

Emerging Role of Agile Software Development for ITS Projects

**INCOSE International Workshop 2016
+ FHWA ITS Webinar**

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Presentation Topics & Audience:

(F=FHWA; I=INCOSE)

- 1. What is “ITS”?** (I)
- 2. Roles in ITS Projects** (I)
- 3. Evolution of ITS** (F+I)
- 4. SE “V” Process** (I)
- 5. Overview of V vs. Agile** (F+I)
- 6. Concluding Comments** (F)

What is “ITS”?...

- **Short Answer = “Technology in Transportation”**
- **USDOT Definition =**
“ITS means electronics, communication, or information processing used ... to improve efficiency or safety of a surface transportation system.” (23CFR940.3)
(Excludes boats, planes and most freight-rail.)
- **Federal regs apply to federally-funded projects**

2. *Typical Roles in ITS Projects*

- FHWA –
 - Provide (some) Funding & **Tech. Assistance**
 - Oversee Regulations (**23 CFR 940.11**, others)
- State/City DOTs –
 - Define Needs & Concepts
 - Program funds
 - **Write RFPs**
 - **Select & Manage Contractors**
- Contractors –
 - System Engineers – **Design. Test.**
 - Vendors – Equipment & **Software** (~COTS)
 - Integrators – **Software** + Hardware + ...

