Electronic Health Records (EHR)
Case Study:

How Southeastern Michigan Health Information Exchange (SEMHIE)
Is Implementing SOA
Based on Model-Driven Message Interoperability™
To Link to the Nationwide Health Information Network (NHIN)

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Object Management Group's SOA in Healthcare Conference
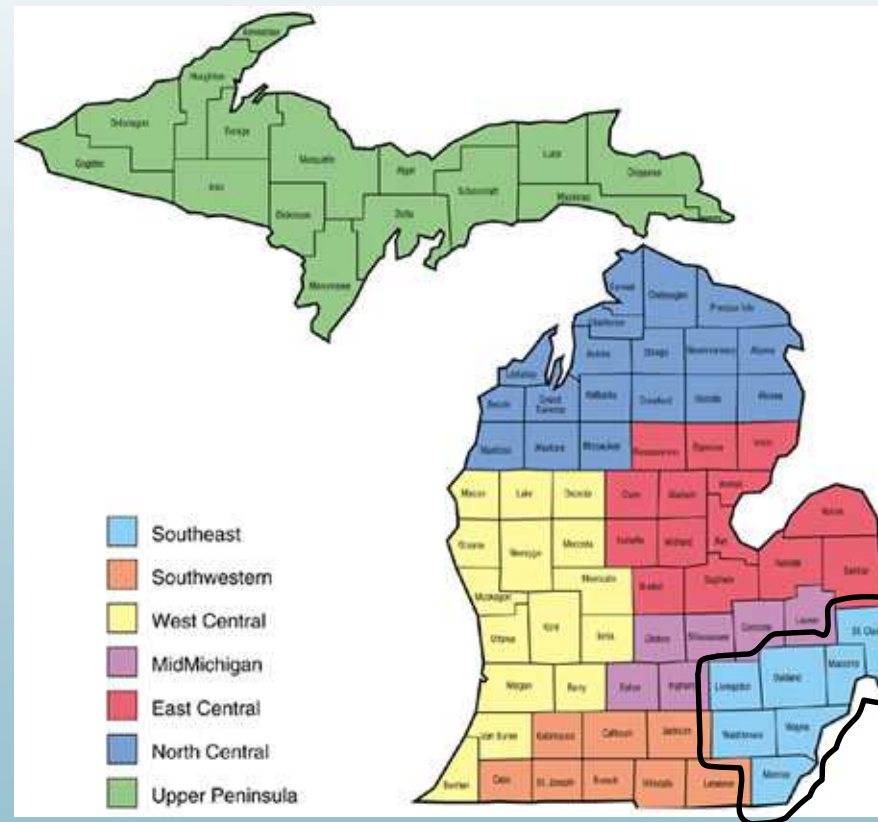Westin Arlington Gateway, Arlington Virginia
July 12, 2010

SEMHIE, SEMHA and SEMBCC:

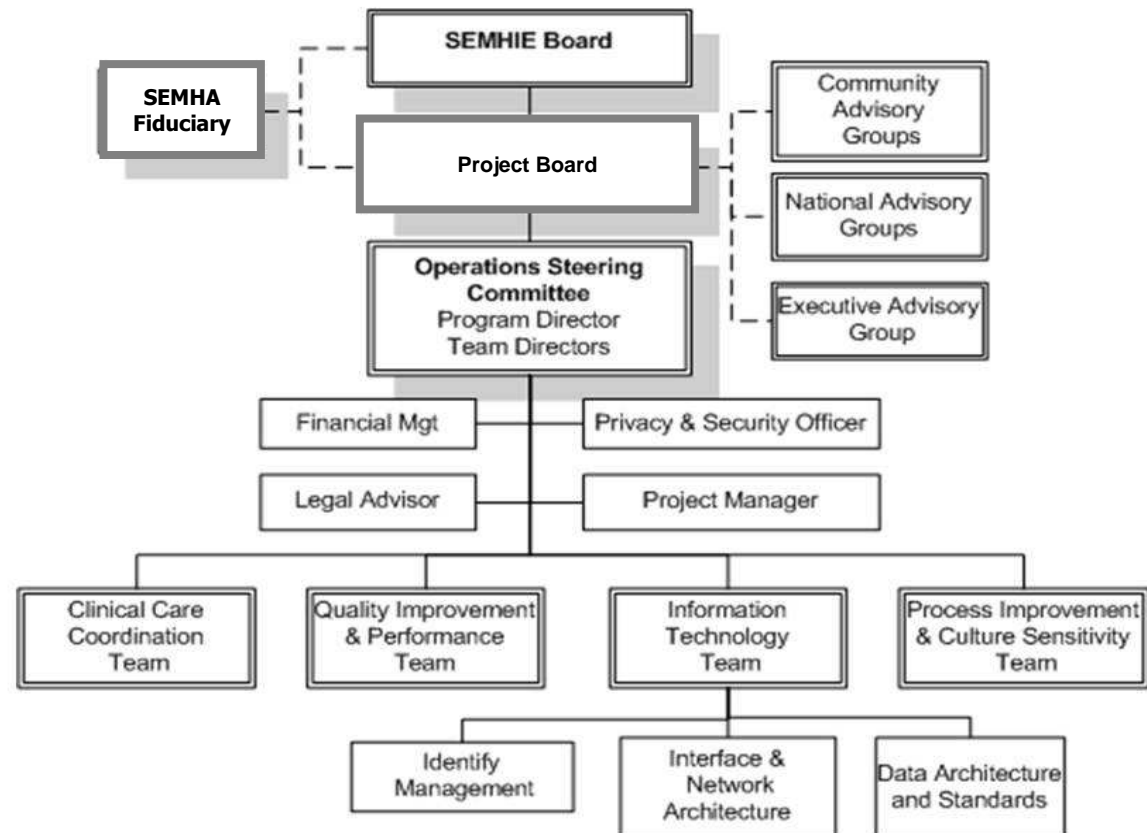## Health Information Exchange in SE Michigan
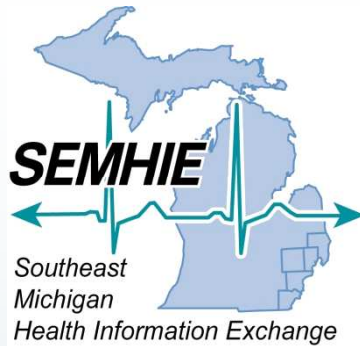
Southeast Michigan Health Information Exchange (SEMHIE)

SEMHIE's Organization Structure

SEMHIE At-A-Glance

- **Non-profit membership corporation**
  - Founded in 2006, incorporated 2008
- **Strong, collaborative leadership** from 60 stakeholders
  - Physicians, 6 major health systems, county medical societies, health plans, QIO, state-wide reference lab, Charter Value Exchange, consumer groups, safety-net organizations, national & state healthcare associations, universities, the US Postal Service, a bank and 3 international employers
- **Brings value, national / international expertise to Michigan**
  - Partners and contributors include national and international industry consortia, modeling and standards bodies, healthcare research groups and vendors
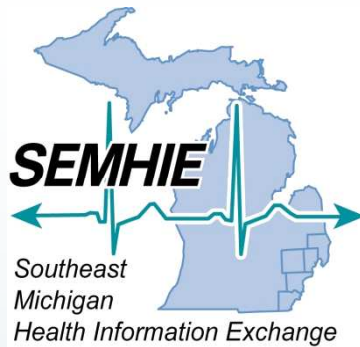
SEMHIE At-A-Glance

- **Large, complex and diverse region**
  - 7 counties in large metropolitan area
  - 14,000+ physician practices, culturally diverse
  - 7 academic and community practice model health systems, including 3 national chains, Top 10 Health System recognition
  - 3 medical schools – 4th under development
  - International boundary with Canada draws patients, employees
  - Large at-risk population speaking 153 languages
  - One of the most ethnically diverse, chronically underserved, and economically disadvantaged communities in the nation

SEMHIE At-A-Glance

- **Leverages Michigan's federally-funded HIE Initiatives**
  - One of 4 sub-state HIEs working on state-level HIE shared services (MiHIN)
  - Participating in Michigan's regional extension center (M-CEITA) leadership
  - Working on health IT workforce initiatives through MCHIT
- **Successful – Grants, Pilots, Contracts**
  - State of Michigan planning grant April '07 - Sept '09
  - HIMSS / GSA e-authentication six-state pilot July '06 – April '07
  - SSA e-Disability Claims with NHIN CONNECT - $2.988 million, 12-month federal contract awarded Feb '10, kick-off July '10

SEMBCC Provider EHR Adoption Rates by Practice Type and in Total*

EHR Adoption	Ambulatory Practice-Based	Hospital-Based	Total
% Adopted	40.3%	92.8%	65.5%
% Non-EHR	59.7%	7.2%	34.5%

* Recent survey (response rate: 67%) of targeted practice locations in the SEMBCC study area (Detroit, Highland Park, Hamtramck, Dearborn and Dearborn Heights) that was conducted by the Michigan State University Institute for Health Care Studies (IHCS) reveals that **the overall adoption rate for EHR is 65.5 percent among area hospitals and ambulatory practice-based physicians**
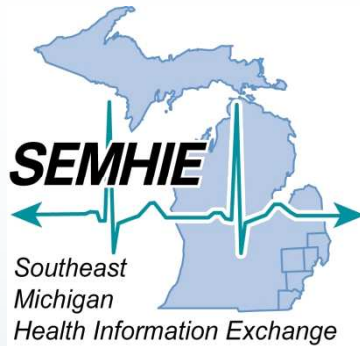
SE Michigan is Advanced in Use of EHR, e-Prescribing

Michigan ranks 3rd in the nation in e-Prescribing the nation

SEMI, launched in 2005 to promote e-Prescribing among physicians in Southeast Michigan, is a coalition including:

General Motors, Ford Motor Company, Chrysler Group LLC, the United Auto Workers, Blue Cross Blue Shield of Michigan, Health Alliance Plan, Henry Ford Medical Group, Medco Health Solutions, Inc. and CVS Caremark Corporation

Through December 31, 2009, nearly 5,000 physicians have enrolled in SEMI, generating more than 18.2 million electronic prescriptions.

