

# Virtual Master Patient Index (VMPI) for two healthcare databases: Electronic Health Records and Patient Management

July 2019

# Multiple healthcare databases VMPI

## Customer Challenge

Leave data in sources and match patients across multiple operational/transactional healthcare databases

Develop a distributed virtual master patient index (VMPI)

Query the VMPI to locate, report and analyze all patient data in multiple data sources

Leave data in sources, but not interfere with applications running on these data sources

Seamlessly integrate master patient data with operational/transactional data

Provide a browser-based tool to query, interact and display results

## Index-based Data Virtualization Solution

Address data quality and security while building content indexes and use to find and match patient data within and across data sources

Build and use link indexes, combine with content indexes for MDM and master data indexes

Leverage content, link and master data indexes to query for and obtain all patient-related data

Indexing and query processing load almost completely absorbed

Automatically used, updated in near real-time and can be distributed vs. centralized

OEM Cambridge Intelligence KeyLines server-based interactive graph visualization

# Key Components and Processes (1 of 2)

- Two data sources:
  - Allscripts Electronic Health Records (EHRs)
  - Allscripts Practice Management (PM)
- Data quality applied during indexing and results retrieval, e.g., for ADDRESS, EMAIL, PHONE and DOB
- Content indexes
- Link Indexes™ to capture relationships among data within and across data sources
  - Simple entities directly connected, e.g., ADDRESS, EMAIL and PHONE
  - Complex entities subject to a composite weighted probabilistic match process, i.e., for POC, PATIENT (a type of PERSON entity)

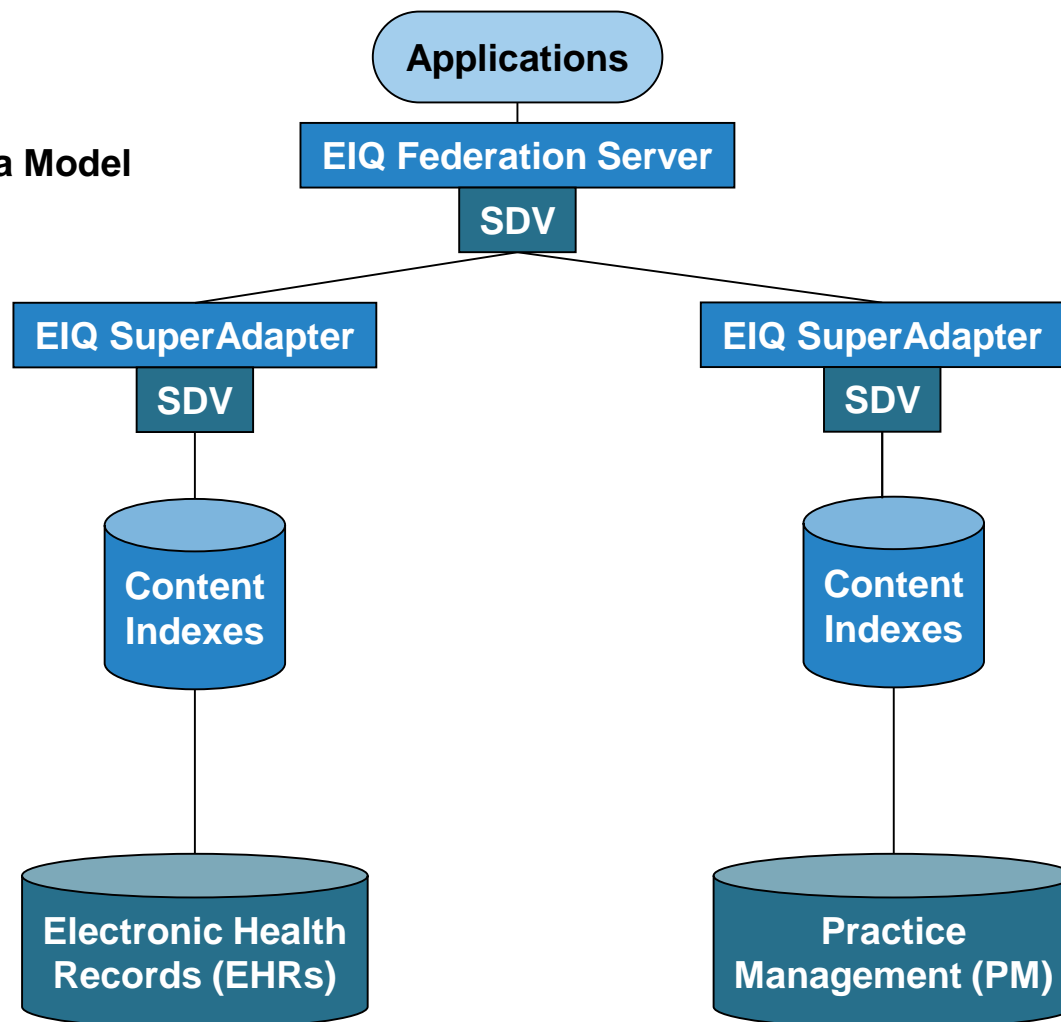
## Key Components and Processes (2 of 2)

