INCOSE International Workshop
Multi-Agency ITS project identification and definition – a Spiral Model Application

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Presentation Agenda

- South Bay Highway Program

- The need for Performance Measurement

- Key Steps in the Process

  - Needs

  - ConOps

  - Requirements

  - Alternatives Analysis

- Factors driving re-assessment

- Review and Prospects

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South Bay Highway Program

- **The South Bay**
  - 14 cities in the Southwest sub-region of Los Angeles County, plus two City of Los Angeles Disrtricts and two County Supervisorial Districts
  - Population : approx. 1 mil.

- **South Bay Highway Program**
  - $2bn worth of projects identified to improve freeways and state highways operations
 - $1.5 bn (esc.$) identified in LA County Measure R ½c sales tax for SBHP over 30 years.
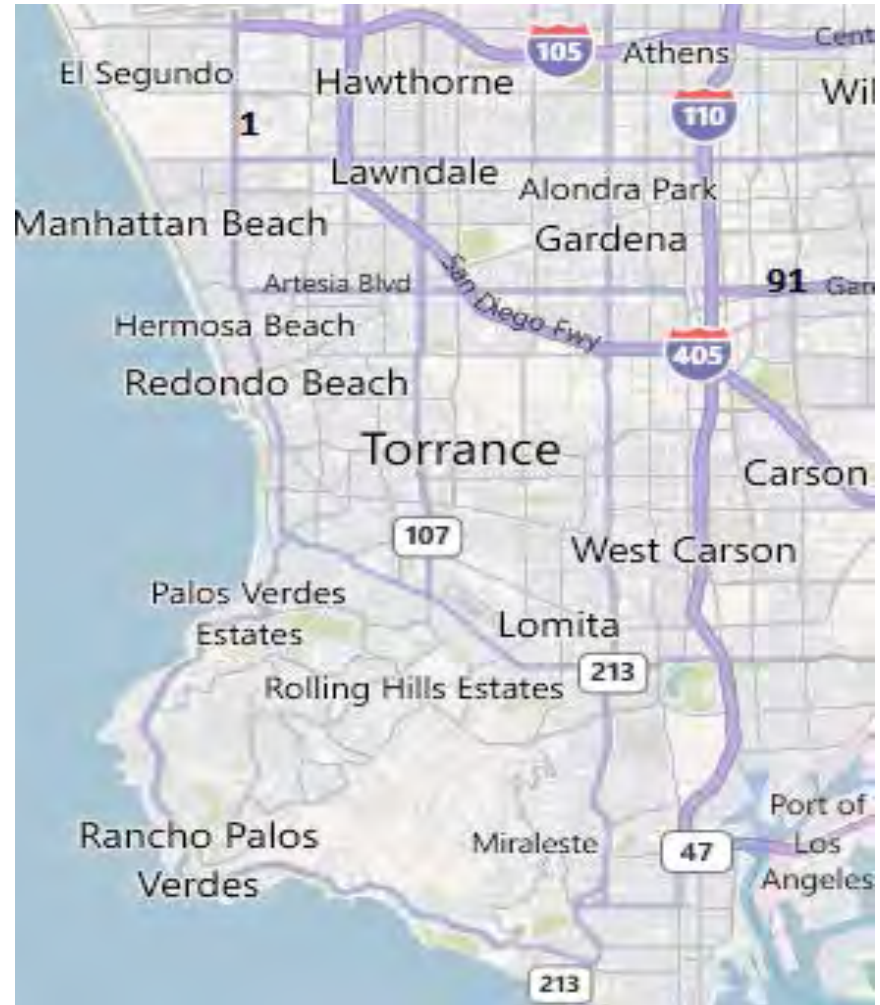
The Need for Performance Measurement

- The Measure R Ordinance identified operational goals and objectives for the use of the sales tax funds against which the impact of the SBHP **program** could be measured.

- In seeking additional funding to fill any funding gaps, **projects** will compete better if:

  - There is a quantifiable need identified

  - Results can be documented

  - The costs / benefits can be quantified to better support similar projects in obtaining future funding

- The need for a Highway (Performance) Measurement System (HMS South Bay) was identified