SEMHIE's Unique Technical Approach

- Neutral, trusted, standards-based exchange
  - Multiple vendors, multiple products & services
- Trusted computing environment
- Advanced privacy and security framework
  - Data-centric security
  - Roles-based access control
  - Agreed upon policies at the business level in document form
  - Policies based on framework of trust assurance that is articulated and understood, with rules that are enforced

SEMHIE's Unique Technical Approach

- SEMHIE is working with experienced providers of security & privacy technologies in the public and private sector
  - ANSI X9 (National Standards Body of Financial Services Industry)
  - FSTC (Financial Services Technology Consortia)
  - OMG (Object Management Group)
  - HIMSS IHE (Healthcare Information & Management Systems Society)
  - Federal Reserve Banking System
  - United States Postal Service
  - Kantara Initiative

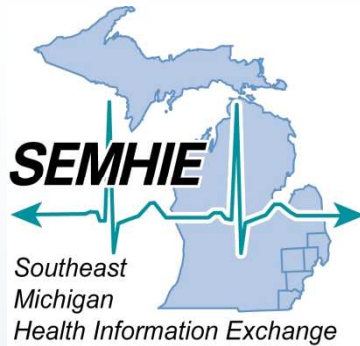# Michigan Goes to Capitol Hill - SSA Partners, too

Dr. Marsha Rappley, Dean, College of Human Medicine, MSU; HH; Denise Holmes, MCHIT & Assoc. Dean, MSU; Janet Olszewski, Dir, MI Dept of Community Health; Ron Geary, USPS; Stephen Ranzini, University Bank; Catherine Evans, Sun Microsystems; Richard Soley, Pres., OMG; Brett McDowell, Exec Dir, Kantara Initiative; Mick Talley, University Bank; Ken Theis, CIO, State of Michigan; Clayton Bonnell, USPS
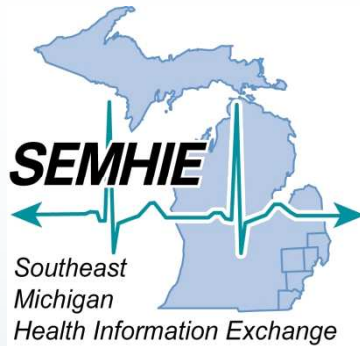
Jim Borland, Healthcare Advisor to SSA Comissioner, Speaks at Michigan Day on Capitol Hill, Sept 25, 2010

$17.4 Million Awarded by SSA for 15 National e-Disability Contracts:

1. **Cal RHIO**, San Francisco, CA - $1,625,000

2. **CareSpark**, Kingsport, TN - $1,363,000

3. **Center for Healthy Communities**, **Wright State University, Healthlink**, Dayton, OH - $999,000

4. **Central Virginia Health Network / MedVirginia**, Richmond, VA - $1,139,000

5. **Community Health Information Collaborative (CHIC)**, Duluth, MN - $977,000

6. **Douglas County Individual Practice Association**, Roseburg, OR - $502,000

7. **EHR Doctors Inc.**, Pompano Beach, FL - $1,000,000

8. **HealthBridge**, Cincinnati, OH - $1,400,000

SEMHA/SEMHIE Received the Largest Contract Award:

9. **Lovelace Clinic Foundation** (LCF), Albuquerque, NM - $1,083,000

10. **Marshfield Clinic Research Foundation**, Marshfield, WI - $998,000

11. **Memorial Hospital Foundation & Memorial Hospital of Gulfport Foundation**, Inc., Gulfport, MS - $1,100,000

12. **Oregon Community Health Information Network (OCHIN)**, Portland, OR - $284,000

13. **Regenstrief Institute, Inc**, Indianapolis, IN - $350,000

14. **Science Applications International Corporation (SAIC),** Reston, VA - $1,587,000

15. **Southeastern Michigan Health Assoc.**, Detroit, MI - **$2,988,000**
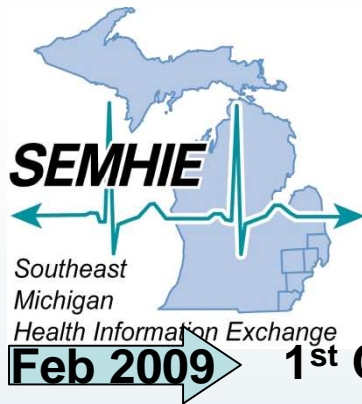
SEMHIE – SSA Timeline

Feb 2009   **1st Contacts - HIMSS AC**

May 2009   **Detroit meeting with Jim Borland & staff**

June 2009   **Washington D.C. meeting at GHIT**

July 2009   **SSA issues RFI**

Aug 2009   **SEMHIE responds to RFI, gets partners**

Sept 2009   **SSA issues RFP, SEMHIE responds, Michigan Day Borland speech**

Feb 2010   **SSA announces 15 awards, including $2.988 million to SEMHIE**

March 2010   **SEMHIE accepts award, organizes**

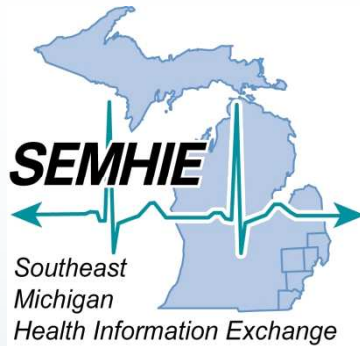**July 2010**   **SEMHIE kick-off scheduled**

June 2011   **12-month project complete**

SEMHIE's SSA Partners

- NHIN developers
  - CNSI, CSC, OMG and Sun/Oracle
- International experience
- Leaders in industry consortia and standards bodies
- Significant resources
- Pro bono contributions
- Committed to Michigan

SEMHIE's SSA Partners

- SEMHIE will start with two health system partners with heavy annual disability claims volumes
  - Henry Ford Health System
  - Oakwood Health System
- SEMHIE's SSA provider business model will be designed and tested by all 6 health systems and selected physician practices so that SEMHIE will be ready for post-contract regional implementation
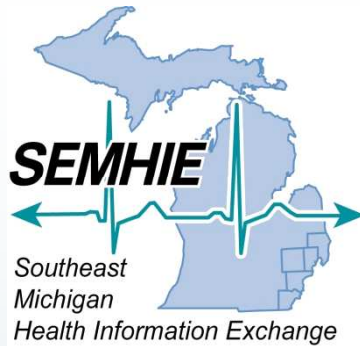
SEMHIE's SSA 12-Month Contract

- Process e-disability claims
- Exchange medical evidence
  - Demographics, allergies, problem lists, lab and radiology results and other key clinical data
- Use standard Continuity of Care Document (CCD) format
- Through SEMHIE's National Health Information Network (NHIN) Gateway
- To the Social Security Administration

SEMHIE SSA e-Disability Claims Project: Benefits

- Projected to reduce time, labor, cost required by providers and SSA to get data required for review of disability claims from 457 day national average to less than 2 days
- Quicker eligibility determination for applicants in bad economy
- Detroit Free Press last month reported that over 40,000 disability claims await final determination in the Detroit area
- Provides structured data for SSA evidence review and analysis
 - SSA has sea of paper and images / PDFs, wants to modernize

SEMHIE SSA e-Disability Claims Project: Benefits

- **Standards and Meaningful Use**
  - Meets known meaningful use criteria for interoperability
  - Continuity of Care Document (CCD) format
  - Standard Patient Consent format approved by HITSP
  - Uses NHIN Connect, 1st Federal Agency to participate in NHIN
- **$2.988 million funding from SSA (largest award)**
- **Will not decrease reimbursement for data gathering**
- **SSA/MedVirginia study (Kay Center for eHealth Research) shows significant ROI to providers ($2.1 million)**

