, 6:44-58.
  - Patent Owner’s expert:
    - “Q And that database has only de-identified data and tokens, correct? A That’s all that’s shown ….” EX1014, 39:2-12.
    - “Q So that would be … a centralized warehouse of data that came from the various source sites …? A Yes.” EX1014, 39:2-12, 20:22-23:13.

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POR, 6-7; Reply, 1, 8.

The ’651 Patent: General Process

- **User**
  - Sends a request for medical information pertaining to individuals to an encryption server. EX1001, 5:12-15.
- **Encryption Server**
  - Generates a request token for each individual using the same method used to create the tokens in the data server. EX1001, 5:14-17, 6:44-49.
- **Data Server**
  - Receives the request tokens from the encryption server and searches for matching tokens. EX1001, 5:17-20, 7:6-9.
  - Produces the requested medical information. EX1001, 8:5-12; 9:53-66.

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Pet., 2-4; POR, 4-6; Reply, 8.

The ’651 Patent

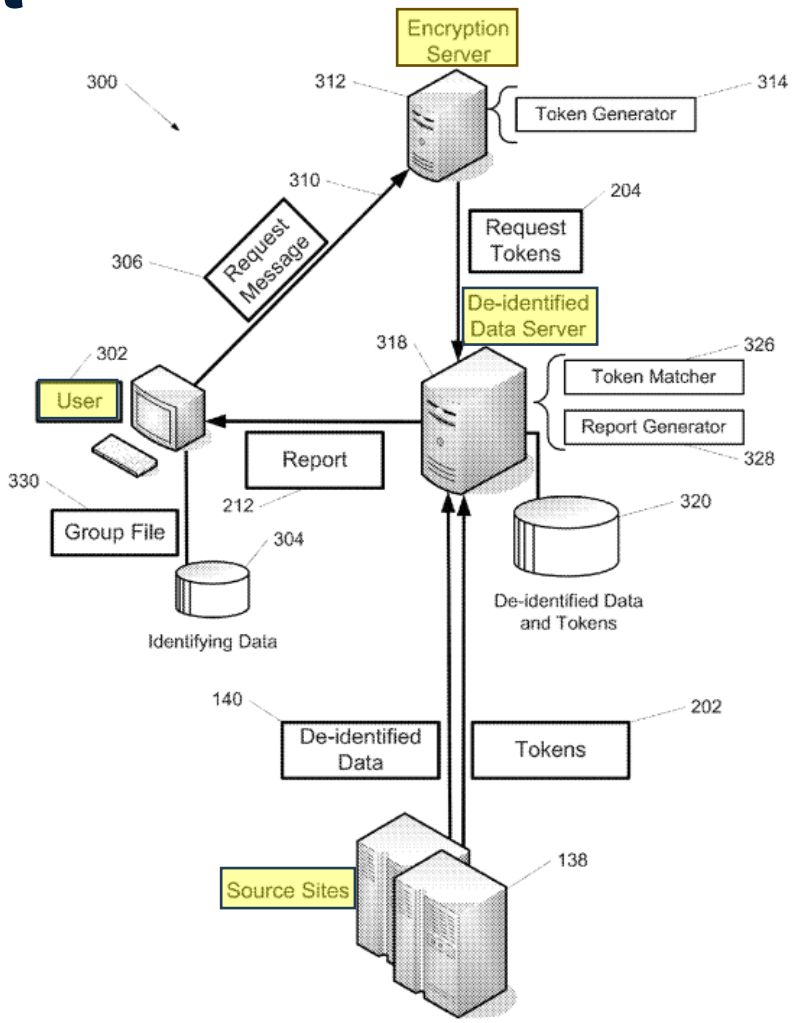

FIG. 3

Reply, 15; POR, 4-5.

Background: Healthcare Data Searches

Examples

- Pharmaceutical companies looking for patients suited for clinical trials. EX1014, 47:12-50:15.
- Insurance companies looking to determine the risk of insuring a known group of individuals. EX1007, [0003], [0008], [0025], [0037].
- Medical researchers. EX1006, [0027].

Databases Are Not Limited to One Type of Search

- Patent Owner's expert admitted that the same database could be used for various types of searches. EX1014, 47:12-50:15 ("I would assume so.").
  - "The language [in Settimi] says: Medical -- that make medical and/or other products. So that could be – that's very broad, I guess." EX1014, 102:3-103:8 (EX1006, [0030]).

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Pet., 39, 57-60; Reply, 6.

Background: HIPAA

HIPAA (45 C.F.R. § 164.514) (Ex2006)

- **Expert Determination**
  - "[G]enerally accepted statistical and scientific principles and methods for rendering information not individually identifiable." 164.514(b)(1) ("risk is very small").
- **Safe Harbor**
  - Removal of specified identifiers. 164.514(b)(2).

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Pet. 5-6; Reply, 11-13.