3. Evolution of ITS (1966 → Now)



Tech. ~2%

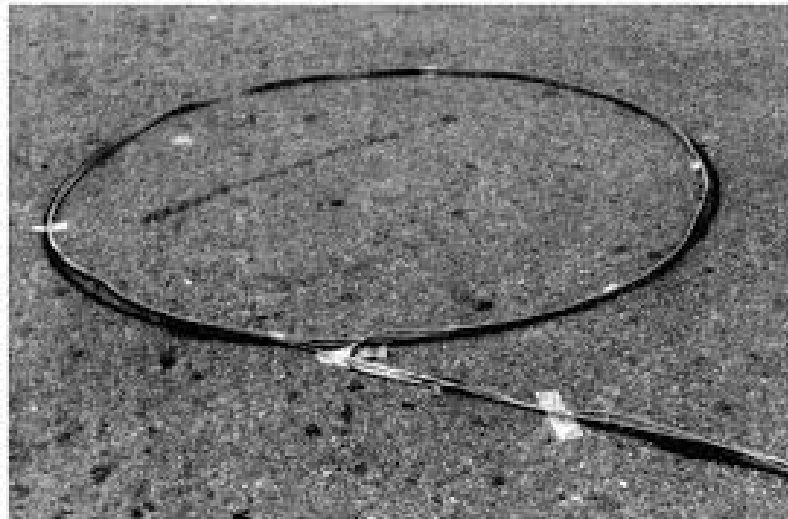


Tech. >50%

1970's – *Arterial* Traffic Management



1980's – Freeway Traffic Management



**Traffic Detection
“loops”**



**Electronic
Message
Signs**

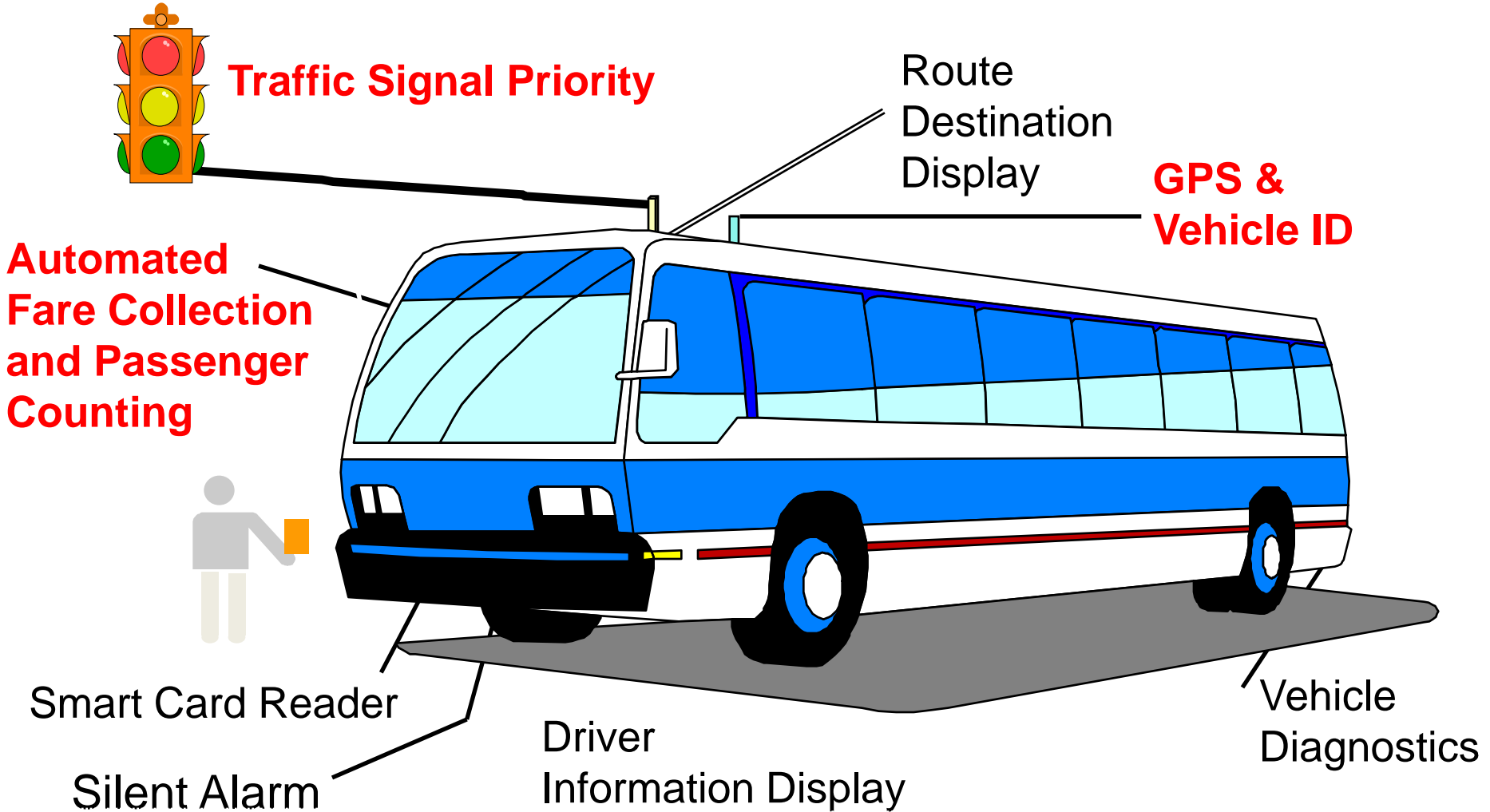


**Ramp
Meters**

1990's – Traffic Management Centers



