ESRI Health GIS Conference
October 19, 2010
Denver, CO

Incorporating Geospatial Capacity to the Indiana Network for Patient Care to Improve Public Health Practice and Research

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Advancing healthcare through research, development, and education

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Indiana Center of Excellence in Public Health Informatics (icePHi)

http://www.regenstrief.org/icephi

— Established at the IU School of Medicine in 2009 via an award from CDC.
— One of only four such centers in the nation.
— Focused on expanding and developing innovative public health information tools to improve patient care

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Indiana Network for Patient Care (INPC)

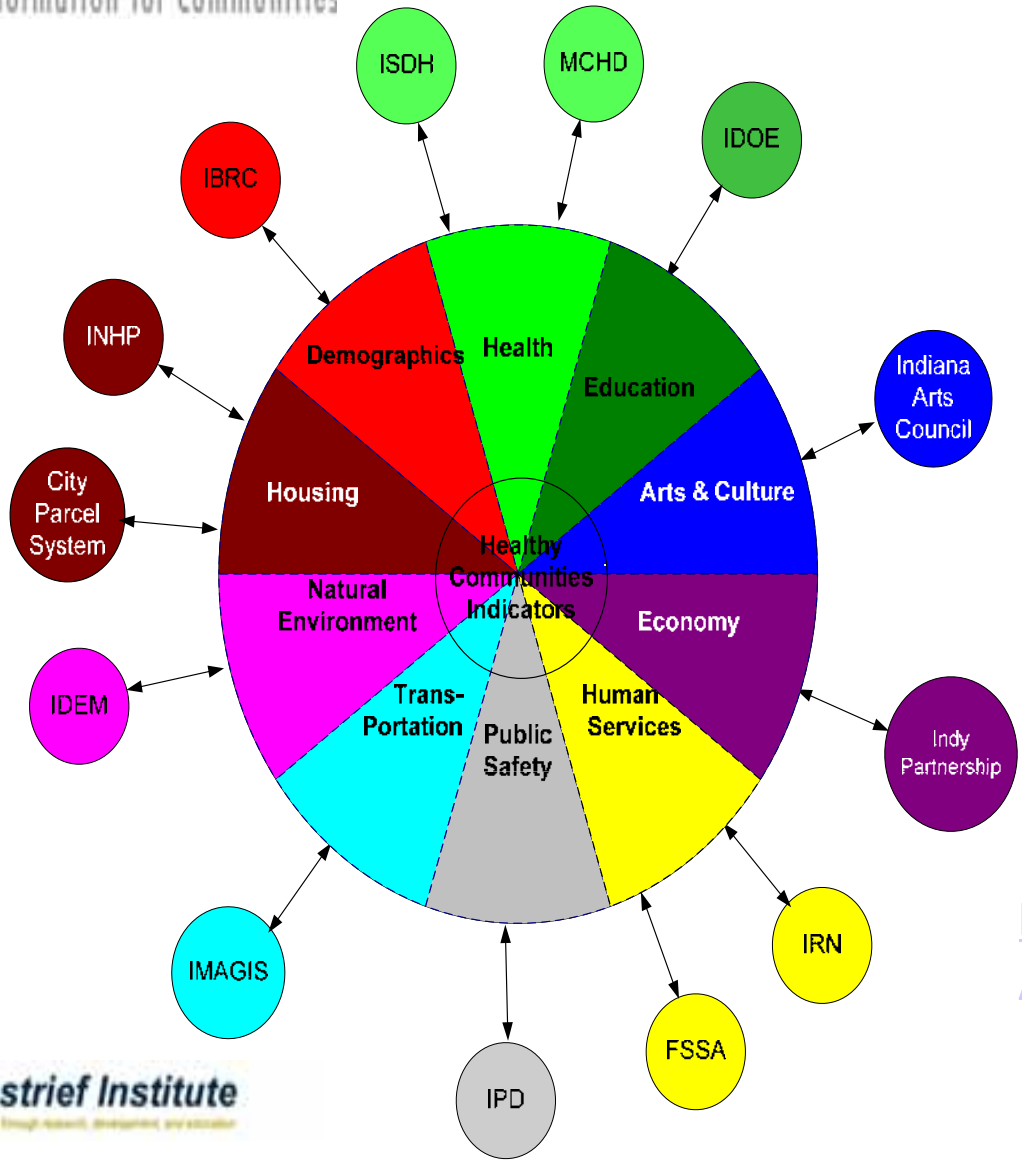
—Contains over 3 billion coded standardized clinical observations dating back over 30 years for over 12 million patients.