Background: HIPAA

HIPAA (45 C.F.R. § 164.514) (Ex2006)

- Re-identification is permitted, so long as "code or other means of record identification is not derived from or related to information about the individual." 164.514(c).
  - However, "a covered entity may disclose codes derived from PHI as part of a de-identified data set if an expert determines that the data meets the de-identification requirements at §164.514(b)(1) [i.e., "the risk is very small"]. EX1016, 30-31.
  - Also, "[t]he re-identification provision … does not preclude the transformation of PHI into values derived by cryptographic hash functions using the expert determination method, provided the keys associated with such functions are not disclosed, including to the recipients of the de-identified information." *Id.*

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Pet., 5-6; Reply, 11-13.

Ground 2 - Evenhaim and Settimi (and Murphy)

Evenhaim

- **HIPAA**: Directed to "compliance with HIPAA." EX1005, 14:59-67.
- **Patient Searching**: Evenhaim's "aggregator" accepts queries pertaining to a list of specific patients. EX1005, 6:57-67 ("parameter list").
  - "can ask about the status of Tom, Dick, Harry, . . . so long as the statistical character of those results will not allow correlation of a result specific back to an individual." EX1005, 8:18-22; 16:57-7:3 ("a pre-defined list").
  - Patent Owner agrees that "identifiers other than a name can be used" in the searching. Sur-Reply, 7-8.
- **Tokenization:** Patient identifying information "is replaced with a unique encryption key, such as a one way hash or Advanced Encryption Standard (AES) or the like[]." EX1005, 12:36-47.

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Pet., 12, 29, 31, 40; Sur-Reply, 7-8.

Ground 2 - Evenhaim and Settimi (and Murphy)

Evenhaim

- **User**
  - Sends a request for healthcare data for a "collection of individuals" to the aggregator (encryption server). EX1005, 8:18-22.
- **Encryption Server**
  - "[C]onverts" the list into a language "mutually accepted by the aggregator and the source-entities." EX1005, 8:30-43 ("ID or the like[]. ").
    - Encryption "key [] will preferably not be known to the … operator, but only a trusted third party such as an escrow agent." EX1005, 12:61-66.
  - Sends the request to a source entity (data server). EX1005, 12:4-13:20.
- **Data Server**
  - Receives the request, performs the search, and produces the results. Pet., 28.

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Pet., 13, 17, 20, 28; Reply, 2-3, 7-8.

Ground 2 - Evenhaim and Settimi (and Murphy)

Evenhaim

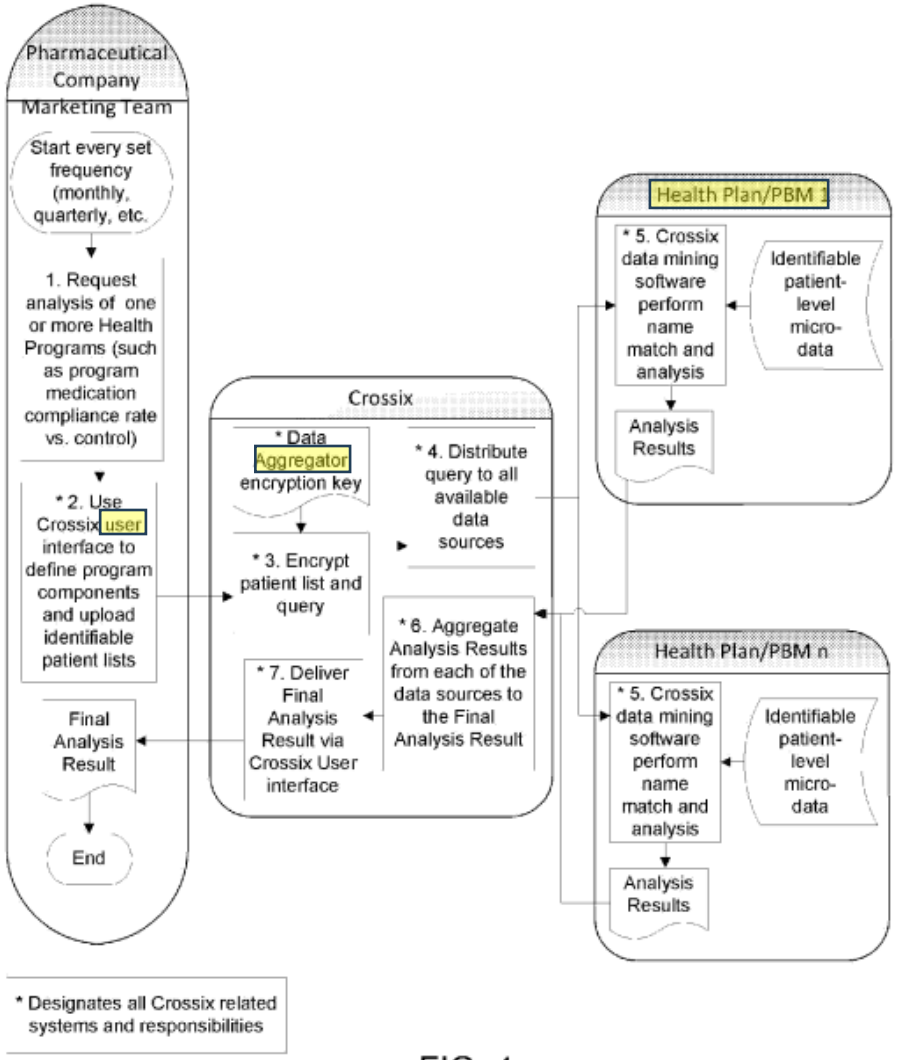

FIG. 4

Pet., 13, 17, 21.