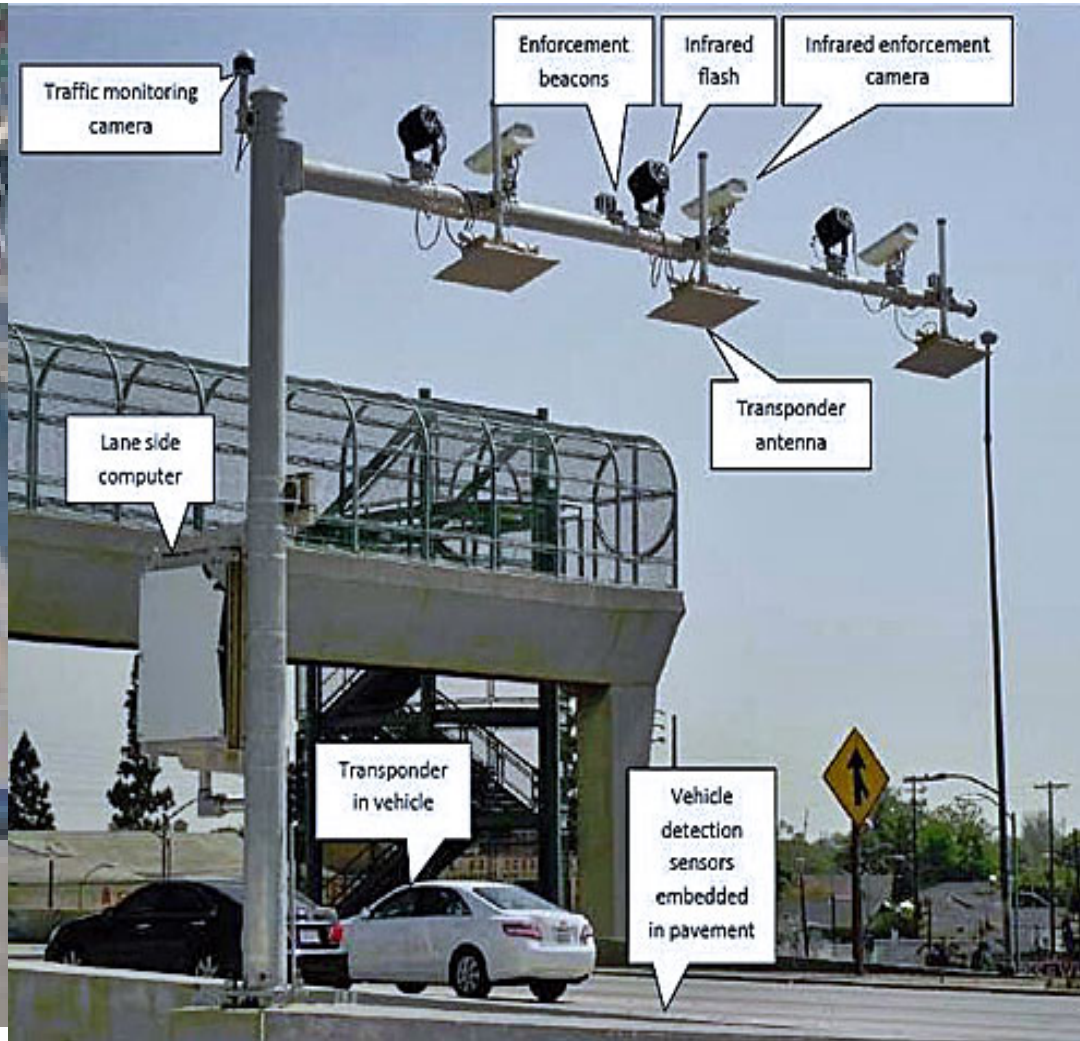
2000's – “Smart Bus” Systems



2000's – Traveler Information

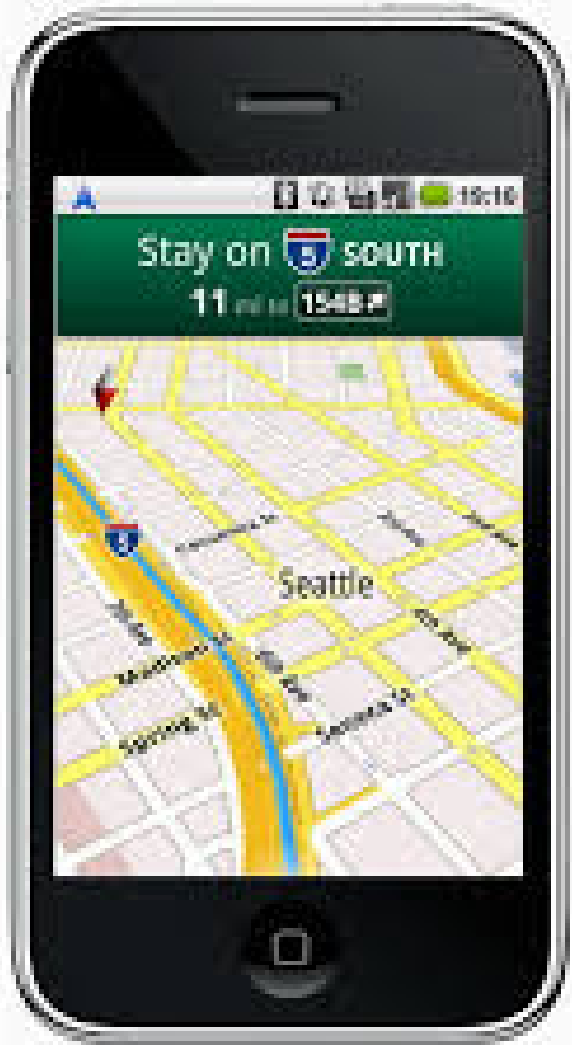


2010's – Electronic Tolling & HOT Lanes



2010's – Mobile Devices

Traffic & Navigation



Parking Info & Guidance



Ride-Hailing & Carpooling



Conclusions:

- 1. ITS projects require higher levels of integration
– multimodal, multi-agency, human users, etc.**
- 2. Rapid technology change (e.g. mobile, cloud,...)
→ Software requirements much more complex,
plus much greater uncertainty/unpredictability**
- 3. Software development must be managed for:
Cost, Schedule, Performance ... plus more**
- 4. Software has become critically important to ITS
→ New software methods *may* be needed.**