- Master data merge process determines best data for PATIENT
  - A single master patient record with a unique PATIENT\_ID is created or updated
- Master patient record or update passed back to each of the data source adapters containing the PATIENT, and the local VMPI created or updated
  - Local adapter master data record created or updated
  - If not already tagged, matched PATIENT identification record indexes tagged with the unique PATIENT\_ID
- Simple SQL queries to use the distributed VMPI to isolate and retrieve any and all PATIENT-related data in sources
- Highly interactive visualization with sections for queries, link graphs, reports, stats and original documents



# Standard SmartData Fabric® (SDF) System Configuration

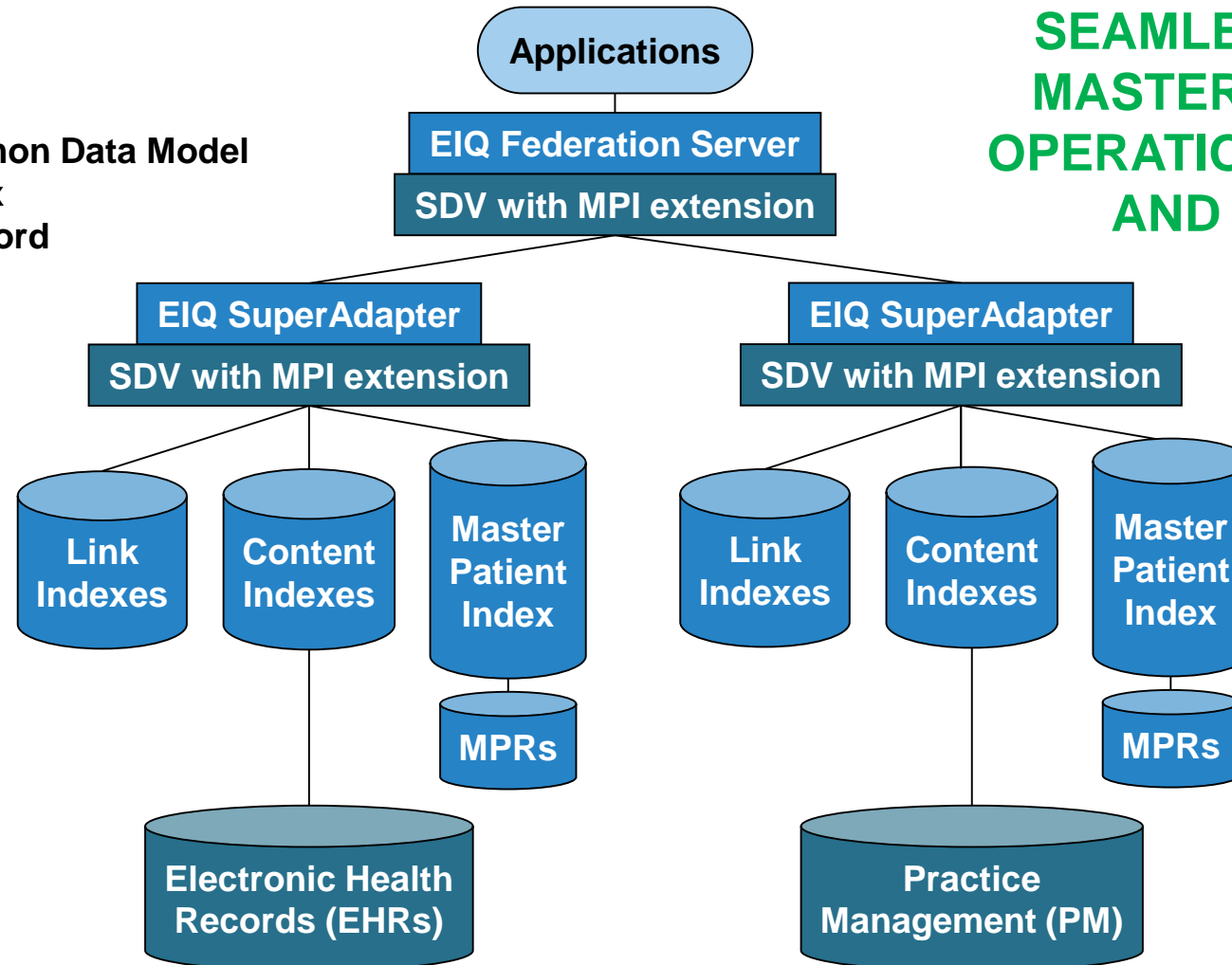
**SDV = Standard Data View  
aka Standard/Common Data Model**