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The Vee Model

The FHWA developed the Vee model for Intelligent Transportation System project deployment
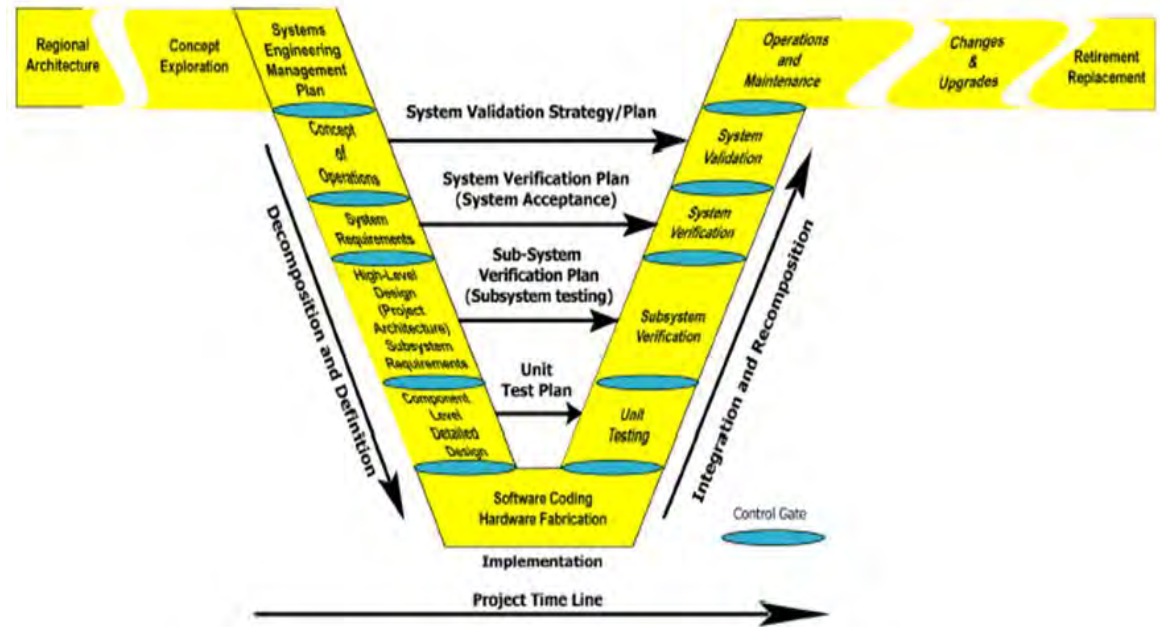
This was initially adopted to formulate the steps needed in defining HMS South Bay, assessing options and identifying an implementation approach.
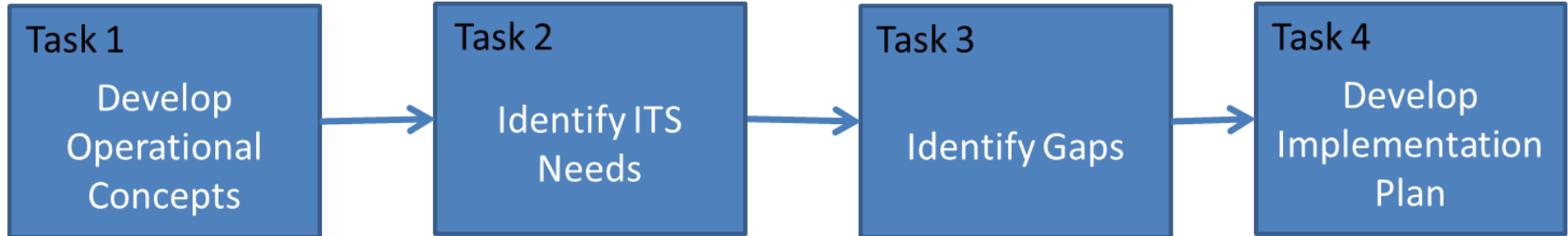
Key Steps in the Process: Needs

■ From the Measure R Ordinance:

- Promote and develop a safe and efficient transportation system through the South Bay sub-region

    1. Improve Local and Regional Mobility and Access

    2. Improve Travel Reliability and Incident/Event Management

    3. Reduce System Demand with Multimodal Strategies

    4. Deliver Projects Efficiently and Cost-Effectively

ConOps: ITS Plan

Task 1	Task 2	Task 3	Task 4
Develop Operational Concepts	Identify ITS Needs	Identify Gaps	Develop Implementation Plan

- Key elements:
  - Strategy identification
  - Agency roles
  - Gaps in ITS systems and operational; capabilities
  - Project Identification and selection

Requirements: Strategic Transp. Element (STE)

- Freeway
  - Data Needs: delay, flow, speed, travel time, VHT, lost lane miles, collisions

- Highways and Arterial Corridors and Intersections
  - Data Needs: delay, flow, speed, travel time, intersection turning movement volume, collisions, signal/communications capability

- Other
  - Data Needs: ITS usage logs, daily transit vehicle revenue hours, daily transit ridership, SBCCOG website access (hits)

Collection Frequency and Periods

- Collect flow and travel time data continuously
  - Allowing the assessment of the network performance under all types of traffic conditions: weekday, weekend, holiday and seasons to provide a holistic approach to highway monitoring.
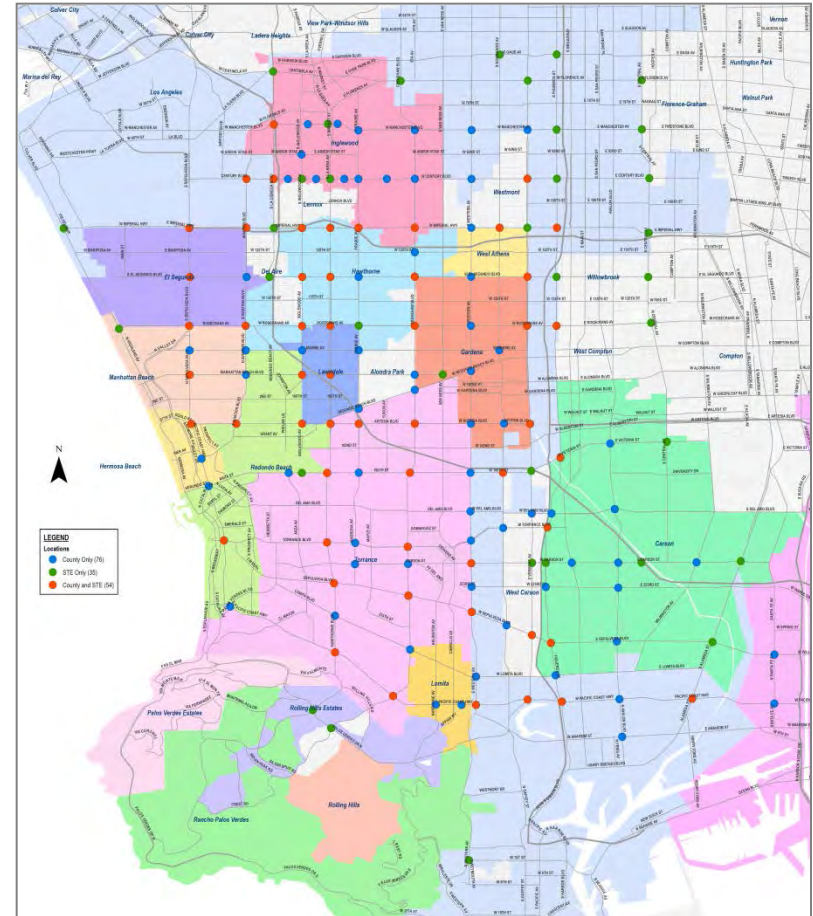
SBHP Detection Plan

