

# Waste Container Analysis

*UMKC SCE SP17 Hack-A-Thon*



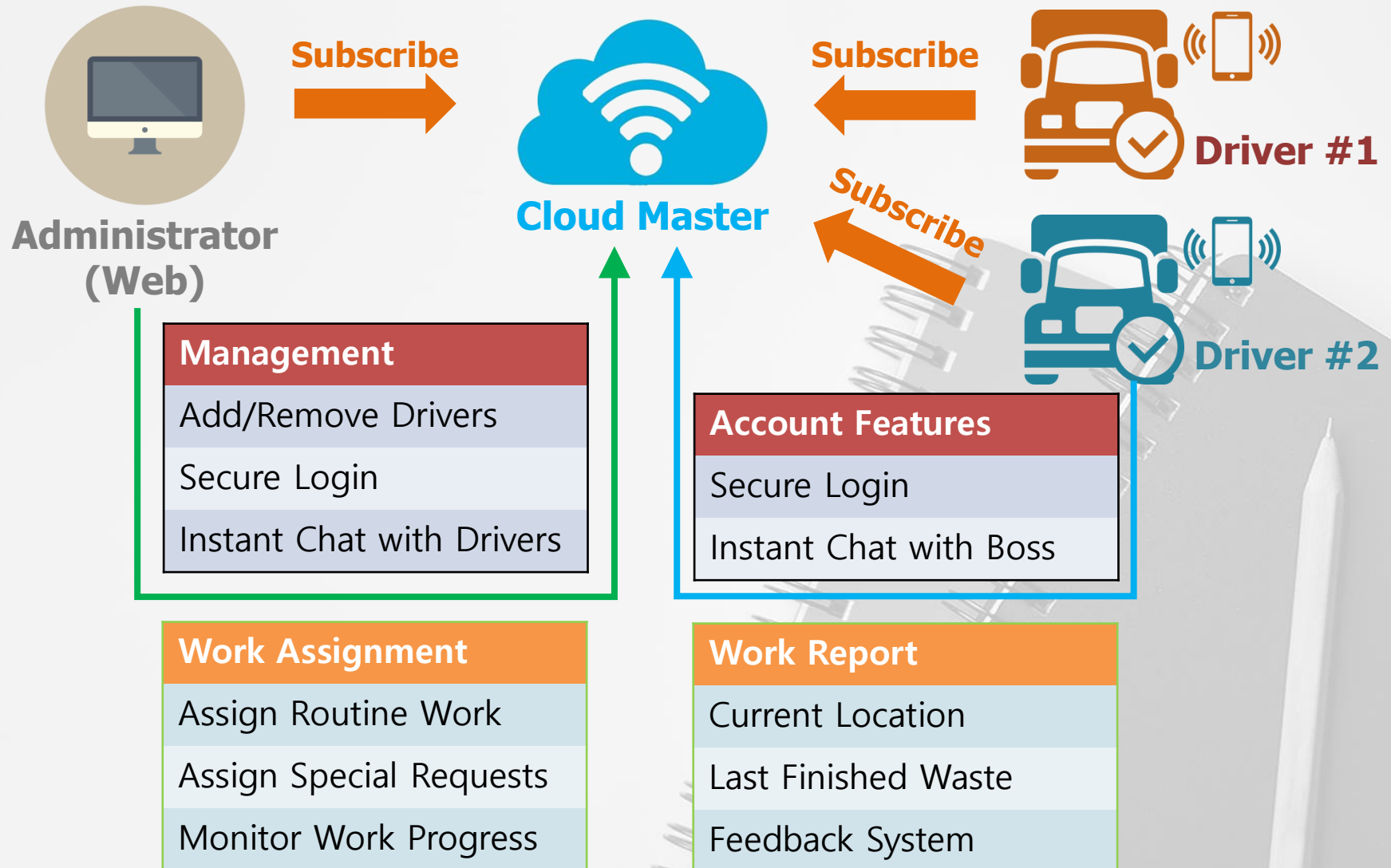
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Use Case Provided by

**UMKC SCE**

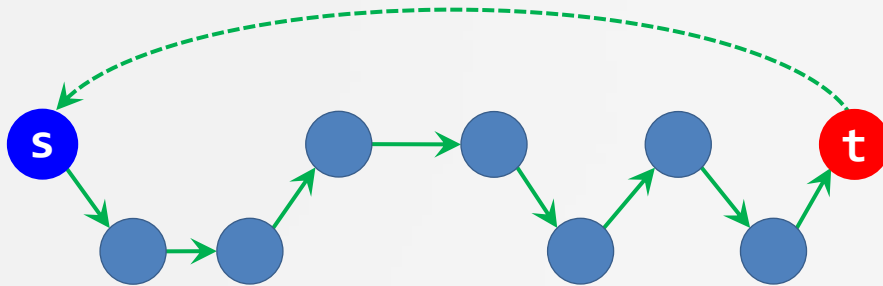
# System Architecture - Web Master and Mobile Terminal

How truck driver (mobile) and supervisor (web) instantly exchange info?



# Algorithm - Engine of “Sky Defender”

Research: how to determine an optimal schedule (shortest path)?