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Ground 2 - Evenhaim and Settimi (and Murphy)

Patent Owner's Arguments

- **Minimums on the Data Server Side**
  - Whether minimums would have been obvious from Evenhaim and Murphy.

    Evenhaim, in particular, describes applying minimums to search results.
- **Privacy-Preserving Rule**
  - Whether Murphy suggests a rule that disallows the same individuals to be included in search results within a predefined period of time.

    Murphy describes blocking repeated searches pertaining to the same individuals within a predetermined period of time.

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POR, 16-40.

Ground 2 - Evenhaim and Settimi (and Murphy)

Patent Owner's Arguments

- **Token Matching**
  - Whether the encryption performed at Evenhaim's aggregator is tokenization (as opposed to standard data transmission encryption).
  - Whether Evenhaim's searching is performed by matching encrypted identifiers (tokens), as opposed to searching by original name only.

Evenhaim describes token matching, and any doubt is rendered moot by Settimi in Ground 2.

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POR, 35-40.

Ground 2 - Evenhaim and Settimi (and Murphy)

Minimums on the Data Server Side ('375, '012, '651 Patents)

- Claim Language for Minimums on Data Server Side
  - The '375 and '012 Patents:
    - [7.g] "a minimum number of matched tokens."
  - The '651 Patent: [7.g]
    - "group includes at least a minimum number of individuals to be included in a report."
- Contrast User Side Minimums
  - The '375 Patent: [7.c] "wherein the request for healthcare information is sent to an encryption server that is configured to determine if the number of individuals in the request is at least a defined minimum number of individuals."

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Pet., 26-27, 48; Reply, 15-17.

Ground 2 - Evenhaim and Settimi (and Murphy)

Minimums on the Data Server Side ('375, '012, '651 Patents)

- **Evenhaim**
  - "It will simply be necessary that the number of the individuals in any population definition be large enough to dilute any definitive conclusion about an individual's personal data into the 'sea' of the group (of names') data." EX1005, 8:43-48
  - "The query engine determines whether the number of participants in each program and the ***% participants matched*** are above a level that ensures consumer individual privacy (based on a statistical definition)." EX1005, 16:5-32 (emphasis added).
  - Petitioner's expert: "Evenhaim further explains that the number of individuals in a query response must be of a number that protects privacy." EX1003, ¶88 (citing EX1005, 8:43-48, 16:5-32).

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Pet., 26-27; Reply, 15-17.

Ground 2 - Evenhaim and Settimi (and Murphy)

Minimums on the Data Server Side ('375, '012, '651 Patents)

- **Murphy**
  - Petitioner's expert: "Though Even[hai]m alone makes this element obvious, Evenhaim and Murphy together further render this limitation obvious." EX1003, ¶89.
  - "One vulnerability is that we allow a large number of queries to be performed that return zero patients .... Therefore, we modify our range algorithm to have a wider obfuscation at values close to zero, and indicate the greater range by returning '<3' when the obfuscated number is less than 3." EX1009, 555.

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Pet., 26-27; Reply, 15-17.

Ground 2 - Evenhaim and Settimi (and Murphy)

The Privacy-Preserving Rule ('651 Patent)

- Claim Language from the '651 Patent
  - [7.h] "… a privacy-preserving rule that disallows same individuals to be included within a defined period of time."
- Murphy
  - Murphy's privacy-preserving rule uses a "history table" that "contains for each query the date/time, the user ID, and the number of patients truly returned by the queries. … The [system] looks at the numeric results of queries performed by that user to see if the exact same number of patients were returned in previous queries within a specific time period. Depending on the time range …, when a certain number of queries return the exact same number of patients, the user is prevented from performing further queries." EX1009, 554.

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Pet., 27-28; Reply, 17.

Ground 2 - Evenhaim and Settimi (and Murphy)

<u>The Privacy-Preserving Rule ('651 Patent)</u>

- **Murphy**
  - The design seeks to force a bad actor to "create[] a detectible pattern" that suggests an "attack." EX1009, 554, 552 ("imperative that a single individual could not be identified through the user interface").
  - While the example query response returning the number of patients matched, Murphy explains that "[t]he database obfuscation method discussed in this paper does not limit the logic of the query, nor the data elements or values that can be used in the query." EX1009, 556.
    - ***Patent Owner's expert agreed***. EX1014, 137:17-138:22 ("those examples are not limiting, it could be other things, too").

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Pet., 27-28; Reply, 17.

Ground 2 - Evenhaim and Settimi (and Murphy)

The Privacy-Preserving Rule ('651 Patent)

- **Murphy**
  - Patent Owner's expert also admitted that Murphy's example in which the query response is a number of patients may fall within the scope of the claims–namely, "a request from a user device for information that characterizes a group" (*see* '651 Patent, [7.b]).