- **Freeway Coverage is good through Caltrans PeMS**
- **Highway and Arterial Monitoring Network is needed**
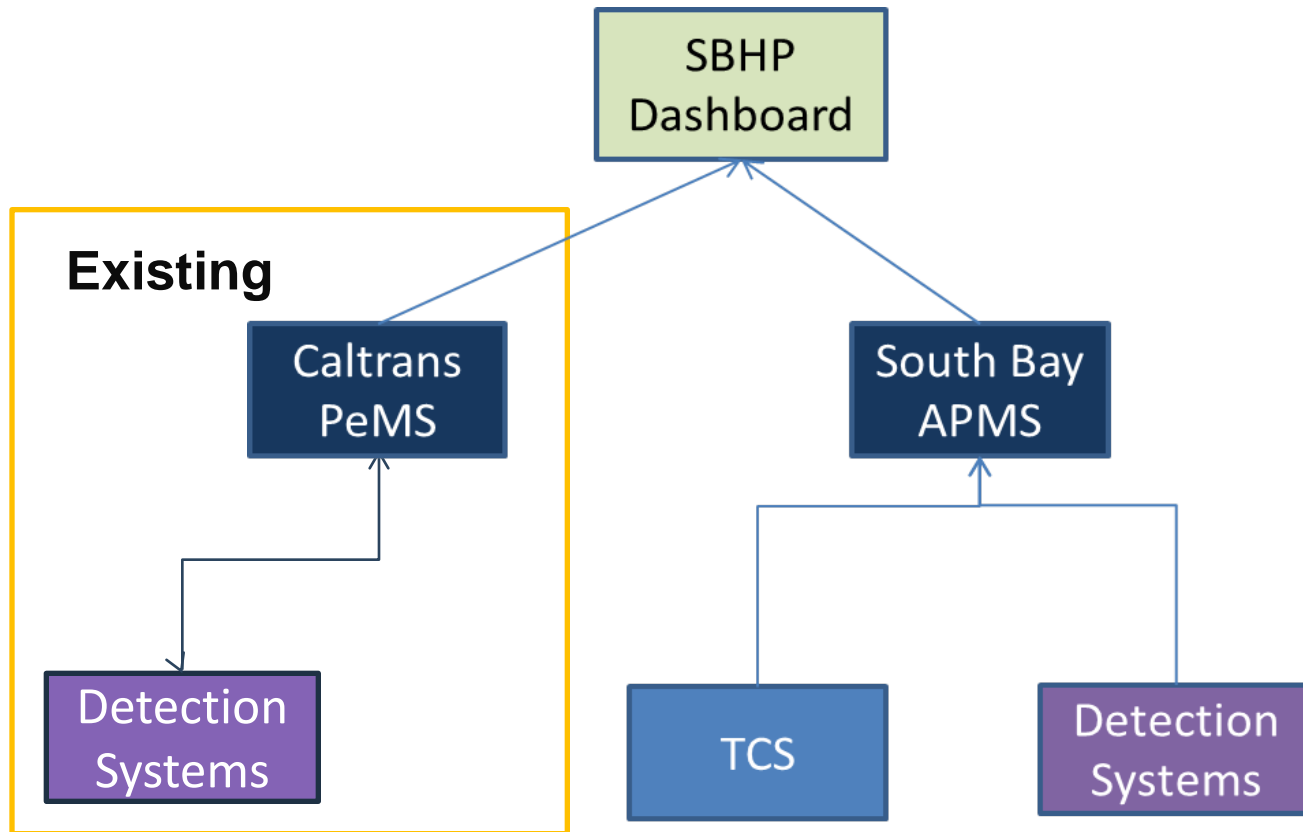
Intersection: ●