4. SE “V” Process Began in Aerospace; Now Widely Used in ITS

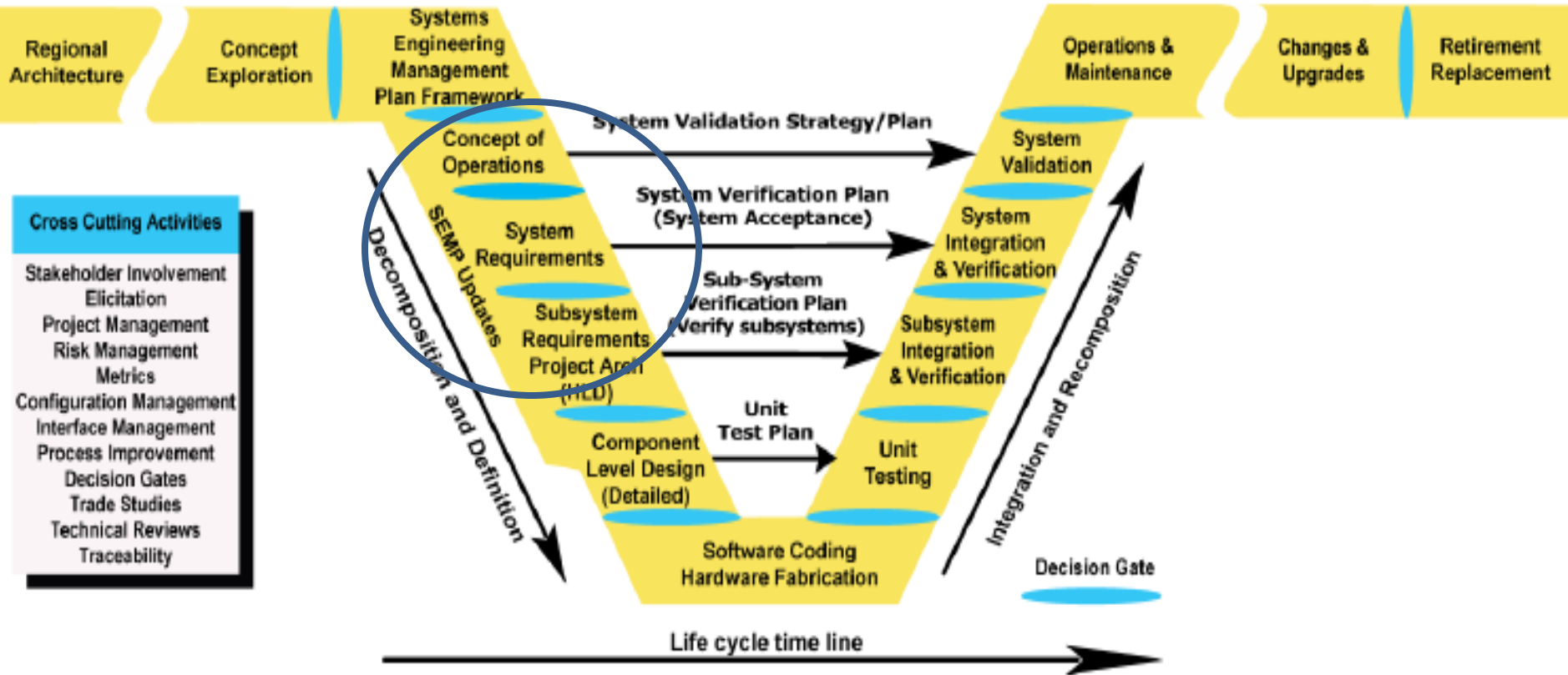
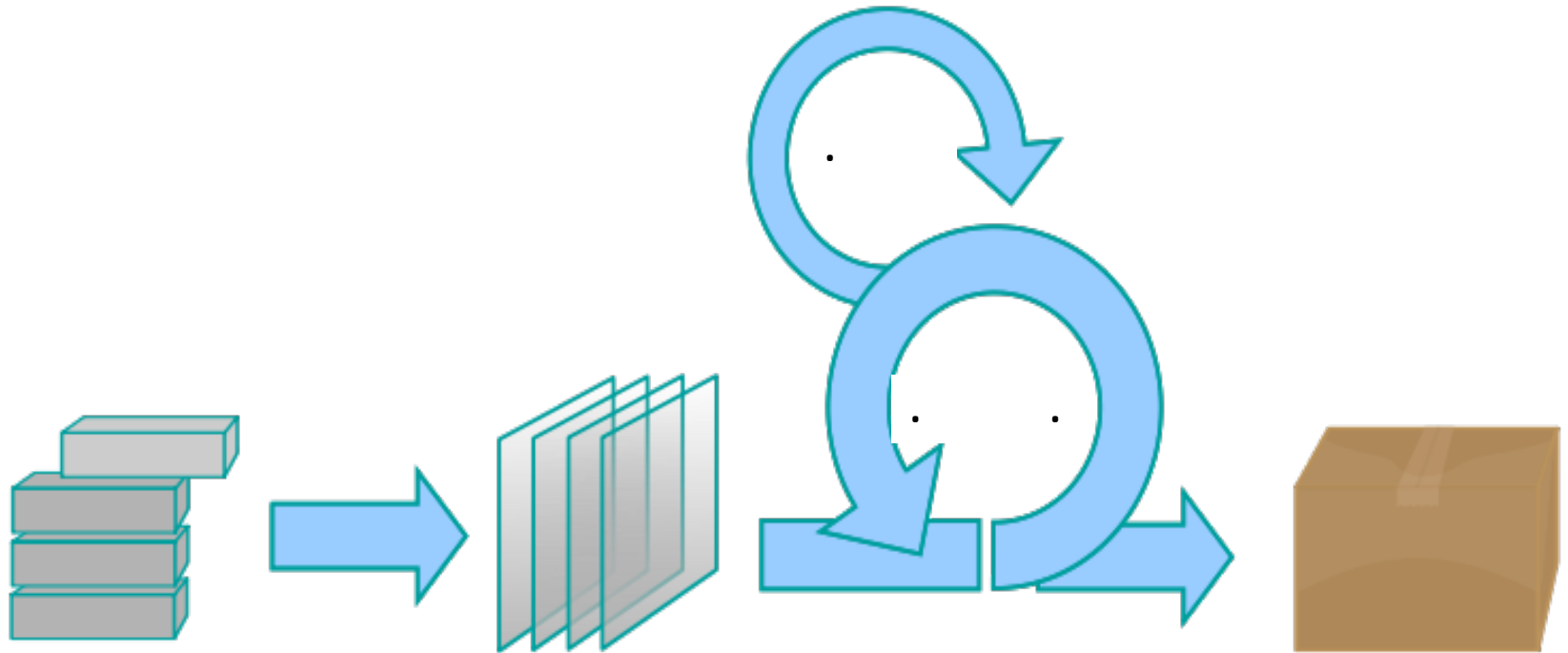


Figure 1-2 ITS Project Life cycle Phases and the Life cycle Tasks in this Guidebook

Human & new-tech requirements hard to foresee.