SEMHIE – SSA:
Provider Information Flow*
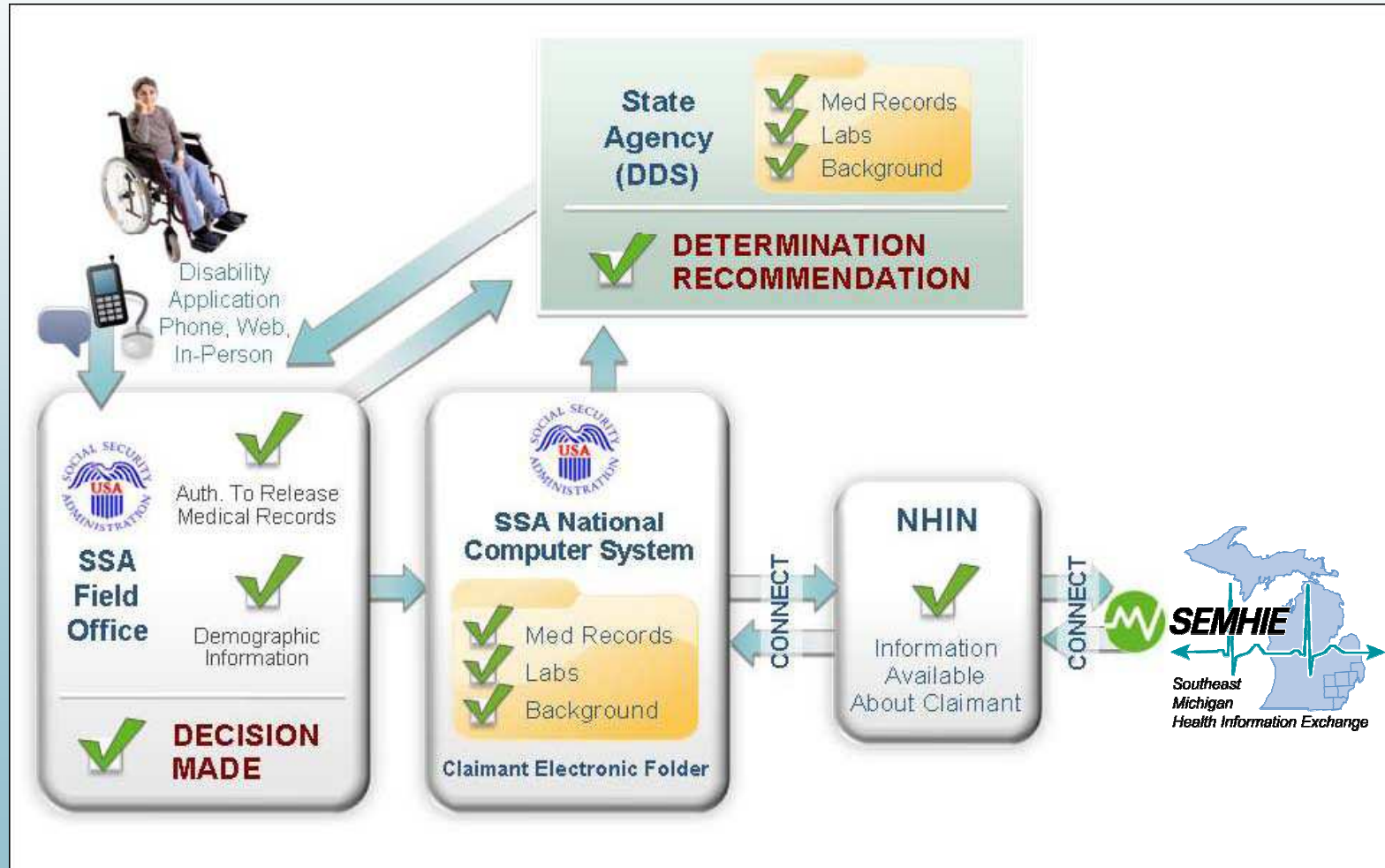
Goals of the SSA Contract:

- Replace "paper" with electronic filing
- Speed up the process of filing and reduce cumbersome paperwork
- Speed up the investigation process by reducing paper
- Utilitize the National Healthcare Information Network (NHIN) for federal government agency transactions

Challenges:

- Data must be shared from multiple sources within the "enterprise"
- Data must be shared across networks
- Data must be shared in a secure environment to maintain privacy and regulatory requirements
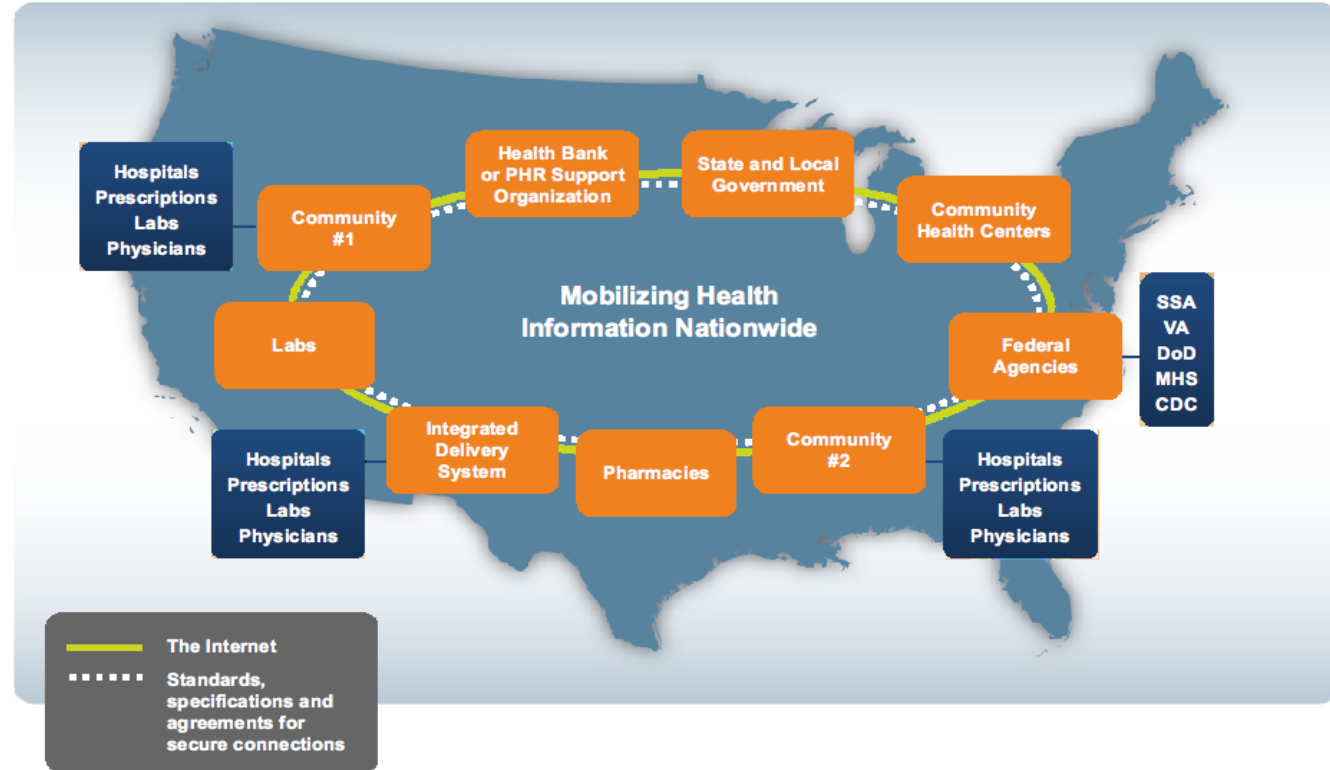
3-Part Problem Approach:
HIE as Gateway

- Extraction of the data

- Conversion of the data to appropriate format

- Transport & communication of the data in an agreed upon set of procedures, to facilitate a secure environment