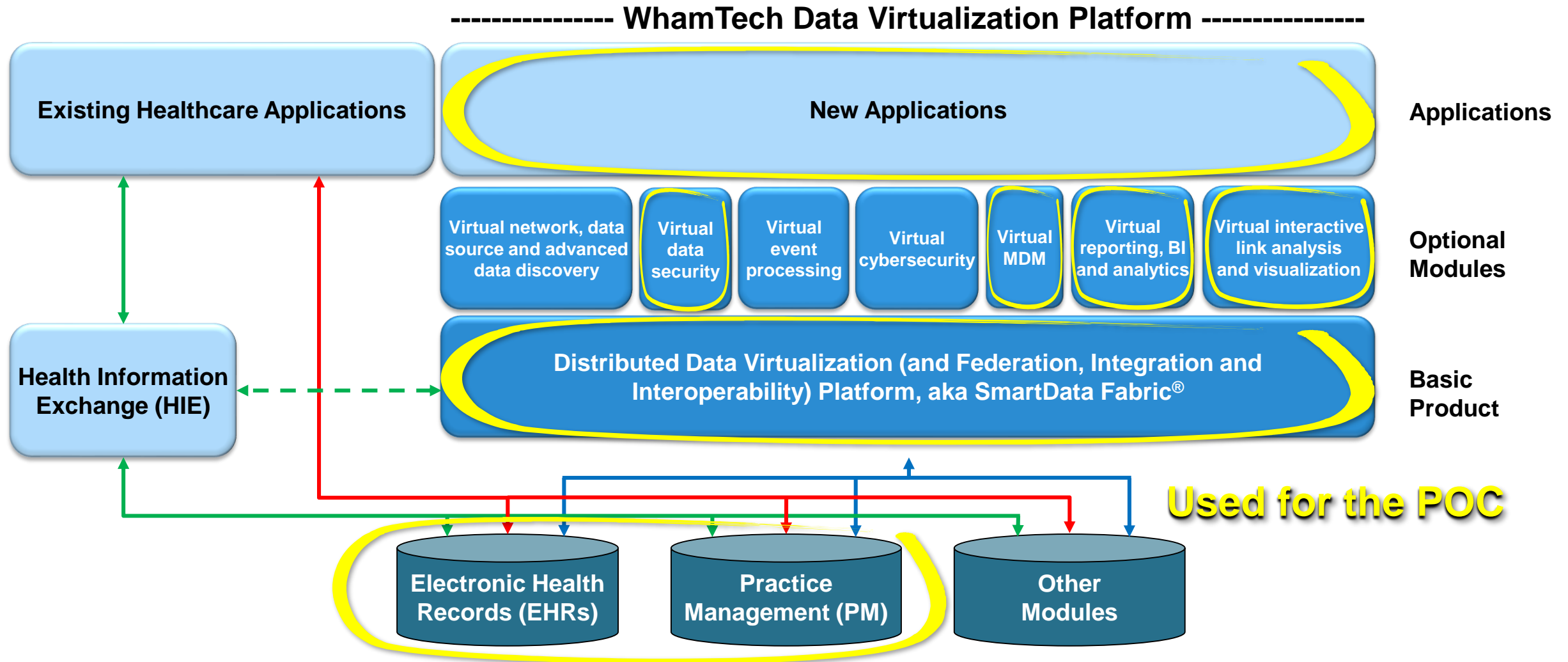
# Distributed VMPI SDF System Configuration

SDV = Standard Data View  
aka Standard/Common Data Model  
MPI = Master Patient Index  
MPR = Master Patient Record

**SEAMLESS INTEGRATION OF  
MASTER PATIENT DATA WITH  
OPERATIONAL/TRANSACTIONAL  
AND ANY OTHER DATA**



# Distributed VMPI Complements Existing Healthcare Applications





# Benefits of Distributed VMPI for Existing Healthcare Applications

- Complements the capabilities of existing applications
  - Could be incorporated as an OEM or existing applications marketed as compatible
- Extends the life of stand-alone applications that might otherwise be replaced by more complete competitor systems by customers
- Enables cooperation among multiple vendors to compete with complete offerings from larger vendors, plus, more capabilities
- Enables HIE capabilities for vendors that have incompatible standards, e.g., non-HL7
  - Serves as a possible stopgap until standards compatible
  - Could be incorporated as an OEM or existing applications marketed as compatible
- Enables future vendor applications that leverage capabilities
  - Could be incorporated as an OEM or new applications marketed as compatible