Mid-block
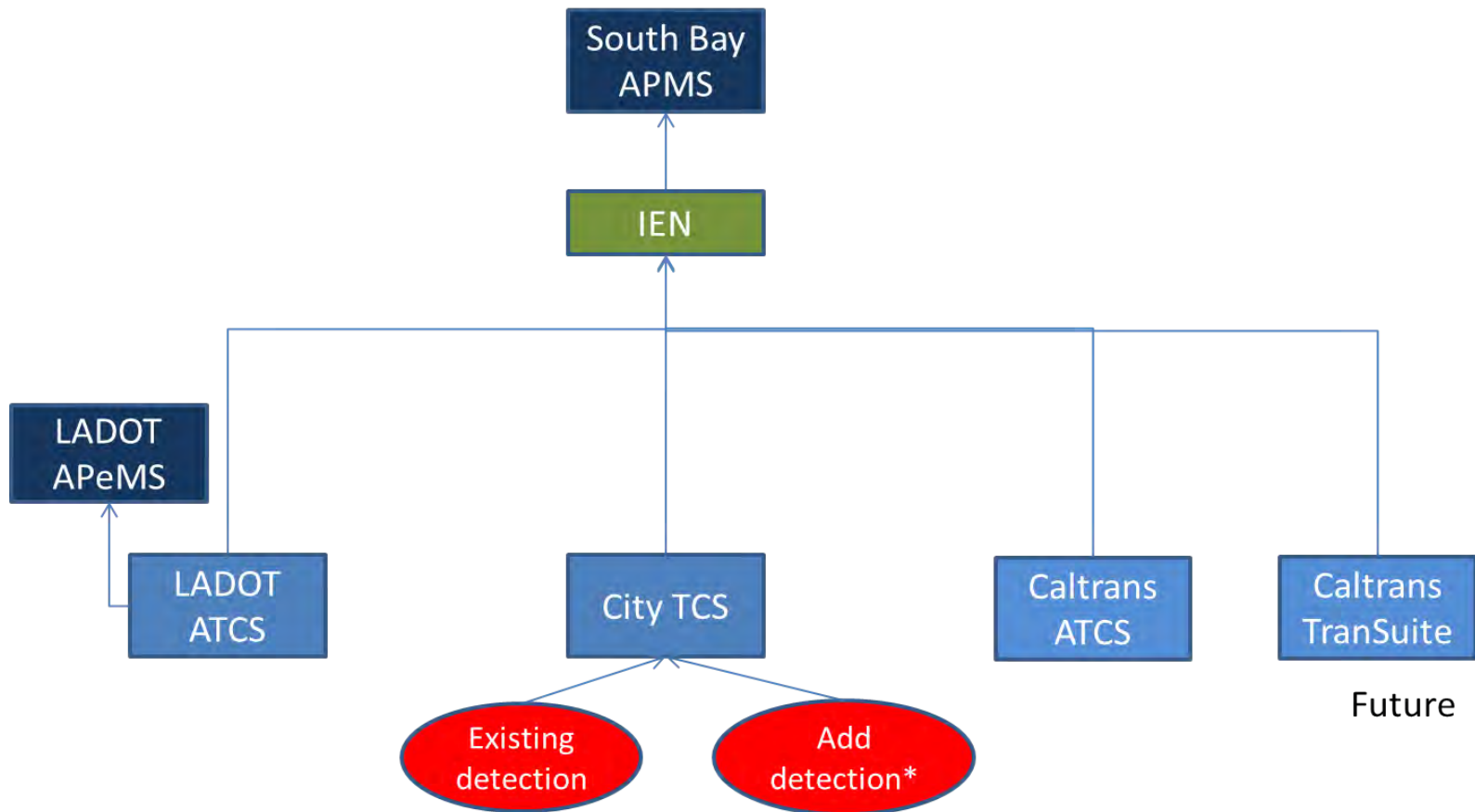
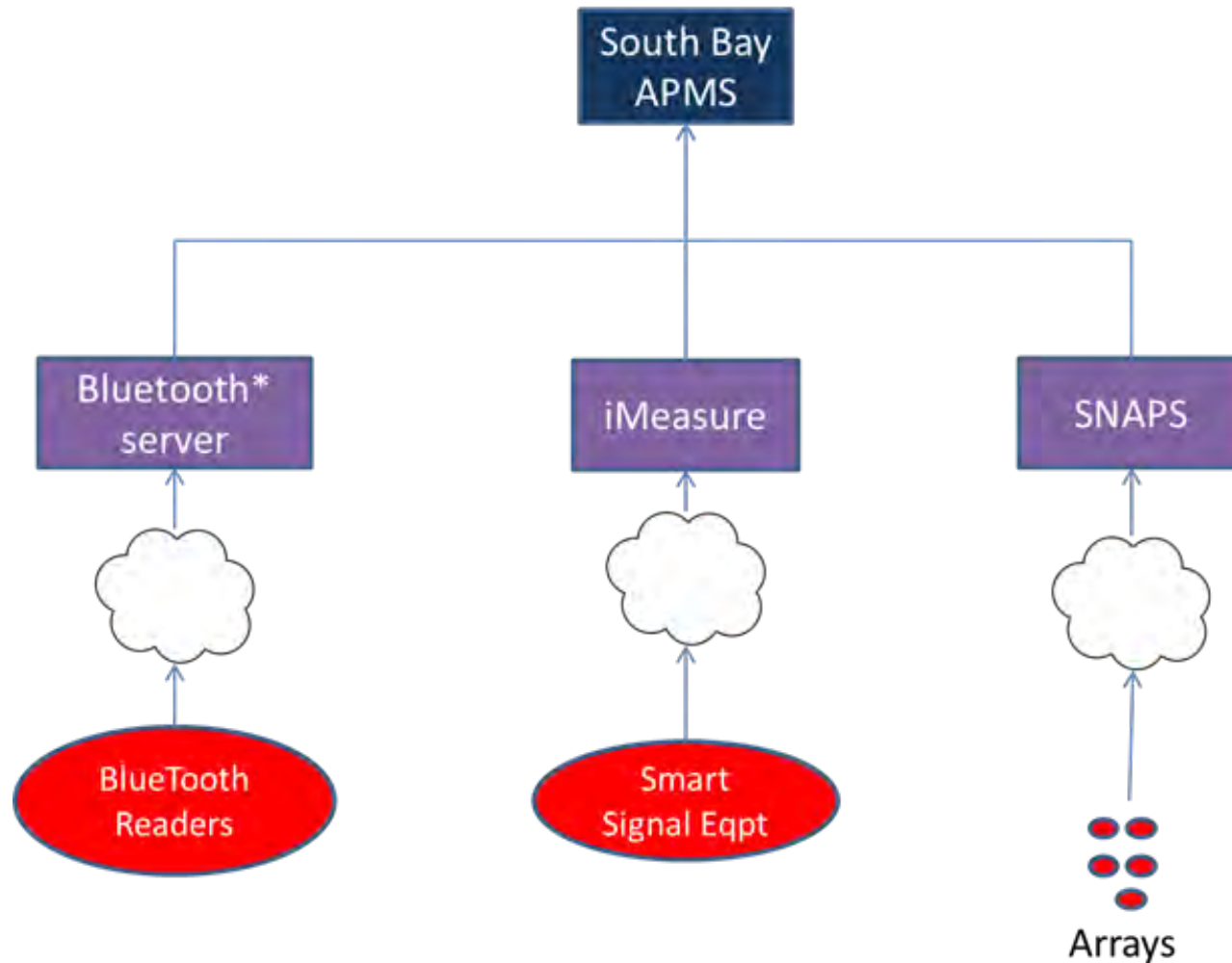# County South Bay Detection Study

Alternatives Analysis

- **Base Option:** Complement Caltrans PeMS with arterial infrastructure-base detection