5. Agile Software Process More Flexible

- More Feedback, Many Iterations



Phyllis will describe this Agile Process next ...

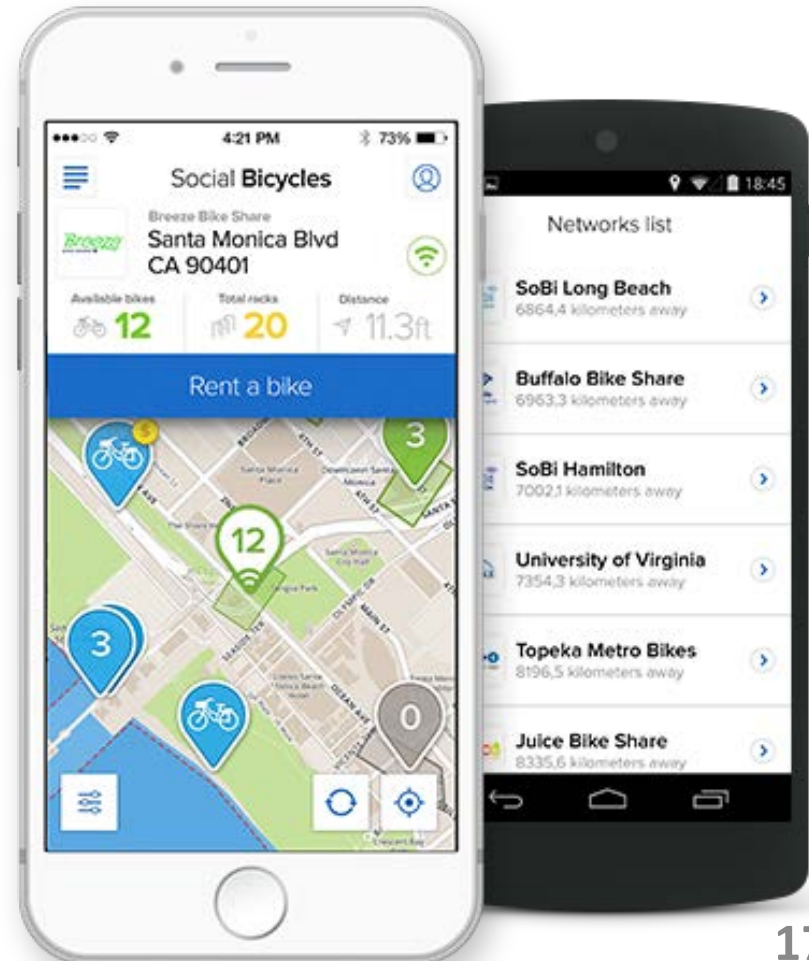
6. *Final* Comments

1. ITS projects require higher levels of integration
– multimodal, multi-agency, human elements
2. **Software is critically important to ITS success**
3. **Software projects must be managed carefully**
→ Cost, Schedule, Performance, Reliability
4. **New software methods are available** – require learning new concepts and terminology.

Phyllis Marbach will describe these methods next, then Ed Fok will discuss ITS examples.

Phyllis will use a “Bikesharing” Example Project:

3rd-Generation Bikeshare --> “Any-to-Any”



Typical Bikeshare Use-Cases ...