> Q So would it be fair that your reference here to "characterizes a group" could be the number of people that have had a particular operation?
>
> A Yes.

EX1025, 61:11-62:12.

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Pet., 27-28; Reply, 17.

Ground 2 - Evenhaim and Settimi (and Murphy)

Token Matching (All Patents)

- **Combination**
  - Both Evenhaim and Settimi use hashes to tokenize identifying information.
    - Both are directed at "reducing the risk of a HIPAA violation." Pet., 41.
  - The combination uses Settimi's centralized database as the source in Evenhaim's system. Pet., 38-42.
    - Settimi's database provides for one centralized search that is more robust than prior designs. Pet., 40-42 ("simplify querying").
    - Settimi's database identifies patient records only by tokens (EPIDs).
  - Thus, Evenhaim's search for specific patients would involve matching tokens. Pet., 38-42, 46-47.

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Pet., 38-42, 46-47.

Ground 2 - Evenhaim and Settimi (and Murphy)

Token Matching (All Patents)

- **Evenhaim's Tokenization**
  - "[T]here are numerous locations where an encryption of ***individual identification*** … could be facilitated. … [including] on the 'aggregator' processor side." EX1005, 12:24-47 (emphasis added).
    - "[I]dentity information … is replaced with a unique encryption key such as a one way ***hash***." *Id.* ("preserves the ability to know that two records belong to the same identity").
  - Data transmission encryption vs. parameter list encryption
    - "[T]ransmitting … may preferably include respective encryption and decryption." *Id.*, 13:33-43.
    - "[R]egardless of [] general … encryption [], a parameter list including 'individuals' should carry a stronger level of encryption." *Id.*, 14:3-13.

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Pet., 4, 15-16, 22; Reply, 13-14.

Ground 1 - Evenhaim (Claims 1-19)

Token Matching (All Patents)

- **Evenhaim's Tokenization**
  - "[A]ll or part of the parameter list is encrypted." EX1005, 8:43-48.
    - Patent Owner's expert ***admitted*** that "this language is very broad," and could indicate encryption of "certain types of fields." EX1014, 74:14-79:3; *see* Ex1005, 8:30-43 ("name").
  - Patent Owner's expert also ***admitted*** that Evenhaim's "super encryption" of identifying information ***would remain after the transmission*** to the data sources.
    - "The transmission encryption is peeled off, but the super encryption remains." EX1014, 74:14-79:3.

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Reply, 13-14.

Ground 2 - Evenhaim and Settimi (and Murphy)

Token Matching (All Patents)

- **Settimi's Centralized Database of Healthcare Information**
  - "[A] secure process for sending de-identified patient information from a[] patient care provider (PCP) site to a data warehouse system where the patient data may be analyzed and compared with a wider range of patient data." EX1006, [0027].
  - "The de-identified patient data is then staged into a data warehouse 210 where it is available for querying." EX1006, [0035] ("queried meaningfully and efficiently").
  - HIPAA compliant. EX1006, [0027]; *see* EX1014, 93:16-95:22 (Patent Owner's expert confirming).

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Pet., 39; Reply, 1-2.

Ground 2 - Evenhaim and Settimi (and Murphy)

Token Matching (All Patents)

- **Settimi's Tokens**
  - Settimi uses "encoded patient identifier[s] (EPID[s])." EX1006, [0038].
    - "[U]nique identifier." EX1006, [0037], [0040].
  - The EPIDs may be formed using a ***hash*** (as in Evenhaim). EX1006, [0041].
    - A hash is an irreversible tokenization. EX1014, 37:8-38:9; 53:18-54:20.

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Pet., 39-40, 42; Reply, 9-10, 13-14.

Ground 2 - Evenhaim and Settimi (and Murphy)

Token Matching (All Patents)

- **Patent Owner incorrectly alleges** that "Settimi's queries necessarily … rely upon patient characteristics" rather than patients. POR, 42.
  - Evenhaim already teaches searching for specific patients. EX1005, 8:18-22.
  - Patent Owner's expert agrees that a medical database would not be limited to one type of query. EX1014, 47:12-50:15.
  - Settimi:
    - "[T]he user may search by the EPID." EX1006, [0047], [0037] ("unique identifier" with "ability to connect all records relating to a single patient").
    - "[A] user may codify additional term(s) and/or create additional rules/search algorithms dynamically." EX1006, [0061].

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Pet., 39; POR, 42; Reply, 3-4, 6.

Ground 2 - Evenhaim and Settimi (and Murphy)

Token Matching (All Patents)

- **Patent Owner incorrectly alleges** that Evenhaim "teaches away" from searching de-identified records. POR, 27-28.
  - Evenhaim's preference is for "high resolution" data that allows ***patient searching***. EX1005, 7:46-58, 16:46-17:3 (explaining that low resolution data does "not provide the capability to aggregate … patients by a pre-defined list of consumers"), 3:32-41; 4:35-39 ("the targeted population").
  - "[t]he aggregator may accept a query that includes … e.g. a list of names …. This sub-step essentially converts a model base postulate about the data (that relationships that the user wonders) into a formal language query phrases according to shared variable definitions mutually accepted by the aggregator and the source-entities. … [T]he parameter list may even include specific individuals ***by name or ID or the like[].***" EX1005, 8:30-43, 10:29-32 ("*identity-free* micro-data").