Master Patient Index

First Name

LISA

Last Name

SSN

Phone

DOB

Search

Electronic Health Records

Practice Management

1. Initial query on “Lisa”, using the form on the left

Query form on the left

Query results shown on the bottom – two different Lisa Taylors are in the VMPI

Entity Properties

Visualization Controls

DOS - 1 +

Query Results

1 to 2 rows of 2 rows. Previous Next

MPI_MDM_ID	MPI_LAST_NAME	MPI_FIRST_NAME	MPI_DOB	MPI_SSNVALUE	MPI_CITY	MPI_ZIP	MPI_STREET1	MPI_STREET2	MPI_STATE	MPI_PHONENUMBER	MPI_EMAILID
26	TAYLOR	LISA	1977-04-12 00:00:00.0	324-33-6543	CORPUS CHRISTI	78405-3511	4401 OLD BROWNSVILLE RD		TX	6263541351	TAYLORFAMILY@GMAIL.COM
27	TAYLOR	LISA	1980-12-12 00:00:00.0	778-54-1124	MIDLAND	79705-4418	901 VETERANS AIRPARK LN		TX	7745682215	PRETTYLISA@YAHOO.COM

Master Patient Index

First Name

LISA

Last Name

SSN

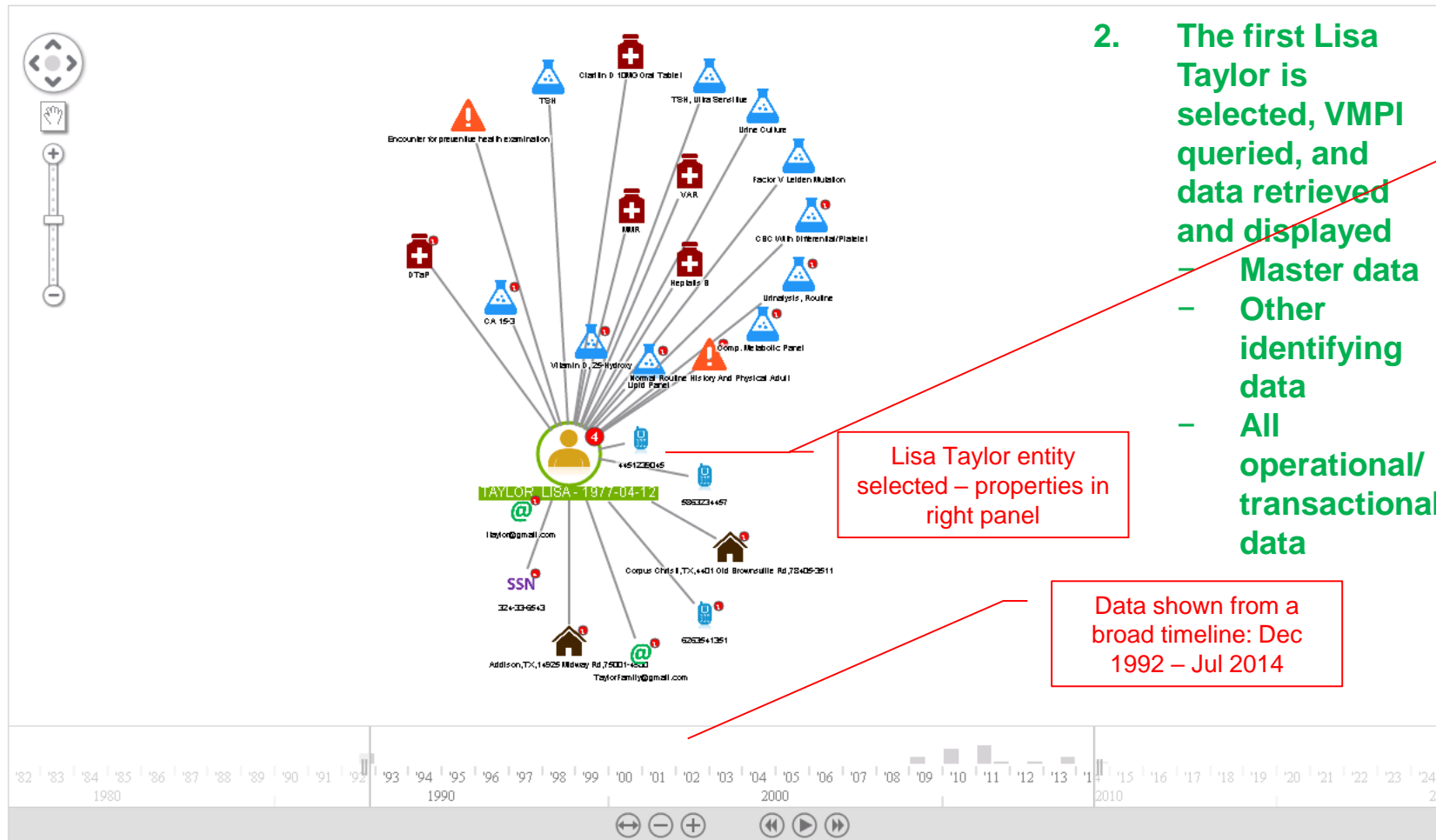
Phone

DOB

Search

Electronic Health Records

Practice Management



2. The first Lisa Taylor is selected, VMPI queried, and data retrieved and displayed