— Receives from 350,000 to 1 million clinical transactions daily from over 200 sources.

— Allows medical providers across the state to securely obtain patients' medical histories.

— Provides statewide syndromic surveillance, public health case detection, and physician alerting services to local and state public health.

SAVI
Information for Communities



—A dynamic, GIS-based community information system established in 1994.

— Contextual data about communities and their populations from 30 data providers

— Online tools to access and analyze information

— User support and capacity building

http://www.savi.org/

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Vulnerabilities by Data Year	Number of Indicators*	Geographic Extent	1980	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Administrative Data (Regular Updates)																									
Census Demographic Data	1,630	MSA	X			X										X									
U.S. Census American Community Survey	979	MSA																		X	X	X			
Education Data	125	MSA				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Home Mortgage Data	254	MSA						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Address Vacancy Data	108	MSA																		X	X	X	X	X	X
Parcel-based Property Data	46	Marion															X	X	X	X					
HUD Subsidized Housing Data	332	MSA																					X		
TANF and Food Stamps Data	62	MSA										X	X	X	X	X	X	X	X						
Indiana State Dept of Health Birth Defect Data	33	MSA																		X					
Indiana State Dept of Health Cancer Data	132	MSA												X	X	X	X	X	X						
Indiana State Dept of Health Comm. Disease Data	14	MSA																	X	X	X				
Indiana State Dept of Health Hospital Data	115	MSA													X	X	X	X	X	X	X	X	X		
Indiana State Dept of Health Vitals Data	89	MSA			X	X	X	X	X	X	X	X	X	X	X	X	X	X							
U.S. Census Small Area Health Insurance Estimates	48	MSA																		X	X				
Juvenile Justice Data	104	Marion						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Marion County Vitals Data	67	Marion		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Adult Crime Data	70	IMPD						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
U.S. EPA Air Quality Data	14	MSA											X	X	X	X	X	X	X	X	X	X	X		
Survey Data (No Current Plans to Update)																									
Child Obesity Data	114	Marion																		X					
Adult Obesity Data	17	Marion																		X					

X - Currently Available
C - Coming Soon
P - Partial Year

*Not all indicators are available for all years. Number of indicators shown represents number of indicators for the most recent data year.

Vulnerabilities by Geography Type

	Number of Indicators*	Geographic Extent	BlockGroup	Census Tract	Township	School Corp	Census Neighborhood	Indy Neighborhood	GINI Neighborhood	ZIP Code	Police Jurisdiction	Health Planning Area	CDC	City	ZIP Code Tabulation Areas (ZCTAs)	Primary Care Service Areas (PCSAs)	County	Metropolitan Statistical Area
Administrative Data (Regular Updates)																		
Census Demographic Data	1,630	MSA	X	X	X												X	
U.S. Census American Community Survey	979	MSA			X	X											X	X
Education Data	125	MSA				X											X	
Home Mortgage Data	254	MSA		X													X	X
Address Vacancy Data	108	MSA		X													X	
Parcel-based Property Data	46	Marion	X	X	X	X		X	X	X	X	X	X	X			X	
TANF and Food Stamps Data	62	MSA		X		X	X											
HUD Subsidized Housing Data	332	MSA		X													X	
Indiana State Dept of Health Birth Defect Data	33	MSA															X	
Indiana State Dept of Health Cancer Data	132	MSA															X	
Indiana State Dept of Health Comm. Disease Data	14	MSA															X	
Indiana State Dept of Health Hospital Data	115	MSA															X	
Indiana State Dept of Health Vitals Data	89	MSA															X	
U.S. Census Small Area Health Insurance Estimate	48	MSA															X	
Juvenile Justice Data	104	Marion	X	X	X	X		X		X	X	X	X	X			X	
Marion County Vitals Data	67	Marion		X		X		X										
Adult Crime Data	70	IMPD	X	X	X	X		X	X	X	X	X	X					
Primary Care Service Area Data	281	MSA													X	X		
U.S. EPA Air Quality Data	14	MSA															X	
Survey Data (No current Plans to Update)																		
Child Obesity Data	114	Marion															X	
Adult Obesity Data	17	Marion										X					X	

*Not all indicators are available for all years.