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Pet., 10, 23; Reply, 6-8, POR, 27-28; Sur-Reply, 3.

Ground 2 - Evenhaim and Settimi (and Murphy)

Token Matching (All Patents)

- **Patent Owner incorrectly alleges** that the Evenhaim-Settimi combination would "risk a HIPAA violation." POR, 22.
  - Evenhaim and Settimi are intended to ***comply*** with HIPAA. EX1014, 33:12-34:4; EX1005, 2:5-26, EX1006, [0009].
  - Patent Owner's bad actor theory.
    - Theorizes a potential "plain text" attack, the defenses for which Patent Owner's expert acknowledges have been known for decades. EX1014, 25:13-28:17 ("A POSA would understand that it would apply known known security techniques"), 42:10-47:11, 45:6-46:1; EX1015, ¶¶ 22-23.

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POR, 22; Reply, 3, 9-11.

Ground 2 - Evenhaim and Settimi (and Murphy)

<u>The Evenhaim-Settimi Combination Would Not Violate HIPAA</u>

- Known defenses to plain text attacks.
  - Salts and cypher block chaining. EX1014, 45:6-46:1; EX1015, ¶¶ 22-23.
  - Additional levels of encryption.
  - Trusted broker/escrow agent.
  - Various compliance options in HIPAA.

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Reply, 10-12.

Ground 2 - Evenhaim and Settimi (and Murphy)

The Evenhaim-Settimi Combination Would Not Violate HIPAA

- **Additional Levels of Encryption**
  - Petitioner's expert: "It would be common and a simple design decision to add a second level of protection. … the tokens in the patient records could be further de-identified with a second encryption key that is only available to the data source. This … further ensure[s] compliance with Privacy laws such as HIPAA." EX1003, ¶ 42.
  - Patent Owner's expert: ***Did not dispute option*** but characterized it as a "'fixe[]' [that] would be required if token matching were to be performed at the data source entities." EX2001, ¶ 107.
  - Petitioner's expert: "This concept of using multiple layers of encryption would have been known to a POSA … and … is generally described in described U.S. Pat. No. 7,668,820." EX1015, ¶ 23 (citing EX1024, 2:20-51).

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Pet., 26; Reply, 10-12.

Ground 2 - Evenhaim and Settimi (and Murphy)

<u>The Evenhaim-Settimi Combination Would Not Violate HIPAA</u>

- **Escrow Agent or Trusted Broker**
  - Evenhaim describes using a "trusted third party such as an escrow agent" on the aggregator side so that the key is "not [] known" to the aggregator. EX1005, 12:63-66; *see also* EX1008, 4:9-19 ("trusted broker").

> Q Could the escrow hold keys for encryption and decryption or both? And I'm speaking generally.
>
> A Oh, there's nothing about escrow agents that prevents them from holding different types of keys in general.

EX1014, 51:17-52:12.

Reply, 10.

Ground 2 - Evenhaim and Settimi (and Murphy)

The Evenhaim-Settimi Combination Would Not Violate HIPAA

- **Escrow Agent or Trusted Broker**

Q What's your understanding of a trusted third party?

A It's a party that's not one of the participants in the protocol itself. It's trusted by the participants to behave properly and competently.

Q And that would include maintaining confidential information perhaps?

A That is one way you could use a trusted third party.

EX1014, 52:12-53:17.

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Reply, 10.

Ground 2 - Evenhaim and Settimi (and Murphy)

The Evenhaim-Settimi Combination Would Not Violate HIPAA

- **HIPAA Options**
  - Statistical de-identification. EX2006, 45 C.F.R. 164.514(b)(1) ("generally accepted statistical and scientific principles and methods for rendering information not individually identifiable"; "risk is very small").
  - Safe Harbor. EX2006; EX1016, 9-11 ("safe harbor"); EX1014, 101:12-10:2.
  - Business Associates. EX1021 (defining business associate), EX1020, 3; EX1016, 6.
    - Patent Owner's expert explained that one would use "a contractual agreement … that the point of this encryption server is that it should not be sharing all of its information with the public." EX1014, 29:13-30:10.

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Pet., 22, Reply, 11-13.

Ground 1 - Evenhaim (Claims 1-19)

Evenhaim Describes Encrypting Individual Identifiers (Tokenization)

- "[P]erson[al] identity information … is replaced with a unique encryption key, such as a one way hash or Advanced Encryption Standard [] or the like[]." EX1005, 12:36-47.

Evenhaim's Aggregator Can Perform Identifier Encryption

- "[T]here are numerous locations where an encryption of ***individual identification*** … could be facilitated. … [including] on the 'aggregator' processor side." EX1005, 12:24-34.
  - Individual identification encryption is not transmission encryption.
    - "[R]egardless of the general level of encryption elected, a parameter list including 'individuals' should carry a stronger level of encryption." EX1005, 14:3-13.