**s** Location of the Company  
**t** Hazardous Waste Center

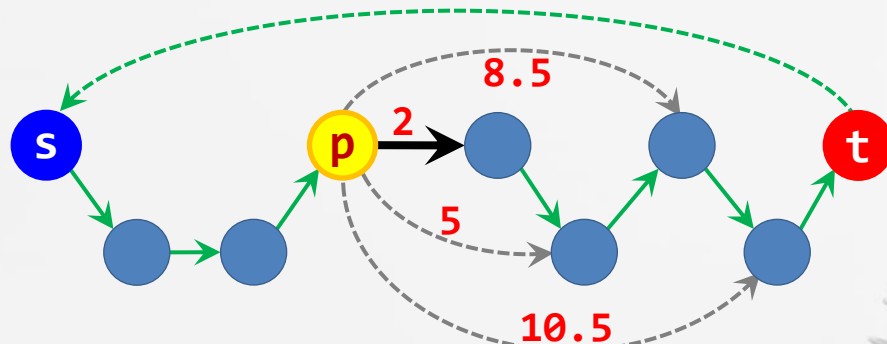
Equivalent Theoretical Model  
“In a complete graph, find a shortest Hamiltonian path from s to t.”  
This is an NP hard problem. We need to find Approx. algorithm.

## The Nearest Neighbor Algorithm

Time bound by P,  $O(n^2)$ .

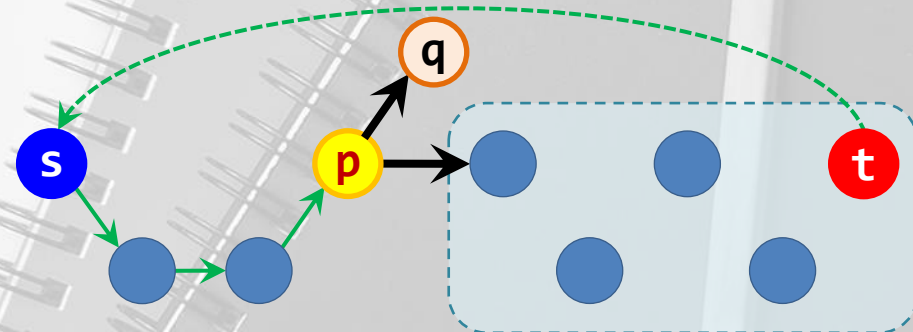
Approximation = 2  
(Less than  $2 * \text{MST}$ )

In each step, choose the nearest node to move.



3

Compare shortest edge with “new edge”.



Determine “old way” after adding new node.

# System Features - Multi-Platform Implementation

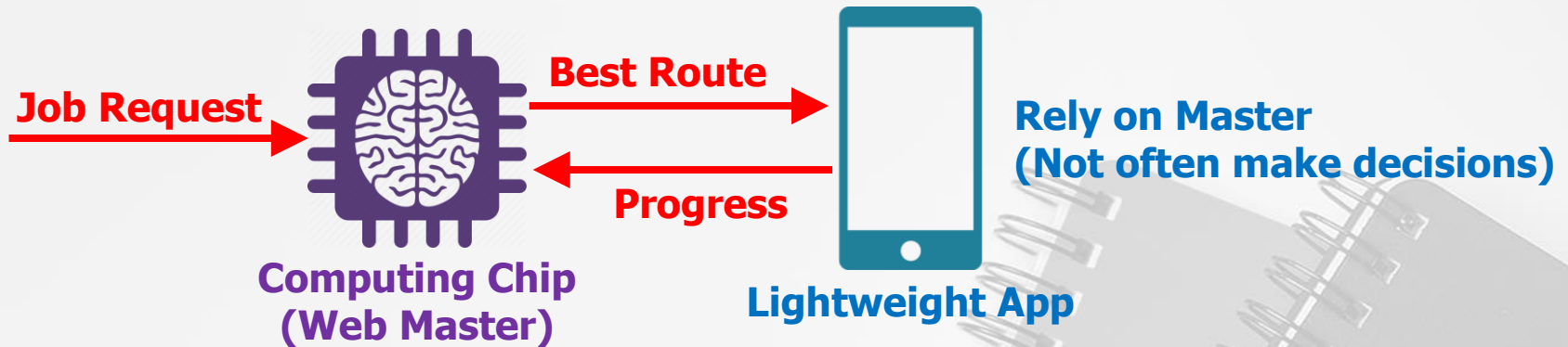
## Features, Applied APIs, Frameworks, and Platforms

Web Application	Android Application
→ Secure Login for Administrator	→ Secure Login for truck driver
→ Register for new drivers	→ Receive tasks instantly
→ Remove drivers	→ Real-time monitoring job progress
→ Send/Receive instant messages to/from active drivers	→ Send/Receive instant messages to/from administrator
→ Get driver's current location	→ Update location information
→ Google Map showing regionalized waste container locations	→ Google Map showing information of the next waste station
→ Google Map showing real-time drivers' locations	→ Google Map showing real-time route to the next waste station
→ Assign routine/special job task to certain drivers	→ Automatic synchronization of job completion info with administrator
→ Powerful computation of optimal driving routes	→ Lightweight application build on the Ionic Platform

# Significance, Innovations of the System

How system can react “smart” in practical scheduling work?

## More Supportive Master for Truck Drivers



## Visualization of Real-Time Route Information



Updates are projected simultaneously to both the mobile terminal and the web master.

## Seamless Instant Message Exchange

Instant message application seamlessly built in.