- Master data
  - Other identifying data
  - All operational/transactional data

Lisa Taylor entity selected – properties in right panel

Data shown from a broad timeline: Dec 1992 – Jul 2014

Entity Properties

FIRST\_NAME: LISA

LAST\_NAME: TAYLOR

DOB: 1977-04-12

MDM\_ID: 26

URN: 0x0F000000040001000000000000000000

EntityType: PERSON

ModelId: 0x0F000000040001000000000000000000

NetworkId: 1

DataSource: PM

URN: 0x0D000000120101000000000000000000

EntityType: PERSON

ModelId: 0x0D000000120101000000000000000000

NetworkId: 1

DataSource: WORKS

URN: 0x0E000000120101000000000000000000

EntityType: PERSON

ModelId: 0x0E000000120101000000000000000000

NetworkId: 1

DataSource: WORKS

URN: 0x10000000040001000000000000000000

EntityType: PERSON

ModelId: 0x10000000040001000000000000000000

NetworkId: 1

DataSource: PM

Visualization Controls

DOS

-

1

+

☒ Group Nodes by Value (except for patients nodes)

Query Results

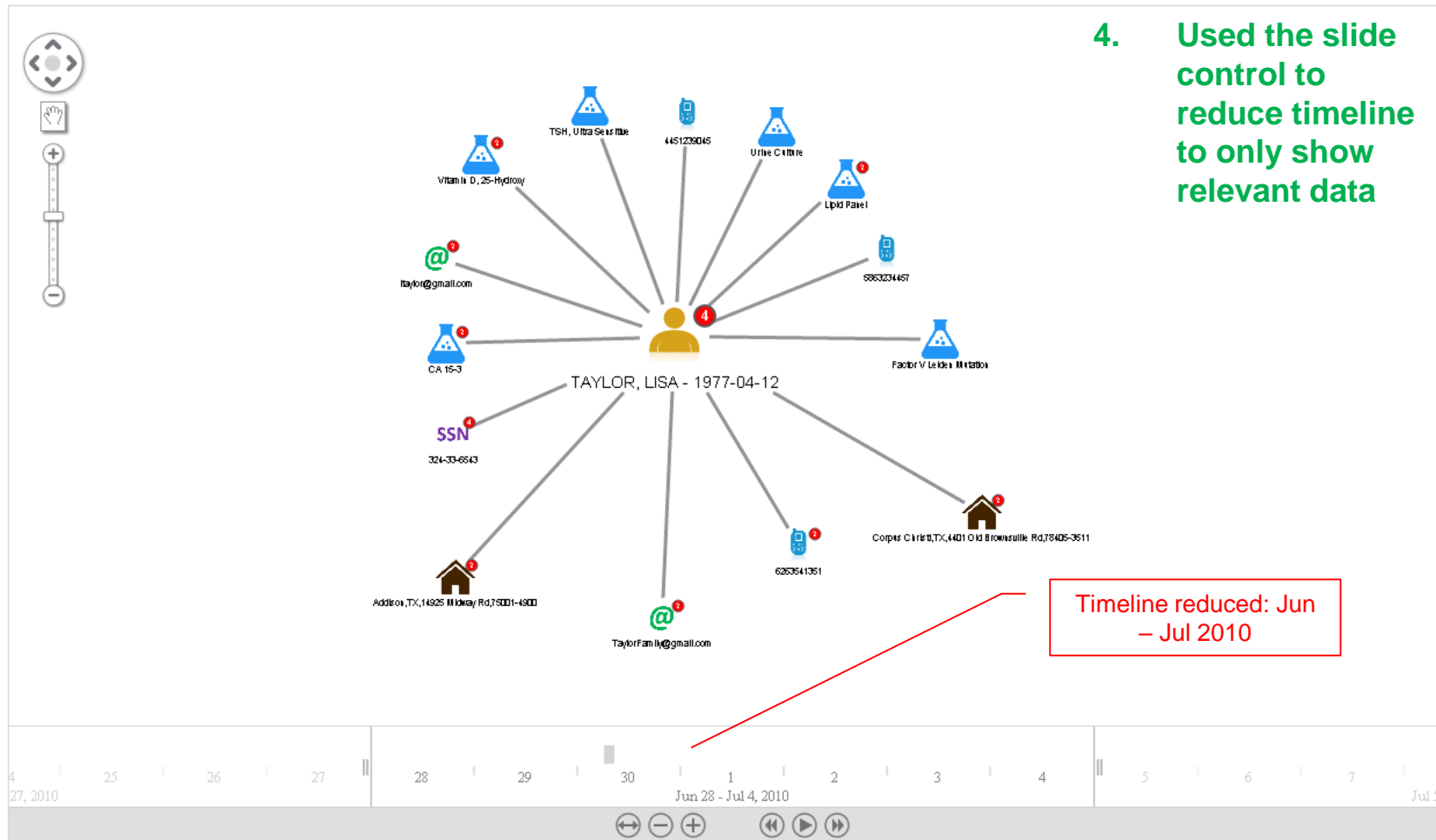
1 to 2 rows of 2 rows.