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Pet., 4, 10, 13, 20; Reply, 13-14.

Ground 1 - Evenhaim (Claims 1-19)

Patent Owner's Expert Acknowledges Evenhaim's "Super Encryption"

- Patent Owner's expert admitted that the parameter list encryption described in Evenhaim differs from transmission encryption and would remain ***after*** the decryption of transmission encryption.
  - "The transmission encryption is peeled off, but the super encryption remains." EX1014, 74:14-79:3.
- "[A]ll or part of the parameter list is encrypted." EX1005, 8:43-48.
  - Patent Owner's expert: "So I think this language is very broad and it could mean that certain types of fields aren't encrypted and others are." EX1014, 74:14-79:3.

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Reply, 13-15.

Ground 3 – Dick, Landi, and Murphy (All Claims)

Dick

- "An illustrative method … compris[es]:"
  - "receiving a request for medical information including identification of a subject …;"
  - "transmitting a query to a medical information repository for information pursuant to the request; and"
  - "receiving a response to the query containing medical information." EX1007, [0011].
- The "subject" of the search "might consist of a human individual or group of humans" and may be identified "by way of name, patient number, … or any other identification." EX1007, [0024], [0025] ("The request may originate with insurance agencies.").

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Pet., 57-60; Reply, 18.

Ground 3 – Dick, Landi, and Murphy (All Claims)

Dick

- "In order to legally distribute such information, a medical information repository would have to remove all 'Identifying' information." EX1007, [0045].
- "The present invention contemplates the use of 'de-identifying' methods and processes for allowing information from the present invention to be distributed ...." EX1007, [0046].

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Pet., 57-58; Reply, 18-19.

Ground 3 – Dick, Landi, and Murphy (All Claims)

Landi

- "[S]ystems and methods that implement secured key encryption for de-identifying patient data to ensure patient privacy, while allowing only the owners of the patient data and/or legally empowered entities to re-identify subject patients." EX1008, 2:30-53 ("encrypted ID").
  - "An Encrypted ID of a given patient is a unique reproducible encrypted version of patient identifying information that is sufficient to uniquely identify the patient." EX1008, 5:13-36 ("store each Encrypted ID with or within a corresponding de-identified data patient data record").
- "[C]entral patient data processing system (30) comprises a repository of persistently stored de-identified patient data records (35) containing de-identified (encrypted) patient identifying information … collected from [] different clinical sites." EX1008, 7:3-10.

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Pet., 58-60.

Ground 3 – Dick, Landi, and Murphy (All Claims)

Combination of Dick and Landi

- While Dick "contemplates the use of 'de-identifying' methods and processes" (EX1007, [0011]), Landi describes de-identification using encrypted tokens. Pet., 60.
- Both use centralized data repositories. Pet., 59-60; EX1007, [0011] ("medical information repository"); EX1008, 4:11-28 ("central patient data processing system (30)").
- Landi describes that the de-identification occurs through encryption, where the healthcare organizations control the keys to avoid "HIPAA issues." EX1008, 8:38-55.

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Pet., 60-62.

Ground 3 – Dick, Landi, and Murphy (All Claims)

Patent Owner's Arguments

- Whether there would be motivation to combine Dick and Landi because Dick (purportedly) already teaches de-identification.
- Whether Dick and Landi suggest tokenization.
- Whether Landi's de-identification to comply with HIPAA would be understood to comply with HIPAA.
- Whether the claims require irreversible encryption.
- Whether Murphy suggests using minimums (addressed above).
- Whether Murphy suggests the privacy-preserving rule (addressed above).

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POR, 48-69.

Ground 3 – Dick, Landi, and Murphy (All Claims)

Dick Invites De-Identification Methods

- Dick references de-identification without detailing specific technical options.
  - "The present invention further contemplates the use of 'de-identifying' methods and processes." EX1007, [0013], [0046]-[0047].
  - Patent Owner admits that the issue at hand is not "mere … 'de-identification'." POR, 60.

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Pet., 57-58; POR, 60; Reply, 18-19.

Ground 3 – Dick, Landi, and Murphy (All Claims)

Landi Provides a Specific De-Identification Method

- Landi details the use of encrypted IDs (tokens).
  - This "process preserves patient uniqueness to enable [] the same patient to be recognized at different collection times. In other words, this process ensures that if data is collected more than once from a particular patient, the patient will be mapped to the same Encrypted ID." EX1008, 11:23-29.

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Pet., 59; Reply, 23.

Ground 3 – Dick, Landi, and Murphy (All Claims)

Landi Offers Its Methods to Comply with HIPAA

- "[N]o HIPAA issues." EX1008, 3:52-57.
- "In accordance with HIPAA." EX1008, 10:52-63.
- Patent Owner's expert could not say whether Landi's methods violated HIPAA.
  - "I would need to review this in the context of HIPAA. … I need to look at that and research it, I can't answer that off the top of my head." EX1014, 34:5-37:7.
  - "HIPAA compliance is – is something that takes weeks of work and analysis." EX1014, 115:15-117:15.