# The SSA Project Prepares SEMHIE For Participation in the NHIN

A Network of Networks

Mobilizing Health Information Nationwide

Hospitals Prescriptions Labs Physicians

Community #1

Health Bank or PHR Support Organization

State and Local Government

Community Health Centers

Labs

Federal Agencies

SSA VA DoD MHS CDC

Hospitals Prescriptions Labs Physicians

Integrated Delivery System

Pharmacies

Community #2

Hospitals Prescriptions Labs Physicians

— The Internet

···· Standards, specifications and agreements for secure connections

A collection of standards, protocols, legal agreements, specifications, and services that enables the secure exchange of health information over the Internet
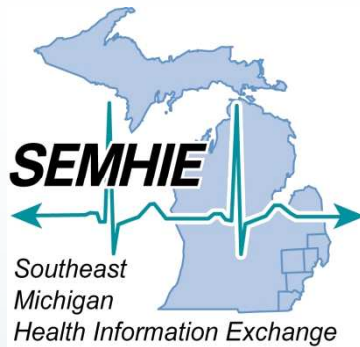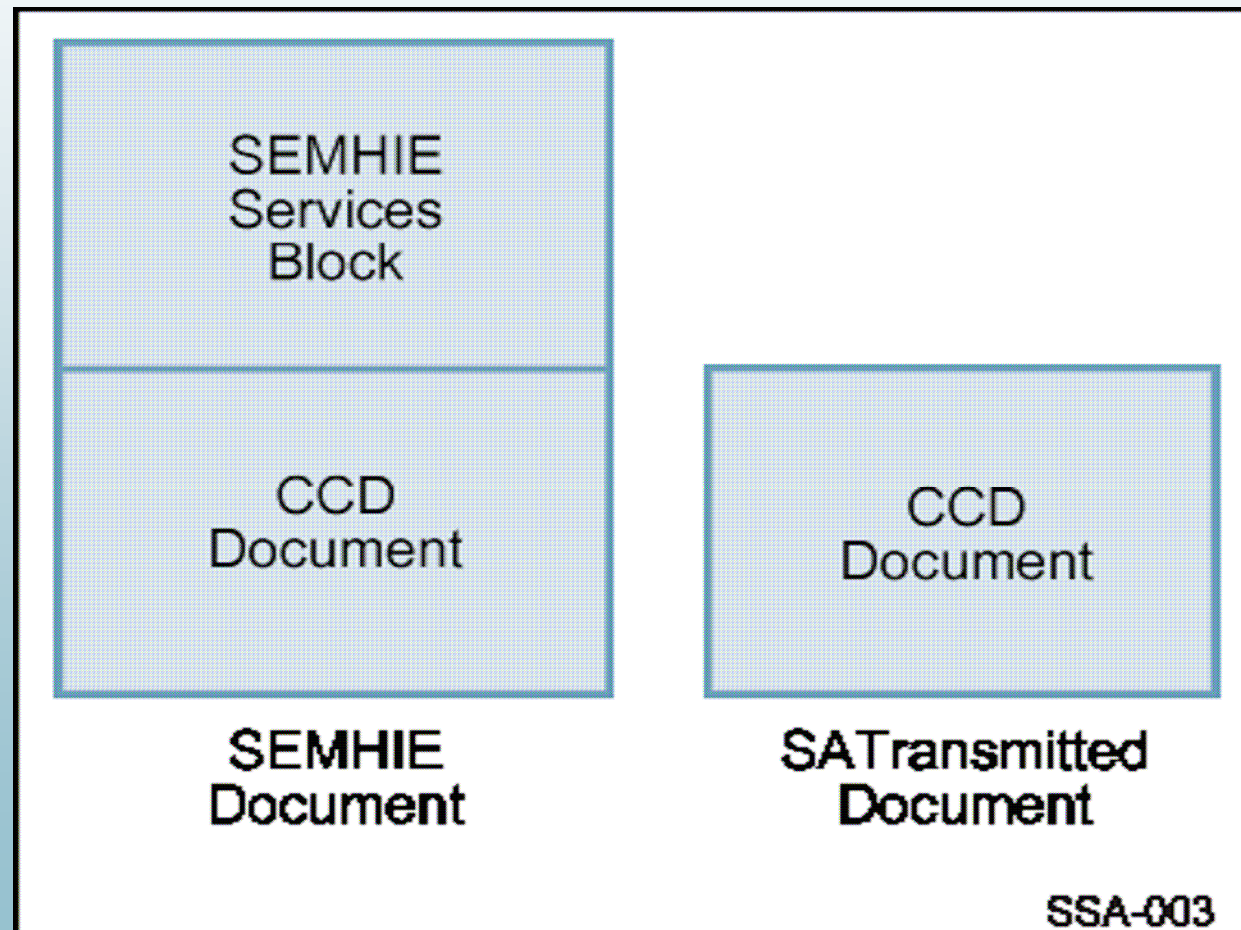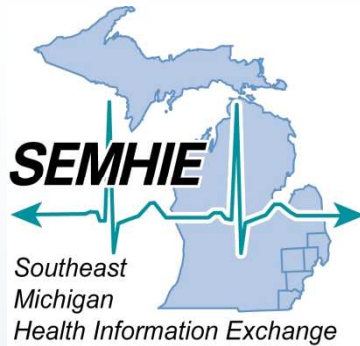
Overview:
SEMHIE's SSA & NHIN Design

SSA-002
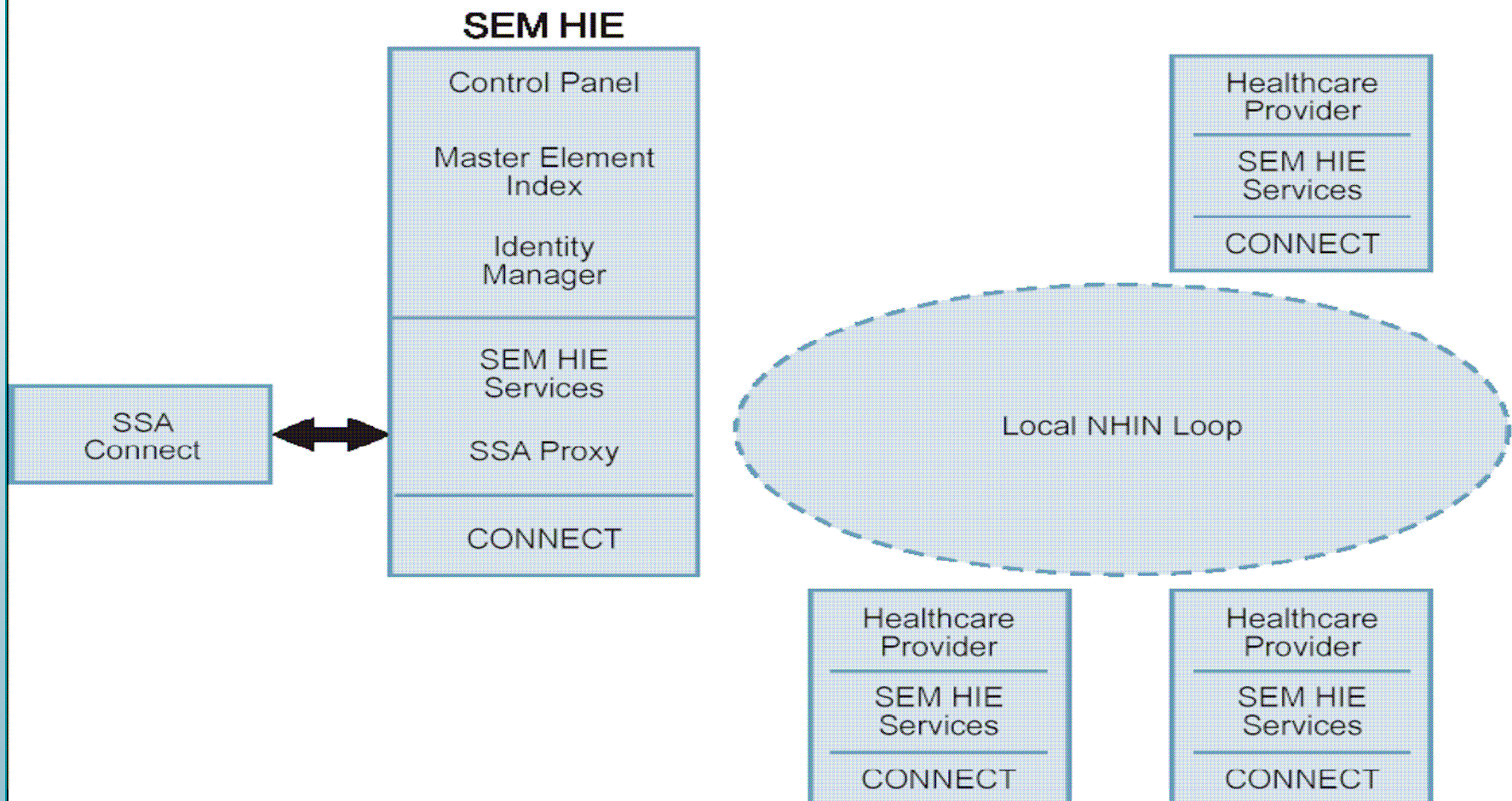
The SEMHIE Document Payload

SEMHIE Services Block

- The SEMHIE Services Block is an additional XML document section that can support the following Services:
  - Efficient data mapping and creation of valid CCD documents (using OMG's MDMI standard)
  - Integrated identity management
  - Data-centric security and multi-level encryption

Two Major Areas of the Project – Technical Perspective

- The NHIN gateway and software architecture
  - NHIN CONNECT
  - Record Locater Service
  - Master Patient Index
  - Hospitals - NHIN edge devices
- The CCD/information formatting and payload
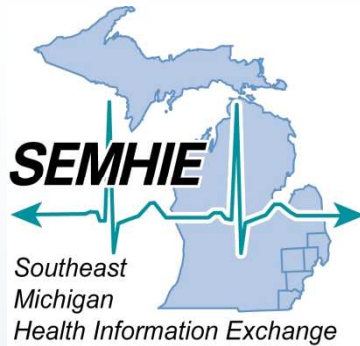 - Integration software / capability to define and map EHR data to CCD
  - CCD generation

Required Elements for SSA

- **Messaging Platform**
  - Authorization Framework
  - Subject Discovery
  - Query For Documents
  - Retrieve Documents
  - Audit

Why Use SOA and MDMI for SEMHIE?