PreviousNext

MPI_MDM_ID	MPI_LAST_NAME	MPI_FIRST_NAME	MPI_DOB	MPI_SSNVALUE	MPI_CITY	MPI_ZIP	MPI_STREET1	MPI_STREET2	MPI_STATE	MPI_PHONENUMBER	MPI_EMAILID
26	TAYLOR	LISA	1977-04-12 00:00:00.0	324-33-6543	CORPUS CHRISTI	78405-3511	4401 OLD BROWNSVILLE RD		TX	6263541351	TAYLORFAMILY@GMAIL.COM
27	TAYLOR	LISA	1980-12-12 00:00:00.0	778-54-1124	MIDLAND	79705-4418	901 VETERANS AIRPARK LN		TX	7745682215	PRETTYLISA@YAHOO.COM



- Electronic Health Records
- Practice Management



4. **Used the slide control to reduce timeline to only show relevant data**

Timeline reduced: Jun  
– Jul 2010

### Entity Properties

PROBLEM: Limb pain  
PROBELM Date: 2011-06-30 01:08:19.940

```
URN: 0x1100000019010700000000000000000000
EntityType: PROBLEM
NodeId: 0x1100000019010700000000000000000000
NetworkId: 1
DataSource: WORKS
```

### Visualization Controls

DOS - 1 +

☒ Group Nodes by Value (except for patients nodes)

### Query Results

1 to 2 rows of 2 rows.

MPI_MDM_ID	MPI_LAST_NAME	MPI_FIRST_NAME	MPI_DOB	MPI_SSNVALUE	MPI_CITY	MPI_ZIP	MPI_STREET1	MPI_STREET2	MPI_STATE	MPI_PHONENUMBER	MPI_EMAILID
26	TAYLOR	LISA	1977-04-12 00:00:00.0	324-33-6543	CORPUS CHRISTI	78405-3511	4401 OLD BROWNSVILLE RD		TX	6263541351	TAYLORFAMILY@GMAIL.COM
27	TAYLOR	LISA	1980-12-12 00:00:00.0	778-54-1124	MIDLAND	79705-4418	901 VETERANS AIRPARK LN		TX	7745682215	PRETTYLISA@YAHOO.COM



MPI_MDM_ID	MPI_LAST_NAME	MPI_FIRST_NAME	MPI_DOB	MPI_SSNVALUE	MPI_CITY	MPI_ZIP	MPI_STREET1	MPI_STREET2	MPI_STATE	MPI_PHONENUMBER	MPI_EMAILID
26	TAYLOR	LISA	1977-04-12 00:00:00.0	324-33-6543	CORPUS CHRISTI	78405-3511	4401 OLD BROWNSVILLE RD		TX	6263541351	TAYLORFAMILY@GMAIL.COM
27	TAYLOR	LISA	1980-12-12 00:00:00.0	778-54-1124	MIDLAND	79705-4418	901 VETERANS AIRPARK LN		TX	7745682215	PRETTYLISA@YAHOO.COM

Patient 360 View

TAYLOR, LISA

MPI ID: 26      Patient ID's: Works [13, 14], PM [12, 13]

- Dashboard

Allergies

Problems

Medications

Immunizations

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Patient Info

TAYLOR, LISA

Female

1977-04-12 00:00:00.0

4401 OLD BROWNSVILLE RD CORPUS CHRISTI TX 78405-3511

Contact Information

TAYLORFAMILY@GMAIL.COM

6263541351

Diagnoses

POISONING, FOOD, OTHER (BACTERIAL)