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Pet., 59-60; Reply, 12-13, 19-20.

Ground 3 – Dick, Landi, and Murphy (All Claims)

HIPAA Offers Numerous Options for Compliance

- Statistical de-identification (164.514(b)(1) ("generally accepted statistical and scientific principles and methods for rendering information not individually identifiable" such that the "risk is very small")).
- Safe harbor (164.514(b)(2)).
- Business associates (Ex1021 ("business associate"); Ex1020, 3; Ex1016, 6).
- Re-identification is permitted (164.514(c)).

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Pet., 5-6, 26, Reply, 10-12, 20.

Ground 3 – Dick, Landi, and Murphy (All Claims)

The Claims Do Not Prohibit Decryptable Tokens

- Claim Construction
  - Token: "An identifier associated with an individual that does not reveal the identity of the individual." Pet., 8.
    - No requirement for irreversible encryption.
- The Specification
  - "creates each token by … encrypt[ing] the personably identifiable information of each group member." EX1001, 6:34-38, 7:2-5 ("for example hash functions and other methodologies"), 7:34-43 ("unencrypted").
- HIPAA Guidance
  - "[A] covered entity may disclose codes derived from PHI as part of a de-identified data set if an expert determines that the data meets the de-identification requirements at §164.514(b)(1)." EX1016, 30-31.

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Pet., 3-4, 8; Reply, 5, 20.

Ground 3 – Dick, Landi, and Murphy (All Claims)

Murphy

- Murphy is directed to preventing targeted attacks on a "clinical data warehouse," which attack could lead to identification of a particular patient. EX1009, 552-53 ("a system that complies with HIPAA's … de-identification").
- "An attack on the system would occur by someone entering criteria into the query tool that would result in only one matching person." EX1009, 552.
- Murphy describes the use of obfuscation to prevent the identification of a particular patient through narrowing parameters, wherein, e.g., rather than answer a query that would specify less than three patients, the systems responds with "<3". EX1009, 555.

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Pet., 14, 27; Reply, 16-17, 24-25.

Ground 3 – Dick, Landi, and Murphy (All Claims)

Murphy

- Murphy's example "<3" (or some other minimum) does not answer a query that asks for a specific number of patients. Ex1009, 556 ("obfuscation method"); Ex1003, ¶229.
  - Patent Owner's admissions support this position.
    - "[S]o that one can't see what the actual values are." EX1014, 134:8-137:16.
    - "[R]ather than returning an absolute value." POR, 67.
- Murphy is not limited to its example query for the number of patients meeting certain criteria. EX1009, 556 ("does not limit the logic of the query").
  - Patent Owner's expert agreed: "those examples are not limiting, it could be other things, too." EX1014, 137:17-138:22.

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Pet., 69; Reply, 4, 24; POR, 67.

Ground 3 – Dick, Landi, and Murphy (All Claims)

Murphy

- Murphy embraces de-identification.
  - Murphy calls de-identification a "good start." EX1009, 553 (stating that even with de-identification "there is still no guarantee that someone cannot be identified in the database").
  - Murphy states that its design removes "reservations about including increasingly patient specific data." EX1009, 556.
- Murphy's design uses minimums to prevent attacks that "would occur by someone entering criteria into the query tool that would result in only one matching person." EX1009, 552 ("imperative that a single individual could not be identified through the user interface").

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Reply, 21-24.

Correspondence of EX1001 Cites

’651 Patent	’375 Patent	’012 Patent	’685 Patent
4:40-45	3:66, 4:4	4:5-10	4:39-44
5:9-20	4:32-43	4:38-49	5:8-19
6:34-38	5:38-40	5:44-46	6:34-37
6:44-7:9	5:46-6:3	5:62-6:9	6:58-7:4
7:34-43	6:33-39	6:41-47	7:34-39
8:5-12	6:64-7:4	7:5-12	8:2-9
9:53-66	8:23-36	8:32-45	9:48-61

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Correspondence of Briefing Cites

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12	POR, 3-5.	POR, 3-5.	POR, 3-5.
13	Reply, 19, 23.	Reply, 21, 24.	Reply, 18-19, 22.
14	Pet., 3, 8; POR, 10-13; Reply, 5; Sur-Reply, 19.	Pet., 3, 8; POR, 5; Reply, 5; Sur-Reply, 19.	Pet., 3, 7; POR, 7-10; Reply, 5; Sur-Reply, 19.
15	POR, 5-9; Reply, 1, 8-9.	Reply, 1, 8.	POR, 6; Reply, 1, 9.
16	POR, 5-8; Reply, 8.	POR, 3-4; Reply, 8.	POR, 3-7; Reply, 9.
17	POR, 7; Reply, 15.	POR, 3; Reply, 15.	POR, 5; Reply, 16.
18	Pet., 37-38, 54-57; Reply, 6.	Pet., 35-36, 52-56; Reply, 6.	Pet., 37-38, 57-60; Reply, 6.