IMPD = Indianapolis Metropolitan Police Department

Census Neighborhood - Census Bureau User Defined Area Program Neighborhoods
Indy Neighborhood - Defined by the City of Indianapolis
GINI Neighborhood - Great Indy Neighborhood Initiative
Binford, Crooked Creek, Near Eastside, Near Westside
Southeast Neighborhood, West Indianapolis

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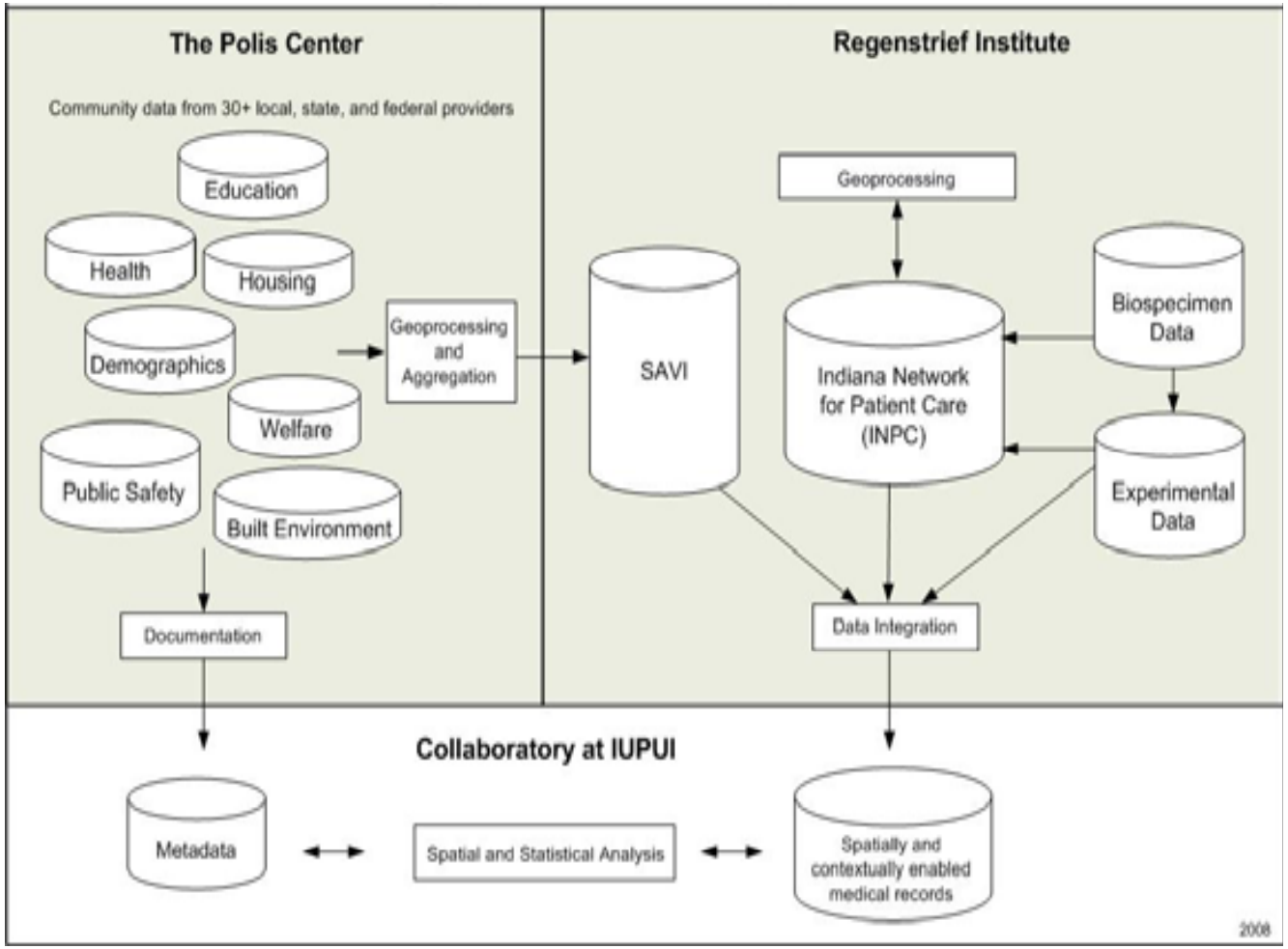