- SEMHIE's 6 health system and physician participants use many different vendor products and platforms for EHR, specialty systems and intra-organizational connectivity
  - Epic, Cerner, Siemens (Soarian, Invision, MedSeries4), McKesson, GE Centricity, CarePlus Classic, CarePlus^{NG} ; Allscripts, Practice Partners, Misys, eClinical Works, NextGen, Greenway; Emergisoft, EPIC ED, Cerner First Net, EMSTAT, T-System/EV, Picis PulseCheck and LYNX; Cielo, WellCentive and many other registries; RelayHealth, Medicity.
- Using flexible, scalable, cost-effective and standards-based architectures and products is critical to successful bi-directional exchange across the region, state and nation.

SEMHIE's Underlying SOA is Critical to Success of Clinical Objectives

- **SEMHIE will create a comprehensive, cooperative network of points of care that services the target population**
  - Technology and standards are evolving and changing
  - Healthcare delivery models are changing
  - Resulting environment will serve as a viable platform for future SEMHIE initiatives, and as a model for other HIEs

- **We have chosen the SOA approach because:**
  - It protects and leverages existing IT infrastructure through utilization of intelligent gateways to common services
  - It is least costly to implement, both in time and money
  - It is highly scalable, easily accommodates addition of new entities, and allows for federation to other established networks

SEMHIE's Underlying SOA is Critical to Success of Clinical Objectives

- Our design is heavily influenced by and conforms to open industry standards for interoperability and information exchange

- Existing gateway technology and available services will be used to populate this architecture

- SEMHIE's use of open standards allows us to leverage work done in other areas and by other institutions
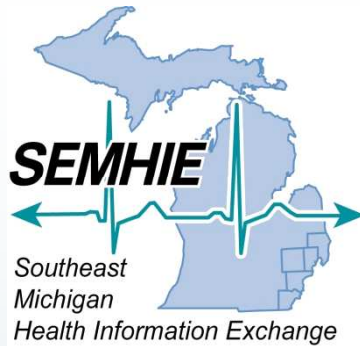
MDMI Uses a Hub & Spoke Approach to Mapping

- Today's bilateral and proprietary mapping approaches:
  - From A to B: Take first left, go one mile, turn right at the lights…
  - If you have <u>100</u> different formats that want to get to each other, each will need 99 sets of procedural directions - **9,900** total

- Directions using a declarative map
  - Each defines its relationship to one ***common point*** – such as between their location, and the town center. (between their data format and the agreed domain dictionary)
  - Combining any <u>two</u> maps creates an avenue for exchange.
  - Each of 100 supports only <u>one</u> Map - **100** total

MDMI Uses a Hub & Spoke Approach to Mapping

- Each new member of a community need only create a map from each of their formats to the agreed common dictionary, and they can begin to exchange data with all other members.

- Using MDMI as the quality control process ensures that <u>every</u> SEMHIE participant, from member 1 to member 10,000+ will be exchanging data that is appropriately understood by each intended recipient
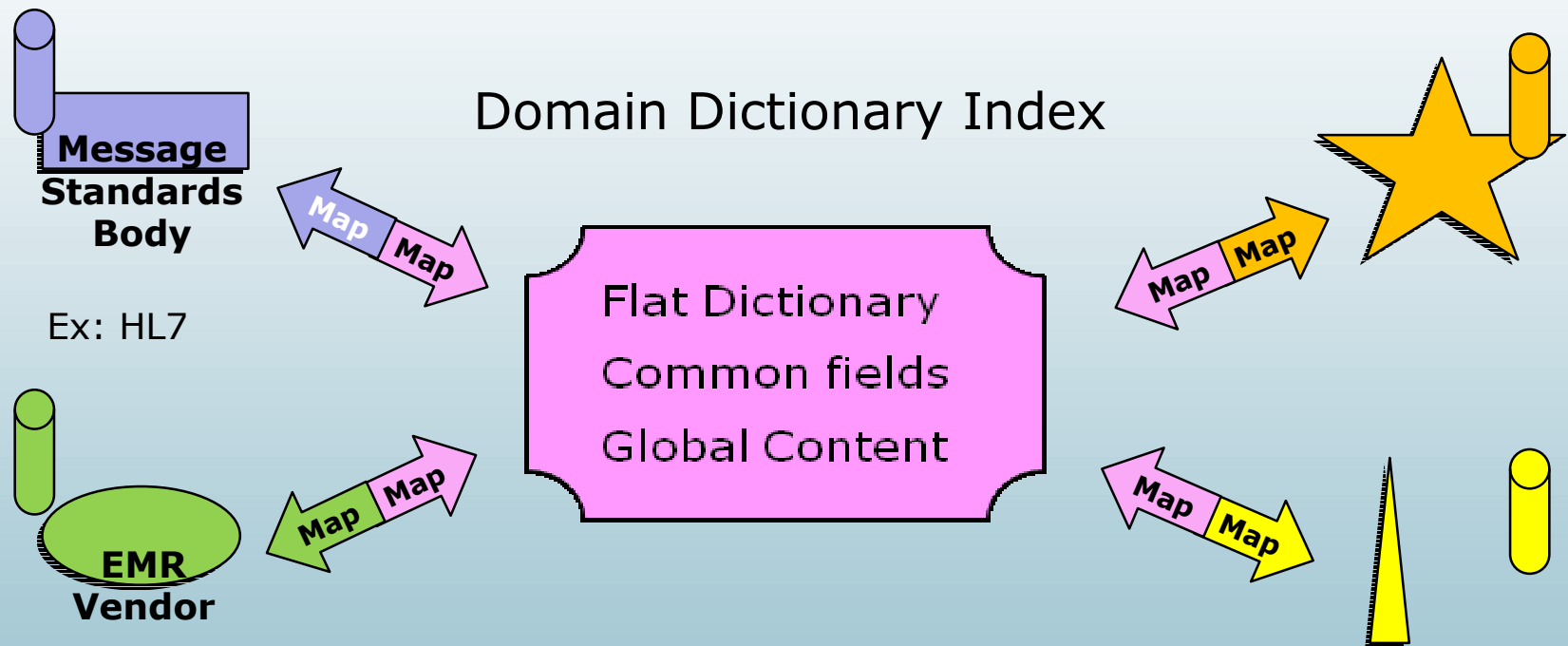
MDMI means Scalability!

Why Use MDMI?

- ## Use of MDMI eliminates all conversion programs
  - Conversion will be done by runtime swallowing of the sender's message, the sender's map, and the recipient's map = yielding a message that has been converted to the recipient's format
  - This will save untold millions of dollar's of the effort of building and supporting conversion programs
- ## Allows new members to participate in the interoperability design in a matter of days, instead of months
- ## Allows all SEMHIE members to exchange data, via NHIN, with government agencies, other HIES, public services, etc.

Step 1 – Create the Map

Domain Dictionary Index

Message Standards Body

Ex: HL7

EMR Vendor

Map Map

Map Map

Map Map

Map Map
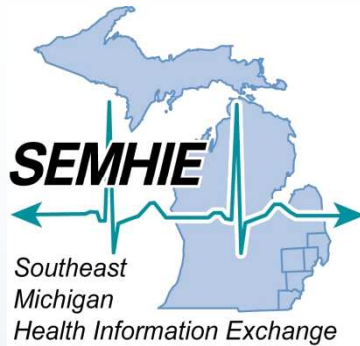
Flat Dictionary
Common fields
Global Content

Each participant builds and maintains **_ONE_** map of the data elements of their messages to the domain dictionary.