# Infrastructure-based detection through TCS

# Stand-alone Detection Systems

New Factor: Big Data

- Infrastructure-based systems would require extensive, costly construction, operation and maintenance
- Big data was now becoming available from the private sector
  - Third party data sources
  - Data collected from mobile sources (GPS, smartphones)
- Could these data sources be used to reduce deployment costs?
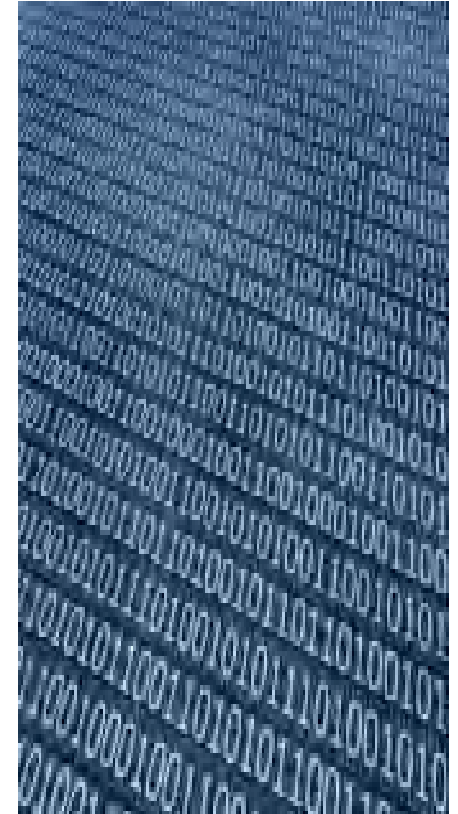
Alternative: Third Party Data
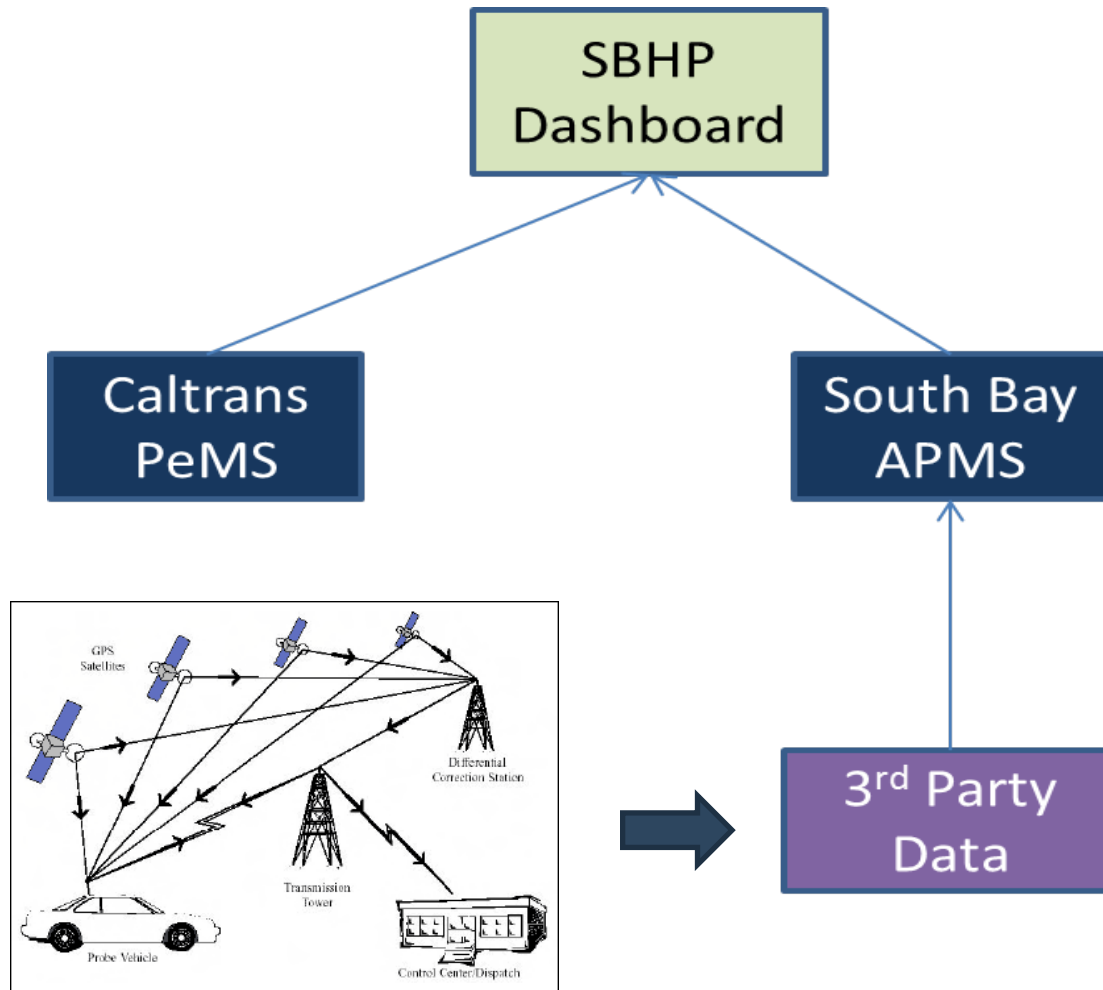
First Recommendations

1. The SBCCOG should implement a HMS for the South Bay based upon automated data collection

2. The HMS should be deployed in a staged approached, based upon corridors in a priority sequence dictated by the Measure R Program of project execution.