Guarantor info

Last Name	First Name	GT Street	Unit	GT City	GT State	GT Zip	Phone	Work Phone	Work Phone Extension	Email
TAYLOR	LISA	14925 Midway Rd		Addison	TX	75001-4900	5863234457			ltaylor@gmail.com
TAYLOR	LISA	4401 Old Brownsville Rd		Corpus Christi	TX	78405-3511	6263541351			TaylorFamily@gmail.com

Preferred Pharmacy

Pharmacy Name	Pharm Street	Unit	Pharm City	Pharm State	Pharm Zip	Prescribe Action
Walgreens Pharmacy	2101 Morgan Ave		Corpus Christi	TX	78405	Sent To Mail
Target Pharmacy	7845 N MacArthur Blvd		Irving	TX	75063	Sent To Mail

Appointment Info

Time	Type	Description	Comments	Scheduled Time
2014-07-10 10:20:00.0	CPE24	Routine Physical Exam	CPE24	2014-07-10 09:40:55.0
2013-07-10 10:20:00.0	CPE	Physical Exam	CPE23	2013-07-10 09:40:55.0
2012-07-10 10:20:00.0	CPE22	Physical Exam	CPE22	2012-07-10 09:40:55.0
2011-07-10 11:20:00.0	CPE21	Physical Exam	CPE21	2011-07-10 09:40:55.0
1997-02-22 10:20:00.0	OV6	Office Visit 6	FEELING DIZZY	1997-02-20 09:40:55.0
1996-07-10 10:20:00.0	CPE	Physical Exam	R HAND SWOLLEN	1996-07-09 09:40:55.0
1992-11-10 10:20:00.0	OV6	Office Visit 6	Flu Shot	1992-10-09 09:40:55.0
1991-07-10 11:20:00.0	CPE	Physical Exam	Face Injury	1991-07-10 09:40:55.0

Policy Info

Abbreviation	Name	Effective Date
BCBTX	Blue Cross Blue Shield Texas	2010-05-01 00:00:00.0
1011	Texas Care	2005-04-01 00:00:00.0
1040	AETNA	1990-08-17 00:00:00.0

Primary Care Physician

First Name	Last Name	Pract Street	Unit	Pract City	Pract State	Pract Zip	Phone
DAVID	SOUTH	N Josey Ln	SUITE 200	Carrollton	TX	75007	6264497350
Bella	Ruse	101 N. Shoreline Blvd.	SUITE 21	Corpus Christi	TX	78401	8654905512

Billing Info

Account Total Balance	Account Insurance Balance	Account Self Balance
5889.0000	5889.0000	5889.0000

Patient 360 View

TAYLOR, LISA

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Allergy Information

Patient ID	Allergy	Status	Category
13	No Known Food Allergies	Active	
14	Morphine Sulfate TBSO	Suspicion	



Patient 360 View

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Patient ID	Name	Category	ProblemType	PRB Onset	PRB Resolution	PRB Status
13	History of	Health Maintenance Concept			Active	142
14	Health Maint.	Health Maintenance Concept			Active	22
14	Health Maint.	Health Maintenance Concept			Active	902
14	Health Maint.	Health Maintenance Concept			Active	332

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Medications

Medication Name	Refill	Start Date	End Date	Prescribed By	Days Supply
VAR	0	1992-11-11 00:00:00.0	1992-11-13 00:00:00.0		2
DTaP	0	1992-11-11 00:00:00.0	1992-11-13 00:00:00.0		2
DTaP	0	2011-07-11 00:00:00.0	2011-07-13 00:00:00.0		2
DTaP	0	2012-07-11 00:00:00.0	2012-07-12 00:00:00.0		1
DTaP	0	2013-07-11 00:00:00.0	2013-07-12 00:00:00.0		1
MMR	0	2014-07-11 00:00:00.0	2014-07-12 00:00:00.0		1