Message standards bodies & vendors also create Maps to the industry dictionary
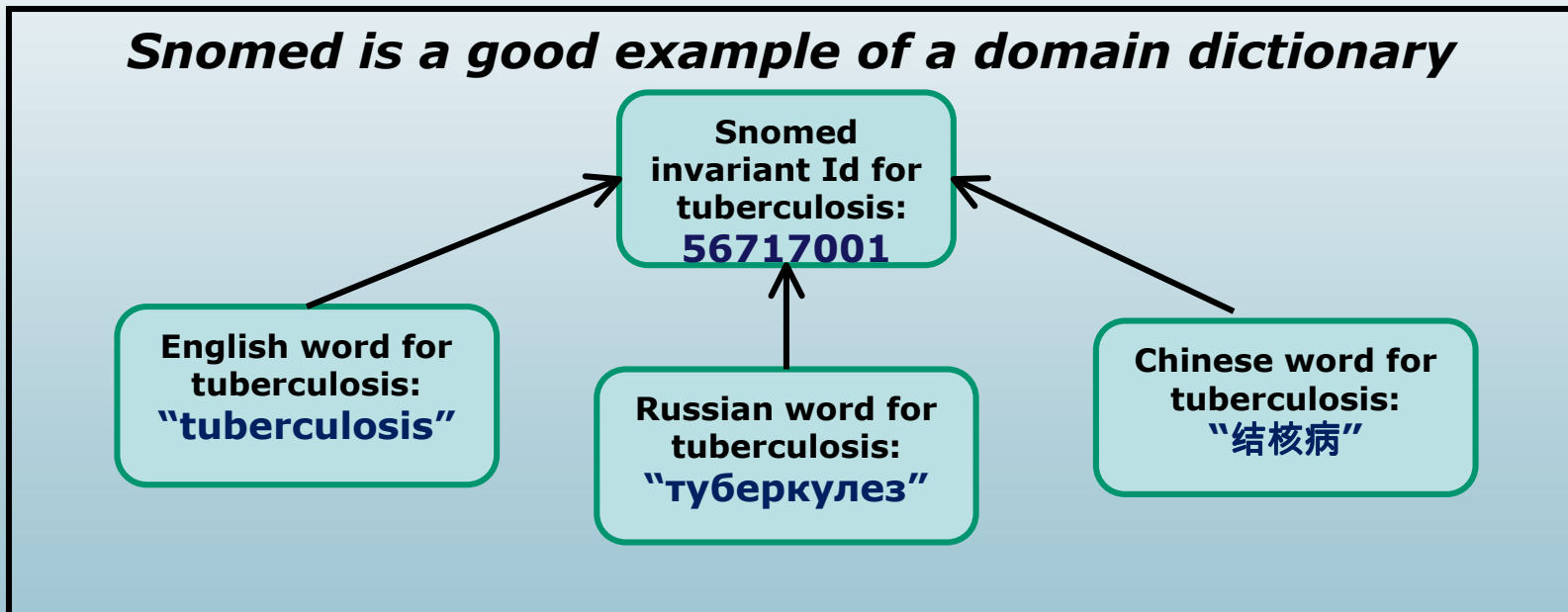
Step 2 – Message conversion
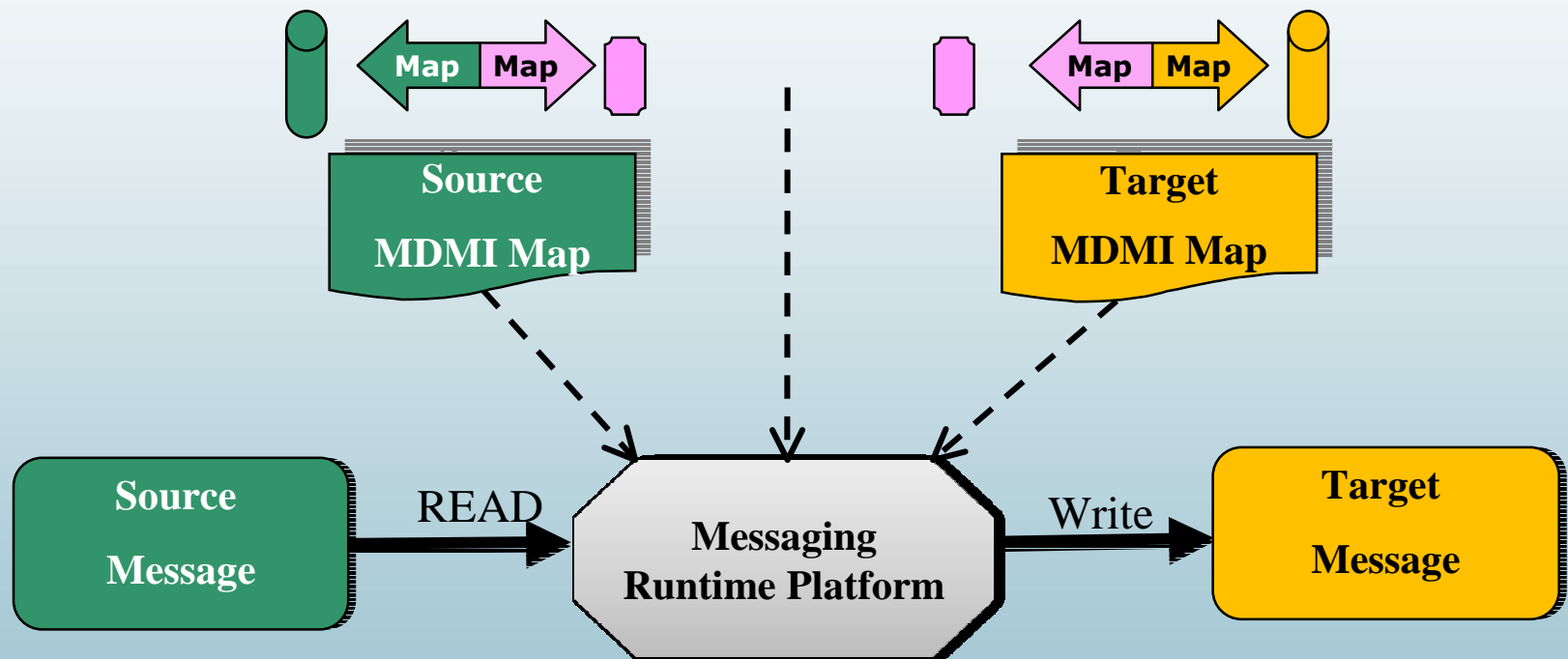
Domain Dictionary Index – the Common Point

- The Domain dictionary/index contains a set of independent business elements that represents the "concepts" or attributes in a domain
  - It is similar Webster's dictionary for English speech
- The Domain dictionary's purpose is to ensure semantic interoperability
  - All physical references to a concept will be mapped to the same entry.
  - A dictionary/index entry needs to have an invariant, permanent id.

Domain Dictionary Index – the Common Point: Snomed Example


Snomed is a good example of a domain dictionary

Snomed invariant Id for tuberculosis: **56717001**

English word for tuberculosis: **"tuberculosis"**

Russian word for tuberculosis: **"туберкулез"**

Chinese word for tuberculosis: **"结核病"**

MDMI:
Simplicity, Flexibility and Standards Key for SEMHIE Interoperability

- SEMHIE will provide a domain dictionary/index for all of the independent semantic elements in the CCD

- Members do not need to know anything about the CCD, its complexity or format

  - They only need to know their own message or data formats and the appropriate entries in the SEMHIE Data Dictionary

- Once members have mapped their internal formats to the HIE dictionary, they will be able to exchange data with all other members that have also mapped their formats to the SEMHIE dictionary
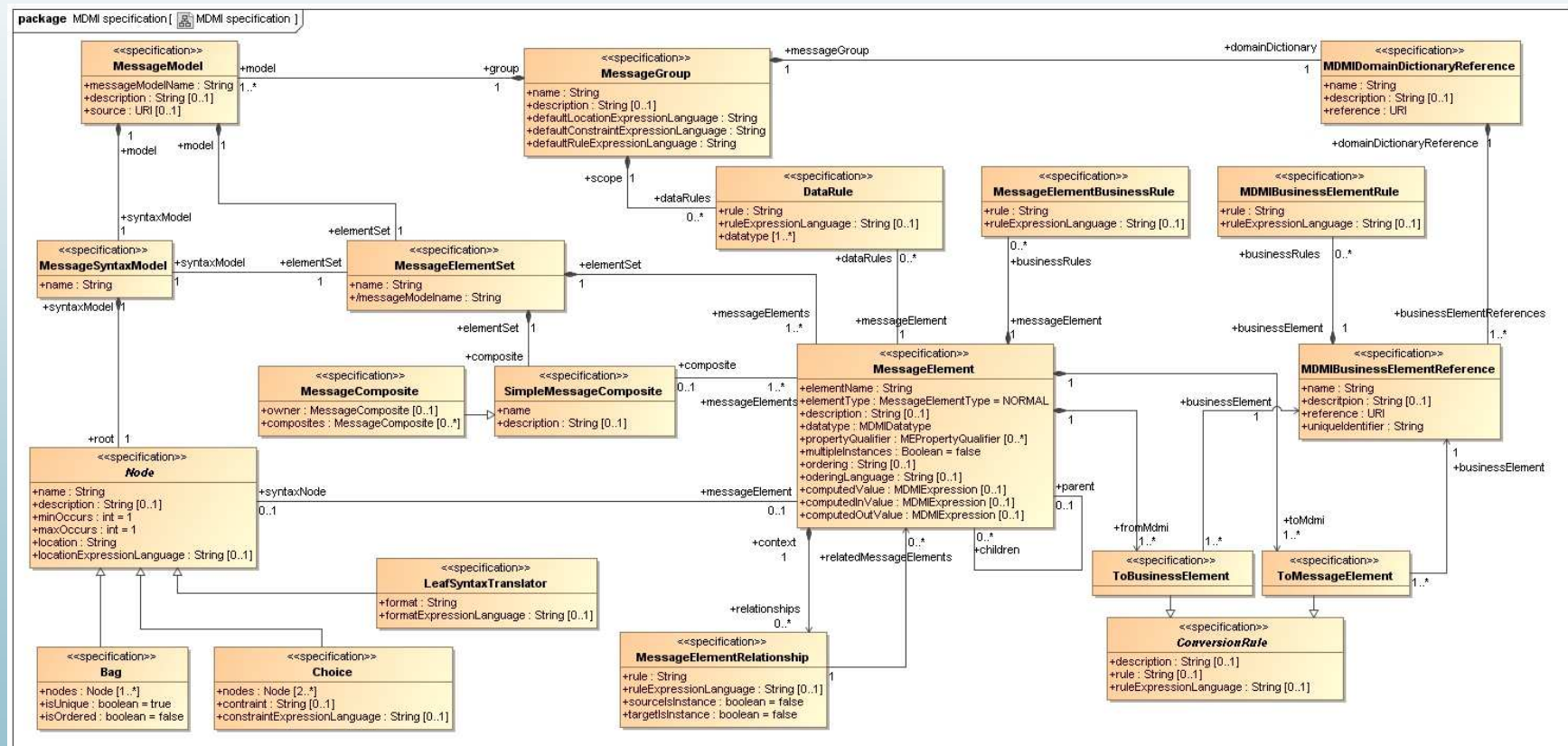
MDMI:
Simplicity, Flexibility and Standards
Key for SEMHIE Interoperability