3. The data collection system should be based upon infrastructure data sources.

4. An agency will act as a lead and host the APMS

New Factor: Cloud Computing

- The applications used for the HMS lend themselves to hosting

- The availability of relevant applications under the SaaS model further supported this approach

- Cloud computing platforms are driving down the cost of hosted services

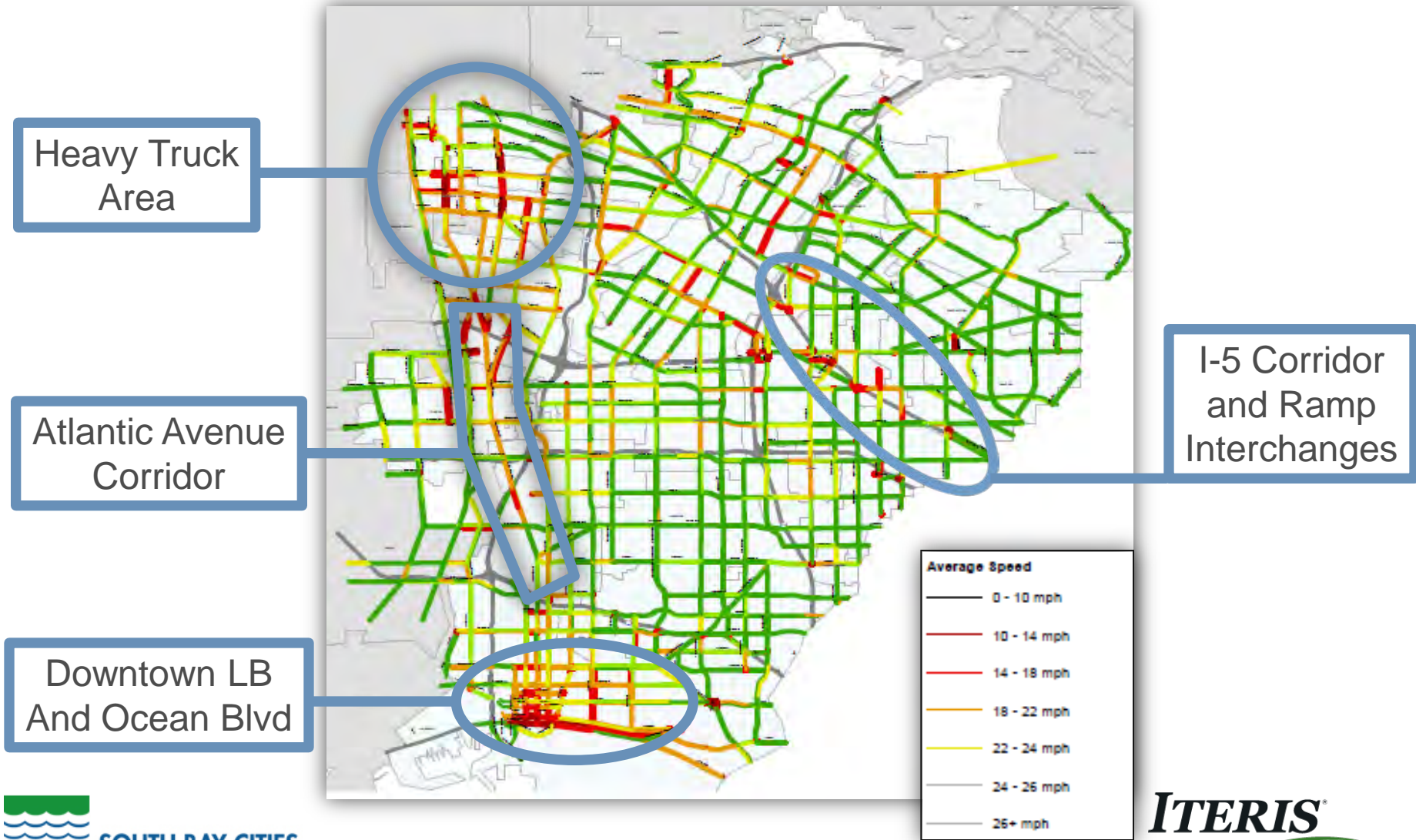**Additional recommendation:**
The lead agency should be able to choose between an agency-hosted and a SaaS APMS solution.

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New Factor: Deployment Constraints

- The staged approach increases the time to deploy extensive infrastructure

- Urgent need for the capability to do project assessment for comparative analysis

Prototyping in Adjacent COG

Heavy Truck Area

Atlantic Avenue Corridor

Downtown LB And Ocean Blvd

I-5 Corridor and Ramp Interchanges

Average Speed

——	0 - 10 mph
——	10 - 14 mph
——	14 - 18 mph
——	18 - 22 mph
——	22 - 24 mph
——	24 - 26 mph
——	26+ mph

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New Factor: Deployment Constraints

- Rapidly reducing cost of third party data (due to intense competition from suppliers) makes **reconsideration** of third party data necessary

Additional recommendation:
Third party data complemented by infrastructure-based detection for counts: Hybrid Solution

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New Factor: Regional Considerations

- The ability to do early potential project assessments using the third party data is recognized by other sub-regions

- The regional agency now has a need for comparable analytics for project comparisons between sub-regions