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19	Pet., 5-6; Reply, 11-13.	Pet., 5-6; Reply, 11-13.	Pet., 5-6; Reply, 11-13.
20	Pet., 5-6; Reply, 11-13.	Pet., 5-6; Reply, 11-13.	Pet., 4-6; Reply, 11-13.
21	Pet., 12, 28-29, 38-39; Sur-Reply, 8-9.	Pet., 12, 23, 25, 36-37; Sur-Reply, 8.	Pet., 12, 26, 28, 38-39; Sur-Reply, 8.
22	Pet., 3, 26-27; Reply, 2-3, 7-8.	Pet., 3; Reply, 2-3, 7-8.	Pet., 3; Reply, 2-3, 7-8.
23	Pet., 13, 17, 19.	Pet., 13, 17, 19.	Pet., 13, 15, 19.
24	POR, 20-43.	POR, 10-35.	POR, 15-33.
25	POR, 27-44.	POR, 17-35.	POR, 22-34.
26	Pet., 26-27; Reply, 15-17.	Pet., 22; Reply, 15-17.	n/a

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27	Pet., 26-27; Reply, 15-17.	Pet., 22; Reply, 15-17.	n/a
28	Pet., 26-27; Reply, 15-17.	Pet., 22; Reply, 15-17.	n/a
29	n/a	n/a	n/a
30	n/a	n/a	n/a
31	n/a	n/a	n/a
32	Pet., 37-40, 43-44.	Pet., 35-39, 43-45.	Pet., 37-40, 43-45.
33	Pet., 4, 15-16, 21; Reply, 13-14.	Pet., 4, 15, 20; Reply, 13-14.	Pet., 3-4, 13, 19-20; Reply, 13-14.
34	Reply, 13-14.	Reply, 13-14.	Reply, 13-14.

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35	Pet., 37-38; Reply, 1-2.	Pet., 35-36; Reply, 1-2.	Pet., 37-38; Reply, 1-2.
36	Pet., 38-40; Reply, 9-10, 13-14.	Pet., 36-38; Reply, 9-10, 13-14.	Pet., 38-39; Reply, 9-10, 13-14.
37	Pet., 37-38; Reply, 4, 6.	Pet., 35-36; Reply, 3, 6.	Pet., 37-38; Reply, 4, 6.
38	Pet., 10, 22-23; POR, 31; Reply, 6-8; Sur-Reply, 3.	Pet., 11, 18-20; POR, 22; Reply, 6-8; Sur-Reply, 3.	Pet., 10, 21; POR, 26; Reply, 6-8; Sur-Reply, 3.
39	POR, 26; Reply, 9-11.	POR, 16-17; Reply, 9-11.	POR, 21; Reply, 9-11.
40	Reply, 10-12.	Reply, 10-12.	Reply, 10-12.
41	Pet., 25; Reply, 10-12.	Pet., 14; Reply, 10-12.	Pet., 24; Reply, 10-12.
42	Reply, 10.	Reply, 10.	Reply, 10.

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43	Reply, 10.	Reply, 10.	Reply, 10.
44	Pet., 21; Reply, 11-13.	Pet., 22; Reply, 11-13.	Pet., 20; Reply, 11-13.
45	Pet., 4, 10, 13, 18; Reply, 13-14.	Pet., 4, 11, 13, 20; Reply, 13-14.	Pet., 3-4, 10, 13, 18; Reply, 13-14.
46	Reply, 13-15.	Reply, 13-15.	Reply, 13-15.
47	Pet., 54-57; Reply, 17.	Pet., 52-55; Reply, 19.	Pet., 57-60; Reply, 16.
48	Pet., 54-55; Reply, 17-18.	Pet., 52-53; Reply, 19-20.	Pet., 57-58; Reply, 17.
49	Pet., 55-57.	Pet., 53-55.	Pet., 58-60.
50	Pet. 56-59.	Pet. 54-57.	Pet. 59-62.

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51	POR, 52-69.	POR, 43-69.	POR, 49-67.
52	Pet., 54-55; POR, 63; Reply, 17.	Pet., 52-53; POR, 59; Reply, 19.	Pet., 57-58; POR, 62; Reply, 16.
53	Pet., 56; Reply, 22.	Pet., 55; Reply, 24.	Pet., 59; Reply, 21.
54	Pet., 56-57; Reply, 13, 19.	Pet., 54-55; Reply, 12, 21.	Pet., 59-60; Reply, 13, 18.
55	Pet., 5-6; Reply, 10-12.	Pet., 6; Reply, 10-12.	Pet., 5-6; Reply, 10-13.
56	Pet., 3-4, 8; Reply, 5, 19.	Pet., 3-4, 8; Reply, 5, 21.	Pet., 3, 8; Reply, 5, 19.
57	Pet., 14-15, 26-27; Reply, 17, 24.	Pet., 14-15, 22; Reply, 17, 23.	Pet., 61-62, 73-74; Reply, 24.
58	Pet., 65; POR, 68; Reply, 4, 25.	Pet., 65; POR, 65; Reply, 4, 24.	Pet., 73-74; POR, 66; Reply, 22-23.
59	Reply, 20-23.	Reply, 23-24.	Reply, 19-22.

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