- Message conversions can take place at:
  - Originator's site
  - Receiver's site
  - Both sites – send message in industry standard
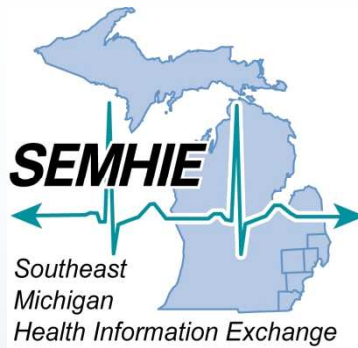
MDMI Specification

SEMHIE – What's Next?

- Share clinical information between
  - Emergency departments, federally qualified health centers, free clinics and medical home providers in the 7-county metropolitan Detroit area
- Goals:
  - Provide complete clinical information on patients wherever they have sought care
  - Improve treatment settings for the underserved population
  - Reduce the number of inappropriate readmissions
- Focus:
  - Reduce incidence of diabetes through improved patient / provider education, monitoring and follow-up
  - Provide quality performance metrics for managing population health and regional cost reductions
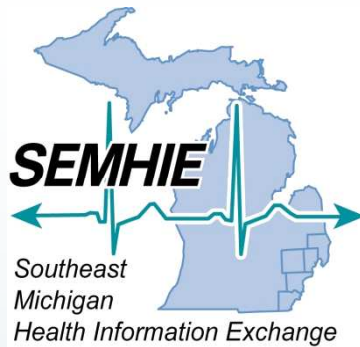
SEMHIE – What's Next?

- Outcome:
  - Help all providers cheaply and easily and securely share the information needed to provide high-quality care for their patients
- Technology:
  - Continue to build out exchange
  - Use CCD, standards, modeling and infrastructure from SSA initiative
  - Continue emphasis on roles-based identity assurance and other advanced security technologies
  - Evaluate e-billing, e-payment and emergency responder options
- Begin dialog with VA facilities in Detroit, Ann Arbor
- Funding possibilities: Beacon2 ??, investors
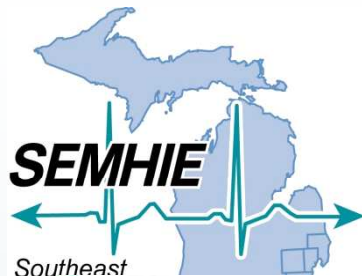
Some of SEMHIE's Beacon Project Vendor Partners

- CNSI
- CSC
- Object Management Group (OMG)
- Oracle (formerly Sun Microsystems)
- Thomson Reuters Healthcare
- CareEvolution
- Picis
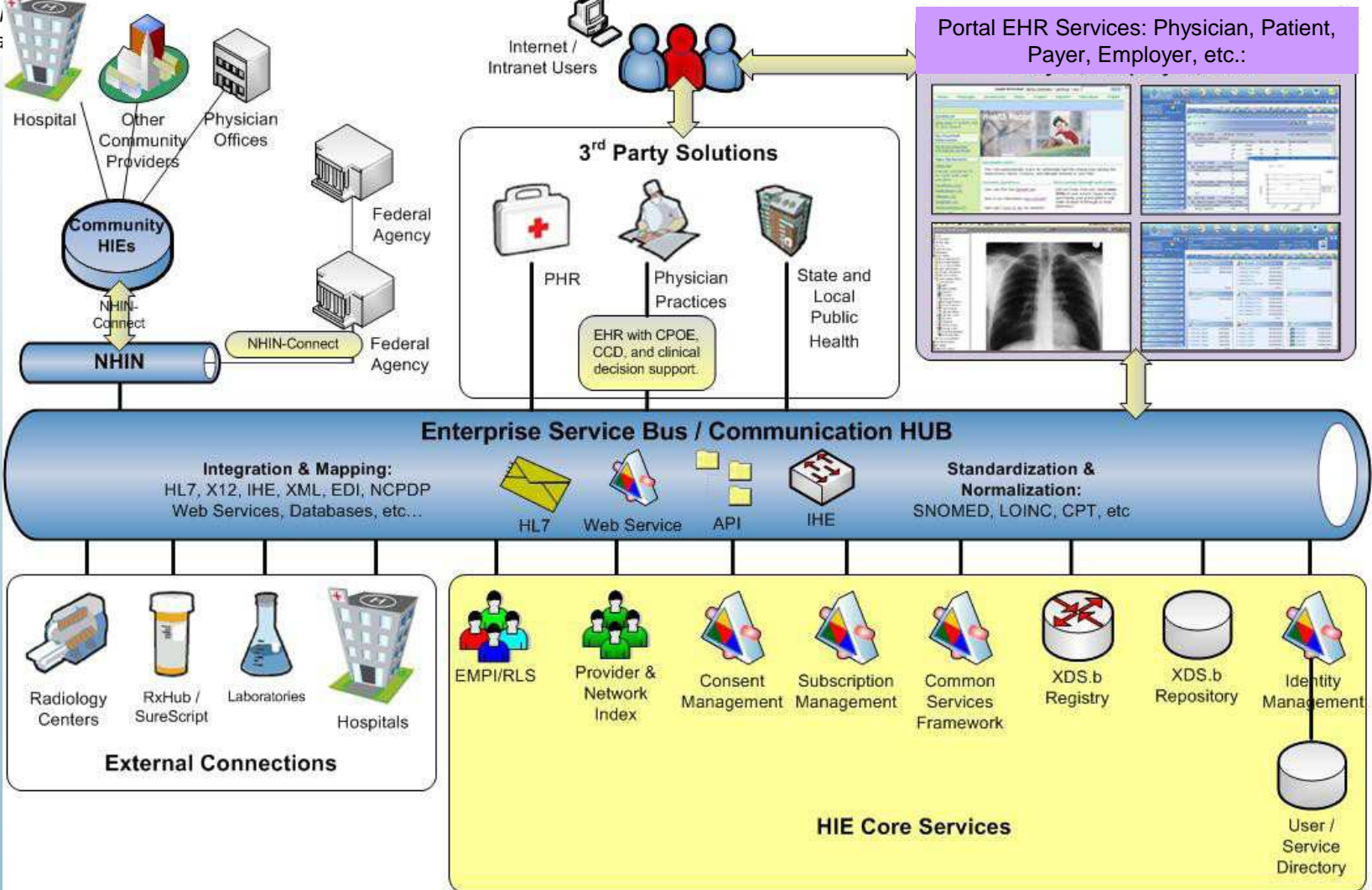- Promia
- My1HIE
- MSMS Connect
- PRISM

SEMHIE/SEMHA/SEMBCC Participants and Supporters:
State, National and International

- Foundations and Institutes
  - Juvenile Diabetes Research Foundation (JDRF)
  - Michigan Organization of Diabetes Educators
  - Robert Wood Johnson Foundation (RWJF)
  - Summit Health Institute for Research and Education (SHIRE)
- State Healthcare Professional Associations
  - MHA, MSMS, MOA, MHIMA, MHIMSS, MPCA, MAFP

- International Consortia and IT Professional Associations
  - Health Information Management Systems Society (HIMSS)
  - Integrating the Healthcare Enterprise (IHE)
  - Internet2
  - Object Management Group
  - Financial Services Technology Consortium (FSTC)
  - ANSI X9
  - Kantara Initiative
 - Association for Quality (ASQ)

SEMHIE Will Expand HIE Beyond SSA Services

Southeast
Mich
Hea

SEMHIE

Internet / Intranet Users

Portal EHR Services: Physician, Patient, Payer, Employer, etc.:

Hospital   Other Community Providers   Physician Offices

Community HIEs

NHIN-Connect

Federal Agency

NHIN-Connect   Federal Agency

NHIN

3rd Party Solutions

PHR   Physician Practices   State and Local Public Health

EHR with CPOE, CCD, and clinical decision support.