- Third party applications are limited in design but may suffice for project identification, selection, and network performance evaluation
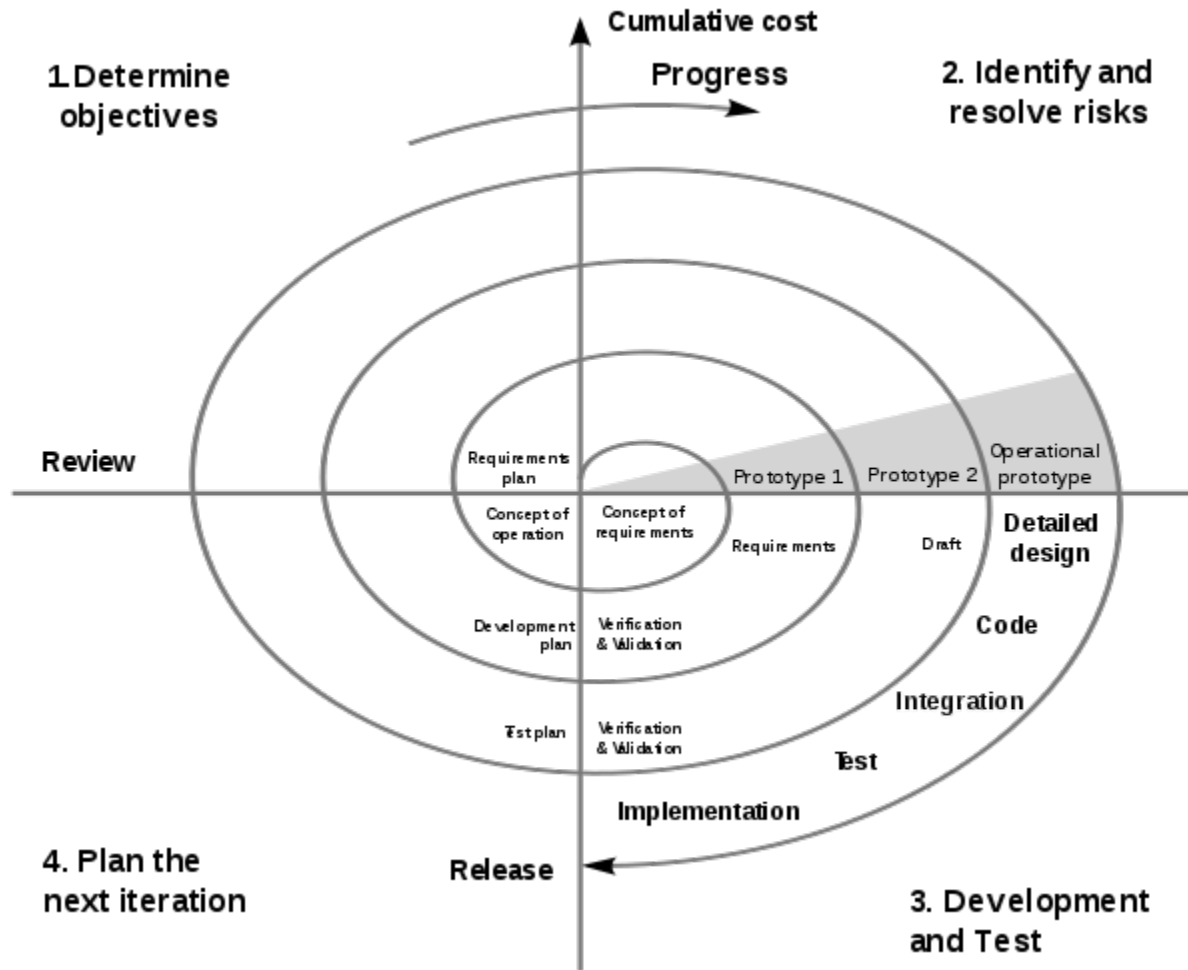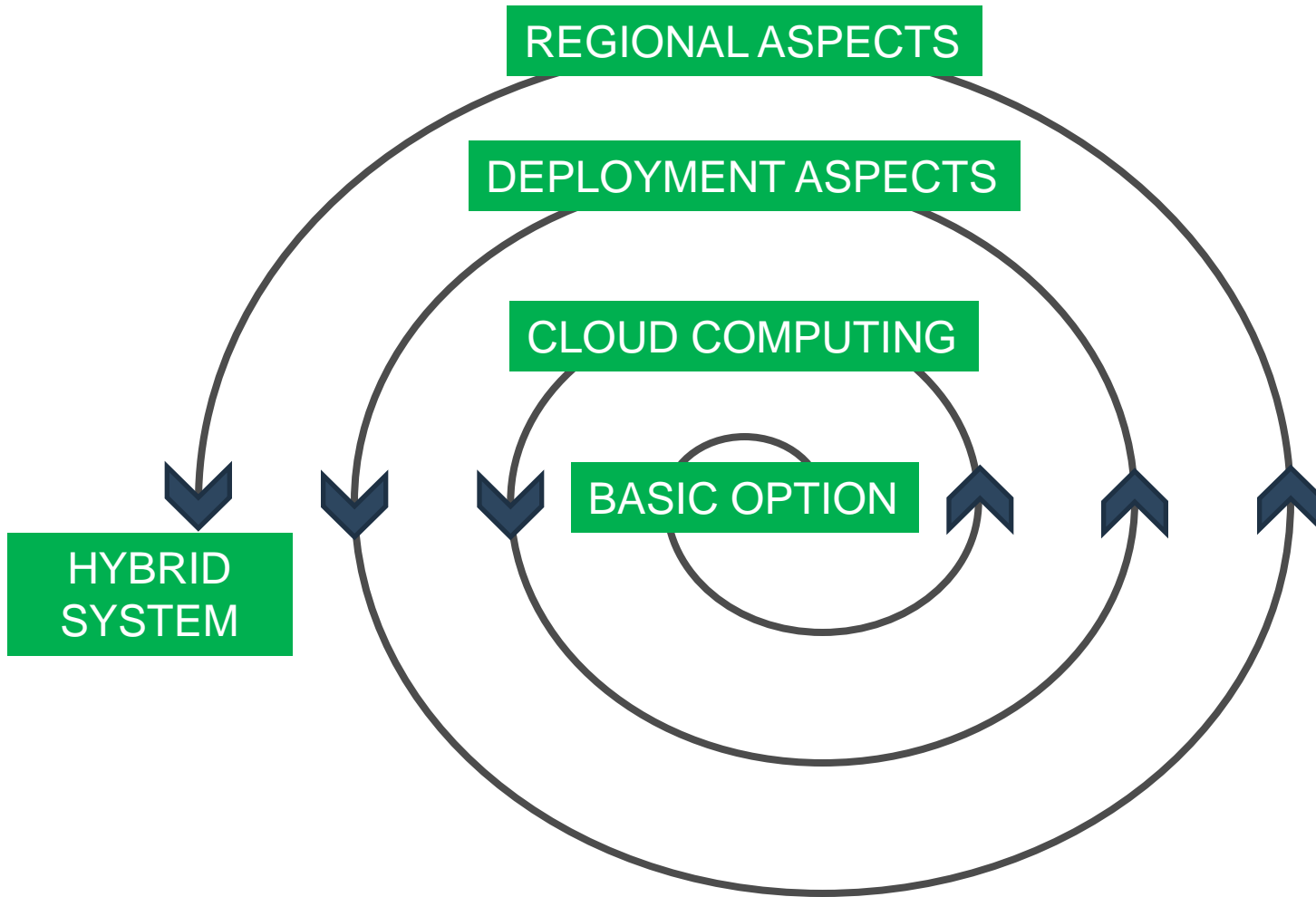
Additional Recommendations:
Region supplying the third party data now a consideration
The infrastructure-based detection will provide flow data collection
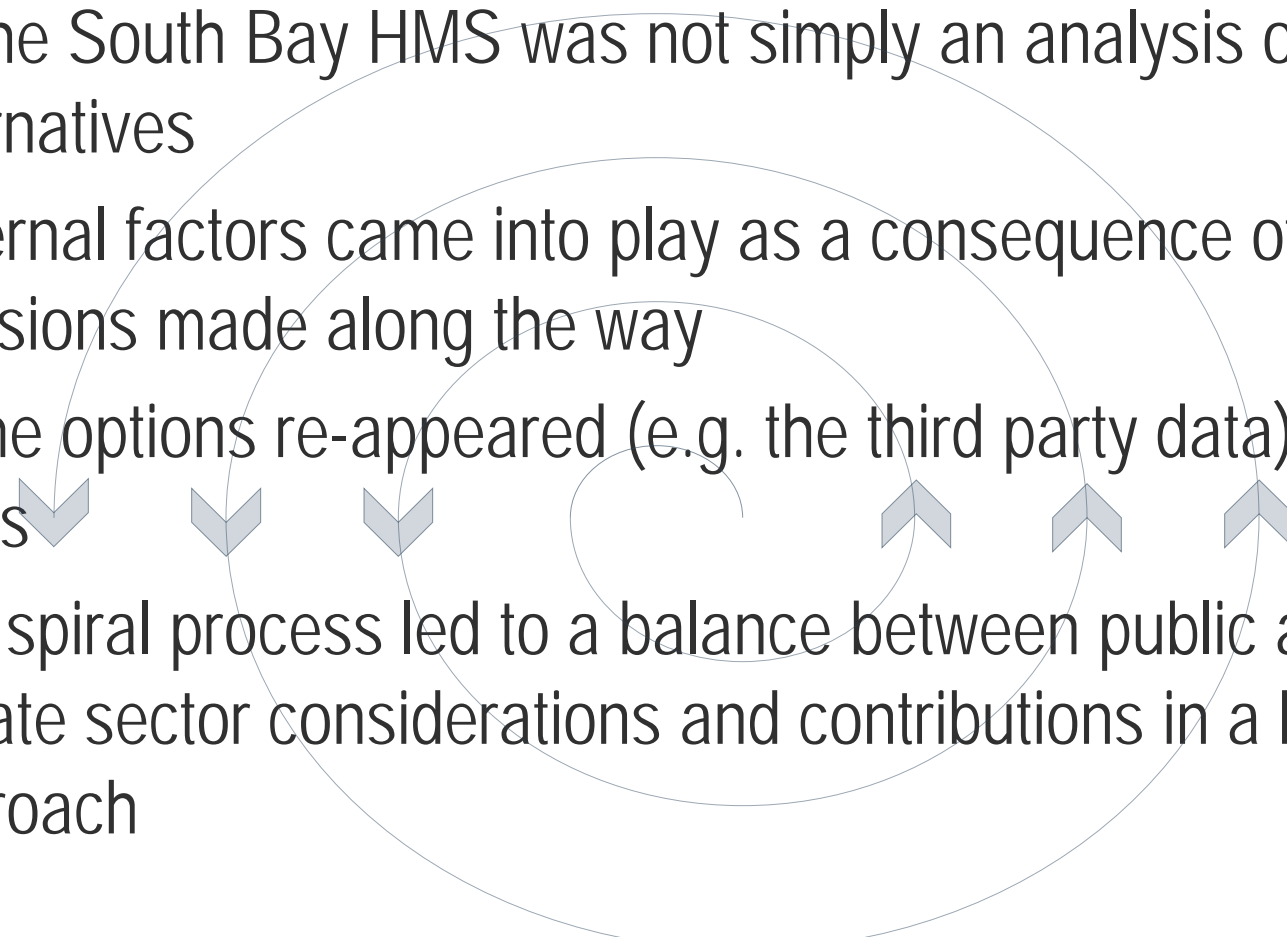
The Spiral or Prototype model