First-Mile / Last-Mile



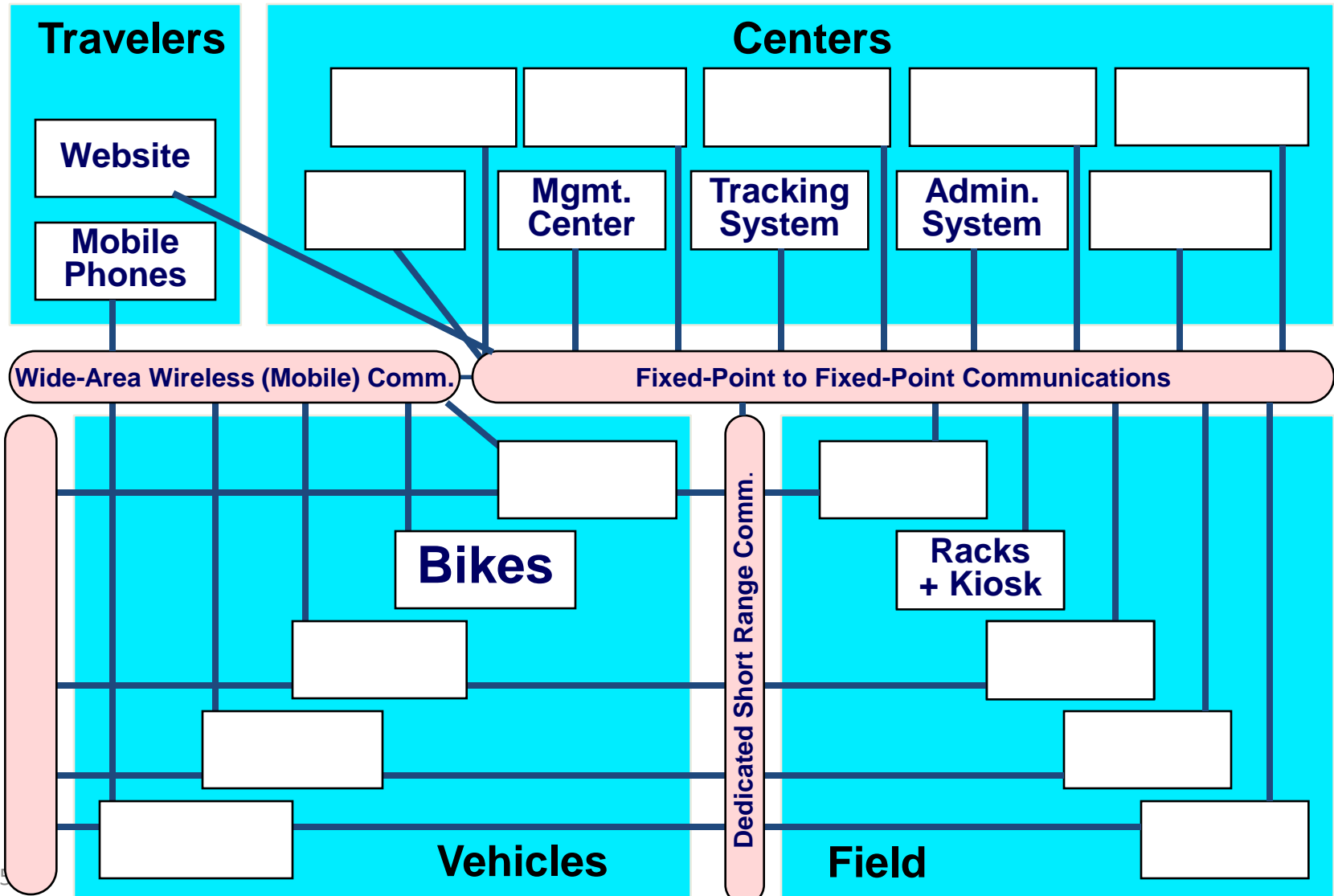
Recreation ... etc.



Bikes have GPS, Cellular Comm., RFID Reader, Solar/Battery, e-Lock, etc.



Bikeshare Project Architecture



Phyllis Marbach will now describe:
-- Agile S/W Development Process
-- Role of S.E. in the Agile Process