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Immunizations			
Vaccine Category	Medication Name	Immunization Administered Date	Immunization Lot Number
Varicella	VAR	2014-04-06 08:00:00.0	ITM213
Varicella	VAR	2012-04-06 08:00:00.0	OOI453
Varicella	VAR	2012-04-06 08:00:00.0	OOI453
Polio	PPD	2013-04-06 08:00:00.0	NF3456
PPD	VAR	2014-04-06 08:00:00.0	ITM213
PPD	PPD	2013-04-06 08:00:00.0	NF3456
DTP/DTaP	DTaP	2008-11-11 08:00:00.0	WUT43
DTP/DTaP	DTaP	2008-11-11 08:00:00.0	WUT43
DTP/DTaP	DTaP	1998-11-11 08:00:00.0	WRT127
DTP/DTaP	DTaP	1998-11-11 08:00:00.0	WRT127
Hepatitis A	Hepatitis A	1980-11-11 08:00:00.0	IO232
Hepatitis A	Hepatitis A	1980-11-11 08:00:00.0	IO232
Hepatitis B	Hepatitis A	1997-04-06 08:00:00.0	SHSD42
Hepatitis B	Hepatitis A	1997-04-06 08:00:00.0	SHSD42
MMR	MMR	2012-04-06 08:00:00.0	NHFR23
MMR	MMR	2012-04-06 08:00:00.0	NHFR23
MMR	MMR	2011-04-06 08:00:00.0	IEY453
MMR	MMR	2011-04-06 08:00:00.0	IEY453
Influenza	Influenza (Split PF)	2010-04-06 08:00:00.0	URN456
Influenza	Influenza (Split PF)	2010-04-06 08:00:00.0	URN456

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Vitals Info

Name	Value	Performed Date
BMI Calculated	34.83	2011-06-11 00:00:00.0
Systolic	120.2	2011-06-11 00:00:00.0
Diastolic	70.0	2011-06-11 00:00:00.0
Height	62.25	2011-06-11 00:00:00.0
Temperature	99.6	2011-06-11 00:00:00.0
Weight	150.8125	2011-06-11 00:00:00.0
O2 Saturation	99.0	2011-06-11 00:00:00.0
BSA Calculated	3.0	2011-06-11 00:00:00.0
Heart Rate	97.0	2011-06-11 00:00:00.0
BMI Calculated	34.83	2010-06-11 00:00:00.0
Systolic	120.2	2010-06-11 00:00:00.0
Diastolic	70.0	2010-06-11 00:00:00.0
Height	62.25	2010-06-11 00:00:00.0
Temperature	99.6	2010-06-11 00:00:00.0
Weight	145.8125	2010-06-11 00:00:00.0
O2 Saturation	99.0	2010-06-11 00:00:00.0
BSA Calculated	2.0	2010-06-11 00:00:00.0
Heart Rate	94.0	2010-06-11 00:00:00.0

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Lab Orders


PatientID	Order Name	Order Date
13	Factor V Leiden Mutation	2010-06-30 01:08:19.94
13	CA 15-3 (Serial Monitor)	2010-06-30 01:08:19.94
13	Urine Culture	2010-06-30 01:08:19.94
13	Vitamin D, 25-Hydroxy	2010-06-30 01:08:19.94
13	TSH, Ultra Sensitive	2010-06-30 01:08:19.94
13	Lipid Panel	2010-06-30 01:08:19.94
14	Comp. Metabolic Panel (14)	2011-06-30 01:08:19.94
14	Urinalysis, Routine	2011-06-30 01:08:19.94
14	CBC With Differential/Platelet	2011-06-30 01:08:19.94
14	CA 15-3 (Serial Monitor)	2011-06-30 01:08:19.94
14	Lipid Panel	2011-06-30 01:08:19.94
14	Vitamin D, 25-Hydroxy	2011-06-30 01:08:19.94
14	TSH	2011-06-30 01:08:19.94
14	Comp. Metabolic Panel (14)	2009-06-30 01:08:19.94
14	Urinalysis, Routine	2009-06-30 01:08:19.94
14	CBC With Differential/Platelet	2009-06-30 01:08:19.94

Patient 360 View

TAYLOR, LISA

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Patient ID's: Works [13, 14], PM [12, 13]

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### Encounters

Encounter Date	Type
2014-07-10 11:30:00.337	Inpatient
2013-07-10 11:30:00.453	Appointment
2012-07-10 11:30:00.123	Appointment
2011-07-10 11:30:00.01	Inpatient
1992-11-10 11:30:00.0	Appointment

Patient 360 View

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Doc_AccessionNumber	Doc_RecordedDTTM	Doc_DictatedDTTM	Encounter_Date
TX_DOC_12321	2011-07-10 11:30:00.01	2011-07-10 11:30:00.01	2011-07-10 11:30:00.01
TX_DOC_72214	2012-07-10 11:30:00.123	2012-07-10 11:30:00.123	2012-07-10 11:30:00.123
TX_DOC_745455	2013-07-10 11:30:00.453	2013-07-10 11:30:00.453	2013-07-10 11:30:00.453
TX_DOC_743518	2014-07-10 11:30:00.337	2014-07-10 11:30:00.337	2014-07-10 11:30:00.337
TX_DOC_77618	1992-11-10 11:45:00.0	1992-11-10 11:45:00.0	1992-11-10 11:30:00.0



# The End