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Public Health and Medical Research

—Predictors of health knowledge (M. Sothmann, MD / C. Mushi-Brunt, PhD)
—Contextual determinants of health (V. Champion, DNS)
—Ecological models of health behavior (K. Russell, DNS)
—Environmental exposure and health risk (M.B. Riner, DNS)
—Environmental determinants of health (G. Liu, MD,, MPH)
—Social determinants of health (S. Wiehe, MD, MPH / M.B. Riner, DNS)
—Health disparities (R.Fife, MD. MPH)
—Exploratory disease mapping/geographic knowledge discovery (I. Yamada, PhD)
—Supporting community-based participatory research (J. Martin, DNS)
— Investigation of prescription opiate abuse (Eric Wright, PhD)

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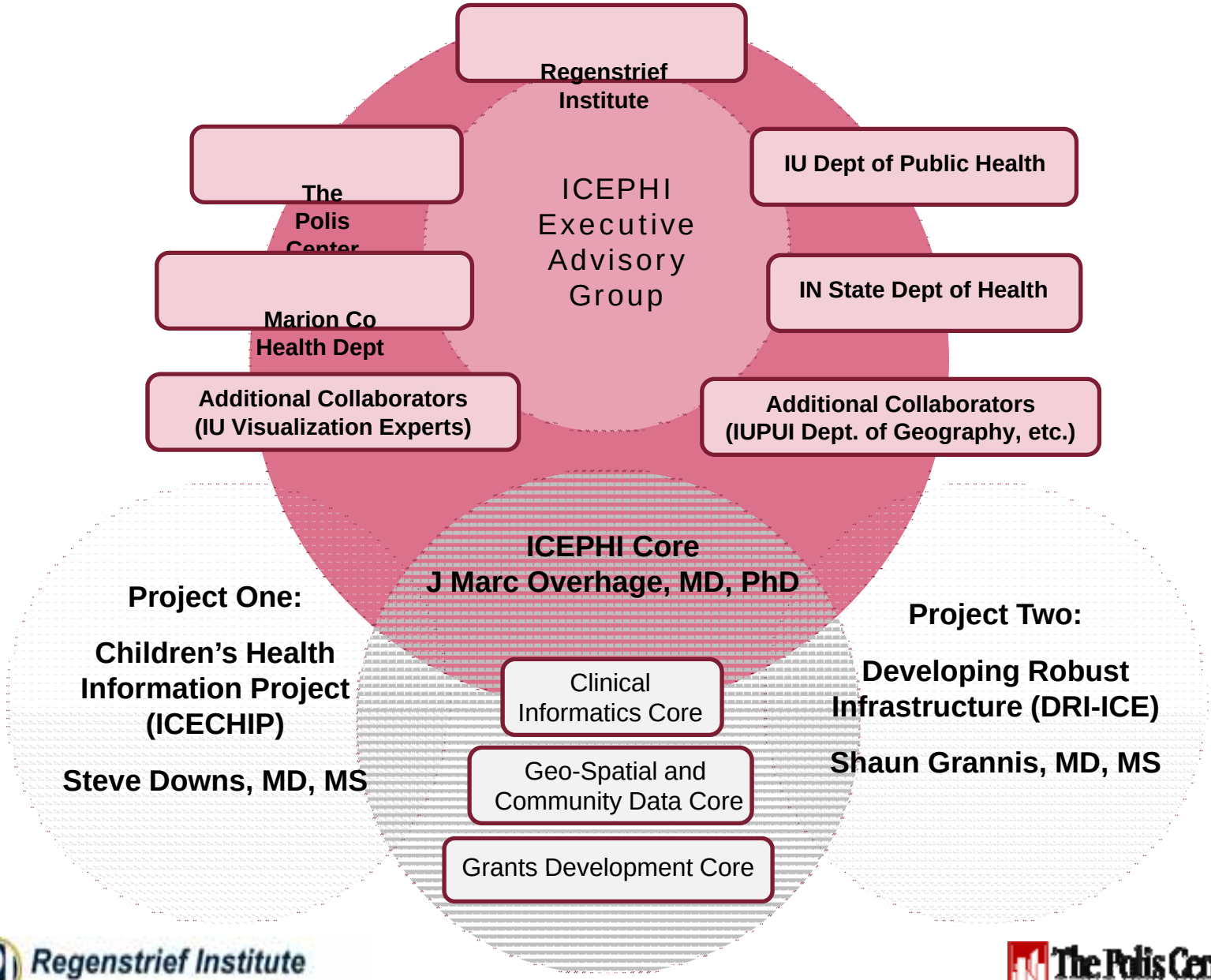