Enterprise Service Bus / Communication HUB

Integration & Mapping:
HL7, X12, IHE, XML, EDI, NCPDP
Web Services, Databases, etc...

HL7   Web Service   API   IHE

Standardization & Normalization:
SNOMED, LOINC, CPT, etc

Radiology Centers   RxHub / SureScript   Laboratories   Hospitals

External Connections

EMPI/RLS   Provider & Network Index   Consent Management   Subscription Management   Common Services Framework   XDS.b Registry   XDS.b Repository   Identity Management

User / Service Directory

HIE Core Services

Future: SEMHIE Services Leverage SOA, MDMI

The SOA platform of the SEMBCC links all participants into a Secure Information Bi-directional Exchange
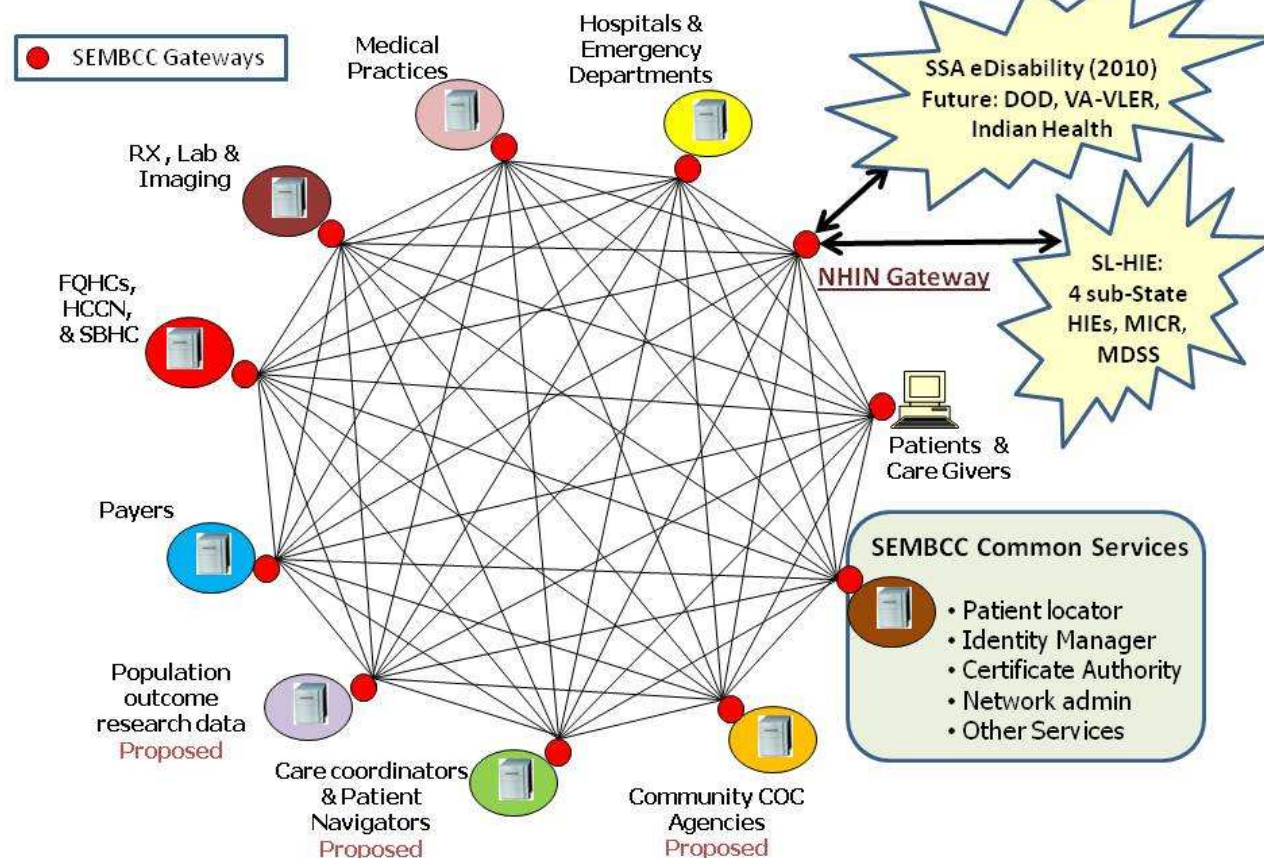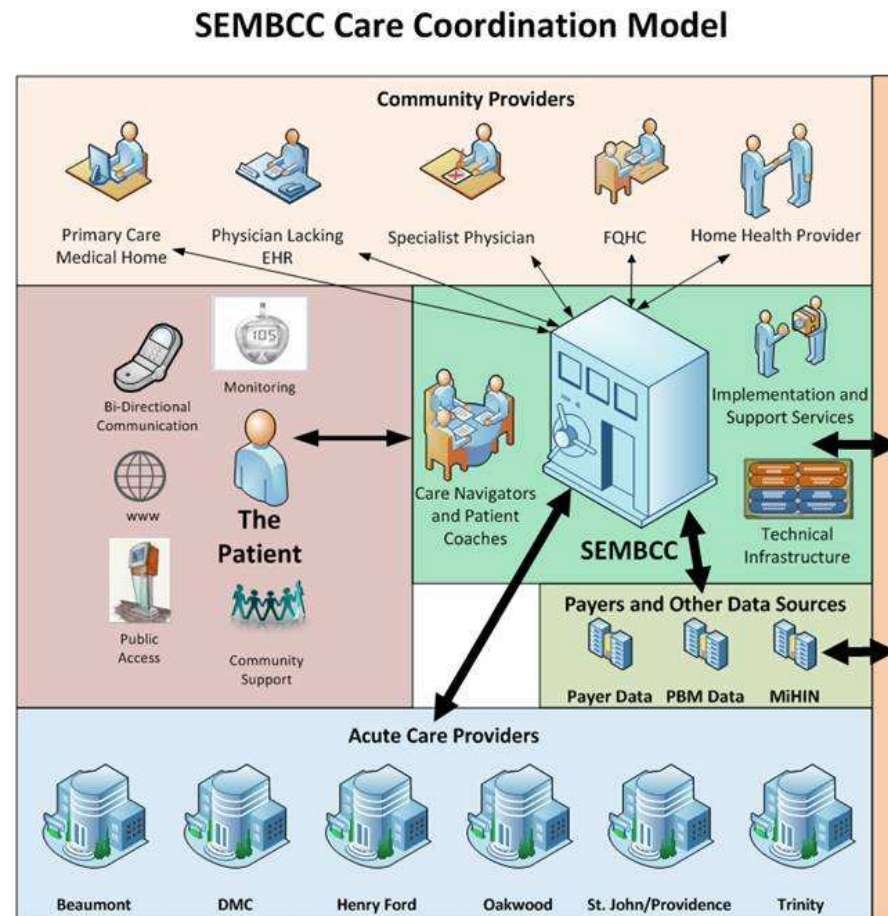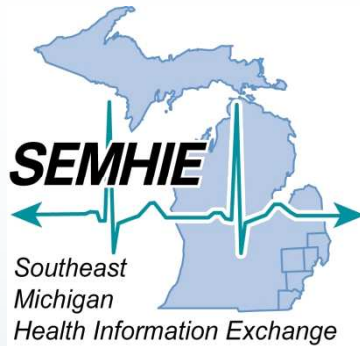
Future:
SEMBCC IT Architecture

SEMBCC IT Architecture for each participating site. Accessed via each site's SEMBCC Gateway

Trusted Computing Environment

Business Services
- Identity Manager
- Record Locator Service
- Patient Registry
- Smart Clinical Dashboard
- Shared proprietary services
- Community-wide data analysis
- Disease Registry tool
- Patient Navigator
- Community Alert
- Care Coordination tool
- SEMBCC privacy policy

Technical Services
- Data Interoperability
- Role-based access
- Digital IDs for people, applications and enterprises
- Consistent Patient Identity
- Integration to external networks
- Patient Privacy
- Certificate authority
- Treatment workflow tracking

Technical Capabilities
- Unique site ID with digital certificates
- Unique person ID
- Multi-level encryption
- Non-repudiable logging of all messages
- Seamless integration to legacy applications
- Mutual Authentication
- Controlled entity access/participation
- Data Centric Security
- Auditable records to person level
- Role-Based Access Control
- Network-wide data aggregation
- Remote queries
- Administrative & support services

SEMBCC Care Coordination Model

SEMBCC Care Coordination Model

Why SOA and MDMI?

- Without SOA and MDMI, SEMHIE would face significant quality, scalability and connectivity challenges plus very high costs for development and ongoing operation and maintenance of the exchange

- With SOA and MDMI, SEMHIE has significant opportunities for future growth, plus improvements in quality, safety, privacy & security and decreased costs for the overall exchange

- SEMHIE believes that it will be easy to join and will provide attractive opportunities for investment by the private sector and that this will spur financial sustainability