HMS South Bay Spiraling to a Project Definition

REGIONAL ASPECTS

DEPLOYMENT ASPECTS

CLOUD COMPUTING

BASIC OPTION

HYBRID SYSTEM

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Review

- The process followed to identify the system to be deployed as the South Bay HMS was not simply an analysis of alternatives

- External factors came into play as a consequence of the decisions made along the way

- Some options re-appeared (e.g. the third party data) in later steps

- The spiral process led to a balance between public and private sector considerations and contributions in a hybrid approach

Issues Raised

- In retrospect, what started as the need to define a **project** turned into the need to identify how best to provide a **service** to the various agencies involved from the local to the Regional level

- The challenge to the public sector in using complex systems and technologies is to **stay agile** and recognize how best to use the private sector's capabilities in achieving public sector goals and objectives

- A further issue in ensuring the chosen solution is to avoid **early obsolescence** with an agile development PPP based on version upgrades in services rather than a fixed concept of operations

- It makes sense to shift the risk to the private sector – **Build or Buy**?

How can Systems Engineering help?

Where to go from here?

- The Vee model imposes a linear approach – well focused on specific project deployment for a static project

- The spiral model permits analysis, trial, reconsideration and adjustment and extends into the post-deployment phase to address maintaining the relevance of the solution

- As the transportation agencies move from capital projects (e.g. building freeways) to IT projects they need to learn from the private sector to meet customer needs with a flexible system framework that can evolve as needs change

- The spiral model may provide the tool to do just that!

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