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Developing Robust Infrastructure (DRI-ICE)

http://www.regenstrief.org/icephi/dri-ice.html

Goal 1:

Augment clinical data captured in an operational HIE with geospatial attributes by designing, implementing, deploying, and evaluating a near real-time process that integrates seamlessly.

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Developing Robust Infrastructure (DRI-ICE)

Goal 2: Expand public health **case detection** and **information extraction** capabilities using an open source framework.

Goal 3: Determine and characterize the **technical performance** and **operational value** of linking real-world data sources for a variety of public health practice scenarios.

Goal 4: Create a framework for **evaluating and prioritizing** sources of clinical data that could be added to our evolving infrastructure to support public health practice.

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Approach

1. Use Case Identification

—INPC administration
—Clinicians
—Researchers
—Public health agencies
—Community-based organizations

2. Use Case Prioritization

3. System Requirements Development (Data and functions)

Clinician Use Case

Goal: To increase awareness of community and/or location-based resources for referral to individual patients

A. Premises

—Leveraging community and/or location-based resources can improve clinical outcomes

—Clinical users may be unaware of community and/or location-based resources

B. Approach

—Enhance clinical transactions with location-based information on resources that are proximate to an individual patient

Clinician Use Case (cont.)

C. Use case

—Clinical user authenticates to an EHR system with access to HIE location information.

—Clinical user selects a specific patient.

—The EHR system's clinical reminder rule that requires location-based information is triggered for the given patient. (e.g., BMI is elevated, so identify community resources to address this problem)

—The EHR system retrieves location-base information. (e.g., what green spaces are near the patients home address)

—The clinical reminder rule uses the location based data to deliver information to the clinical user to inform care.

—The clinical user reviews the reminder and, if deemed appropriate for the clinical situation, acts on the reminder.

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Administration Use Case

Goal: To identify monitoring metrics for capturing location-based data to support HIE use cases and sustainability.

A. Premises

—To be sustainable, HIE's must aggregate collections of health care data to meaningfully support multiple use cases.

—To meaningfully support multiple use cases, data captured must be of sufficient quality and completeness.

—To ensure the data is of sufficient quality and completeness, the capture of data (such as location-based data) must be monitored.

—To monitor data capture process, we must identify monitoring metrics.

Administrative Use Case

B. Approach

Monitoring metrics to include absolute and relative number of records that:

- —Successfully geocode
- —Fail a geocoding attempt
- —Have not been geocoded

C. Use cases:

INPC administrator:

- — Authenticates to the INPC administrative system
- —Submits queries for monitoring metrics to the INPC administrative system
- —Receives response from the INPC administrative system
- —Reviews monitoring metrics for unexpected values that require further investigation
- —…

Requirements

- Maintenance of data confidentiality
- Geocoding accuracy and completeness
- Near-real time data processing
- Performance
- Documentation of each geocode
- Distributed system

Solution

- ArcGIS Server
- Composite geocoding service – to take advantage of the best available reference data to get best available accuracy while also getting greatest completeness
- Annual re-evaluation of address reference data
  - Local data sources (E911 and parcels)
  - ESRI Premium Streetmap
- ZP4 address cleaning software
- Metadata schema

Initial System Outputs

- PolisID
- Address
- City
- State
- ZIP Code
- Latitude, Longitude
- Score
- Census Year
- County
- Block Group ID

Future Directions

- Expand requirements based on additional use cases
- Reevaluation of reference data sources.
- Addition of reference data layers.
- Control of parameters and reference layers in response to each specific need for output geographic coordinates/attributes.

- Investigation of geomasking techniques
- Use of location data for matching clinical records

Technical Team

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